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THE EMERGENCE OF PRAISE AS CONDITIONED REINFORCEMENT AS A FUNCTION OF OBSERVATION IN PRESCHOOL AND SCHOOL AGE CHILDREN

LA EMERGENCIA DEL ELOGIO COMO REFORZAMIENTO CONDICIONADO EN FUNCIÓN DE LA OBSERVACIÓN EN NIÑOS DE EDAD PREESCOLAR Y DE EDAD ESCOLAR

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Abstract: We tested the effects of an observational intervention on the conditioning of praise as a reinforcer with 2-school age and 2-preschool age children for whom vocal praise did not reinforce either performance (the emission of previously learned operants) or learning (the acquisition of new operants). Pre-intervention reversal designs for performance tasks showed praise did not reinforce; similarly, baselines showed the children did not learn when praise was the reinforcer and corrections were done for learning new material. The intervention consisted of multiple observational sessions in which each participant performed other performance tasks simultaneously with a peer confederate under conditions in which the confederate received praise for performing and the target child did not. Following the intervention, the post-interventions reversal designs showed that vocal praise functioned as reinforcement for performance and the post-intervention multiple baselines showed that the vocal praise acted as reinforcement for learning. The results are discussed in terms of the emergence of reinforcement as a function of observational Pavlovian conditioning (i.e., the observation of stimulus-stimulus pairings) and the potential for this procedure to condition praise as social reinforcement in applied settings.

Key words: emergent conditioned reinforcement, observational learning, conditioned reinforcement, praise, social reinforcement, Pavlovian conditioning by observation

Resumen: Se probaron los efectos de una intervención observacional en el condicionamiento del elogio como reforzador en dos niños de edad preescolar y en dos niños de edad escolar, para quienes el elogio no reforzó su ejecución (la emisión de operantes previamente aprendidas) ni el aprendizaje (la adquisición de nuevas operantes). Los diseños reversibles preintervención mostraron que el elogio no funcionó como un reforzador de la ejecución de las tareas. Asimismo, los datos obtenidos durante las líneas base mostraron que los niños no aprendieron cuando se empleó el elogio como reforzador y se usó la corrección para aprender un material novedoso. La intervención consistió en sesiones observacionales múltiples en las cuales cada participante ejecutó diferentes tareas simultáneamente con un compañero confederado, en las que el confederado recibió un elogio por ejecutar las tareas y el participante no. Los diseños reversibles post-intervención mostraron que el elogio funcionó como un reforzador para aprender las tareas. Los resultados se discutieron en términos de la emergencia del reforzamiento en función del aprendizaje observacional Pavloviano (i.e., la observación de apareamientos estímulo-estímulo) y se discutió el potencial de este procedimiento para condicionar al elogio como un reforzador social en los escenarios aplicados.

Palabras clave: reforzamiento condicionado emergente, aprendizaje observacional, reforzamiento condicionado, elogio, reforzamiento social, condicionamiento Pavloviano por observación

Recent research reported the identification of observational conditions under which neutral stimuli (i.e., pieces of string, plastic discs) were conditioned as reinforcers for both learning and performance (Greer & Singer-Dudek, 2008). The work extends evidence on types of social learning in humans and is related to findings in social learning in nonhuman animals. The purpose of the experiment reported herein was to test one potential the procedure may have for applications in education and psychology and in addition whether behavior, vocal praise, could be conditioned as a reinforcer as were the objects used in the initial study.

Social learning in non-human species remains a central topic in some areas in psychology (Zentall, 1996).

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While social learning was a central topic in behavior analysis a few decades ago (Kazdin, 1973), it has received little attention in recent years. This is puzzling since social learning remains a central concern in educational applications of behavior analysis particularly with regard to observational learning and social reinforcement. The most conspicuous form of social reinforcement is vocal praise and it is the most accessible reinforcement operation available to most teachers in classrooms and parents in homes. Many teachers and parents presume that verbal praise acts as a reinforcer for performance and learning in classrooms for young and typically developing children; however, reinforcement operations may or may not act to reinforce performance or learning (Catania, 2007). Children, for whom vocal praise does not reinforce learning or performance, are at considerable disadvantage since it is the most common educational reinforcer (Skinner, 1968). Similarly, praise and related social attention appear to play a critical role in the learning of facts and the incidental acquisition of language and other types of socialization and acculturation (Greer & Ross, 2008; Hart & Risley, 1995; Pistoljevic & Greer, 2006; Schaufler & Greer, 2006). Children for whom social attention does not reinforce language acquisition cannot profit from incidental language interactions with parents or teachers (Greer & Ross, 2008). Their vocabulary is not likely to expand at the rate needed to be successful in school, where a vocabulary of 86,000 words is necessary for success (McGuiness, 2004).

Early work in applied behavior analysis repeatedly reported on the importance of praise as a reinforcer for classroom management (Hall Lund, & Jackson, 1968; Kazdin, 1973). Still other early studies showed that praise also could function as a conditioned reinforcer to, in turn, condition music stimuli as a reinforcer for auditory, observing responses (Greer, Dorow, Wachhaus, & White, 1973), and recent work has affirmed that relation with print stimuli (Tsai & Greer, 2006). Thus, while praise appears to typically acquire reinforcement properties incidentally and early on in school and home settings, it is a conditioned rather than unconditioned reinforcer. The evidence abounds for children for whom reinforcement operations require edibles, toys, play, or tokens for backup edibles or preferred activities. When praise does not function as reinforcement for classroom social behavior and learning for children they are at a disadvantage particularly in mainstream school settings. Texts in behavior analysis describe the potential for pairing edibles with praise as a likely means of conditioning praise alone as a reinforcer for learning and performance and this appears to be the case in many, if not most, incidences. However, it is possible given Greer and Singer-Dudek’s (2008) findings that observation might play a role in conditioning praise as a reinforcer for performance or learning and indeed may be the most common process whereby praise acquires reinforcement properties for most typically developing children.

