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LET'S LEARN TOGETHER!

THE ACQUISITION OF OBSERVATIONAL LEARNING REPERTOIRES AS A FUNCTION OF PEER-YOKED CONTINGENCIES IN CHILDREN WITH AUTISM AND OTHER DEVELOPMENTAL DISABILITIES

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CHAPTER 1

REVIEW OF THE LITERATURE

1.1 Introduction

People often base their experience on learning through observation. This happens in many different areas of everyday life, such as school, work, and relationships, where we all observe other people's behavior to obtain information about how we should act or react ourselves. What we all observe, however, includes not only others' behavior, but also the contingencies that surround that behavior, producing consequences, and compose the interactions between a person and the physical and social stimuli of the outside world (Kanfer, 1965; Miller & Dollard, 1941). This happens because people are rarely in the position to learn everything they need to know about the surrounding events through direct contingencies (Kazdin, 1979; Ollendick, Dailey, & Shapiro, 1983); more often, they observe others' conduct and recognize the reinforcing or punishing effects of that behavior on the environment (Bandura, Ross, & Ross, 1963; Sechrest, 1963). This is particularly true, for example, in classroom contexts, where instruction mostly takes place in large group and students are expected to be able to learn by observing their classmates receiving direct instruction and consequences, and without being explicitly reinforced for this observational behavior (Pereira-Delgado, 2005) .

In human development, moving from the observation of another's behavior to the inclusion of that behavior, or some form of it, into the individual's repertoire necessitates,

however, of pre-requisites that may or may not have been previously acquired (Greer, Dudek-Singer, & Gautreaux, 2006; Greer & Keohane, 2004). These pre-requisites were defined as observational learning repertoires, and their lack may be associated with other deficits (Greer & Keohane, 2004). During the last decades research has focused on observational learning in individuals with developmental disabilities (Egel, Richman, & Koegel, 1981; Goldstein & Mousetis, 1989; Rehfeldt, Latimore, & Stromer, 2003; Schoen & Ogden, 1995; Varni, Lovaas, Koegel, & Everett, 1979); indeed, learning through observation is fundamental to facilitate these students' way to effective learning.

1.2 Early references to observational learning

1.2.1 Greek philosophers

Terms such as modeling, imitation and vicarious learning are probably derived from the Greek word "mimesis" and refer to the "imitation of another person's words or actions" (Brown, 1993). The Greeks aligned the use of this term with relation to the arts and literature. Early Greek philosophers established that certain literary works had to be used as models and students imitated their components (Clark, 1957). Isocrates advocated the modeling of both form and function when teaching apprentices the details of public speaking (Norlin, 1929). Aristotle spoke of the conundrum of life imitating art or vice versa. His interests were in the larger effects that were dependent on the experiences of the audience and the context of the dramatic performance (Rosenthal & Zimmerman, 1978). Eventually, the emphasis on apprentices modeling the elocution of their contemporaries spread to imitation of other social behaviors and ethical philosophies.

1.2.2 Early behaviorists

In alignment with the theoretical implications of Principles, James (1890) attributed imitation to phylogenic reasoning. However, James granted that this argument was not sufficient to discern how individuals function as imitators of others. He argued that overt behavior occurred in tandem with a corresponding covert behavior. This belief facilitated the notion that imitation relied on stored representations of behavior (James, 1890).

The emphasis at this time in certain scientific communities was centered on the acquisition of new behaviors. Thorndike (1911) asserted that he experimentally dispelled the belief that an organism could acquire untaught behaviors merely through observing others.

In similar fashion as his contemporaries, Watson (1914) was also skeptical about a connection between imitation and new behaviors. However, his own experiments provided slight evidence of vicarious learning in monkeys (Watson, 1914). Later, Watson (1919) contended that imitation played a minor role in the acquisition of motor skills but a larger component in the development of language repertoires of children shaped by modeling their parent's use of language.

For both Thorndike and Watson, the lack of clarity that surrounded imitation did not encourage the validity of imitation as scientific phenomenon worth investigating. Interest in imitation and related phenomena was categorized with other mentalistic concepts and was mentioned only vaguely in subsequent writings of methodological behaviorists. Thus, in this period, the lack of consensus about imitation and learning via observation only continued to expand.

By and large the circular debate about learning by observing did not contribute to expansion of the scientific knowledge about imitation. The mention of imitation inevitability became an artifact of discussion rather than scientific study. In reference to this discussion, Mead (1909) asserted that it would be wise not to attribute imitation as actions rooted in instinct and this view was also ultimately held by Skinner (1957).

1.3 Animal research

During the early stages of experimental psychology little evidence existed for the presence of observational learning in non-humans (Thorndike, 1901; Watson, 1908). As stated previously, the interests in observational learning as a phenomenon waned. Later, studies began surfacing on experiments involving primates and imitation (Yerkes, 1934). Yerkes' experiments were followed by a number of studies across a variety of species such as cats (Herbert & Harsh, 1944), rats (Colson, 1967), and birds (Dawson & Foss, 1965). The Herbert and Harsh experiment provided identification for several previously undistinguishable components of observational performing. In their experiment they established the significance of performing a task without the presence of the model and carefully differentiating between immediate and delayed responding.

Perhaps one of the most critical distinctions Herbert and Harsh emphasized was the description of the target behavior from a functional perspective rather than a topographical one. As a direct result of these distinctions, Meyers (1970) investigated the manipulation of schedules of reinforcement on demonstrator monkeys and subsequent appetitive learning behavior of observer monkeys. Regardless of the change in schedule of reinforcement, the

observer monkeys continued to emit target behaviors at a rate comparable to that of the anticipated rate under the various schedules of reinforcement. He concluded that it appeared the effectiveness of observational learning may be dependent on the observers having opportunities to view the observer making errors, thus aiding in discrimination.

In relation to an applied setting, Greer et al. (2004) experimentally tested the role of observing corrections versus observing errors in observational learning with children and found that the observations of errors was critical in observational learning originating from serving as a tutor or tutee.

Biederman, Roberston, & Vanayan (1986) investigated observational behavior change with pigeons via a within-subjects design in order to test the effects of past experimental conditions. This study suggested that the effects generated from exposure to various conditions may be altered by setting factors. These authors posited that attending behaviors involved with these conditions should be further investigated.

In addition to both of the above mentioned animal studies, the conditioning of stimuli as "aversive" stimuli has also been attributed to observation. Riess (1972), studied rats that were placed in an observational area and then observed rats being shocked while the shock was paired with exposure to light presentations. During this procedure, the observer rats were only exposed to environmental conditions of the model, but never received shock treatments. After being exposed to this pairing, the observer rats emitted avoidance behaviors when presented with similar light conditions. Subsequently, when the shock conditions were removed for the model rats, the observer rats decreased their avoidance behaviors.

These results supported the effects found by Bandura (1969) with human subjects and observing aversive conditions implemented on other humans. Together, these experiments provided evidence for observational behavior change of both respondent and operant behaviors across species.

During the later part of the 1960's, a concentration of experiments employing observational learning components (modeling and imitation) as an intervention began to surface. Lovaas (1966), Bandura and Mendlove (1968), O'Connor (1969) focused their investigations on a wide range of socially significant behaviors such as responding to feared objects, social interactions and language emission based on behaviors resulting from observing a model.

One of the limitations to some of these experiments was the consistent presence of models in the environments of the observers. This limitation has relevance to the generalization of the target behaviors to natural environments. Typically, in natural environments, behaviors are not explicitly modeled as in structured settings. Brody, Lahey and Combs (1979) demonstrated the effects of intermittent adult modeling on the acquisition of target behaviors by observers. Their results showed that behaviors acquired under intermittent modeling conditions were learned and maintained equally, regardless of the prevalence of the modeling conditions (50% versus 100% of modeling opportunities). This study increased the interests in investigating other behaviors and scenarios that could test for observational behavioral change.

The emphasis on changing behavior by observation in the applied literature was enhanced by the passage of the federal legislation regarding the education of children with

disabilities. Interpretation of a least restrictive environment stipulation led many professionals to determine the benefits and risks of including children with more significant disabilities in general education classes (Stainback & Stainback, 1991). This cultural influence raised research questions relating to the effectiveness of peer models on students with disabilities. Egel, Richman and Koegel (1981) tested the effects of typically developing peers as models on evoking color discriminations by autistic students. For each participant a dramatic increase in targeted behaviors was reported after exposure to peer-models performing the target discriminations. Although, the authors stated that many factors may have been in place for occasioning these behaviors.

Even though modeling was well established as a strategy for children to emit behavioral changes after observing, many argued that much more research was necessary for developing effective instructional procedures for language acquisition (Browder, Schoen & Lentz, 1987). Goldstein and Mousetis (1989) suggested that research should seek to determine if an observer could respond to discriminative stimuli that were not limited by topographical characteristics (i.e., a functional response class). The authors designed an experiment to test the effects of observational learning and matrix strategies on recombinative generalization of language. Their data showed that all of the participants demonstrated the acquisition of the responses modeled by their peers. However, it is critical to this review that many of the base words used in the study were already part of the participants' verbal repertoires.

The next important contribution to the applied literature was designed to test the effects of triadic instruction for learning independent living skills on acquiring target skills

simply from observing another peer being directly taught (Griffen, Wolery, & Schuster, 1992). Griffen et al. (1992) trained a student to prepare food in a chained fashion using a time delay tactic. At the same time two other peers observed this instruction. Although each of the observers acquired the untaught skills at a rate similar to the student directly being taught, it should be noted that in the pre-treatment phase ascending trends were reported. In addition, during this phase, the subjects were reinforced for correct responding. Furthermore, the researchers discussed that the students' existing repertoires and past experiences may have attributed to their acquisition of the observed responses. Based on these data, Griffen et al. (1992) also posited that the subjects would not have emitted changes in behavior via observing without the existence of a generalized imitation repertoire. Based on these limitations, although behavior change may have occurred, the students did not learn from a functional perspective.

Werts, Caldwell, & Wolery (1996) used typically developing peers to demonstrate chains while developmentally disabled students modeled these chains. Additionally, Werts et al. (1996) also monitored the social interactions between the models and observers after the instructional sessions. The peer models in this study described each step as they performed it. Therefore, it remains unknown whether this verbal mediation was required in order for the observers to acquire the tasks. There was also no reported change in the level of social interactions between peers and observers as a result of the instructional arrangement.

MacDonald, Dixon, & Leblanc (1986) and Latimore (2001) showed that stimulus classes could be formed via observation. Gardner (2001) used observational learning to establish reinforcement properties in neutral stimuli. Nuzzolo (2002) demonstrated that

teachers could learn accurate scientific Tacts through observing other teachers use these Tacts functionally. Although Nuzzolo, who tested for learning, did establish pre-experimental repertoires, most of the other researchers did not design their experiments to account for true learning, and in this vein, some of the participants did not learn from the model. Therefore, the scarcity of evidence identifying learning from observation has created a need for future experiments that either address generalized imitation repertoires or observational learning as a repertoire.

There have been few studies investigating observational learning and students with emotional or behavior disorders. Christy (1975), Birnbrauer, Hopkins, and Kauffman (1982), and Drabman and Lahey (1974) failed to show consistent results when studying the effectiveness of vicariously reinforcing peers and any changes in behavior attributed to observing these students. Clearly, the above referenced investigations were about performance in which adult reinforcement may actually serve as vicarious negative reinforcement for the participants to emit incompatible behaviors. These results have led some to conclude that vicarious reinforcement serves to temporarily increase behavior, but if the child does not come in contact with direct contingencies, responding decreases over time.

Modeling, imitation and vicarious learning with reference to a procedure as an implementation of observational learning has been investigated in the experimental applied literature as a procedure to teach a variety of skills and repertoires.

