The Effects of Peer Monitoring on Observational Stimulus Control in Preschoolers With and Without Social Delays; In-Vivo Versus Video and Learning Versus Performance

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ABSTRACT

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Two experiments were conducted to test the effectiveness of a peer-monitoring procedure on the induction of observational learning and observational performance of preschoolers via a combined experimental-control group design with a “nested” multiple probe across participants design (Greer & Du, 2015; Greer, Stolfi, & Pistoljevic, 2007). Six participants in Experiment 1 were split into matched pairs; one participant in each pair was assigned to the in-vivo condition, and one assigned to the video condition. All were assessed on their correct responding to in-vivo observational learning and performance probes prior to and following the peer-monitoring intervention. The peer-monitoring intervention consisted of two stages; the first was a training stage, in which participants monitored responses of peer confederates that were previously in their repertoire, and the second stage required participants to monitor responses not in their repertoire. The results of Experiment 1 showed that five of the six participants demonstrated that they had observational performance following the intervention. However, the emergence of the observational learning capability was only found with participants originally assigned to the in-vivo intervention condition. Upon completing the intervention again, but in the in-vivo condition, all participants originally assigned to the video intervention condition did demonstrate observational learning. In Experiment 2, the same procedures were implemented, however the observational performance and learning pre-and post-
intervention probes were conducted in both the video and in-vivo conditions. In addition, I also tested the effects of the peer-monitoring procedure on the emission of social contact in a free play setting between experimental conditions. The findings remained constant in Experiment 2; the video condition was not effective in inducing observational learning, but was for observational performance. Therefore, the peer-monitoring intervention led to the emergence of observational performance, but the presence of a peer audience was required in order for observational learning to emerge. Furthermore, participants originally assigned to the in-vivo condition emitted higher numbers of social contact in a free play setting than the participants originally assigned video condition.
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Bianca M. Vassare
DEDICATION

This is dedicated to all my former students that I had the pleasure of teaching, though they taught me just as much if not more! Thank you for always reminding me that I have chosen the right profession.
CHAPTER I
INTRODUCTION AND REVIEW OF LITERATURE

Introduction

The impact of others on individual human and non-human behavior has been prominently studied across many scientific disciplines, demonstrating the significance of observing others and being in the presence of an audience. These behaviors are types of verbal, or social behavior, and have enabled individuals to increase correct responding in regards to both learning and performance skills. Though there have been numerous theories on the development of social behavior, behavior analysis has provided the most extensive and objective data as to how this behavior emerges, and its placement in a more comprehensive view of overall verbal behavior. I will expand on the research related to social behavior, observational learning, the role of an audience, and its relation to verbal behavior development.

Observational learning, though explained differently in the social, cognitive, and behavior analytical fields, plays an essential role in education, especially the education of children with disabilities (Greer, 1994; Greer, Singer-Dudek, & Gautreaux, 2006). Unfortunately, much of this research has focused on the behavior changes after this capability has emerged, and not on interventions that can induce it. Acquiring this capability not only enables individuals to learn indirectly from others, it also allows them to learn in various settings without direct instruction (Greer & Ross, 2008). Though the presence or absence of this capability is often seen as phylogenetic, it can be learned, as research in behavior analysis has shown (Greer, Singer-Dudek, & Gautreaux, 2006). Inducing this capability with children diagnosed with disabilities can better prepare them
for a more mainstreamed education, such as an inclusive teaching environment. After the observational learning repertoire has been established, teachers and other educational professionals can alter the way they now teach these individuals, which increases overall instructional time and acquisition rate across students. The extensive evidence-based research related to observational learning continues to support the idea that individuals can acquire new operants, performance skills, and conditioned reinforcers through observational procedures, which have significantly contributed to both the academic and self-management gains of children.

**Review of literature**

**Social Learning with Non-Human Animals**

Many other researchers sought to study the effects of observational learning on behavior, not solely with human animals but non-human animals as well. In 1944, Herbert and Harsh conducted an experiment to determine whether cats could acquire performance skills through observation. The subjects observed other cats either completing five separate tasks with a high percentage of accuracy, or observed the trial and error process during which the other cats were attempting to learn the specified skill. Findings from this study demonstrated that not only did the cats acquire more skills when they observed the learning process as opposed to the correct presentation of the skill, but that the subjects also acquired more performance skills after observing a higher frequency of incorrect responses emitted by the other cats during the learning process (Herbert and Harsh, 1944). These results were later supported with school-age students in a study conducted by Neu (2013).
Results from Herbert and Harsh (1944) were further supported by Corson in 1967, who found that rats also demonstrated the ability to learn through observation. Corson (1967) compared the acquisition rate of learning to press a level for food access between rats who were taught via a shaping procedure and rats who were taught through an observational procedure. Although the rats assigned to the observation condition did not observe all errors made by the rats they were observing, it was found that the rats who acquired the skill of assessing food from the lever following an observational procedure learned at a substantially faster rate than the rats who acquired this skill through the shaping procedure (Corson, 1967). These findings suggest that observational learning is not only effective for animals to acquire skills, but may also be a faster method of learning than other procedures.

Godin and Dugatkin (1996) found that invertebrates also alter their behavior upon observation of others. Typically female guppies, a common species of freshwater fish, mate with male guppies that have bold coloring (Dugatkin, 1996). However after observing female guppies mate with dull colored male guppies, more female guppies tended to mate with male guppies that displayed dull coloring (Dugatkin, 1996). Though Godin and Dugatkin attributed these findings to behavior changes, behavior analysts later determined that the results of this study were a function of the change in reinforcement (Greer, Singer-Dudek & Gautreaux, 2006). Therefore, the reinforcement of the female guppies shifted from mating preference of bold coloring to a mating preference of dull coloring following the mating observation. Research related to social learning of other species continues to expand, demonstrating that learning through observation results in changed behavior across many different organisms.
Vicarious Conditioning and its Relation to Bandura’s Social Learning Theory

Bandura, a social-cognitive psychologist, described vicarious conditioning as a means of learning in his social learning theory, defining it as the emotional behaviors of an individual or group having an effect on the emotional behaviors of another (Bandura, 1977; Berger, 1962; Craig & Weinstein, 1965). This vicarious conditioning occurred in Craig and Weinstein’s (1965) study, where participants were told that shocks would be administered to their peers upon their (the peers) incorrect responding. The “learning” of the participants, or observers, was not measured in this study. The participants who observed their peers consistently emit incorrect responses had substantially higher levels of arousal than other participants that either observed peer confederates successfully respond to the task, or were aware that shocks would be delivered upon incorrect responding. From a social-cognitive perspective, these results suggest that the participants learned to emit more emotional responses after being aware of the potential risks that were imposed on the individuals they were observing. However, a behavioral explanation of these findings is simply that the implementation of a variable schedule, and not participants’ “awareness” was responsible for the behavior change.

Bandura conducted a follow-up study related to vicarious conditioning, which supported prior research that found that not only can emotional responses be conditioned through observing others, but observing the consequences of others’ behaviors can also have an effect on the observer’s future behaviors (Bandura, 1965). This analysis of behavior change was similar to that of Kazdin’s (1973) definition; vicarious reinforcement occurs when “the behavior of the observer is altered in the same direction as that of a reinforced model.” (Kazdin, 1973, p. 71) In Bandura’s follow up study,
children observed adults via a video playing with a doll aggressively, however, the participants either observed the adults being rewarded, being punished, or receiving no consequence for their aggressive behaviors (Bandura, 1965). Findings demonstrated that children who observed adults receiving reinforcement for their aggressive behavior emitted more aggressive behaviors with the doll themselves, whereas children who observed adults get punished for aggressiveness emitted fewer aggressive behaviors than the former group, in addition to the group who observed no consequences being delivered to the adult (Bandura, 1965). This continues to support Bandura’s social learning theory, and incorporates the role of observed consequences in human learning.

Though Albert Bandura understood the role others play, particularly in regards to observation and modeling and their effect on individual behavior, he failed to provide further explanation as to how social learning fits into a larger scope of development. Not only are observing responses social, they are emissions of verbal behavior. For the remainder of this paper, social learning through observation will now be referred to as “observational learning,” as the act of observing in itself is social.

**Observational Learning among Individuals**

The term observational learning has been used since the mid 1960s, and many individuals have sought to analyze this type of learning in multiple ways. In 1979, Varni, Lovaas, Koegel, & Everett wanted to test the effectiveness of observational learning on children who were either diagnosed with autism or were typically developing. These participants (N=30) ranged from the ages of one year to 16 years of age, and the findings of this study demonstrated that the children who were typically developing acquired more performance skills through observation than their autistic peers (Varni et. al., 1979).
These results suggested that there may be certain prerequisites needed to for observational learning to occur, such as conditioned reinforcement for 2D and 3D stimuli, and peer attention (Byers, 2016; Varni et. al.). Yussen (1974) also found “attention” to be a variable that affected observational learning, as well as age, proposing that as children get older, their recall and attention to the behaviors of others increases. The participants who emitted more attentive behaviors during the study also emitted more correct responses to the tasks that they were observing (Yussen, 1974).

Griffen, Wolery, and Schuster (1992), examined the effects of observation on the acquisition of performance tasks taught to the peer confederates. The tasks that participants observed were a series of three task analyses that included chained steps of how to make three different snacks. Prior to the observation, none of the target participants were able to successfully complete the steps within each of the three task analyses, however, after observing their peers receive instruction on the three chained tasks, all participants were able to complete 89% to 100% of the task components (Griffen, Wolery & Schuster, 1992). These results demonstrated that the participants were able to acquire the skills of three tasks without being directly taught to do so. Vinter and Perruchet (2002) found observation to be effective in emitting performance skills as well; both children and adults were able to indirectly learn how to draw figures simply after observing their peers draw each figure step by step. Research has also shown that children can also acquire more complex self-management skills such as self-editing behaviors via observation as well (Zimmerman & Kitsantas, 2002).

New repertoires have been acquired by observation; Ramirez and Rehfeldt (2009) conducted a study in which the participant acquired and maintained Spanish symmetric
relations following the observation of a peer learning them via instruction. However, it is important to note that in these studies, observational learning was already in repertoire for participants, thus, observational learning was not induced following these observational interventions.

**Testing Observational Learning as a Capability**

In spite of the research outlined above that supports observational learning as an effective method for increasing target behaviors or learning new behaviors, none of the above studies showed functional relationships between an observational intervention and the emergence of the observational learning capability. To clarify, observational learning did not function as a dependent variable, which would have consisted of measuring the ability to learn indirectly through the observation of others’ consequences, both before and after the intervention.

Some researchers have attempted to measure responses emitted by participants after observing behaviors of others during an observational intervention, but did not measure their responses prior to the implementation of the intervention (Greer, Singer-Dudek & Gautreaux, 2006). Studies that did include pre-intervention and post-intervention data did not conduct a post-intervention assessment using novel stimuli; therefore the emergence of the observational learning capability was not measured, though the effectiveness of an observational intervention involving a particular skill may have been. In order to determine whether the observational learning capability has been induced, and subsequently enable students to learn in new ways, researchers must measure participants’ responses to observed behaviors before, during, and after the observational intervention, in addition to using novel stimuli during each probe session.
This observational learning capability is part of a larger trajectory of cusps and capabilities that extensively outline verbal behavior development.

**Verbal Behavior Developmental Theory**

The Verbal Behavior Development Theory outlines the path of how individuals ultimately become truly “verbal,” or at the point where a bidirectional relationship between listener and speaker responses (speaker-as-own-listener) is established (Greer & Speckman, 2009). This theory encompasses several cusps and three capabilities (generalized motor imitation, naming, observational learning) in order of their emergence during development. Cusps refer to new behavior changes, and capabilities are behaviors that enable individuals to learn in new ways (Greer & Ross, 2008; Rosales-Ruiz & Baer, 1996).

The pre-listener repertoires that are the foundation of verbal behavior are often developed very early in the life of an individual; voices heard by a fetus in-utero function to select out initial instances of this social behavior (Greer & Keohane, 2006). Once a child is born, pre-listener cusps include having faces and voices function as conditioned reinforcers, in addition to visual stimuli (both 2D and 3D). After the onset of these pre-listener cusps, one can then assess to see whether listener cusps and capabilities are in repertoire, such as auditory matching, basic listener literacy, and generalized matching. At this point, the listener component of being “verbal” has been mastered, however, emitting appropriate echoics, independent mands/tacts, and the transformation of stimulus function across these verbal operants completes the speaker half of “verbal.” However, in order to be fully verbal, these listener and speaker components must join to
become a higher order operant, as opposed to two separate ones. This key component of verbal development is also known as the naming capability.