A series of studies investigating observational learning as a dependent variable identified three interventions that resulted in the acquisition or enhancement of observational learning (Davies Lackey, 2005; Gautreaux, 2005; Greer, Keohane, Meincke, Gautreaux, Pereira, Chavez-Brown, & Yuan, 2004; Pereira-Delgado 2005; Stolfi, 2005). The three interventions were intensive monitoring training involving learning to monitor the behavior of peers (Gautreaux), learning to monitor the accuracy of peers who are learning new responses (Pereira-Delgado), and yoked reinforcement contingencies between the observer and the observed (Davies-Lackey; Stolfi). In these studies and others (Rehfeldt & Root, 2005) observational learning is defined as and consists of the acquisition of new operators or higher order operators as a function of indirect contact or observation of the contingencies of reinforcement and correction received by others. In these cases the learner observes others receive reinforcement for correct responses and correction operations for incorrect responses (i.e., learn units). One series of experiments suggested that when tutors learn as a function of tutoring others, the learning occurs as a function of observation or indirect contact with the contingencies of reinforcement and corrections (Greer et al., 2004). The same series of studies showed that reinforcement for correct responses alone without corrections for incorrect response was not effective in tutors learning from acting as tutors.

In studies on observational learning as a dependent variable a distinction is made between the effects of observation on the learning of new operators (e.g., learning of math operations, vocabulary, or new languages) and the effects of observation on changing performance where performance is defined as and consists of the emission of previously learned operators (e.g., following classroom rules, changing lanes in a traffic jam). Greer, Singer-Dudek, and Gautreaux (2006) identified several distinct...
types of observational effects. They distinguished between imitation, observational learning, and the changing of performance as three classes of observational effects. Imitation is under direct reinforcement control of a class of responding (i.e., generalized imitation) where the response belongs to a class of reinforced behavior for the imitator; the imitator is not under the control of the consequences received by others. On the other hand, both observational learning and performance change is under the control of indirect contact with operant contingencies (i.e., observational contact with the contingencies received by others). They also pointed to research on observation where it is an independent variable that may be used effectively with individuals whose learning or performance is affected by indirect contact with contingencies (e.g., vicarious reinforcement for managing classroom behavior).

The latter type of research is distinguished from research devoted to developing observational learning repertoires in those missing them as described above. Finally, Greer and Singer-Dudek (2008) identified the emergence of conditioned reinforcement as a function of a particular type of observational experience. In the latter research the effect concerned the emergence of reinforcers rather that the learning of new operants or the vicarious effects on performance.

Greer and Singer-Dudek (2008) reported that preschool aged children, for whom plastic discs and pieces of string did not function as reinforcers, acquired reinforcement effects for these neutral stimuli as a function of an observational intervention like the one used in the present study. In the Greer and Singer-Dudek’s observational intervention, the target children were denied access to the strings or discs while observing others receive them. At no time where the strings or discs used as tokens for exchange for backup reinforcers, hence the stimuli were not conditioned as generalized reinforcers; rather the stimuli themselves acquired reinforcement value. No other directly related studies in the basic or applied sciences of behavior with humans have been identified to date. Prior findings using peer-mediated contingencies with young children were effective in converting previously non-preferred foods as reinforcers for performance and learning may also be related, but the possible role of the appetitive effects of food confound a test of the role of observation in conditioning reinforcers (Greer, Dorow, McCorkle, Williams, & Asnes, 1991; Greer, McCorkle & Sales, 1998; Rozin & Schiller, 1980).

However, incidences of what appears to be observational or social conditioning of reinforcers has been reported in social learning and biological experiments with non-human animals involving, for examples, the conditioning of sexual preference in guppies (Dugatkin, 1996, 2000; Dugatkin & Godin, 1992), conditioned snake fear in rhesus monkeys raised in isolation (Mineka & Cook, 1988). Zentall (1996) interpreted the sources for the conditioning of snake fear in the rhesus monkeys as follows, “Presumably, the fearful conspecific serves as the unconditioned stimulus, and the snake serves as the conditioned stimulus. It appears that exposure to the fearful conspecific or to a snake alone is insufficient to produce fear of snakes in the observer” (Zentall, 1996, p. 231). Zentall suggested that the effect was due to Pavlovian observational learning, where the monkeys’ innate ability to respond to the facial cues, posture, or squeals of conspecifics and the pairing of the observed responses with the snake stimulus resulted in the conditioned stimulus control. Similarly Greer and Singer-Dudek (2008) drew on this interpretation to explain the conditioning of the strings and discs with young children.

The evidence to date suggests that the conditioning of reinforcers under observational conditions like those used in the Greer and Singer-Dudek (2008) report is still another type of observational learning. Are there potential applications for these findings? A recent dissertation and unpublished research suggest that the procedure was successful in conditioning performance of math problems (O’Rourke, 2006) and observing books (Pereira-Delgado, Greer, & Oblak, 2007) as reinforcers for performance and learning. We tested whether the Greer and Singer-Dudek procedure would act to condition vocal praise as a reinforcer for performance and learning.

METHOD

Participants

Four males, ages 3-7, participated in this study. Two of the participants (Participants A and B) attended a combined kindergarten-second grade class in a public school located outside of a major metropolitan area, while Participants C and D attended a privately run publicly funded preschool, also located outside of a major metropolitan area. Table 1 provides detailed information about each
participants. In the following paragraphs we describe their verbal developmental levels, and the effect of vocal praise as a reinforcer for learning and performance because these characteristics constituted the primary reasons for why they were selected for the experiment. See Greer and Ross (2008) for a complete description of the verbal development assessment.

