

# COMPARISON OF VIDEO PRIMING TECHNIQUES FOR CHILDREN WITH AUTISM

by

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(Under the Direction of John Langone)

## ABSTRACT

This study attempts to isolate one component of effective video based instruction for children with autism. More specifically, this study, in the context of an adapted alternating treatments design, evaluates the relative effectiveness of two different types of video models for teaching students with autism to put away groceries. The types of video differ in their perspective: 1<sup>st</sup> person perspective versus 3<sup>rd</sup> person perspective. The results do not clearly indicate superiority of one type of video model over another.

INDEX WORDS: Autism, video, modeling, priming, computer, and functional skills

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B. A., The University of Georgia, 1998

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A Dissertation Submitted to the Graduate Faculty of The University of Georgia in Partial  
Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

ATHENS, GEORGIA

2005

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## DEDICATION

I was given an incredible opportunity to pursue and complete this degree. Without hesitation I must dedicate this to Courtney and Ashton. Without them this would not have been possible.

## ACKNOWLEDGEMENTS

I would like to thank several people for their guidance and assistance. First, my committee members, all of whom have given of their time to read drafts of this study, look at my data, and try to steer me in the right direction. Their council has truly made this challenge an incredible learning experience.

I need to thank Catherine for her assistance in the classroom. And I need to thank the five students who were willing to work with me on this study and learn to put away groceries. In addition, the ideas for this project came from my learning experiences with the students with whom I worked, I owe them my thanks.

# TABLE OF CONTENTS

|                                               | Page |
|-----------------------------------------------|------|
| ACKNOWLEDGEMENTS.....                         | v    |
| LIST OF TABLES.....                           | ix   |
| LIST OF FIGURES .....                         | x    |
| CHAPTER                                       |      |
| 1 INTRODUCTION .....                          | 1    |
| Rationale.....                                | 4    |
| Research Questions .....                      | 6    |
| Definitions and Principle Measures .....      | 7    |
| 2 LITERATURE REVIEW .....                     | 8    |
| Priming .....                                 | 9    |
| Video .....                                   | 16   |
| Synthesis.....                                | 36   |
| 3 METHODS .....                               | 44   |
| Participants .....                            | 44   |
| Settings and Arrangements.....                | 47   |
| Materials.....                                | 48   |
| Response Definitions and Data Collection..... | 52   |
| Other Measures.....                           | 53   |

|                                            |     |
|--------------------------------------------|-----|
| Experimental Design .....                  | 53  |
| Procedures .....                           | 55  |
| Social Validity .....                      | 58  |
| 4 RESULTS .....                            | 75  |
| Reliability .....                          | 75  |
| Acquisition .....                          | 77  |
| Generalization .....                       | 80  |
| Comparative Measures .....                 | 82  |
| Errors .....                               | 85  |
| Social Validity .....                      | 86  |
| 5 DISCUSSION .....                         | 122 |
| Results and Limitations .....              | 123 |
| Future Directions .....                    | 130 |
| Technology and the Future .....            | 133 |
| REFERENCES .....                           | 138 |
| APPENDICES .....                           | 146 |
| A PARENTAL CONSENT FORM .....              | 146 |
| B PRE/POST DATA SHEETS .....               | 148 |
| C SCREEN CAPTURE OF COMPUTER DATA .....    | 150 |
| D PROCEDURAL CHECKLIST: PRIMING .....      | 152 |
| E PROCEDURAL CHECKLIST PRE/POST-TEST ..... | 154 |
| F SOCIAL VALIDITY: PARENT .....            | 157 |



|   |                                |     |
|---|--------------------------------|-----|
| G | SOCIAL VALIDITY: TEACHER ..... | 159 |
| H | SOCIAL VALIDITY: STUDENT ..... | 161 |

## LIST OF TABLES

|                                                            | Page |
|------------------------------------------------------------|------|
| Table 1: Design components of priming studies.....         | 37   |
| Table 2: Primarily social skills interventions.....        | 39   |
| Table 3: Primarily functional skills interventions.....    | 42   |
| Table 4: Psychometric characteristics of participants..... | 61   |
| Table 5: Stimuli sample pool .....                         | 62   |
| Table 6: Comparative measures.....                         | 89   |
| Table 7: Video times .....                                 | 90   |
| Table 8: Item errors.....                                  | 91   |

# LIST OF FIGURES

|                                                        | Page |
|--------------------------------------------------------|------|
| Figure 1: Photograph of pre/post test environment..... | 63   |
| Figure 2: Photograph of video environment .....        | 65   |
| Figure 3: Screen capture of probes .....               | 67   |
| Figure 4: Screen capture of first person primes .....  | 69   |
| Figure 5: Screen capture of third person primes.....   | 71   |
| Figure 6: Flow of stimuli .....                        | 73   |
| Figure 7: Justin acquisition .....                     | 92   |
| Figure 8: Allison acquisition.....                     | 94   |
| Figure 9: Chris acquisition.....                       | 96   |
| Figure 10: Bryan acquisition.....                      | 98   |
| Figure 11: Nathan acquisition.....                     | 100  |
| Figure 12: Justin mean correct.....                    | 102  |
| Figure 13: Allison mean correct .....                  | 104  |
| Figure 14: Chris mean correct.....                     | 106  |
| Figure 15: Bryan mean correct .....                    | 108  |
| Figure 16: Nathan mean correct.....                    | 110  |
| Figure 17: Justin's errors .....                       | 112  |
| Figure 18: Allison's errors .....                      | 114  |
| Figure 19: Chris's errors .....                        | 116  |

|                                  |     |
|----------------------------------|-----|
| Figure 20: Bryan's errors .....  | 118 |
| Figure 21: Nathan's errors ..... | 120 |

## CHAPTER 1

### INTRODUCTION

Demonstrations of video based instruction for children with autism are becoming more prevalent in the literature (c.f. Ayres & Langone, in press). Researchers have used video to teach a range of skills from functional skills like washing one's face (e.g. Charlop-Christy, Le, & Freeman, 2000), to social language skills (Taylor, Levin, & Jasper, 1999) and reduction of problem behavior (Schreibman, Whalen, & Stahmer, 2000). As more investigations document the success of video and video modeling as components of instructional packages for people with autism, researchers will need to begin identifying the most important characteristics of those interventions and videos.

Though the published literature may display a bias toward successful intervention, research on video based instruction supports that video is a good tool for teaching people with autism. The simple claim that video based instruction is an appropriate teaching tool ignores the depth and variety of possibility for video based intervention and is analogous to suggesting that text books are a good teaching tool for a social studies class. Therefore, the question arises: are all video based instructional packages beneficial for children with autism? If they are beneficial, identifying the characteristics of the video or the framework of the instruction that makes the intervention successful become more important for designing efficient instruction.

The number of variables that one can manipulate when designing video based instruction are innumerable. Bandura explored many of variables associated with

observational learning for example, characteristics of effective models and vicarious reinforcement (c.f. Bandura, Ross, & Ross, 1961; Bandura, 1977). The degree to which these ideas apply to video based instruction and children with autism needs further investigation.

There are a number of reasons why teachers might use video models or primes rather than real live models. One reason would be the difficulty involved with repeated practice using live models, staging situations such as role playing, and the variation of relevant stimuli. Charlop-Christy, Le, and Freeman (2000) make an argument for use of video priming by citing earlier work from Thelen, Fry, Fehrenbach and Frauschi who in a 1979 review outlined three strengths of video based modeling over in vivo modeling: 1) video allows the creation of scenarios that may be difficult to contrive in a classroom setting 2) the instructor has greater control over the delivery of the stimuli in video based instruction 3) the video is recyclable and can be viewed repeatedly.

Further, video-based instruction has also been suggested to be a powerful teaching tool for students with autism because it can focus the instructional environment narrowly on a television screen or computer monitor (Sherer, Pierce, Paredes, Kisacky, Ingersoll, & Schreibman, 2001). Charlop-Christy et al. go further in this regard saying that if the children have a tendency to over select on certain stimuli during training, the ability to zoom-in on select features with video may increase the probability that a child will over select on relevant rather than irrelevant characteristics.

Video may be powerful but it can also be time consuming to create and prepare for instruction. One must recruit actors to shoot footage of staged events or wait for target events to occur naturally. Either way, video must be edited and assembled in a format

that one can easily use for instruction. However, once a teacher readies video for instruction, he or she has a tool, a library of models that a student can view ad infinitum. This “recyclability” of video models and video based instruction alleviates the logistical problems one might associate with recruiting models to assist with different learning scenarios and requiring those models to repeat the same behavior multiple times without variation, and, in the long term, this makes video an efficient way to deliver instruction. Video can present a target behavior in precisely the same manner every viewing thereby giving the teacher the opportunity to repeatedly highlight critical characteristics of the target behaviors being performed by the models. If teachers are going to spend time designing and using video, they need to know which video features are most important for the learner. Some preliminary work has already taken place to this end.

Sherer et al. (2001) reported findings suggesting that no difference exists between children learning via video self modeling [VSM] or peer models. This would tend to contradict Bandura’s argument that the more similar a learner to a model, the more likely the behavior will be learned via observational learning (Bandura, 1977). Other characteristics, however, require additional exploration. For example, it would be beneficial to determine which would be more powerful: video models of non-examples followed by a correction, video models of accurate examples, or a combination of both. Similarly, it would be important to study how the speed of the model influences children with autism as they learn from the video. Along the same vein, this study will address another characteristic related question by examining whether video shot from the first or third person perspective is more potent for teaching functional domestic living skills.

Because video has the potential to play this valuable role for teachers, a systematic line of research is needed to identify those characteristics that make video based instruction most successful (Ayres & Langone, in press). By isolating different variables in comparative studies, researchers will have the ability to discriminate factors that contribute to the effectiveness of video based instruction. This study represents one comparison that is designed to determine what, if any, differential effects exist related to first versus third person video thereby making video instruction more efficient and effective.

### *Rationale*

Based on diagnostic characteristics, people with autism frequently have difficulty with joint attention (American Psychiatric Association [APA], 2000). Deficits in joint attention are significantly more common amongst individuals with autism than other individuals with disabilities (Lewy & Dawson, 1992) and this can adversely impact an individual's ability to develop Theory of Mind [TOM] (Jones & Carr, 2004). One aspect of TOM related to the current study is the ability (or inability) to identify the stimuli to which another person is attending (Baron-Cohen, 1997). When considering an intervention based on observational learning and modeling, the observer (learner) must be able to perform two tasks: watch the model, and identify the stimuli to which the model reacts. If one expects an individual with autism to learn from a model, that student must have the ability to discriminate the relevant environmental stimuli that occasion the target behaviors. If the individual with autism cannot identify the discriminative stimulus, then one cannot expect that person to reasonably learn the target behavior through observation. Third person video represents the traditional perspective that an observer



uses when watching a model. First person video may provide a more efficient learning perspective because it may eliminate the need for an observer to have TOM and identify the relevant stimuli to which a model attends.

For individuals with autism addressing TOM through video based instruction becomes a greater possibility as researchers have documented effectiveness video and video priming (e.g., Charlop & Milstein, 1989). The evidence base for video based instruction is growing but requires further work to isolate characteristics that influence the effectiveness of video and identify how to integrate video into instruction. This study will begin to help isolate the characteristics of effective video primes by evaluating whether the perspective depicted in the video influences acquisition or generalization when video is used as a prime. Priming specifically refers to the introduction of a stimulus that alters a behavior at a point after the stimulus is withdrawn (Baer & Wolf, 1970). Presumably, if children with autism have difficulty understanding the perspective of other people, first person video primes will be a more effective instructional tool.

To evaluate the efficiency of video on acquisition and generalization, a functional target behavior will need to be carefully selected. One skill that is universally useful as students grow and become more independent and at the same time will provide precisely the right opportunity to measure differences in the treatment effects is food storage. Everyone has to be able to properly store food. When arriving home from the grocery store, one must safely store food to avoid spoilage. Learning this behavior will provide students with an enhanced opportunity to participate in the daily lives of their families as well as prepare them for independent living when they eventually leave their parents'

home. The methods section will explain in detail how this behavior is ideally suited for measurement in a comparative single subject design.

### *Research Questions*

Progress in the development of effective intervention requires careful and studied evolution of research. The literature reviewed herein provides a foundation for research in priming and the current study is situated to answer fundamental questions about priming and video primes. These answers in turn will allow more detailed future investigations to refine aspects of priming with and without video to provide students the most efficient instruction possible. The questions that will be answered by this study include:

1. Will students with autism learn responses from video primes?
2. Will they learn faster from first or third person video primes?
  - a. Will they make fewer errors with one type of video prime or another?
  - b. Will they reach criterion more quickly with one type of model or the other?
3. If the students acquire this behavior on the computer, will the student generalize this behavior to in vivo probes?

The underlying hypothesis is that students with autism may learn better with first person primes because of deficits in Theory of Mind. First person video would not require them to understand or monitor the environmental stimuli to which others pay attention.

*Definitions and Principle Measure*

## 1. Student performance measures

## a. Computer

- i. Accuracy of response: correctly selecting the correct storage location for an item by clicking on an icon or touching a touch screen within 15s of the presentation of the stimulus.
- ii. Errors to criterion: the number of incorrect responses a student makes during PC Probes before they master set of stimuli.
- iii. Total time in priming: The computer calculates the total amount of time a student spends in a priming session from the point at which the first prime begins to play until the last prime ends.
- iv. Sessions to criterion: The total number of priming sessions required for a student to reach criterion on the computer.

## b. In-Vivo

- i. Accuracy of response: the number of items the student correctly stores in 10 minutes.
- ii. Rate of correct response: If the student is able to put away all of his or her groceries within the allotted time, the rate of correct response will provide additional information about student improvement.