Naming, or speaker as own listener behavior, refers to the verbal capability of learning incidentally (Greer & Longano, 2010). In other words, an operant taught as a listener response can also result in a related speaker response without that particular response being directly taught. Both multiple exemplar instruction and stimulus-stimulus pairings have been effective interventions to induce this capability (Greer, Stolfi, & Pistoljevic, 2007; Longano & Greer, 2006). In these interventions, having conditioned reinforcement for both auditory and visual stimuli was essential in joining the speaker with the listener behaviors (Longano & Greer, 2015).

After the naming capability has been induced, an individual can then progress to more advanced verbal behavior cusps and capabilities, such as the observational learning capability, in which individuals learn simply through observing the consequences received by peers. The induction of these capabilities enable individuals to learn without direct instruction and in novel ways, in addition to doing so at a higher acquisition rate than before.

**Research on the Emergence of Observational Learning**

As mentioned above, observational learning functions as both a cusp and a capability in the Verbal Behavior Developmental Theory, therefore once induced, changes the way individuals can acquire academic and performance skills, in addition to acquiring conditioned reinforcers (Greer & Ross, 2008). In 1998, Catania defined observational learning as “learning based on observing the responding of another organism (and/or its consequences).” (Catania, 1998, p. 399). In behavior analysis,
observational learning does not only involve observing the behavior of another, but also the consequences that the other individual obtains, such as reinforcement or punishment.

Greer, Singer-Dudek, and Gautreaux (2006) outlined three types of observational learning that can be induced and exhibited in individuals, and they include observational learning of new operants, of performance, and of conditioned reinforcement for stimuli. All three types of observational learning involve directly observing the consequences of others, consistent with Catania’s (1998) definition.

Observational learning of new operants refers to learning higher order operants that were not previously in the individual’s repertoire (Greer, Singer-Dudek, & Gautreaux, 2006). Davies-Lackey (2005) tested the effectiveness of a peer-yoked contingency game board on the emergence of observational learning for new operants, in which participants received tokens for their team based on both peers emitting correct responses to math facts. Prior to this intervention, the participants were unable to acquire textual responses by observing their peers receive reading instruction, however following the peer-yoked contingency, the participant acquired novel textual responses from observing their peers (Davies-Lackey, 2005). Peer-yoked contingencies were also found to induce the observational learning capability in Stolfi (2005), as participants emitted correct responses to picture stimuli following the intervention. Findings from a study conducted by Neu (2013) further supported research on observational learning of new operants, and also found that individuals acquire new repertoires at a faster rate when observing correctional procedures after the emission of incorrect responses as opposed to solely observing reinforcement delivery upon correct responding.
The second type of observational learning, acquiring performance skills through observation, has also shown to be effective in enhancing performance repertoires of individuals. Decades of studies have demonstrated that observational learning can function as a teaching strategy to acquire both new operants and performance behaviors. Gold (2013) found that observational learning, observational performance, and naming were induced following a peer-yoked contingency intervention. Additional findings from this study also determined that the presence of a peer during the probe sessions substantially affected the responses emitted by participants (Gold, 2013).

Data from Greer and Singer-Dudek (2008) showed that plastic discs became conditioned reinforcers after participants were denied access to these originally neutral stimuli, showing that observational learning can also function to condition stimuli. These findings remained consistent in a study conducted in 2008, in which pieces of string that were neutral stimuli prior to the observational learning intervention became conditioned reinforcers for all participants during learning and performance tasks (Singer-Dudek, Greer, & Schmelzkopf, 2008). Moreover, vocal praise has functioned as a conditioned reinforcer for participants in regard to both learning and performance tasks following an observational intervention (Greer, Singer-Dudek, Longano, & Zrinzo, 2008). Singer-Dudek, Oblak, and Greer (2011) produced similar results, in which children’s books became conditioned reinforcers following an observational intervention, which consisted of the target participants being denied access to books while their peer confederates were given them. Research related to observational learning continues to be conducted, and how effective it has become in the realm of teaching remains significant across a variety of participants, settings, and behaviors.
The Role of the Audience

Observational learning requires other peers to be present during the intervention, as they function as an audience for the participants. Research from various scientific approaches appears to acknowledge the effect the audience has on an individual’s behavior. This audience effect was first observed by Triplett (1898), where participants cycled at a much faster rate when competing against their peers as opposed to when they were timed by a clock. Neuroscientists propose that when in the presence of an audience, implicit cognitive processes occur, which vary based on population descriptors such as age, culture, and level of cognitive development (Hamilton & Lind, 2016). The medial prefrontal cortex has been associated with this covert behavior in fMRI scans; Somerville, Jones, Ruberry, Dyke, Glover, and Casey (2013) found that adolescent participants (N=69) when told they were being observed by a peer live via a video camera, showed substantial increases of activation in this area of the brain then during times in which they were told that the video camera was off, or in the process of being powered on. However, drawing conclusions on audience effect from the neuroscience approach is difficult, as many audience scenarios incorporate other cognitive components, such as fear, reward processing, and morality, which all relate to other parts of the brain (Hamilton & Lind, 2016).

Individuals who attempt to provide cognitive explanations call the presence of this audience "social facilitation," and theorize that the behavior change is a function of the speaker "wanting" to conform to the norm (Guerin, 1986). Those who comprise a child’s “audience” in social settings often vary; audience members could be parents or novel adults, peers, or even those who emit few vocal behaviors, such as infant siblings.
Research has been conducted to investigate the impact of these different audiences on children’s behaviors, and findings have remained inconsistent as to the effects peers have on behavior as opposed to an adult audience. Findings from Martin, Gelfand, and Hartmann (1971) showed that following the observation of aggressive behavior by an adult model, children who served as participants emitted more aggressive behavior in a free play setting when a peer was observing them than when they were observed by an adult. In this particular study, no consequences were given to either the adult model displaying the aggressive behavior, or to the participants during the free-play observation period. Fantuzzo, Jurecic, Stovall, Hightower, Goins, and Schachtel (1988) also measured the differences between peer and adult audiences on behaviors, specifically, positive social behavior. They found that participants assigned to the peer group dyad condition substantially increased their positive social behavior following the intervention compared to their peers who were assigned to the adult or control group dyad conditions (Fantuzzo et al., 1988). This was similar to the results of Ledford and Wolery (2015), who found that following small group instruction with other peers, participants increased their prosocial behavior, such as sharing, across instructional and non-instructional settings. Additionally, peers who were viewed as a “supportive” audience were shown to have a positive effect on the emission of correct responses to a performance task by participants (Butler & Baumeister, 1998).

In behavior analysis, an audience, or listener, is necessary in order for verbal behavior to be maintained, as it serves as a discriminative stimulus for reinforcement upon the emission of verbal behavior (Skinner, 1957). The behavior of the audience can predict future behaviors of an individual playing the role of the speaker; therefore, there
are positive audiences, which reinforce high emissions of verbal behavior, and negative audiences, who punish or fail to reinforce verbal behavior (Skinner, 1957). The frequency of reinforcement delivered by the audience determines the overall strength that particular audience has over the listener's behavior. Research analyzing the presence of peers on the verbal behavior of children has consistently demonstrated that peer audiences increase verbal operants, or social contact, of participants. Donley and Greer (1993) found that conversational units, defined by Lodhi and Greer (1989) as two consecutive rotations between listener and speaker responses by two individuals, substantially increased when the teacher was absent from the room, and decreased when the teacher was present. This data showed that the presence or absence of a negative audience could affect the strength of an originally neutral audience (Donley & Greer, 1993). A peer-yoked contingency and social listener reinforcement (SLR) protocol have also yielded high emissions of verbal operants following the completion of these interventions (Baker, 2014; Vogt, 2009). Furthermore, it was found that participants in the SLR condition increased their emission of social contact substantially more than their peers who were assigned to the video modeling condition (Baker, 2014). Peer presence has also functioned to condition neutral stimuli as reinforcers through observation; Singer-Dudek and Oblak (2013) found that toothpicks and string became conditioned reinforcers for participants only after a peer was present during the intervention. An extension of this study was conducted by Baowaidan (2016), whose findings not only supported those by Singer-Dudek and Oblak (2013), but also demonstrated that participants showed an increase in peer observing responses, self-initiated social interactions, reciprocations to peer-initiated social
interactions, and vocal/non-vocal mands following the observational intervention to condition reinforcers.

**Peer-Monitoring, Modeling, and Tutoring**

Due to the strong effects of peer presence on social, performance, and learning outcomes, tactics that incorporate peer involvement have been extremely successful. Though instructors often use direct instruction to teach performance tasks and academic skills, there are alternatives that can be used to teach or establish these repertoires (Fowler, 1986). One of these alternative teaching strategies is the implementation of peer-monitoring, which enables a peer confederate to observe and record data on the behaviors of another peer. This tactic has been analyzed in several research studies, and the effectiveness of peer-monitoring continues to remain consistent across a variety of educational fields. Peer-monitoring was first found to be effective in reducing inappropriate performance behaviors, such as inappropriate social interactions, and disruptive classroom behaviors (Dougherty, Fowler, & Paine, 1985; Fowler, 1986).

Dougherty, Fowler, and Paine (1985), conducted a study in which adult and peer monitors were implemented in a playground setting to observe and record their peers’ inappropriate social behaviors. After the first target participant was exposed to adult, peer, and self-monitoring conditions, a decrease in inappropriate social behavior on the playground was observed and recorded (Dougherty, Fowler, & Paine, 1985). Following this, this participant was then required to play the peer-monitor role for another target participant. Results from this study demonstrated that the first participant substantially reduced his inappropriate social behavior after completing the role of a peer monitor, therefore suggesting that peer-monitoring also has a positive effect on the peer monitors.
themselves, and not just on the target participants (Dougherty, Fowler, & Paine, 1985). Fowler (1986) had similar findings, in which three participants substantially decreased their disruptive and non-participative behavior in the classroom following their role as peer monitors for other students (Fowler, 1986). Peer tutors were also shown to increase academic skills; Greer and Polirstok (1982) examined the effects of increased social reinforcement during peer tutoring sessions on on-task behavior and reading scores of participants. They found that not only did the tutors’ reading scores and on-task behaviors increase when delivering approvals to their peers, but that the tutees’ behaviors increased upon the delivery of positive reinforcement from their peers (Greer & Polirstok, 1982).

Peer modeling is another tactic that has also been extensively researched, and it involves a peer observing another, with the intention of imitating the peer’s behavior. Peer modeling has been shown to increase academic achievement with students diagnosed with disabilities. Egel, Richman, and Koegel (1981), studied the effects of peer modeling on the emergence of acquisition tasks for four young children diagnosed with disabilities. After their participants observed the correct responses of their peers, the number of the correct responses emitted by the target participants substantially increased, and in addition, their correct number of responses emitted remained at a high level during subsequent acquisition sessions in which peer models were no longer present (Egel, Richman, & Koegel, 1981).

Greer, Keohane, Meincke, Gautreaux, Pereira, Chavez-Brown, and Yuan (2004) summarized their compilation of findings on peer tutoring, stating that in order for peer tutoring to be effective, learn units (Greer, 2002) must be in place to ensure that individuals (both the tutor and tutee) are learning from the consequences of the behaviors,
in this case verbal vocal responses, of their peers. The learn unit, “a countable unit of teacher and student interaction,” (Greer & McDonough, 1999, pg. 6) occurs during instruction, and consists of presenting a vocal or non-vocal antecedent, a behavior emitted by the other individual, and consequence for that behavior (reinforcement or correction). The studies described within Greer et. al. (2004) also demonstrated that students playing the tutor role can learn the skills that they are teaching to the tutee through multiple exemplar instruction, and that peer tutors can also acquire writing skills as a function of teaching the tutee.

Gautreaux (2005) demonstrated that academic skills can also be acquired through peer tutoring. In this study, eight participants were selected to be peer tutors for their classmates, and monitored and consequated their peers’ responses to math instruction. Prior to the peer-monitoring/tutoring intervention, none of the target participants emitted correct responses to the related math rules and problem-solving skills, however following the peer tutoring sessions, all participants emitted a higher number of correct responses to the math rules that they were responsible for teaching to their peers (Gautreaux, 2005). Moreover, studies conducted by Davies-Lackey (2005) and Stolfi (2005) showed that peer-yoked contingencies also functioned to enable participants to acquire academic repertoires. These findings suggested that peer tutoring could induce observational learning for new operants (Davies-Lackey, 2005; Gautreaux, 2005; Stolfi, 2005). Pereira-Delgado (2005) used a peer-monitoring procedure to induce observational learning; results demonstrated that the participants emitted correct responses to textual and pictorial stimuli that were not originally in their repertoire as a function of observation. These results were later supported by Delgado and Greer (2009), who also found a
functional relationship between peer-monitoring and the emergence of the observational learning capability.