Table 1

Participant descriptions and tasks completed during all experimental conditions

<table>
<thead>
<tr>
<th>PARTICIPANT A:</th>
<th></th>
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<tbody>
<tr>
<td>7-year old male diagnosed with autism</td>
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<tr>
<td>Had a generalized matching repertoire, emitted mands and tacts with autoclitics, some sequels, and limited conversational units</td>
<td></td>
</tr>
<tr>
<td>Performance Task: Pointing to the shapes crescent, star, diamond, oval, circle, rectangle, heart in a field of two</td>
<td></td>
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<tr>
<td>Learning Tasks: Tacting community helpers (police officer, mailman, doctor, firefighter), yes/no tact function (i.e., responding “yes” or “no” to the question “is this a(n) (object)?”), pointing to words following the vocal antecedent, “point to (and, the, on, at).”</td>
<td></td>
</tr>
<tr>
<td>Intervention Task: Matching target symbols on a bingo-like board</td>
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<tr>
<th>PARTICIPANT B:</th>
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<tbody>
<tr>
<td>7-year old male diagnosed with Other Health Impairment</td>
<td></td>
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<tr>
<td>Had a generalized matching pointing repertoire, textually responding to 20-30 sight words, transcribed words and sentences fluently, emitted mands and tacts with autoclitics, some sequels, and conversational units</td>
<td></td>
</tr>
<tr>
<td>Test Scores: Brigance- Reading (Grade Equivalent 1.1-2), Math (Grade Equivalent 1.1-1.8), Listening (Grade Equivalent 1.6), Writing (Grade Equivalent 1.1-1.6)</td>
<td></td>
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<tr>
<td>Performance Task: Pointing to the shapes crescent, star, diamond, oval, circle, rectangle, heart in a field of two</td>
<td></td>
</tr>
<tr>
<td>Learning Tasks: Vocally identifying coin values given a dime plus another coin (penny, nickel, dime, quarter), vocal and written spelling words i.e., “write the word (who, has you, how),” or “spell the word (who, has, you, how),” putting three words printed on index cards in alphabetical order</td>
<td></td>
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<tr>
<td>Intervention Task: Matching target symbols on a bingo-like board</td>
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<tr>
<th>PARTICIPANT C:</th>
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<tbody>
<tr>
<td>3-year old male diagnosed as preschooler with a disability</td>
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<tr>
<td>Had a generalized matching repertoire, emitted mands and tacts with autoclitics, tacted pictures of common objects and followed one-step directions reliably</td>
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<tr>
<td>Performance Task: Tacting pictures of the shapes heart, star, circle, square, rectangle, diamond, and oval</td>
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<tr>
<td>Learning Tasks: 1:1 correspondence (4-8), tacting community helpers (policeman, fireman, mailman), tacting rooms in the home (bedroom, kitchen, bathroom)</td>
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<tr>
<td>Intervention Task: Matching uppercase letters when the target stimulus and a non-exemplar were presented</td>
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<tr>
<th>PARTICIPANT D:</th>
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<tr>
<td>3-year old male diagnosed as preschooler with a disability</td>
<td></td>
</tr>
<tr>
<td>Had a generalized matching repertoire, emitted mands and tacts with autoclitics, tacted pictures of common objects, and followed two-step directions reliably</td>
<td></td>
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<tr>
<td>Performance Task: Tacting pictures of the shapes heart, star, circle, square, rectangle, diamond, and oval</td>
<td></td>
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<tr>
<td>Learning Tasks: Letter sequencing the letters A-E on index cards, tacting community helper functions (fireman, mailman), and sorting (animals, transportation)</td>
<td></td>
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<tr>
<td>Intervention Task: Matching uppercase letters when the target stimulus and a non-exemplar were presented</td>
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study. Participants C and D, were new to schooling and did not have a history of vocal praise as a reinforcer for performance and learning tasks. Also, they lacked an extensive history of edible and praise pairings for reinforcement operations, and, therefore, were considered candidates for the study.

Participant A was diagnosed with autism and functioned on a listener/emergent speaker level of verbal behavior (Greer & Ross, 2008). The teacher’s presence resulted in instructional control over the child. As a listener, he followed multi-step directions, had hear-do capabilities, and generalized imitation. Participant A also had an emergent speaker repertoire, which included echoic-to-mand and echoic-to-tact, independent mands and tacts, and transformation of establishing operations across mands and tacts; that is, if taught a response as a tact he could use the response in a mand context without direct instruction or vice versa (Nuzzolo-Gomez & Greer, 2004). Standardized test scores showed Participant A to be functioning at a pre-kindergarten level across academic repertoires. Refer to Table 1 for a detailed description of test scores and academic assessments.

Participant B was diagnosed as “Other Health Impaired” and functioned at the beginning reader and writer level of verbal behavior. His reader/writer repertoire included: the presence of books as conditioned reinforcers and looking at books was a preferred activity, print transcription, simple dictation (hear-write), joint stimulus control across saying and writing (Greer, Yuan, & Gautreaux, 2005). Joint stimulus control across saying and writing means that if taught to spell a word orally, he could write the word without direct instruction or vice versa. Participant B read on a first-grade level. He also performed at a first grade level in mathematics, dictation, and writing (see Table 1).

Participants C and D were preschoolers with diagnoses of being at risk for a disability, and both functioned on listener/emergent speaker levels of verbal behavior (see Table 1). Their listener levels of verbal behavior included the following capabilities: the presence of a teacher resulted in instructional control over the children, voices functioned as conditioned reinforcers (i.e., the children oriented to adults talking), visual stimuli on a desktop functioned as a conditioned reinforcer (i.e., the introduction of visual instructional stimuli resulted in the children attending to the stimuli), capacity for sameness (i.e., they had cross modal transfer of sameness across senses), fluent matching repertoire for 2D and 3D stimuli, basic listener literacy (i.e., responded to numerous vocal instructions), and generalized imitation (i.e., they imitated novel behavior). As emergent speakers, Participant C and D had the following verbal capabilities: echoic-to-mand and echoic-to-tact, and independent mands and tacts (i.e., they could echo or repeat novel words taught in either mand or tact functions and they used mands and tacts spontaneously) (Greer & Ross, 2008).

There were four peer confederates who participated in the study during the conditioning procedure (Table 2). Peer Confederates A-C served as confederates for Participants A and B, and Peer Confederate D served as the confederate for Participants C and D. Peer Confederate A was a seven-year old female diagnosed with autism. She functioned on a beginning reader/writer level of verbal behavior. Peer Confederate B was a seven-year old male diagnosed with autism who functioned on an emergent reader/emergent writer level of verbal behavior. Peer Confederate C was a seven-year old male diagnosed as Other Health Impaired who functioned on a reader/writer level of verbal behavior. Peer Confederate D was a four-year old male diagnosed as a preschooler at risk for a disability who functioned on a listener/emergent speaker level of verbal behavior. The confederates were chosen because they had similar repertoires as the participants; however, vocal praise functioned as a reinforcer for learning and performance for the confederates, whereas it did not for the participants. Refer to Table 2 for descriptions of peer confederates.