## CHAPTER 2

### LITERATURE REVIEW

To establish a foundation for this study, the review of literature consists of two primary foci. First an examination of priming literature related to instruction of students with autism will expose vast weaknesses in design elements of the published literature. While most of these priming studies have focused on teaching social skills, the format of their instructional sequence closely parallels this investigation. The second focus scrutinizes current literature on video based instruction for students with autism. While some of the video literature overlaps with the priming literature, this later portion of the review concentrates less on issues of design and more on issues of the characteristics of video instruction that have been used with students with autism. The literature reviewed on video based instruction has been accepted for publication by Education and Training in Developmental Disabilities and is being inserted here in its entirety with permission from the publisher pending.

Evaluated together, the current base of literature on priming and video based instruction reveals that “what we know, that is what we possess in our knowledge base for educational treatment and intervention, is infinitely less than what we want to know and what we need to know” (Ayres & Langone, in press). The combination of these reviews will reveal that this area of video based research holds promise but requires further systematic investigation.

## Priming

Evidenced based practice in special education is paramount to the success of students with disabilities. Identifying evidenced based practices and implementing these strategies in the classroom is part of the role of a special education teacher. The task of identifying evidence based practiced becomes difficult when the social validity of certain interventions and treatments exceeds the empirical efficacy data. Interventions for children with autism have long suffered from a host of interventions, like vitamin therapies and sensory integration, whose social validity exceed empirical support (Schwartz, 1999). Some currently popular social skills intervention strategies for children with autism are based on the behavioral process of priming: social stories (Barry & Burlew, 2004; Hagiwara & Myles, 1999; Kuttler, Myles, & Carlson, 1998; Lorimer, Simpson, Myles & Ganz, 2002; Rowe, 1999; Scattone, Wilczynski, Edwards, & Rabian, 2002; Smith, 2001; Swaggart et al. 1995; Theimann & Goldstein, 2001;), power cards (Keeling, Myles, Gagnon, & Simpson, 2003), video priming (Charlop-Christy & Danjeshavar, 2003; Charlop & Milstein, 1989; Charlop-Christy, Le, & Freeman, 2000; Schreibman, Whalen, & Stahmer, 2000; Sherer et al., 2001, Simpson, Langone & Ayres, 2004; Taylor, Levin, & Jasper, 1999) and script fading (Koegel, Koegel, Frea, & Green-Hopkins, 2003; Zanolli, Daggett & Adams, 1996) which has varied research support.

In general priming involves low demand conditions where a student has access to rich schedules of reinforcement prior to the student experiencing higher demand conditions or a thinner schedule of reinforcement (Wilde, Koegel, & Koegel, 1992). For example, before transitioning from one classroom to another, a teacher may “remind” the class to walk quietly on the right side of the hallway by asking a simple question, “What

is the rule for walking in the hallway?” Students would then hopefully respond to this prime by walking down the right side of the hallway quietly. By definition, priming takes place prior to a scheduled activity or event. Therefore, teachers are afforded a facile way to manipulate antecedent events, promote pro-social and academic behaviors while potentially reducing the likelihood of problem behaviors. While priming techniques have been used to teach a variety of skills to children with autism some current trends in classroom instruction warrant consideration.

New variations of priming strategies, like social stories and powercards, have not yet had strong empirical support, but are widely touted as intervention strategies for children with autism (c.f. Rowe, 1999; Smith, 2001). Wolery and Garfinkle’s (2002) general review of interventions and program evaluations for young children with autism revealed serious design and measurement flaws in the published literature. The priming literature exhibits several of these and other flaws that restrict the external validity of their findings. Because of these design short-comings, further research is needed in this area to validate or invalidate the use of these strategies.

In a search of the research literature for studies involving priming for children with autism, 21 empirical single subject research studies were initially identified based on using the following search terms with autism: priming, script fading, video, social stories, and power cards. The identified studies clustered around certain interventions as indicated by the key terms but some studies blended multiple approaches to priming. For example, Norris and Datillo (1999) and Hagwari and Myles (1999), used video and social stories. In addition, several of the studies used treatment packages that included a priming component (e.g. Theimann & Golstein, 2001).

This review focuses on the research design elements of the priming literature rather than on specific outcomes (see Table 1). An appropriate research design is a prerequisite for demonstrating reliable and valid results. Therefore this critique follows the tact of Wolery and Garfinkle in looking at research design and adherence to experimental design guidelines (issues related to procedural fidelity, inter-observer agreement, social validity) while taking into consideration recommendations made in 2001 by the Committee on Educational Interventions for Children with Autism of the National Research Council [NRC].

The NRC recommended that researchers reporting on single-subject (or group designs) should include specific information about participants and participant's families, concluding that familial situation may influence treatment outcomes and that the diversity of characteristics evident in children with autism are important factors to consider. Further, echoing Sidman's position that "the soundest empirical test of the reliability of data is provided by replication" (1960, p.70), the NRC highlights the need for replications of treatment effects as a necessary condition to form conclusions about the effects of treatment. This review focuses on the extent to which the single-subject research designs employed in the priming literature allow for direct intra and inter subject replications. Lastly, this review takes into account efforts made by researchers to report generalization and maintenance of treatment effects.

#### *Procedural reliability and Inter-observer Agreement*

Procedural reliability is important to the integrity of research because it is a measure of how closely treatment implementation follows the planned protocol. Of the 21 studies reviewed, only 9 studies presented procedural reliability. While 42% of studies

reporting data about adherence to treatment seems low, the data are high compared to the 13.9% Wolery and Garfinkle (2000) reported in the 60 cases they reviewed. Of the studies reporting procedural reliability, the range was 82 to 100% with most averaging 90% or higher. These studies also collected procedural reliability in 20 to 100% of sessions.

More researchers reported inter-observer agreement. With studies that evaluate social interaction, inter-observer agreement is critical because of the sometimes ambiguous nature of recording social interactions. Only 3 of 21 studies did not report any inter-observer agreement (Swaggart, Gangon, Bock, & Earles, 1995; Keeling, Myles, Gagnon, & Simpson, 2003). Those authors reporting inter-observer agreement typically calculated agreements by taking the number of agreements, dividing by the number of agreements plus the number of disagreements and multiplying by 100. They overwhelmingly collected inter-observer data in more than 30% of total sessions. The range of agreement stretched from a low of 64% (Norris & Datillo, 1999) to highs of 100% in several studies.

### *Social Validity*

Social validity is typically a secondary, subjective measure that is used to evaluate the social importance of goals, treatments and outcomes of research (Wolf, 1978). Perhaps more importantly for researchers, social validity is a “defensive tactic” of research that helps researchers evaluate the likelihood that consumers will use their intervention once the study concludes (Schwartz, 1999). Only five studies reported measures of social validity (Barry & Burlew, 2004; Charlop & Milstein, 1989; Hagiwara & Myles, 1999; Scattone, Wilczynski, & Edwards, 2002; Sherer, Pierce, Paredes,



Kisacky, Ingersoll, & Schreibman, 2001; Theimann & Goldstein, 2001), but at 23%, this figure is higher than Wolery and Garfinkle's 8.3% for autism intervention studies. Some of the researchers may have assumed social validity was implicit in their selection of target behaviors and the fact that they had obtained informed consent from participants or their guardians. Regardless, social validity evaluations of treatment outcomes and procedures can be and should be reported to supplement primary research findings. Research without the social context of participants' and families' goals, the stakeholders' feelings about the intervention, and the community's evaluation of outcomes, remains abstract and not "applied."

### *Maintenance and Generalization*

One of the principal goals of applied research in the behavioral tradition is to achieve generalizable outcomes (Baer, Wolf & Risley, 1968). Seven studies reported data about the generalization of treatment and five studies, all having reported generalization data, also provided data about maintenance of treatment outcomes. With priming research, it is important for the data to demonstrate that after intervention has concluded, the student reliably engaged in the newly learned behavior. Beyond simply reporting generalization and maintenance data, future research needs to evaluate the systematic fading of primes. For instance, many of the video priming studies required a student to view a video clip and then "do the same" immediately afterward (e. g Charlop, Christy, Le, & Freeman, 2000; Charlop & Milstein, 1989). In the context of maintenance researchers should evaluate the temporal proximity of primes to the demands to perform the target behavior. Systematic fading in this way would help to determine the potency of a prime and how latency between the prime and the target demand condition effect

behavior. The key is to identify how far in advance primes can be viewed in order to still be effective. The further a prime can be from the anticipated point at which a behavior is expected to occur and still be effective will assist practitioners with structuring their class schedules and instructional delivery.

### *Reporting on Characteristics of Participants and Families*

The NRC made the recommendation to include information about a student's family situation based on the assumption that where and how a student lives could influence the effectiveness of treatment. Essentially wanting to report on potential history threats, this recommendation by the NRC has not been systematically followed since its first printing in 2001. Whether following the NRC's recommendations or not, those studies published since 2001 were more likely (4 of 11) to report information about a student's family than those published prior to 2001 (0 of 10). However, when confronting page limits and other editorial considerations, researchers may likely chose to write a more detailed and replicable description of intervention procedures rather than include information about a student's family. The diversity of individuals identified with autism dictates that researchers take special care to report as specifically as possible characteristics of their participants and how participants were selected. Authors approached the description of participants by providing test data, behavioral observations data, or both. The level of detail in this information is important in single subject research because systematic replications of the same treatment with different populations extend the external validity (Wolery & Ezell, 1993). Only 12 of the 21 studies provide standardized test data and behavioral data; 7 of the studies only provided behavioral observation data and 2 studies relied on standardized tests numbers to describe

participants. Without sufficient descriptions of participants, the generality and applicability of a study's results limit the ability of a study to help form a basis for evidenced based practices.

### *Replication of Effects*

Replication is a fundamental process of scientific inquiry: "replication...reduces a scientist's margin of error and increase confidence that findings which withstand repeated tests are real" (Tawney & Gast, 1984, p. 95). Sidman (1960) outlined two distinct types of replication. The first of these, direct replication, is the form of replication most often appearing in a single study with intra or inter subject replication. The second type, systematic replication, occurs in a separate study by the same or other researchers. Systematic replication through collected studies forms the foundation for concluding that a specific intervention is best practice.

In single subject research, a researcher can demonstrate direct replication in a study by showing intra or inter subject replication of effects. Ideally, researchers design their studies with the possibility of showing both. This can be accomplished, for example, by replicating withdrawal or reversal designs (intra-subject) with several students (inter-subject) or by using a multiple baseline across behaviors (intra-subject) and replicating with multiple students (inter-subject) or by using a multiple baseline across participants (inter-subject) and then replicating the same intervention with another set of behaviors and the same set of students(intra-subject).

Of the 21 studies surveyed, 14 were designed to allow both intra and inter-subject replication. An a priori condition for having inter-subject replication is the inclusion of more than a single participant. This requirement immediately excluded five studies that

had only a single student (see Table 1). Of the remaining studies, five had 2 participants that allowed for inter-subject replication but did not conform to the general standard of three replications. Eighteen studies were designed to allow demonstration of intra-subject replications (refer to the summary in Table 1).

### *Summary*

With a small field of studies providing the foundation for priming interventions for students with autism, researchers should redouble their efforts to systematically replicate what has been preliminarily demonstrated in this area. If teachers choose to use priming procedures, they do so without a mass of empirical data for support. For example, of the studies reviewed here, eight evaluated social stories as part of an intervention package or individually (Hagiwara & Myles, 1999; Kuttler, Myles & Carson, 1998; Swaggart, Gagnon, Bock & Earles, 1995; Norris & Dattilo, 1999; Scatone, Wilczynski & Edwards, 2002; Barry & Burlew, 2004; and Brownell, 2002; Theimann & Goldstein, 2001) and while these studies may posit intriguing ideas that may facilitate positive change in the behavior of children with autism, sound systematic evaluation needs to occur. Further, the relevant characteristics of a prime and what makes a potent prime requires further investigation. This will only occur after researchers systematically build an empirical base.

### *Video*

The focus of this review is video-based modeling for people with autism. Studies were identified that use video as part of an instructional package for students with autism. In the process of reviewing the studies, the focus of instruction with video separated into two primary areas: (a) instruction of social skills with video and (b) instruction of

functional skills with video. Information regarding the literature reviewed here is presented in relation to these categories and includes recommendations for future research and implications for practice.

### *Method*

Studies identified for this review met the following criteria (1) the study was empirical and published in a peer-referred journal (2) the study examined use of video as an intervention tool for students with autism, (3) at least some participants in the study were identified as having a diagnosis of autism (4) if the study included other participants, results needed to be reported in a format that allowed evaluation of treatment effects on individuals with autism separate from the others, and (5) the article had to be written in English. To locate studies, a computer search on the ERIC and PsycInfo databases was conducted using combinations of the search terms and phrases: video and autism. After identifying the initial group, an ancestral search of their references was conducted in to locate additional articles. Lastly, a manual search was done of the tables of contents of relevant journals: *Focus on Autism and Developmental Disabilities*, *Journal of Educational Computer Research*, and *Journal of Special Education Technology*. Fifteen articles were ultimately identified for this review.

In the process of cataloging the studies, patterns were found in the clusters of skills researchers targeted for intervention; in nine of the studies researchers used video in an effort to teach social skills (see Table 2) and in six of the studies the researchers used video primarily to improve functional skills of the participants (see Table 3). Evidence of other patterns in the literature surrounded what students viewed in the video and when they viewed it relative to opportunity to engage in the target behaviors. Seven

studies identified used video of either adult or peer models for the video portion of their intervention (Alacantara, 1994; Charlop & Milstein, 1989; Charlop-Christy, Le, & Freeman, 2000; Haring, Kennedy, Adams, & Pitts-Conway, 1987; Ogletree & Fischer 1995; Simpson et al. in press; Taylor, Levin, & Jasper, 1999). In four studies, students watched video footage of themselves (Hagiwara & Myles, 1999; Lasater & Brady, 1995; Sherer et al. 2001; Thiemann & Goldstein, 2001, Wert & Neisworth, 2003). Three studies used video that did not directly depict human models (Norman, Collins, & Schuster, 2001; Schreibman, Whalen, & Stahmer, 2000; Shipley-Benamou, Lutzker, & Taubman, 2002).