1.4 Towards a shared definition of observational learning

The comprehension and operational definition of observational learning have represented a source of debate and research since the early 1960s (Bandura & Walters, 1963; Catania, 2007; Gewirtz, 1971; Metz, 1965; Staats, 1975). There is still a marked overlap between the different operational definitions that have been made through the years and there is poor agreement about what constitutes observational learning and its influential factors (Catania, 2007; Deguchi, 1984; Greer, Dudek-Singer, & Gautreaux, 2006; Pereira-Delgado & Greer, 2009). Terms such as "modeling", "imitation", "vicarious reinforcement" and "observational learning" have often been used interchangeably, but a few distinctions must be made, in order to establish a solid and exhaustive theoretical base that may lead to greater precision and incisiveness of research.

Catania (2007) defined observational learning as "learning based on observing the responding of another organism (and/or its consequences)" (pag. 399). This means that observational learning requires that the individual duplicates not only the topography, but also the contingencies that surround the observed behavior. This kind of learning involves the observation of the contingencies, not only the behavior, and this is why, according to Catania (2007), observational learning doesn't always include imitation. For example, it could occur without imitation, when an individual learns not to imitate a model's behavior because the observed consequences are unfavorable.

Catania (2007) defined modeling as a synonym of imitation, although a slightly bigger emphasis was put on the action of providing a model that may be object of imitation.

Kazdin (1979) defined vicarious reinforcement as an increase, or decrease, in the behavior of an individual who observes others receiving consequences for their behavior. This means that indirect contact with reinforcing or punishing contingencies may influence observer's behavior. These effects, however, are not always coherent with the ones that could be expected as connected to vicarious reinforcement, as demonstrated in various studies (Bol & Steinhaur, 1990; Kazdin, 1973; 1977; Ollendick, Shapiro, & Barrett, 1982; Sechrest, 1963). Deguchi (1984) pointed out that observational learning, which occurs through vicarious reinforcement, can be described as a "one-trial demonstration of relatively novel behavior following an exposure to the modeled behavior without any direct manual guidance, prompting, or external reinforcement" (pag. 84). According to Deguchi (1984), however, this ability may take origin in the subject's conditioning history, so reinforcement could play a role for the emergence and control of one-trial learning, especially in natural environment. Deguchi, Fujita, and Sato (1988) analyzed the role of direct reinforcement in vicarious reinforcement and observational learning, showing that subjects exposed to vicarious reinforcement initially increased, then decreased, their behavior; subjects exposed to direct reinforcement or direct and vicarious reinforcement together, instead, showed an increase in behavior and a maintenance of it through time. Greer, Dudek-Singer, and Gautreaux (2006) suggested that these findings could be explained considering that participants' behavior examined in the studies was already in their repertoire, meaning it could not be defined as true learning. In these studies (Deguchi, Fujita, & Sato, 1988), experimental subjects were simply emitting operants that were already in their repertoire, but were now occasioned by

the observation of the contingencies surrounding the model's behavior and maintained by direct reinforcement of observer's imitative behavior.

In Deguchi, Fujita, and Sato (1988) study, as in many other researches (e.g., Bol & Steinhaur, 1990; Ollendick, Dailey, & Shapiro, 1983), little attention was directed to the distinction between acquisition of new operants and performance of behaviors already in repertoire. Catania (2007) defined learning as "roughly, acquisition, or the process by which behavior is added to an organism's repertory, a relatively permanent change in behavior" (pag. 395). Also, Greer, Dudek-Singer, and Gautreaux (2006) defined learning as the acquisition of operants or higher-order operants. They defined an operant as a class of responses that is modified by its consequences, while higher-order operants include other classes of behavior that serve as their own operants such as those required to produce novel behaviors or generalized responding (Catania, 2007). These authors suggest to refer to performance, instead, for behaviors that are already in an individual's repertoire (Catania, 2007), and whose rate of emission could change, for example, as a function of observing contingencies received by others (Greer, Dudek-Singer, & Gautreaux, 2006). Since learning also occurs vicariously, Greer, Dudek-Singer, and Gautreaux (2006) re-defined learning as the acquisition of operants or higher-order operants as the function of direct contact with reinforcing or punishing contingencies, or as a function of the observation of others being in contact with the contingencies of reinforcement, punishment or corrections of incorrect responses. Moreover, Pereira-Delgado (2005) distinguished between vicarious reinforcement and observational learning, as the latter refers, as already stated, to the acquisition of new

operants, whereas the first refers to altering the momentary rate of behavior emission, which does not necessarily include learning.

Greer, Dudek-Singer, and Gautreaux (2006) also identified five different types of changes in behavior resulting from observation of contingencies surrounding others' behavior: 1) changes in performance, 2) acquisition of new operants, 3) acquisition of higher-order operants, 4) conditioning previously neutral stimuli as reinforcers through observation and 5) acquisition of an observational learning repertoire. Since learning is different from performance, every kind of behavior change based on observation needs preliminary assessment operations, in order to verify the presence or absence of specific operants or higher-order operants or requirements to acquire them. Some studies included this preliminary assessment to test if participants had the target behaviors in their repertoire prior to implementation of observation as an independent variable, in order to control for learning as the actual outcome (Egel, Richman, & Koegel, 1981; Griffen, Wolery, & Schuster, 1992; Rehfeldt, Latimore, & Stromer, 2003; Werts, Caldwell, & Wolery, 1996).

1.5 Recent research on induction of observational learning

An observational learning repertoire represents a fundamental requisite especially for students, either typically developing or with disabilities, in order to effectively learn in classroom contexts. Rothstein and Gautreaux (2007) explained that observational learning repertoires may be evoked, if missing, in three principal ways: peer tutoring, monitoring and peer-yoked contingencies. These procedures may also be combined into an Observational

System of Instruction, in order to provide extensive classroom instruction based on observational learning.

Greer, Keohane, Meinke, Gautreaux, Pereira-Delgado, Chavez-Brown and Yuan (2004) reported the results of five experiments showing that the key elements for effective tutoring are the presence of the components of learn units. A Learn Unit was defined as the least divisible component of instruction that includes both student and teacher interaction and predicts new stimulus control for the student (Greer, 1994). The learn unit includes both student's and teacher's interlocking operants, and each of these operants can be defined as a three-term contingency (S^d, behavior, consequence) (Greer, 2002). Peer tutoring and direct instruction, both delivered as learn units, were compared by Greer, Keohane, Meinke, Gautreaux, Pereira-Delgado, Chavez-Brown, and Yuan (2004), who identified peer tutoring as the most effective teaching strategy. Moreover, tutoring that includes learn units is necessary not only for tutors and tutees, but also for students observing the tutoring, who especially benefit from observing correction operations done by tutors with tutees (Greer, Keohane, Meinke, Gautreaux, Pereira-Delgado, Chavez-Brown, & Yuan, 2004).

Pereira-Delgado (2005; 2009) described two experiments consisting in a peer-monitoring intervention to teach observational learning in children diagnosed with developmental disabilities. The peer-monitoring procedure was focused on teaching the students to monitor their peer's correct and incorrect responses during learn unit presentation by the teacher. Observational learning emerged for all participants, because, after the intervention, they all showed higher levels of correct responding than in their pre-experimental probes when observing peers receiving learn units. The students also showed

generalization of correct responding across different types of response and across peer confederates. These results suggested that observational learning might be a behavioral developmental cusp (Rosales-Ruiz & Baer, 1997), a change in the capability of an individual that is crucial to facilitate subsequent development. Observational learning could also constitute a capability, a developmental stage that is acquired incidentally or induced and allows the individual to learn in ways that were not possible before (Rosales-Ruiz & Baer, 1997; Greer & Ross, 2008; Greer & Speckman, 2009).

Gautreaux (2005) tested the effects of engaging in monitoring training on the acquisition of observational learning repertoires and other collateral behaviors such as generalization of the procedure to self-monitoring and listening to one-step directions in middle-school students diagnosed with emotional disturbance and behavioral disorders. The results of these studies showed that intensive monitoring training is effective in inducing observational learning and other collateral behaviors.

Davies-Lackey (2005) tested the relationship between a yoked-peer contingency and the acquisition of an observational learning repertoire in children with autism. Yoked contingencies can be defined as conditions where subjects must work or learn together in order to receive reinforcement (Greer & Ross, 2008). In Davies-Lackey's study the participants earned points in a game only when the target student emitted a correct response to a stimulus previously taught to an observed peer. The results of this study show a functional relationship between the yoked-peer contingencies and the emergence of an observational learning repertoire by the observers.

Stolfi (2005) conducted a similar study on students with developmental delays, showing equal results.

Rothstein and Gautreaux (2007) not only demonstrated the existence of a relationships between peer-yoked contingencies and the emergence of an observational learning repertoire, but also pointed out the capacity of observational learning interventions to induce naming, which involves a bidirectional relationship between the listener and speaker capabilities of an individual and facilitates rapid acquisition of a large number of new verbal operants.

1.6 Conclusions

Although observational learning appears to be unanimously considered as a fundamental requisite for individuals to successfully face different situations in everyday life, with special mention to students in classroom contexts, there seems to be poor agreement about its operational definition and its distinction from phenomena such as imitation, modeling and vicarious reinforcement. Different researchers have tried to shed light upon these distinctions: Deguchi, Fujita and Sato (1988) underlined the role that natural reinforcement could play on the emergence of new behavior after observation, whereas Greer, Dudek-Singer, and Gautreaux (2006) pointed out the importance of distinguishing between performance of behaviors already in an individual's repertoire, whose rate of emission may be changed after observation of consequences received by a model, and acquisition of new behaviors, corresponding to learning. This distinction naturally leads to underlining the importance of preliminary assessment of behaviors that are or are not already in the individual's repertoire, in order to verify if interventions based on observation produce

effective learning (Greer, Dudek-Singer & Gautreaux, 2006). Further research would be needed to identify systematic and exhaustive procedures capable of effectively assessing the presence or absence of a complex repertoire such as observational learning.

Different studies tried to identify effective ways to induce observational learning (Greer, Keohane, Meinke, Gautreaux, Pereira-Delgado, Chavez-Brown & Yuan, 2004; Davies-Lakey, 2005; Gautreaux, 2005; Pereira-Delgado, 2005; 2009; Stolfi, 2005; Rothstein & Gautreaux, 2007). The results of these experiments show that peer-tutoring, monitoring and peer-yoked contingencies, combined with the presence of learn units, appear to be effective on the emergence of an observational learning repertoire in children who previously lacked it. More research should be conducted to replicate these findings and to create a system of instruction devoted to facilitate the emergence of observational learning especially in classroom and large group contexts.

1.7 Strategies for increasing observational learning

As stated above, there are a number of potential skills which when deficient may preclude learning through observation. Although more research is needed to demonstrate the particular prerequisite skills and the most efficient strategies to teach them, some practical strategies that may increase attending, imitation, and the discrimination of contingencies, can be described (Taylor & DeQuinzio, 2012). Some of the strategies are based on empirical research and others on clinical practice. Although a benefit of observational learning is to increase new responses without the direct instruction of each individual learner, building the prerequisite responses will initially require individualized instruction. General classroom

strategies can also be used to facilitate these skills in a group instruction format (Taylor & DeQuinzio, 2012).

