Assessing the Potential Aversiveness of Vicarious Reinforcement Arrangements in Preschool Children

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Abstract

Vicarious reinforcement (VSR) refers to a change in behavior as a result of observing the delivery of reinforcement to another person (Kazdin, 1973). As such, VSR procedures would appear to be a viable teaching strategy for use in group settings (e.g., preschool classrooms) as it may prove to be an efficient and effective strategy. However, some researchers have reported the emergence of problem behavior under conditions in which only the model's behavior is reinforced and reinforcement is withheld from observers' behavior (Gureghian, et al., 2013). The purpose of this study was to experimentally examine the extent to which a VSR positive arrangement may be aversive for young children by arranging conditions under which the observer can terminate (i.e., escape or avoid) the delivery of positive reinforcement to the model. To date, 5 typically developing preschool children have participated, and an experimental arrangement has been proposed for a follow-up study assessing the potential aversiveness of a vicarious negative reinforcement arrangement. Although results were mixed, the majority of observers displayed behavior suggesting that a VSR positive arrangement was aversive, and some participants exhibited negative side effects (e.g., problem behavior and negative vocalizations). Results are discussed in terms of implications and applied issues related to the use of VSR in the classroom and other applied settings.

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Table of Contents

List of Figures

List of Tables

Introduction

Vicarious reinforcement refers to a change in an observer's behavior as a result of observing a model's behavior being reinforced (Kazdin, 1977). In other words, the observer's responding changes without directly contacting reinforcement. Both behavioral psychologists and social psychologists have studied vicarious reinforcement effects, although the theoretical perspectives differ with respect to why vicarious responding occurs. Regardless, applications of vicarious reinforcement would appear to potentially offer teachers and clinicians an efficient and effective teaching strategy if teachers only have to reinforce the appropriate behavior of a few students to increase the appropriate behavior of a group of students. However, research findings on the extent to which vicarious reinforcement arrangements are effective and efficient have been mixed. Further, some researchers have reported negative side effects of using vicarious reinforcement procedures.

The purpose of this paper is to provide a brief synopsis of the behavior analytic literature on vicarious reinforcement and to present findings for a study designed to assess the extent to which vicarious ***positive*** reinforcement arrangements with young children were either aversive and/or associated with negative side effects.

Concept of Vicarious Reinforcement

Bandura (1971) and Kazdin (1973) described vicarious reinforcement as a change in the behavior of one individual as a result of observing another individual's behavior being reinforced. That is, the individual's behavior changes without directly contacting reinforcement. Masia and Chase (1997) described vicarious reinforcement as a behavioral process that increases the observer's behavior that is similar to that of a model as a result of watching the model's behavior being reinforced or punished. The term "vicarious reinforcement" is not conceptualized as a behavioral principle but rather a descriptive term that describes the interaction between behavior and environmental variables. Although there are a number of other terms that may be used to describe or explain vicarious reinforcement, such as observational learning and imitation, the same operant mechanisms that are used to explain other behavioral phenomena are the basis upon which vicarious responding is conceptualized (Mazur, 2006).

Behavioral Perspective on Vicarious Reinforcement

A behavior analytic conceptualization relies on processes that can be observed and measured such that inferences to cognitive processes are eliminated (Baer et al., 1968). Thus, vicarious reinforcement can be conceptualized according to one's "learning history and the relation of this history to current environmental variables…." (Masia & Chase, 1997, p. 44). Specifically, a behavior analytic account of vicarious responding can be conceptualized according to an individual's history of reinforcement for imitation, intermittent reinforcement, and the process of stimulus control.

An individual's learning history seems to play an important role in vicarious responding – specifically the role of generalized imitation (Fryling et al., 2011; Masia & Chase, 1997; Pierce & Cheney, 2004). Generalized imitation is an operant response class in which novel or new imitative behavior is likely to occur as a result of a history of reinforcement for imitating others' behavior (Mazur, 2006). In fact, a generalized imitative repertoire may be a prerequisite response class that an observer must have learned to attend to the effects of a vicarious reinforcement arrangement. Therefore, to state that vicarious reinforcement occurred, observers must by definition be able to observe the model's behavior and the associated consequences to then be able to emit that same behavior (i.e., imitate).

The role of intermittent reinforcement is also pertinent in a behavior analytic conceptualization of vicarious reinforcement (Ollendick et al., 1983; Weisberg & Clements, 1977). Intermittent reinforcement is defined as reinforcement that does not follow every response, and intermittently reinforced behavior will occur in the absence of reinforcement and is resistant to extinction (Skinner, 1953). That is, behavior will continue to occur even if every response is not followed by a reinforcer, even under extremely lean schedules of reinforcement (Ferster & Skinner, 1957). Therefore, within the context of vicarious reinforcement, if imitation of the model's reinforced behavior occurs in the absence of direct reinforcement, it is likely that the observer has a history of intermittent reinforcement for imitative behavior. For example, Weisberg and Clements (1977) found that following a history of direct intermittent reinforcement for compliance for a group of children, praising only one child's compliant behavior in the group was sufficient to sustain the group's compliance. Ollendick et al. (1983) also found that when intermittent praise was delivered to an observer for puzzle completion that their level of puzzle completion was comparable to models who contacted continuous reinforcement for puzzle completion. A history of intermittent reinforcement alone, however, is insufficient to conceptualize all instances of vicarious responding because it is unlikely that the observer has a history of reinforcement for all modeled behavior (Masia & Chase, 1997).

Although a generalized imitative repertoire and a history of intermittent reinforcement likely play an important role in vicarious responding, they do not sufficiently account for all environmental variables that likely contribute to vicarious responding. In addition to historical variables as factors influencing vicarious reinforcement effects, the process of stimulus control has been discussed extensively as a factor influencing vicarious responding (Camp & Iwata, 2009; Deguchi et al., 1988; Kazdin, 1973, 1977, 1979). Behavior that has been reinforced in the presence of a stimulus but not reinforced in the absence of that stimulus is considered a discriminated operant (Catania, 2007). The stimulus then becomes discriminative for the availability of reinforcement. Within the context of vicarious reinforcement, a model's behavior being reinforced may function as a compound discriminative stimulus (i.e., the modeled behavior and reinforcer delivery) that signals the availability of reinforcement for the observer (Masia & Chase, 1997). That is, the availability of reinforcement for a model's behavior may signal the availability of reinforcement for the observer if the observer has an established history of receiving reinforcement when another individual's behavior is also reinforced.

In summary, a comprehensive account of behavior change due to vicarious reinforcement must consider the roles of intermittent reinforcement, generalized imitation, and stimulus control. An understanding and through analysis of these mechanisms are also instrumental to the potential efficiency and effectiveness of implementing vicarious learning arrangements in applied settings. These are especially important considerations as the research to date demonstrates that often continuous analysis and manipulation of environmental contingencies must occur before behavior change may be observed in the observers.

Experimental Research on Vicarious Learning

Accounts of imitation and observational learning can be found in research published as early as the 1920s when researchers were interested in the process of vicarious extinction and addressing fearful and avoidant behaviors in children and animals (Jones, 1920; Masserman, 1943). However, it was more so in the 1960s that research on observational learning and learning through imitation began to expand. Social learning theorists argued that a behavior analytic view of observational learning was not sufficient to explain three primary behavioral changes: (a) imitation that occurred in the absence of direct reinforcement of the observer's behavior, (b) imitation that occurred following a delay, and (c) a greater probability of an observer imitating a model's reinforced behavior than the model's nonreinforced or punished behavior. Therefore, social learning theorists were convinced that cognitive variables were required to provide a comprehensive explanation of behavior.

Bandura and Huston (1961) tested the "hypothesis" that reinforcement for a model's behavior influenced the performance, but not the acquisition of, aggressive behavior. Sixty-six preschool males and females served as participants and adult males served as models. Participants watched a 5-min video in which a model approached an adult-sized Bobo doll and ordered him to move out of their way. When the doll did not move, the model engaged in aggression (in the form of hitting, kicking, and sitting on the doll) and negative vocalizations (statements related to the doll not complying with the model's demand). Corresponding contingencies for the model according to each experimental condition occurred at the end of the film (model-rewarded condition, model-punished condition, and no-consequence condition). Results revealed that boys were more likely to imitate the aggressive behavior of the model than girls and that the rewarded and no-consequence groups did not differ in the occurrence of aggression. However, participants in these groups emitted significantly more aggressive behavior than participants in the punished group.

Bandura concluded that when observers saw a model contact reinforcement that the observers' performance on a skill may be affected but not their acquisition. Further, Bandura explained that mere exposure to a model does not facilitate conditions for imitative or observational learning. Bandura did address other factors to consider when evaluating the efficacy and efficiency of observational learning such as the role of establishing operations, the observer's prior experience in "discriminative" observation, and the observer's "anticipation" of positive and negative reinforcements. Further, Bandura suggested adding discriminative stimuli to enhance the relevant modeling stimuli. Bandura also pointed out that the rate, amount, and complexity of stimuli may also influence the degree of imitative learning. Finally, Bandura discussed the influence of generalization from a prior history of reinforcement of imitative behavior and how this may affect the occurrence of future behavior on the part of the observer.

Following decades of assessing vicarious arrangement procedures in operant learning tasks and in more translational studies, researchers began to examine vicarious learning in more socially significant settings. Researchers began assessing children with autism's ability to learn tasks with the use of peer modeling (Egel et al., 1981; Werts et al., 1996). In general, these studies found that children with autism could learn from peer models and acquisition of the target skill maintained following removal of peer models.

Hallenbeck and Kauffman (1995) conducted a review of 34 articles with 1,602 participants of observational learning studies to identify conditions under which students with behavioral disorders would benefit from observational learning procedures. Specifically, they wanted to identify: (a) whether students with behavioral disorders imitated desirable behaviors of their peers, (b) the types of models these students are most likely to imitate, (c) how to make models more salient, (d) conditions under which models have unintended vicarious effects, (e) conditions in special classes and schools conducive to imitation of undesirable models and, (f) the relative strength of imitation vs. direct reinforcement procedures for students with emotional or behavioral disorders.

Hallenbeck and Kauffman concluded that just placement alone in mainstream or regular-education classes with their typically developing peers for students with emotional and behavior disorders was not enough to ensure imitation of appropriate behaviors by peers. However, imitation of appropriate peer models by students with emotional and behavior disorder may occur in special classes or schools that have made certain accommodations. Specifically, such modifications may include (a) using guided practice with explicit models (and instructions to imitate certain behaviors), (b) making the models salient by increasing the observers' perception of similarity to the model, (c) monitoring the extent to which desirable imitation occurs, (d) providing direct and frequent reinforcement for imitation of desired behaviors, (e) decreasing the likelihood that observers perceive model's reinforcement as punishment, and (f) minimizing observers' frustration in academic and social settings.

Although Hallenbeck and Kauffman (1995) provided an extensive review of observational studies at the time of publication, an important area lacking in the vicarious reinforcement literature is the few behavior analytic studies assessing the parameters of reinforcement in vicarious learning arrangements such as the quality of reinforcement (Camp and Iwata 2009), magnitude, immediacy, and schedule (Ollendick, 1982; Camp & Iwata, 2009; Deguchi, 1988; and Christy, 1975). Further, the specific type of items used in vicarious learning arrangements have been limited to the use of praise (Bol & Steinhauer, 1990; Broden et al., 1970; Kazdin, 1973a, 1973b, 1977; Kazdin et al. ,1975; Ollendick et al., 1982; Ollendick, et al., 1983; Ollendick & Shapiro, 1984; Strain et al.,1976; Strain & Timm, 1974; Weisberg & Clements, 1977; Witt & Adams, 1980), edibles (Christy, 1975), and in some cases generalized conditioned reinforcers, specifically tokens (Lech, 1986). In addition, the vicarious literature is also lacking in empirical investigations on different arrangements such as vicarious negative reinforcement and vicarious negative and positive punishment.

Vicarious Reinforcement as a Teaching Strategy

Vicarious reinforcement has been utilized as a teaching strategy across multiple behaviors and settings. Vicarious reinforcement strategies may save instructional time for therapists and educators by resulting in a spread of effects of appropriate behavior and the prevention of inappropriate behaviors for target participants. For example, O'Connor (1969) assessed modification of social withdrawal through symbolic modeling. The purpose was to enhance social behavior in preschool "isolates." Participants watched a film with and without social aspects that included positive consequences for social behavior. Those participants that watched the social film (symbolic modeling) increased their level of social interaction to that of non-isolate children. For the control group, there were no observed changes in social behaviors. O'Connor described his methods as an efficacious procedure for treating social withdrawal. Further, the immediate treatment effects of this intervention may diminish the need for further interventions on social behaviors. However, with the addition of reinforcement of appropriate social behaviors, one could monitor maintenance effects.

Drabman and Lahey (1974) assessed feedback in relation to classroom behavior modification for one female target student and her classmates. Drabman and Lahey assessed the use of feedback only in this procedure as feedback is often a component in behavior management strategies in mainstream education. However, researchers wanted to assess its effectiveness with a single participant. Further, they wanted to evaluate the behavior of the participant's peers changed even when they were not involved in the experimental manipulation. One 10-year old female who was referred due to inappropriate behavior and lack of social interactions with peers served as the participant. Research assistants collected baseline data on out-of-chair behavior, inappropriate use of classroom materials, play (when the participant should be on task), noise, non-compliance, time off-task, vocalization (talking out of turn), orienting (toward teacher and work materials), and aggression toward peers and adults. In addition, researchers also collected data on the frequency of positive and negative statements toward the participant by her teacher and peers. Researchers used an ABAB design with the delivery of feedback to the participant from her teacher as the independent variable. During baseline phases classroom procedures were implemented as usual and during feedback phases on a FT-15 min schedule the teacher would rate the participant's performance during the interval on a scale from zero (very poor behavior) to ten (very good behavior). Feedback delivered to the participant from the teacher was not made public, the participant's peers were not made aware of the study's purpose. Researchers found that as the levels of disruptive behavior for the target student improved, the overall levels of disruptive behavior of her classmates improved, even though class behavior was not systematically addressed. Positive and negative comments by the teacher increased and decreased respectively by the end of the study, but there was no significant difference in the occurrence of positive or negative comments by peers toward the participant. Researchers determined that feedback alone may not only be an effective method to decrease inappropriate behavior for a target student but can also improve the inappropriate behavior of the target student's classmates. Notably, they also discussed the possible temporary effectiveness of feedback alone without the use of backup reinforcers even though the current participant's appropriate behavior was reported to maintain throughout the school year. Further, the researchers discussed the ease of implementing this procedure as compared to a more complex treatment such as a token economy to address disruptive behaviors in a classroom setting.

Keyes and Vane (1975) assessed the effects of vicarious reinforcement on modeling by schizophrenic hospital patients. The authors noted that many of the variables important in modeling by typically developing subjects had been investigated extensively but that less was known about modeling with schizophrenics, which would be important information to help inform the design of rehabilitation plans. Previous studies (Bishop & Beckman, 1971; Kanfer & Marston, 1963) demonstrated that schizophrenics were less likely to imitate the behavior of a model than participants without schizophrenia. Participants were adult males diagnosed with chronic schizophrenia at a psychiatric hospital. Participants observed another patient request an edible (a piece of cake) from an experimenter. Specifically, the model introduced himself to the experimenter, shook his hand, and requested the cake. Researchers found that very rarely did any participant imitate the entire chain of behaviors. Conditions were either positive vicarious reinforcement, negative vicarious reinforcement (which should have been categorized as vicarious punishment as the experimenter responded “no” to the model’s request), and no vicarious reinforcement. Results revealed that the participants imitated the model to some degree and did so regardless of consequences. Researchers hypothesized that the effectiveness of vicarious learning may be limited to populations without a diagnosis of schizophrenia. Instead, clinicians and researchers should use direct reinforcement procedures for individuals with schizophrenia. Keyes and Vane (1975) provided another example of the application of vicarious learning processes in a clinical setting but also its potential limitations.

Okovita & Bucher (1976) assessed the attending of children who were in close proximity to a target child who was reinforced for attending behaviors. One child from a group of three received direct reinforcement (tangibles and edibles) for appropriate behavior. Researchers also controlled for teacher attention, to minimize potential confounds. For the other two children, researchers observed either an increase or at least no decrease in appropriate attending behaviors. Further, researchers reported no reported side effects for children whose behavior was not reinforced, therefore providing some evidence that not only could vicarious reinforcement be an effective teaching strategy but could also be socially acceptable. Hall et al. (1968) also reported, at least anecdotally, that target study behavior increased for non-reinforced students. Some of these early studies provided preliminary results that vicarious learning arrangements may serve as an efficient teaching strategy based on the population and careful manipulation of variables that may affect behavior.

Strain et al. (1977) assessed the effects of peer social initiations on the behavior of withdrawn preschool children. Researchers used peers as models to help remediate social deficits in participants. Peer models were selected based on observations that they were more socially active than other children. Peer models were trained by an experimenter through role play and were instructed to try getting the other boys to play with them. Participants were six preschool boys' ages ranging from 39 to 53 months in a private treatment center for children with behavioral issues. Participants were observed to rarely engage in positive interactions with peers and engaged in tantrum behaviors. Sessions occurred away from classrooms for 20 min a day and experimenters alternated the order of pairs across days. Teachers instructed the pairs that it was time to play with friends. Researchers collected data on motor-gestural and vocal-verbal behaviors emitted by the participants and teacher behaviors such as prompting and reinforcement. In baseline the models were instructed to not initiate any social play with the participants but that the models could play in the room. During intervention, the confederate was instructed to try and engage the dyads, the teacher was not to prompt or reinforce social play. Results revealed that positive social behaviors of all subjects increased and for 5 of the 6 participants also increased the frequency of positive social initiations. This study demonstrates that with initial training, peers may be useful models for appropriate behaviors, alleviating teacher or therapist workload.

Witt and Adams (1980) assessed direct and observed reinforcement in a classroom, specifically the reinforcement for socially approved and disapproved behaviors in pairs of kindergarten females. Participants were referred by their teachers due to reported inappropriate classroom behavior. One participant received social reinforcement for appropriate classroom behaviors in one condition. Researchers then placed the contingency on inappropriate classroom behaviors. Pairs were randomly assigned, as was the designation of roles (model or observer) within each pair. Sessions occurred in the classroom with other students present, and pairs were seated next to each other. Inappropriate behavior was divided into multiple categories: out of chair, touching other's property, vocalizations, orienting responses, noises, aggression, off task behavior, and playing. Appropriate behavior was scored as the absence of any of the above-mentioned behaviors. Conditions included baseline (typical classroom contingencies), reinforcement of appropriate behavior (verbal praise delivered to the model when appropriate behavior was observed), and reinforcement for inappropriate behavior (verbal praise delivered to the model when inappropriate behavior was observed). For all participants (model and observer), target behavior increased corresponding with the condition in place. Researchers stated that the results of the study make a case for using vicarious contingencies given the increase in appropriate behavior for both children.

Zrinzo and Greer (2013) discussed in the results of their study on the establishment of reinforcers for learning specific tasks in young children, that the efficiency of vicarious reinforcement procedures may be dependent on participants having certain repertoires (e.g., naming skills, ability to learn new operants through observation). They stated that social learning is an important way in which humans and non-humans acquire critical repertoires and is more efficient than learning through trial and error and that social learning is the primary way in which much of verbal behavior is learned. Further, based on their research on conditioning reinforcement with young children through the process of observational learning, Zrinzo and Greer discussed that observational learning may play a role in establishing social reinforcers. In addition, they suggested (with caution) that observational learning in general may influence the emergence of a variety of behaviors such as socially learned addictions including smoking.

Further, vicarious reinforcement is often provided as an account of the development of social skills in children (Puttallaz & Heflin, 1990), due to the important of learning through observation. In addition, vicarious reinforcement is a process in the development of fear acquisition without direct exposure to the feared stimulus (Ost, 1985; Rachman, 1977). For example, Ost (1972) assessed six different phobic groups (agoraphobics, claustrophobics, social phobics, animal phobics, blood phoibcs, and dental phobics) and the relation of different behavioral treatments to the acquisition of that groups specified phobia. Rachman (1977) outlined the conditions under which an individual may not acquire persistent fears following dangerous situations. Finally, vicarious reinforcement may often be a component in several therapeutic and educational interventions such as social skills training and language acquisition strategies such as Brigham and Sherman (1968) who assessed preschoolers imitation of English and Russian words when reinforcement was delivered for only one set of responses; Cooke and Apolloni (1976), who taught four children with disabilities four positive social emotional behaviors (smiling, sharing, positive physical interactions, and compliments) with the use of instructions, modeling, and praise; and O’Connor (1969) who attempted to systematically increase appropriate social interactions of preschoolers using a film that depicted appropriate social interactions.

In summary, the use of vicarious learning arrangements may be effective under some circumstances, as illustrated by the articles discussed. However, for procedures to be effective, researchers often made modifications to the original independent variable. Further, researchers and clinicians need to also consider other variables such as the characteristics of the model, other individuals whose behavior is not targeted during intervention, and the durability or lack of maintenance effects.