Structuring this review around social skills and functional skills allows a detailed and focused discussion on these curricular areas significant to students with autism. Each article is discussed with regard to three primary variables: first, what or who was filmed for the video portion of the intervention; second, how the video was used as part of an instructional package; third, a critical analysis of the study's results and features of the interventions that had an impact on student behavior. The final portion of the overall review will examine commonalties between successful use of video to teach students with autism, highlighting implications for practitioners and suggesting future research.

### *Review*

*Social skills.* The *Diagnostic statistic manual of mental disorders-IV-TR (DSM-IV-TR, 1995)* delineates several characteristics of autism that are directly related to social skills. For example, deficits in non-verbal behaviors (e.g. eye gaze), lack of friendships with peers, absence of behavior related to sharing interests or emotions with people all illustrate behaviors exhibited by people with autism. Other characteristics included in the

DSM-IV-TR describe how people with autism often have difficulty engaging in conversation and that they may use repetitive words or phrases in their conversation. Children's play may be restrictive and void of social imitation. Further, people with autism may exhibit adherence to schedules or routines that appears extreme. A great deal of research in autism attempts to address these social-behavioral issues. Six studies reviewed in this article used video in an attempt to improve social behaviors so that students would have greater access to everyday interactions with their peers without disabilities and have greater opportunity to integrate with their peers in general education and social situations.

Studies designed to remediate social skills deficits addressed a range of specific behaviors. Most narrowly targeted conversational skills and social conventions of conversation (e.g. topic maintenance, eye gaze). Two used video of scripted scenarios to teach conversation skills. Charlop and Milstein (1989) filmed two adults engaging in scripted conversation about different concrete objects (e.g. a box) and common abstract issues (e.g. how some one is feeling). Taylor et al. (1999) also used scripted conversation of an adult conversing with one of the participants' siblings.

Charlop and Milstein (1989) used their videos as instructional models for three young children with autism. The videos contained scripted conversational exchanges in the format of questions and answers between the two adult conversation partners. Students viewed these videotapes individually and then were asked to do what they saw in the video. During probe trials on the concrete conversations, the objects that the adults used in the video models were present as referents for the conversation. Students acquired the scripted conversation and generalized the conversation to novel settings and

conversation partners. Students also exhibited increases in related response variation. Further, students maintained these conversation skills 15 months after intervention ended and researchers reported positive findings in regard to social validity. One of the conclusions the researchers inferred from their findings was that their participants' echolalic speech patterns and strong rote memories helped them to acquire the target skills. In sum, video proved useful as a tool to model conversational speech.

Taylor et al. (1999) took a similar approach except that they varied their videos slightly from the format employed by Charlop and Milstein (1989). First, rather than filming adults conversing they filmed an adult engaging in conversation with a child during a play scenario. This approach aligns with what Bandura (1969) suggested about the characteristics of peer models and the ability to predict how well other students will imitate their behavior. Second, the researchers reported results from another experiment in which they only scripted the conversation of the adult model in the video and allowed the child conversation partner more natural opportunities to respond. Participants in the study viewed the videos three times and then were given the opportunity to engage in the play scenario depicted in the video clip. While the students viewed the video, the researchers supplied positive verbal praise for attending to the clip. In the first experiment the student made dramatic increases in his play comments after introduction of the intervention (in baseline conditions the student did not make any scripted or unscripted response). In the second experiment, the participant made increase in his verbal statements during play; he repeated statements modeled in the video but also made novel statements.



This study replicated the findings of Charlop and Milstein (1989) but with some variation. Taylor et al. (1999) concluded that because their second experiment succeeded in increasing the number of statements made by the participant, both novel and scripted, that using a normative, more natural conversational model with a wider variety of response than would be allowed by a scripted conversation may promote more spontaneous unique speech. Regardless, in both studies use of video facilitated acquisition and response generalization of conversation skills by students with autism allowing them more naturalistic social interactions with peers and adults.

Simpson, Langone, and Ayres (in press), focused on a broader array of social skills: taking turns, following teacher instructions and initiating greetings. Students worked on a computer program that presented a declarative statement about one of the target behaviors and then showed video examples of peers engaging in the target behaviors. Students all showed improvements in the target behaviors but some of the students had accelerating baselines. These accelerations are somewhat muted by the steady baselines and sudden changes in level for most of the behaviors. One limitation of their study was that some of the students already possessed parts of the target behaviors in their repertoire so the gains made by these students was limited by a ceiling effect.

Three other studies specifically addressed conversation and each used video in a different manner. Ogletree and Fischer (1995) used video segments from animated Disney movies to teach a young student with autism to improve her response latency to questions, her ability to stay on topic during a conversation, and the length of time she would look someone in the eye while speaking to them. The student watched the selected video clips while discussing good and bad examples of the target behavior with the

teacher. Then 10 min segments of the student's interactions were videotaped and evaluated for her engagement in the target responses. The researchers reported marginal improvement in the student's target behaviors.

Ogletree and Fischer (1995) saw the largest impact of their intervention on topic maintenance where the student moved from a ratio of on topic to off topic statements of 54% up to 100% after intervention. This comes with a caveat; the researchers admit that control over the topics in probe sessions varied and that certain topics may have provided better opportunities for the student to remain on topic. The researchers never gathered baseline data on the student's eye gaze so any data gathered after intervention cannot be attributed to effects of treatment. With regard to reducing the student's response latency, the researchers did not report any significant gains; however baseline data already showed the student responding within appropriate lengths of time to most dialogue thus intervention on this behavior may not have been warranted.

In 2001, Thiemann and Goldstein used yet another permutation of video based intervention to address conversation skills for students with autism. Targeting a range of conversation conventions (e.g. responding, securing attention, initiating a request), Thiemann and Goldstein's intervention had three primary components. The first involved students reading a social story (see Gray, 1995) that was designed to discuss the targeted skills. Second, the student's had an opportunity to interact with peers without disabilities in a situation that would require engagement in the targeted skills. The peers were taught to use either written or picture cues to prompt the student to engage in the target behaviors. These interactions were video taped. Third, following taping, the students

viewed the tapes and evaluated their own behavior on the tapes in a self-monitoring exercise.

Students made improvements on acquisition of all of the dependent variables. Some students generalized the behaviors to novel settings and activities. The authors also reported that maintenance data does not show durable effects of treatment over time. Despite these positive results for acquisition and mixed results for generalization and maintenance, experimental control was questionable for some of the behaviors. For example, accelerating baselines and highly variable data before and after treatment make attribution of positive changes in behavior to treatment difficult. Further, design of the treatment did not allow for separation of effects based on different treatment elements (e.g. social stories, peer prompting, and self-monitoring). This final point stands out as especially significant because the researchers essentially evaluated three different treatment options with varying degrees of research support. Social stories have little empirical data to support their use (e.g. Kuttler, Myles, & Carlson, 1998; Hagiwara & Myles, 1999). Peer mediated instruction or peer tutoring has wide acceptance as best practice (see Fischer & Schumaker, 1995) and effectiveness of self monitoring and self management techniques have also been verified through research (see McDougall, 1998). The unique aspect of this study that teachers could easily translate into practice is the self-monitoring component. Unfortunately, the data do not show that this alone had a positive impact on student behavior.

Wert and Neisworth (2003) contributed to a scant body of literature on video self modeling (VSM). This is a procedure whereby video is collected showing the student performing some target behavior with the assistance or prompting of others. The prompts

are then edited out to give the appearance that the individual is performing the target behavior independently (Hosford, 1981). In a very well controlled study the researchers evaluated effectiveness of VSM to teach spontaneous requesting to preschoolers with autism. After taping the students during a play session receiving prompts to request items, the researchers edited out the prompts. Students then viewed these tapes each morning before going to school. All students had very stable baseline data that increased markedly once VSM was introduced. Further, students maintained the target behavior for two to six weeks following intervention. This study suggests of VSM is an very effective tool for modeling social behaviors to students with autism. It may not be the most parsimonious, however, considering the investment in time and equipment to create video tapes.

In teaching conversation skills, Sherer et al. (2001) used a research approach. Using a multiple baseline design across participants paired with an alternating treatments design, they compared effectiveness of two different types of video models (VSM and peer modeling) to teach answering conversational questions to five students with autism. To facilitate comparison the researchers used two sets of questions, one for each treatment condition. Some questions required a finite answer (e.g. what school do you attend) while others required more abstract or indefinite responses (e.g. what is your favorite game). The researchers do not report any evaluation of comparable difficulty of the question sets.

In one set of videos used for intervention, students viewed themselves correctly engaging in the target behaviors; in the other set of videos, students viewed another child without disabilities conversing with an adult while modeling the target behaviors. The

video of the participant engaging in the target behaviors was created by taping a conversation with the child where the researchers prompted correct responses. In editing, these prompts were removed to produce a video with the appearance of the child engaging independently in the target behaviors. The researchers took baseline data before and after the creation of the videos to control for threats to internal validity posed by the prompted conversations. In treatment, students viewed the video of the target conversation three times on the night prior to probes.

Data showing four of five participants making significant gains in regard to the dependent variables, with two participants responding correctly in nearly 100% of opportunities. Students that reached 100% levels of appropriate social engagements also generalized this behavior to untrained settings and conversation partners. Of these students who showed large gains, all but one made rapid gains immediately upon introduction of the intervention. One student made gains only after several probe sessions during intervention; therefore changes in the student's behavior may have resulted from repeated exposure to the probe conditions rather than the video intervention. Another student never correctly responded to more than 20% of opportunities; however at baseline levels, he did not perform any of the target behaviors. The most intriguing finding from this study was comparison of the two treatments. The researchers reported no significant differences in acquisition based on which video the student watched: themselves or others. This finding implies that if the time required to make edited self modeling videos is greater than the time to tape a single model accurately performing the behavior (without editing), then using the student as their own model is not an efficient use of time.

In 2000, Schreibman et al. used video in an attempt to reduce tantrum behavior exhibited by three students with autism. The researchers produced videos of event sequences that parents reported typically elicit tantrum behavior. The videos did not depict human models, rather they showed what the student would see as the student made the transitions from their home to a community outing where they typically engaged in tantrum behavior. In treatment, students watched the videos just prior to transitioning to the community outings and they received positive verbal praise for attending to the video. This procedure appears in the literature as priming (see Wilde, Koegel, & Koegel, 1992), whereby the teacher attempts to prepare a student for a pending sequence of events by showing the student pictures, symbols or stimuli representative of coming events.

All students showed decreases in tantrum behavior to near zero levels and generalized this appropriate behavior to other community outings. Limiting the generality of these results the researchers did not provide an operational definition of their dependent variable: tantrum. While lay terminology may suggest certain behaviors that constitute a tantrum, and the authors defined several of these, they did not describe precisely which combinations or which individual behaviors constituted a tantrum. For example, the authors described verbal resistance, which was defined as when a student said “No” or “stop,” but they did not indicate if this alone was tantrum behavior. Regardless of this limitation, all students showed marked decreases in their tantrum behavior.

The last study to specifically address social skills bridges the discussion of using video to teach social skills and functional skills by evaluating the effects of video in the instruction of both. Charlop-Christy et al. (2000) reported on the use of video to teach an

array of skills from spontaneous greetings, to appropriate cooperative play, to brushing teeth. Their research focused on comparing in-vivo modeling to video modeling. In the intervention students watched models (video or in vivo) and then were asked to do the same behavior. The researchers described using models in the video footage who engaged in the task at a slower than normal rate of speed. For their rationale they cite previous research on use of video suggesting that slower paced models facilitate acquisition, though the study they cite as an example, Charlop and Milstein (1989) did not report the evaluation of pace of modeling as an independent variable. The researchers did not specifically report if the in-vivo models also modeled behavior at a slower than normal pace but they stated the in-vivo and video conditions were identical except for means of delivery.

Both interventions were proved successful for some students on some behaviors but overall they did not have resounding effects. A few students showed dramatic gains; while some students showed only marginal gains in acquisition and in several cases trends in data remained flat across conditions. The researchers concluded that video led to more rapid acquisition and generalization.

Social skills instruction for students with autism remains a challenge for educators. Studies reviewed here provide initial evidence that video based instruction can be an effective component of intervention. Only further research will help to elucidate critical characteristics of video models and the most effective procedural uses of video as part of an instructional package. In the broadest sense, social skills function as the key to social inclusion and without proficiency in these skills, students with autism will remain isolated from their peers.

*Functional skills.* In the field of developmental disabilities, the term functional skills has become a generic term used to collectively refer to sets of life skills that people need to use in the community, in their home, and in the work place. Researchers have reported use of video to teach a limited number of functional skills to students with autism. Two studies in this review (Alcantara, 1994; Haring et al. 1987) used video to teach shopping skills to students with autism. The remaining four studies used video to address a wider assortment of skills that primarily occur within the home.

Haring et al. (1987) taught three adults with autism how to purchase items from community stores in-vivo until they participants achieved 90% accuracy on the operational steps of the task analysis of the skill in one setting. Operational steps on the task analysis were separated from social steps with the former being essential for making a purchase (e.g. handing the cashier money) and the latter considered non-essential for making a purchase (e.g. saying hello). After achieving 90% accuracy on operational steps, the participant viewed video of a model performing the target behaviors in a store. The setting of the video taping (whether in the initial training store, in one of the generalization stores, or a setting the students never encounter) is unclear. However, once participants began watching the videos, impressive changes occurred in responses in the initial training setting and in generalization settings (these were probed periodically during training in the initial training environment and students consistently showed low levels of accurate performance).

The researchers reported large increases in number of accurate social responses made by participants after introduction of the video intervention. In addition, each participant began to generalize their purchasing skills to the untrained environments.



Results of this research are important to consider in the discussion of community based instruction because of the inherent cost and logistical obstacles of such programs (Wissick, Gardner, & Langone, 1999). If educators can teach skills in a single setting to some degree of mastery and then use video to facilitate generalization to other settings, the teacher can maximize the effectiveness and efficiency of his or her instruction by allowing students the opportunity to learn more varied skills in more settings rather than having to spend large portions of time in a set of similar settings drilling the same skills. Video can serve as a supplement and extension of the in-vivo instruction.