Incorporating peers into teaching strategies have also shown to substantially enhance performance tasks, such as appropriate social skills and task analyses. Wolery, Ault, Gast, Doyle, and Griffen (1991) paired participants into dyads to test the effectiveness of peer observation on the acquisition of performance tasks. Each member of the dyad was responsible for teaching a peer a part of the task, and results demonstrated that the participants learned most of the tasks through observing their peers teach, and did not require direct instruction (Wolery, 1991). Werts, Caldwell, and Wolery (1996) produced similar results, demonstrating that participants emitted correct responses to performance tasks through peer modeling of response chains via a multiple probe design. Morrison, Kamps, Garcia, and Parker (2001) studied the effects of peer-monitoring on the frequency of social behaviors for students diagnosed with disabilities. The participants of this study were exposed to both peer-monitoring and self-monitoring conditions, in which they recorded instances of social skills such as sharing and initiations of themselves and of their peers. It was found that all target participants substantially increased their social skills following the peer-monitoring and self-monitoring interventions, however, no substantial differences were observed between the two intervention conditions (Morrison et al., 2001). However, the latter studies did not induce observational learning as a capability, rather, they measured responses to a particular performance task following observation. The peer-involved teaching strategies outlined above: peer modeling, tutoring, and monitoring, have all shown to have a
positive impact on students’ observational acquisition for new operants and for observational performance tasks.

**Video Modeling/Playback**

Psychologists and those in the education field have also investigated the differences in behavior when an individual observes another via video. Some studies reported that when participants are required to view their peers’ behaviors on a video, the skill to identify appropriate versus inappropriate behaviors emerges (Kern-Dunlap et al., 1992; Smith, Smees, & Pellegrini, 2004). Kern-Dunlap et al. (1992) found that after participants watched a video that showed their peers emitting positive and negative interactions, they correctly identified which behaviors were appropriate and inappropriate at a much higher accuracy. In addition, these participants also emitted more socially appropriate interactions with their peers than they had prior to the video playback (Kern-Dunlap et al., 1992). Smith, Smees, and Pellegrini (2004) found similar findings; after video playback of peer interactions, participants were better able to discriminate between “real” fighting and “play” fighting following the video presentation.

Video playback has also been shown to increase social skills and functional living skills of children (Baker, 2014; Deitchman et al., 2010; Haring, Kennedy, Adams, Pitts-Conway, 1987; Maione & Mirenda, 2006; Nikopoulos & Keenan, 2004; Shipley-Benamou, Lutzker, & Taubman, 2002). In addition to increased play skills and social reciprocations, researchers have also found that after participants observed their peers via video playback, they were also more likely to initiate conversations with peers than before (Baker, 2014; Deitchman et al., 2010; Maione & Mirenda, 2006; Nikopoulos & Keenan, 2004). Haring, Kennedy, Adams, and Pitts-Conway (1987) analyzed the effects
of video modeling on the acquisition of purchasing items, and found video modeling to be an effective teaching procedure that also resulted in the generalization of accurately purchasing items. Shipley-Benamou, Lutzker, and Taubman (2002) further supported video modeling as an effective tactic when they found that following the video observation of peers, target participants were able to complete a series of task analyses such as making orange juice, mailing a letter, and feeding a pet. Both Haring, et. al (1987) and Shipley-Benamou (2002) measured these daily living skills prior to and after the completion of the intervention, demonstrating the effectiveness of video modeling on the generalization of these repertoires.

Researchers have also sought to compare the differences in observational acquisition in video modeling settings and in-vivo settings. Charlop-Christy, Le, and Freeman (2000) found that their participants acquired and generalized performance skills at a higher rate when learning through video modeling as opposed to in-vivo, though the acquisition rate for a learning task between both conditions was the same. In their study, no substantial differences were found in regard to correct responding to performance or learning skills following the intervention; participants in both the in-vivo condition and video modeling condition mastered the skills they were taught. However, these findings differed from those of Gena, Couloura, and Kymissis (2005), who found that there were no substantial differences between the two conditions in relation to acquiring affective behavior, which was defined as exhibiting sympathy, disapproval, and appreciation. Both studies conducted by Charlop-Christy et.al (2000) and Gena et.al (2005) did not test for observational learning as a capability due to the lack of measurement of correct participant responses to a novel skill upon observing their peers, although responses to
generalization probes were measured. Currently, research is limited in regards to the method of observational learning (in-vivo or video) that is most efficient in inducing this skill as a capability. In addition, the majority of studies outlined above emphasized the observation of peers' behaviors, as opposed to the observation of peers' consequences, which is the critical component in inducing the observational learning capability.

**Rationale for Experiment 1**

As previously mentioned, most research in regard to observational learning has been conducted when the observational learning capability was already in the participants’ repertoire prior to the start of the studies, therefore they acquired performance and learning skills as a function of observing their peers (Griffen, Wolery, & Schuster, 1992; Ramirez & Rehfeldt, 2009; Varni et. al., 1979; Vinter & Perruchet, 2002; Zimmerman & Kitsantas, 2002). Observational learning has rarely been recognized within studies as a dependent variable, which involves inducing this verbal behavior capability in order for individuals to learn indirectly from observing the consequences of others, a skill that was absent from their repertoire prior to an observational intervention (Davies-Lackey, 2005; Gold, 2013; Greer, Singer-Dudek, & Gautreaux, 2006). Peer-monitoring, as shown by Pereira-Delgado (2005) and Greer and Delgado (2009), is an effective tactic to induce this observational learning capability, as the intervention requires individuals to attend to the behaviors and consequences emitted by peer confederates in order to emit correct peer-monitoring responses. However, no research has been conducted on the effectiveness of this peer-monitoring observational intervention via video playback. Additionally, no studies have analyzed the possible differences in effects of video monitoring between performance (skills already in
repertoire) and learning tasks. Findings from studies such as Charlop-Christy et.al (2000) and Gena et.al (2005) remain inconsistent as to which method, in-vivo or video playback, is most effective in increasing correct responses emitted by participants following observation.

The current study seeks to answer the following questions: 1) Will a peer-monitoring procedure via video playback condition also function to induce observational learning and performance? 2) Will there be a difference in the rate of learning across in-vivo and video conditions? 3) If observational learning and/or performance does not emerge following the intervention for participants originally assigned to the video condition, will these capabilities emerge after the intervention is completed in the in-vivo condition?
CHAPTER II
EXPERIMENT I

Purpose

The purpose of this study was to determine whether a peer-monitoring procedure, either in vivo or through video playback, was effective in inducing observational learning and observational performance. The group differences in correct responding between the in-vivo and video experimental groups during pre-intervention and post-intervention observational probes were also measured and compared throughout the intervention.

Method

Participants

Six participants, ranging from three to four years of age, who functioned as listener/speakers, were selected for this study. These participants were selected for this study based on data demonstrating that they did not learn new operants or emit correct responses to performance skills as a function of observation. However, all participants had observational learning for conditioned reinforcers in repertoire prior to the study as defined by Greer and Singer-Dudek (2008). The experimenter matched the participants into pairs based on similar percentages of correct responding during baseline observational acquisition and performance probes. Then, one target participant within a matched pair was placed into the in-vivo group (observational peer-monitoring procedure as shown in Delgado & Greer, 2009), with the other target participant being placed into the video playback group (observational peer-monitoring procedure via video playback). All participants had conditioned reinforcement for books, 3D and 2D print, and
demonstrated that they had one-to-one correspondence for numeral objects in repertoire when directly assessed (Table 1).

Table 1

*Experiment 1 Participant Descriptions and Repertoires Pre-intervention*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Gender</th>
<th>Age</th>
<th>Educational Diagnosis</th>
<th>Level of Verbal Behavior</th>
<th>Listener Half of Naming</th>
<th>Speaker Half of Naming</th>
<th>Peer Attention</th>
<th>Observational Learning for Conditioned Reinforcers</th>
<th>Standardized Test Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Male</td>
<td>3.11</td>
<td>Autism</td>
<td>Listener/ Speaker</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>DAYC-2 Test Cognitive Score: 96</td>
</tr>
<tr>
<td>C</td>
<td>Male</td>
<td>3.6</td>
<td>Autism</td>
<td>Listener/ Speaker</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Battelle Developmental Inventory Cognitive Score: 84</td>
</tr>
<tr>
<td>D</td>
<td>Female</td>
<td>3.6</td>
<td>Speech/ Language Impairment</td>
<td>Listener/ Speaker</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>DAYC Test Cognitive Score: 98</td>
</tr>
<tr>
<td>E</td>
<td>Male</td>
<td>3.4</td>
<td>Autism</td>
<td>Listener/ Speaker</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>DAYC-2 Test Cognitive Score: 82</td>
</tr>
<tr>
<td>F</td>
<td>Male</td>
<td>4.1</td>
<td>N/A</td>
<td>Listener/ Speaker</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>N/A</td>
</tr>
<tr>
<td>I</td>
<td>Male</td>
<td>3.8</td>
<td>Speech/ Language Impairment</td>
<td>Listener/ Speaker</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>DAYC Test Cognitive Score: 92</td>
</tr>
</tbody>
</table>

*Note.* DAYC-2 refers to the Developmental Assessment of Young Children 2nd Edition

**Setting**

This study took place at a private preschool, which was located in a suburb of the New York metropolitan area that enrolled students both with and without disabilities.

There were two settings: (1) in a small section of one classroom, at a child-sized trapezoid-shaped desk for all baseline and intervention sessions, (2) in a child-sized chair
at a desk facing a SMART Board® or laptop computer, where the videos were displayed for the intervention for the video playback group. During baseline and in-vivo intervention sessions, the target participant sat side by side with a peer confederate at a desk in a child-sized chair in order to ensure that he/she could easily see the stimuli and observe the consequences delivered to the peer confederate. During video intervention sessions, target participants sat in a child-sized chair facing the monitor that was playing the video. No other instruction or children were present in this section of the classroom when observational learning probes or intervention sessions were taking place.

Materials

Materials for this study included a 5-min video of a peer confederate receiving (a) learn units from a teacher on matching identical and non-identical stimuli by color, and (b) a 5-min video of a peer confederate receiving learn units from a teacher on simple addition with pictorial stimuli. In the first video, various color stimuli were used, such as Lego blocks, pipe cleaners, pom poms, cookie cutters, crayons, and pieces of construction paper. In the second video, a Lakeshore® simple addition board was used with ladybugs to demonstrate pictorial addition (Figure 1). Other stimuli used in the probe sessions and intervention sessions included 2.5x7 cards that had simple addition math problems written on them, 4x6 inch index cards with double digit number stimuli, a 4x6 inch index card with a plus (+), a 4x6 inch index card with a minus (-), and event sequence cards. The picture sequence cards were made from sequence components of the Carson-Dellosa © curriculum and Lauri Early Learning Center © curriculum (Carson-Dellosa Publishing Company, Inc., 2004; Patch Products, Inc., 2009).
Figure 1. Visual representation of the simple addition pictorial board that was used for Stage 2 of the peer-monitoring intervention.

**Design**

The design of this study was a combined experimental-control group design with a “nested” multiple probe design across participants (Greer & Du, 2015; Greer, Stolfi, & Pistoljevic, 2007) to compare the effects of the peer-monitoring observational learning intervention in vivo and via video playback.

**Design Sequence**

The sequence of design is displayed in Figure 2 and was implemented as: 1) pre-intervention observational learning and performance probes for all participants, 2) Stage 1 of the peer-monitoring intervention for Matched Pair #1 until mastery, 3) Post-Stage 1 intervention observational learning and performance probes for Matched Pair #1, 4) Stage 2 of the peer-monitoring intervention for Matched Pair #1 until mastery, 5) Post-Stage 2
intervention observational learning and performance probes for Matched Pair #1, 6) pre-intervention observational learning and performance probes #2 for the Matched Pair #2. The design sequence was then repeated, and following this, another set of pre-intervention observational learning and performance probes were conducted prior to Matched Pair #3 beginning the intervention stages. Finally, all participants originally assigned to the video playback went through the peer-monitoring intervention again, but in the in-vivo condition.
**Figure 2.** The design sequence including pre-intervention probe sessions, intervention stages, and post-intervention probe sessions.
**Independent Variable**

A peer-monitoring observational learning intervention (Delgado & Greer, 2009) was the independent variable in this study. There were two experimental conditions; the in-vivo condition and the video playback condition. In the in-vivo condition, participants monitored responses of a peer who was physically present. In the video playback condition, participants peer-monitored responses while watching peer confederates receive instruction via video. There were two stages of the peer-monitoring observational intervention: Stage 1 was a training stage in which participants peer-monitored responses already in their repertoire; Stage 2 consisted of peer-monitoring responses that were not in their repertoire.