Vicarious Arrangements

Studies that have involved vicarious *positive* reinforcement arrangements appear to be much more common that other vicarious contingency arrangements such as vicarious negative reinforcement and vicarious punishment. Further, many of these studies have utilized group designs. However, there are a few empirical studies investigating various vicarious learning arrangements. Sechrest (1963) examined the effects of positive or negative reinforcement delivered to one child in a pair for puzzle completion. There were ninety participants from kindergarten through third grade included in this study. Participants were paired based on their classroom teacher's input and on their ability level. For the two test groups one child was randomly selected to receive positive or negative reinforcement and whether reinforcement was explicit (direct) or implicit (vicarious) in the form of verbal praise or reprimands and the control group received no programmed consequences. The target task was the speed of puzzle completion. Conditions consisted of explicit (direct) reinforcement (verbal praise for task completion), explicit negative reinforcement condition (verbal reprimand related to the task), and control (no programmed consequences for task completion). During sessions, an experimenter asked the dyads to "play some games" and experimenters attempted to minimize any perception of competition between the dyads by refraining from making comments on the speed of completion. Results revealed that positive reinforcement (both explicit and implicit) facilitated performance (speed of task completion) whereas negative reinforcement (both explicit and implicit) hindered performance (decrement in speed). Sechrest stated that implicit (vicarious) reinforcement effects would be limited to small groups and in tasks related to competition. Sechrest concluded that considerations should be made for contingencies on task completion, especially in competitive scenarios. However, Sechrest's findings should be assessed cautiously because reprimands were categorized as the consequence for direct and vicarious negative reinforcement procedures when reprimands should have been categorized as a consequence for positive or vicarious punishment procedures.

Kelly (1966) compared the effects of positive and negative vicarious reinforcement in an operant learning task. One hundred and twenty male and female preschoolers were matched in same-sex model-observer dyads. Participants were divided into three conditions: positive social reinforcement (praise), negative social reinforcement (criticism), and no programmed reinforcement. In the positive social and negative social reinforcement conditions, consequences were delivered on a FI-30 s schedule. Models performed a simple motor task (dropping marbles into an opening) and observers then worked on the task with no direct reinforcement. According to results, Kelly reported that the highest rate of responding by the observers occurred under negative reinforcement contingencies and vicarious negative reinforcement contingencies. Kelly explained the results in terms of observers' identification with the models and that punishment appeared to increase the observers' "drive" more than vicarious positive reinforcement contingencies. Similar to Sechrest, Kelly's findings should also be viewed cautiously as criticism was classified and negative social reinforcement as opposed to a positive punishment consequence. Therefore, it is possible that vicarious negative arrangements are even less understudied in the literature due to the mis-categorization of consequences in the published studies, at least regarding early research on vicarious learning arrangements.

Vicarious punishment procedures (both positive and negative) are also understudied in the literature. However, there a few notable studies (Cheyne, 1972; Malouff et al., 2009; Morris et al.,1973; Rice, 1976; Spiegler & Liebert, 1973, Van Houten et al., 1982). These studies have assessed the effects of vicarious punishment arrangements on a variety of behaviors such as prosocial behavior, recall of verbal information, and word association. In general, researchers have found vicarious punishment arrangements to have a generalized inhibitory effect on behaviors. Also, the limited research on vicarious punishment indicates less behavior change is observed when participants observe a model being punished.

Side Effects of Direct Reinforcement

Before discussing potential side effects of *vicarious* positive reinforcement arrangements, it is important to be aware of the reported side effects associated with positive reinforcement per se (i.e., *direct* positive reinforcement). Balsam and Bondy (1983) pointed out that the presentation of not only aversive stimuli but also appetitive stimuli can elicit nontargeted behavior that is countertherapeutic. The authors reviewed the literature to date on reported negative side effects of reinforcement and discussed the ways in which potential problems may arise with the use of reinforcement, including elicited or emotional effects (aggression and ritualistic behavior, approach to the reinforcing agent, and suppression of the target response), operant effects (decreased rate of alternative responses, lack of generalization to other environments, and response inducted), transient effects such as behavioral contrast (i.e., reduction in response rate to below baseline levels following removal of reinforcement), and inappropriate imitation. The take home point was that both appetitive and aversive control procedures can be effective clinically, but one must be aware that both have the potential for correlated negative side effects.

Some researchers have systematically studied and documented positive and negative side effects associated with direct reinforcement. For example, Piazza et al. (1996) proposed a procedure to assess both reinforcing and negative effects of differential reinforcement procedures in individuals with self-injurious behavior based on the preference assessment procedure described by Pace et al. (1985). The modified preference assessment included conducting concurrent observations of preference and self-injurious behavior (SIB) during stimulus presentation to predict which stimuli could effectively compete with, or elicit, SIB when used in a differential-reinforcement-of-other behavior (DRO) schedule. Results revealed that reinforcers for the behavior in the DRO contingency did not predict reinforcer effectiveness for target SIB. These results provide some evidence that the potency of reinforcement is influenced by a variety of factors including the schedule of reinforcement. Further, the authors stated that the preference assessment may be useful in identifying stimuli that produce negative side effects, especially in relation to clinically significant behavior such as SIB.

Vollmer et al. (1997) wanted to specifically document side effects related to noncontingent reinforcement (NCR), especially given that there were very few published studies on the negative side effects at that time. Although NCR is reported to have a numerous advantages as a treatment for aberrant behavior (e.g., ease of implementation, high rates of reinforcement), Vollmer noted that potential disadvantages of NCR include incidental reinforcement of aberrant behavior and extinction bursts when NCR is withdrawn. Vollmer et al. reported results of a treatment evaluation in which NCR was implemented for the severe aggression of a young girl with severe mental retardation. Specifically, researchers analyzed extinction bursts and incidental reinforcement by analyzing within-session response patterns and response distributions during functional analyses. Vollmer et al. found that these side effects and the rates of aggression were mitigated by the addition of a brief omission contingency. In summary, Vollmer et al. finding is important to note that even well-established reinforcement-based interventions require monitoring and modification to not only mitigate negative side effects but to also observe improvements in target behavior.

Lerman et al. (1999) discussed the effects of reinforcement on attenuating the undesirable effects of extinction. Specifically, they wanted to address the issue of spontaneous recovery during function-based treatments that included extinction. Researchers also discussed in their introduction the manipulation of certain reinforcement parameters such as the implementation of dense reinforcement schedules could reduce or mitigate the various side effects of extinction such as behavior bursts and extinction-induced aggression. Researchers observed that negative vocalizations and inappropriate behavior was lower during the higher reinforcement magnitude condition as compared to the lower reinforcement magnitude condition.

Volkert et al. (2005) assessed the duration and magnitude of reinforcement on problem behavior during functional analyses. Although differences in reinforcer magnitude did not have differential results on the identified functions of behavior, Volkert et al. suggested that reinforcer magnitude may have important implications under certain conditions. The delivery of a relatively smaller magnitude of reinforcer may allow identification of behavioral function more quickly because the establishing operation remains strong throughout session. However, the delivery of a relatively larger magnitude of reinforcer may be more helpful in cases where severe behavior is a concern.

Thompson et al. (2003) compared the effects of extinction, non-contingent reinforcement (NCR), and differential reinforcement of other behavior (DRO) as control conditions. Overall, their results suggested that extinction produced more rapid and consistent effects than DRO and NCR. Further, researchers concluded that the use of extinction was also observed to have very few side effects. However, there are various side effects specific to NCR and DRO procedures. A potential advantage with NCR is the persistence of responding which may lead to accidental reinforcement of a target response and NCR may also be a procedure that can minimize negative side effects (Vollmer et al., 1993; Vollmer et al. 1998). However, a limitation of NCR is the possibility of adventitious reinforcement. Whereas in DRO procedures adventitious reinforcement is not a disadvantage, however DRO has been described to share similar side effects with extinction (Cowdery et al., 1990).

There are a limited number of investigations examining positive and negative side effects of direct reinforcement procedures. Limited evidence does suggest that researchers and clinicians must consider potential positive and negative side effects that may arise with the use of reinforcement procedures, as well as the advantages and disadvantages of manipulating various reinforcer dimensions. Given that direct reinforcement procedures may be associated with both positive and (perhaps more importantly) negative side effects, it is not surprising that numerous researchers have reported the occurrence of negative side effects associated with *vicarious* reinforcement procedures.

Side Effects of Vicarious Reinforcement

Some researchers have reported the occurrence of negative side effects using vicarious reinforcement procedures. Most reports of this phenomenon have been anecdotal; very few researchers have directly measured such side effects or targeted them as dependent variables per se. To date, empirical evidence regarding the conditions under which vicarious reinforcement may produce negative side effects is lacking.

Christy (1975) systematically assessed the common assumption (at the time) that delivering tangible reinforcers to specific children will have adverse effects on peers. Therefore, researchers collected data on complaints made by observers during sessions. Sessions occurred in a preschool setting for children with minor behavioral problems in their classrooms. Eleven participants ranged in age from 3.5-6 years were recruited. Researchers collected data on in-seat behavior, aggression, disruptive behavior, and verbalizations. Verbalizations were classified in two categories complaints, which included criticisms of the procedures (e.g., “It’s not fair, I am sitting too”) and requests that were either direct or implied for a reinforcer (e.g., “Tomorrow make me a deal”) and comments which included questions or statements about the reward (“What are you giving him?”) and the target child’s sitting behavior (“He’s out of his chair, he doesn’t get a goody.”). Experimenters used a multiple-baseline design and the intervention consisted of a verbal contingency and edible rewards for in-seat behavior. During the session, the teacher walked around and engaged in conversations with the children, provided suggestions and assistance, and praised efforts while the children were engaged with the target task (working with clay). The teacher did not ask children to sit or praise or comment on sitting behavior. Results showed observers complained more at the beginning of the phase in which the model received the edible reinforcer as compared to the end of the phase. It is likely that observers’ complaining behavior may have extinguished as their behavior did not contact reinforcement.

Ollendick et al. (1982) examined potential vicarious reinforcement effects when one child observed another child receive direct reinforcement in both typically developing children and children with intellectual and developmental disabilities (IDD). In Study 1, 10 pairs of typically developing children ages 5-7 years completed a puzzle task in a laboratory setting. The groups were divided into a control group (no programmed consequences) and the experimental group (reinforcement, in the form of verbal praise, was randomly delivered to one child in the pair). During sessions, children were instructed to complete as many puzzles as possible. In Study 2, researchers attempted to evaluate the applicability of the procedures from Study 1 to seven pairs of children with IDD ages 5-7 years who presented with deficits in play skills. Prior to intervention, researchers conducted three baseline observations of appropriate play skills with reminders every 3 min to play with the toys. During intervention, researchers continued to remined participants to engage with the item but also provided verbal praise to the target in the dyad when appropriate play behavior was observed. Dyads played with blocks in the playroom of an inpatient hospital, and the experimenter delivered praise for appropriate play behavior to the child who demonstrated more deficits in play skills. Researchers only collected data on the occurrence of inappropriate (e.g., mouthing blocks, throwing blocks, etc.) and inappropriate play behavior (e.g., building with blocks, using trucks to transport block, etc.). Results of both studies were similar. Although participants who observed other children contacting reinforcement initially had increased responding, levels decreased over time in ways resembling extinction. Ollendick and colleagues reported that Study 1 participants engaged in attention-seeking behaviors, with verbal (“I did well too, look at my puzzles.”) and nonverbal behaviors such as yawns, sighs, out of seat behavior, and dropping puzzles. Participants in Study 2 engaged in behaviors such as toy stealing, property destruction, peer and experimenter aggression, and stereotypic behaviors. However, none of these observations were analyzed in a quantitative manner. Ollendick and colleagues stated that due to these correlated behaviors in Study 2, participants seemed to behave as if they were punished as sessions continued. However, Ollendick and colleagues did not provide much discussion on the correlated behaviors of the participants' in Study 1.

In 1983 Ollendick, et al. conducted a similar study to their 1982 study, that was designed to assess the effects of one child observing another child receive direct reinforcement for behavior. Forty-eight participants were divided into control and experimental groups. Across all pairs, one participant was selected to receive direct reinforcement for their performance on puzzle completion while, the other participant either received no programmed consequence or intermittent reinforcement. In Study 1, one child was praised continuously, whereas the other child received no praise. During sessions, participants were seated adjacent to each other with an experimenter facing them. Participants were instructed to complete one puzzle per minute for a total of 10 puzzles. Contingent on the condition, verbal praise delivered by the experimenter took the form of statements such as “That's really good,” “You really worked hard.,” That is great!,” “Congratulations!,” and so on. Results revealed that although the observer's performance initially increased due to observing the model, their performance decreased over time to levels lower than baseline. In Study 2 intermittent praise was delivered to the observer as a potential strategy to reverse the effects found in Study 1. The addition of the implementation of intermittent reinforcement to the observer resulted in performance comparable to that of the participant who was continuously reinforced. However, Ollendick and colleagues again reported that observers emitted negative statements such as, “It's not fair” and “I quit” when they observed the model's behavior being reinforced. Ollendick and colleagues reported, similar to their 1982 article, that these statements appeared that the participants perceived that they were punished.

Ollendick and Shapiro (1984) assessed a vicarious learning arrangement and potential side effects. Participants included 216 school aged children in first through sixth grades. Sessions took place in an adjacent room to the participants' classroom and participants were seated adjacent to each other. During sessions. experimenters limited their interactions with the participants to conversations about school related activities. Experimenters only spoke to the participants to provide instructions explaining the task (a simple matching worksheet). Participants were instructed to complete some examples first before beginning the task to ensure they understood how to complete the tasks. Experimental conditions consisted of a control condition (engagement in the task resulted in no programmed consequences) and the reinforcement condition (one child in each group was randomly selected to receive direct social reinforcement related to their performance on the task for the first eight trials e.g., "That's really good", "You worked hard", etc.) For the final two trials, children in both conditions were praised for their performance in an attempt to reverse any detrimental effects caused by the experimental procedures. Researchers measured correct performance on the task and "affective responses" which included verbal and nonverbal behaviors. Verbal statements included "Look at mine… I can do them too." and "She's the teacher's favorite, anyway". Nonverbal statements included writing an X on the page, non-compliance with the task, stealing the model's packet and property destruction. Results revealed that observers performed worse and emitted more side effects that children in the direct reinforcement and control conditions. Researchers also stated that older children (fourth through sixth graders) performed worse than younger children (first and second graders). However, researchers pointed out that there was not a direct link between performance and side effects. Specifically, as the older participants performed worse, they did not have a higher rate of verbal and nonverbal side effects. Researchers hypothesized this may be due in part to what society deems appropriate behavior based on one's developmental and chronological age.

Bol and Steinhauer (1990) collected data on observers' negative statements and found that observers emitted a significantly higher rate of negative verbal behaviors as compared to the models who received direct reinforcement for their behavior. The researchers classified verbal behavior into one of the following categories: attention getting, complaints, and aggression. Forty-eight children were recruited as participants for the study. Sessions occurred in a separate room from the children's classroom. During sessions, children were positioned at a table together and were provided with instructions related to the task. Researchers videotaped all sessions and collected data on the verbal behavior of all participants. Researchers also divided verbal behavior into multiple categories and included: attention getting ("Look at my puzzle."), approval of content ("Mine's fun."), disapproval of content ("Darn, I have a pig."), remarks of simplicity ("This one's easy."), remarks of difficulty ("I have a hard one."), complaints ("I don't want to do these."), aggressive responses ("You're stupid."), empathic responses ("We both did well."), and competitive responses ("I beat you that time."). The experimenter informed each child they had eight puzzles with only one minute to complete each and to put together as many as they can before they were instructed to stop. During sessions there was a control activity (picture book) so that at any point children could elect to stop and do the alternative activity. Experimental conditions consisted of no reinforcement (neither child received any reinforcement), direct reinforcement (one child in the pair received continuous reinforcement) in the form of verbal praise such as "That's really good." and "You did very well." following performance on each of the eight puzzles, and the control/direct reinforcement condition (both children within a pair received direct reinforcement for their performance on each of the eight puzzles) in the form of verbal praise. Following the eight trials (completion of all eight puzzles), all participants were instructed to complete two additional puzzles each that they had previously worked on during the first session and no control activity was available. After completion of these two additional puzzles, both participants received praise to minimize the adverse effects of not receiving reinforcement in the other conditions of the experiment. Results revealed verbal responses related to attention getting, complaints, aggression, and difficulty were higher in vicarious reinforcement condition. In the direct reinforcement condition, verbal responses were higher in the content approval, content disapproval, simplicity, empathy, and competition categories. Specifically, vicarious reinforcement was correlated with the highest statements related to aggressive, complaints, and attention getting remarks. In addition, participants whose behavior was directly reinforced inserted more puzzle pieces that those participants who experienced vicarious reinforcement. In fact, 10 of 12 participants who experience vicarious reinforcement showed a decrease in task completion. However, one important limitation of the study is that the researchers did not assess how reinforcing verbal praise was for participants. Negative statements emitted by participants may have resulted from the observer's target responding not contacting reinforcement and thus decreased. Bol and Steinhauer (1990) suggested this pattern of responding may indicate a situation in which observers increase their rate of responding as a result of observing a model's behavior result in reinforcement. If direct reinforcement is removed following a previously reinforced response, responding will likely undergo extinction, which has been shown to be aversive (Azrin et al., 966; Sajwaj et al., 1972; Lerman & Iwata, 1996; Todd et al., 1989).

Bol and Steinhauer (1990) also suggested that unequal distribution of reinforcers creates inequity, or unfairness, between the model and observer. Previous research on reinforcer inequity has shown that inequity is aversive for the individual who receives smaller or no reinforcers (Marwell & Schmitt, 1975; Shimoff & Matthews, 1975). If vicarious reinforcement contingencies are indeed aversive, observers may be more likely to respond to escape or avoid vicarious reinforcement conditions. Thus, further investigation of the specific conditions under which these types of negative side effects are more likely to occur seems warranted.

The previously discussed studies highlight the idiosyncratic side effects observed (anecdotally and empirically) during the experimental evaluation of vicarious learning arrangements. Further different topographies of side effects have been observed in typically developing children and children with developmental disabilities. The documentation of these side effects suggest that caution must be used when implementing vicarious learning arrangements and that further analysis is required to understand under what conditions side effects may be observed.

In summary, vicarious learning effects are likely a product of an individual's history of reinforcement for imitative behavior and the interaction of several behavioral processes including intermittent reinforcement, stimulus control, and generalization. Applications of vicarious reinforcement would appear to offer teachers and clinicians an efficient and effective teaching strategy. Using vicarious reinforcement as a teaching strategy, teachers or peers model appropriate behavior to increase the likelihood that other children will observe the behavior and the associated positive or negative consequences. Presumably, the children who observe the behavior and the consequences would be more likely to engage in the same behavior. This presumption is likely one of the reasons educators recommend the need for inclusion of individuals with IDD in general education classrooms. As reviewed earlier, various studies support the need for inclusive environments (Hallenbeck and Kauffman (1996), Egel et al.

(1981), and Werts et al. (1996). Vicarious reinforcement may be an efficient and effective teaching strategy. If teachers only have to reinforce the appropriate behavior of a few students to increase the appropriate behavior of the entire class, then vicarious reinforcement can be viewed as an efficient teaching strategy. If vicarious reinforcement reliably increases and maintains appropriate behavior with children with and without intellectual and developmental disabilities, then vicarious reinforcement can be viewed as a valuable teaching strategy. However, as Hallenbeck and Kaufman's (1996) literature review suggests, the potential effectiveness and efficiency of vicarious learning arrangements depends on strategic planning, assessment, and modification throughout implementation. That is, simply including an individual in a setting with their same-aged peers does not ensure that vicarious learning will occur. Further, vicarious reinforcement effects have been shown to be fleeting and unlikely to maintain over time without a history of direct reinforcement first.

Considering that these studies have suggested that vicarious reinforcement procedures may be aversive (to the observer), further investigation of the specific conditions under which these types of negative side effects are more likely to occur seems warranted. This seems especially important because vicarious reinforcement procedures appear to be an attractive teaching strategy for use in classroom settings and seems to be one of the bases upon which the principle of inclusion is favored. However, the research supporting the use of vicarious reinforcement arrangements is not definitive either in its efficiency, effectiveness, aversiveness, or the potential level of side effects

Aversive Control

Given that the main purpose of the current study is to better understand the potential aversiveness of vicarious reinforcement procedures, it is also important to address the topic of aversive control. As early as the 1950s researchers such as Sidman and Boren (1957) reported a need to analyze aversive control, especially exploring the topic in a laboratory setting. For example, Sidman (1958) assessed side effects of aversive control in a monkey when exposed to electric shock. Sidman observed that the monkey engaged in irrelevant and superstitious behavior to avoid the electric shock. Sizemore and Maxwell (1985) also studied the use of electric shock in rats and observed suppressed responding (punishment).

Hineline (1984) stated that conceptually, aversive control is defined in terms of punishment and negative reinforcement. At the time of publication, the most commonly discussed and studied aversive stimulus was the use of electric shock in human and non-human participants in laboratory settings. Perone (2003), stated that a stimulus is aversive if its contingent removal, delay, or avoidance maintains behavior (negative reinforcement) or if its contingent presentation suppresses behavior (punishment). More recently, Hunziker (2018) proposed defining a stimulus as aversive if its removal is contingent on a response and has the effect of increasing the probability of future occurrences of that response.

Balsam and Bondy (1983) summarized and addressed negative side effects of aversive control of over 30 articles that assessed the various side effects associated with aversive control. However, many of these articles were either basic experimental research on punishment and avoidance with animals or case studies. Very few of the reviewed studies assessed aversive control in a systematic manner. Side effects reported in their review included: elicited and emotional effects (general behavior that is therapeutically inappropriate because the behavior is problematic in and of itself or because in some way it interferes with the successful implementation of a therapeutic intervention), anger and aggression (directed toward the implementer of the aversive or punishing contingencies or to any other individual), withdrawal, and general suppression (of responses other that the targeted response), ritualistic or inflexible behavior (development of avoidance responses due to the aversive contingencies that may be insensitive to differing environmental contingencies).

Balsam and Bondy also discussed operant effects including escape and avoidance behaviors, generalization and discrimination (the degree of behavioral change may not generalize to important settings outside the setting of the clinical intervention or that too broad a range of stimuli may suppress a response), transient effects (temporary effects), imitation (will the client imitate inappropriate behavior of the clinician or researcher?), and response induction (not only will a target response be suppressed but so might responses that belong to the same operant class or if an avoidance response is conditioned other less appropriate responses may be strengthened).