Alcantara (1994) reported findings in use of video to teach shopping skills that differed somewhat from Haring et al. (1987). Where Haring et al. taught participants in-vivo and used video as a tool to facilitate generalization to untrained settings, Alcantara used video for teaching acquisition of purchasing skills following a 32 step task analysis. Students viewed narrated video of a model performing the correct behaviors. The narration included descriptions of the relevant stimuli in the video. Immediately after viewing the videos participants went into the community to make a purchase.

Alcantara (1994) reported that students began to acquire skills through video based instruction alone; however some steps in the task analysis needed direct instruction in-vivo. For this component of the intervention, the researcher used a least to most prompting procedure. All students acquired and generalized the purchasing skills to new settings. The researcher also reported a decrease in the total amount of time required for students to make a purchase. Measurements like this help to provide a practical framework with which to consider the success of an intervention. While reporting that a student can perform all of the steps required to make a simple purchase, if that purchase

takes them 30 min, then the intervention needs reshaping to reduce the duration to a more typical level.

The next two studies both used VSM to target increases in functional skills. Rather than using video to teach acquisition of target functional skills, Lasater and Brady (1995) used video to increase participant fluency in several skills. The researchers taped the students performing the target skills and similar to Sherer, et al. (2001) and Wert & Neisworth (2003), they edited the tapes to represent the ideal model of the behavior. In Lasater and Brady's case, that required editing out off-task behavior during performance of the functional skills. Students viewed four videos prior to engaging in the target behavior. The first video showed the student performing the behavior with all off-task behaviors edited out, the second video showed the student's natural performance of the behavior with all off-task behavior included, and the final two videos were identical to the first. During viewing of videos, the researcher asked the student questions about the clips in an attempt to help the student to discriminate appropriate on-task behaviors. Following the video, the student and researcher engaged in a brief behavioral rehearsal of the skill and the student was then asked to perform the skill. In all cases students increased their fluency in the skill and decreased off task behavior. Further, they generalized task fluency to other untrained tasks. This suggests that the intervention succeeded in specifically reducing off task behavior that interfered with task fluency and by repeatedly viewing and discriminating on-task from off-task behavior, students learned the appropriate response durations required to complete the tasks in a reasonable amount of time.

In another study designed using self modeling, Hagiwara and Myles (1999) designed multimedia based social stories with video vignettes of the student engaged in the target behaviors. The researchers specifically addressed hand washing and time on task. The description of video clips in the multimedia based social story is very limited and therefore it is difficult to discern how videos were edited but the researchers did provide screen captures of several pages from the story book. Students went through the storybook on the computer and then had the opportunity to engage in the target behavior. Results do not provide convincing evidence of the impact of treatment. For one student, data were nearly flat from baseline to treatment with percentage of overlap almost 50% in some cases. For another student, researchers reported overlap between baseline and intervention data near 70%. The high degree of overlap between baseline and treatment conditions in this study may be attributable, in part, to the already high degree of skilled performance students exhibited in baseline. With some students already achieving above 80% accuracy (or time on task), students had very little space to improve. This study is notable because it is the only study that tried to combine video with computer technology to teach students with autism.

The final two studies used video shot from the perspective of the person engaging in the task. Shipley-Benamou et al. (2002) filmed video as if the camera were the eyes of the person performing the task. Norman et al. (2001) described this video as being filmed from the subjective view point. Students saw the hands of a person setting the table or mailing a letter depending on the target skill. The video included narration describing the steps of the skill. The first 5s of the video included a clip of a cartoon to capture the student's attention and during the video the researchers provided verbal praise for

attending. After students viewed the video they had the opportunity to do what they saw. All students made significant improvements in the target skills and these changes in behavior proved durable one month after intervention ended.

In 2001, Norman et al. used a video based instructional package with subjective video to teach functional skills to a group of students, one of whom was diagnosed with autism. Using a well described procedure, researchers taught students in a small group format using a total task presentation paired with a constant time delay (CTD) procedure (Wolery, Ault, & Doyle, 1992). The video served as part of the controlling prompt in the CTD procedure. The student with autism acquired the first skill targeted in the multiple baseline design, cleaning glasses, but the researchers had to make alterations to the procedures for him because of the length of time it took for him to acquire the skill. The researchers added a massed trials component to the intervention to assist the student with acquisition. This student then returned to the group instructional format, skipping the second skill targeted for intervention, and he succeeded in acquiring the third targeted skill (engaging a zipper) without procedural modifications. Aside from acquiring the skills, the student also made dramatic improvements in the amount of time it required him to complete the tasks (from 8 min 1 s for cleaning glasses to 4 min, 36 s to 29 s for engaging a zipper). They reported that this method of instruction was more efficient for this student than methods with which he had previously been taught.

Similar to the studies reviewed addressing social skills, researchers have successfully used video to teach acquisition and generalization of functional skills to students with autism. Again, the components of intervention require further investigation but this small body of literature suggests that a variety of skills can be taught via video

based instruction. Further implications with regard to community based instruction and video use exist when one considers the ability to include video as part of a simulation or training routine.

*Conclusions.* What we know, that is what we possess in our knowledge base for educational treatment and intervention, is infinitely less than what we want to know and what we need to know. Using video to teach students with autism is an area full of possibilities for teaching individuals with autism complex skills. In the area of social skills, Sherer et al. (2001), Theimann and Goldstein (2001), and Charlop-Christy et al. (2000), Taylor et al. (1999) Charlop and Milstein (1989) have demonstrated the power of video for teaching conversation skills. Students with autism were able to accurately imitate the models presented via video. Schreibman et al. (2000) used a unique strategy with VSM to alter tantrum behavior exhibited by students during transitions. Video has also proved useful for teaching grocery shopping skills (Alcantara, 1994, Haring et al. 1987). Others present convincing results concerning the potency of video as an instructional component for basic self-help or daily living skills of preparing food (Lasater & Brady, 1995), cleaning glasses (Norman et al., 2001), and mailing a letter (Shipley-Benamou et al., 2002).

A genuine question that arises out of syntheses such as this is: How can teachers take this information and apply it to everyday teaching and instruction? Therein lies the challenge, not only to teachers, but researchers as well. Theimann and Goldstein (2001), presented one option of using video for students to perform self evaluations. Their report can help teachers to design protocols and programs specific to the students they serve. For example, teachers could use video to enhance student awareness of behaviors

targeted for change such as the decrease of self stimulatory behaviors or the increase of time on task.

Several studies present possibilities for use of video recording of conversations (e.g., Charlop & Milstein, 1989). While this body of research demonstrates the utility of video for teaching conversations, educators need to design and implement individualized instruction to meet the needs of their students. Teachers might design video lessons that depict students initiating and sustaining a variety of conversation appropriate for individuals their age. Using information about style and types of conversations taped in the research literature as a foundation, teachers can build more comprehensive programs to help students meet their goals.

Finally, researchers have demonstrated effectiveness of using video models for teaching functional skills to learners who have autism (e.g., Norman et al., 2001). For example, video has been used to teach preparation of food, shaving, and other daily living skills (e.g., sorting clothes, making a bed). Video can isolate steps of a process and show perfect, repeated demonstrations of critical steps. Singularly, one of the more important behavioral principles for teaching students who have significant disabilities is the need to provide repetition of the targeted skills while manipulating important exemplars (e.g., materials). Video models allow for skills to be taught multiple times during the day without having the teacher involved in the instruction each time. Teachers can assign the instruction to their paraprofessional, for example, and be more confident that instruction will be reliably delivered because video models are archived, or standardized, and thus delivered in a consistent manner. In addition, video models allow teachers to provide learners with repetition of critical steps of the task analysis by replaying the prompt

depicted in the video. This strategy can be especially useful when using digital video delivered by a computer. Therefore, teachers can prepare a number of lessons using video models to depict a variety of functional skills (e.g., making a bed) that can be used over again with many students.

In sum, researchers have explored a variety of skills sets in which teachers can integrate video as a component of instruction. While they have demonstrated the functionality of video to present multiple exemplars, control the presentation and allow repeated exposures to the identical stimuli as students are acquiring skills, little progress has been made in identifying the critical components of video models and video based instruction. The value of video to present an assortment of stimuli which may or may not be immediately accessible in the classroom is self-evident, but how that video is made and how it is used needs further exploration. Sherer et al. (2001) have begun to take the first steps in comparatively evaluating components of video modeling by weighing VSM against video models of adults performing target skills. Systematically isolating video components and then repackaging them into the most efficient and effective tools for teaching should be the goal of research in this area.

With video technology that can provide vivid depictions of the natural environment and with computer technology evolving to make incorporation of video into computer programs easier, researchers may want to focus further investigation into this area. Combining rapid feedback and salient interactive video features may create optimal learning environments for students with autism. The only obstacle to empirical investigation in this area is the creation of quality programs based on sound instructional practice. To date the educational software industry has provided little in this realm. If, by

demonstrating products like these are viable, the dissemination of quality products to teachers and students becomes a real possibility.

### Synthesis

Priming can effectively improve the adaptive behaviors of children with autism and the growing interest in the use of video as an instructional tool underscores the potential for combining priming with video. Before incorporating video in priming interventions, researchers need additional evidence as to the best or most efficient video format to use in primes. The proposed study will build on the current data concerning video based instruction and priming to identify whether primes presented in the first or third person are more effective for instruction. The data gleaned from this investigation will assist practitioners with selecting the most efficient route for video based priming intervention. Further, this study will provide a foundation for additional inquiry into other characteristics of effective video based instruction.



Table 1. Design components of priming studies

| Citation                                    | N | Procedural Reliability <sup>1</sup> | Inter-observer Agreement <sup>2</sup> | Social Validity <sup>3</sup> | Maintenance <sup>4</sup> | Generalization <sup>5</sup> | Family Information <sup>6</sup> | Participant Characteristics <sup>7</sup> | Inter-subject Replication <sup>8</sup> | Intra-subject Replication <sup>9</sup> |
|---------------------------------------------|---|-------------------------------------|---------------------------------------|------------------------------|--------------------------|-----------------------------|---------------------------------|------------------------------------------|----------------------------------------|----------------------------------------|
| Bainbridge & Myles (1999)                   | 1 | None                                | 20, 100, 100                          | None                         | None                     | None                        | Yes                             | B,T                                      | N                                      | Y                                      |
| Barry & Burlew (2004)                       | 2 | None                                | 33, X, 97-100                         | Performance                  | None                     | None                        | Yes                             | B                                        | Y                                      | Y                                      |
| Brownell (2002)                             | 5 | No                                  | No                                    | None                         | None                     | None                        | None                            | B                                        | Y                                      | N                                      |
| Charlop & Milstein (1989)                   |   |                                     |                                       |                              |                          |                             |                                 |                                          |                                        |                                        |
| Charlop-Christy, & Daneshvar                | 3 | None                                | 100, 100                              | None                         | Yes                      | Yes                         | None                            | B,T                                      | Y                                      | Y                                      |
| Charlop-Christy, Le, & Freeman (2000)       | 5 | 100, 99, X                          | 50, X, 90-100                         | None                         | None                     | Yes                         | None                            | B,T                                      | Y                                      | Y                                      |
| Hagiwara & Myles (1999)                     | 3 | None                                | 33, X, 89-100                         | Tx                           | None                     | None                        | None                            | T                                        | Y                                      | Y                                      |
| Keeling, Myles, Gagnon, & Simpson (2003)    | 1 | None                                | None                                  | None                         | None                     | None                        | None                            | B                                        | N                                      | Y                                      |
| Koegel, Koegel, Frea & Green-Hopkins (2003) | 2 | None                                | >33, 81&90, 83-100                    | None                         | None                     | None                        | None                            | B, T                                     | Y                                      | Y                                      |
| Kuttler, Myles & Carson, (1998)             | 1 | None                                | 34, 94, X                             | None                         | None                     | None                        | None                            | B,T                                      | N                                      | Y                                      |
| Lorimer, Simpson, Myles, & Ganz, (2002)     | 1 | None                                | 33, 96.1, X                           | None                         | None                     | None                        | Yes                             | B,T                                      | N                                      | Y                                      |
| Norris & Datilo (1999)                      | 1 | 20, 100, 100                        | 20-25, X, 64-100                      | None                         | None                     | None                        | None                            | B, T                                     | N                                      | Y                                      |
| Scattone, Wilczynski, & Edwards (2002)      | 3 | 25, X, 91-100                       | 30, 93, 89-100                        | Tx                           | None                     | None                        | None                            | B, T                                     | Y                                      | N                                      |

<sup>1</sup> Procedural Reliability: The first number indicates the minimum percentage of session data was taken, the second number is the mean, and the third set of numbers is the range. If an X appears in the sequence, this means the authors did not provide that specific figure.

<sup>2</sup> Inter-observer Agreement: The first number indicates the minimum percentage of session data was taken, the second number is the mean, and the third set of numbers is the range. If an X appears in the sequence, this means the authors did not provide that specific figure.

<sup>3</sup> Social Validity: *Performance* means that the student performance was evaluated, *Tx* means the procedures were evaluated, *Goals* means that the goals were evaluated.

<sup>4</sup> Maintenance: means some measure of the independent variable at some point following the conclusion of treatment is provided.