**Dependent Variables**

The dependent variables were the number of correct responses to observational learning for new operants and observational performance pre-intervention and post-intervention probes, and the numbers of correct and incorrect peer-monitoring responses emitted by participants during the Stage 1 and Stage 2 intervention sessions. Additionally, the total numbers, means, and standard deviations of correct responses to these pre-intervention and post-intervention probes emitted by both experimental groups (in-vivo and video conditions) were measured.

**Definition of Observational Learning and Observational Performance**

Observational learning has been defined in this study as the capability to acquire new repertoires as a function of observing others’ behaviors and their consequences to those behaviors (Greer, Singer-Dudek, & Gautreau, 2006). In this study, observational performance was defined as the capability to emit correct responses to novel stimuli for a
familiar skill or task as a function of observing the behaviors and consequences of other peers. The criteria for demonstration of these capabilities was set at 70% correct responding or higher during the post-intervention probe sessions.

Definition of Behaviors

Responses to observational learning for new operants and performance probes. Responses emitted by participants during the observational probes were recorded for both the performance task and the acquisition task. All probe sessions were conducted in-vivo. Correct responses to the performance task were defined as placing the picture stimuli in their appropriate position within the event sequence and were recorded as a plus (+); incorrect responses to this task were defined as placing a picture stimulus in the incorrect position within the sequence or not responding within 5 s, and were recorded as a minus (-). During the acquisition task, correct responses were defined as accurately identifying the number stimuli in a vocal topography (+), and incorrect responses such as vocally emitting an incorrect response to a number stimulus or not emitting a response within 5 s of the antecedent were recorded as a minus (-).

Responses to peer-monitoring intervention. A plus (+), or a correct response during the peer-monitoring intervention, was defined as holding up the appropriate card (either a plus or a minus) subsequent to the peers’ response. If the peer confederate emitted an incorrect response, target participants had to hold up a minus card to receive a correct peer-monitoring response (+). Similarly, if the peer confederate emitted a correct response, the target participants had to hold up a plus card to receive a plus for their peer-monitoring response. A minus (-) during the peer-monitoring intervention was defined as
holding up the incorrect response card after the peer confederate emitted his/her response, or not holding up a card at all within a 5 s period.

**Procedures**

**Pre-intervention and post-intervention probes.** The probes conducted prior to the intervention included the observational probes for the acquisition and performance; these were conducted in-vivo. Prior to the implementation of these probes, pre-experimental probes were conducted to ensure that the acquisition tasks selected for the pre-intervention probes were not in repertoire. During both observational probes, the target participant was seated directly beside the peer confederate (Figures 3 & 4).

**Observational performance task probes.** In the first observational performance probes, the target participant observed a peer confederate receive a total of 16 learn units on sequencing four separate 4-event series. After learn units had been delivered to the peer confederate on the first event series, the instructor conducted a probe with the target participant by asking him/her to sequence the pictures of the event series that the peer had just completed. Following this, the instructor delivered learn units to the peer confederate on the second event series, which was followed by a probe with the target participant. This continued until both the target participant and the peer confederate had an opportunity to sequence all four event series (Table 2). All responses emitted by the target participants were unconsequated.
Figure 3. The seating arrangements of the participant, peer confederate, and teacher during the observational performance probes. The participant and peer confederate sat side by side, and the teacher is sat next to the peer confederate consequating his/her responses to the sequencing task.

Table 2

Event Sequence Stimuli Used for Observational Performance Probes

<table>
<thead>
<tr>
<th>Event Series 1: How to Make Chocolate Milk</th>
<th>Event Series 3: Steps to Eating a Birthday Cake</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pour white milk into a glass</td>
<td>1. A parent lights the candle</td>
</tr>
<tr>
<td>2. Pour chocolate syrup into the glass</td>
<td>2. The birthday girl/boy blows out the candle</td>
</tr>
<tr>
<td>3. Mix both with a spoon</td>
<td>3. The parent cuts the cake into slices</td>
</tr>
<tr>
<td>4. Drink the chocolate milk</td>
<td>4. Eat birthday cake slice</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event Series 2: Steps to Eating a Banana</th>
<th>Event Series 4: Steps to a Piñata</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pick up a banana from the fruit bowl</td>
<td>1. A parent hangs up the piñata</td>
</tr>
<tr>
<td>2. Unpeel the banana</td>
<td>2. The child gets blindfolded</td>
</tr>
<tr>
<td>3. Put the banana peel in the garage can</td>
<td>3. The child hits the piñata with a stick</td>
</tr>
<tr>
<td>4. Eat the banana</td>
<td>4. Candy drops from the piñata</td>
</tr>
<tr>
<td>Event Series 5: How to Make a Cake</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td></td>
</tr>
<tr>
<td>1. Gather ingredients (flour, vanilla)</td>
<td></td>
</tr>
<tr>
<td>2. Mix ingredients and put into pan</td>
<td></td>
</tr>
<tr>
<td>3. Put the pan into the oven</td>
<td></td>
</tr>
<tr>
<td>4. Eat the finished cake</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event Series 6: Sequencing the Seasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fall</td>
</tr>
<tr>
<td>2. Winter</td>
</tr>
<tr>
<td>3. Spring</td>
</tr>
<tr>
<td>4. Summer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event Series 7: Growing Stages of a Chicken</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Starts as a solid white egg</td>
</tr>
<tr>
<td>2. A little chick begins to grow in the egg</td>
</tr>
<tr>
<td>3. The little chick hatches out of the egg</td>
</tr>
<tr>
<td>4. The chick becomes an adult chicken</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event Series 8: How a Rainbow Appears</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. First there is sun</td>
</tr>
<tr>
<td>2. Then clouds come into the sky</td>
</tr>
<tr>
<td>3. It starts to rain</td>
</tr>
<tr>
<td>4. A rainbow appears</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event Series 9: How to Wash Clothes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Put dirty clothes into a basket</td>
</tr>
<tr>
<td>2. Take the clothes and place them in the washing machine</td>
</tr>
<tr>
<td>3. Hang up the clothes to dry</td>
</tr>
<tr>
<td>4. Fold the clean clothes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event Series 10: How to Mail a Letter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Write the letter</td>
</tr>
<tr>
<td>2. Put the letter into an envelope</td>
</tr>
<tr>
<td>3. Put a stamp on the envelope</td>
</tr>
<tr>
<td>4. Put the envelope into the mail box</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event Series 11: Steps to Wrapping a Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Get tape, scissors, a bow, and wrapping paper</td>
</tr>
<tr>
<td>2. Wrap the first side of the gift using tape</td>
</tr>
<tr>
<td>3. Wrap the other side of the gift with tape</td>
</tr>
<tr>
<td>4. Put a bow on top of the gift</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event Series 12: Getting Ready for School</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Wake up</td>
</tr>
<tr>
<td>2. Eat breakfast</td>
</tr>
<tr>
<td>3. Brush your teeth</td>
</tr>
<tr>
<td>4. Get on the school bus</td>
</tr>
<tr>
<td>Event Series 13: Making a Valentine Card</td>
</tr>
<tr>
<td>--------------------------------------</td>
</tr>
<tr>
<td>1. Get scissors</td>
</tr>
<tr>
<td>2. Cut the paper into a heart shape</td>
</tr>
<tr>
<td>3. Put glue on the heart</td>
</tr>
<tr>
<td>4. Place the letters and decorations on</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Put the bear on the table</td>
<td>1. Get in ready position at the starting line</td>
<td>1. Get the dog food and bowl</td>
</tr>
<tr>
<td>2. Put on his vest, pants, and bowtie</td>
<td>2. Run with the other racers</td>
<td>2. Scoop out the dog food</td>
</tr>
<tr>
<td>3. Put on his hat</td>
<td>3. Cross the finish line</td>
<td>3. Put the dog food into the bowl</td>
</tr>
<tr>
<td>4. Place him in the stroller</td>
<td>4. Win a trophy</td>
<td>4. Set the bowl down so the dog can eat it</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event Series 16: Getting Pizza Delivery</th>
<th>Event Series 20: Washing Dishes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Set the table with silverware, plates, and glasses</td>
<td>1. Turn on the water</td>
</tr>
<tr>
<td>2. Pay the delivery man for the pizza</td>
<td>2. Put soap on the dish and scrub with a sponge</td>
</tr>
<tr>
<td>3. Bring the pizza over to the table</td>
<td>3. Rinse off the dish with water</td>
</tr>
<tr>
<td>4. Eat the pizza with family members</td>
<td>4. Dry the dish with a towel</td>
</tr>
</tbody>
</table>
Note. All sequence stimuli were given to participants and peer-confederates as pictorial sequence cards.

Observational learning probes. In the observational learning probes, the target participant observed a peer confederate receive a total of ten learn units which involved identifying sight words or double-digit numbers. Learn units were first delivered to the peer confederate on the first five double-digit numbers or sight words; this was then followed by an opportunity for the target participant to respond to the same numbers or words. Following this, the instructor presented learn units on the last five double-digit numbers or sight words, and afterwards, the target participant had the opportunity to respond to those five stimuli. All responses emitted by the target participants were unconsequated.

Figure 4. The seating arrangements of the participant, peer confederate, and teacher during the observational learning probes. The participant and peer confederate are setting side by side, facing the teacher.
**Intervention.** After pre-intervention probes were conducted on all participants and matched pairs were assigned, the first matched pair was randomly selected to begin the intervention. The matched pairs that were assigned based on pre-intervention probe data are shown in Table 2; their performance on baseline observational probes are displayed in Figure 5. The intervention for both the in-vivo group and the video playback group consisted of two peer-monitoring stages; one which involved the target participants monitoring peers’ responses that were in repertoire for them (Stage 1), and the other which involved peer-monitoring responses that were not in repertoire (Stage 2).

In the first stage, the target participants observed their peer confederate emit 10 responses related to matching identical and non-identical stimuli by color. After each response was emitted by the peer confederate, the instructor required the target participant to hold up either a plus (+) which represented a correct response, or a minus (−), which represented an incorrect response. Then the instructor first consequated the target participant on their peer-monitoring response (ie. “Great job!” if he/she held up a plus following a correct response from the peer confederate), and then consequated the peer confederate. This sequence continued until the target participant had an opportunity to monitor all 10 responses emitted by the peer confederate.

In the second stage, the target participants observed their peer confederate emit 15 responses related to simple addition via pictorial representation. Just like Stage 1, the target participant was given an opportunity to consequate his/her peer first, prior to the instructor doing so. The second stage consisted of peer-monitoring five simple addition pictorial problems; each problem was comprised of three learn units; a learn unit for placing the correct number of ladybugs on the 1st leaf that matched the first numeral of
the math problem, a learn unit for placing the correct number of ladybugs on the 2\textsuperscript{nd} leaf that matched the second numeral of the math problem, and a learn unit for tacting the sum of both numerals (and ladybugs). If the assigned math problem was “2+3” for example, the target participant held up either a plus (+) or a minus (−) immediately after the peer confederate placed a number of ladybugs on the 1\textsuperscript{st} leaf, repeated this after the peer placed ladybugs on the 2\textsuperscript{nd} leaf, and again held up a data collection card (+ or −) after the peer vocally tacted the sum (“Five!”).

All stages were the same across both groups, however the in-vivo group participants peer-monitored in vivo, while the video group peer-monitored via video playback. During the video playback intervention sessions, the experimenter paused the video immediately after each peer confederate’s response to give the target participant an opportunity to emit his/her peer-monitoring response. The target participants were required to continue peer-monitoring Stage 1 until they met criterion of 90\% x 1 session. Following this, the experimenter conducted a post-stage probe session for both observational learning and performance. Then, the target participants moved on to Stage 2. Once criterion was met on this stage, final post-intervention probes were conducted. After this was completed for the first matched pair, the experimenter simultaneously conducted observational learning and performance pre-intervention probes for the participants in the second matched pair once again prior to those individuals beginning the intervention. This was also done with the third matched pair; therefore, only one matched pair underwent the intervention at a time, and each following matched pair was given another set of pre-intervention observational probes (performance and acquisition) before beginning with the intervention sessions.
Table 3

Assignment of Matched Pairs and Experimental Conditions

<table>
<thead>
<tr>
<th>Matched Pair #1</th>
<th>In-Vivo Condition</th>
<th>Video Playback Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant C</td>
<td></td>
<td>Participant E</td>
</tr>
<tr>
<td>Matched Pair #2</td>
<td>Participant F</td>
<td>Participant B</td>
</tr>
<tr>
<td>Matched Pair #3</td>
<td>Participant I</td>
<td>Participant D</td>
</tr>
</tbody>
</table>

Additional intervention for participants in the video playback condition. If any of the participants originally assigned to the video playback did not acquire observational learning for performance and/or acquisition following the completion of the peer-monitoring intervention via video, they went through the intervention again, but in the in-vivo condition. The sequence of methods remained the same as the participants who originally underwent the peer-monitoring intervention in the in-vivo condition.