Setting

The participants and peer confederates attended classrooms that used behavior analytic procedures to teach all aspects of the curriculum. Participants A and B attended a self-contained elementary classroom for children with a range of developmental disabilities and children without disabilities where behavior analytic procedures were also used for all instruction.

During the pre and posttest functional analyses the data were collected in the classroom setting. During these sessions the other children in the class received individual and group instruction from other professionals in the same room. The experimenter and the independent observers sat next to the participant at a horseshoe shaped table in child-sized chairs.
The conditioning intervention, which was implemented after the pre-intervention functional analyses, consisted of the participants observing a peer confederate receive vocal praise for a matching task. Two desks were arranged next to each other in an office adjacent to the classroom. A closed easel separated the two desks. A participant sat at one of the desks, while the peer confederate sat at the other desk. The participant and the peer confederate were able to see each other, but were not able to see each other’s matching task or responses. Each child was given a board with several abstract symbols and shapes arranged in rows and columns. The board was similar to a “bingo” board.

To present a trial, the experimenter stood behind the participant and the peer confederate presenting each with a card with a symbol on it and directed the children to “Match” the card to same symbol on the board on their desk. The experimenter presented the flashcards to both the participant and peer confederate simultaneously. To present the flashcards, the experimenter reached over the children, who were sitting in front of the teacher, and placed the flashcard in their visual fields and then gave the vocal direction “Match”. The participant and the peer confederate then responded by matching the flashcard to the board on their desks. The screen between the children ensured that modeling did not occur. The presence of the experimenter behind the participants limited visual contact with the teacher and ensured attention to vocal instructions and vocal praise.

Design

The design for the experiment consisted of a pre and post-intervention functional analyses of vocal praise as a reinforcer for responses. There were two different pre-
Praise conditioned by observation and post-intervention response assessments: 1) a pre-intervention ABAB functional analysis involving comparisons of praise and edible effects on performance tasks, and 2) baselines for three learning tasks involving the use of praise for correct responses and corrections for incorrect responses. Following the observational conditioning intervention, the functional analyses for performance and learning were repeated to test if praise had acquired reinforcing properties.

The sequence of the study consisted of (a) pre-intervention reversal (ABAB) designs for the functional analysis of reinforcement control of praise and edibles for performance tasks in order to compare the effects of edible reinforcement versus vocal praise reinforcement, (b) baseline phases in which participants received only vocal praise contingent upon correct responses to three learning tasks, (c) the observational conditioning intervention, and (d) a repeat of the reversal design (ABAB) for Participants C and D (post-intervention consisted of only one return to each condition [BA] for Participants A and B) testing the effects of vocal praise and edibles for the performance task following intervention, and (e) a return to the three learning tasks following the observational intervention in which only vocal praise was delivered contingent upon correct responses to learn unit presentations and corrections for incorrect responses as the participants had received in baselines. Each of the steps in this sequence is described in detail below.

Pre-intervention-baseline for the performance tasks

Pre- and post-intervention assessments of performance involved alternating phases of repeated sessions with edible reinforcement and repeated sessions of vocal praise delivered contingent upon correct responses. Participants received edibles in the A phases and vocal praise in the B phases. No other form of reinforcement was delivered during each phase. The experimenter ignored incorrect responses and refusals to respond and the subsequent trial was presented.

The performance task that was chosen for each participant was one that each participant had in his repertoire. It was one that the participants could emit readily. For Participants A and B, the task was pointing to black and white pictures of the following shapes: crescent, star, diamond, oval, circle, rectangle, and heart. For Participants C and D, the task was tacting black and white pictures of the following shapes: heart, star, circle, square, rectangle, diamond, and oval. Sessions for performance tasks consisted of 20-trials where the experimenter stated, “Point to ____.” Correct responses received either edibles or vocal praise depending on the functional analysis conditions. Incorrect responses resulted in no feedback; rather, the next trial was presented. The duration of each session was timed using a timer that the experimenter started at the onset of the first presentation and stopped following the reinforcement for the last presentation, if it was reinforced, or immediately after an incorrect response. When the experimenter had the participant’s attention, the timer was started at the onset of the vocal instruction to, “Point to ____.” The number of correct and incorrect responses respectively per minute were calculated by dividing the duration of the session in seconds by 60 seconds. The resulting number was then divided by the total number of correct or incorrect responses respectively for each session yielding number per minute of correct and incorrect responses.

During the timed sessions for the edible phases a preferred edible was dropped into a transparent cup located on the table in front of the participant when a correct response was emitted. The edibles that were used during the edible phases were M&M’s®, Skittles®, Oreos®, Gummies® and Nerds®. The participants were required to wait until the end of the 20-trial session before they could consume the edibles they earned for emitting correct responses. Pre-intervention performance sessions for Participants ranged between 45 seconds and 1 minute, 30 seconds in duration. Sessions for each phase for the performance task were implemented until the participants emitted a steady state of correct response per minute and incorrect response during the edible and vocal praise phases.

Baselines for the learning tasks

Following the pre-intervention functional analyses of the experiment, baselines were also obtained on learning in which vocal praise and correction feedback was provided in teaching new repertoires. These baselines were the first components of a multiple baselines across participants for learning new repertoires. The implementation of the
learning tasks was the only portion of the study in which 20-learn unit sessions were implemented. Learn units consist of reinforcement operations by the experimenter using vocal praise alone for correct responses and corrections for incorrect responses, in which the correct response was provided by the experimenter and the participants were required to repeat the correct response while attending to the relevant instructional stimuli. Corrections were not reinforced, consistent with the learn unit procedure (Greer & McDonough, 1989). Three learning tasks for each of the participants were implemented in order to determine if the participants learned the new skills when only vocal praise was in place as the reinforcement operation. See Table 1 for a description of learning tasks for each participant. Unlike the pre-baseline phases of the study, the learning task sessions were not timed sessions since the nature of the tasks differed across participants.