Teach sustained attention to peer models: the child with autism must first demonstrate proficiency in looking at, or orienting toward, a model for an extended duration so that he may observe the entire response performed by the model and subsequent consequences. To date, there is no research specifically evaluating strategies for increasing sustained attention by children with autism. Shaping, a procedure in which successive approximations of a target response are differentially reinforced (Cooper, Heron, & Heward, 2007), could be an effective strategy for increasing sustained attention. Teachers, at first, may reinforce short instances of looking at, or orienting toward, a model and then systematically increase the duration required for reinforcement. Initially, to shape attention toward a model, the teacher could have the child with autism sit across from a peer and provide an instruction to the child to look at the peer model (e.g., the teacher could say, "Look at John") and use a gesture prompt of pointing in the direction of the peer. When the child looks in the direction of the peer, the teacher would provide praise and a preferred snack or toy to reinforce his response of looking toward the peer. To ensure the child is actually looking at the peer, the teacher could ask the child questions about the peer's responses or behavior (e.g., ask, "What is John doing?"). The child's correct answer ensures that he has looked at the peer. To increase the likelihood that the child will look at the peer, the teacher could have the peer model fun or interesting actions or activities (such as demonstrating play with a fun toy). Over time, to shape longer durations of looking at the peer model, the teacher could have the peer model perform a sequence of actions out of the chair and with other peers or teachers. The teacher

could use a timer to cue the expected duration of attending, which can be systematically increased over time. As the child is able to sustain attention to the peer for longer periods of time, the teacher could add distractor stimuli, such as other students or toys, that may divert the child's attention and teach the child to sustain attention to the model even when these distracting stimuli are present.

Promote generalized imitation of peer's vocal and motor responses: imitation is when the child's behavior is contiguous to the behavior of a model and is topographically similar to that of the model (Baer et al., 1967). As described earlier, research has illustrated that prompting and reinforcement procedures can be used to shape imitative repertoires in children with autism using adult models. Arguably, peer imitation is an essential prerequisite skill for observational learning. Studies published using peers as models are less abundant; however, they do provide a framework for developing peer imitation training procedures (Carr & Darcy, 1990; Ganz, Bourgeois, Flores, & Campos, 2008; Garfinkle & Schwartz, 2002). To teach imitation of peer responses, a teacher may initially have the child sit across from a peer at a table or in a play area. The teacher would then ask the peer to demonstrate actions (e.g., the peer is instructed to push a car back and forth) and would present an instruction to direct the child to imitate the peer (e.g., the teacher would say, "Do what John is doing"). If necessary, the teacher could guide the child to imitate the peer's action. When the child does, the teacher would provide praise and a preferred snack or toy, to reinforce the imitative response. To promote generalization, the teacher would have the peer model different actions each time, until the child can imitate novel actions without any prompting or reinforcement. To increase the likelihood that the child with autism will imitate the peer, the

teacher could have the peer model actions associated with preferred toys that the child may not know how to operate. Or the teacher can have the peer model actions that lead to a desired outcome for the child with autism. For example, the teacher may present a new toy to the child and when the child shows interest in the toy, but is unable to operate it, the teacher could have the child observe the peer manipulate the toy to know how it works. The teacher would then provide the child with autism an opportunity to imitate the action with the toy.

In addition to this structured imitation training with peers, Brown, Brown, and Poulson (2008) argued that it is also important to teach children with autism to imitate the responses of peers without a verbal instruction. The authors reasoned that in more "ordinary" learning environments, such as general education classrooms, verbal instructions to imitate peers and programmed consequences for doing so are not likely to occur. Thus, structured imitation training should attempt to establish imitation of peers under conditions that are similar to those involved in observational learning. This can be promoted by eventually teaching imitation of peers in a variety of contexts and eventually fading or no longer using directives for imitation, such as "Do what John is doing."

Finally, the child with autism will have to demonstrate a response modeled by a peer following some delay (Garcia, 1976). To teach this, the teacher could present novel actions for the child to imitate and impose a delay of time between the modeled action and the opportunity for the child to display the response. For example, the teacher could have the child observe the peer demonstrating a specific action with a novel toy and wait 15 minutes before giving the toy to the child with autism to assess whether the child demonstrates the responses modeled by the peer. This same sequence can be con- ducted to teach the child

with autism to imitate vocal behavior. For example, the child could observe a peer answering a teacher's question (e.g., the peer says, "four" in response to the teacher's question, "How much is two plus two?"), and the teacher could wait a few minutes and then present the question to the child with autism to see whether he imitates what was modeled by the peer (i.e., says, "four").

Teach discrimination of consequences: finally, and arguably, the most complex component response of observational learning is discriminating the consequences of the responses of others. This requires that the learner can respond differentially to complex stimuli, that is, the modeled response (e.g., a correct answer) as well as the consequences associated with each modeled response (e.g., teacher praise). Within the observational learning paradigm, learners must match the responses of the model that were rein- forced and refrain from engaging in responses that were not. Because of the complexity of the discrimination, it might be helpful to first teach learners to discriminate reinforced from non reinforced responses by engaging in an arbitrary response (e.g., pointing to a red card versus pointing to a green card; see Pereira-Delgado & Greer, 2009). Requiring a simple response, such as pointing, initially will help teachers determine whether the learner with autism can discriminate among the complex stimuli without requiring additional verbal behavior. For example, initially, the teacher could seat the child in view of a peer modeling both correct and incorrect responses to a lesson. When the model engages in a correct response as indicated by teacher praise (e.g., "Excellent, you are correct!"), the teacher could prompt the child to point to the green card. When the model engages in an incorrect response, as indicated by the teacher's corrective statement (e.g., "No, that's not correct"), the teacher would not provide

praise and would prompt the child to point to the red card. Eventually, the teacher would remove all prompts until the child accurately points to the green card when the model is correct and the red card when the model is incorrect.

Have the child practice the skills to learn new information: following mastery of the above prerequisites, teachers may consider implementing the following observational learning sequence: The teacher would first identify a skill the child cannot demonstrate but a peer can (e.g., reading of sight words, new vocabulary, answers to general knowledge questions, etc.). The child would be prompted to observe a peer engaged in an instructional session with a teacher related to the novel response (e.g., the teacher asks the peer to read sight words). The child should be able to observe the instructional stimuli that the peer sees (e.g., the child should see the sight words). After each correct response demonstrated by the model, the teacher could turn to the child with autism and ask him to repeat what the peer just said or to imitate what the peer just did. When the child responds correctly, the teacher could provide praise and preferred stimuli (e.g., toys, stickers, tokens). Later (e.g., 15 min to a half-hour later), the teacher could test the child on the responses modeled by the peer (e.g., the teacher asks the child to read the sight words) to determine whether he is learning the new responses as a result of observing the peer demonstrate the responses (Taylor et al., 2012). Assessing the response in the absence of the model tests the extent to which the observer has acquired novel responses as a result of observing the model.

Implement general classroom strategies: in addition to teaching the skills individually, teachers can promote the skills during group lessons throughout the school day (Taylor, 2013). For example, to increase attending of the child with autism toward peers, during a

group lesson, the teacher could monitor the child's attention and provide directives to the child to look at peers per- forming actions. The teacher could present the instructions directly to the child with autism (e.g., by saying, "Billy, look at what Peter is doing") or to the entire group (e.g., by saying, "Everyone look up here"). In addition, to ensure the child with autism is attending to the peer, the teacher might ask the child to recall or name actions performed by the peer immediately after the peer performs the response. For example, if a peer is called to the front of the room to complete a math problem, the teacher could ask the child with autism to say what the peer did (e.g., by saying, "Billy, what problem did Peter just complete?").

To encourage imitation of peer responses, if the child is unable to answer a question correctly, the teacher should call on a peer to model the correct answer, reinforce the peer, and then call on the child again to see whether he imitates the correct response of the peer. In addition, to encourage the child with autism to attend to the consequences provided to the peer, teachers should be explicit when providing consequences to the peer's response (e.g., when the peer is correct, say, "You are right! The capital of New York is Albany" and when the peer is incorrect, say, "No that's not correct. The Capital of New York is not Trenton"). The teacher can then assess whether the child with autism is discriminating the consequences by asking the child if the peer was correct or not. To promote generalization, the teacher could implement these strategies with a variety of lesson types and instructional stimuli.

Learning by observing others is an essential skill, but one that may not come so easily for children with autism. Behavior-analytic explanations of observational learning provide a framework for experimental evaluation of the mechanisms associated with observational learning (Deguchi, 1984; Masia & Chase, 1997) and for the remediation of observational

learning deficits in individuals with severe developmental disabilities, such as autism (Greer et al., 2006; Taylor et al., 2012). If we are to increase the learning opportunities of children with autism in typical learning environments, clini- cal practice must incorporate learning objectives and instructional strategies to develop the skills necessary to learn by observation. More research is certainly necessary to identify all of the responses required for observational learning as well as efficient methodologies. Nevertheless, an emerging body of literature is available that outlines strategies to improve the observational learning skills of children with autism. By improving such skills, we will undoubtedly enhance the educational and social opportunities for children with autism.

CHAPTER 2

EXPERIMENT 1

Participants

One 7 year-old male (Participant A) and one 8 year-old male (Participant B) elementary school students were selected for participation in this experiment.

At the onset of this study, Participant A attended the first grade at a public elementary school in a city in Northern Italy. He had a diagnosis of Elective Mutism, according to the diagnostic criteria of DSM-IV-TR (APA, 2000). He attended school 5 days a week, four hours a day; he was fully included, but regular teachers individualized materials and exercises when needed. In fact, the student sometimes showed difficulty to keep the pace of the class or to follow directions given by the teachers to all students. He had an emergent reader-writer level of verbal behavior development (Greer & Keohane, 2005; Greer & Ross, 2008).

At the onset of the study, Participant B attended the third grade at a public elementary school in a city in Central Italy. He had a diagnosis of Autism with no Mental Retardation, according to the diagnostic criteria of DSM-IV-TR (APA, 2000). He had an emergent reader-writer level of verbal behavior development (Greer & Keohane, 2005; Greer & Ross, 2008).

These students were selected for this study because they did not have an observational learning repertoire as determined by the CABAS® International Curriculum and Inventory of Repertoires for Children from Pre-school through Kindergarten (C-PIRK®) (Greer & McCorkle, 2009), that was conducted approximately one month prior to the study. During this assessment, the Participants observed a classmate learn to vocally identify a group of

pictures presented by a teacher. The teacher then provided each of the Participants with an opportunity to identify the same pictures in order to assess whether the Participant had on observational learning repertoire. The students chosen for this study were the students who did not acquire these responses through observation.

Setting and Materials

This study took place in two different Learning Centers.

Participant A attended a Learning Center located in a metropolitan area in Northern Italy. The methodology of instruction used in the Center was based on teaching as Applied Behavior Analysis. Participant A attended a class where Comprehensive Application of Behavior Analysis to Schooling (CABAS®) (Greer, 1992) was implemented. All instruction was measured as Learn Units (Greer, 2002) and all of the students' responses to Learn Units were measured.

The classroom where Participant A was included had a 4:1:2 student to teacher to teaching assistant ratio and included four students with autism or other developmental disabilities.

Pre-experimental probes, pre probes, post probes and peer-yoked contingencies sessions were conducted in the student's classroom, which was approximately 5 x 6 meters. The classroom contained two large horse-shoe shaped instructional tables with four chairs, one small rectangular table with four small chairs, a play area, a shelf containing instructional and teachers' materials, and a one-direction mirror.

When the experimenter was working with the students, she sat in one of the chairs at the large instructional table while the two students, the Participant and the peer, were seated, side by side, directly in front of her. During peer-yoked contingencies sessions, the game board was

placed on the table in front of the students. While probe and intervention sessions were being conducted, the other children were working with their teachers at the other instructional tables in the same classroom.

Participant B attended a Learning Center located in a metropolitan area in Central Italy. The methodology of instruction used in the Center was based on teaching as Applied Behavior Analysis. The experiment was entirely conducted under the supervision of a teacher certified as CABAS® Rank II.

Pre-experimental probes, pre probes and post probes with the game peer and peer-yoked contingencies sessions were conducted in a room usually used as an office. The room contained three large tables with six chairs, a bookcase and sometimes a computer.