Interobserver Agreement

Interobserver agreement was conducted across all observational baseline and intervention probe sessions. Interobserver agreement was obtained for 84% of observational learning and performance probes, with a mean agreement of 100%. Interobserver agreement was obtained for 90% of intervention sessions, with a mean agreement of 98%.

Results

Baseline Measures

Figure 5 shows the baseline data for the participants, which consisted of the observational performance and acquisition pre-intervention probes. As shown, all six
participants emitted low percentages of correct responses to both the performance and acquisition observational probes (range 0-30%). Participant D and Participant I were the only participants to emit any correct responses during the observational learning probe; however, correct responding during the observational performance probe remained low across all participants (Figure 5). Participants E, B, D, and F emitted 19% correct responding, Participant C emitted 13%, and Participant I emitted 5% correct responding to the observational performance pre-intervention probe. In regards to the observational acquisition pre-intervention probe, Participants D and I emitted 30% correct responding; Participants E, B, F, and C emitted no correct responses (Figure 5).

![Graph showing percentage correct for observational learning probes](image)

*Figure 5. Baseline data emitted by participants E, B, D, F, C, and I during observational learning probes for performance and acquisition.*
**Matched Pair #1**

The pre-intervention and post-intervention probe session data for the first matched pair are displayed in Figure 6, and shows that prior to the intervention, Participant C (in-vivo condition) emitted 13% and Participant E (video playback condition) emitted 19% of correct responses to the performance pre-intervention probe; both Participants C and E emitted 0% of correct responses to the acquisition pre-intervention probe (Figures 5 & 6).

Peer-monitoring intervention data are represented in Figure 7 and Table 4, where Participant C (in-vivo condition) met criterion on Stage 1 in three sessions, and Participant E (video playback condition) met criterion on this stage in 5 sessions. Six peer-monitoring sessions were needed for Participant C in the second stage, whereas Participant E only required 4 sessions (Figure 7).

Following the completion of the first peer-monitoring stage, Participant C (in-vivo) emitted 75% and Participant E (video playback) emitted 13% of correct responses to the observational performance post-intervention probe, and responded correctly at 30% (Participant C) and 0% (Participant E) accuracy to the observational acquisition post-intervention probe (Figure 6). Following the completion of the second peer-monitoring stage, Participant C emitted 83% and Participant E emitted 80% of correct responses to the performance post-intervention probe, and responded correctly at 80% (Participant C) and 0% accuracy (Participant E) to the acquisition post-intervention probe (Figure 6).

Once the intervention in the in-vivo condition had been implemented for Participant E, 3 sessions were required to meet criterion on Stage 1, and 4 sessions were conducted to meet criterion on Stage 2 (Figure 7). After the completion of the peer-monitoring intervention in the in-vivo condition, Participant E emitted 88% correct
responding to the performance post-intervention probe and 30% correct responding to the acquisition post-intervention probe following Stage 1 of the intervention. After completing Stage 2 of the intervention, Participant E responded with 88% accuracy to the performance post-intervention probe, and responded with 70% accuracy to the acquisition post-intervention probe (Figure 6).

**Matched Pair #2**

Figures 5 and 6 also display pre-intervention and post-intervention probe data, in addition to intervention data for the second matched pair; both Participant F (in-vivo condition) and Participant B (video playback condition) emitted correct responses at 19% accuracy on the first performance pre-intervention probe sessions, and 0% accuracy on the first acquisition pre-intervention probe sessions. Participant F emitted correct responses at 31% accuracy and Participant B responded with 34% accuracy to the second performance pre-intervention probe. During the second acquisition pre-intervention probe, Participant F responded with 20% accuracy and Participant B emitted 0% correct responding (Figure 6).

Both participants only required one session of peer-monitoring to meet criterion on Stage 1, and two sessions of peer-monitoring to meet criterion on Stage 2 (Figure 7). Post-intervention data following the completion of Stage 1 for these participants were obtained; Participant F (in-vivo) responded at 100% accuracy to the performance post-intervention probe, and 30% accuracy to the acquisition post-intervention probe (Figure 6). Participant B (video playback) responded correctly with 60% accuracy to the performance post-intervention probe, and 20% accuracy to the acquisition post-intervention probe following the Stage 1 peer-monitoring intervention (Figure 6). After
meeting criterion on the second stage of peer-monitoring, Participant F (in-vivo) responded at 100% accuracy and Participant B (video playback) responded at 93% to the performance post-intervention probes. During the acquisition post-intervention probes following Stage 2 of the intervention, Participant F emitted 70% correct responding, and Participant B emitted 50% correct responding (Figure 6).

Once the intervention in the in-vivo condition had been implemented for Participant B, 1 session was required to meet criterion for both Stage 1 and Stage 2 (Figure 7). After the completion of the peer-monitoring intervention in the in-vivo condition, Participant B emitted 100% correct responding to the performance post-intervention probe and 40% correct responding to the acquisition post-intervention probe following Stage 1 of the intervention. After completing Stage 2 of the intervention, Participant E responded with 100% accuracy to the performance post-intervention probe, and responded with 70% accuracy to the acquisition post-intervention probe (Figure 6).

**Matched Pair #3**

Participant I (in-vivo) and Participant D (video playback) emitted 30% correct responding to the first acquisition pre-intervention probe; Participant I responded with 6% accuracy and Participant D responded with 19% accuracy to the first performance pre-intervention probe (Figure 5). Participant I emitted 20% correct responding and Participant D emitted 50% correct responding to the second acquisition pre-intervention probes. During the second performance pre-intervention probes, Participant I responded with 25% accuracy, and Participant D responded with 19% accuracy (Figure 6).

Participant I required 7 sessions to meet criterion on Stage 1 of the peer-monitoring intervention, and 3 sessions to meet criterion on Stage 2 (Figure 7).
Participant D required 2 sessions to meet criterion for both Stages 1 and 2. After the completion of the 1st stage, Participant I (in-vivo) emitted correct responses at 100% accuracy for the performance post-intervention probe, and emitted correct responses at 40% accuracy to the acquisition post-intervention probe. Participant D (video playback) emitted correct responses at 44% accuracy for the performance post-intervention probe, and emitted correct responses at 50% accuracy to the acquisition post-intervention probe. After Stage 2 of the peer-monitoring intervention, Participant I (in-vivo) responded with 100% accuracy to the performance post-intervention probe, and with 80% accuracy to the acquisition post-intervention probe. Participant D (video playback) responded with 50% accuracy to the performance post-intervention probe following Stage 2, and with 40% accuracy to the acquisition post-intervention probe (Figure 6).

Once the intervention in the in-vivo condition had been implemented for Participant D, 1 session was required to meet criterion for both Stage 1 and Stage 2 (Figure 7). After the completion of the peer-monitoring intervention in the in-vivo condition, Participant D emitted 69% correct responding to the performance post-intervention probe and 90% correct responding to the acquisition post-intervention probe following Stage 1 of the intervention. After completing Stage 2 of the intervention, Participant E responded with 100% accuracy to the performance post-intervention probe, and responded with 90% accuracy to the acquisition post-intervention probe (Figure 6).
Figure 6. Pre- and post-intervention data for Participants C, F and I (in-vivo condition) and Participants E, B, and D (video condition), in addition to post-intervention data following the completion of in-vivo peer-monitoring for participants originally assigned to the video playback condition (solid line).
Figure 7. Intervention session data for Participants C, F and I (in-vivo condition) and Participants E, B, and D (video condition).
Group Differences Between the Video and In-Vivo Conditions

Group data including means and standard deviations (SD) obtained from both experimental groups are displayed in Figures 8 and 9, in addition to Tables 4 and 5.

Observational performance probes. Both the in-vivo and video playback groups substantially increased their correct responses to the observational performance probe following the intervention, however, the in-vivo group and the video group following in-vivo training produced the highest gains in correct responding (Figure 8, Table 4). The in-vivo group emitted a total of 8 correct responses out of 48 response opportunities prior to the intervention, and emitted 44 correct responses following the intervention. Participants originally assigned to the video condition emitted a total of 11 correct responses during the pre-intervention observational performance probes, and emitted 31 correct responses during the post-intervention probes. This group further increased their correct responding following the in-vivo training; they emitted 46 correct responses out of 48 response opportunities during the final observational performance post-intervention probes.
Figure 8. Group data emitted by participants during pre- and post-observational performance probes.
Observational learning probes. During the observation learning post-intervention probes, no difference was seen in correct responding in the video condition; substantial increases were observed in the in-vivo and video post in-vivo training conditions (Figure 9, Table 5). The in-vivo group emitted a total of 4 correct responses out of 30 response opportunities pre-intervention, and emitted 23 correct responses post-intervention. The video group emitted a total of 5 correct responses prior to the intervention, and 9 correct responses during the post-intervention observational learning probes. After completing the intervention in-vivo, the video group emitted 23 correct responses out of 30 response opportunities.
Figure 9. Group data emitted by participants during pre- and post-observational learning probes.
Table 4

*Means and Standard Deviation (SD) Scores for Correct Responses to Observational Performance Pre- and Post-Probes*

<table>
<thead>
<tr>
<th>Probes</th>
<th>In-Vivo Group</th>
<th>Video Playback Group</th>
<th>Video Playback Group Post In-Vivo Training</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Pre-Intervention</td>
<td>2.67</td>
<td>2.08</td>
<td>3.67</td>
</tr>
<tr>
<td>Post-Intervention</td>
<td>15</td>
<td>1.73</td>
<td>10.33</td>
</tr>
</tbody>
</table>

Table 5

*Means and Standard Deviation (SD) Scores for Correct Responses to Observational Learning (Acquisition) Pre- and Post-Probes*

<table>
<thead>
<tr>
<th>Probes</th>
<th>In-Vivo Group</th>
<th>Video Playback Group</th>
<th>Video Playback Group Post In-Vivo Training</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Pre-Intervention</td>
<td>1.33</td>
<td>1.16</td>
<td>1.67</td>
</tr>
<tr>
<td>Post-Intervention</td>
<td>7.67</td>
<td>.58</td>
<td>3</td>
</tr>
</tbody>
</table>
Discussion

Extensive research has continued to support the notion that individuals can learn from observing others’ behaviors and consequences for those behaviors (Greer, Singer-Dudek & Gautreaux, 2006). Results from Experiment 1 validate the findings demonstrated by Pereira-Delgado (2005), as well as Delgado and Greer (2009), and validate the effectiveness of a peer-monitoring intervention on the emergence of the observational learning capability. However, this peer-monitoring intervention was only effective for establishing the observational learning repertoire when participants peer monitored in an in-vivo setting as opposed to via video playback. Although participants who were originally assigned to the video playback condition for the peer-monitoring intervention did not acquire observational learning for acquisition following the intervention, five of the six did acquire observational learning for performance. These results differ from results obtained by Charlop-Christy, Le, and Freeman (2000), who found no differences in correct responding between the in-vivo and video conditions in regard to a learning task. This suggests that the observational learning capability may have already been in repertoire for participants in that particular study.

Prior to the intervention, all participants emitted low percentages of correct responses during the observational performance probe, and simply imitated both the correct and incorrect responses that were emitted by their peers, as opposed to attending to their peers’ consequences (approvals or corrections). However, during the post-intervention probe sessions for observational performance, all participants attended to both their peers’ responses to the sequencing task and to the consequences that were being delivered to their peers by the instructor. In addition, the experimenter observed
that all participants began to emit echoics during the post-intervention observational learning probes following each stage of peer-monitoring. Participants E, B, and D, who were assigned to the video playback condition, did not demonstrate observational learning for acquisition upon completing the intervention, but observational learning for acquisition of new operants did emerge for participants who were originally assigned to the in-vivo condition (Figure 9). Further, post-intervention probe data from Experiment 1 show that all participants originally in the video condition did acquire observational learning for acquisition following the completion of the peer-monitoring intervention in the in-vivo condition; this was observed within both the individual and group data.