Observational conditioning intervention

The tasks that were used during the observational conditioning interventions were ones that both the participants and peer confederates had previously mastered (performance tasks). They differed from the performance tasks used for the pre and post-intervention functional analyses.

During the observational conditioning procedure, the participant sat next to a peer confederate at a table. Peer confederates for Participant A and B were other children in the same class as the participants. Peer confederates were also selected based on the fact that they had similar levels of academic achievement. Most importantly, peer confederates were selected because vocal praise functioned as a reinforcer for them prior to the onset of the study. Peer confederates were not of particular social significance to the participants other than being peers in their class. Peer confederates were not made aware of the purpose of the study, and therefore did not discuss the conditioning procedure with the participants at any point throughout the study (Table 2).

A partition was placed between the participant and the peer confederate so that neither the participant nor the peer confederate could see what the other was doing. For Participants A and B, the task involved each participant matching symbols. Participants and confederates were given a bingo-like card with 10 symbols printed on it. The experimenter then provided each participant with a symbol that matched one of the pictures on card and the vocal antecedent “match.” Participants C and D were presented with one letter to be matched to one of two letters located on the table in front of them (a correct letter and an incorrect letter) and the experimenter emitted the vocal antecedent “Match.” Across all participants, following the presentation of the stimulus and the vocal antecedent, the participants and confederates were given five seconds to match the presented stimulus to its corresponding matching stimulus. Each session consisted of ten trials. The peer confederate received vocal praise contingent upon correct responses. The participant was not consequated for correct or incorrect responses but heard the peer receiving vocal praise. That is, the participant did not receive praise while the confederate did.

Repeat of reversal design and return to three learning tasks (post-intervention)

Following the observational intervention, we returned the participants to the initial performance task as a test of the reinforcement effects of vocal praise relative to the edible effects. For Participants A and B two phases were implemented, a single vocal praise phase (B) followed by a single edible phase (A). Four phases were conducted with participants C and D, two edible and two vocal praise phases (ABAB). In addition as a test of the vocal praise as a reinforcer for learning, we returned the participants to instruction on their three acquisition tasks to complete the multiple baseline.

Data collection

We collected data on four response conditions—pre and post performance tasks, baseline (pre-intervention) and treatment phases (post-intervention) for the learning tasks, and responses during the observational conditioning intervention. Correct responses were recorded as pluses (+) and incorrect responses were recorded as minuses (-) using pen and data forms. During the pre- and post-intervention and conditioning phases of the study, data were collected on responses to trials with reinforcement for correct responses and no feedback for incorrect responses. In the conditioning intervention the participants, did not
receive any consequences, and data were collected on their correct and incorrect responses (not responding was recorded as incorrect also). Each pre- and post-intervention sessions of tests for reinforcement for performance consisted of 20-trials. Sessions during the conditioning phases of the study consisted of 10 trials. Data throughout the three learning tasks (baseline) for each participant were collected as responses to 20-learn unit presentations per session as described above. Learn units are well-documented instructional components that predict learning and the evidence show that they are a necessary, if not sufficient, condition for effective instruction (Greer & McDonough, 1999). Thus, if vocal praise functioned as a reinforcer for learning, the presence of learn units in the baseline would have predicted learning. If they did not learn from learn units prior to the conditioning procedure, yet did after the conditioning procedure, the intervention was the likely source for the participants learning with vocal praise.

Interobserver agreement

Interobserver agreement observations were conducted for 24% of the total performance task sessions (pre/post intervention functional analyses). Agreement scores ranged from 95% to 100% agreement with a mean agreement of 99%. Interobserver agreement was collected for 21% of the learning task sessions and was 100%. Interobserver agreement was conducted for 100% of the conditioning praise sessions. Agreement scores ranged from 90% to 100% agreement with a mean agreement of 99%. Interobserver agreement was calculated by dividing the numbers of point-to-point agreements on each participant’s responses by the total number of agreements plus disagreements and multiplying this number by 100%.

RESULTS

Pre and post-intervention performance conditions

Figure 1 (top panel) shows correct and incorrect responses rates (numbers per minute) for Participant A when the respective edible and vocal praise conditions were in effect. The first edible phase showed variable and high correct responding rates (mean 14.9, range 11.6 to 19) with correspondingly low and relatively stable rates of incorrect responses (mean 0.9, range 0 to 2.4). During the first vocal praise phase for this participant, the mean number of correct responses per minute was 9.4, ranging from 0 to 15.4 correct while the incorrect mean rate was 4.6 (range 0 to 14.4). In this phase a gradual extinction effect was apparent. During the return to edible phase, this participant’s mean rate of correct responses was 14.5, ranging from 11.4 to 17.3 correct responses per minute with immediate and sharp changes in levels of responding. The mean rate of incorrect responses per minute during this phase was 2.1, ranging from .8 to 3.8 incorrect responses per minute. For the return to vocal praise phase, the mean rate of correct responses per minute was 8, ranging from 0 to 12.9 correct responses per minute and with and sharp and abrupt changes in level. The mean number of incorrect responses per minute during this phase was 6.7, ranging from 2.3 to 15.4 incorrect responses per minute. Following the conditioning vocal praise intervention, the vocal praise phase was re-implemented (phase 5). The participant emitted a mean of 13 correct responses per minute, ranging from 7.6 to 19 and a mean of 2 incorrect responses per minute, ranging from 0 to 5. Finally, when we returned to the edible condition (phase 6), the participant emitted a mean of 16.2 correct responses per minute, ranging from 15 to 18.2, and a mean of 1.2 incorrect responses per minute, ranging from 0 to 2.7.