<sup>5</sup> Generalization: Indicates that some measure of generalization of behavior to some novel stimuli was provided (or response generalization was reported)

<sup>6</sup> Family Information: *Y* Indicates that some description of the students family is provided; *N* indicates no information is provided

<sup>7</sup> Participant Characteristics: *B* indicates that behavioral information is provided, *T* indicates that test scores are provided

<sup>8</sup> Inter-subject Replication: *Y* indicates that the author's design allowed for demonstration of inter-subject replication

<sup>9</sup> Intra-subject Replication: *Y* indicates that the author's design allowed for demonstration of intra-subject replication

| Citation                                                                    | N | Procedural<br>Reliability | Inter-observer<br>Agreement | Social<br>Validity | Maintenance | Generalization | Family<br>Information | Participant<br>Characteristics | Inter-subject<br>Replication | Intra-subject<br>Replication |
|-----------------------------------------------------------------------------|---|---------------------------|-----------------------------|--------------------|-------------|----------------|-----------------------|--------------------------------|------------------------------|------------------------------|
| Sherer, Pierce,<br>Paredes, Kisacky,<br>Ingersoll,&<br>Schreibman<br>(2001) | 5 | None                      | 33, 99, 88-100              | Tx                 | Yes         | Yes            | None                  | T                              | Y                            | Y                            |
| Schreibman,<br>Whalen, &<br>Stahmer (2000)                                  | 3 | None                      | 33,97.8, 87.8-<br>100       | None               | None        | None           | None                  | T                              | Y                            | N                            |
| Shipley-Benamou,<br>Lutzker, &<br>Taubman (2002)                            | 3 | None                      | 30, X, 96-100               | None               | Yes         | Yes            | Yes                   | B                              | Y                            | Y                            |
| Simpson,<br>Langone, & Ayres<br>(in press).                                 | 4 | 30, 100%                  | 30, X, 97-100               | None               | None        | None           | None                  | B                              | Y                            | Y                            |
| Swaggart,<br>Gagnon, Bock, &<br>Earles, 1995                                | 3 | None                      | None                        | None               | None        | None           | None                  | B                              | Y                            | Y                            |
| Taylor, Levin &<br>Jasper (1999)                                            | 2 | None                      | 30,97, 70-100               | None               | None        | None           | None                  | B                              | Y                            | Y                            |
| Theiman &<br>Goldstein (2001)                                               | 5 | 20, 89, 82-<br>100        | 30, X, 80-100               | Tx                 | Yes         | Yes            | None                  | B,T                            | Y                            | Y                            |
| Zanolli & Dagget<br>(1998)                                                  | 2 | 100, 95, x                | >33, 94, 78-<br>100         | None               | None        | None           | None                  | B                              | Y                            | Y                            |
| Zanolli, Dagget, &<br>Adams (1996)                                          | 2 | 100, 90, X                | >33, X, 86-100              | None               | None        | None           | None                  | B,T                            | Y                            | Y                            |

Table 2

## Primarily social skills interventions

| Reference                             | Participants                                                                                                   | Targeted Skills                                                                                                                                                                                                                                                             | Dependent Variables/Measure                                                                                            | Independent Variable(s)                                                                                                                                                                                                  | Research Design                                                                                                                                                                                                                                   | Conclusions/ Results                                                                                                                                                                                                                 |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Charlop-Christy, Le, & Freeman (2000) | <ul style="list-style-type: none"> <li>5 students 7-11 years old</li> <li>All diagnosed with autism</li> </ul> | <ul style="list-style-type: none"> <li>labeling emotions</li> <li>independent play</li> <li>spontaneous greetings</li> <li>Oral communication</li> <li>Conversation</li> <li>Cooperative play</li> <li>Social play</li> <li>Brushing teeth</li> <li>Washing face</li> </ul> | <ul style="list-style-type: none"> <li>Percentage of correct and independent performance of target behavior</li> </ul> | <ul style="list-style-type: none"> <li>Compared in-vivo modeling to video modeling</li> <li>Same procedures for video and in – vivo modeling.</li> <li>Students watch model and then are asked to do the same</li> </ul> | <ul style="list-style-type: none"> <li>Multiple baseline design across students and multiple baseline within participant across two settings</li> <li>Interobserver agreement reported</li> <li>Procedural reliability reported</li> </ul>        | <ul style="list-style-type: none"> <li>Report that video led to faster acquisition and facilitated generalization more than in vivo</li> </ul>                                                                                       |
| Charlop & Milstein (1989)             | <ul style="list-style-type: none"> <li>3 students 6-7 years old</li> <li>All diagnosed with autism</li> </ul>  | <ul style="list-style-type: none"> <li>Conversation skills</li> </ul>                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>Adherence to scripted conversation</li> </ul>                                   | <ul style="list-style-type: none"> <li>Students watched video of 2 adults having the target conversation then student asked to do the same</li> </ul>                                                                    | <ul style="list-style-type: none"> <li>Multiple probe design across settings and within subjects</li> <li>Multiple probe design across behaviors</li> <li>Interobserver agreement reported</li> <li>No procedural reliability reported</li> </ul> | <ul style="list-style-type: none"> <li>Increase in adherence to script</li> <li>Increase in response variation</li> <li>Generalization to other topics of conversation</li> <li>Generalization across settings and people</li> </ul> |
| Ogeltree & Fischer (1995)             | <ul style="list-style-type: none"> <li>1 student 5 years old</li> <li>All diagnosed with autism</li> </ul>     | <ul style="list-style-type: none"> <li>Semantic and pragmatic language skills</li> </ul>                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>Eye gaze</li> <li>Topic maintenance</li> <li>Response latency</li> </ul>        | <ul style="list-style-type: none"> <li>Watch and discuss one 2-5 min video segment from a Disney movie</li> </ul>                                                                                                        | <ul style="list-style-type: none"> <li>Multiple baseline design across behaviors</li> <li>No procedural reliability reported</li> <li>No interobserver agreement reported</li> </ul>                                                              | <ul style="list-style-type: none"> <li>No change in response latency</li> <li>No improvements in eye gaze that can be assuredly attributed to treatment effects</li> <li>Increase in topic maintenance</li> </ul>                    |

| Reference                                                       | Participants                                                                                                   | Targeted Skills                                                                                                            | Dependent Variables/Measure                                                                                                                                                                     | Independent Variable(s)                                                                                                                                                                                                                | Research Design                                                                                                                                                                                                            | Conclusions/ Results                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Simpson, Langone, & Ayres (in press)                            | <ul style="list-style-type: none"> <li>4 students 5-6 years old</li> <li>All diagnosed with autism</li> </ul>  | <ul style="list-style-type: none"> <li>Following directions</li> <li>Sharing materials</li> <li>Greeting others</li> </ul> | <ul style="list-style-type: none"> <li>Frequency of skill performance per 36 opportunities per day (12 per target skill)</li> </ul>                                                             | <ul style="list-style-type: none"> <li>Video embedded into an interactive computers based program describing and showing the target behaviors</li> </ul>                                                                               | <ul style="list-style-type: none"> <li>Multiple probe across students</li> <li>Reports procedural and interobserver reliability</li> </ul>                                                                                 | <ul style="list-style-type: none"> <li>All show improvements</li> <li>Some accelerating baselines</li> <li>No tests of generalization to novel settings</li> </ul>                                                                                               |
| Schreibma, Whalen, & Stahmer (2000)                             | <ul style="list-style-type: none"> <li>3 students 3-6 years old</li> <li>All diagnosed with autism</li> </ul>  | <ul style="list-style-type: none"> <li>reduce tantrum behavior</li> </ul>                                                  | <ul style="list-style-type: none"> <li>Percentage of observation intervals with tantrum behavior</li> </ul>                                                                                     | <ul style="list-style-type: none"> <li>View video of transition just prior to transitioning</li> <li>Video did not depict models rather it showed the rout of the transition.</li> <li>Verbal praise for attending to video</li> </ul> | <ul style="list-style-type: none"> <li>Multiple probe design across participants</li> <li>Interobserver agreement reported</li> <li>No procedural reliabilityreported</li> </ul>                                           | <ul style="list-style-type: none"> <li>All students reduced tantrum behavior to near zero levels</li> </ul>                                                                                                                                                      |
| Sherer, Pierce, Paredes, Kisacky, Ingersoll,& Schreibman (2001) | <ul style="list-style-type: none"> <li>5 students 4-11 years old</li> <li>All diagnosed with autism</li> </ul> | <ul style="list-style-type: none"> <li>Answering conversational questions</li> </ul>                                       | <ul style="list-style-type: none"> <li>Percentage of correct conversational exchanges including latency or response, accuracy of response and asking the therapist the same question</li> </ul> | <ul style="list-style-type: none"> <li>Student viewed tapes of themselves correctly performing the target behavior</li> <li>Students viewed tapes of others correctly performing the target behavior</li> </ul>                        | <ul style="list-style-type: none"> <li>Multiple baseline design across participants</li> <li>Alternating treatments design</li> <li>Interobserver agreement reported</li> <li>No procedural reliabilityreported</li> </ul> | <ul style="list-style-type: none"> <li>No immediate changes for 2 participants</li> <li>All improved over baseline</li> <li>The 2 participants who reached mastery also generalized the target skills to untrained settings and conversation partners</li> </ul> |

| Reference                      | Participants                                                                                                                                                                                        | Targeted Skills                                                                                                   | Dependent Variables/Measure                                                                                                                                                                                   | Independent Variable(s)                                                                                                                                               | Research Design                                                                                                                                                                                           | Conclusions/ Results                                                                                                                                                    |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Taylor, Levin, & Jasper (1999) | <ul style="list-style-type: none"> <li>2 students ages 6 and 9</li> <li>All diagnosed with autism</li> </ul>                                                                                        | <ul style="list-style-type: none"> <li>Social communication</li> <li>Comments during play</li> </ul>              | <ul style="list-style-type: none"> <li>Percentage of scripted comments repeated during play</li> <li>Number of scripted and unscripted comments during play</li> </ul>                                        | <ul style="list-style-type: none"> <li>Student viewed a video segment 3 times prior to play</li> <li>Video depicted sibling engaging in play with an adult</li> </ul> | <ul style="list-style-type: none"> <li>Multiple baseline design across settings</li> <li>Interobserver agreement reported</li> </ul>                                                                      | <ul style="list-style-type: none"> <li>Students acquired scripted dialogue</li> <li>Evidence of response generalization</li> </ul>                                      |
| Theimann & Goldstein (2001)    | <ul style="list-style-type: none"> <li>5 students ages 6-12 years old</li> <li>4 students diagnosed with autism</li> <li>1 student with social impairments but not diagnosed with autism</li> </ul> | <ul style="list-style-type: none"> <li>Social communication</li> </ul>                                            | <ul style="list-style-type: none"> <li>Number of contingent response</li> <li>Number of securing attention behaviors</li> <li>Number of initiating comments</li> <li>Number of initiating requests</li> </ul> | <ul style="list-style-type: none"> <li>Social story read prior to session</li> <li>Self monitoring of video feedback after session</li> </ul>                         | <ul style="list-style-type: none"> <li>Multiple baseline design across behaviors replicated across students</li> <li>Interobserver agreement reported</li> <li>Procedural reliability reported</li> </ul> | <ul style="list-style-type: none"> <li>Students acquired the target behaviors</li> <li>Some students generalized the target behaviors to untrained settings.</li> </ul> |
| Wert & Neisworth (2003)        | <ul style="list-style-type: none"> <li>4 pre-school aged children</li> <li>All diagnosed with autism</li> </ul>                                                                                     | <ul style="list-style-type: none"> <li>Spontaneous requesting (requesting something without prompting)</li> </ul> | <ul style="list-style-type: none"> <li>Frequency of spontaneous requests during a 30 minute play session</li> </ul>                                                                                           | <ul style="list-style-type: none"> <li>Students viewed 5-min VSM tapes daily for 5 days 60min prior to arriving at school</li> </ul>                                  | <ul style="list-style-type: none"> <li>Multiple baseline design across participants</li> <li>Interobserver agreement reported</li> </ul>                                                                  | <ul style="list-style-type: none"> <li>All students acquire the target skill</li> </ul>                                                                                 |

Table 3  
Primarily functional skills interventions

| Reference                                     | Participants                                                                                                  | Targeted Skills                                                                       | Dependent Variables/Measures                                                                                                                                             | Independent Variable(s)                                                                                                                                                                                                                                       | Research Design                                                                                                                                                                                                    | Conclusions/ Results                                                                                                                                                                                                                                   |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alacantara (1994)                             | <ul style="list-style-type: none"> <li>3 students 8-9 years old</li> <li>All diagnosed with autism</li> </ul> | <ul style="list-style-type: none"> <li>Grocery shopping skills</li> </ul>             | <ul style="list-style-type: none"> <li>32 step task analysis of selecting an item and purchasing the item from the clerk at the store</li> </ul>                         | <ul style="list-style-type: none"> <li>student viewed tape of teacher making a purchase then was taken to the store to do the same</li> <li>Supplemented video instruction with a least to most prompting system in the community setting</li> </ul>          | <ul style="list-style-type: none"> <li>Multiple baseline design across settings and within participants</li> </ul>                                                                                                 | <ul style="list-style-type: none"> <li>Students acquired the target skills</li> <li>Generalized the skills across settings</li> <li>Decreased total time required for student to make a purchase in the store.</li> </ul>                              |
| Hagiwara & Myles (1999)                       | <ul style="list-style-type: none"> <li>3 students 7-9 years old</li> <li>all diagnosed with autism</li> </ul> | <ul style="list-style-type: none"> <li>Washing hands</li> <li>Time on task</li> </ul> | <ul style="list-style-type: none"> <li>Percentage of steps completed of a task analysis</li> <li>Average duration of on-task behavior during a 20 min session</li> </ul> | <ul style="list-style-type: none"> <li>Viewing of a multimedia social storybook on the computer prior to opportunity to engage in target activity.</li> </ul>                                                                                                 | <ul style="list-style-type: none"> <li>Multiple baseline design across settings</li> <li>Interobserver agreement reported without explanation of procedures</li> <li>No procedural reliability reported</li> </ul> | <ul style="list-style-type: none"> <li>Minimal change for all students</li> <li>Intervention was not successful</li> </ul>                                                                                                                             |
| Haring, Kennedy, Adams, & Pitts-Conway (1987) | <ul style="list-style-type: none"> <li>3 adults 20 years old</li> <li>All diagnosed with autism</li> </ul>    | <ul style="list-style-type: none"> <li>purchasing skills</li> </ul>                   | <ul style="list-style-type: none"> <li>Percentage of social and operational steps performed correctly on task analyses</li> </ul>                                        | <ul style="list-style-type: none"> <li>Students instructed in-vivo until they achieved 90% of task analysis steps independently</li> <li>Then students watched video of a familiar peer performing the target skills and were asked to do the same</li> </ul> | <ul style="list-style-type: none"> <li>Multiple baseline design across participants</li> <li>Interobserver data reported</li> <li>No procedural reliability reported</li> </ul>                                    | <ul style="list-style-type: none"> <li>Students all acquired skills in-vivo</li> <li>Student data stabilized after introduction of the video intervention</li> <li>Largest increase in the percentage of social skills performed correctly.</li> </ul> |