The findings from Experiment 1 demonstrated a functional relationship between the in-vivo peer-monitoring intervention and the emergence of observational learning for both acquisition and performance. No functional relationship was shown between the video playback peer-monitoring intervention and the emergence of observational learning for acquisition, however, there was a functional relationship between this condition and observational learning for performance. These results also suggest that there is a difference in social reinforcement of learning in a setting in which a student observes another peer via a video, as opposed to in-vivo. Findings from Experiment 1 also show that this difference in social reinforcement may only be in regards to learning new operants, and not necessarily for performance tasks, as five of the six participants acquired observational performance following the intervention regardless of the intervention condition (in-vivo or video playback). Group data further support the results found in Experiment 1; substantially more correct responses were emitted by the group originally assigned to the video condition only after they completed the peer-monitoring
intervention in-vivo. Moreover, their mean level of correct responding to the observational acquisition probes following the in-vivo training was similar to that of the group originally assigned to the in-vivo condition.

There were a few limitations in this study; firstly, all pre-intervention and post-intervention probe sessions for observational acquisition and performance were conducted in-vivo, therefore, this did not control for participants’ responses to these probes in both the in-vivo and video playback condition. In addition, data obtained from the second pre-intervention observational probes show that some participants did minimally increase their correct responding to either the performance or acquisition probes prior to beginning the intervention, demonstrating that sequence effects occurred.

**Rationale for Experiment II**

Findings from Experiment 1 demonstrated that all participants, upon completing the peer-monitoring intervention in the in-vivo condition, acquired both observational learning for acquisition and for performance. Results from this experiment also showed that the peer-monitoring intervention was not effective in the emergence of observational learning for acquisition when done via video playback. However, all pre-intervention and post-intervention observational learning probes for participants were done in-vivo, regardless of the experimental condition that was assigned to them. Though this method allowed the experimenter to measure the emergence of observational learning in an in-vivo setting, it did not yield measurements of the participants’ responses to observational learning probes in a video playback setting. Measuring behaviors in both settings across all pre-intervention and post-intervention probes will better test for differences, if shown, between the experimental conditions. In Experiment 2, the experimenter conducted both
video and in-vivo observational learning pre-intervention and post-intervention probes for acquisition and for performance across all participants.

Data from Experiment 1 also suggested that there was a difference in regards to the social reinforcement of learning in-vivo, as opposed to via video. Anecdotally, participants originally assigned to the in-vivo condition emitted more approvals and social initiations to peers during non-structured periods throughout the school day. However, no other behaviors other than those emitted during observational learning probes were measured to further investigate this possible difference in social reinforcement. Experiment 2 also included pre-intervention and post-intervention vocal and non-vocal verbal operant probes, which measured the frequency of speaker and listener behaviors and social interactions, of each participant. Adding these dependent measures extended the analysis of the difference between the in-vivo and video experimental conditions, and their effects on the participants’ social behaviors in a free-operant setting.
CHAPTER III

EXPERIMENT II

Methods

Participants

Six preschoolers were selected to be participants for Experiment 2; no participants from Experiment 1 were used for this study. The participants for Experiment 2 were chosen based on data that they did not have observational learning for acquisition or performance in repertoire. Six participants functioned on a listener/speaker level of verbal behavior. These participants ranged from three to five years of age; five of six participants were diagnosed with a disability. All participants had conditioned reinforcement for books, 3D and 2D print, peer attention, and demonstrated that they had one-to-one correspondence in repertoire during direct assessments (Table 6).

Table 6

Experiment 2 Participant Descriptions and Repertoires Pre-intervention

<table>
<thead>
<tr>
<th>Participant</th>
<th>Gender</th>
<th>Age</th>
<th>Educational Diagnosis</th>
<th>Level of Verbal Behavior</th>
<th>Listener Literacy</th>
<th>Speaker Half of Naming</th>
<th>Peer Attention</th>
<th>Observational Learning for Conditioned Reinforcers</th>
<th>Standardized Test Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Male</td>
<td>3.4</td>
<td>Speech/Language Impairment</td>
<td>Listener/ Speaker</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>G</td>
<td>Male</td>
<td>4.8</td>
<td>Autism</td>
<td>Listener/ Speaker</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>H</td>
<td>Male</td>
<td>5.7</td>
<td>Autism</td>
<td>Listener/ Speaker</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>J</td>
<td>Female</td>
<td>3.5</td>
<td>N/A</td>
<td>Listener/ Speaker</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>K</td>
<td>Male</td>
<td>3.6</td>
<td>Speech/Language Impairment</td>
<td>Listener/ Speaker</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>L</td>
<td>Male</td>
<td>5.3</td>
<td>Autism</td>
<td>Listener/ Speaker</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Note. DAYC refers to the Developmental Assessment of Young Children; WPPSI-IV refers to the Wechsler Preschool and Primary Scale of Intelligence-4th Edition.
Setting

The setting of this study was similar to that of Experiment 1, as the classroom and school remained the same. The set up of pre-intervention, intervention, and post-intervention observational learning probe sessions were identical to that of Experiment 1. Vocal and non-vocal verbal operant probes conducted in Experiment 2 were video recorded in another area of the classroom in a free-operant setting, which had a variety of toys, books, and pretend play activities to engage in; only two other peers were present during the duration of these probes.

Materials

Most materials used for Experiment 2 were also used in Experiment 1, however a laptop computer was also used to video record the vocal and non-vocal verbal operant probes in Experiment 2.

Design

Just as in Experiment 1, a combined experimental-control group design with a “nested” multiple probe design across participants (Greer, Stolfi, & Pistoljevic, 2007) was used. A multiple probe design across participants was also used to measure the effects of the intervention on vocal and non-vocal verbal operants emitted by participants.

Design Sequence

The design sequence of Experiment 2 was similar to Experiment 1, the only difference being that observational learning and performance video probes were also conducted prior to participants beginning the peer-monitoring intervention, and following the conclusion of each peer-monitoring training stage. In addition, verbal operant probes were conducted before the implementation of the intervention, and were conducted after all participants completed both stages of the intervention.
**Independent Variable**

The independent variable remained the same in Experiment 2; a peer-monitoring intervention, in both in-vivo and video playback conditions, was implemented to analyze the effects on the emergence of observational learning and performance repertoires of participants, in addition to the emission of vocal and non-vocal verbal operants in a free-operant setting.

**Dependent Variables**

Many of the dependent variables measured in Experiment 1 remained constant in Experiment 2, however, the frequency of vocal and non-vocal verbal operants emitted in a 5-min free-operant play setting were also measured in this experiment. In addition, correct responses emitted by participants to observational learning and performance probes conducted via video modeling were also measured.

**Definition of Behaviors**

Responses to observational learning and performance pre-intervention and post-intervention probes, as well as responses to the peer-monitoring intervention stages, were defined identically to that of Experiment 1.

**Responses to vocal and non-vocal verbal operant probes.** Unreciprocated initiations were defined as emitting vocal or non-vocal verbal behavior toward a peer for social reciprocation (e.g., handed the peer a puppet to play with), which was not reinforced by a peer. Conversational units were defined as two or more instances in which both the target participant and a peer rotated between listener and speaker roles twice consecutively. For example, if the peer asked the target participant “Are you playing with the blocks?,” the participant responded with “Yes, do you want to play?”
the peer emitted the response, “Sure,” and the participant said “Okay.” If a peer demonstrated a listener response or a speaker response that was not consequated by a peer, the experimenter recorded this instance of behavior as a sequelic (e.g., the peer asked the participant “Did you want that toy?” and the participant responds with “No.” Missed social opportunities were defined as ignoring or not responding to a peer when he/she emitted a vocal or non-vocal response specifically to the target participant. Approvals were defined as delivering a positive statement to a peer such as “Thanks for sharing with me” or “Awesome tower!,” disapprovals were negative statements directed toward a peer, such as “I don’t like the way you’re playing this game.” Mand functions were defined as requesting an object, information, or social contact with a peer. Examples of mand functions included “Where is the orange dinosaur?,” “Can I play with you too?,” whereas tact functions were defined as identifying a stimulus in the environment in attempts to seek reinforcement from the listener.

**Procedures**

The original observational learning and performance pre-intervention and post-intervention probes (conducted in an in-vivo setting), in addition to the procedures for the peer-monitoring intervention stages implemented in Experiment 1 were also used for Experiment 2. The same stimuli from Experiment 1 were used for this study in regards to the observational performance and learning probes and peer-monitoring intervention, however, grade-level words were used as textual stimuli for the observational learning probes in Experiment 2 for Participant H. The matched pairs that were assigned based on pre-intervention probe data are shown in Table 7; their performance on baseline observational probes are displayed in Figure 10. As in Experiment 1, if participants
originally assigned to the video playback condition did not acquire observational learning for acquisition and/or performance following the intervention, they went through the peer-monitoring intervention again but in the in-vivo condition.

Table 7

Assignment of Matched Pairs and Experimental Conditions for Experiment 2

<table>
<thead>
<tr>
<th>Matched Pair #4</th>
<th>In-Vivo Condition</th>
<th>Video Playback Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant J</td>
<td>Participant A</td>
<td></td>
</tr>
<tr>
<td>Matched Pair #5</td>
<td>Participant H</td>
<td>Participant L</td>
</tr>
<tr>
<td>Matched Pair #6</td>
<td>Participant K</td>
<td>Participant G</td>
</tr>
</tbody>
</table>

**Observational performance probe via video modeling.** A sequence task was also used for this performance probe, with different pictorial sequence stimuli. Participants first watched a video showing a peer receiving learn units on how to appropriately sequence the pictures of one event series, and were then given the opportunity to sequence the same task without the aid of the video or feedback from the instructor. The next video was then shown to the participants, again with a peer receiving learn units to sequence a different event series, followed by an attempt by the participants to sequence the same event series they had just observed in the video. This continued until participants had watched all four videos of peers learning to sequence four different event series, and had attempted to independently sequence them.

**Observational learning probe via video modeling.** In this observational learning probe, participants observed their peers via video receive learn units from an instructor on textually responding to five words. After learn units had been delivered to
the peer confederate on each of the five words, the video was paused, and target participants were then asked to textually respond to these same five words that were written on an index card held up by the instructor. No feedback was given to them on their responses, and following this, the video was continued, and participants watched a peer confederate receive another 5 learn units on the same five words. After the conclusion of this, participants were again told to attempt to textually respond to these five words. This probe was considered complete when the participants had the opportunity to observe a total of 10 learn units given on five words, and had attempted to textually respond to each of the words twice.

**Verbal operant probes.** The verbal operant probes were conducted in a free operant play setting, in which the target participant was told to play in the toy area with two other peers for a 5-min period. These probes were conducted prior to the pre-intervention observational learning and performance probes, and again after all participants had completed both stages of the peer-monitoring intervention (in their original experimental condition). During this time, the experimenter recorded a video via a laptop computer. Unreciprocated initiations, conversational units, sequels, missed social opportunities, mand and tact functions were measured during these probe sessions. All vocal and non-vocal verbal operant probes were video-recorded, and individuals conducting interobserver agreement were calibrated prior to data collection. The verbal operant measures were then observed and tabulated based on the number of speaker and listener behaviors emitted by target participants per verbal episode.
**Interobserver Agreement**

Interobserver agreement was conducted across all observational learning baseline and intervention probe sessions, in addition to vocal verbal operant probes. Interobserver agreement was obtained for 67% of observational learning for acquisition and performance probes, with a mean agreement of 100%. Interobserver agreement was obtained for 42% of intervention sessions, with a mean agreement of 99%. Interobserver agreement was obtained for 100% of vocal verbal operant probes, with a mean agreement of 88%, ranging from 81% to 93%.

**Results**

**Baseline Measures**

Baseline measures consisted of both in-vivo and video observational learning and performance probes for all participants; these results are shown in Figure 10. Participants emitted low numbers of correct responses across all observational probes, though more correct responses were emitted during in-vivo and video observational performance probes than during in-vivo and video observational acquisition probes. The percentages of correct responding during the in-vivo observational performance probes ranged from 0% to 56%, and ranged from 0% to 50% during the in-vivo observational acquisition probes. Percentages of correct responding during the video observational performance probes ranged from 13% to 50%, and ranged from 0% to 20% during the video observational acquisition probes.
Figure 10. Baseline data emitted by participants A, G, H, J, K, and L during observational learning probes for performance and acquisition.