Figure 1 (bottom panel) shows the number of correct and incorrect responses for Participant B under edible and vocal praise conditions respectively. During the first edible phase, the mean number of correct responses per minute was 16.8, ranging from 14.3 to 18.2 correct responses per minute with no incorrect responses. During the next phase (vocal praise phase), the participant emitted a mean of 11.8 correct responses per minute, ranging from 0 to 17.9. The mean rate of incorrect responses was 2.4, ranging from 0 to 16.7. During the return to edible phase, the participant’s mean rate of correct responses per minute was 16.6, ranging from 13.6 to 19. The mean incorrect responses per minute during this phase was 1.2, ranging from 0 to 4.5. During the final pre-intervention phase (vocal praise phase), the participant emitted a mean of 8.1 correct responses per minute, ranging from 0 to 14.3. The mean number of incorrect responses per minute during this phase was 4.4, ranging from 0 to 15.4.
When we returned to the vocal praise conditions following the conditioning vocal praise intervention, the participant emitted 16.8 correct responses per minute, ranging from 15.4 to 17.6, and .2 incorrect responses per minute, ranging from 0 to .9. Finally, when we returned to the edible phase, the participant emitted a mean of 15.5 correct responses per minute, ranging from 12.9 to 16.7, and a mean of .3 incorrect responses per minute, ranging from 0 to 1.4.

Figure 2 (top panel) shows pre- and post-intervention performance conditions for Participant C. In the first edible phase Participant C emitted stable and high correct rates (mean = 26.5, range = 25 to 28.5) and no incorrect responses. This participant emitted 0 incorrect responses during this phase. During the first vocal praise phase, the mean correct rate was 2.8 (range = 0 to 7.4 correct responses per minute). The mean rate of incorrect responses during this phase was 22.5, ranging from 13.7 to 26.7.
Thus, unlike Participants A and B, Participant C showed an immediate change in levels for both correct and incorrect rates. During the return to edible phase, the mean rate of correct responses was 22.7, ranging from 3.2 to 33.3 correct responses per minute. The mean rate of incorrect responses per minute during this phase was 1.3 (range = 0 to 14). For the return to vocal praise phase, the mean rate correct was 2, (range = 0 to .87 correct). The mean incorrect rate was 23.6, (range =17.4 to 26.7).

Following the observational conditioning intervention for the first edible phase post-intervention, the participant emitted a mean rate of 27.7 correct responses per minute, (range =22.5 to 30.8) and no incorrect responses. In the subsequent vocal praise phase, the participant emitted a mean rate of 32.2 correct responses (range = 29.4 to 36.7) and no incorrect responses. In the next and final edible phase, Participant C emitted a mean rate of 26.25 correct responses per minute (range 23.5 to 29.9) with no incorrect responses. In the final vocal praise
phase, he emitted a mean of 31.2 correct responses per minute, (range = 29.9 to 31.7) and no incorrect responses.

Figure 2 (bottom panel) shows the numbers of correct and incorrect responses for Participant D when edible and vocal praise conditions were in effect. During the first edible phase, the mean rate of correct responses was 24.8 (range from 20 to 33.3) with a mean of 0.1 (range 0 to 1.4). During the next phase (vocal praise phase), the participant emitted a mean of 15 correct responses per minute (range = 0 to 29). The mean rate of incorrect responses was 6.8 (range = 0 to 25). During the return to edible phase, the participant’s mean rate of correct was 32.3, ranging from 28.6 to 33 and there were no incorrect responses. During the final phase (vocal praise phase), he emitted a mean of 14.3 correct responses per minute (range = 0 to 24). The mean rate of incorrect responses was 9.4 (range = 0 to 26.7).

Following the conditioning intervention, the vocal praise phase was re-implemented. Participant D emitted a mean of 30 correct responses, (ranging from 28 to 33) and no incorrect responses. During the next phase (vocal praise phase), he emitted a mean of 29 correct responses (range = 27 to 32) and no incorrect responses. During the next edible phase, he emitted a mean of 29 correct responses per minute (range = 28 to 30) and no incorrect responses. During the final vocal praise phase, he emitted a mean of 31 correct responses per minute (range = 29 to 33) and no incorrect responses.

Pre and post-intervention learning conditions

Note that these Figures show multiple baselines across Participants as a control for non-experimental instructional histories. However, we describe the effects for each participant by referring to each participant’s performance in each of his/her perspective instructional tasks. Thus, the three tasks for each individual are distributed across Figures 3, 4, and 5 for Participants A and B and 6, 7, and 8 for Participants C and D. Figures 3-8 however illustrate the feature of the design that controls for non-experimental instructional histories (i.e., possibilities that the participants might have learned the skills from some non-experimental source or sources) and maturation. Separate multiple baselines across participants were done because Participants A and B were located in a different school than Participants C and D.

During pre-intervention conditions, Participant A’s mean number of correct responses for tacting community helpers was 2.7, ranging from 0 to 9 (Figure 3). For yes/no tacts, his mean number of correct responses was 7.8, ranging from 0 to 13 (Figure 4). Finally, his mean number of correct responses for word identification was 4.5, ranging from 3 to 9 (Figure 5). Participant B’s mean number of correct responses for tacting coin amounts was 4.1, ranging from 1 to 8 (Figure 3). For spelling, his mean number of correct responses was 4.9, ranging from 1 to 15 (Figure 4). Finally, for arranging words in alphabetical order, his mean number of correct responses was 4.8, ranging from 0 to 8 (Figure 5).

We then returned to teaching the three acquisition tasks following the conditioning vocal praise procedure. Following the conditioning procedure, Participant A emitted a mean of 16.7 correct responses for tacting community helpers, ranging from 14 to 19 and he achieved criterion on this task after six sessions (Figure 3). He emitted a mean of 18 correct responses for yes/no tacts ranging from 17 to 19, and achieved criterion on this task after three sessions (Figure 4). Finally, for word identification, the participant emitted a mean of 15.4 correct responses, ranging from 11 to 18 and achieved criterion on this task after ten sessions (Figure 5). During the return to tacting coin amounts for Participant B, he emitted a mean of 13.3 correct responses per minute ranging from 9 to 20 and achieved criterion following twelve sessions (Figure 3). For spelling, the participant emitted 19 correct responses across the two sessions it was implemented, and achieved criterion on this task after two sessions (Figure 4). These data suggest latent learning in the baseline, where the task may have been learned but not emitted because of the lack of vocal praise function to reinforce during the baseline. That is he may have learned the task from corrections but the “latent” correct responses were not reinforced by the vocal praise. Finally, for arranging words in alphabetical order, the participant emitted a mean of 12.5 correct responses, ranging from 7 to 20 and achieved criterion after eight sessions (Figure 5).