Pre probes and post probes with the non-game peer were conducted at the Participant's school, in a room used as a library. The library was next to the student's classroom and contained four large instructional tables, 8 chairs, a chalkboard and four bookcases. Probe sessions at school were conducted during recess.

The materials used in this study were picture flashcards and a game board.

The picture flashcards were 8 x 10 centimeters. The pictures on the cards were digital images. The categories of pictures used in this experiment included: fishes, gemstones, birds, flowers. Each category contained five exemplars for each target picture (i.e., fishes: 5 exemplars of a bream, a piranha, a catfish; gemstones: 5 exemplars of an emerald, a ruby, an amethyst; birds: 5 exemplars of a crow, a wren, a heron; flowers: 5 exemplars of a dahlia, a peony, a lily) (See Figure 1).

The game board used during treatment sessions consisted of a cork board that was 40 x 50 centimeters. A paper sheet adhered on the board; the paper was blue and decorated with stars'

and planets' images. There were two golden rays going from the base to the top of the board, with labels showing "Start" at the beginning and "Finish" at the end. There were eleven Velcro circles on both rays. Velcro was also put behind four characters showing vehicles (a flying car, a spaceship, a skyrocket, and a plane) that the children and the teacher could choose for the game, so that the vehicles could be moved up and down the Velcro stages on the rays (See Figure 2).

During probe and treatment sessions a clipboard, collection forms and pens were also used. All probe sessions were recorded with HD smartphone cameras.

Method

Dependent Variable

The target behavior in this study was a pure Tact response that was learned as a function of observation. A pure Tact response was defined as a "verbal operant in which a response of a given form is evoked by a particular object or event" (Skinner, 1957, p. 82) and is under the control of generalized reinforcement, such as attention from another person (i.e., the student first sees the picture and then vocally says the name of the depicted item, thereby making verbal contact with the stimulus). Pure Tacts occurred when the stimulus was present and there was no vocal antecedent.

The target behavior was further defined as the student acquiring a Tact response by observing reinforcement and/or correction operations delivered to another student by the teacher. For example, Observational Learning occurred if the student emitted the Tact for "amethyst" without being directly taught this Tact. The Tact was acquired only after observing another student receive Learn Units for this stimulus.

Data were also collected on the number of pictures each Participant mastered through observation, during pre probes and post probes with different peers. These probe sessions were run with the game peer (the student with whom the Participant experienced the peer-yoked contingencies) and the non-game peer, a peer who was not in the peer contingencies in order to test for generalization of Observational Learning.

As previously described, each set of twenty pictures included four exemplars of five different pictures. For example, a set of gemstones included four exemplars of rubies, four exemplars of emeralds, four exemplars of diamonds, four exemplars of amethysts, and four exemplars of sapphires. The exemplars varied in terms of shape and size, while the discriminating features were held constant. For example, the shape and size of the gemstones varied across exemplars while the color (the identifying feature) was the same across the four exemplars of each gemstone.

The criterion for mastery of a picture was defined as the student correctly identifying the picture 3/4 or 4/4 times during the twenty trial probe session.

Independent Variable

The Independent Variable implemented in this study was the "Stellar Game" in which the peer-yoked contingencies were implemented. A peer-yoked contingency is a contingency of reinforcement or punishment in which the performance of one or more individuals determines the delivery of the consequence to the dyad or group (Greer & Ross, 2008). That is, a particular contingency (i.e., the delivery of reinforcement) depends upon the performance of one or more individuals in a dyad or group.

While playing the “Stellar Game”, the Participant and the game peer alternated taking turns in which they were required to tact pictures presented by the experimenter.

During the peer-yoked contingency condition, different sets of pictures were used. Each set of twenty pictures included 5 exemplars of four different pictures. For example, a set of birds included 5 exemplars of heron, 5 exemplars of crow, 5 exemplars of redbreast, and 5 exemplars of swallow. The exemplars varied in terms of shape and size, while the discriminating features were held constant. For example, the positions in which the birds were represented varied across exemplars while the color (the identifying feature) was the same across the 5 exemplars of each bird.

The criterion for mastery of a set of pictures was defined at 90% correct Tact responses for two consecutive sessions.

Data collection

For the Dependent Variable, data were collected on the number of correct responses learned through observation during probe trials for Tact responses. Students’ responses during probe trials were discrete and the number of trial presentations was controlled by the experimenter. These probe trials included consequences for students’ correct responses (reinforcement) and did not include consequences for students’ incorrect responses (correction procedure).

A correct response was recorded as a plus (+) on the data sheet and an incorrect response was recorded as a minus (-) on the data sheet.

The experimenter also wrote down the name of the picture that was presented during each trial next to the plus (+) or minus (-) on the data collection form.

During treatment sessions, the Participant and the game peer played the “Stellar Game” in which the peer-yoked contingencies were implemented. While playing the “Stellar Game”, the Participant and the game peer alternated taking turns in which they were required to tact pictures presented by the experimenter. Each turn consisted of the student tacting two different pictures. If the Participant correctly identified the picture during his turn, a plus (+) was recorded on a data collection form using a pen. If the Participant incorrectly identified one or more of the pictures, a minus (-) was recorded on the data collection form.

Since the number of trials presented to the Participant varied across sessions, the reported data were the percentage of correct responses emitted by the Participant in each session. This was calculated by dividing the number of correct responses emitted by the Participant by the total number of trials presented in each session.

Table 3 shows the collection form used during this experiment.

Design

A delayed multiple probe design across participants (Cooper, Heron, & Heward, 2007) was used to test the effectiveness of the peer-yoked contingency procedure.

Each of the Participants was presented with probe sessions both before and after the peer-yoked contingencies treatment was implemented. These probe sessions were run with two different peers: the game peer (the student with whom the Participant experienced the peer-yoked contingencies) and the non-game peer, a peer who was not in the peer contingencies in order to test for generalization of Observational Learning.

The experiment consisted of the following steps:

1. pre-experimental probes for four categories of pictures (i.e., fishes, gemstones, flowers, birds);
2. pre probes to test for Observational Learning across two peers (game peer and non-game peer);
3. peer-yokes contingency intervention;
4. post probes for Observational Learning across two peers.

Pre-experimental probes

During pre-experimental probes, the Participant was presented with a selection of picture flashcards for each category of stimuli. These probes were conducted to ensure that the student did not already have these Tacts in his repertoire.

The student was required to respond vocally while looking at the card with no vocal antecedent provided by the experimenter. If the student responded correctly, the experimenter provided vocal praise to reinforce that response. This was done to prevent the response from being placed into extinction. This procedure avoids falsely identifying the student as not having discriminative control for a stimulus when in fact the student did have the response. It should be noted that vocal praise did function as a reinforcer for all of the Participants based on prior instructional observation. If the student did not respond correctly, the experimenter did not provide a correction, but moved on to the next trial.

Table 1 shows the results of the pre-experimental probes.

Pre probes

During the pre probe, the experimenter sat in a chair next to the table and the two students sat across from her. The experimenter delivered tokens to both students throughout the course of each session. At the end of each session, the students exchanged their tokens for an item of their choice (e.g., play with an IPad).

During the pre probe, the target Participant was seated next to the game peer.

The experimenter then conducted the probe by presenting flashcard to both the game peer and the target Participant.

During this pre probe, the experimenter alternated between presenting four Learn Units to the game peer and then presenting four probe trials to the target Participant. At first, the game peer was presented with four different pictures, one at a time, by the experimenter. No vocal antecedent was given by the experimenter and the game peer was required to say the name of the item in the picture. The peer received vocal praise then he emitted the correct Tact, and a correction procedure when he emitted an incorrect Tact. The correction procedure consisted of the experimenter providing the correct response and having the peer echo that response. During this time, the experimenter would intermittently provide reinforcement in the form of vocal praise and token delivery to the target Participant sitting next to the peer for “sitting nicely” or “waiting nicely” (carefully separated from the response to the Tact stimulus).

After the game peer received four Learn Units (one for each picture), the experimenter then presented the same four pictures to the target Participant. If the Participant named the picture correctly, the experimenter provided vocal praise in order to prevent the response from being placed into extinction. If the target Participant did not identify a picture correctly, the experimenter did not say anything and moved on to the next picture.

This procedure continued in an alternating fashion until the game peer received a total of 20 Learn Units (four Learn Units for 5 different items) and the target Participant received 20 probe trials. It should be noted that multiple exemplars of the pictures were used for each item in a set, so that there were 20 different pictures (four exemplars for each of the 5 items) in a set of stimuli.

Following this probe, another pre probe was conducted using the non-game peer in place of the game peer. In other words, the same procedure was then repeated using the same target Participant and the non-game peer.

The stimuli used in this study were counterbalanced across the two Participants. Pre probes were also time-delayed across Participants.

Peer-yoked contingency

A peer-yoked contingency is a contingency of reinforcement or punishment in which the performance of one or more individuals determines the delivery of the consequences to the dyad or group (Greer & Ross, 2008). That is, a particular contingency (i.e., the delivery of reinforcement) depends upon the performance of one or more individuals in a dyad or group.

During the peer-yoked contingency conditions in this study, the experimenter sat in a chair next to the table and the two students sat across from her. The game board was placed on the table in front of the students.

The experimenter asked the two students to be a team and pick a character to represent their team for the game. The experimenter then picked one of the remaining characters to represent her for the game. The experimenter then asked the students to choose something they would like to have if they won the game. The experimenter chose something that she would win if

she beat them at the game. The game began and the experimenter conducted a session using flashcards.

During the “Stellar Game”, the target Participant was seated next to the same game peer from the pre probe. The game board was placed on the table in front of the students. Winning the game was defined as having your character reach the top of the ray first. There were 11 steps that each character had to climb before reaching the top of the ray.

The game peer was first presented with a set of stimuli, two pictures at a time. The pictures were presented on flashcards and the age peer was required to emit two consecutive Tact responses during each turn. The experimenter delivered reinforcement, in the form of vocal praise, or correction procedures accordingly. The correction procedure involved the experimenter emitting the correct Tact response and requiring the peer to echo that response. The target Participant was then presented with the same two pictures to tact. The order in which the two pictures were presented was rotated in order to control for echoic responding. For example, the game peer was presented with an amethyst and then a ruby during his turn. When it was then the target Participant turn, he was sometimes presented with a ruby and then the amethyst to insure that the Participant was not just echoing the responses given by the game peer. In other words, this was done to insure that the Participants’ responses were under the control of the presented stimuli rather than the game peers’ vocal responses.

If the target Participant responded correctly to a presented stimulus, the peers team’s character was moved one step up on the game board. If the target Participant emitted an incorrect Tact, the experimenter did not give a correction. Instead, she moved her character up one step on the game board. This procedure continued until one of the characters reached

the top of the rays. The procedures for the game are outlined in Table 5. The winning team then earned the preferred item.