| Reference                                  | Participants                                                                                                              | Targeted Skills                                                                                                                                                                                     | Dependent Variables/Measure                                                                                                                                                                                            | Independent Variable(s)                                                                                                                                                                                                                                                 | Research Design                                                                                                                                                                                              | Conclusions/ Results                                                                                                                                                                                                                  |
|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lasater & Brady (1995)                     | <ul style="list-style-type: none"> <li>2 students 14-15 years old</li> <li>1 participant diagnosed with autism</li> </ul> | <ul style="list-style-type: none"> <li>Shaving</li> <li>Making lunch</li> <li>Sort and load laundry</li> <li>Make peanut butter and jelly sandwich</li> <li>Hang pants</li> <li>Make bed</li> </ul> | <ul style="list-style-type: none"> <li>number of steps performed independently on task</li> <li>analysis of skill</li> <li>time to complete task</li> <li>percentage of intervals with interfering behavior</li> </ul> | <ul style="list-style-type: none"> <li>View sequence of 4 videos 15-30s</li> <li>Answer questions during video</li> <li>Behavioral rehearsal</li> </ul>                                                                                                                 | <ul style="list-style-type: none"> <li>Multiple baseline design across behaviors</li> <li>Interobserver agreement</li> <li>No procedural reliability reported</li> </ul>                                     | <ul style="list-style-type: none"> <li>Increased fluency in all behaviors</li> <li>Reduced off-task behavior</li> <li>Fluency generalized to untrained activities</li> </ul>                                                          |
| Norman, Collins, & Schuster (2001)         | <ul style="list-style-type: none"> <li>3 students ages 8 -12</li> <li>1 student diagnosed with autism</li> </ul>          | <ul style="list-style-type: none"> <li>cleaning glasses</li> <li>putting on a watch</li> <li>engaging a zipper</li> </ul>                                                                           | <ul style="list-style-type: none"> <li>% of independent response on task analysis of target skill</li> </ul>                                                                                                           | <ul style="list-style-type: none"> <li>Group instruction utilizing video footage as a prompt in CTD procedure</li> <li>Modified with massed trials for student with autism</li> </ul>                                                                                   | <ul style="list-style-type: none"> <li>Multiple probe design across behaviors replicated across students</li> <li>Interobserver agreement data reported</li> <li>Procedural reliability reported</li> </ul>  | <ul style="list-style-type: none"> <li>Student with autism acquired 2 of the 3 target skills.</li> <li>Reduced response duration</li> </ul>                                                                                           |
| Shipley-Benamou, Lutzker, & Taubman (2002) | <ul style="list-style-type: none"> <li>3 students all 5 years old</li> <li>all diagnosed with autism</li> </ul>           | <ul style="list-style-type: none"> <li>Prepare to mail a letter</li> <li>Mail a letter</li> <li>Pet care</li> <li>Set table</li> </ul>                                                              | <ul style="list-style-type: none"> <li>Percentage of task analysis steps performed independently</li> </ul>                                                                                                            | <ul style="list-style-type: none"> <li>Students viewed video shot from the first person perspective</li> <li>Narrator spoke on tape to give task instructions</li> <li>Student was asked to do what they saw in the video right after viewing the video clip</li> </ul> | <ul style="list-style-type: none"> <li>Multiple baseline design across behaviors replicated across students</li> <li>Interobserver agreement reported</li> <li>No procedural reliability reported</li> </ul> | <ul style="list-style-type: none"> <li>Students all made large gains in independent performance of the target skills</li> <li>Maintenance data reported</li> <li>durability of results one month after intervention ended.</li> </ul> |

## CHAPTER 3

### METHODS

#### *Participants*

The participants in this study included 5 elementary school aged students who have a primary special education eligibility of autism (see summary in Table 4). To participate in the study, students had to meet the following selection criterion. Students had to have either IEP goals and objectives related to food preparation or their parents expressed an interest in their child acquiring the target skill. Students had to be able to attend action on a computer screen for 10 min and manipulate a mouse to hit a 2cm by 2cm target on the computer screen. Lastly, students' parents had to sign a consent form (see Appendix A).

*Justin.* Justin was 8 years 10 months old at the beginning of the study. He was a quiet and shy student who had sufficient communication skills to respond to questions about what was going on in his classroom and his school but not to initiate an exchange. He had some sight vocabulary but did not tend to comprehend long strings of words. The classroom teacher reported that Justin had an exceptional rote memory but had difficulty solving practical every day problems. He received most of his educational services in a self-contained classroom for students with autism.

His test scores on adaptive behavior skills were in the low range of average and his cognitive abilities based on the Differential Ability Scale (DAS) fell within the 1st percentile for his age. While five years earlier he had scored a composite of 43 on the



CARS (severe autism range) his evaluation on the GARS, conducted more recently, was fairly high for a student considered to have autism. The evaluating psychologist related that, in her professional judgment, the test score was inflated because the classroom teacher rated Justin as she viewed him within the structure of her classroom. With the supports provided to Justin in the classroom, his autistic like behaviors appeared to be somewhat ameliorated according to the psychologist's assessment.

*Allison.* Allison was a very polite and shy 6 year 10 month old African-American female. She responded to questions but did not readily initiate conversation. Frequently she would speak to her self in a muffled voice and giggle if anyone asked her to speak louder. Her IEP contained goals and objectives related to daily living skills and social communication.

Allison's psychometric scores show that she had a low average IQ (79 Full Scale and 74 Verbal). While her academic eligibility for special education was with autism spectrum disorders, her CARS score was in the non-autistic range (25.5). Her awkward social behaviors and communication deficits were the factors that led to the autism eligibility. She spent most of her school day with typically developing peers in a kindergarten classroom where, academically, she was performing similarly to her age-mates.

*Chris.* When Chris began as a participant in the study he was 6 years 2 months old. He was a Caucasian male who was shy but responsive to friendly questions (e. g. "what did you do over the weekend.") but would not initiate or continue a conversational exchange. Chris occasionally had difficulty transitioning from one task to another. He

demonstrated weakness in social communication skills and had IEP goals related to daily living skills.

Standardized test scores for Chris show that he had an average to above average IQ. His score on the School Readiness Composite of the Bracken Scales measured in the advanced range. His special education eligibility for autism was determined by his CARS total score of 30 which would place him in the mild range of autism. Like Allison, Chris received most of his educational services in a general education kindergarten classroom.

*Bryan.* Bryan was a very energetic 7 year 10 month oldCaucasian male. He was quite verbally expressive but his comments were not always relevant to the current situation. On other occasions his comments were tangentially relevant to the situation but not typical. For instance, while putting away some grocery items, Bryan narrated what he was doing commenting that “now I am going to put away the peanuts, where are the elephants? I want to feed them the peanuts. Oh, carrots, I’m going to give these to a horse. And, ah, the cheese. I need to give this to the mouse.” His sight reading was quite advanced and a psychologist noted that his sight reading ability exceeded what would be expected based on his IQ. While Bryan was reported to have difficulty transitioning from one task to another and having his schedule interrupted, no difficulties were evident during the course of the study.

Bryan’s test scores indicated that cognitively he is functioning in the low average range. He exhibits weaknesses in adaptive behavior especially in the areas of community use, self care and social interaction. His autism related assessments place him in the mild to moderate range of autism. Most of his educational services were delivered in a self-contained classroom for children with autism.

*Nathan.* Nathan was a shy but talkative Caucasian male. Though he spoke a great deal, he was not always speaking to anyone rather he seemed to be talking aloud to himself. He would readily respond to any question and took his time to contemplate a response. He was very cooperative during the study however the classroom teacher reported that, when frustrated, Nathan would occasionally display aggression including throwing furniture.

Nathan's test scores indicate that he has above average intelligence. His reading ability was above grade level. Behaviorally on the other hand, Nathan's test scores indicate below average adaptive behavior. Socially, Nathan was awkward in his interaction with others. He would not look at the person who was speaking to him and he often appeared not to be listening then he would respond appropriately. The evaluating psychologist interpreted his score on the GARS to be within a range that is considered to indicate Asperger's Syndrome.

#### *Setting and Arrangements*

In-vivo Pre-Test/Post-Tests were conducted in a kitchen in the school that was normally used as a teacher's lounge. The setting included a full sized refrigerator and cabinets as well as a table with chairs, a set of shelves (See Figure 1 for a photograph of the environment). The characteristics of the in-vivo setting closely mirrored the scenarios depicted in the videos (refer to Figure 2). The primary differences involved the layout of the room. The kitchen in the video vignettes was a traditional kitchen with cabinet space located directly adjacent to the refrigerator/freezer. In the school the refrigerator/freezer was approximately 1.5m from the cabinets. Because the participants in this study were elementary aged students and therefore were not tall enough to reach cabinets 1.5m off

the ground (as depicted in the videos), a small step stool was placed in front of the cabinets for student use. This was not depicted in the videos. All computer sessions took place in the students' special education classroom. These occurred in an area of the room isolated from other distractions. Students not receiving probes and students not participating in the study were engaged in their regular schedule of activities working either independently or with the paraprofessional.

### *Materials*

*Stimulus sets.* The training stimuli used in this study were selected from a pool of items that are typically stored in one of three locations in the home: refrigerator, freezer, or pantry/cabinet. In an effort to ensure the social validity of the items used for training, a list of items was generated by asking five individuals to examine items in their home in each of these locations and list the first 15 items they found in each location (see Table 5). When individuals differed on where they stored an item (e.g., bread) the item was placed into a category based on where the item is located in the store (grocery stores put already baked loaf bread on the shelves rather than in the refrigerator) unless that item required other storage once opened (e.g., salsa). In the latter case, the item was put into the category where one would store it after it was opened because this was determined to be the best place to store the food to avoid spoilage. From this list the 12 most common items in each storage category were selected for use and included in a stimulus pool (see Figure 3 for process of stimulus selection).

The pool of 36 stimuli were divided into 6 sets. Each set contained two items stored in each of the three locations. Because food item containers generally fall into one of three broad shape categories: boxes or cubes (most often card stock or laminated card

stock), cylinders (glass jars, aluminum cans, some drink containers), and free form containers or no containers. (e.g. bags of rice, bag of fresh carrots) and to avoid students over-selecting based on this irrelevant characteristic, the training sets were divided accordingly. Thus, each set had two items that were box shaped, two that were cylindrical and two that were free form. Within these divisions, no set contained two items that were the same shape and stored in the same location. For example, not set contained a box of cereal and a box of crackers (both stored in the pantry).

These six stimulus sets were then divided amongst the students: Justin, Allison, and Chris all worked with sets one through three while Nathan and Bryan worked with sets four through six. After the sets were divided amongst the students, each student had one set designated as a first person prime set, a third person prime set and a control set. This division was counterbalanced across students.

*Pre-test/post-test for generalization.* The Pre-Test and Post-Test sessions required the use of genuine materials to assess stimulus and response generalization. These items were identical to the items students saw during training (same brand and size). Each student received grocery bags containing their 18 target items. The student had access to a table or counter on which to place the bags as he or she put away the groceries.

*Computer program.* The computer program, designed in Authorware specifically for this study, requires the use of a Windows computer with a CD-ROM and sufficient memory to display short video clips. Students logged into the program with the assistance of their teacher who also guided them to the right exercise on the computer (probe or prime session). The computer was programmed with the schedule of the intervention and

probes, thus after logging in for a priming session, the computer delivered the primes and moved on to the probes for the stimulus set just primed.

During PC Probe sessions, the computer showed the student a series of single photographs on the bottom of the screen (see Figure 3). After showing the student each photograph, the computer asked the student where to store the item. Four choices appeared at the top of the screen depicting possible storage options: refrigerator, freezer, cabinet/pantry and a fourth neutral storage location where one would not store food. A photograph of a mailbox was used. Consideration was given to using a photograph of other familiar items like the trash can or a filing cabinet but concern arose that students may know that some food, when spoiled, is put into the trash. The option of showing a filing cabinet as the fourth picture was ruled out because, according to the teacher reports, many of the students were accustomed to seeing teachers store some foods in their classroom filing cabinets because the cabinets locked and they could therefore keep students from accessing the food.

During the primes, the computer proceeded through a series of brief video clips that begin with showing an individual returning from the grocery store and putting away of six grocery items. The model placed their grocery bags on the counter and then the program will paused. The students clicked on a small 2cm x 2cm button in the lower right hand corner to begin the rest of the priming sequence. The students then saw a series of six individual clips (one for each item in their training set). The software paused after each item was put away by the model in the clip. Students were then required to click on the a small 2cm by 2cm button in the lower right hand corner to continue. This interaction was included to require at least some student attention to the software in order

for the software to continue displaying the models. When the student finished viewing the last video, no button was visible; instead, the computer showed a black screen with audio and text telling the student that it is time to answer some questions about storing food.

*Priming videos.* Depending on the condition, videos depicted the scenario from a first (Figure 4) or third person perspective (Figure 5). Third person videos showed action from the perspective of a person not involved in the action of the video. This view point is similar to the one used by the vast majority of television shows. First person videos showed the action from the perspective of a participant in the scenario. This would be the equivalent of equipping a football player's helmet with a camera that shows what they see as they play. In both styles of video, the model was shown returning from the store, placing his or her bags on the counter and proceeding to put each item away individually.

All videos displayed an adult actor. The choice to use only an adult actor was made for four primary reasons. First, logistically, arranging for an adult actor was believed to be an easier considering the need to secure parental permissions. Second, an adult actor was believed to require less training and coaching than age mate actors and thus would facilitate faster filming. The first and second reasons support a third reason: if a teacher or group of teachers were to implement this on their own, in their own classroom, they would need the most expedient way to produce the videos as possible. Fourth, for students with autism, Ihrig and Wolchik (1988) reported no differences in student acquisition, generalization, or maintenance of skills learned from adult models or peer models.