During pre-intervention conditions, Participant C’s mean number of correct responses for number-object correspondence was 4.1, ranging from 2 to 6 (Figure 6). For tacting community helpers, his mean number of correct responses was 4, ranging from 2 to 6 (Figure 7). Finally, his mean number of correct responses for tacting rooms in the home was 6.4, ranging from 2 to 10 (Figure...
Participant D’s mean number of correct responses for letter sequencing was 3.6, ranging from 0 to 10 (Figure 6). For tacting community helper function, his mean number of correct responses was 3.5, ranging from 0 to 13 (Figure 7). Finally, his mean number of correct responses for sorting was 10.1, ranging from 4 to 12 (Figure 8).

Following the observational intervention, Participant C emitted a mean of 15.2 correct responses, ranging from 12-18 (Figure 6) for 1:1 number to objects correspondence. The mastery criterion for the teaching tasks or curricular objectives was 90% for two successive sessions and Participant C achieved criterion after five sessions. For the second learning task, tacting community helpers, Participant C emitted a mean of 14.8 correct responses, ranging from 10-19 correct responses (Figure 7), and achieved criterion after six sessions. He had a mean of 17 correct responses, ranging from 12-20 (Figure 8) for the third learning task (tacting rooms in a house). The participant mastered the skill after three sessions post-conditioning.

Participant D had a mean of 14.3 correct responses ranging from 8-18 (Figure 6) post-conditioning for the first learning task, letter sequencing, and he met criterion in 12 sessions. He had a mean of 18.25 (range: 17-20) correct responses and criterion was achieved after 4
sessions for the second learning task, functions of community helpers (Figure 7). Finally, he had a mean of 18 correct responses (range: 17-19) for the learning task of sorting (Figure 8) and he achieved criterion after three sessions.

Prior to the intervention the participants did not learn the three tasks when praise was used as the consequence during the reinforcement operations. All of the components learn units were in place; that is, corrections were done for incorrect responses and a reinforcement operation was done for correct responses. Following the intervention they did learn when the same procedures were in effect.

**Intervention condition data**

Figure 9 shows the responses of all four participants during the observational intervention sessions. During the intervention, each peer confederate emitted 100% correct responding for all sessions; however, these data are omitted for brevity’s sake. They are available from the first author. Across the 14 sessions of conditioning vocal praise, Participant A emitted 6.4 correct responses (out of 10), ranging from 0 to 10. Across the 33 sessions of conditioning vocal praise for Participant B, this participant emitted a mean of 8.3 correct responses (out of 10), ranging from 0 to 10. Across the 12 sessions of con-
conditioning vocal praise, Participant C emitted a mean of 2.8 correct responses (out of 10), ranging from 0 to 7. Across the 11 sessions of conditioning vocal praise, Participant D emitted a mean of 6.3 correct responses (out of 10), ranging from 0 to 10. Each of these figures show a gradual extinction effect. The participants simply ceased responding.

DISCUSSION

The intervention functioned to condition vocal praise as a reinforcer for performance and learning for these pre-school and school age participants. The data demonstrate applied utility for the finding reported in Greer and Singer-Dudek (2008) where they demonstrated the emergence of conditioned reinforcement for pieces of string and plastic discs. Our findings suggest that behavior itself, the experimenters’ vocal praise as social reinforcement, acquired reinforcing properties for both learning and performance, thereby extending the effect found by Greer and Singer-Dudek from objects (yarn and plastic discs) to behavior per se. In this case the behavior was the emission of praise by adult experimenters.

Several prior studies suggested a similar effect with food (Greer, Dorow, McCorkle, Williams, & Asnes, 1991;
Greer, McCorkle & Sales, 1998; Rozin & Schiller, 1980). However, in the food studies the procedure cannot be attributed to the emergence of conditioned reinforcement for previously non-preferred foods, because the procedure may have only acted to encourage the children to sample the foods and tasting the foods may have resulted from the unconditioned reinforcement of the appetitive effects of food.

In the research in social learning in non-human species (Zentall, 1996), the effects of consuming food as a function of observation are identified as incidences of reinforcer enhancement. However in the case of the reinforcer enhancement process described by Zentall the effects are relatively permanent unlike the temporary effects identified with establishing or motivational operations (Michael, 1993a, 1993b) on the enhancement of

Figure 6. Correct responses to learn unit presentations for acquisition task 1 for Participants C and D.
Figure 7. Correct responses to learn unit presentations for acquisition task 2 for Participants C and D.
consequences as reinforcement. For example, Rozin and Schiller (1980) reported that having children observe other children consume peppers resulted in the observing children consuming and developing a preference for chili peppers, an effect replicated with other food (Greer et al., 1998). But, in the case of the yarn and plastic discs in the Greer and Singer-Dudek (2008) study and in the study reported herein, the relatively permanent effect of the observation can be attributed to conditioning since there are no inherent appetitive or unconditioned properties in the stimuli that were conditioned. In the present study we found that the behaviors of vocal praise acquired reinforcement similar to the effects found for yarn and string.