In conclusion, it is important to understand not only the mechanisms of aversive control but also the advantages and disadvantages of aversive control and the conditions under which an individual may be likely to engage in behavior to avoid or delay aversive contingencies. Additionally, it seems important to further knowledge about potential side effects of vicarious learning arrangements.

Purpose

Further investigation of vicarious reinforcement arrangements seems warranted based on a review of existing literature. Few studies have investigated vicarious *negative* reinforcement arrangements. If responding can be altered by watching others receive positive reinforcers, it seems reasonable to assume that watching others receive negative reinforcers (i.e., escape or avoidance) could influence an observer's responding. Several studies have reported the occurrence of side effects associated with positive and negative reinforcement arrangements, but few have provided empirical, systematic evidence. Even fewer studies have investigated whether vicarious reinforcement arrangements are actually aversive

The purpose of the current study was to conduct a translational investigation of vicarious reinforcement arrangements in which young children were exposed to situations in which a model child received reinforcement for engaging in specific behaviors and another child (the observer) did not. First, we evaluated the extent to which a vicarious positive reinforcement effect in the observer child's behavior would be observed. Subsequently, we evaluated the extent to which vicarious positive reinforcement contingencies are aversive. That is, would participants (observers) emit a response that produces temporary escape from vicarious positive reinforcement arrangement? In addition, we evaluated the extent to which vicarious positive reinforcement conditions are non-preferred by directly measuring occurrences of correlated negative vocalizations and problem behavior.

General Method

Participants, Setting, and Materials

Five typically developing preschool-aged children participated as observers. Four typically developing preschool-aged children participated as models and some children served as models for more than one observer. All participants were enrolled in a Midwestern-university early education program that was staffed by undergraduate students who were enrolled in a course for early childhood education and supervised by graduate students and faculty of the department. Throughout the remainder of this manuscript, child participants will be referred to as either observers (i.e., participants for whom the effects of vicarious reinforcement were evaluated) or models. Observers were able to imitate age-appropriate fine-and gross-motor tasks based on researcher observation and consultation with classroom supervisors. Sessions were conducted in small research rooms equipped with a one-way observation window, and each room contained relevant task materials (which will be described in detail below). Trained undergraduate students enrolled in a research practicum course or a graduate research assistant served as a therapist and always accompanied the children.

Experimental Arrangement

Five-minute sessions were conducted two to four times per day in 30 min blocks, three to five days per week throughout the participants' school day. Sessions were conducted around meal and nap times, as well as necessary academic activities. Sessions were terminated for the day if emotional responding (see below) occurred for 10 consecutive s. The session termination criterion was reset if emotional responding did not occur for 10 consecutive s. A decision to drop a model or observer based on continuous emotional responding was based on consultation with the classroom supervisors, the participant's caregivers, and supporting anecdotal information prior to, during, and after sessions. No participants to date were dropped from the study due to persistent emotional responding. One to three experimenters (undergraduate and/or graduate research assistants) rotated within each condition. To enhance discrimination, conditions were conducted in three different rooms and each condition was correlated with uniquely colored stimuli such as the session materials, the therapist's shirt, and the color of the session room. For example, the baseline conditions were conducted in a yellow room, with the therapist wearing a yellow shirt, and using yellow task materials. The vicarious reinforcement condition was conducted in a green room, with a therapist wearing a green shirt, and using green task materials. Prior to each session, the therapist stated and practiced the session contingencies with the model and the observer three times. For example, if it was the VSR+ condition the therapist would say, "(Model's name), when you stack a card you get a treat, now you do it. (Observer's name) when you stack a card you do not get a treat. When you touch the stop sign (avoidance response), nothing happens. Now you try it". The target task that produced the reinforcer was present across all conditions and the model and observer had their own set of the target task. A control activity (described below) and the reinforcer (i.e., edibles) were present across conditions during the study. Table 3 depicts the participant-specific materials. The "bug-in-ear" device was worn by the model across all sessions and was used by the experimenter in the session booth to prompt the model to engage in the target response during relevant conditions (see below). Following each daily block of sessions, the observer and model were allowed five min access to a preferred item/activity or edible of his or her choice and experimenter attention for participation in research sessions. A multielement and reversal experimental design were used across both studies to evaluate the effects of the experimental conditions on levels of observer responding.

Aversive Properties of Vicarious Positive Reinforcement

The purpose of the study was to assess whether vicarious positive reinforcement contingencies were aversive. We used a vicarious positive reinforcement arrangement because previous research has reported problem behavior and negative vocalizations primarily evaluated vicarious *positive* reinforcement arrangements; however, findings are still limited and anecdotal in nature. Specifically, we were interested in identifying the conditions under which the observer was more likely to terminate the positive reinforcement contingency for the model.

Preference Assessments

Prior to the start of the study, two preference assessments were conducted with observers. First, a paired-choice preference assessment (Fisher et al., 1992) was conducted to identify highly preferred edible items for use as reinforcers during experimental conditions. Edibles were selected for inclusion in the preference assessment based on caregiver, teacher, and participant verbal reports. A total of eight edibles were selected to include in the preference assessment. During the paired-choice preference assessments, trained data collectors recorded selection responses using paper/pencil data collection. Consumption was defined as the child eating the edible item and swallowing it. The top three edibles were then used throughout the duration of the study. This allowed the observer a choice prior to each session of their top preferred edible to be present in session and potentially minimize satiation. A second, independent data collector also collected data on at least 33% of trials. Interobserver agreement was calculated by comparing data collectors' records on a trial-by-trial basis. An agreement was scored if both data collectors recorded selection of the same item. Any ties between two preferred items were resolved by assessing the intervals in which both of those items were paired. The item that was selected in that interval was ranked higher. An agreement coefficient was calculated by dividing the number of agreements by the total number of agreements plus disagreements and multiplying by 100. IOA averaged 100% (see Figures 5, 10, 15, 20, and 25 for results of the paired choice preference assessment).

Second, for all experimental conditions, it was possible that observers might engage in the target response (even in baseline) simply because there were no other activities available during session. Therefore, a moderately preferred activity was available throughout each session as a control procedure. A free-operant preference assessment (Roane et al., 1998) was conducted to identify this "control activity", as well as to select the target task for use as the target response. Control task activities were selected that were associated with a low but not zero levels of responding (i.e., activity that the observer can do but is unlikely to do in the absence of reinforcement). Control task activities included small tangible items, specifically a doll, farm animal, sea animal, and a dinosaur.

Third, the same method was used to identify the target task for each observer. Target tasks were repeatable fine motor tasks and included stacking cards on a dowel rod, placing cards in a box, lacing card, and stringing beads. Target tasks were selected that were associated with a low, but not zero, levels of responding (i.e., activity that the observer can do but is unlikely to do in the absence of reinforcement). A second, independent data collector collected data on 33% of sessions for the control task, and 33% of sessions for the target task. Interobserver agreement was calculated by dividing each five-minute session into five-second intervals and comparing the records of two data collectors on an interval-by-interval basis. The number of agreement intervals was divided by the number of agreement and disagreement intervals and multiplied by 100% to obtain the agreement coefficient. IOA averaged 95%, with a range of 90%-100%, for the control task and averaged 94%, with a range of 90%-100%, for the target task. Figures 7, 12, 17, 22, and 27. depict results of the free operant preference assessment for the control task. Figures 6, 11, 16, 21, and 26 depict results of the free operant preference assessment for the target task.

Compliance Training (Model)

Based on the review of the literature and the purposes of the current studies, model pre-assessments were designed to ensure that (a) child models were explicitly trained to emit the target responses required by the various experimental conditions, and (b) continuous data regarding the level of the model’s compliance was collected across all experimental conditions. Models were selected for potential inclusion based on classroom supervisors’ recommendations, specifically participants who rarely or never engaged in non-compliance or challenging behaviors and were also reported to prefer helping teachers and supervisors in the classrooms. Following the pre-assessments with the observers, but prior to the start of the study, compliance training was conducted with the models as the models were trained on the specific tasks that were selected for the observers.

The purposes of compliance training were to: (a) to ensure that the models would be capable of complying with therapist instructions to respond and not respond toward the target task and to engage in appropriate behavior even if the observer emitted problem behavior or off-task behavior, and (b) provide them a history of wearing, and receiving adult instructions via, a "bug-in-the-ear" device. Prior to the start of each training session, the therapist provided instructions to the model (e.g., "I want to see how well you can do these tasks. Sometimes I will ask you to do the task, so wait until I tell you and only do it once. You will wear these headphones so I can talk to you when I am not in the room."). During compliance training the adult delivering instructions to the model and a data collector were in the observation booth; an experimenter was in the session room with the model. Data collectors were present in the observation booth.

Compliance training was five min in duration and an instruction (e.g., "Stack" or "Lace the card") was delivered approximately every 15 s. Praise was provided for correct responding throughout the session by the prompter (e.g., "Nice work, girlie" or "Very good."). If incorrect responding occurred (i.e., the model did not correctly respond when prompted), the experimenter reminded the model to emit the correct response (e.g., "Remember, each time you're asked to stack, you put the ring on the stacker."). Trained data collectors used hand-held devices or the B-data pro app on PC machines to record the frequency of instructions and compliance and engagement with the task. Compliance was defined as emitting the target response within five seconds of the instruction. Compliance was calculated by dividing the frequency of compliant behaviors by the frequency of instructions delivered and multiplying by 100%. Models were required to demonstrate at least 90% compliance across two consecutive sessions to be included in the study. See Figures 1-4 for the results of model compliance training.

Response Measurement, Interobserver Agreement, and Procedural Integrity

Trained data collectors used hand-held devices with the !Observer data app (or B-Data Pro data collection program on PC laptops) to record the responses exhibited by both the model and observer. The dependent variable was *completion of the target task* identified via the free operant preference assessment. For the five participants (Ryan, Jacob, Kaleb, Jonah, and Karlie), the target task was placing laminated paper discs on a dowel rod, lacing a card, or placing a laminated card in a box. Frequency of target task completion by both the model and the observer were also recorded. Data were also collected on the *termination (escape) response* (i.e., placing hand on a "STOP" card that terminated the model's reinforcement contingency). The frequency of the termination response was recorded for the observer only. All frequency data were then converted to rate for data analysis. Data were also collected on problem behavior and negative vocalizations. Data collectors used 10-s partial interval recording to measure problem behavior and negative vocalizations. *Problem behavior* was defined as any behavior that could harm either the model, observer, or therapist or cause damage to the session room and materials. Problem behavior included but was not limited to: throwing or swiping task materials, grabbing or attempting to grab the reinforcer, stealing the model's materials, kicking wall, blocking reinforcer delivery, blocking model from engaging in target task, stepping on task materials, mouthing task materials, and throwing materials at experimenter. *Negative vocalizations* were defined as statements of inequity such as comments or complaints about wanting or not getting the edible reinforcer, complaints about not wanting to engage in the target task, name calling or insulting, whining/crying, and negative comments directed toward the model or therapist. As a measure of procedural integrity, data collectors recorded the frequency of *reinforcer delivery* to the model and the observer (when the therapist's hand was extended toward the child, with an edible reinforcer in their hand, far enough that the child is within arm's reach of the edible) and *removal of the reinforcer* (i.e., removal of the model's reinforcer from the session table contingent upon the observer hitting the STOP card with their whole hand touching the STOP card, regardless of the magnitude).

Interobserver agreement was assessed by having a second data collector record engagement with the above-described responses simultaneously, but independently on an average of 33% of the sessions. IOA averaged 94% (range, 82%-100%) and 96% (range, 79%-100%) for engagement with the target task for the model and observer, respectively. IOA averaged 99% (range, 93%-100%) for the termination (escape) response for the observer. Finally, IOA averaged 98% (range, 77%-100%) and 97% (range, 70%-100%) for problem behavior and negative vocalizations, respectively. Procedural integrity data were also collected during 100% of total sessions. Procedural integrity for correct implementation of observer contingencies will average 99% (range, 89% to 100%) and for model contingencies averaged 99% (range, 92%-100%).

Experimental Conditions

Each experimental condition was paired with uniquely colored stimuli to enhance discrimination across conditions. Specifically, each condition was conducted in a different colored session room with matching colored target task materials. The target task (i.e., task that produced the edible), control activity (i.e., moderately preferred toy), and the "STOP" card (i.e., stimulus that terminated the reinforcement contingency for the model) were present across all experimental conditions but only the observer had access to the "STOP" card (i.e., it was taped to the table in front of the observer). The observer and model each had their own, but identical set of edibles that was placed across from them and in front of the therapist. Except for Baseline 1, the model was instructed to engage in the target task via the bug-in-the-ear device approximately once every 15 s across all other conditions. The therapist was instructed to engage in minimal interactions during the session, but the model and the observer were free to talk and even play with each other during session. Table 1 is a summary of session contingencies.

Baseline 1. Prior to the start of session, the observer was exposed to the session contingencies. That is, the experimenter prompted the observer to emit the target response and the termination response (i.e., touch the "STOP" card). When the observer emitted the target response (e.g., stacking paper discs on a rod) the experimenter stated, "When you stack, nothing happens." The experimenter prompted the model to emit the target response and when the model emitted the target response the experimenter stated, "When you stack, nothing happens." When the observer hits the "STOP", card the experimenter did not remove the model's edibles from the table and said, "When you hit the "STOP" card, nothing happens." The experimenter prompted the observer and model to do this three times before the session started. During the session, the model was instructed to *not* engage in the target task. However, the model did wear the bug-in-the-ear device across all conditions. No programmed consequences were delivered to the model or observer for engaging with the target task. If the observer engaged in the termination response for the removal of the model's reinforcer (i.e., touched the "STOP" card), the experimenter briefly said, "Not now." This condition was conducted to assess whether the observer would engage in the target response without any programmed consequences.

Baseline 2. Prior to the start of the session, the observer was exposed to the session contingencies in an identical manner to Baseline 1. Baseline 2 was identical to Baseline 1 except that the model was instructed to *engage* in the target task every 15 s. This condition was conducted to assess whether the observer would imitate the model's behavior (i.e., engage in the target response) in the absence of direct or vicarious reinforcement contingencies.

Vicarious Reinforcement (VSR+). Prior to the start of session, the observer was exposed to the session contingencies in a similar manner to Baseline 1. The model was instructed to engage in the target task every 15 s. Model responses for engagement with the target task resulted in a FR-1 schedule of reinforcement. No consequences were arranged for observer target responses. If the observer engaged in the termination response for the removal of the model's reinforcer (i.e., touched the "STOP" card), the experimenter said, "Not now." This condition was conducted to provide the observer with a history of observing the model's behavior being reinforced. Further, we wanted to observe if engagement in target task completion by the observer were differentiated compared to baseline levels, thereby suggesting a vicarious reinforcement effect.

Direct Reinforcement + Escape (SR+ plus Escape). Prior to the start of session, the observer was exposed to the session contingencies in a similar manner to Baseline 1. This condition was identical to the vicarious reinforcement + escape condition with one exception. Observer responses for engagement with the target task resulted in the reinforcer on a FR-1 schedule of reinforcement. That is, observer target task responding produced direct reinforcement. The purpose of this condition was to assess if the observer's behavior was sensitive to direct reinforcement.

Vicarious Positive Reinforcement + Escape (VSR + plus Escape). Prior to the start of session, the observer was exposed to the session contingencies in a similar manner to Baseline 1. Model responses for engagement with the target task resulted in a FR-1 schedule of reinforcement. No consequences were delivered for observer target responses. However, if the observer touched the "STOP" card, the experimenter terminated delivery of the model's reinforcer for 15 s and state, "Okay, (model's name) doesn't get any right now." The purpose of this condition was to assess if a vicarious positive reinforcement arrangement was aversive for the observer.

Direct Reinforcement (SR+) Control condition. Prior to the start of session, the observer was exposed to the session contingencies. Model responses for engagement in the target task resulted in no programmed consequences. Observer responses for engagement with the target task resulted in the reinforcer on a FR-1 schedule of reinforcement. Observer responses for engagement in the termination response resulted in no programmed consequences. This controlled for the possibility that observing the model contacting direct reinforcement may have been aversive for the observer, regardless of whether or not the observer contacted direct reinforcement. It is important to note that not all observers have experienced this condition as it was added later in the development of the study. To date, only Jonah and Karlie have experienced this condition.

Results and Discussion

Figures 9, 14, 19, 24, and 29 depict the results for Jacob, Kaleb, Ryan, Karlie, and Jonah respectively. The top panel in each graph depicts the rate of avoidance (i.e., observer hitting the STOP card to terminate the model's reinforcement contingency). The second and third panels depict the percentages of problem behavior and negative vocalizations, respectively. The bottom two panels depict the rate of engagement with the target task (i.e., task that produces the reinforcer) for the observer (fourth panel) and model (bottom panel). Asterisks above sessions represent sessions when observers met session termination criterion (10 consecutive s of emotional responding). Tables 4 and 5 summarizes the results for all participants. Participant results will be discussed in terms of response patterns that are aversive and non-aversive. Jacob, Ryan, Karlie, and Jonah's data sets demonstrate a pattern of responding that suggests vicarious positive arrangements ***were*** aversive. Kaleb's data set demonstrates a pattern of responding that suggests vicarious positive arrangements ***were not*** aversive.

During baseline, Jacob (Figure 9) rarely engaged in the avoidance response, engaged in zero to low levels of problem behavior and negative vocalizations, and engaged in zero to low levels of engagement with the target task. During the imitation test, Jacob engaged in zero to low levels of responding despite the fact that the model continued to engage with the target task suggesting that Jacob did not engage in the target task simply because he observed the model engaging in the task. During the VSR+ phase in which the reinforcer was only delivered to the model for engaging with the target task, Jacob engaged in overall low levels of target task completion and did not engage in the escape response. Jacob engaged in low levels of problem behavior and negative vocalizations that maintained during the phase. During the Aversiveness test phase in which hitting the "STOP" card produced removal of the model's reinforcer for 15 s, Jacob demonstrated differentiated responding across the VSR + Escape and SR + Escape conditions in which he terminated the model's reinforcer more often in the VSR + Escape condition in which his responding to the target task resulted in no reinforcer as compared to the SR + Escape condition in which his responding to the target task resulted in the reinforcer. Additionally, Jacob engaged in low levels of problem behavior in the VSR + Escape condition and no problem behavior in the SR + Escape condition. Jacob engaged in negative vocalizations during the VSR + Escape condition but none during the SR + Escape condition. Jacob showed a differentiated pattern of responding with respect to the target task in which higher levels of responding occurred in the SR + Escape condition compared to the VSR + Escape condition suggesting that his behavior was sensitive to direct reinforcement. For further experimental control over the independent variable, we returned to the VSR+ and Escape phase and replicated the findings. Taken together, Jacob's data suggest that the vicarious reinforcement contingency arranged for the model was likely aversive such that he was more willing to terminate the model's contingency in the condition in which his behavior resulted in extinction (VSR+ Escape condition), in addition we did observe some side effects across sessions, but at overall low levels, suggesting the vicarious positive arrangements may not necessarily be non-preferred.

Ryan's pattern of responding (see Figure 19) suggested that vicarious reinforcement procedures were aversive. During baseline, Ryan engaged in low rates of target tasks completion across both Baseline 1 and 2. In the VSR+, we observed slightly higher rates of target task completion. However, during the Aversiveness Test Phase, we observed much higher rates of target task completion in the SR + Escape condition than in the VSR+ Escape condition. We reversed back to the VSR+ phase and although Ryan did engage in the target task, the rate of engagement was not comparable to the rates observed in the SR+ Escape. With a reversal back to the Aversiveness Test Phase, there was an immediate increase in the rate of target task completion in the SR+ Escape condition and a decrease in the VSR + Escape. During baseline, Ryan engaged in near zero levels of the avoidance response, this pattern of responding was also observed in both VSR+ phases. In the first Aversiveness Test Phase, we observed differentiated levels of engagement, specifically Ryan was more likely to terminate the model's access to reinforcement in the condition when he could not access direct reinforcement (VSR+ Escape) than in the condition where he could access direct reinforcement (SR+ Escape). However, in the second Aversiveness Test Phase, we did not observe similar levels to the first Aversiveness Test

Phase and in fact observed near zero levels of engagement in the avoidance response across both conditions. In summary, Although Ryan engaged in zero levels of problem behavior (aside from session six) and zero levels of negative vocalizations (aside from session 42) he did emit the avoidance response at higher rates in the VSR + Escape condition than in the SR + Escape condition during the first Aversiveness Test Phase. Further, Ryan, differentially responded in the SR + Escape condition than in the VSR + Escape condition for engagement in the target task response. Taken together, Ryan's data suggest that vicarious reinforcement arrangements may be aversive, despite nearly zero levels of problem behavior and negative vocalizations, suggesting the vicarious positive arrangements may not necessarily be non-preferred

Before discussing results for Karlie and Jonah, it is important to point out two differences from the three other observers. First, the control condition (SR+ only) was added to help account for multiple aspects of the session contingencies that may be aversive for observers. The SR+ Escape condition had accounted for the potential aversiveness of the observer not contacting direct reinforcement by reinforcing the observers' engagement in the target response on a FR-1 schedule. The SR+ condition accounted for the possibility that just the mere presence of the edibles and the observer observing the model contact direct reinforcement might signal reinforcement is available for the model. Hence, in the SR+ condition the model was still prompted to engage in the target task every 15 s, but no edibles were delivered to the model or were even present during session. Second, timers (with sound) which signaled the start and end of the termination of the model's reinforcement contingency had been present in all previous sessions across all conditions. However, upon further discussion it was decided that the mere presence and sound of the timers may be an additional stimulus cue the observers were responding to instead of the programmed session contingencies. Beginning on session 19 for

Karlie and session 20 for Jonah, timers were removed from the table and hidden by the therapist such that the observers nor the models could see or hear the timer.