### *Response Definitions and Data Collection*

Below are descriptions of response topographies for each condition. Additional variables relevant to the measure of intervention efficiency are included below in a section titled other measures (see Appendix B for data sheets).

*Pre-test/post-test.* During the Pre-Test/Post-Test student could make three possible responses.

1. A correct response was scored if a student places an item in the proper storage location.
2. An incorrect was scored if a student places an item in the incorrect storage location. Data was collected to note where the student put each item.
3. Students had a total of 10 minutes to put away 18 grocery items. For any items that the student did not placed in either the refrigerator, freezer, or pantry, at the end of 10 minutes, a No Response was scored.

Data were recorded to show the percentage of items the student attempted to put away, and the percentage of errors for those attempts. In addition, any noticeable strategy that a student used was noted (e.g. pulls all freezer items out first and puts them away or sorts items on the table first)

*PC Probes.* During PC Probes, the computer scored a student's response in one of three ways (see screen capture in Appendix C).

1. Correct responses were scored when the student completed an accurate response within 5s of the computer question.
2. Incorrect responses were scored when a student completed a response within 5s of the question but the answer was inaccurate.



3. If a student failed to respond within 5 s the trial will be scored as no response.

### *Other Measures*

To evaluate efficiency of intervention, several measures were collected. First, the total time for filming, editing, and digitizing all video did not differ based on perspective. Computer programming time was not differentially effected by the perspectives either. During intervention, the total time students spent at the computer for was recorded by the computer program. This showed how quickly the students moved through the video primes. To further judge the efficiency of intervention, total percentage of errors per condition was calculated. These measures, evaluated together and compared to acquisition and generalization, were used to assist with determining the relative efficiency of first person versus third person video primes. Similar data were be collected during in-vivo Pre-Test/post test probes.

### *Experimental Design*

An adapted alternating treatments design [AATD] was be used to evaluate functional relationships between the dependent and independent variables as well as to assess relative efficiency of intervention (Holcombe & Wolery, 1994). This is different from an alternating treatments design [ATD] in that, with AATD, two similar but functionally separate behaviors are each receiving a separate intervention. With ATD a single behavior receives two different treatments. With any multi-treatment evaluation, the risk of multi-treatment interference via carry over effects exists. However, if this can be controlled to a degree by holding a set of behaviors in a baseline condition (see the following section entitled *Sequencing of conditions* for an explanation) and monitoring

changes in that set of behaviors. Sequencing effects threaten the internal validity of multi-treatment studies, but using an AATD design with rapidly alternating interventions helps to reduce the likelihood that sequencing will interfere.

Answering the primary research question about relative effectiveness will require visual analysis of the data. With an AATD design the visual analyst looks for separation of the data between the two treatments. In other words, a visual analyst identifies one treatment as more effective when the data for that treatment consistently move in a therapeutic direction with a steeper slope and reach criterion at an earlier stage than data for the other treatment. If data begin to increase for both behavior sets receiving treatment, the one that increases the most rapidly (i.e. reaches criterion first given an equal number of treatment sessions) would be identified as the better treatment option.

*Sequencing of conditions.* After stimuli sets were selected for each participant, the in vivo Pre-Test occurred whereby student responses for storage of all stimuli were measured. Then, as previously described, the stimulus sets were identified as intervention sets (first and third) and a control set. During initial PC Probes, each set was probed individually (to better mirror the probes that occur once treatment begins). In intervention, the first person and third person stimulus sets received intervention in an alternating fashion with no set being trained more than two consecutive sessions (e.g. if Session 1 is 1<sup>st</sup> person, Session 2 is 3<sup>rd</sup> person, Session 3 is 3<sup>rd</sup> person, Session 4 has to be 1<sup>st</sup> person). The control set received no treatment but was still probed on the computer at least once per week. Once a student met criterion in PC Probes (six out of six correct responses for one behavior set in at least three consecutive sessions over at least 2 days),

and had had an equal number of presentations of the other intervention set, he or she began Post-Test generalization probes.

### *Procedures*

*History training.* To ensure that all students were familiar with putting away groceries and that any poor performance on their part was a function of insufficiently developed skills and not lack of understanding directions, history training was required. This training took two forms. First, in naturalistic classroom interactions, the classroom teacher asked participating students to put various objects away with the request “Please put this away.” This request mirrored the request that students would hear during the pretest and Post-Test as well as during the PC Probes. Essentially, it evaluated whether or not students were able to reliably respond to the command to put an item away. The second form of history training required was an introduction to the environments in the pre/post tests. Because students may not have been familiar with the environment for their pre/post test, it was necessary to make certain that they knew the places where they could store grocery items. Immediately prior to the pre/post test sessions, the researcher brought the student to the food storage areas and, while pointing sequentially at the pantry/cabinet, freezer and refrigerator said, “You can put food away here, here and here.” The researcher paused for 2-3s and then repeated the sequence in reverse order.

*Pre-test/post-test.* Assessment of the student’s behavior related to where one should store food was evaluated in the context of putting away groceries. These Pre-Test sessions took place over a series of at least three sessions prior to baseline and similarly, the Post-Test occurred over at least three session after the students reached criterion on responding to computer based questions. With the student standing less than 1m from the

refrigerator/freezer and pantry or cabinet space, the researcher handed the him or her a shopping bag containing their targeted 18 items (6 requiring refrigeration, 6 requiring storage in the freezer and 6 typically stored in a pantry) and gave the instruction: “Please put away the groceries. Make sure that you put them in the right place.” The researcher moved away from the student to observe sat at a table with the reliability observer (the researcher and reliability observer were not able to view what the other wrote). Students had 10min to complete the task once the researcher handed them the bag. No one provided the students with any prompts; if students requested help, the researcher responded by telling the student just to “do your best to put everything away.” When the student finished, or when the 10 min had expired the researcher thanked the student for their hard work and the student transitioned to his or her next activity.

*PC Probes.* The students engaged in the PC Probes prior to treatment and then once treatment began, they engaged in probe trials immediately following each priming session. The student received a total of six trials per session (one for each target item in the assigned set). In all PC Probes, a grocery item appeared at the bottom of the computer screen (refer again to Figure 3) and the student heard the question “Where do you store this?” Four pictures then appeared at the top of the screen depicting storage options. Students had 15s to respond. If they did not respond within that time frame by clicking one of the pictures, the computer repeated the question. If the student still did not respond within 15s, the computer moved to the next trial. If the student responded after the computer repeated the question, the computer tracked the student’s response differently than if the student responded on the first occasion that the question was asked. When the student responded, the computer screen was cleared and the next trial began. Pre-

treatment PC Probes continued for each student until his or her data are stable in regard to level and trend.

*Priming.* Computer priming sessions consisted of a student working on a computer program that showed them a sequence of videos depicting someone putting groceries in their appropriate locations. Students received one to two priming sessions per day. On days when students took part in two priming sessions the sessions were spaced by at least 1 hour. During a given session, students only saw primes from one perspective or another (first or third) and only of items in that stimulus group. After students saw a single item put away, the computer program paused and required students to click a button on the screen to continue to the next video. The sequence of videos within a priming session was randomized. For example, if a student had eggs, milk, ice cream cookies, frozen peas, and oatmeal in one of their treatment groups, the sequence in which they saw those items stored varied across sessions. Once they saw one item put away (e.g. eggs), the computer paused, the students hit a button on the screen, and the computer presented the next video from that stimuli set (e.g. oatmeal).

Immediately after a computer priming session, the student began PC Probes corresponding to the stimulus set on which they had just received primes. To probe the control set, the student was asked to sit at the computer and work on some other academic task unrelated to food storage. At the end of that activity or within 15min of beginning that activity, the student engaged in the probes for the control set of stimuli.

### *Reliability*

*Reliability and procedural reliability.* Inter-observer reliability and procedural reliability data were gathered in at least 33% of all Pre-Test/post tests sessions for each

student. Procedural reliability of the computer primes was not needed per se however; the teacher followed a daily checklist that sequences the procedural steps for the study (See Appendix D for an example). This ensured that the students received the correct primes prior to a PC Probe session, that the environment was quiet, and the computer program ran without problems. Inter-rater reliability was not needed for the PC Probes because the computer collected all data.

For the Pre-Test/post test conditions, the researcher and reliability observer both collected data on the student responses. These data were compared using a point-by point comparisons in which agreements were divided by agreements plus disagreements and multiplied by 100 to compute a percentage. In part because of the discrete nature of student responses, the inter-observer reliability during pre/post test was 100%. The reliability observer gathered measures of procedural reliability in Pre-Test/post test sessions as well as reliability on student behavior, while the researcher facilitated the session and acted as the primary data collector. A protocol checklist was used (see Appendix E) to monitor the researcher's implementation of the Pre-Test/post test (i.e. presentation of the stimuli).

### *Social Validity*

When Wolf (1978) asked where applied behavioral analysis found its heart because of the burgeoning trend in reporting consumer opinions about treatment objectives, protocol and outcomes, he helped to reemphasize that applied behavior analysis is a field born out of practicality and that intervention needs to be socially important (Baer, Wolfe, & Risley, 1968). Proper storage of foods is an important skill for independent living. However, to ensure that the objectives, intervention and outcomes

meet the needs of consumers and were deemed worthy by their community, a survey of parents, teachers and students was conducted.

Parents were first asked to sign an informed consent form for their child to participate in the study. This confirmed in the most basic ways that they approve of the objectives and content of the intervention. At the conclusion of the study, parental input was sought via survey (see Appendix F). This survey solicited information regarding parent ranking of the importance of these functional skills related to other functional skills, and, more subjectively, their feelings about the degree to which these particular skills are important to their child. The survey also included questions concerning any possible changes in the child's behavior in the home following intervention (whether the child helped putting away groceries).

The teacher also completed a survey at the conclusion of the study (see Appendix G). With questions similar to those directed toward the parents, feedback from the teacher was also solicited concerning the ease or difficulty of implementing this type of video based priming. As Schwartz (1999) suggested, one of the values in social validity is that it can function as a "defensive tactic of research" and help to determine whether interventions will continue to be used once the research concludes, therefore the teacher was also asked if they she would use this same program with other students. The teacher was asked to comment about whether she thought she might use some similar intervention to teach another skill or skill set, and, if so, whether she would prefer to use first person or third person video. Part of the survey addressed the teacher's perceived difficulty in developing a similar style of program to use as an intervention tool.

Students had an opportunity to provide input via a survey (see Appendix H). These surveys were administered orally by the teacher and responses were recorded by her. The survey focused mostly on issues of consumer satisfaction with the intervention. Questions revolved around whether the student enjoyed using the program and watching the videos as well as if they could identify what the videos were teaching. Students also viewed two pairs of videos (each pair having the first and third person prime of putting away the same grocery item). The teacher asked them if they could tell the difference and which one they preferred. This last questions was an attempt to help identify not only if the student had a preference for the video perspective, but if there was any relation between their preference and their performance.



Table 4. Psychometric characteristics of participants<sup>10</sup>

| Name    | Age <sup>11</sup> | Adaptive Behavior <sup>12</sup> | Autism Spectrum Related Assessments | Cognitive and Adaptive Skills <sup>13</sup> |
|---------|-------------------|---------------------------------|-------------------------------------|---------------------------------------------|
| Justin  | 8.10              | Vineland                        | GARS:                               | DAS                                         |
|         |                   | Communication: 76               | Stereotyped Behaviors: 7            | Composite: 64                               |
|         |                   | Daily Living: 77                | Communication: 9                    | Verbal: 63                                  |
|         |                   | Socialization: 92               | Development: 7                      | Non-Verbal Reasoning: 75                    |
|         |                   | Composite: 79                   | Autism Quotient: 80                 |                                             |
| Allison | 6.10              | Vineland                        | CARS                                | WPPSI-III                                   |
|         |                   | Communication: 54               | Total Score: 25.5                   | Full Scale: 79                              |
|         |                   | Daily Living: 64                |                                     | Verbal: 74                                  |
|         |                   | Socialization: 67               |                                     |                                             |
|         |                   | Composite: 57                   |                                     |                                             |
| Conner  | 6.2               | Vineland                        | CARS                                | MSEL                                        |
|         |                   | Composite: 72                   | Total Score 30                      | Composite: 90                               |
| Bryan   | 7.10              | ABAS                            | CARS                                | DAS                                         |
|         |                   | Composite: 54                   | Total Score: 31                     | Composite: 77                               |
|         |                   |                                 |                                     | Verbal: 72                                  |
|         |                   |                                 |                                     | Nonverbal reasoning: 89                     |
| Nathan  | 8.0               | ABAS                            | GARS                                | WISC-IV                                     |
|         |                   | Composite: 83                   | Autism Quotient: 96                 | Verbal: 132<br>(no other scores available)  |

<sup>10</sup> All test scores given as standard scores<sup>11</sup> Age is written as years (decimal) months<sup>12</sup> Scores on the Vineland Adaptive Behavior Scales or Adaptive Behavior Assessment System (ABAS)<sup>13</sup> Including scores on IQ and adaptive behavior scales

Table 5. Stimuli sample pool

| Pantry/Cabinet              | Refrigerator                | Freezer                  |
|-----------------------------|-----------------------------|--------------------------|
| Crackers                    | Butter                      | Juice concentrate        |
| Microwave popcorn           | Milk                        | Frozen pizza (box)       |
| Box of cereal               | Eggs                        | Bag of frozen vegetables |
| Oatmeal container           | Sliced cheese               | Box of frozen vegetables |
| Canned soup                 | Orange juice                | Round tub of ice cream   |
| Dry pasta in a bag          | Container of cottage cheese | Box of popsicles         |
| Rice in a bag               | Small yogurt                | Bag of frozen ravioli    |
| Bag of chips                | Apple juice                 | Frozen pie crusts        |
| Bag of cookies              | Bag of shredded cheese      | Frozen meal              |
| Bag of pretzels             | Jar of jelly                | Frozen burrito           |
| Box of hot chocolate mix    | Ketchup bottle              | Bag of frozen biscuits   |
| Bag of sugar                | Jar of salsa                | Ice cream sandwiches     |
| Bottle of oil               | Salad dressing              | Bag of frozen fruit      |
| Glass container of nuts     | Head of lettuce             | Box of ice cream         |
| Cardboard container of nuts | Bag of carrots              | Frozen Pizza (wrapped)   |