Figure 8. Correct responses to learn unit presentations for acquisition task 3 for Participants C and D.
This study raises several questions and limitations. First, in the pre-intervention tests for the relative reinforcement effects for performance of praise versus edibles, three participants (Participants A, B, and D) required extended sessions before the praise did not reinforce the performance task in the first praise condition. This may be attributable to schedule effects or spill over from the prior and initial edible phase. Moreover, the children had extensive experience with edibles as reinforcement in their daily instruction and this may have necessitated prolonged sessions in their first encounter with praise alone. Such an effect is not unlike the spill over effects found in

Figure 9. Number of correct responses to the performance tasks during the observational conditioning intervention for Participants A, B, C, and D.
multiple schedule reinforcement studies. The prevalence of the effect resulted in the now common incorporation of change over components in experimental analyses of multiple schedules. In our case, once the children experienced the praise operations for the second time, the differences in the consequences were either immediate or more immediate than their first phase. In the second encounter with the praise conditions, after a single response or a few response, where praise alone was delivered without the edible, may have functioned as a stimulus discriminative for the ensuing consequences for accurate responding. As such, the discrimination of the different conditions was apparent in the second encounter with the vocal praise. Similar effects were found in the prior studies (Greer, McCorkle, & Sales, 1996; Greer & Singer-Dudek, 2008). Establishing discriminative stimuli for each condition would probably result in more immediate effects of the different consequences. For example, in one recent related dissertation (O’Rourke, 2006) performing math problems was the target behavior to be conditioned. Green tokens were used for preferred item phases, while red tokens were used for access to doing math problems. At the beginning of the sessions the tokens to be in use were conspicuously present. In that study the differences in responding were immediate. The different colored tokens acted as a discriminative stimulus for the trials that followed and the spillover effects were largely missing. We could have also extended the post-intervention sessions for the two contingencies to test the prolonged effect of praise as a reinforcer particularly for Participants A and B. Participants C and D had two complete reversals suggesting the relative permanence of the effect.

Still another limitation concerned the almost immediate mastery of one of the three learning tasks for Participant A and B (Figure 5, top and bottom panels) and all of the tasks for Participant D (Figure 8, 9, and 10, bottom panel) where the first post intervention instructional session resulted in criterion or almost criterion level responding. Greer and Singer-Dudek (2008) found similar effects for two participants in their study and they suggested that these instances were possible cases of “latent learning.” That is the participant may have learned from the corrections but because the praise did not reinforce correct responding they did not emit correct responses until the praise was conditioned. However, this problem is not one peculiar to the questions addressed in our study; rather it is a problem in identifying the possibility of latent learning under any instruction where there are correction operations and the putative reinforcer does not, in fact, reinforce. Clearly, more research concerning this issue is needed. There were however, numerous examples in the data we reported where a more gradual and typical learning trend was evident.

What are the likely mechanisms underlying the emergence of conditioned reinforcement from the experiences we created in the intervention? Given the explanations in the social learning research in non-human species and our own interpretation, the most parsimonious explanation to date is that the effect is due to observation of stimulus-stimulus pairings or Pavlovian conditioning as described by Zentall (1996). That is the pairing of a peer, or the peer’s expression (a conditioned or unconditioned reinforcer) on receiving the praise while the target participant was denied praise may have acted to condition the praise (unconditioned reinforcer) as a reinforcer for performance and learning. Indeed, our findings suggest that studies like those of Kazdin (1973) need to be revisited. In Kazdin’s study on the effects of observing teachers reinforcing other children, resulted in the observing children behaving like the observed children as a function of observing others receive praise. Moreover, other studies (Ollendick, Dailey, & Shapiro, 1983) found that the reinforcement-of-others effect did not maintain responding for the observing participants unless the observing participants themselves received praise (note the extinction effects shown in Figures 11 and 12). It is not entirely unlikely that the act of observing others receive praise, when the observing children were denied praise, functioned to condition praise as a reinforcer for all or some of those observing children in studies on vicarious reinforcement like the children studied in the Kazdin and Ollendick et al. studies. That is the effect that they found might be one that followed from observational conditioning. Indeed the very powerful effect of using contingent praise with young children in classrooms may be attributed in part to the emergence of conditioned reinforcement by observation.

While future studies should test for the role of the experimenter in the conditioning process, it is not likely that the pairing of the teacher conditioned praise since that pairing was present also in pre-intervention functional analyses. The presence of an adult together with the presence of the peer may be important. Future research should
eliminate the presence of an adult and arrange conditions in which the praise or unconditioned objects are dispensed by recorded voices or mechanical means respectively.

The recent series of studies on social learning as observational learning (Davies-Lackey, 2005; Gautreaux, 2005; Greer, Keohane, Meincke, Gautreaux, Pereira, Chavez-Brown, & Yuan, 2004; Pereira-Delgado & Greer, 2007; Stolfi, 2005) suggest that analyses of the different types of observational learning is key to furthering a basic science of observational learning, as well as teaching as applied behavior analysis and other applied fields concerned with learning and performance. These studies suggest that observational learning is different than changes in performance as a result of observation. Also, the ability to learn from indirect contact with contingencies is a repertoire that is missing in some children and it can emerge after certain interventions are done suggesting that observational learning is learned (Greer & Singer-Dudek, 2008). Moreover, conditioned reinforcement for vocal praise, which is a key educational reinforcer and source of incidental language acquisition, can emerge from observational conditions like those we report, at least with children like those we studied. We suggest that conditioning reinforcement by using the observational intervention that we describe may portend powerful new procedures for applied behavior analysis. The expansion of children’s community of reinforcers is key to their educational progress and the possibility that children’s community of reinforcers can be expanded using the intervention that we describe might prove useful. In the case of the children we studied, vocal praise is now a conditioned reinforcer that can be used for instruction and management, eliminating the reliance on edible reinforcement, or indeed, back up reinforcers for tokens. As a result of the intervention vocal praise became a form of what Skinner (1968) described as educational reinforcement where, prior to the conditioning intervention, praise did not function as an educational reinforcer for learning. This makes it possible for these participants to now benefit from the almost exclusive reliance on praise as a reinforcement operation by teachers in typical educational settings.

While the identification of the emergence of conditioned reinforcement from observation is a new finding, there are numerous common types of behavior that might be explained by or related to the phenomenon. It is not unusual for children who do not prefer a toy, to begin requesting the toy when a sibling is given that toy or begins to play with it. Still other examples of the effects of observational conditioning may extend to the effects advertising has on purchasing. It may be possible that the phenomenon is related to the prevalence of advertisements featuring popular media figures in fashion, fads, and changes in tastes. However, the extension of the present findings to these common cultural phenomena requires additional research. Nevertheless, for participants like those in this study and in the Greer and Singer-Dudek’s (2008) study it appears that reinforcers may be conditioned through observation under the conditions like those we described.

REFERENCES


Trabajo invitado