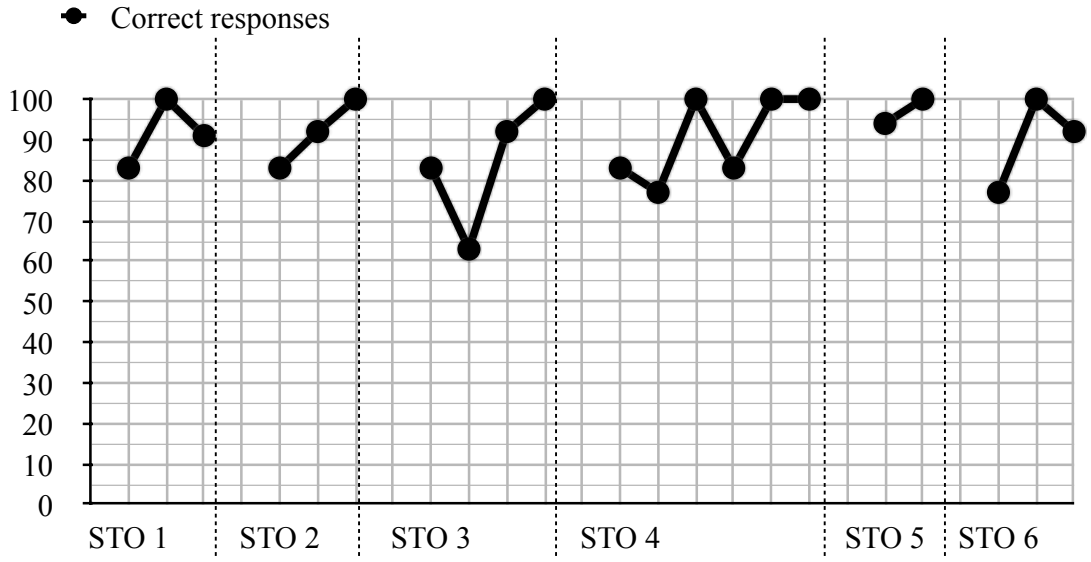
The target Participant was required to meet mastery criterion across two sets of stimuli under the peer-yoked contingencies before a post probe was conducted. Mastery criterion for a set of stimuli under the peer-yoked contingency was set at the target Participant emitting 90% accurate Tact responses across two consecutive sessions.

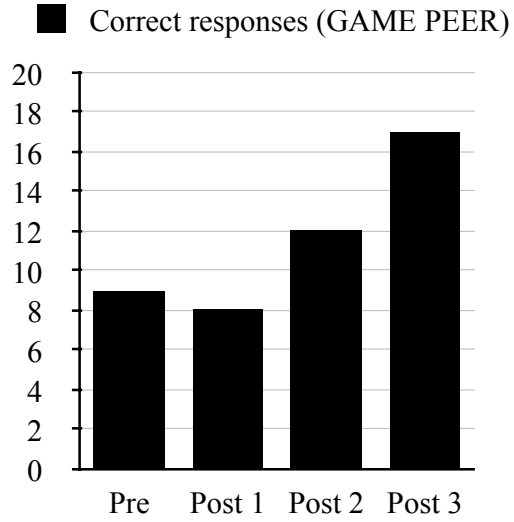
The target student and the game peer played the game three to 6 times every day they both attended the Learning Center.

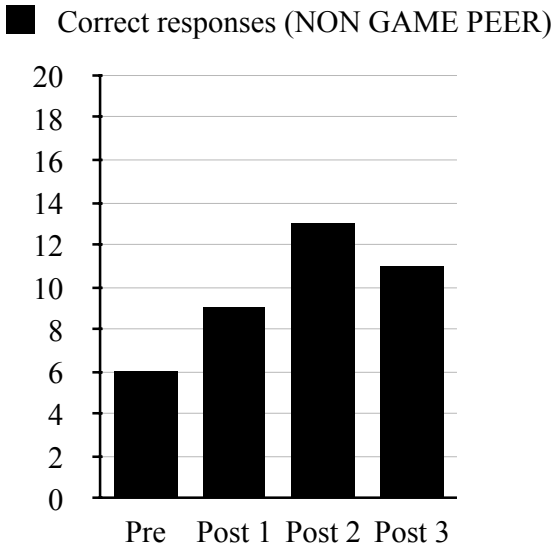
Post probes

After the target student mastered two sets of pictures under the peer-yoked contingencies, post probes were conducted in order to measure Observational Learning. There were two post probes conducted with the target student. During one of the post probes, the target student observed the game peer (the peer with whom he played the "Stellar Game"). During the other post probe, the target student observed the non-game peer (a peer that did not play the "Stellar Game" with the target student) in order to measure generalization of Observational Learning. Post probes were conducted in the same classrooms of the pre probes. The format for the post probes was the same as the format described for the pre probes.

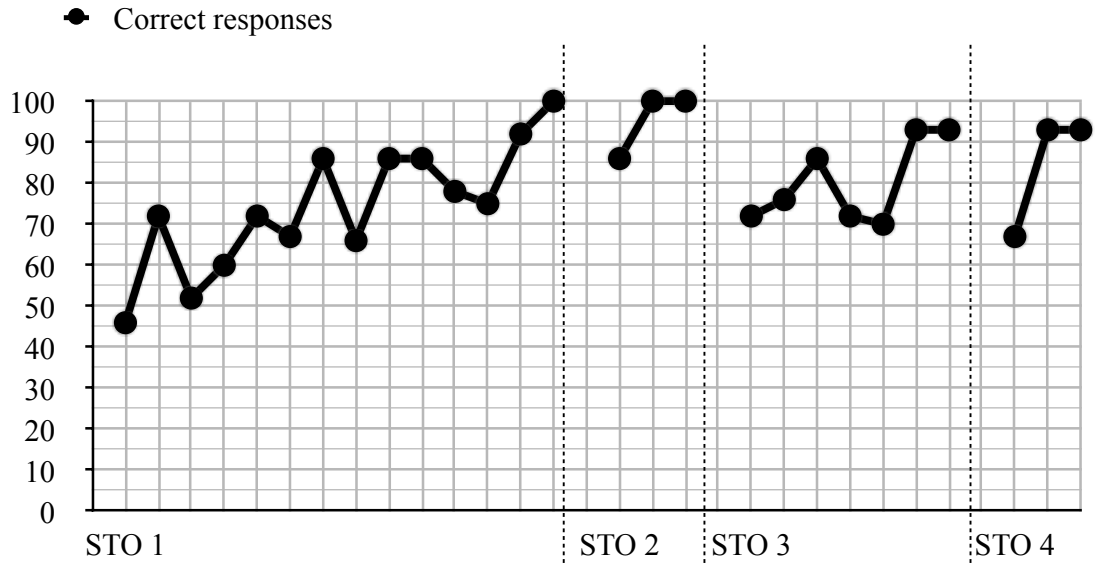
Results for Participant A.

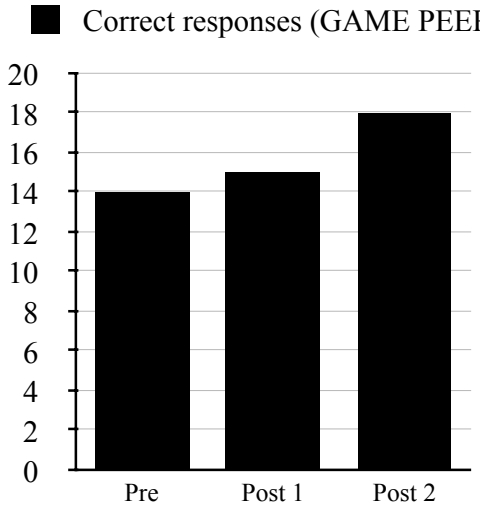


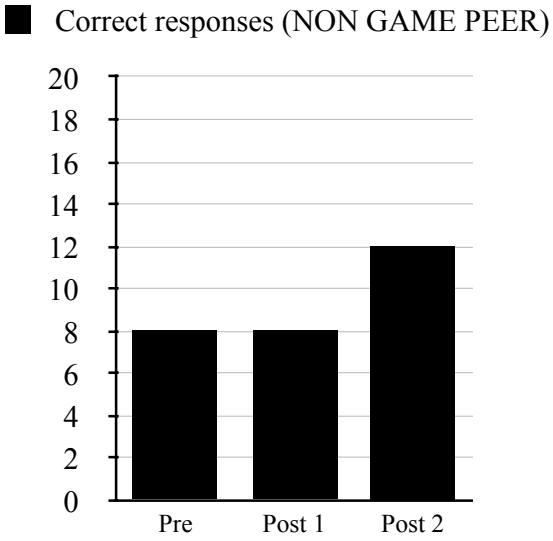




Results for Participant B.







CHAPTER 3

EXPERIMENT 2

Participants

Three male students were selected for participation in this experiment.

Participant C was a four year-old male with a diagnosis of Autism with no Mental Retardation, according to the diagnostic criteria of DSM-IV-TR (APA, 2000). At the onset of the study, he attended a kindergarten in a suburban area in Northern Italy. He had an emergent reader-writer level of verbal behavior development (Greer & Keohane, 2005; Greer & Ross, 2008).

Participant D was a 7 year-old male with a diagnosis of Autism with no Mental Retardation, according to the diagnostic criteria of DSM-IV-TR (APA, 2000). At the onset of the study, he attended the first grade at a public elementary school in a suburban area in Northern Italy. He had an emergent reader-writer level of verbal behavior development (Greer & Keohane, 2005; Greer & Ross, 2008).

Participant E was a 5 year-old male with a diagnosis of Autism with no Mental Retardation, according to the diagnostic criteria of DSM-IV-TR (APA, 2000). At the onset of the study, he attended a kindergarten in a city in Northern Italy. He had an emergent reader-writer level of verbal behavior development (Greer & Keohane, 2005; Greer & Ross, 2008).

These students were selected for this study because they did not have an observational learning repertoire as determined by the CABAS® International Curriculum and Inventory of Repertoires for Children from Pre-school through Kindergarten (C-PIRK®) (Greer &

McCorkle, 2009), that was conducted approximately one month prior to the study. During this assessment, the Participants observed a classmate learn to vocally identify a group of pictures presented by a teacher. The teacher then provided each of the Participants with an opportunity to identify the same pictures in order to assess whether the Participant had on observational learning repertoire. The students chosen for this study were the students who did not acquire these responses through observation.

Setting and Materials

This study took place in a Learning Center located in a suburb outside a metropolitan area in Northern Italy.

The methodology of instruction used in the Center was based on teaching as Applied Behavior Analysis. Participants C, D, and E attended a class where Comprehensive Application of Behavior Analysis to Schooling (CABAS®) (Greer, 1992) was implemented. All instruction was measured as Learn Units (Greer, 2002) and all of the students' responses to Learn Units were measured.

The classroom where all the Participants were included had a 7:1:4 student to teacher to teaching assistant ratio and included 7 students with autism or other developmental disabilities.

Pre-experimental probes, pre probes, post probes and peer-yoked contingencies sessions were conducted in the students' classroom, which was approximately 5 x 8 meters. The classroom contained two large horse-shoe shaped instructional tables with four chairs, one small round table with four small chairs, a play area, two shelves containing instructional and teachers'

materials, a “soft corner” with mattresses on the floor and on the walls and some cushions, and a one-direction mirror.

When the experimenter was working with the students, she sat in one of the chairs at the small round instructional table while the two students, the Participant and the peer, were seated, side by side, directly in front of her. During peer-yoked contingencies sessions, the game board was placed on the table in front of the students. While probe and intervention sessions were being conducted, the other children were working with their teachers at the other instructional tables in the same classroom.

The materials used in this study were picture flashcards and a game board.

The picture flashcards were 8 x 10 centimeters. The pictures on the cards were digital images. The categories of pictures used in this experiment included: fishes, gemstones, birds, flowers. Each category contained five exemplars for each target picture (i.e., fishes: 5 exemplars of a bream, a piranha, a catfish; gemstones: 5 exemplars of an emerald, a ruby, an amethyst; birds: 5 exemplars of a crow, a wren, a heron; flowers: 5 exemplars of a dahlia, a peony, a lily) (See Figure 1).

The game board used during treatment sessions consisted of a cork board that was 40 x 50 centimeters. A paper sheet adhered on the board; the paper was blue and decorated with corals’ and bubbles’ images. There were two paths made of shells going from the base to the top of the board, with labels showing “Start” at the beginning and “Finish” at the end. There were eleven Velcro circles next to both paths. Velcro was also put behind four cartoon characters (Nemo, Squirt, Dory, and Pearl) that the children and the teacher could choose for the game, so that the characters could be moved up and down the Velcro stages on the paths (See Figure 3).

During probe and treatment sessions a clipboard, collection forms and pens were also used. All probe sessions were recorded with HD smartphone cameras.