**Matched Pair #1**

Participants A and J both emitted low numbers of correct responses to both in-vivo and video observational acquisition and performance probes, as shown in Figure 10. Participant A (video condition) responded with 0% accuracy to both in-vivo observational probes, and to the video observational acquisition probe; he responded with 13% accuracy to the video observational performance probe. Participant J (in-vivo condition) emitted 19% correct responding and 20% correct responding to the in-vivo observational performance (IVOP) and acquisition (IVOA) probes, emitted 25% correct responding to the video observational performance (VOP) probe, and 10% correct responding to the video observational acquisition probe (VOA).
Participant J met criterion to Stage 1 of the peer-monitoring intervention following three intervention sessions; nine sessions were required for this stage for Participant A. Five sessions of the Stage 2 peer-monitoring intervention were conducted for Participant J, and three sessions were conducted for Participant A. These intervention data are displayed in Figure 12. Following the Stage 1 intervention, Participant A (video condition) responded with 50% accuracy to the IVOP probe, 0% accuracy during the IVOA and VOA probes, and 63% to the VOP probe (Figure 11). Participant J (in-vivo condition), after completing the Stage 1 intervention, emitted 31% correct responding to the IVOP probe, 10% to the IVOA probe, 19% to the VOP probe, and 0% to the VOA. However, Participant J substantially increased her correct responding following the Stage 2 intervention; she responded with 88% accuracy to the IVOP probe, 70% accuracy to the IVOA probe, 69% accuracy to the VOP probe, and 30% accuracy to the VOA probe.

After completing the Stage 2 intervention, Participant A emitted 88% correct responding to the IVOP probe, 30% correct responding to the IVOA and VOA probes, and 82% to the VOP probe (Figure 11).

As a result of Participant A not acquiring the observational acquisition capability, the peer-monitoring intervention was implemented again for this participant in the in-vivo setting. He required three intervention sessions for both Stage 1 and Stage 2, as shown in Figure 12. Following the Stage 1 peer-monitoring intervention, Participant A emitted 100% correct responding to the IVOP probe, 50% to the IVOA probe, 88% correct responding to the VOP probe, and 40% correct responding to the VOA probe. These measures of correct responding increased post-Stage 2 intervention, in which Participant A emitted correct responding at 100% accuracy for both IVOP and VOP.
probes, 80% accuracy to the IVOA probe, and 60% accuracy to the VOA probe (Figure 11).

**Matched Pair #2**

During the first pre-intervention probe sessions, Participant H emitted 25% correct responding to the IVOP probe, 50% correct responding to the IVOA probe, 44% to the VOP probe, and 20% correct responding to the VOA probe. During the second pre-intervention probe sessions, he responded with 19% accuracy to the IVOP probe, 30% accuracy to the IVOA probe, 25% accuracy to the VOP probe, and responded with 10% accuracy to the VOA probe (Figure 11). Participant L, during the first pre-intervention probe sessions, emitted 38% correct responding to the IVOP probe, 30% to the IVOA probe, 31% to the VOP probe, and 10% to the VOA probe. As for the second pre-intervention probe sessions, Participant L emitted 50% correct responding to the VOP probe, 30% to the IVOP probe, 19% to the VOP probe, and 0% correct responding to the VOA probe (Figure 11).

As shown in Figure 12, Participant H required three intervention sessions, and Participant L one intervention session, to meet criterion on the first stage of peer-monitoring. During Stage 2, three intervention sessions were necessary for Participant H, and two sessions were conducted for Participant L (Figure 10). Following the completion of Stage 1, Participant H emitted 44% correct responding to the IVOP probe, 50% to both the IVOA and VOA probes, and 18% to the VOP probe. Post Stage 1 probes for Participant L were as follows: 100% correct responding to both IVOP and VOP probes, 50% correct responding to the IVOA probe, and 20% to the VOA probe. Subsequent to the Stage 2 peer-monitoring intervention, Participant H responded with 88% accuracy to
the IVOP probe, 100% accuracy to both the IVOA and VOP probes, and responded with 50% accuracy to the VOA probe. During the second post-intervention probes, Participant L emitted 100% correct responding to both IVOP and VOP probes, 20% correct responding to the IVOA probe, and 30% to the VOA probe (Figure 11).

Another peer-monitoring intervention was implemented for Participant L in the in-vivo condition following the completion of the intervention in the video condition. Participant L met criterion on Stage 1 of the intervention in one session, and met criterion on Stage 2 of the intervention in two sessions (Figure 12). After completion of Stage 1, Participant L responded with 93% accuracy to the IVOP probe, 60% accuracy to the IVOA probe, 100% accuracy to the VOP probe, and with 50% accuracy to the VOA probe (Figure 11). Following the completion of Stage 2, Participant L emitted 100% correct responding to both IVOP and VOP probes, emitted 90% correct responding to the IVOA probe, and 70% correct responding to the VOA probe.

**Matched Pair #3**

Initial baseline data for Participants K and G can be shown in Figure 10; both pre-intervention probes are displayed in Figure 11. During the first pre-intervention probes, Participant K responded with 56% accuracy to the IVOP probe, 10% to the IVOA probe, 50% to the VOP probe, and responded with 0% accuracy to the VOA probe. Participant G emitted 38% correct responding to the first IVOP probe, 0% correct responding to both the IVOA and VOA probes, and 50% correct responding to the VOP probe during the first pre-intervention probe sessions (Figure 11).

Participant K required 1 session for Stage 1; Participant G required 7 sessions (Figure 12). Both participants required 4 sessions to meet criterion during Stage 2 of the
intervention. After completion of Stage 1 of the intervention, Participant K responded with 100% accuracy to both IVOP and VOP probes, 40% accuracy to the IVOA probe, and responded with 10% accuracy to the VOA probe. Participant G, following Stage 1 intervention, emitted 60% correct responding to the IVOP probe, 53% correct responding to the VOP probe, and 0% correct responding for both IVOA and VOA probes. Post Stage 2 training, Participant K responded with 100% accuracy to both IVOP and VOP probes, 80% accuracy to the IVOA probe, and 70% accuracy to the VOA probe (Figure 11). During the second post-intervention probe sessions, Participant G responded with 87% accuracy to the IVOP probe, 30% accuracy to the IVOA probe, 73% accuracy to the VOP probe, and 20% accuracy to the VOA probe.

Participant G underwent the peer-monitoring intervention stages again, but did so under in-vivo conditions. This participant required three intervention sessions to meet criterion on Stage 1; afterwards he emitted 100% correct responding on the IVOP probe, 60% on the IVOA probe, 87% on the VOP probe, and 40% correct responding on the VOA probe (Figures 11 & 12). Two intervention sessions were conducted for Participant G to meet criterion for Stage 2 in the in-vivo condition. Following this, he responded with 100% accuracy to the IVOP probe, and with 80% accuracy to the IVOA probe. Participant G emitted 94% accuracy to the VOP probe, and emitted 70% accuracy to the VOA probe (Figures 11 & 12).
Figure 11. Pre- and post-intervention data for Participants J, H and K (in-vivo condition) and Participants A, L, and G (video condition), in addition to post-intervention data following the completion of in-vivo peer-monitoring for participants originally assigned to the video playback condition (solid line).
Figure 12. Intervention session data for Participants J, H and K (left side-in-vivo condition) and Participants A, L, and G (right side-video condition).
**Group Differences Between the Video and In-Vivo Conditions**

Differences in correct responding across the in-vivo condition, video condition, and the video condition post in-vivo training groups are shown in Figures 13 and 14, as well as Tables 8 and 9.

**Observational performance probes.** Both the in-vivo group and video group substantially increased their correct responding during the post-intervention observational performance probes (Figure 13). This correct responding continued to increase following the post in-vivo training for participants originally assigned to the video condition. The in-vivo group emitted a total of 18 correct responses out of 48 response opportunities pre-intervention, and emitted a total of 44 correct responses following the intervention. Participants in the video group emitted a total of 16 correct responses to the pre-intervention observational performance probes, and emitted a total of 44 correct responses after completing the intervention. Post in-vivo training, the original video group emitted a total of 48 correct responses to the performance probes.
Figure 13. Group data emitted by participants during pre- and post-observational performance probes. This group data is only taken from the in-vivo pre- and post-probes conducted in Experiment 2, as no substantial differences were observed across the in-vivo and video probe data.
**Observational learning probes.** Substantial differences were observed between the experimental conditions in regards to the data obtained during the post-intervention observational learning probes; participants assigned to the in-vivo condition emitted substantially more correct responses than their peers in the video condition (Figure 14). Furthermore, participants originally assigned to the video condition did increase their accuracy of correct responding to the observational learning probe following the post in-vivo training (Figure 14). The in-vivo group emitted a total of 5 correct responses out of 30 response opportunities prior to the intervention, and emitted a total of 25 correct responses during post-intervention observational learning probes. During pre-intervention probes, the video group emitted a total of 3 correct responses out of 30 response opportunities, and emitted a total of 8 correct responses after completing the intervention. After participating in the in-vivo intervention, the video group emitted 25 correct responses to the post-intervention observational learning probes.
Figure 14. Group data emitted by participants during pre- and post-observational learning probes. This group data is only taken from the in-vivo pre- and post-probes conducted in Experiment 2, as no substantial differences were observed across the in-vivo and video probe data.
Table 8

*Means and Standard Deviation (SD) Scores for Correct Responses to Observational Performance Pre- and Post-Probes*

<table>
<thead>
<tr>
<th>Probes</th>
<th>In-Vivo Group</th>
<th>Video Playback Group</th>
<th>Video Playback Group Post In-Vivo Training</th>
</tr>
</thead>
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<tr>
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<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Pre-Intervention</td>
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<td>5.20</td>
<td>5.33</td>
</tr>
<tr>
<td>Post-Intervention</td>
<td>14.67</td>
<td>1.15</td>
<td>14.67</td>
</tr>
</tbody>
</table>

Table 9

*Means and Standard Deviation (SD) Scores for Correct Responses to Observational Learning (Acquisition) Pre- and Post-Probes*

<table>
<thead>
<tr>
<th>Probes</th>
<th>In-Vivo Group</th>
<th>Video Playback Group</th>
<th>Video Playback Group Post In-Vivo Training</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Pre-Intervention</td>
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<td>1.53</td>
<td>1</td>
</tr>
<tr>
<td>Post-Intervention</td>
<td>8.33</td>
<td>1.53</td>
<td>2.67</td>
</tr>
</tbody>
</table>

Verbal Operant Probes

Verbal operant probes were conducted prior to the participants entering the peer-monitoring intervention, and following the intervention in their original experimental condition (in-vivo or video). These verbal operant probe data are displayed in Figure 15. Four out of the six participants increased their total number of verbal operants emitted during the 5-min session in the free-operant play setting, one participant’s emission on
these operants remained stable during pre- and post-intervention probes, and one participant decreased the amount of operants that were emitted.

Prior to the peer-monitoring intervention, Participant J emitted 0 mands, 6 tacts, 2 conversational units, 1 sequelic, and 0 unreciprocated initiations. Participant H emitted 4 mands, 2 tacts, 0 conversational units, 5 sequelies, and 0 unreciprocated initiations. Participant K emitted 2 mands, 9 tacts, 0 conversational units, 1 sequelic, and 6 unreciprocated initiations. Participant G emitted 2 mands, 16 tacts, 2 conversational units, 6 sequelies, and 0 conversational units. Participant A emitted 7 mands, 2 tacts, 0 conversational units, 7 sequelies, and 0 unreciprocated initiations. Participant L emitted 2 mands, 1 tact, 0 conversational units, 1 sequelic, and 7 unreciprocated initiations.

Following the peer-monitoring intervention, Participant J emitted 3 mands, 10 tacts, 3 conversational units, 5 sequelies, and 1 unreciprocated initiation. Participant H emitted 0 mands, 12 tacts, 0 conversational units, 3 sequelies, and 4 unreciprocated initiations. Participant K emitted 3 mands, 11 tacts, 3 conversational units, 2 sequelies, and 8 unreciprocated initiations. Participant G emitted 6 mands, 9 tacts, 5 conversational units, 5 sequelies, and 0 conversational units. Participant A emitted 0 mands, 5 tacts, 0 conversational units, 0 sequelies, and 0 unreciprocated initiations. Participant L emitted 4 mands, 9 tacts, 3 conversational units, 3 sequelies, and 3 unreciprocated initiations.
Figure 15. Total number of verbal operants (unreciprocated initiations, sequelics, conversational units, tacts, mands) emitted by Participants H, K and J (in-vivo condition) and Participants G, A, and L (video condition) during a 5min free-operant play session following the peer-monitoring intervention.

Figure 16 displays the number of missed opportunities to emit verbal behavior with other peers in the free-operant play setting, both pre- and post-intervention sessions. Before the implementation of the intervention, Participant A had 7 missed opportunities
to respond, Participant H had 5 missed opportunities, Participants G and L had 4 missed opportunities, Participant K had 3 missed opportunities to respond, and Participant J had 2 missed opportunities to respond to peers. Following the intervention, Participants K, J, G, and L had 2 missed opportunities to respond; Participants H and A had 0 missed opportunities to respond to peers’ initiations.