Karlie's data (see Figure 24) in baseline, showed zero to low levels of responding across all dependent variables, except for target task completion. Karlie, reliably engaged in the target task across sessions, with higher rates of responding in the imitation test, indicating that she was imitating the model. Based on anecdotal reports and observations, Karlie and the model engaged in cooperative and imaginative play during session, often involving the target and control task materials. For Karlie specifically, her target task was placing cards on a dowel rod and the control task was a small toy dog. Karlie and the model would often pretend to feed the dogs the stacking cards and other games. In the VSR+ phase we observed variability in responding in the target task, compared to baseline levels. Responding remained at zero across all other dependent variables. In the Aversiveness Test Phase, we observed differentiated levels of responding in the SR+ Escape and the SR+ phase as compared to the VSR+ Escape phase in target task completion. We also observed differentiated levels of responding in the VSR+ Escape (with slight variability) condition as compared to the SR+ Escape and the SR+ conditions toward the avoidance response. Zero levels of problem behavior and negative vocalizations were observed across all sessions. Karlie terminated the model's reinforcer more often in the condition where she could not access direct reinforcement (VSR+ Escape) in the Aversiveness Test phase. However, during session the model would on occasion ask Karlie, "Why are you doing that?" (i.e., engaging in the avoidance response). Karlie would sometimes respond "Because I want to/like to". Therefore, suggesting that there may be other variables influencing responding toward the avoidance response. These data tentatively suggest that vicarious positive reinforcement contingencies were aversive for her but not necessarily non-preferred due to the zero level of problem behavior and negative vocalizations.

Jonah's data (see Figure 29) in baseline, showed zero-low levels of responding across all dependent variables, except for target task completion. Jonah, engaged in the target task across most sessions, with differentiated responding in the imitation test. Based on review of session videos, Jacob would often play with his target task (lacing card) during sessions. Specifically, he would lace the card to make it into a taco and engage in cooperative play with the model. In the VSR+ phase, we observed nearly equivalent levels of target task completion than in baseline. In the Aversiveness Test phase, we observed differentiated levels of responding in the SR+ Escape and the SR+ phase as compared to the VSR+ Escape phase in target task completion. We also observed differentiated levels of responding in the VSR+ Escape condition as compared to the SR+ Escape and the SR+ conditions in the avoidance response. Zero levels of problem behavior (except during session 6, when Jonah appeared to accidentally tear the lacing card, which would be considered property destruction) and negative vocalizations were observed across all sessions. As Jonah terminated the model's reinforcer more often in the condition where she could not access direct reinforcement (VSR+ Escape) in the Aversiveness Test Phase, these data suggest that vicarious positive reinforcement contingencies were aversive for him but not necessarily non-preferred due to the zero levels of problem behavior and negative vocalizations. It also important to note that the model would ask Jonah why he engaged in the avoidance response and often Jonah would state "Because I want to", similar to Karlie Therefore it is also necessary to be tentative with Jonah's results as there may have been other variables influencing engagement in the avoidance response.

Kaleb (Figure 14) showed a slightly different pattern of responding. During baseline Kaleb engaged in zero to low levels of responding for each dependent variable. Upon introduction of the VSR+ phase, we continued to observe low or even lower levels of all dependent variables. When the Aversiveness test phase was introduced, Kaleb engaged in the avoidance response for very few sessions across conditions. That is, Kaleb rarely terminated the model's reinforcement contingency regardless if Kaleb did (SR + Escape) and did not (VSR + Escape) receive the edible reinforcer for engaging in the target task. Low levels of problem behavior and negative vocalizations were observed, and he engaged in the target task at much higher levels when direct reinforcement for engagement in the target task was available. Because Kaleb very rarely terminated the model's reinforcer across conditions in the Aversiveness test phase, these data suggest that vicarious reinforcement contingencies were not aversive for him.

Discussion

The purposes of the current study were to (a) assess the extent to which vicarious positive reinforcement arrangements were aversive, (b) to identify potential associated side effects, specifically the occurrence of negative vocalizations and problem behavior in relation to the vicarious positive reinforcement arrangements, and (c) provide additional evidence of the extent to which vicarious reinforcement effects would be observed in an analogue setting

Only 2 of 5 participants (Ryan and Karlie) showed vicarious responding prior to exposure to direct reinforcement. All participants showed behavior sensitive to direct reinforcement. These results are consistent with previous research suggesting that vicarious reinforcement produces temporary effects (i.e., initial increases in responding that do not maintain over time). Additionally, Karlie's task completion responding under both baseline conditions was similar to differential responding demonstrated by the model. Therefore, it is unclear whether Karlie's responding during the VSR+ phase was a result of imitation (i.e., only the behavior of the model influenced observer behavior) or vicarious reinforcement (both the model's behavior and the associated consequence for the model's behavior influenced observer behavior).

Four of the 5 participants showed differentially higher levels of escape responding in the VSR + plus Escape condition as compared to the SR+ plus Escape condition suggesting that the vicarious positive reinforcement arrangement was aversive. Interestingly, only one of these participants (Jacob) consistently showed correlated negative side effects (problem behavior and negative vocalizations). Therefore, relying on detection of elicit or emotional behavior to indicate the existence of an aversive situation is limited and likely to result in an underestimation. We did not conduct a component analysis to precisely identify reasons why the VSR+ arrangement was aversive. Potentially, not receiving the preferred edible was aversive for participants' regardless of whether the model received it. That is, extinction may have been responsible for the aversiveness of the VSR+ plus Escape condition. We attempted to address this possibility with Jonah by including the SR+ condition (escape not available). Alternatively, we could have included a condition in which neither the model nor the observer received reinforcement (extinction for both model and observer) but the observer could produce escape to reinforcement.

Jacob was the only participant for whom we observed problem behavior and negative vocalizations associated with the VSR+ arrangements (both with and without escape available). It is possible that the experimental preparation of the current study did not establish a context aversive enough to evoke negative side effects by the other 4 children who consistently responded to escape the VSR+ contingency. Because the Aversiveness Test Phase was conducted using a multielement design, the rapid alternation of conditions involving direct reinforcement may have reduced the overall aversiveness of the vicarious reinforcement conditions (i.e., carryover effects). Future investigations might choose to use a reversal design to control for this possibility.

This study is particularly noteworthy in that, to date, very few studies have experimentally evaluated side effects of vicarious positive reinforcement. Thus, this study extends previous literature by establishing an experimental preparation to study the potential aversiveness and associated side effects commonly reported in the vicarious reinforcement literature. Results of the study offer at least some empirical support for the hypothesis that vicarious positive reinforcement arrangements are aversive, which suggests that applied usage of teaching and intervention strategies based on vicarious reinforcement should be recommended with a degree of caution. Given that response patterns across participants were idiosyncratic, general conclusions about the aversiveness of vicarious reinforcement remain tentative. There are some additional limitations to note that have implications for future research.

First, we included a control condition (SR+) in the aversiveness test phase as a way to address other potential stimuli that may be aversive (i.e., reinforcer delivery to the model, regardless of the reinforcement contingency for the model, or the avoidance response) and were responsible for producing escape responding in the VSR+ plus Escape condition. However, the SR+ condition was only evaluated with a small subset of participants (Karlie and Jonah). Therefore, more participants should be included in the study.

A second limitation is that no assessment of generalization was conducted (even though the purpose was to assess the aversiveness of vicarious positive and negative arrangements). This study was conducted in a controlled setting using very specific discriminative stimuli. Although this allowed for a thorough evaluation of stimulus control and side effects, the extent to which similar patterns of responding will occur in a more naturalistic setting, with different responses, and with different people are unknown. Because vicarious reinforcement is a procedure that may be useful as a teaching strategy, it is important to evaluate and ensure therapeutic effects are likely to occur in the settings in which use is likely. Thus, future research should assess vicarious responding within a controlled context to establish its effects, then assess whether those stimuli or responses generalize to a less-controlled environment.

A third limitation stems from the fact that some researchers have shown that mere reinforcer delivery to the model, regardless of the model's behavior, can influence the observer's behavior (Drabman & Lahey, 1974; Hall et al., 1968; Kazdin, 1977). Thus, it is possible that reinforcer delivery alone could influence patterns of responding for those participants who may demonstrate vicarious responding. Future researchers may consider evaluating the influence of noncontingent reinforcement delivery to the model on levels of observer responding.

Finally, a fourth limitation is the inclusion of pre-session exposure prior to each session. Across all participants, the therapist explained the contingencies and then had the model and the observer practice the session contingencies prior to the start of each session. All participants were typically developing preschoolers with developmentally appropriate expressive and receptive language skills. The use of pre-session exposure may have influenced results of the observers, and behavior may have been under the control of rules as compared to session contingencies. Given that each condition was color correlated (i.e., the session room, task materials, and shirt of the therapist) to facilitate discrimination, future researchers should consider excluding the use of rules prior to sessions with similar populations.

Consistent with previous research, results demonstrated the temporary effect (or lack of effect) of vicarious reinforcement. In addition, previous research also demonstrated the importance of a history of reinforcement to establish vicarious responding. As such, it does not seem appropriate to solely recommend using vicarious reinforcement procedures as a teaching strategy. However, Camp and Iwata (2009) and Deguchi et al. (1988) noted that vicarious reinforcement procedures may be useful in evoking initial responding but that responding must be followed by reinforcement such that further responding will continue. We observed lower levels of problem behavior and negative vocalizations when responding was directly reinforced. Therefore, to reduce potential negative side effects of vicarious reinforcement, direct reinforcement should be arranged for observers' responding. Reinforcement histories or schedules of reinforcement could also be evaluated with respect to their influence on vicarious responding. Also, a generalized imitative repertoire should be assessed to ensure that the observer is capable of producing behavior similar to that of the model before arranging vicarious reinforcement strategies.

Finally, there is limited research on other vicarious learning arrangements such as *negative* reinforcement, as well as positive and negative *punishment*. As a follow-up study to assessing the potential aversiveness of a vicarious positive reinforcement arrangement, we had designed a study to evaluate the potential aversiveness of a vicarious negative reinforcement arrangement. However, due to the health and safety concerns of COVID-19 in-vivo research was suspended which halted further research. Once in-vivo research is safe to conduct or an alternative method to conducting this research is identified we will experimentally evaluate the potential aversiveness of a vicarious negative reinforcement arrangement.

Future researchers might also consider evaluating other factors that might aid in enhancing vicarious reinforcement effects. For example, model characteristics such as popularity or number of models have been suggested to influence vicarious responding. Also, pairing models and observers based on similar behavioral function may be an effective treatment for increasing appropriate behavior. In addition, researchers might also consider collecting data on how the effects of a vicarious arrangement may affect the social interactions between dyads. For example, in the current study, observers frequently oriented away from the model during conditions when the observer could not contact direct reinforcement. We also recorded comments emitted by both the model and observer related to the contingencies of each condition in the study. For instance, observers would emit statements such as “When we are done with research, I will get treats and you (model) will get none.” Some of the models would emit statements such as “Why are you (observer) never letting me get treats? Why do you keep touching the stop sign?” Experimenters may need to communicate with classroom teachers to assess whether session contingencies appear to have a “spillover” effect to the classroom, thereby resulting in inappropriate social interactions among dyads. However, in a more applied setting or potentially if the session contingencies were found to be more aversive for participants, it may be important to note if there are any other side effects related to a vicarious reinforcement arrangement.

In addition, extensions of vicarious learning arrangements should be further studied. Such as Koehler and Iwata (2017) who recommend assessing model characteristics, the history of direct exposure, and generality of findings. Future lines of research should also assess vicarious learning arrangements in classroom settings. For example, Harper (2011), who studied stimulus control effects, specifically assessed discriminative stimulus and s-delta conditions. Finally, vicarious learning arrangements should be assessed with various behaviors and populations as the effectiveness and efficiency of vicarious learning arrangements is tentative and mixed. For example, Harper et al. (2013) assessed vicarious reinforcement as one of the treatments for assessing and treating social avoidance. Elliott (1970) assessed vicarious arrangements in relation to blood donating in adults, and Alvero and Austin (2004) implemented vicarious learning strategies to improve occupational safety. Considering that the literature on side effects of vicarious reinforcement is sparse, there are many areas for future research.

The current body of vicarious reinforcement literature primarily addresses benefits and/or side effects observers may experience, as well as how strategies based on vicarious reinforcement benefit the implementer. However, there has been very little discussion about benefits for models or potential negative side effects. A systematic review of research focused explicitly on the benefits and side effects models experience during vicarious reinforcement would greatly extend knowledge about the conditions under which vicarious learning arrangements should (or should not) be implemented. This information is important to clinicians and therapists who select peer models for inclusive settings.

Finally, it is worth noting that because the children (both models and observers) in the current study were exposed to potentially aversive contingencies, several protective safeguards were in place to monitor the participants' behaviors prior to, during, and after research sessions. All research projects required not only caregiver consent but also participant assent. If participants were to be observed to avoid an experimenter, it may have been a sign that research has become aversive. Therefore, discussions of either how to make the research experience less aversive (e.g., the experimenter builds rapport with the participant, participants may bring a friend to research) or whether this continued participation was appropriate for the participant were held immediately. Experimenters also maintained consistent communication with classroom supervisors about research participants behavior during their daily activities (especially regarding any positive or negative comments or behaviors that may relate to the session contingencies). On the consequent side, regardless of performance, all participants received attention from the experimenter and access to a treat room with other tangible and edible items following each block of daily research sessions. During session, the termination criteria (10 consecutive seconds of crying/whining) for either participant would terminate a session. If emotional responding were to persist across sessions, experimenters would then need to consider dropping the participant.

References

Azrin, N.H., Hutchison, R.R., & Hake, D.F. (1966). Extinction-induced aggression. *Journal of the Experimental Analysis of Behavior, 9*(3), 191-204. https://dx.doi.org/10.1901%2Fjeab.1966.9-191

Baer, D. M., Peterson, R. F., & Sherman, J. A. (1967). The development of imitation by reinforcing behavioral similarity to a model. *Journal of the Experimental Analysis of Behavior, 10*(5), 405-416. https://doi.org/10.1901/jeab.1967.10-405

Baer, D. M., Wolf, M. M., & Risley, T. R. (1968). Some current dimensions of applied behavior analysis. *Journal of Applied Behavior Analysis,1*(1), 91-97. https://dx.doi.org/10.1901%2Fjaba.1968.1-91

Bailey, J. S., & Burch, M. R. (2002). *Research Methods in Applied Behavior Analysis.* Sage Publications.

Balsam, P. & Bondy, A. S. (1983). The negative side effects of reward. Journal of Applied Behavior Analysis, *16*(3), 283-296. https://dx.doi.org/10.1901%Fjaba.1983.16-283

Bandura, A. (1965). Influence of model's reinforcement contingencies on the acquisition of imitative responses. *Journal of Personality and Social Psychology, 1*, 589-595. http://dx.doi.org/10.1037/h0022070

Bandura, A. (1971). Vicarious and self-reinforcement processes. In R. Glaser (Ed.), *The nature of reinforcement.* Academic Press.

Bandura, A. (1977). *Social Learning Theory*. Prentice-Hall.

Bandura, A., Ross, D., & Ross, S. (1961). Transmission of aggression through imitation of aggressive models. *Journal of Abnormal and Social Psychology, 63*(3), 575-582. https://psycnet.apa.org/doi/10.1037/h0045925

Bandura, A, & Huston, A. C. (1961). Identification as a process of incidental learning. *The Journal of Abnormal and Social Psychology, 63*(2), 311-318. https://psycnet.apa.org/doi/10.1037/h0040351

Bandura, A., Ross, D., & Ross, S. (1963). Vicarious reinforcement and imitative learning. *Journal of Abnormal and Social Psychology, 67*, 601-607. http://dx.doi.org/10.1037/h0045550

Bishop, B.R., & Beckham, L. (1971). Conformity and imitation among hospitalized patients. *Journal of Clinical Psychology, 27*(4), 529-532. https://doi-org.www2.lib.ku.edu/10.1002/1097-4679(197110)27:4<529::AID-JCLP2270270439>3,CO;2-T

Bol, L., & Steinhauer, G. D. (1990). Decreases in behavior in vicarious reinforcement procedures. *Psychological Reports, 66*, 583-594. https://doi.org/10.2466%2Fpr0.1990.66.2.583

Brigham, T. A., & Sherman, J. A., (1968). An experimental analysis of verbal imitation in preschool children. *Journal of Applied Behavior Analysis, 1*(2), 151-158. https://dx.doi.org/10.1901%2Fjaba.1968.1-151

Broden, M., Bruce, C., Mitchel, M. A., Carter, V., & Hall, R. V. (1970). Effects of teacher attention on attending behavior of two boys at adjacent desks. *Journal of Applied Behavior Analysis, 3*(3), 199-203. https://dx.doi.org/10.1901%2Fjaba.1970.3-199

Camp, E. M., & Iwata, B. A. (2009). Some determinants of vicarious reinforcement effects. [Unpublished doctoral dissertation]. University of Florida.

Catania, A. C. (2007). *Learning, interim* 4th edition. Solan Publishing.

Cheyne, J. A., (1972). Direct and vicarious reinforcement: A note on punishment and negative instances. *Journal of Educational Psychology, 63*(1), 63-68. https://dx.doi.org/10.1037/h0032242

Christy, P. R. (1975). Does use of tangible rewards with individual children affect peer observers? *Journal of Applied Behavior Analysis, 8*(2), 187-196. https://dx.doi.org/10.1901%2Fjaba.1975.8-187

Cooke, T. P., & Apolloni, T. (1976). Developing positive social-emotional behaviors: A study of training and generalization effects. *Journal of Applied Behavior Analysis, 9*(1), 65-78. https://dx.doi.org/10.1901%2Fjaba.1976.9-65

Cowdery, G. E., Iwata, B. A., & Pace, G. M. (1990). Effects and side effects of DRO as treatment for self-injurious behavior. *Journal of Applied Behavior Analysis, 23*(4), 497-506. https://dx.doi.org/10.1901%2Fjaba.1990.23-497

Deguchi, H. (1984). Observational learning from a radical-behavioristic viewpoint. *The Behavior Analyst, 7*(2), 83-95. https://dx.doi.org/10.1007%2Fbf03391892

Deguchi, H., Fujita, T., & Sato, M. (1988). Reinforcement control of observational learning in young children: A behavioral analysis of modeling. *Journal of Experimental Child Psychology, 46*(3), 362-371. https://dx.doi.org/10.1016/0022-0965(88)90066-5

Egel, A. L., Richman, G. S., & Koegel, R. L. (1981). Normal peer models and autistic children's learning. *Journal of Applied Behavior Analysis, 14*(1), 3-12. https://dx.doi.org/10.1901%2Fjaba.1981.14-3

Fahmie, T. A., Iwata, B. C., & Mead, S. C. (2016). Within-subject analysis of a prevention strategy for problem behavior. *Journal of Applied Behavior Analysis, 49*(4), 915-926. 10.1002/jaba/343

Fahmie, T. A., Macaskill, A. C., Kazemi, E., & Elmer, U.C., (2018). Prevention of the development of problem behavior: A laboratory model. *Journal of Applied Behavior Analysis, 51*(1). 25-39. 10.1002/jaba/426

Ferster, C. B., & Skinner, B. F. (1957). *Schedules of Reinforcement*. Appleton-Century-Crofts.

Fisher, W. W., Piazza, C. C., Bowman, L. G., Hagopian, L. P., Owens, J. C., & Slevin, I. (1992). A comparison of two approaches for identifying reinforcers for persons with severe and profound disabilities. *Journal of Applied Behavior Analysis, 25*(2), 491–498. https://dx.doi.org/10.1901%2Fjaba.1992.25-491

Fryling, M. J., Johnston, C., & Hayes, L. J. (2011). Understanding observational learning: An interbehavioral approach. *The Analysis of Verbal Behavior, 27*, 191-203. https://doi.org/10.1007/BF03393102

Gureghian, D., Neidert, Pamela L., Dozier, Claudia, Knowlton, Earle, Reed, Derek, & Sherman, James. (2013). Vicarious Reinforcement Procedures: An Analysis of Stimulus Control and Potential Side Effects, ProQuest Dissertations and Theses.

Hall, V. R., Lund, D., and Jackson, D. (1968). Effects of teacher attention on study behavior. *Journal of Applied Behavior Analysis, 1*(1), 1-12. https://dx.doi.org/10/1901%Fjaba.1968.1-1

Hallenbeck, B.A., & Kauffman, J. M. (1995). How does observational learning affect the behavior of students with emotional or behavioral disorders? A review of research. *The Journal of Special Education*, *29 (*1), 45-71. https://psycnet.apa.org/doi/10.1177/002246699502900103

Hineline, P. N., (1984). Aversive control: A separate domain? *Journal of the Experimental Analysis of Behavior, 42*(3), 495-509. https://doi.org/10.1901/jeab.1984.42-495

Hunziker, M. H. L. (2018). The (non) definition of aversive control in behavior analysis. *The Brazilian Journal of Behavior Analysis*, *14*(2), 191-198. 10.18542/rebac.v14i2.7538

Jones, M.C. (1924). The elimination of children's fears. *Journal of Experimental Psychology*, *7*(5), 383-390. https://psycnet.apa.org/doi/10.1037/h0072283.

Kazdin, A. E. (1973a). The effect of vicarious reinforcement on attentive behavior in the classroom. *Journal of Applied Behavior Analysis, 6*(1), 71-78. https://dx.doi.org/10.1901%2Fjaba.1973.6-71.

Kazdin, A. E. (1973b). The effect of vicarious reinforcement on performance in a rehabilitation setting. *Education and Training of the Mentally Retarded*, *8*(1), 4-11. https://www.jstor.org/stable/23876165.