Method

Dependent Variable

The target behavior in this study was a pure Tact response that was learned as a function of observation. A pure Tact response was defined as a "verbal operant in which a response of a given form is evoked by a particular object or event" (Skinner, 1957, p. 82) and is under the control of generalized reinforcement, such as attention from another person (i.e., the student first sees the picture and then vocally says the name of the depicted item, thereby making verbal contact with the stimulus). Pure Tacts occurred when the stimulus was present and there was no vocal antecedent.

The target behavior was further defined as the student acquiring a Tact response by observing reinforcement and/or correction operations delivered to another student by the teacher. For example, Observational Learning occurred if the student emitted the Tact for "amethyst" without being directly taught this Tact. The Tact was acquired only after observing another student receive Learn Units for this stimulus.

Data were also collected on the number of pictures each Participant mastered through observation, during pre probes and post probes with different peers. These probe sessions were run with the game peer (the student with whom the Participant experienced the peer-yoked contingencies, that in this study was another target Participant) and the non-game peer, a peer who was not in the peer contingencies in order to test for generalization of Observational Learning.

As previously described, each set of twenty pictures included four exemplars of five different pictures. For example, a set of gemstones included four exemplars of rubies, four exemplars of emeralds, four exemplars of diamonds, four exemplars of amethysts, and four exemplars of sapphires. The exemplars varied in terms of shape and size, while the discriminating features were held constant. For example, the shape and size of the gemstones varied across exemplars while the color (the identifying feature) was the same across the four exemplars of each gemstone.

The criterion for mastery of a picture was defined as the student correctly identifying the picture 3/4 or 4/4 times during the twenty trial probe session.

Independent Variable

The Independent Variable implemented in this study was the "Sea Game" in which the peer-yoked contingencies were implemented. A peer-yoked contingency is a contingency of reinforcement or punishment in which the performance of one or more individuals determines the delivery of the consequence to the dyad or group (Greer & Ross, 2008). That is, a particular contingency (i.e., the delivery of reinforcement) depends upon the performance of one or more individuals in a dyad or group.

While playing the "Sea Game", the two target Participants alternated taking turns in which they were required to tact pictures presented by the experimenter.

During the peer-yoked contingency condition, different sets of pictures were used. Each set of twenty pictures included 5 exemplars of four different pictures. For example, a set of birds included 5 exemplars of heron, 5 exemplars of crow, 5 exemplars of redbreast, and 5 exemplars of swallow. The exemplars varied in terms of shape and size, while the

discriminating features were held constant. For example, the positions in which the birds were represented varied across exemplars while the color (the identifying feature) was the same across the 5 exemplars of each bird.

The criterion for mastery of a set of pictures was defined at 90% correct Tact responses for two consecutive sessions.

Data collection

For the Dependent Variable, data were collected on the number of correct responses learned through observation during probe trials for Tact responses. Students' responses during probe trials were discrete and the number of trial presentations was controlled by the experimenter. These probe trials included consequences for students' correct responses (reinforcement) and did not include consequences for students' incorrect responses (correction procedure).

A correct response was recorded as a plus (+) on the data sheet and an incorrect response was recorded as a minus (-) on the data sheet.

The experimenter also wrote down the name of the picture that was presented during each trial next to the plus (+) or minus (-) on the data collection form.

During treatment sessions, the Participant and the game peer played the "Sea Game" in which the peer-yoked contingencies were implemented. While playing the "Sea Game", the Participant and the game peer alternated taking turns in which they were required to tact pictures presented by the experimenter. Each turn consisted of the student tacting two different pictures. If the Participant correctly identified the picture during his turn, a plus (+) was recorded on a data collection form using a pen. If the Participant incorrectly identified one or more of the pictures, a minus (-) was recorded on the data collection form.

Since the number of trials presented to the Participant varied across sessions, the reported data were the percentage of correct responses emitted by the Participant in each session. This was calculated by dividing the number of correct responses emitted by the Participant by the total number of trials presented in each session.

Table 4 shows the collection form used during this experiment.

Design

Two single subject designs with pre probes and post probes (Cooper, Heron, & Heward, 2007) were used to test the effectiveness of the peer-yoked contingency procedure.

Each of the Participants was presented with probe sessions both before and after the peer-yoked contingencies treatment was implemented. These probe sessions were run with two different peers: the game peer (the student with whom the Participant experienced the peer-yoked contingencies) and the non-game peer, a peer who was not in the peer contingencies in order to test for generalization of Observational Learning.

The experiment consisted of the following steps:

1. pre-experimental probes for four categories of pictures (i.e., fishes, gemstones, flowers, birds);
2. pre probes to test for Observational Learning across two peers (game peer and non-game peer);
3. peer-yokes contingency intervention;
4. post probes for Observational Learning across two peers.

Pre-experimental probes

During pre-experimental probes, the Participant was presented with a selection of picture flashcards for each category of stimuli. These probes were conducted to ensure that the student did not already have these Tacts in his repertoire.

The student was required to respond vocally while looking at the card with no vocal antecedent provided by the experimenter. If the student responded correctly, the experimenter provided vocal praise to reinforce that response. This was done to prevent the response from being placed into extinction. This procedure avoids falsely identifying the student as not having discriminative control for a stimulus when in fact the student did have the response. It should be noted that vocal praise did function as a reinforcer for all of the Participants based on prior instructional observation. If the student did not respond correctly, the experimenter did not provide a correction, but moved on to the next trial.

Table 1 shows the results of the pre-experimental probes.

Pre probes

During the pre probe, the experimenter sat in a chair next to the table and the two students sat across from her. The experimenter delivered tokens to both students throughout the course of each session. At the end of each session, the students exchanged their tokens for an item of their choice (e.g., play with an IPad).

During the pre probe, the target Participant was seated next to the game peer.

The experimenter then conducted the probe by presenting flashcard to both the game peer and the target Participant.

During this pre probe, the experimenter alternated between presenting four Learn Units to the game peer and then presenting four probe trials to the target Participant. At first, the game peer was presented with four different pictures, one at a time, by the experimenter. No vocal antecedent was given by the experimenter and the game peer was required to say the name of the item in the picture. The peer received vocal praise then he emitted the correct Tact, and a correction procedure when he emitted an incorrect Tact. The correction procedure consisted of the experimenter providing the correct response and having the peer echo that response. During this time, the experimenter would intermittently provide reinforcement in the form of vocal praise and token delivery to the target Participant sitting next to the peer for "sitting nicely" or "waiting nicely" (carefully separated from the response to the Tact stimulus).

After the game peer received four Learn Units (one for each picture), the experimenter then presented the same four pictures to the target Participant. If the Participant named the picture correctly, the experimenter provided vocal praise in order to prevent the response from being placed into extinction. If the target Participant did not identify a picture correctly, the experimenter did not say anything and moved on to the next picture.

This procedure continued in an alternating fashion until the game peer received a total of 20 Learn Units (four Learn Units for 5 different items) and the target Participant received 20 probe trials. It should be noted that multiple exemplars of the pictures were used for each item in a set, so that there were 20 different pictures (four exemplars for each of the 5 items) in a set of stimuli.

Following this probe, another pre probe was conducted using the non-game peer in place of the game peer. In other words, the same procedure was then repeated using the same target Participant and the non-game peer.

The stimuli used in this study were counterbalanced across the two Participants. Pre probes were also time-delayed across Participants.

Peer-yoked contingency

A peer-yoked contingency is a contingency of reinforcement or punishment in which the performance of one or more individuals determines the delivery of the consequences to the dyad or group (Greer & Ross, 2008). That is, a particular contingency (i.e., the delivery of reinforcement) depends upon the performance of one or more individuals in a dyad or group.

During the peer-yoked contingency conditions in this study, the experimenter sat in a chair next to the table and the two students sat across from her. The game board was placed on the table in front of the students.

The experimenter asked the two students to be a team and pick a character to represent their team for the game. The experimenter then picked one of the remaining characters to represent her for the game. The experimenter then asked the students to choose something they would like to have if they won the game. The experimenter chose something that she would win if she beat them at the game. The game began and the experimenter conducted a session using flashcards.

During the "Sea Game", the target Participant was seated next to the same game peer from the pre probe. The game board was placed on the table in front of the students. Winning the game was defined as having your character reach the top of the ray first. There were 11 steps that each character had to climb before reaching the top of the ray.

The game peer was first presented with a set of stimuli, two pictures at a time. The pictures were presented on flashcards and the age peer was required to emit two consecutive Tact

responses during each turn. The experimenter delivered reinforcement, in the form of vocal praise, or correction procedures accordingly. The correction procedure involved the experimenter emitting the correct Tact response and requiring the peer to echo that response. The target Participant was then presented with the same two pictures to tact. The order in which the two pictures were presented was rotated in order to control for echoic responding. For example, the game peer was presented with an amethyst and then a ruby during his turn. When it was then the target Participant turn, he was sometimes presented with a ruby and then the amethyst to insure that the Participant was not just echoing the responses given by the game peer. In other words, this was done to insure that the Participants' responses were under the control of the presented stimuli rather than the game peers' vocal responses.

If the target Participant responded correctly to a presented stimulus, the peers team's character was moved one step up on the game board. If the target Participant emitted an incorrect Tact, the experimenter did not give a correction. Instead, she moved her character up one step on the game board. This procedure continued until one of the characters reached the top of the rays. The procedures for the game are outlined in Table 5. The winning team then earned the preferred item.

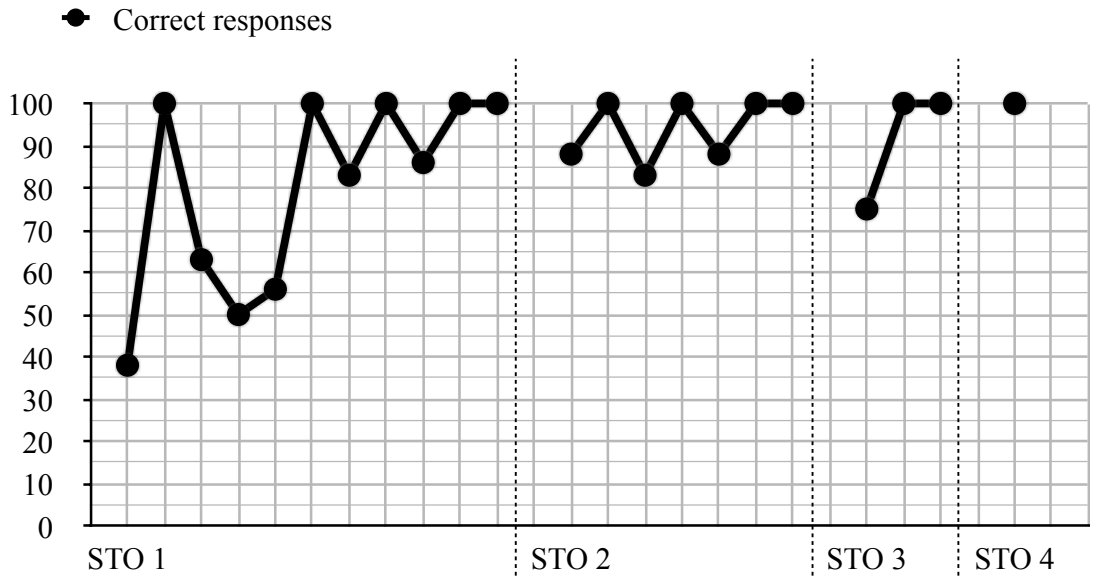
The target Participant was required to meet mastery criterion across two sets of stimuli under the peer-yoked contingencies before a post probe was conducted. Mastery criterion for a set of stimuli under the peer-yoked contingency was set at the target Participant emitting 90% accurate Tact responses across two consecutive sessions.