![Bar chart showing missed opportunities](chart.png)

**Figure 16.** Total number of missed opportunities emitted by Participants H, K and J (in-vivo condition) and Participants G, A, and L (video condition) during a 5min free-operant play session following the peer-monitoring intervention.

Group means and standard deviations of social contact pre-intervention and post-intervention are represented in Figure 17. The mean social contact of the in-vivo condition pre-intervention was 12.67 (standard deviation of 4.76), and post-intervention
was 22.67 (standard deviation of 4.04). In the video condition, the mean number of social contact pre-intervention was 17.67 (standard deviation of 7.64), and post-intervention was 17.33 (standard deviation of 10.79).

![Bar chart showing mean number of social contact in in-vivo and video conditions before and after intervention.](chart)

**Figure 17.** Mean number of social contact emitted by participants in the in-vivo condition (left) and video condition (right) during pre- and post-intervention verbal operant probes. The solid error bars represent the standard deviations.

**Discussion**

Findings from Experiment 2 validated those from Experiment 1, as participants originally assigned to the in-vivo condition acquired the observational learning capability, in addition to observational performance (Figure 11). Participants originally assigned to the video condition also demonstrated observational performance following the peer-monitoring intervention, however, the observational acquisition capability was not induced (Figure 11). These data demonstrate the differences between the peer-
monitoring intervention in the in-vivo and video conditions, which were further supported by group data (Figures 13-14; Tables 7 & 8). After the peer-monitoring intervention was implemented in the in-vivo condition for participants who were originally assigned to the video condition, all participants demonstrated that they had the observational learning in repertoire (Figure 11). Similar trends in data were observed across the video and in-vivo observational performance post-intervention probes; participants originally in the in-vivo condition typically emitted higher percentages of correct responding to the in-vivo observational acquisition post-probe, as opposed to the video observational acquisition post-probe.

Verbal operant probe data from Experiment 2 supported findings from Baker (2014), as participants in the in-vivo condition increased their emission of verbal operants substantially more than their peers in the video condition following the peer-monitoring intervention sessions (Figure 17). However, most participants, regardless of their original condition assignment, substantially increased the number of tacts emitted in the post-intervention free operant setting, showing that they sought more social reinforcement from their peers following the intervention. All participants substantially reduced the total number of missed opportunities to peers’ social initiations following the interventions, demonstrating the effectiveness of the peer-monitoring procedure in regards to peer awareness (Figure 16).
CHAPTER IV

GENERAL DISCUSSION

A peer-monitoring procedure was used to induce observational performance and learning across participants that were either assigned to an in-vivo or video playback intervention condition. In Experiment 1, all pre- and post-intervention probes were conducted in-vivo; observational performance emerged across the majority of participants regardless of their assigned intervention condition. The completion of the peer-monitoring intervention, in either condition, led to the emergence of observational performance across participants. However, all participants needed to complete the peer-monitoring intervention in-vivo for the observational learning capability to emerge. The in-vivo condition resulted in the pairing of peer-monitoring and conditioned reinforcement for peers. These findings were consistent in Experiment 2, where pre- and post-probes were conducted both in a video and in-vivo setting. Additionally, participants originally assigned to the in-vivo condition emitted substantially more frequencies of social contact in a free-operant play setting post-intervention than their peers assigned to the video condition, demonstrating that peers now functioned as conditioned reinforcers for the participants following the in-vivo condition, but did not for participants post-intervention in the video condition. Further discussion of these findings is below.

Observational Performance

Demonstration of the observational performance capability, as defined in this study, refers to the emission of correct responses to novel stimuli following the observation of peers’ consequences to a familiar task. In Experiment 1 and Experiment 2, participants sequenced novel pictorial event series prior to and following the peer-
monitoring intervention, either in the video or in-vivo condition. Findings from Experiment 1 showed that 5 out of the 6 participants demonstrated observational performance following the peer-monitoring intervention, regardless of the original experimental condition they were assigned to (Figure 6). Similar results were found in Experiment 2; all 6 participants demonstrated observational performance during both the post-intervention video and in-vivo performance probes (Figure 11). Post-intervention data from both experiments indicated that the peer-monitoring intervention was effective in inducing observational performance in the in-vivo condition and in the video condition.

These findings extend results detailed in Delgado (2005), as well as Delgado and Greer (2009), in which observational learning emerged as a function of a peer-monitoring intervention. Furthermore, all participants originally assigned to the video condition in Experiment 2 also demonstrated observational performance during post-intervention video performance probes; this shows that peer-monitoring functioned to gain participants’ attention to the consequences given to their peers during performance tasks. Results from Experiments 1 and 2 also showed that observational performance did emerge at a faster rate among most participants originally assigned to the in-vivo condition than their peers assigned to the video condition. This differs from conclusions drawn by Charlop-Christy, Le, and Freeman (2000), who found that the learning rate of performance skills was higher via video modeling as opposed to in-vivo modeling. However, the study conducted by Charlop-Christy, et al. (2000) did not analyze the emergence of observational performance as a capability, rather, they measured the correct emission of performance skills through observation. Research conducted in the current
study not only demonstrates that the observational performance capability is learned and not phylogenetic, but also displays the effectiveness of peer-monitoring in regard to performance tasks, both via video and in-vivo settings. Therefore, the peer-monitoring intervention was the catalyst to the induction of observational performance across either experimental condition.

**Observational Learning**

Observational learning refers to a verbal developmental capability that when induced, enables individuals to acquire new operants indirectly through the observation of others’ consequences (Greer, Singer-Dudek & Gautreaux, 2006). Many researchers have sought to teach novel skills through observation when this capability is already in repertoire, however, few have produced data that highlight how to establish this capability. The implementation of a peer-yoked contingency and peer-monitoring have been shown to induce the observational learning capability (Davies-Lackey, 2005; Stolfi, 2005; Delgado, 2005; Delgado & Greer, 2009). This study analyzed whether the emergence of this capability would occur following a peer-monitoring intervention in either an in-vivo or video playback setting.

In this study, substantial differences were found between the experimental conditions in relation to the induction of observational learning. In both Experiment 1 and Experiment 2, none of the participants originally assigned to the video peer-monitoring condition demonstrated observational learning until they completed the intervention again in the in-vivo condition. Thus, peer-monitoring in the video condition alone was ineffective in inducing observational learning. Moreover, this experimental condition was most likely ineffective because of the lack of audience during the peer-monitoring
intervention, and therefore the social pairings between the peers and reinforcement for monitoring responses was unable to occur.

Skinner (1957) states that an audience is fundamental for the maintenance of verbal behavior, however, results from this study demonstrate that an audience is also necessary to induce observational learning. During the peer-monitoring intervention in the video condition, no peers were present, therefore, it is likely that peer-monitoring in this condition had less reinforcement value than in the in-vivo condition. This supports findings from Fantuzzo et al. (1988), in which participants assigned to a peer group dyad increased their social behavior more than participants assigned to adult or control group conditions; Donley and Greer (1993) had similar findings. In addition, no other individuals were present during the video observational learning pre-intervention and post-intervention probes in Experiment 2 other than the experimenter and participant, which could have negatively affected participants’ responses, as was shown in Gold (2013). Though the experimenter was present during the peer-monitoring intervention in the video condition, the experimenter seemed to function as a neutral audience, which could explain the participants’ low percentages of current responding to the learning tasks. Butler and Baumeister (1998) found that students who felt they were in the presence of a “supportive” audience emitted more correct responses to a novel, difficult skill. A “supportive” audience within a verbal behavior approach is an audience who frequently delivers reinforcement to the individual, who in this case was the peer. The absence of the peer during the monitoring intervention resulted in observational learning not emerging in the video condition. The crucial role of the peer audience in both Experiment 1 and 2 was validated by the findings that participants did demonstrate the
observational learning capability after completing the peer-monitoring intervention in the in-vivo condition. Therefore monitoring another peer via video was not enough to induce this verbal capability; the physical presence of a peer was necessary in order to do so. Following the completion of the intervention in the in-vivo setting, all participants can now acquire new operants indirectly simply though observing the consequence delivered to their peers; a method of learning that they did not have in their repertoire before. Completing the peer-monitoring intervention in-vivo altered the reinforcement value of social contact, whereas the peer-monitoring intervention via video resulted in establishing simply the topography of peer observation. Results of probes following the in-vivo intervention demonstrated that all participants could now learn new operants for unfamiliar stimuli as a function of observation of peers. Taken together with other social cusps that were present at the onset of the experiments, such as the observational learning of new reinforcers, these participants’ responses were now under observational stimulus control.

**Emission of Verbal Operants**

Verbal operants, or various types of verbal behavior that have specific functions, were measured in Experiment 2 (Skinner, 1957). Just as the role of the audience was critical in the induction of observational learning across participants in Experiments 1 and 2, the audience (or lack there of) also had an effect on the frequencies of verbal operants emitted by participants. Recent studies have supported these findings; Vogt (2009) and Baowaidan (2016) both found that the implementation of an observational intervention, whether to acquire new operants or condition reinforcers, functioned to increase the emissions of verbal operants by participants. Following the completion of the peer-
monitoring intervention, participants in Experiment 2 who were originally assigned to the in-vivo condition emitted substantially more verbal operants than their peers originally assigned to the video condition (Figure 17). These considerable increases were particularly seen across unreciprocated initiations and tacts; verbal operants that function to gain social reinforcement. Therefore, peer-monitoring in-vivo resulted in participants seeking more access to social reinforcement from their peers, a behavior that was not demonstrated with two of the three participants who peer-monitored via video playback.

Similar findings were shown in Baker (2014), where participants who participated in a social listener reinforcement protocol emitted more verbal operants, specifically sequelics, tacts and conversational units, than peers who participated in a video modeling protocol. The results from Experiment 2 further validate data obtained in Baker (2014), as social reinforcement was heightened across participants originally assigned to the in-vivo condition. However, all participants from Experiment 2 decreased their total number of missed social opportunities following the peer-monitoring intervention (regardless of experimental condition), whereas most participants in the video modeling condition in Baker (2014) increased their total number of missed social opportunities. This difference could be attributed to the peer-monitoring procedure implemented in this study, which required participants to respond to their peer several times during each session, therefore their high frequencies of responding to a peer generalized to a free-operant play setting. The educational significance of the results within these experiments emphasized the emergence of social reinforcement during the in-vivo peer-monitoring condition. The potential implications are even greater for children with autism whose core symptoms include social deficits.
Limitations

There were multiple limitations in this study, particularly in regard to the verbal operant probes. During these probe sessions, the peers that were present in the free-operant play setting along with the participants were not the same students across all pre-intervention and post-intervention probes. Therefore, this difference could have affected the emission of verbal operant probes emitted by the target participants. In addition, the verbal operant probes were conducted in a section of a classroom in which 10 out of the 12 participants regularly engaged in play. For two of the participants, this play setting was less familiar, which possibly could have resulted in less accurate measurement of emission of verbal operants of these particular participants.

Two pre-intervention observational learning and performance probes were conducted for the second and third matched pairs in both Experiment 1 and Experiment 2, one prior to the start of the study, and one immediately before entering into the intervention sessions. Some of the participants minimally increased their correct responding to these probes from the first to the second probe sessions, demonstrating that some learning, although insignificant, was taking place prior to the implementation of the intervention due to sequence effects.

Additionally, participants assigned to the video condition may have had an instructional history with learning to tact pictorial stimuli through other technological equipment such as an Ipad; this could have had an effect on their performance in regard to learning via the video.
Future Research

The current study sought to analyze the differences between in-vivo and video peer-monitoring on the emergence of the observational learning and performance capabilities. This was the first study to compare video playback effects on learning tasks; future studies could further investigate how video modeling alters responses to new operants across various domains, or compare the differences between an in-vivo condition and a live video condition. In addition, more research can be conducted to determine whether the findings of the emergence of observational learning between in-vivo and video conditions are consistent across protocols implemented to induce other verbal cusps and capabilities, such as naming, generalized imitation, and transformation of stimulus function. Moreover, future researchers could also measure social contact during instructional settings prior to and following interventions across both in vivo and video conditions.

The majority of participants in Experiment 1 and Experiment 2 were educationally diagnosed with autism spectrum disorder (ASD), however, this study did not control for these diagnoses. Future studies could further demonstrate the effect of an observational intervention such as this one on preschoolers diagnosed with ASD.
REFERENCES