Kazdin, A. E. (1977). Vicarious reinforcement and direction of behavior change in the classroom. *Behavior Therapy, 8*(1), 57-63. https://doi.org/10.1016/S0005-7894(77)80121-4

Kazdin, A. E. (1979). Vicarious reinforcement and punishment in operant programs for children. *Child Behavior Therapy*, *1*(1), 13-36. https://doi.org/10.1300/J473v01n01_04

Kazdin, A. E., Silverman, N. A., & Sittler, J.L. (1975). The use of prompts to enhance vicarious effects of non-verbal approval. *Journal of Applied Behavior Analysis, 8*(3), 279-286. https://dx.doi.org/10.1901%2Fjaba.1975.8-279

Kelly, R. (1966). Comparison of the effects of positive and negative reinforcement in an operant learning task. *Journal of Educational Psychology*, *57*(5), 307-310. https://doi.org/10.1037/h0023772

Koehler, L. J. & Iwata, B, A. (2017). Examination of vicarious punishment effects. Paper presentation at the Annual Association for Behavior Analysis International meeting, Denver, CO.

Lerman, D.C., & Iwata, B.A. (1996). Developing a technology for the use of operant extinction in clinical settings: An examination of basic and applied research. *Journal of Applied Behavior Analysis, 29*(3), 345-382. https://dx.doi.org/10.1901%2Fjaba.1996.29-345

Lerman, D. C., Kelley, M. E., Van Camp, C. M., & Roane, H. S., (1999). Effects of reinforcement magnitude on spontaneous recovery. *Journal of Applied Behavior Analysis, 32*(2), 197-200. https://doi.org/10.1901/jaba.1999.32-197

Malouff, J. Thornsteinsson, E., Schutte, N., & Rooke, S. E. (2009). Effects of vicarious punishment: A meta-analysis. *The Journal of General Psychology, 136*(3), 271-285. https://dx.doi.org/10.3200/GENP.136.3.271-286

Marwell, G., & Schmitt, D. R. (1975). *Cooperation: An experimental analysis*. Academic Press.

Masserman, J. H. (1943). *Behavior and neurosis*. University of Chicago Press

Masia, C. L., & Chase, P. N. (1997). Vicarious learning revisited: A contemporary behavior analytic interpretation. *Journal of Behavior Therapy and Experimental Psychiatry, 28*(1), 41-51. https://dx.doi.org/10.1016/S0005-7916(96)00042-0

Mazur, J. E. (2006). *Learning and Behavior* (6th ed.). Pearson Prentice Hall.

Morris, W. N., Marshall H. N., & Miller, R. S. (1973). The effects of vicarious punishment on prosocial behavior in children. *Journal of Experimental Child Psychology, 15*(2), 222-236. https://dx.doi.org/10.1016/0022-0965(73)90144-6

O' Connor, R. D. (1969). Modification of social withdrawal through symbolic modeling. *Journal of Applied Behavior Analysis, 2*(1), 15-22. https://dx.doi.org/10.1901/jaba.1969.2-15

Ollendick, T. H., Dailey, D., & Shapiro, E. S. (1983). Vicarious reinforcement: Expected and unexpected effects. *Journal of Applied Behavior Analysis, 16*(4), 485-49. https://dx.doi.org10.1901/jaba.1983.16-485

Ollendick, T. H., & Shapiro, E. S. (1984). An examination of vicarious reinforcement processes in children. *Journal of Experimental Child Psychology, 37*(1), 78-91. https://doi.org/10.1016/0022-0965(84)90059-6

Ollendick, T. H., Shapiro, E. S., & Barrett, R. P. (1982). Effects of vicarious reinforcement in normal and severely disturbed children. *Journal of Consulting and Clinical Psychology, 50*(1), 63-70. http://doi.org/10.1037//0022-006x.50.1.63

Ost, L. G. (1985). Ways of acquiring phobias and outcome of behavioral treatments. *Behaviour Research and Therapy, 23*(6), 683-689. https://doi.org/10.1016/0005-7967(85)90066-X.

Perone, M. (2003). Negative effects of positive reinforcement. *The Behavior Analyst, 26*(1), 1-14. https://doi.org/10.1007/bf03392064

Phillips, R. E. (1965). Group size and test anxiety in a simulated group verbal conditioning situation. [Doctoral Dissertation] University of Washington.

Phillips, R. E. (1968). Vicarious reinforcement and imitation in a verbal learning situation. *Journal of Experimental Psychology, 76*(3), 669-670. https://doi.org/10.1037/h0021174

Piazza, C. C., Fisher, W. W., Hanley, G. P., Hilker, K. & Derby, K. M. (1996). A preliminary procedure for predicting the positive and negative effects of reinforcement-based procedures. *Journal of Applied Behavior Analysis, 29*(2), 137-152. https://dx.doi.org/10.1901%2Fjaba.1996.29-137

Pierce, D. W., & Cheney, C. D. (2004). *Behavior analysis and learning* (3rd ed.). Psychology Press.

Puttallaz, M. & Heflin, A. H. (1990). Parent-child interaction. In S. R. Asher & J. C. Coie (Eds.) *Children's Status in the Peer Group* (pp. 189-216). Cambridge University Press.

Rachman, S. (1977). The conditioning theory of fear acquisition: A critical examination. *Behaviour Research and Therapy, 15*(5), 375-387. https://doi.org/10.1016/0005-7967(77)90041-9

Rehfeldt, R. & Root, S. L. (2005). Establishing derived requesting skills in adults with severe developmental disabilities. *Journal of Applied Behavior Analysis, 38*(1), 101-105. https://dx.doi.org/10.1901%2Fjaba.2005.106-03

Roane, H. S., Vollmer, T. R., Ringdahl, J. E., & Marcus, B. A. (1998). Evaluation of a brief stimulus preference assessment. *Journal of Applied Behavior Analysis, 31*(4), 605-620. https://dx.doi.org/10.1901%2Fjaba.1998.31-605

Sajwaj, T., Twardosz, S., & Burke, M. (1972). Side effects of extinction procedures in a remedial preschool. *Journal of Applied Behavior Analysis, 5*(2), 163-175. https://doi.org/10.1901/jaba.1972.5-163

Shimoff, E., & Matthews, B. A. (1975). Unequal reinforcer magnitudes and relative preference for cooperation in the dyad. *Journal of the Experimental Analysis of Behavior, 24*(1), 1-16. https://dx.doi.org/10.1901%2Fjeab.1975.24-1

Sidman, M. F. (1958). By-products of aversive control. *Journal of the Experimental Analysis of Behavior, 1*(3), 265-280. http://dx.doi.org/10.1901%2Fjeab.1958.1-265

Sidman, M. & Boren, J. J. (1957). A comparison of two types of warning in stimulus in an avoidance situation. *Journal of Comparative and Physiological Psychology, 50*(3*)*, 282-287. 10.1037/h0046474

Sidman, M. & Boren, J. J. (1957). The relative aversiveness of warning signal and shock in an avoidance situation. *Journal of Abnormal and Social Psychology, 55*(3),339-334. 10.1037/h0043237

Sizemore, O. J., & Maxwell, F. R. (1985). Selective punishment of interresponse times: The roles of shock intensity and scheduling. *Journal of the Experimental Analysis of Behavior, 44*, 355-366. https://dx.doi.org/10.1901%2Fjeab.1985.44-355

Skinner, B. F. (1953). *Science and Human Behavior*. Macmillan.

Spiegler, M. D., & Liebert, R. M. (1973). Imitation as a function of response commonality, serial order, and vicarious punishment. *Journal of Experimental Child Psychology, 15*(1), 116-124. https://doi.org/10.1016/0022-0965(73)90135-5

Strain, P. S., Shores, R. E., & Kerr, M. M. (1976). An experimental analysis of “spillover” effects on the social interaction of behaviorally handicapped preschool children. *Journal of Applied Behavior Analysis, 9*(1), 31-40. https://dx.doi.org/10.1901%2Fjaba.1976.9-31

Strain, P. S., & Timm, M. A. (1974). An experimental analysis of social interaction between a behaviorally disordered preschool child and her classroom peers. *Journal of Applied Behavior Analysis, 7*(4), 583-590. https://dx.doi.org/10.1901%2Fjaba.1974.7-583

Thompson, R. H., Iwata, B. A., Hanley, G. P., Dozier, C. L., & Samaha, A. L. (2003). The effects of extinction, noncontingent reinforcement, and differential reinforcement of other behavior as control procedures. *Journal of Applied Behavior Analysis, 36*(2), 221-238. https://dx.doi.org/10.1901%2Fjaba.2003.36-221

Todd, J. T., Morris, E. K., & Fenza, K. M. (1989). Temporal organization of extinction-induced responding in preschool children. *The Psychological Record, 39*, 117-130. https://doi.org/10.1007/BF03395056.

Van Houten, R., Nau, P. A., Mackenzie-Keating, S. E., Sameoto, D., & Colavecchia, B. (1982). An analysis of some variables influencing the effectiveness of reprimands. *Journal of Applied Behavior Analysis, 15*(1), 65-83. https://dx.doi.org/10.1901%2Fjaba.1982.15-65

Volkert, V. M., Lerman, D. C., & Vrondran, C. (2005). The effects of reinforcement magnitude on functional analysis outcomes. *Journal of Applied Behavior Analysis, 38*(2), 147-162. https://dx.doi.org/10.1901%2Fjaba.2005.111-04

Vollmer, T. R., Iwata, B. A., Zarcone, J. R., Smith, R. G., Mazaleski, J. L. (1993). The role of attention in the treatment of attention-maintained self-injurious behavior: Noncontingent reinforcement and differential reinforcement of other behavior. *Journal of Applied Behavior Analysis, 26*(1), 9-21. https://dx.doi.org/10.1901%2Fjaba.1993.26-9

Vollmer, T. R., Progar, P. R., Lalli, J. S., Van Camp, C. M., Sierp, B. J. Wright, C. S., Nastasi, J., & Eisenschink, K. J. (1998). Fixed-time schedules attenuate extinction0induced phenomena in the treatment of severe aberrant behavior. *Journal of Applied Behavior Analysis, 31*(4), 529-542. https://dx.doi.org/10.1901%2Fjaba.1998.31-529

Vollmer, T. R., Ringdahl, J. E., Roane, H. S., & Marcus, B. A. (1997). Negative side effects of noncontingent reinforcement. *Journal of Applied Behavior Analysis, 30*(1), 161-164. https://dx.doi.org/10.1901%Fjaba.1997.30-161

Weisberg, P., & Clements, P. (1977). Effects of direct, intermittent, and vicarious reinforcement procedures on the development and maintenance of instruction-following behaviors in a group of young children. *Journal of Applied Behavior Analysis, 10*(2), 314.

http://doi.org/10.1901/jaba.1977.10-314

Werts, M. G., Caldwell, N. K., & Wolery, M. (1996). Peer modeling of response chains: Observational learning by students with disabilities. *Journal of Applied Behavior Analysis, 29*(1), 53-66. https://dx.doi.org/10.1901%2Fjaba.1996.29-53

Wilson, A. N., Kasson, E. N., Gratz, O., & Guercio, J. M. (2015). Exploring the clinical utility of a stimulus avoidance assessment to enhance a relaxation training model. *Behavior Analysis in Practice, 8,* 57-61. https://doi.org/10.1007/s40617-014-0035-y

Witt, J. C., & Adams, R. M. (1980). Direct and observed reinforcement in the classroom. *Behavior Modification, 4*(3), 321-336. https://doi.org/10.1177%2F014544558043003

Zrinzo, M., & Greer, D. R., (2013). Establishment and maintenance of socially learned conditioned reinforcement in young children: Elimination of the role of adults and view of peers' faces. *The Psychological Record, 63,* 43-62. https://doi.org/10.11133/j.tpr.2013.63.1.004

Table 1

Summary of session contingencies for VSR Positive

Phase	Baseline		Vicarious Test	Aversiveness Test		
Condition	BL 1	BL 2 *(imitation test)*	VSR+	VSRESC (Aversiveness)	SRESC (EXT)	SR+ (control)
Prompts *(for model to do T TASK)*	None	FT 15s	FT 15s	FT 15s	FT 15s	FT 15s
MOD T TASK	EXT: Ignore	EXT: Ignore	SR+ Edible Delivered	SR+ Edible Delivered	SR+ Edible Delivered	EXT: Ignore
OBS T TASK	EXT: Ignore	EXT: Ignore	EXT: Ignore	EXT: Ignore	SR+: Edible Delivered	SR+: Edible Delivered
OBS TERM R	EXT: Ignore	EXT: Ignore	EXT: Ignore	ESC: Remove MOD Edibles for 15 sec	ESC: Remove MOD Edibles for 15 sec	EXT: Ignore

Table 2

Summary of session contingencies for VSR Negative

Phase	Baseline		Vicarious Test	Aversiveness Test		
Condition	BL 1	BL 2 *(imitation test)*	VSR-	VSRESC (test) (Aversiveness)	SR terminate (EXT)	SR- (control)
Model R						
- Aversive task	NONE	YES	YES	YES	YES	YES
- Escape R	NONE	YES (FT 15-s prompts), but ignored	YES (FT 15-s prompts) & 15-s break from aversive task (SR-)	YES (FT 15-s prompts) & 15-s break from aversive task (SR-)	YES (FT 15-s prompts) & 15-s break from aversive task (SR-)	YES (FT 15-s prompts), but ignored
Observer R						
- Aversive task	Ignored	Ignored	Ignored	Ignored	Ignored	Ignored
- Escape R	Ignored	Ignored	Ignored	Ignored	15-s break from aversive task (SR-)	15-s break from aversive task (SR-)
- Avoidance R	Feedback: “not now”	Feedback: “not now”	Feedback: “not now”	Return Model to Aversive Task	Return Model to Aversive Task	Ignored

Table 3
Participants' materials and target responses for VSR Positive

Participant	Target Response	Control Response	Aversive Task	SR +/-
Jacob	Cards in Box	Whale	N/A	Sour Gummy Worms, Cheetos, Skittles
Ryan	Lacing Card	Whale	N/A	Goldfish, Cheetos, Cheez-its
Kaleb	Lacing Card	Horse	N/A	Cheetos, Cheez-its, Goldfish
Jonah	Lacing Card	Dinosaur	N/A	Kit-Kats, Oreos, Gummy Worms
Karlie	Stack Cards	Dog	N/A	Kit-Kats, Oreos, Sour Patch Kids

Figure 1

Percentage of compliance with instructions for model training for Darla for VSR Positive

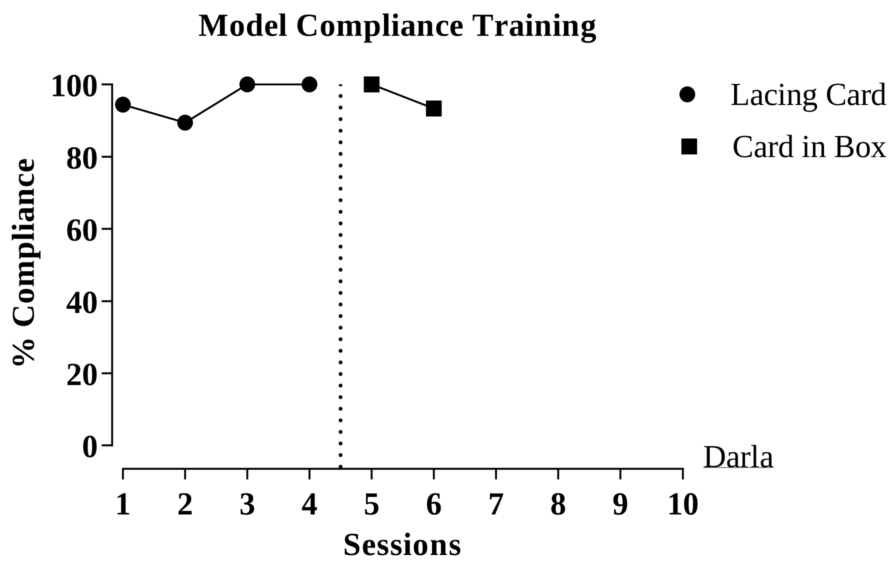


Figure 2

Percentage of compliance with instructions for model training for Brian for VSR Positive

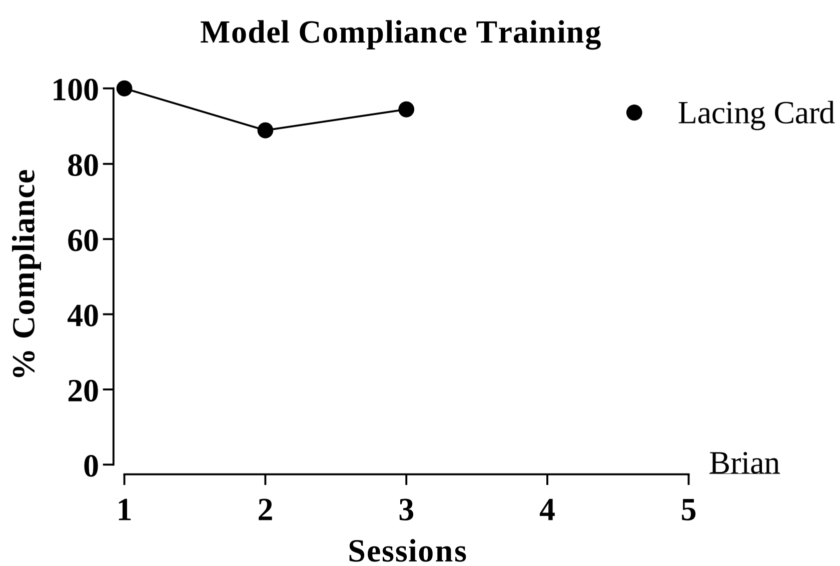


Figure 3

Percentage of compliance with instructions for model training for Kat for VSR Positive

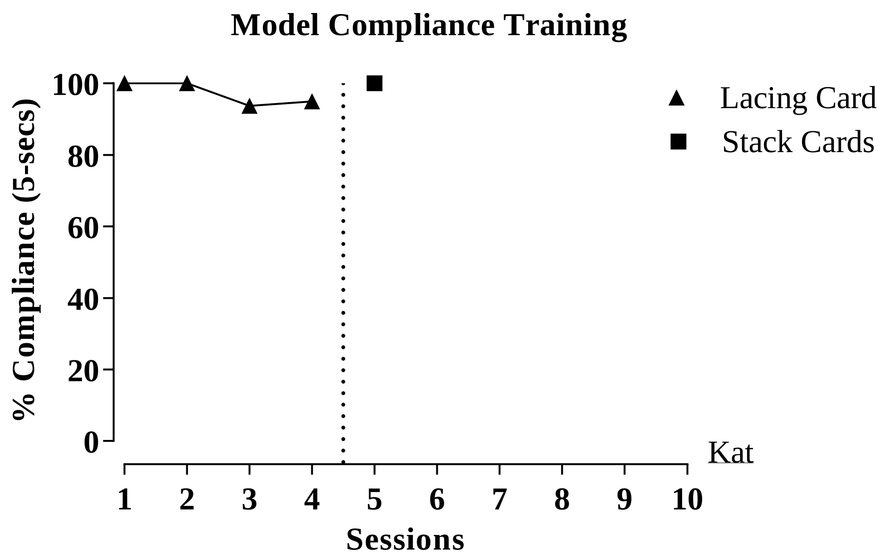


Figure 4

Percentage of compliance with instructions for model training for Adele for VSR Positive