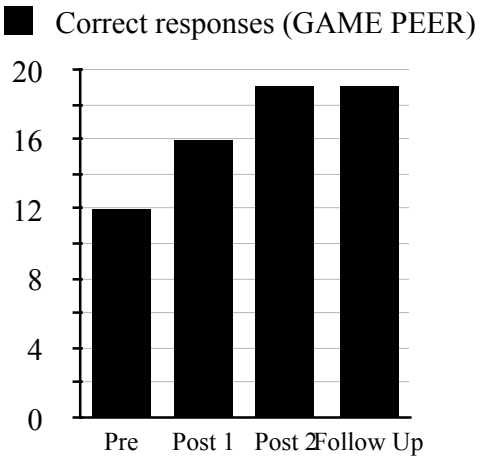
The target student and the game peer played the game three to 6 times every day they both attended the Learning Center.

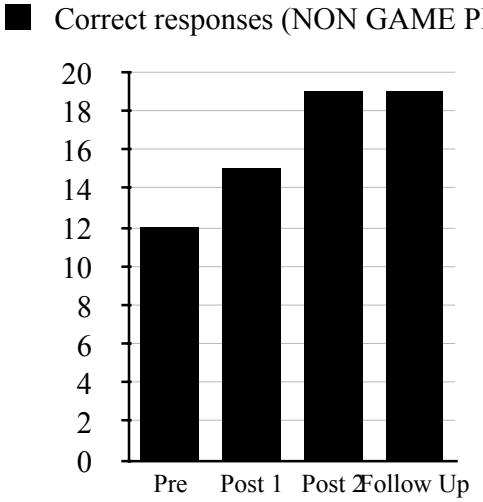
Post probes

After the target student mastered two sets of pictures under the peer-yoked contingencies, post probes were conducted in order to measure Observational Learning. There were two post probes conducted with the target student. During one of the post probes, the target student observed the game peer (the peer with whom he played the "Stellar Game"). During the other post probe, the target student observed the non-game peer (a peer that did not play the "Stellar Game" with the target student) in order to measure generalization of Observational Learning. Post probes were conducted in the same classrooms of the pre probes. The format for the post probes was the same as the format described for the pre probes.

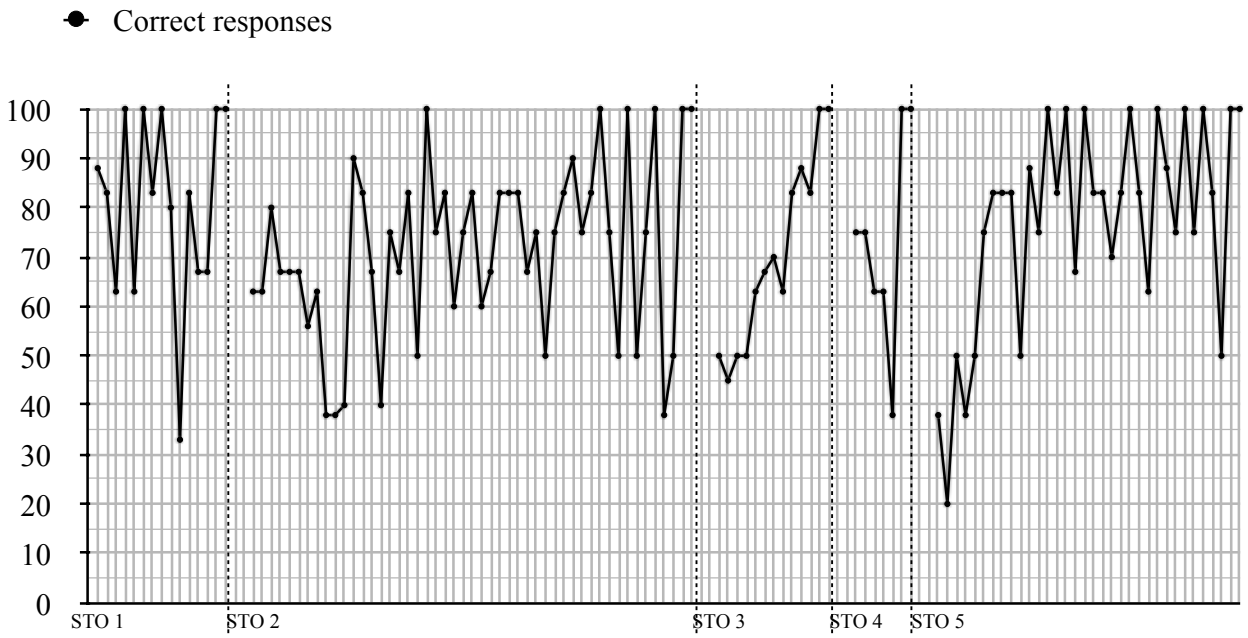
Results for Participant C.

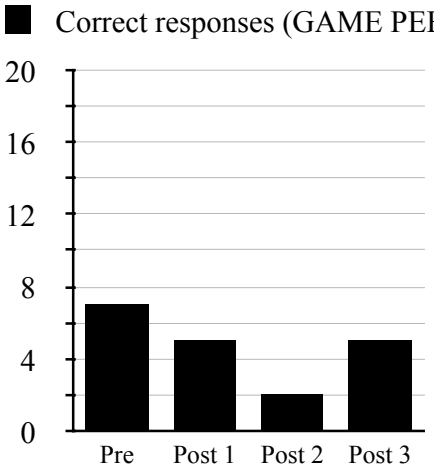


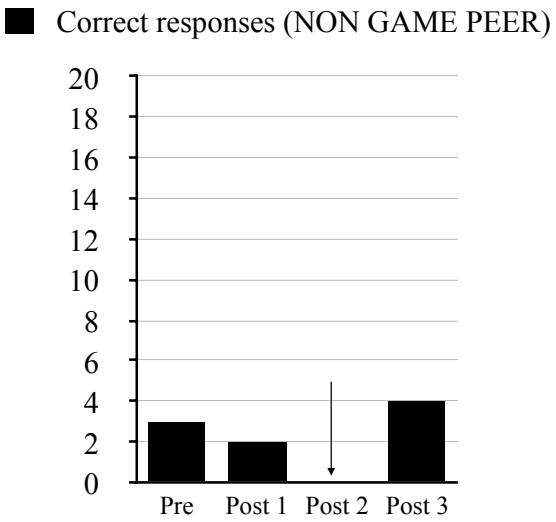




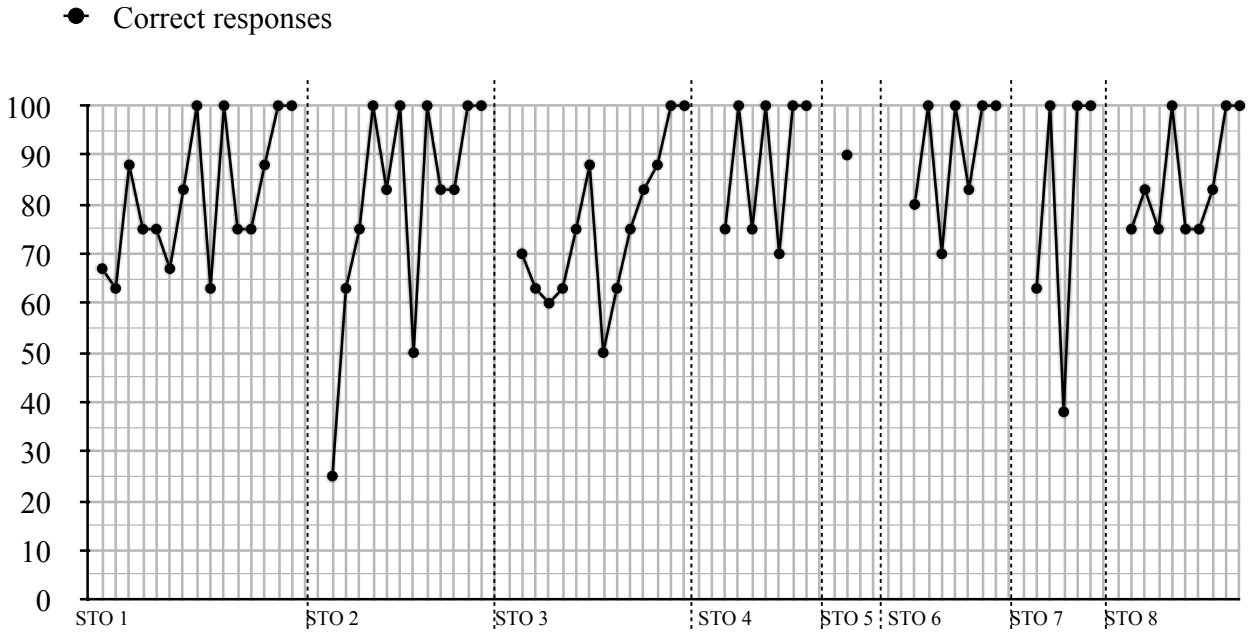
Results for Participant D.

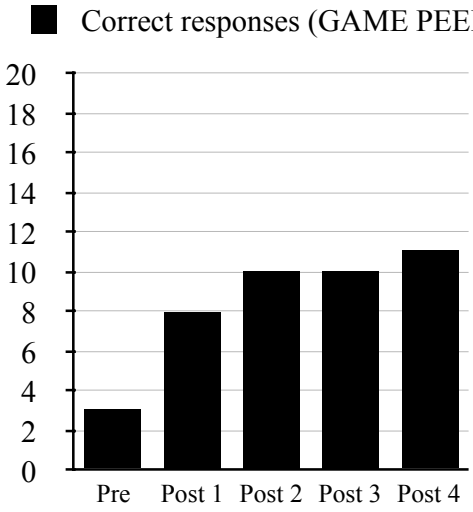


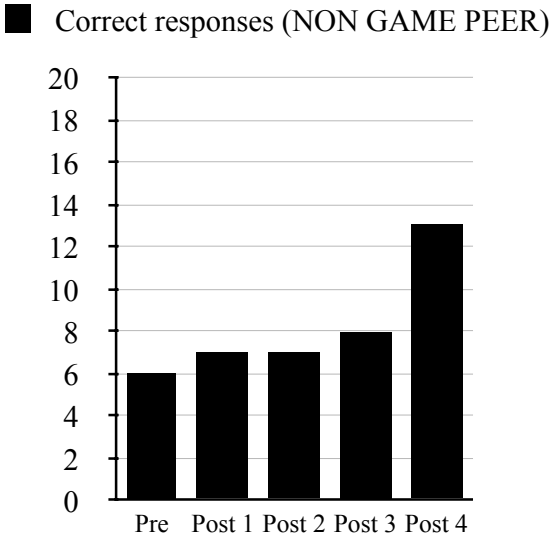




Results for Participant E.







CHAPTER 4

GENERAL DISCUSSION

The purpose of the current study was to test the effects of peer-yoked contingencies on the observational learning repertoires of young children with developmental delays who did not learn by watching others prior to the onset of the experiments. Additional research into tactics such as peer-yoked contingencies is critical because, to date, there are only a few experiments that have identified tactics that can be implemented to effectively teach observational learning to students who prior to the treatment did not learn by watching others (Greer, Keohane, Meinke, Gautreaux, Pereira-Delgado, Chavez-Brown & Yuan, 2004; Davies-Lakey, 2005; Gautreaux, 2005; Pereira-Delgado, 2005; 2009; Stolfi, 2005; Rothstein & Gautreaux, 2007).