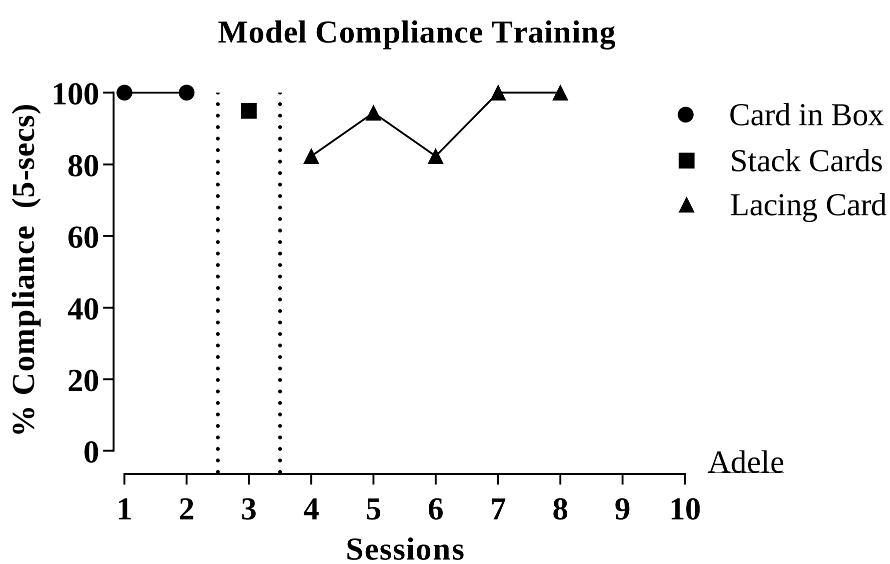


Figure 5

Results of the PSPA for Jacob for VSR Positive

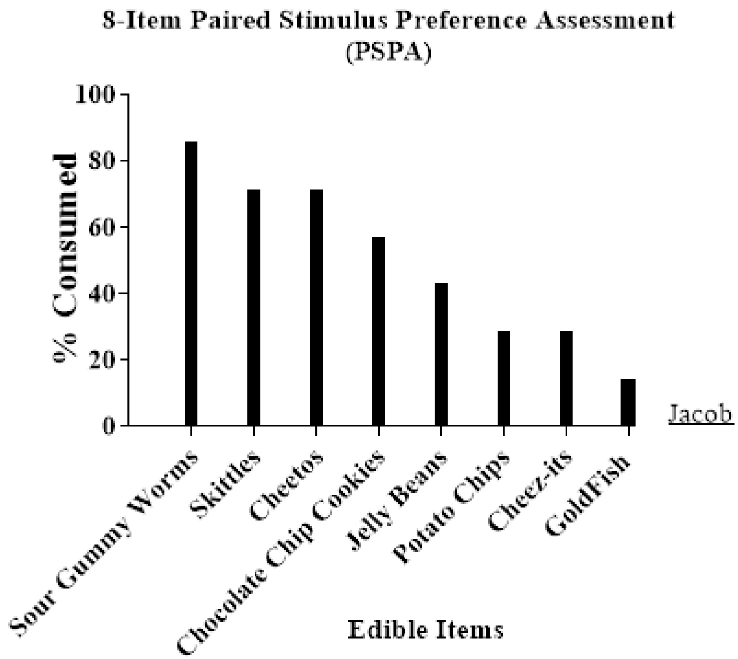


Figure 6

Results of the FOPA for Jacob for VSR Positive

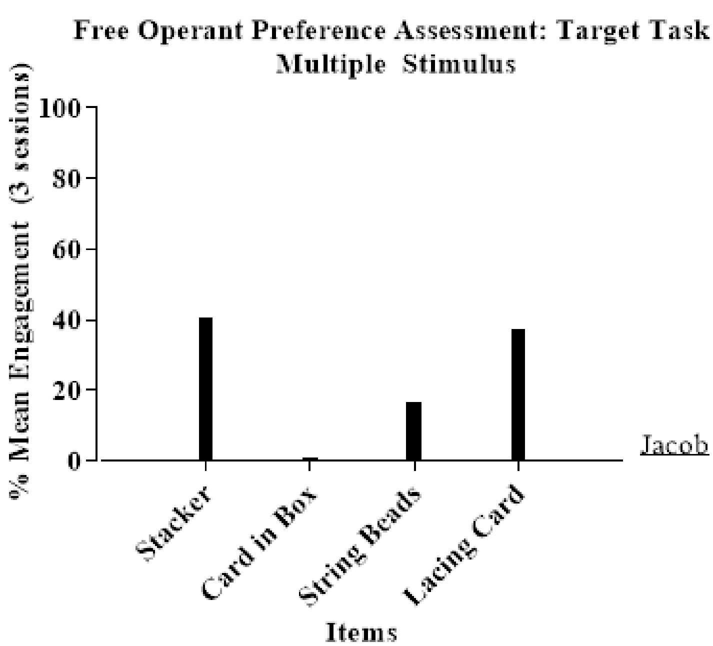


Figure 7

Mean percentage of engagement in the control task for Jacob for VSR Positive

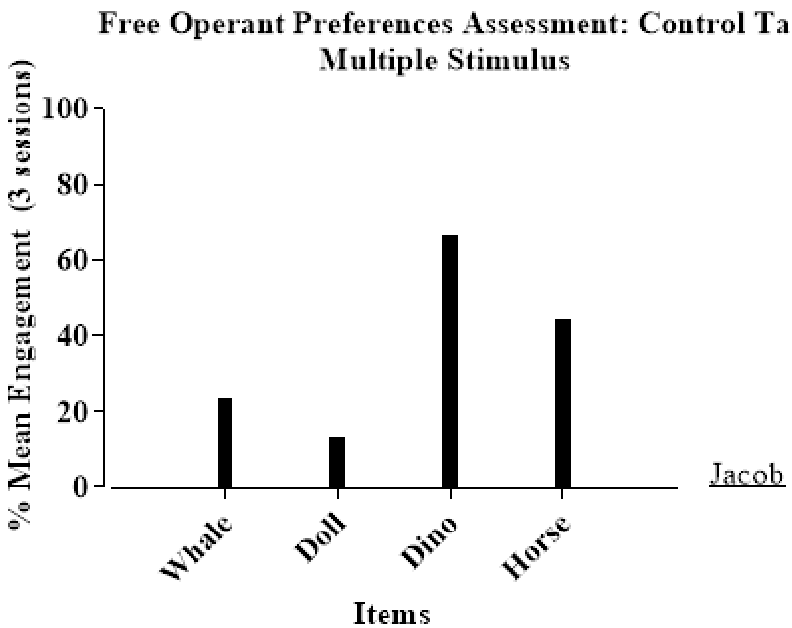


Figure 8

Rate of engagement with the target task across phases and conditions for Jacob (observer) and Darla (model) for VSR Positive

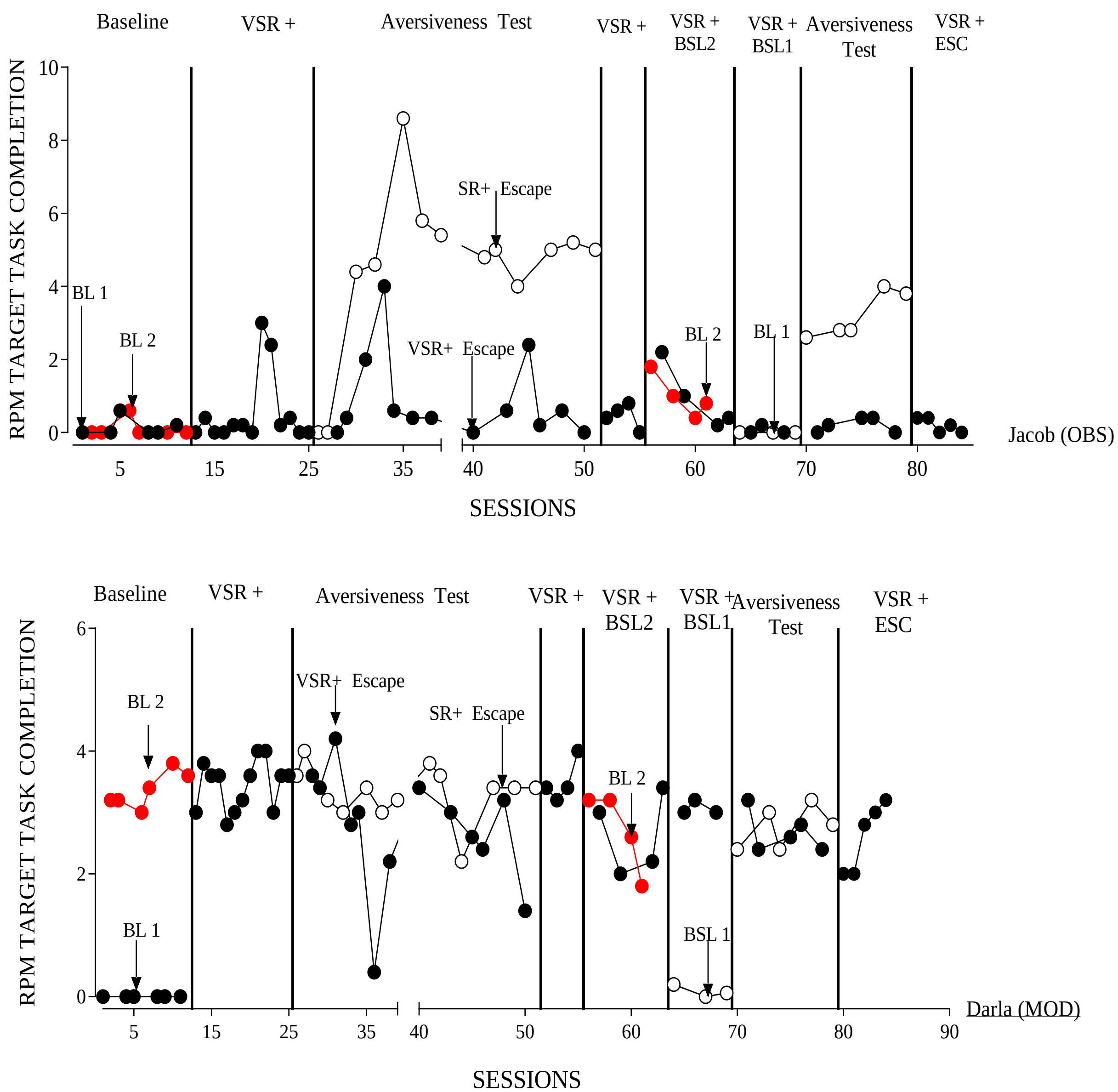


Figure 9

Rate of avoidance response (top panel), percentage of problem behavior, and negative vocalizations (second and third panels) across phases and conditions for Jacob (observer)

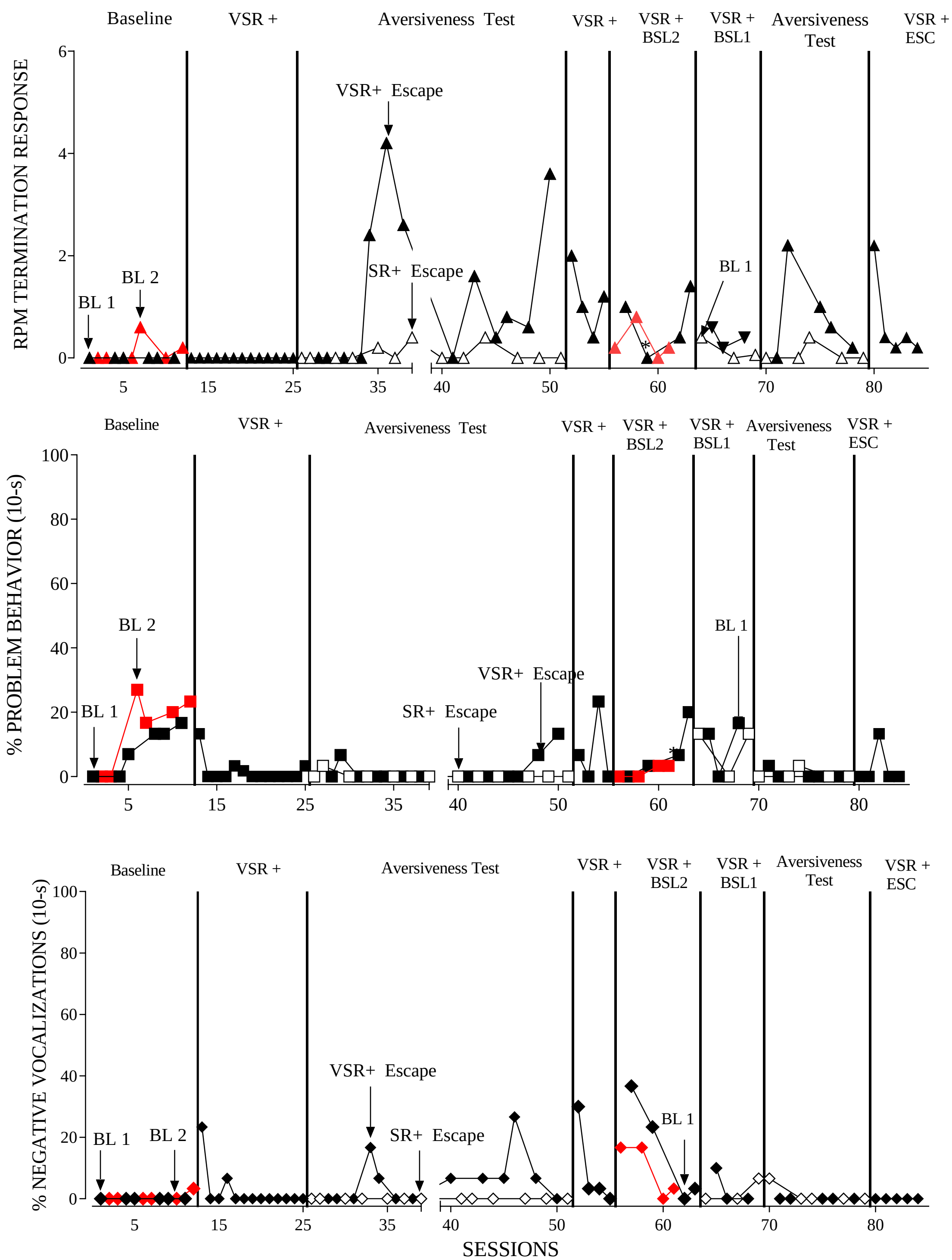


Figure 10

Results of the PSPA for Kaleb for VSR Positive

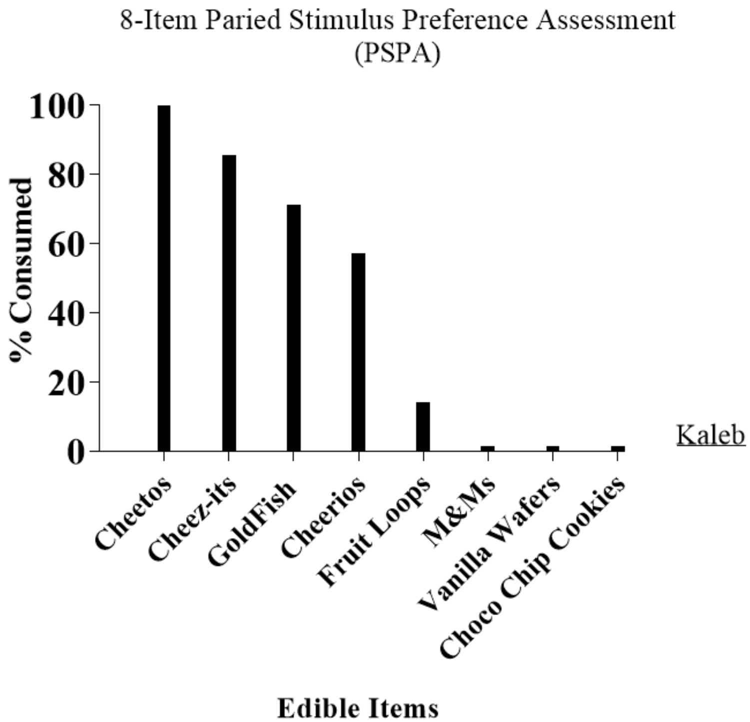


Figure 11

Results of the FOPA for Kaleb for VSR Positive

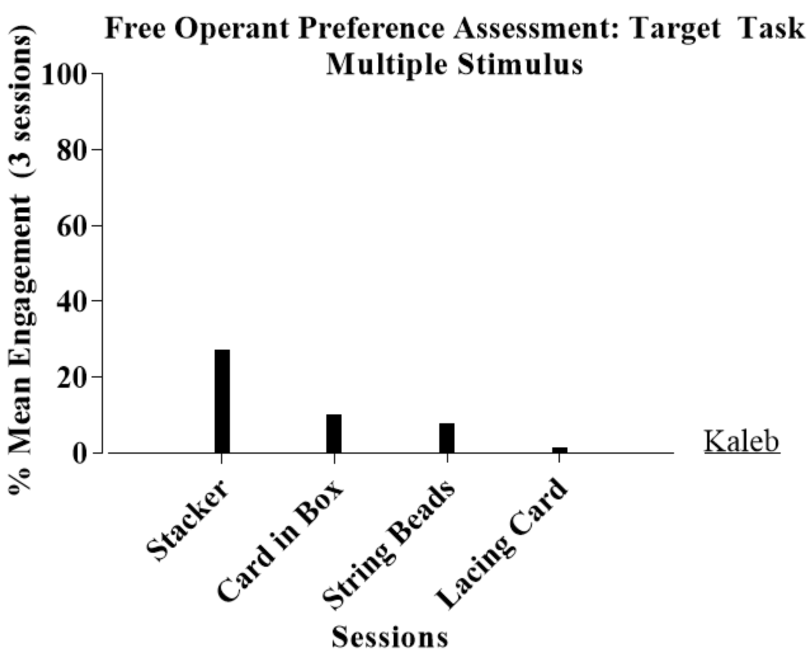


Figure 12

Results of the FOPA for Kaleb for VSR Positive

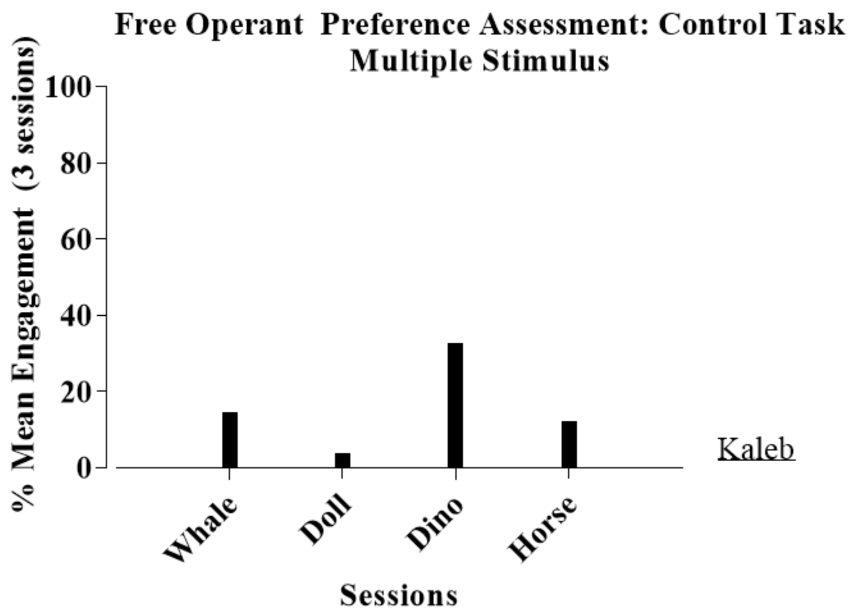


Figure 13

Rate of engagement with the target task across phases and conditions for Kaleb (observer) and Darla (model) for VSR Positive

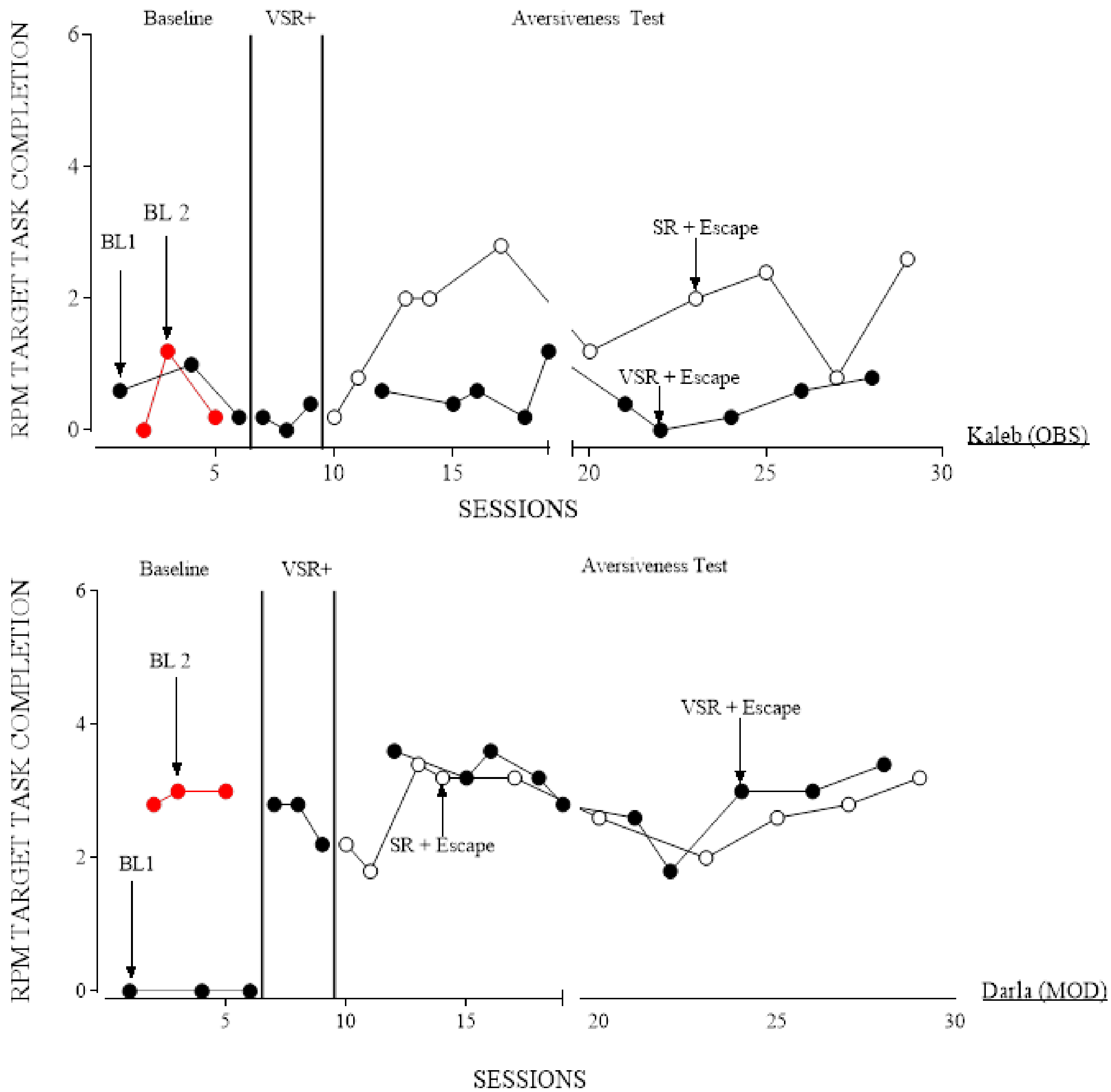


Figure 14

Rate of avoidance response (top panel), percentage of problem behavior, and negative vocalizations (second and third panels) across phases and conditions for Kaleb (observer).

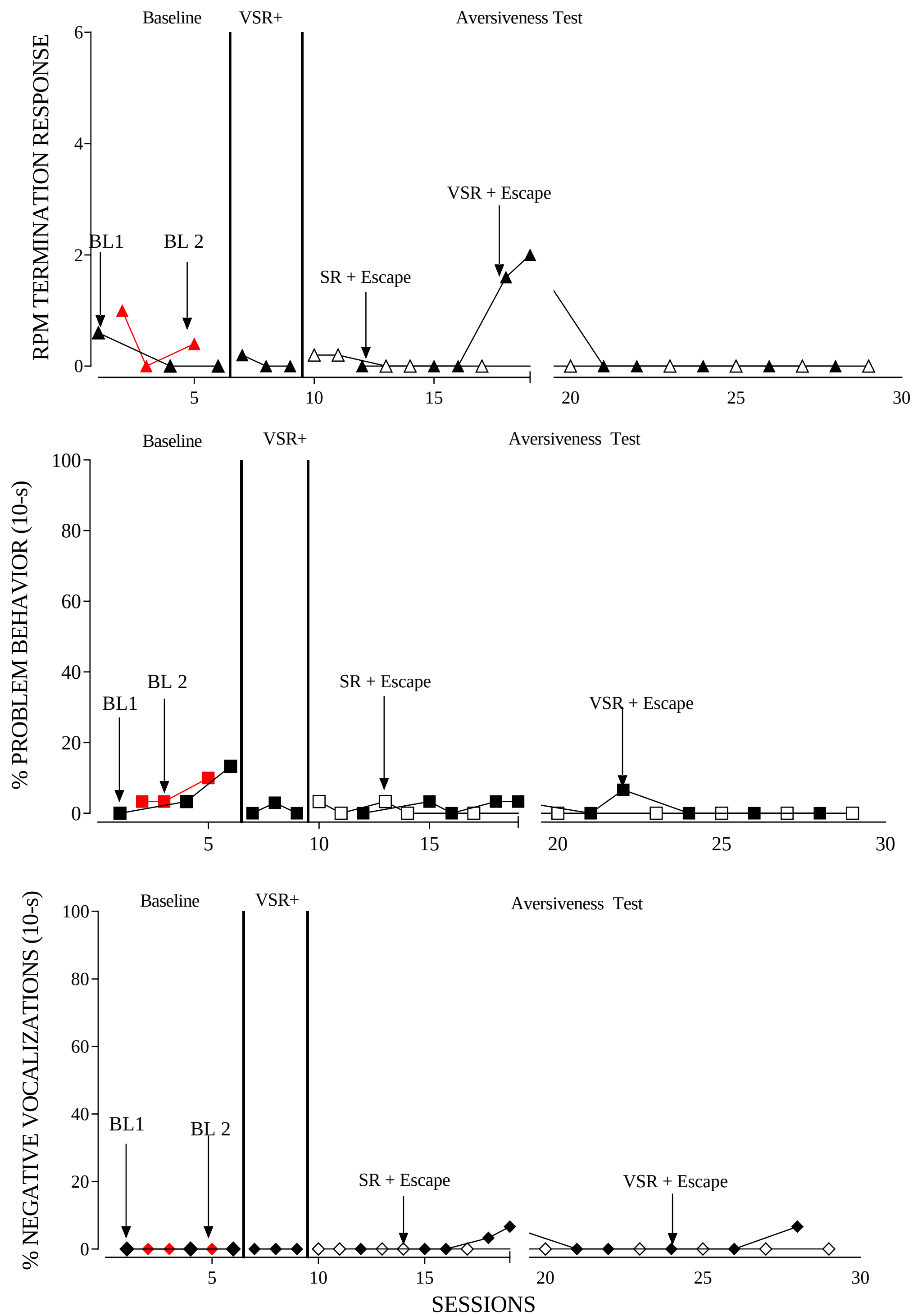


Figure 15

Results of the PSPA for Ryan for VSR Positive

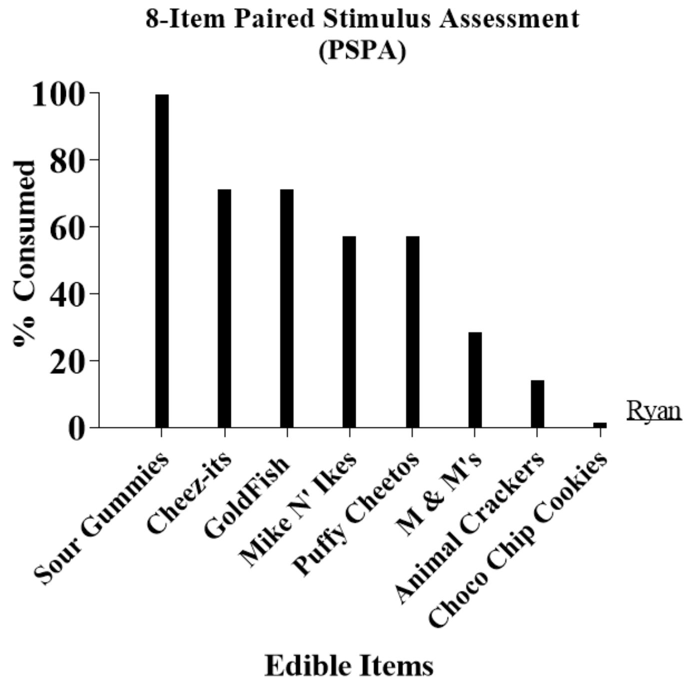


Figure 16

Results of the FOPA for Ryan for VSR Positive

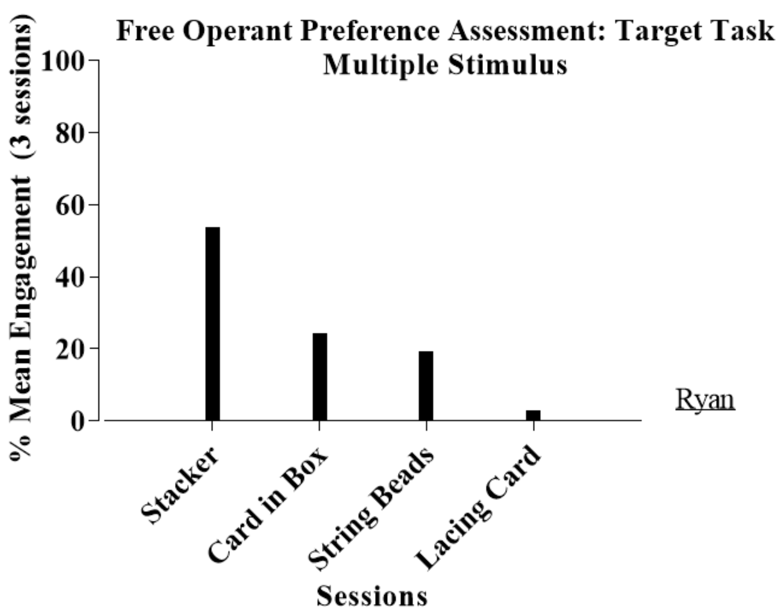


Figure 17

Results of the FOPA for Ryan for VSR Positive

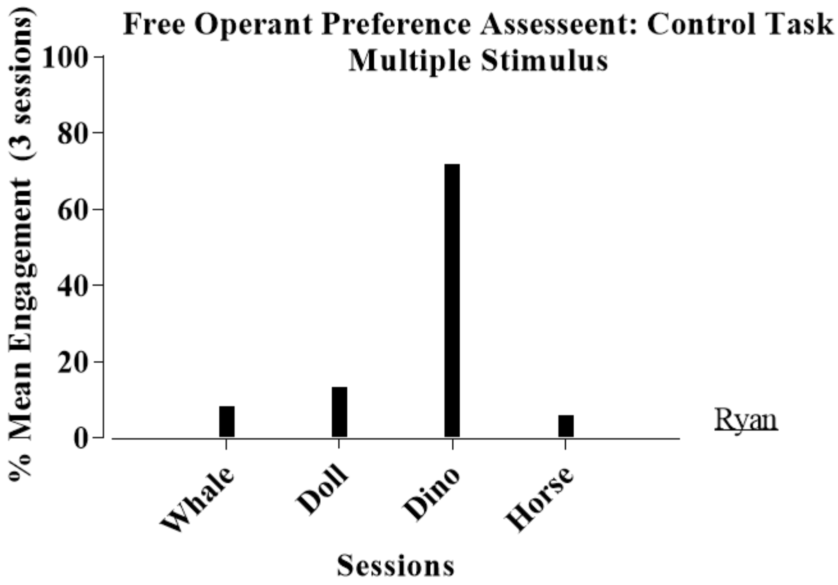


Figure 18

Rate of engagement with target task across phases and conditions for Ryan (observer) and Darla (model) for VSR Positive

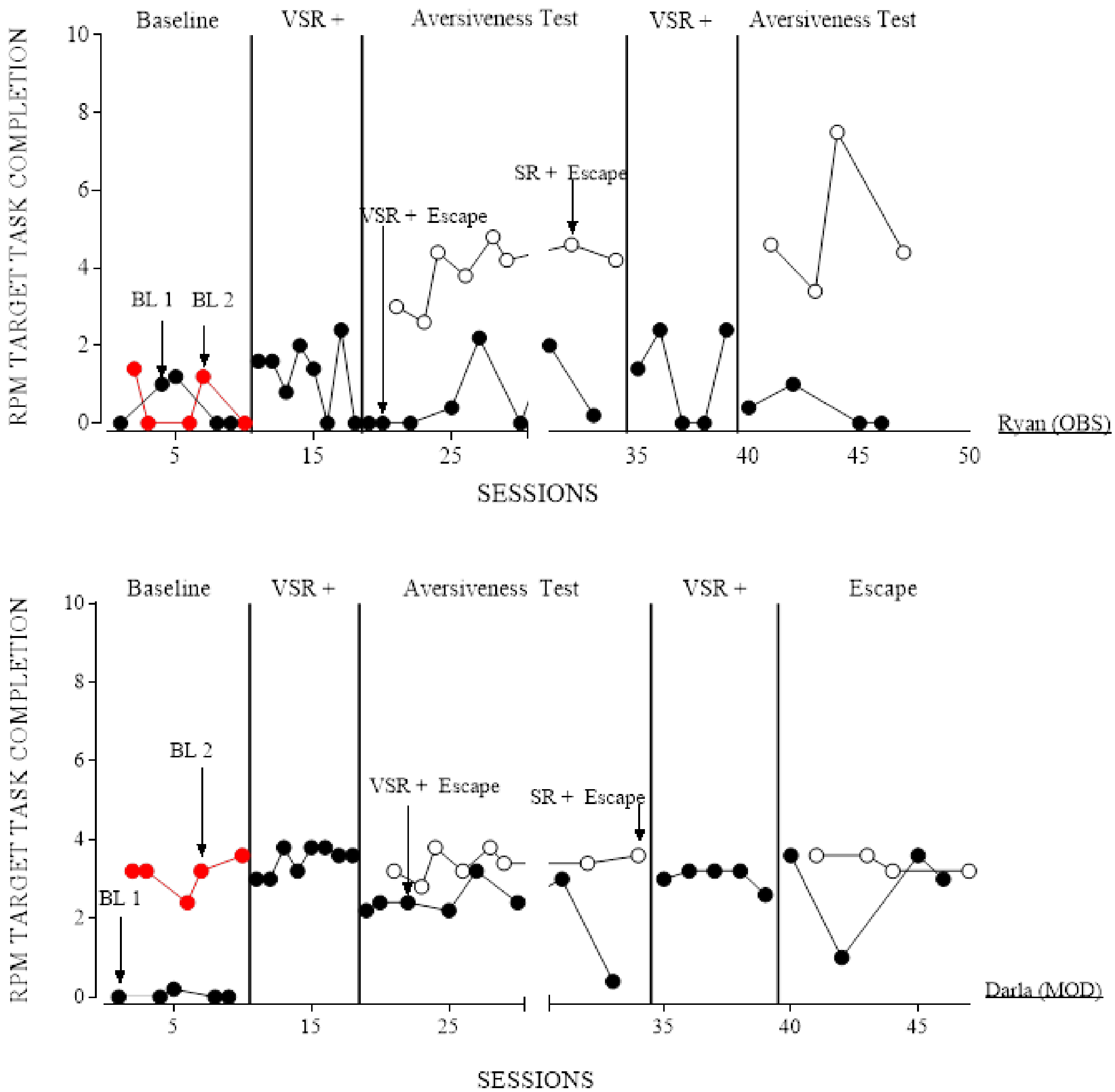


Figure 19

Rate of avoidance response (top panel), percentage of problem behavior, and negative vocalizations (second and third panels) across phases and conditions for Ryan (observer).

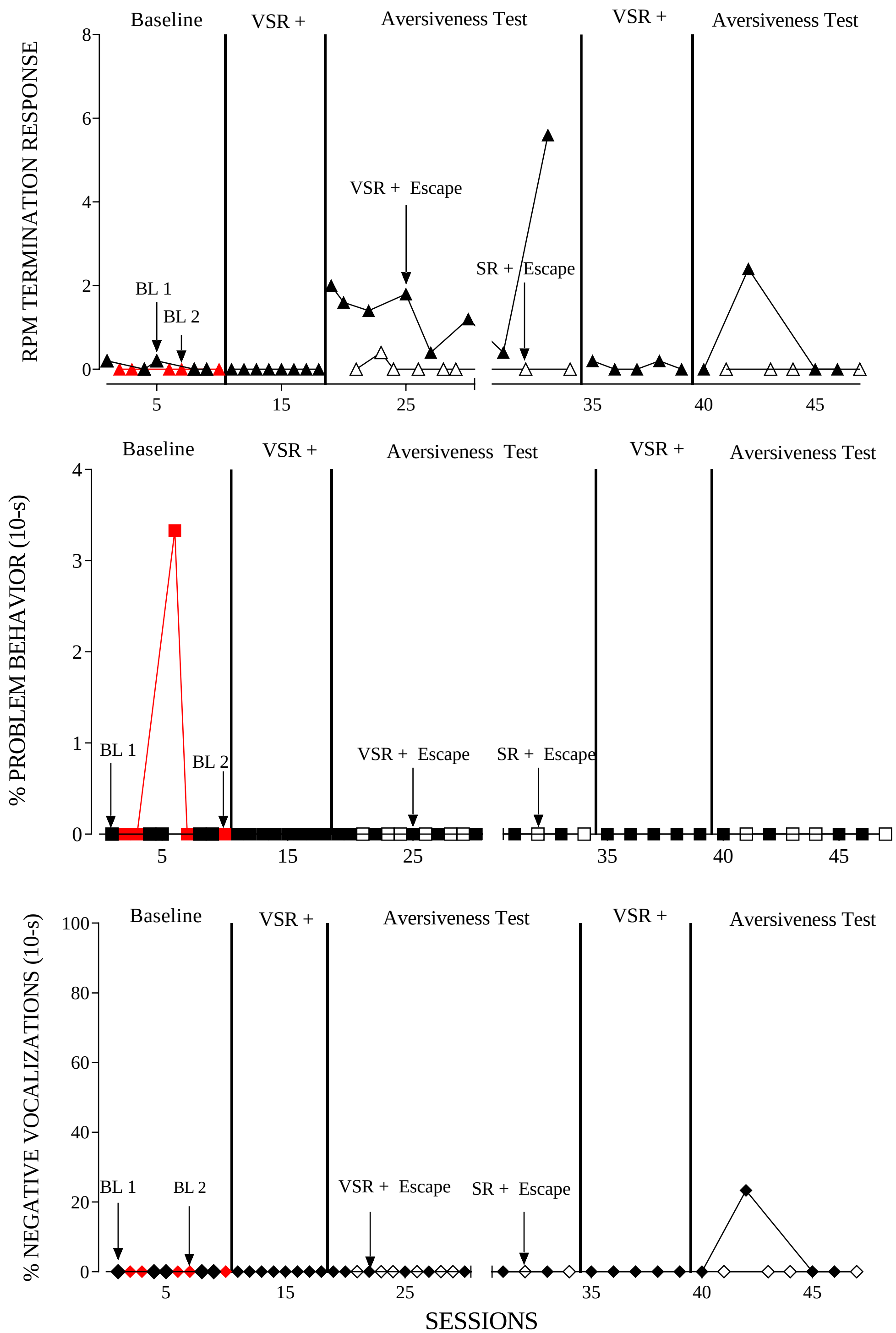


Figure 20

Results of the PSPA for Karlie for VSR Positive

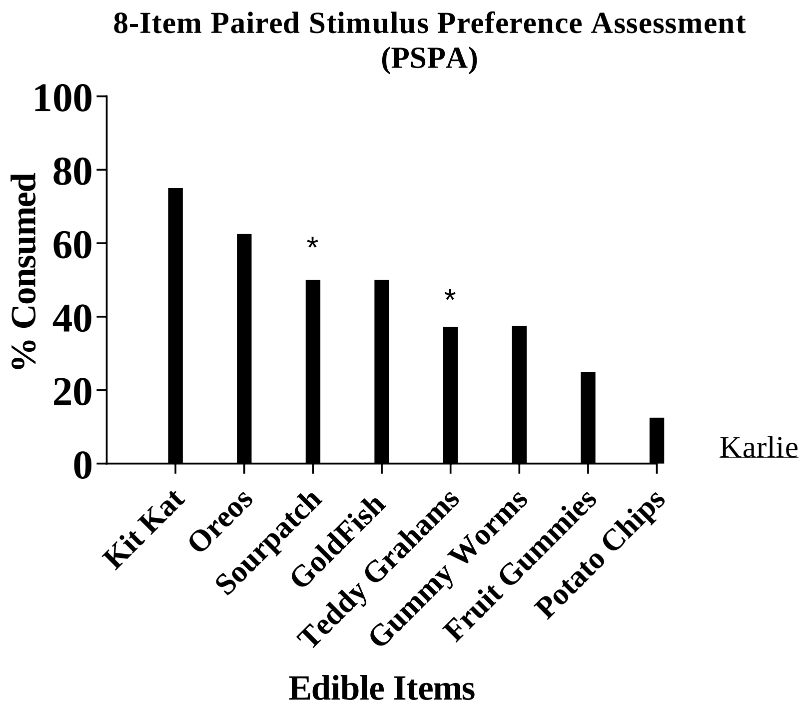


Figure 21

Results of the FOPA for Karlie for VSR Positive

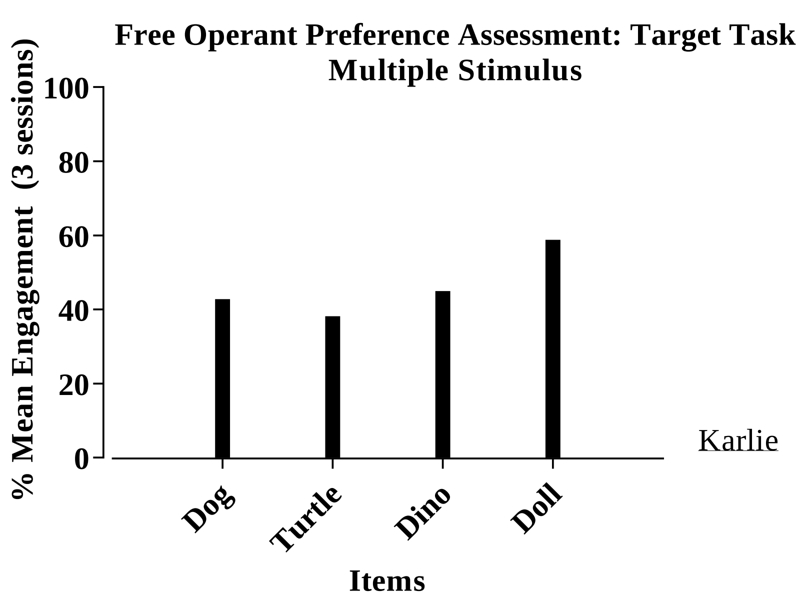


Figure 22

Results of the FOPA for Karlie for VSR Positive

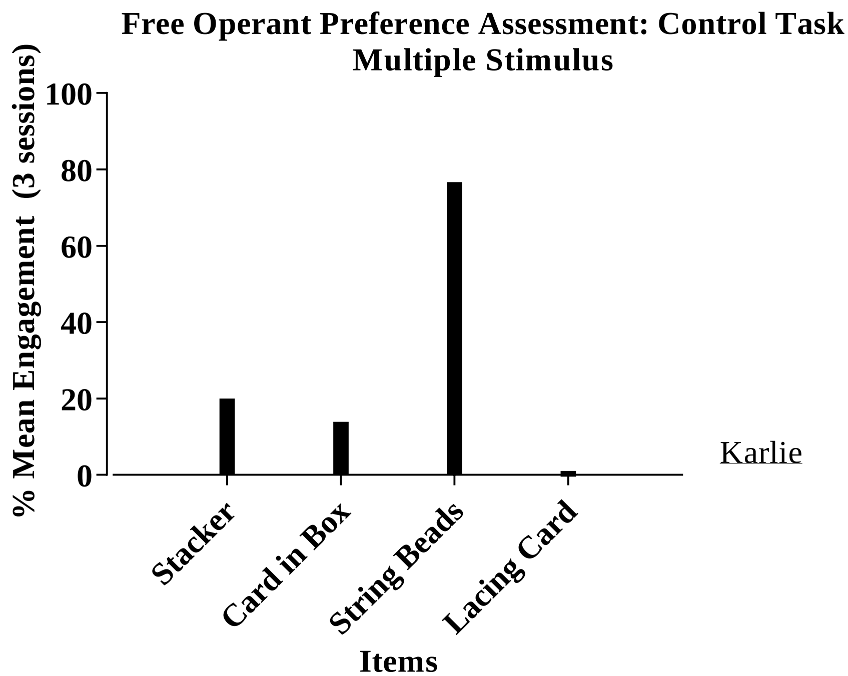
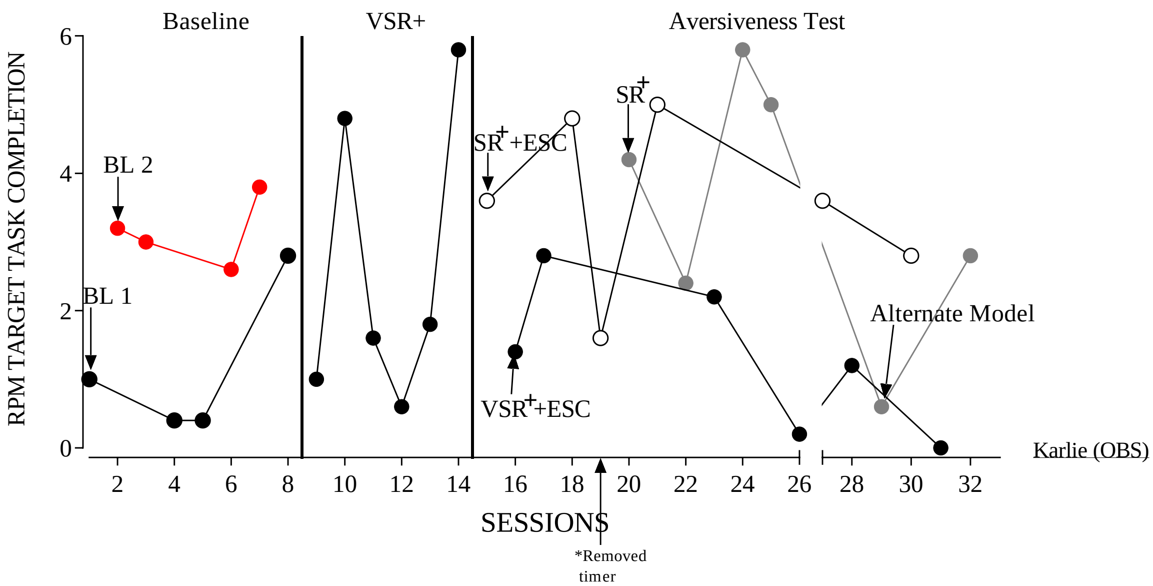