It should be noted that there were several limitations to these experiments. First, the pre probes and post probes were very stringent measures of observational learning. The format of these probes only gave the Participants one session to emit any responses they may have acquired via observation. Perhaps if there were more than one session of opportunities or additional measures of observational learning, the results may have shown an even greater increase in the acquisition of this repertoire. Since the Participants were pre-school or elementary school students, there may have been many setting events and motivational variables that could have affected the data during the probes. Another limitation to these experiments was that the dependent variable only measured Tact responses. The Participants in these experiments learned how to learn by watching other students, a repertoire they did

not have prior to the onset of the study. However, only Tact responses were measured in these studies. Perhaps other reposes could also be measured to test the effects of the peer-yoked contingencies on other repertoires, such as other academic and social repertoires.

It is possible that the peer-yoked contingency was an effective intervention for these students because it set up a very powerful establishing operation (Micheal, 1993). The Participants had to learn to watch others in order to win the game for the team. This taught the Participants not only to to learn by observing, but also that reinforcement from peers could be recruited this way. This could be attributed to the "yoked" nature of the contingencies during the game, which the previous research on group contingencies has shown to be quite powerful (Litow & Pumroy, 1975).

Another important finding of this research was that each of the Participants required a different number of experiences with the peer-yoked contingencies in order to acquire an observational learning repertoire. It appeared that this difference could be attributed to each Participant's level of verbal behavior (Greer & Ross, 2008). In other words, students that had fewer verbal capabilities prior to the onset of the study required additional exposure to the peer-yoked contingencies in order to induce observational learning. This is consistent with previous research findings that have shown that certain individuals, specifically those with lower cognitive capacities, lacked observational learning repertories (i.e., Shoen & Ogden, 1995; Farmer, Gast, Wolery, & Winterling, 1991).

Another possible factor that could have had an effect on the Participants' performance was the degree to which peers functioned as conditioned reinforcers for that particular Participant.

It is also important to consider that these results also found differences in observational learning after observing the game peer and the non-game peer. While some students acquired

more Tact responses after watching the game peer, other Participants showed the greatest increase in observational learning after watching the non-game peer. A possible explanation for this difference may also involve how the Participants used the peer-yoked contingencies as a way of recruiting reinforcement from the peers as well as that Participant's particular instructional history with that peer.

The results of this experiment showed that the peer-yoked contingency intervention was an effective tactic to induce observational learning repertoires in students with disabilities. According to Greer and Ross (2008), this type of observational learning would be identified as the acquisition of observational learning as a new repertoire because this intervention taught the students how to learn new operants through observation when they could not do so prior to the intervention. The acquisition of this repertoire has not been extensively investigated, therefore this study contributes to the literature on this type of observational learning.

There is also a need for additional analyses of the environmental conditions that induce observational learning repertoires in order to identify all of the variables that can account for the acquisition of this repertoire. While chronological age (Elsner & Ascherleben, 2003) and the presence of a developmental disability (Varni et al., 1979) have been reported as factors in the acquisition of observational learning, there have not been experiments that have identified environmental sources for the acquisition of observational learning. The findings of the current study show that learning through indirect contact with the contingencies of instruction required direct instruction for young children with developmental disabilities. This suggests that typically developing children learn through observation as a result of certain environmental experiences. The results of this study as well as other recent findings in the

area of observational learning (Davies-Lackey, 2005; Gautreaux, 2005; Pereira-Delgado, 2005; Stolfi, 2005) suggest that certain environmental experiences can induce observational learning in students, even very young students with developmental delays, that did not previously learn by watching others.

Perhaps the most important contribution of this research is that it provides educators with a scientifically proven teaching procedure that can be used to teach students how to learn by watching others. The large body of research concerning this topic has already shown that students can learn more effectively when they have observational learning repertoires (Hallenback & Kaufman, 1995; MacDonald, Dixon, & LeBlanc, 1986; Schoen, 1989). This study provides a tactic that can be used with students to insure that students are able to benefit from having this repertoire.

Figure 1. Some examples of the picture flashcards.

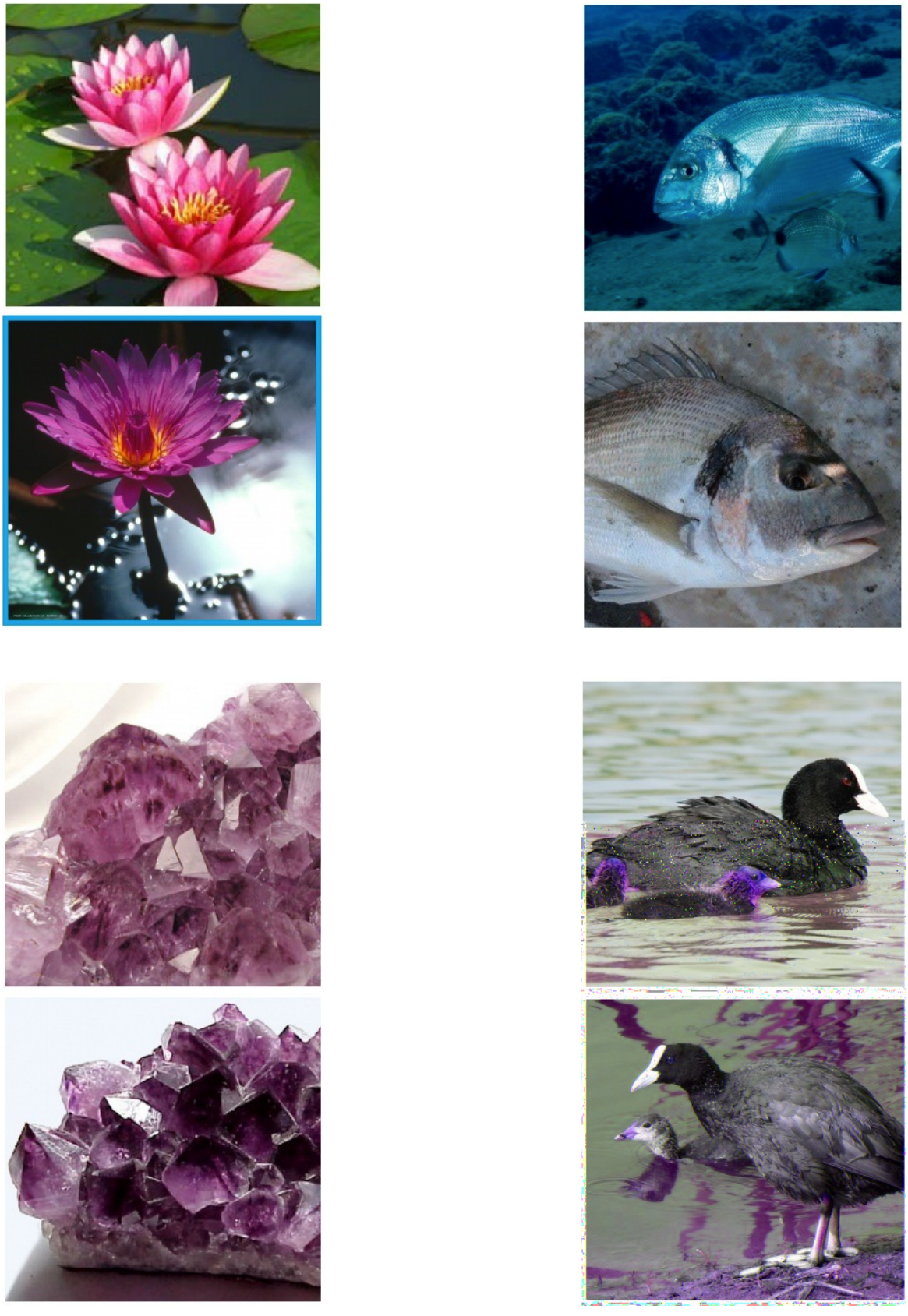


Figure 2. Game board used during the “Stellar Game”.

Figure 3. Game board used during the “Sea Game”.

Table 1 - Results of pre-experimental probes (number of correct Tact responses).

	Fishes	Flowers	Birds	Gemstones
Participant A	0	0	0	0
Participant B	0	0	0	0
Participant C	0	0	0	0
Participant D	0	0	0	0
Participant E	0	0	0	0

Table 2 - Sets of stimuli used for each Participant across phases.

Participant	Pre probe with game peer	Pre probe with non-game peer	Peer-yoked contingencies	Post probe with game peer	Post probe with non-game peer
A	Gemstones	Flowers	Fishes Birds	Gemstones	Flowers
B	Flowers	Gemstones	Fishes	Flowers	Gemstones
C	Fishes	Gemstones	Birds	Fishes	Gemstones
D	Fishes	Gemstones	Flowers	Fishes	Gemstones
E	Fishes	Gemstones	Birds	Fishes	Gemstones

Table 3 - Collection form used in Experiment I.

LUs	Target	Peer		Target	Peer		Target	Peer
1								
2								
1								
2								
3								
4								
3								
4								
5								
6								
5								
6								
7								
8								
7								
8								
9								
10								
9								
10								
11								
12								
11								
12								
13								
14								
13								
14								
15								
16								
15								
16								
TOTAL								

Table 4 - Collection form used in Experiment II.

LUs	Target 1	Target 2		Target 1	Target 2		Target 1	Target 2
1								
2								
1								
2								
A								
B								
A								
B								
3								
4								
3								
4								
C								
D								
C								
D								
5								
6								
5								
6								
E								
F								
E								
F								
7								
8								
7								
8								
G								
H								
G								
H								
TOTAL								

Table 5 - Procedure for the “Stellar Game”.

1. Students select the character to represent their team.
2. The experimenter selects her character to represent opposing team.
3. Students select the preferred item that they will earn if their character wins.
4. The experimenter selects the item to win if her character wins the game.
5. The experimenter presents two flashcards to the game peer and provides consequences for the responses (vocal praise for a correct response and a correction procedure for an incorrect response).
6. The experimenter then presents the same two flashcards to the Participant without direct consequences.
7. a) If the game peer emits a correct response and the Participant emits a correct response, their character moves up one step. b) If the game peer emits a correct response and the Participant emits an incorrect response, the experimenter’s character moves up one step. c) If the game peer emits an incorrect response and the Participant emits an incorrect response, the experimenter’s character moves up one step. d) If the game peer emits an incorrect response and the Participant emits a correct response, their character moves up one step.
8. The first character that reaches the top of the rays on the game board (11 steps in total) wins the game and earns the preferred item.

Table 6 - Procedure for the “Sea Game”.

1. Students select the character to represent their team.
2. The experimenter selects her character to represent opposing team.
3. Students select the preferred item that they will earn if their character wins.
4. The experimenter selects the item to win if her character wins the game.
5. The experimenter presents two flashcards to Participant 1 from the set used for Participant 2 and provides consequences for the responses (vocal praise for a correct response and a correction procedure for an incorrect response).
6. The experimenter then presents the same two flashcards to Participant 2 without direct consequences.
7. a) If Participant 1 emits a correct response and Participant 2 emits a correct response, their character moves up one step. b) If Participant 1 emits a correct response and Participant 2 emits an incorrect response, the experimenter’s character moves up one step. c) If Participant 1 emits an incorrect response and Participant 2 emits an incorrect response, the experimenter’s character moves up one step. d) If Participant 1 emits an incorrect response and Participant 2 emits a correct response, their character moves up one step.
8. The experimenter presents two flashcards to Participant 2 from the set used for Participant 1 and provides consequences for the responses (vocal praise for a correct response and a correction procedure for an incorrect response).
9. The experimenter then presents the same two flashcards to Participant 1 without direct consequences.
10. a) If Participant 2 emits a correct response and Participant 1 emits a correct response, their character moves up one step. b) If Participant 2 emits a correct response and Participant 1 emits an incorrect response, the experimenter’s character moves up one step. c) If Participant 2 emits an incorrect response and Participant 1 emits an incorrect response, the experimenter’s character moves up one step. d) If Participant 2 emits an incorrect response and Participant 1 emits a correct response, their character moves up one step.
8. The first character that reaches the top of the path on the game board (11 steps in total) wins the game and earns the preferred item.

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