Figure 23

Rate of engagement with the target task across phases and conditions for Karlie (observer) and Arianna and Kat (models) for VSR Positive



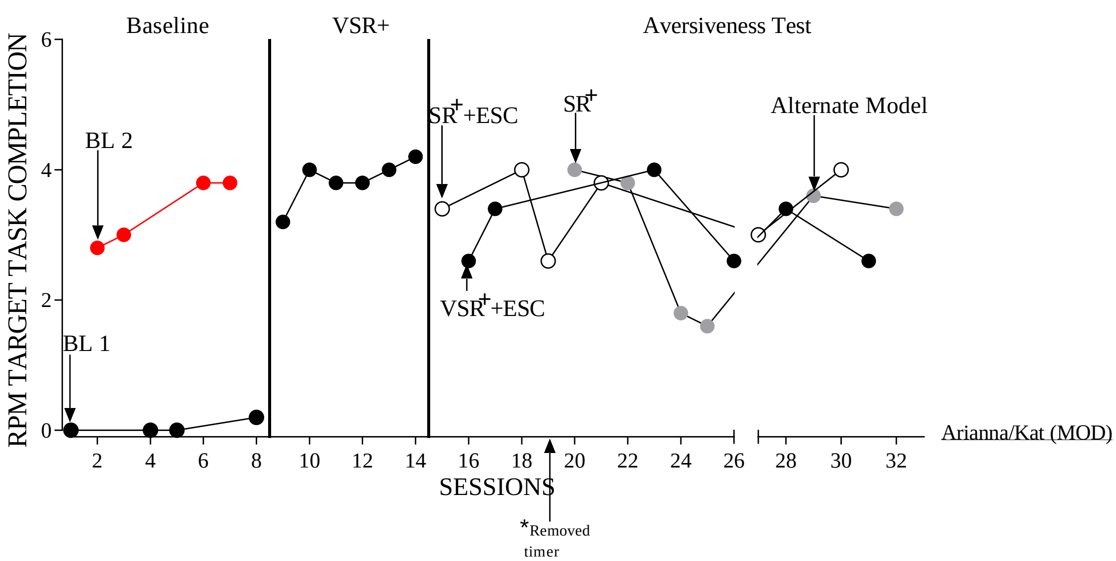


Figure 24

Rate of avoidance response (top panel), percentage of problem behavior, and negative vocalizations (second and third panels) across phases and conditions for Karlie (observer) across phases and conditions for VSR Positive

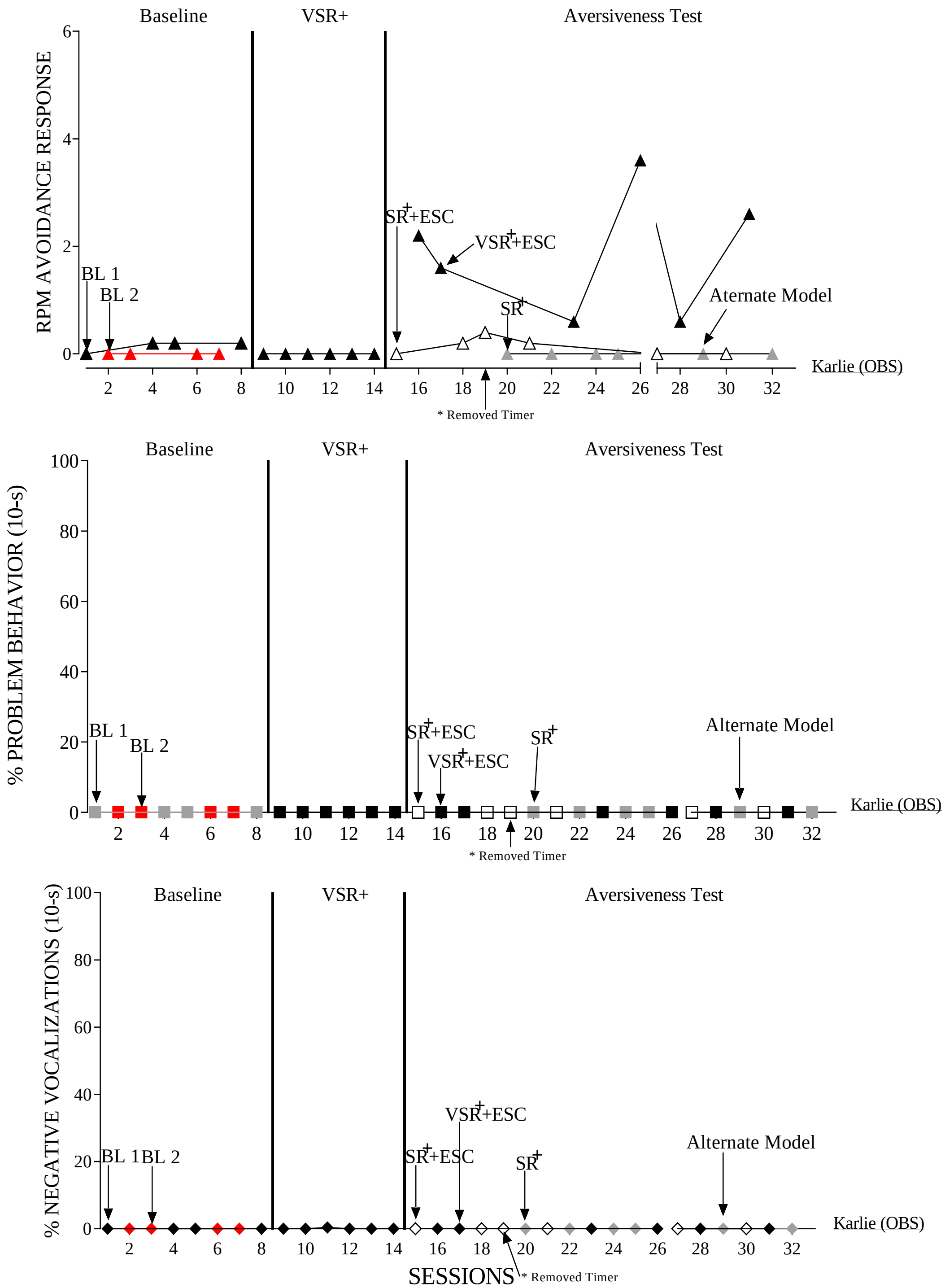


Figure 25

Results of the PSPA for Jonah for VSR Positive

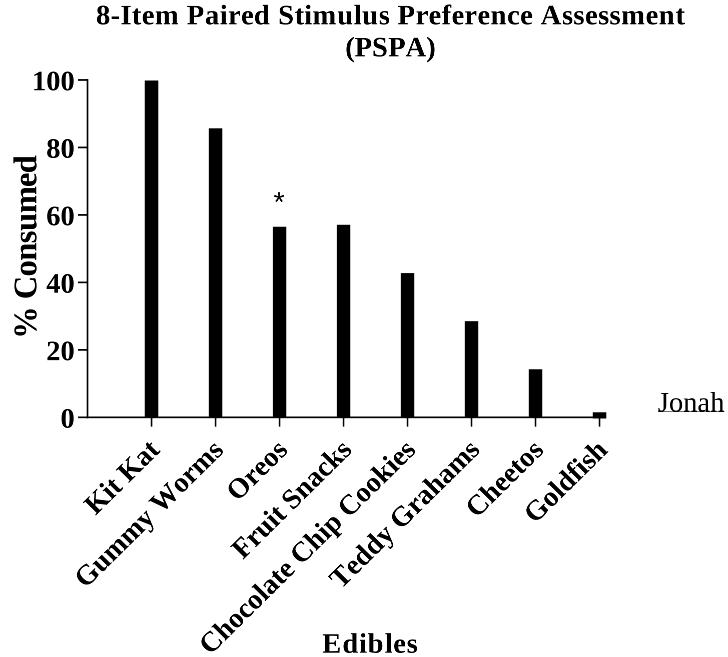


Figure 26

Mean percentage of engagement for the FOPA for Jonah for VSR Positive

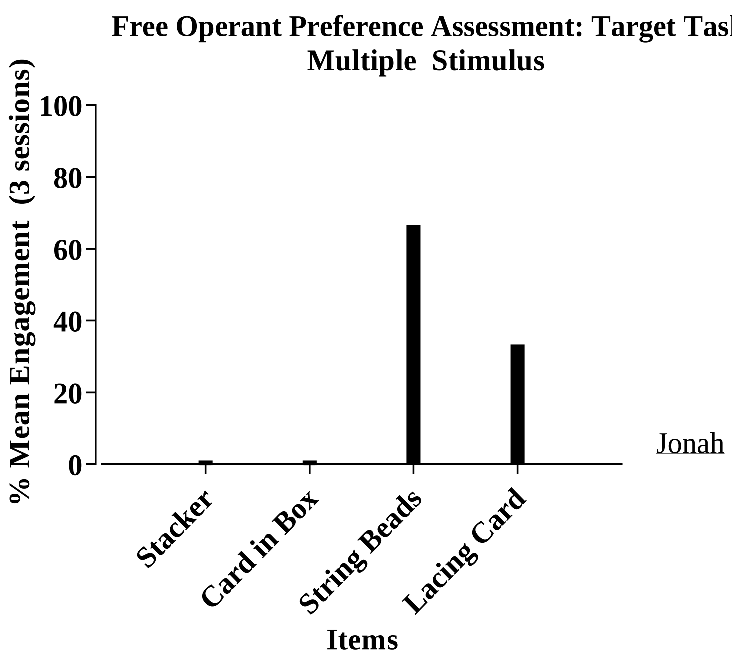


Figure 27

Mean percentage of engagement for the FOPA for Jonah for VSR Positive

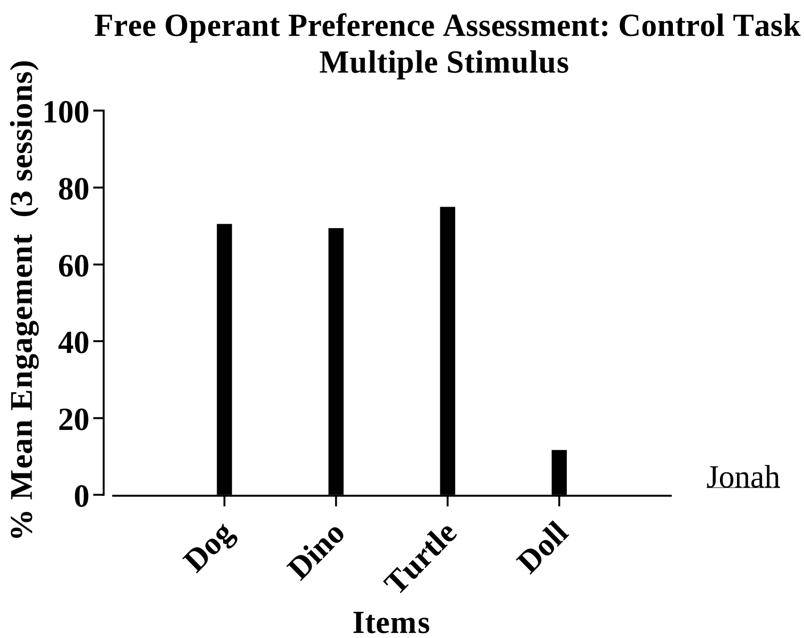


Figure 28

Rate of engagement with the target task across phases and conditions for Jonah (observer) and Arianna (model) for VSR Positive

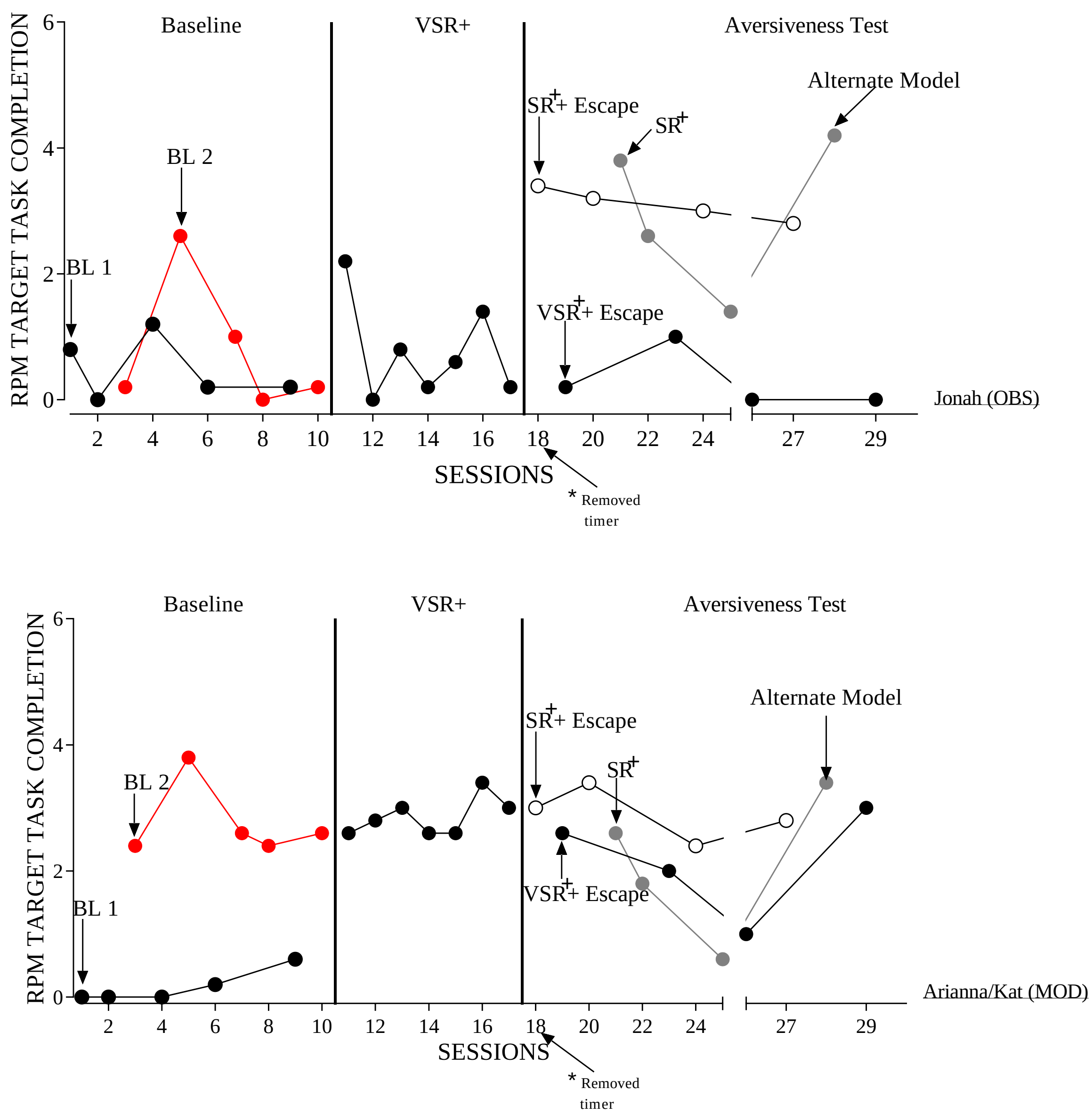


Figure 29

Rate of avoidance response (top panel), percentage of problem behavior, and negative vocalizations (second and third panels) across phases and conditions for Jonah (observer). across phases and conditions for VSR Positive

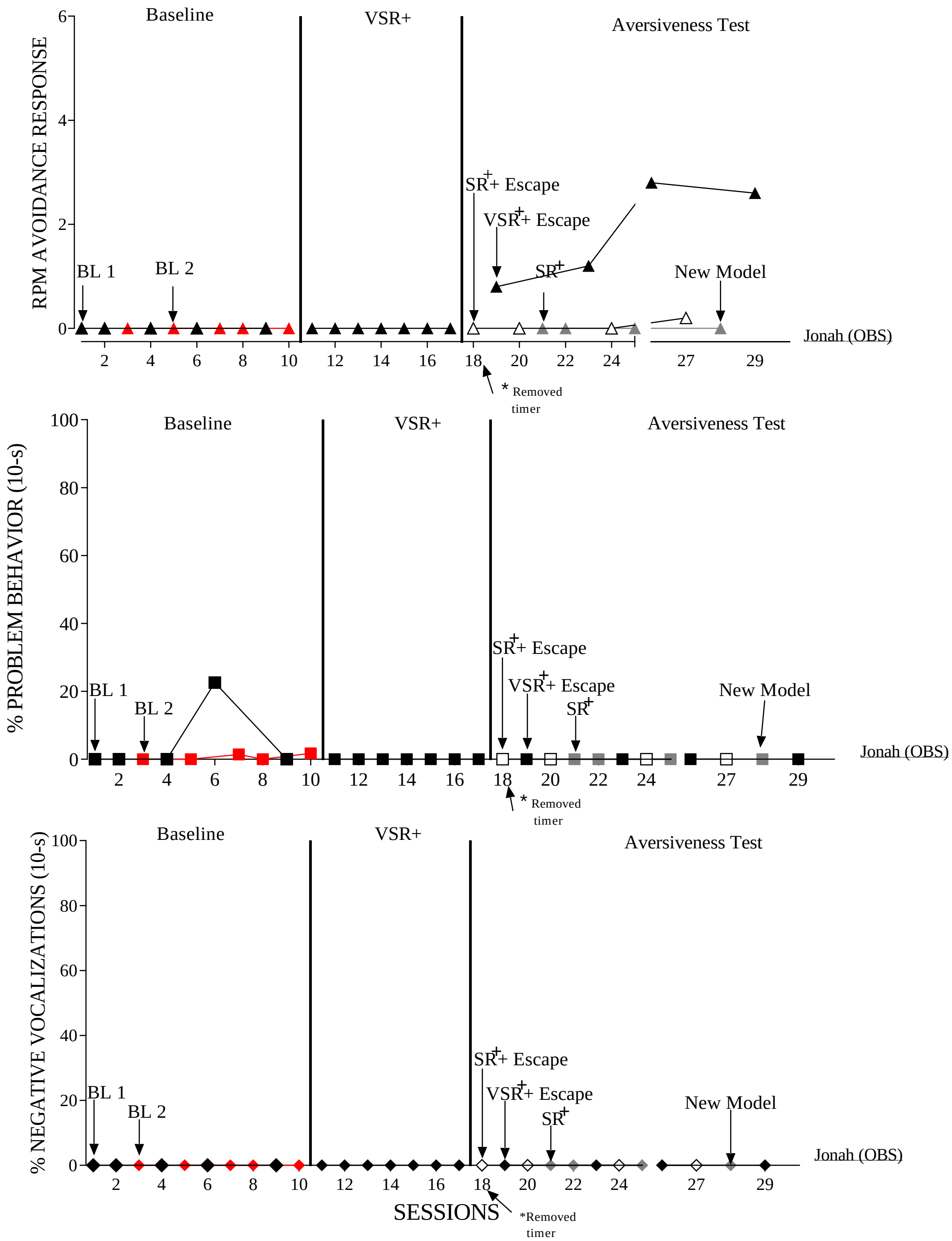


Table 4

Summary of vicarious positive reinforcement effects prior to and following direct reinforcement

Participant	VSR Effect Prior to SR+?	SR+ Effect?	VSR Effect after SR+?
Jacob	No	Yes	Yes
Kaleb*	No	Yes	N/A
Ryan	Yes	Yes	Yes
Karlie*	Yes	Yes	N/A
Jonah*	No	Yes	N/A
Total	2/5	5/5	2/5

Note. Did not follow direct SR+ phase with VSR for Kaleb, Jonah, or Karlie and therefore unable to determine if there was a subsequent VSR effect

Table 5

Summary of aversive properties of vicarious positive reinforcement

Participant	Imitation	Initial VSR?	VSR Maintained?	Non-Preferred?	Aversive?	Direct SR+?
Jacob	No	No	N/A	Yes	Yes	Yes
Kaleb	No	No	N/A	No	No	Yes
Ryan	No	Yes	Yes	No	Yes	Yes
Karlie	Yes	No	N/A	No	Yes	Yes
Jonah	Yes	No	N/A	No	Yes	Yes
Total	2/5	1/5	1/5	1/5	4/5	5/5