Figure 1. Photograph of Pre/Post-Test environment



Figure 2. Photograph of video environment



Figure 3. Screen capture of PC Probes





Figure 4. Screen capture of first person primes

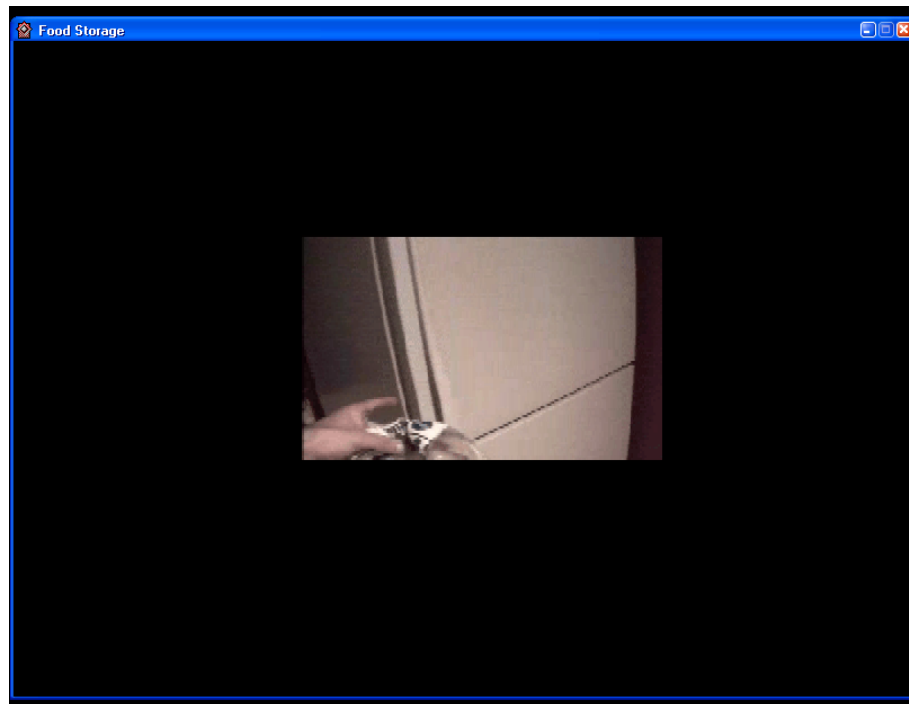
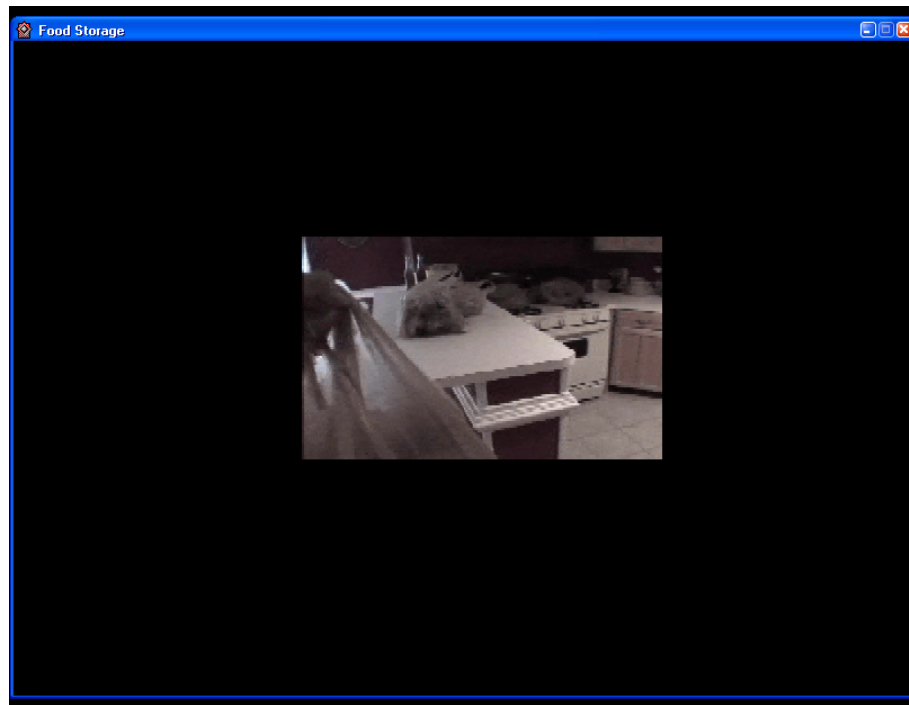


Figure 5. Screen capture of third person primes

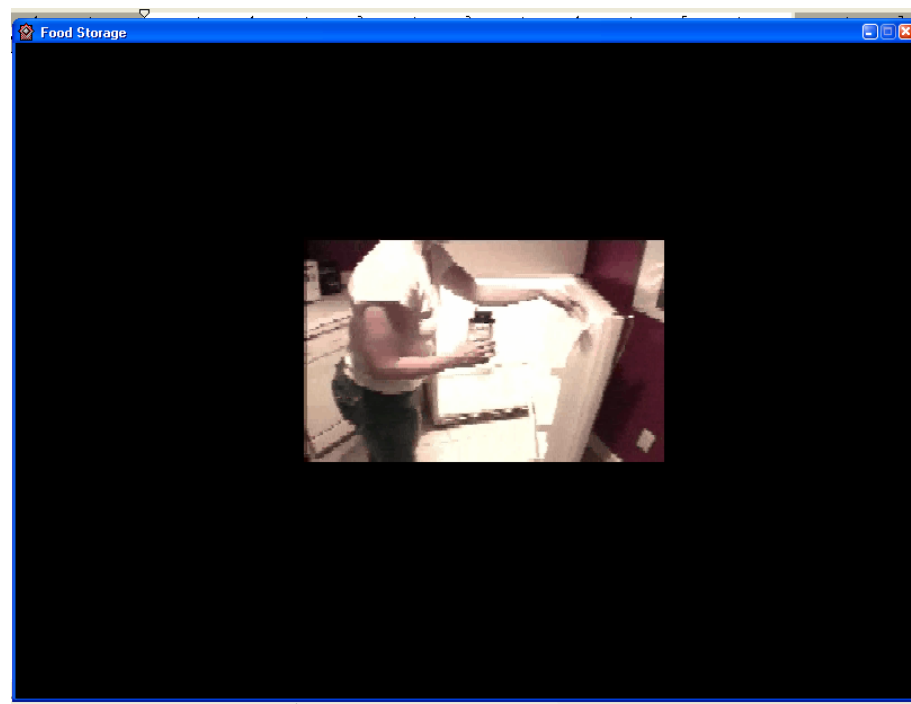
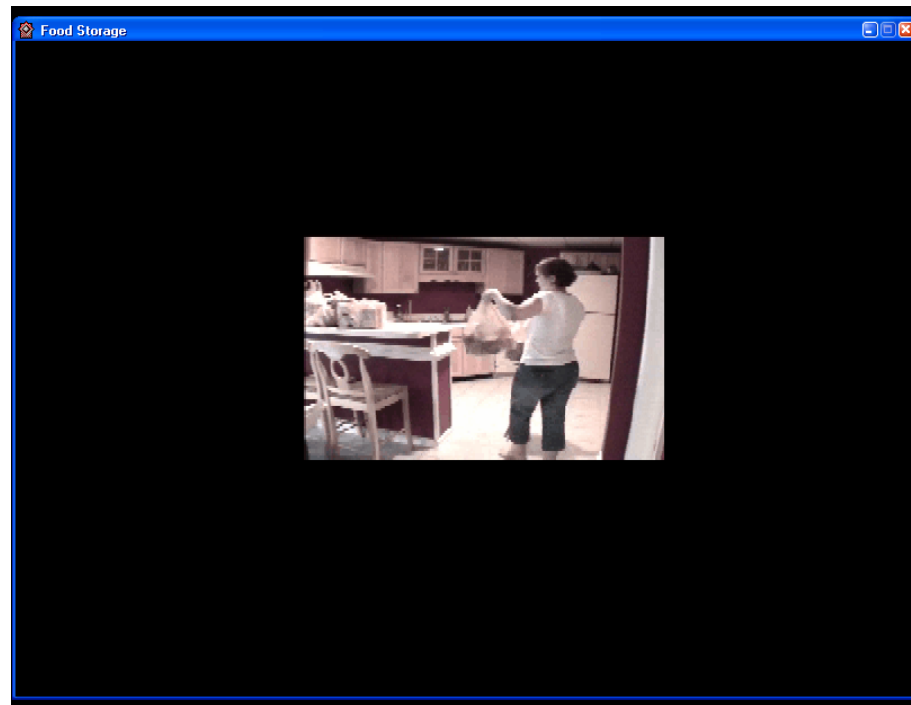
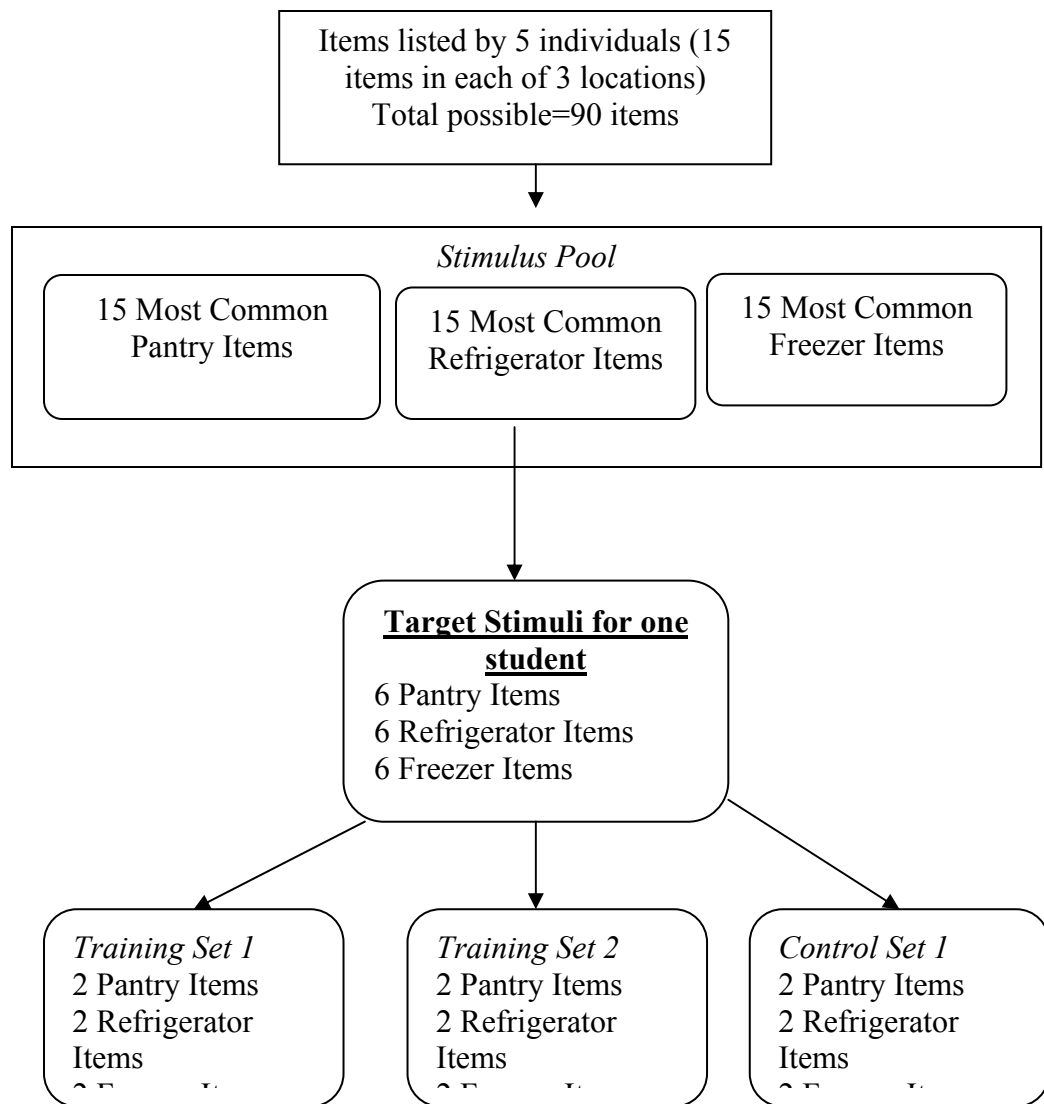


Figure 6. Flow of stimuli



## CHAPTER 4

### RESULTS

The purpose of this study was to compare first person video modeling to third person video modeling. The rationale behind this question was to identify any potential benefit from using one type of video based model over the other. Initial results for the five participating students did not provide a clear indication of the superiority of one perspective of video modeling of the other. The results of individual student performance are outlined in the context of different variables of interest: acquisition, generalization and comparative measures/measures of instructional efficiency. Following this, data are presented concerning the target stimuli: error rates, concentration of errors across students and stimulus characteristics. The results chapter concludes with data gathered from the social validity surveys taken by the teacher, parents and students.

#### *Reliability*

Inter-observer reliability data were collected in half of Justin's Pre-Test probes and one third of all other participants Pre-Test Probes and was calculated at 100%. Procedural reliability data were collected simultaneous with inter-observer reliability and also equaled 100%. Reliability and procedural reliability data were gathered in one third of all Post Test sessions for all students. Inter-observer agreement equaled 100% across all students. In all but two cases procedural reliability equaled 100%. In one case, during a Post-Test session for Bryan, the reliability observer noticed that Bryan had not been given all 18 of his target grocery items before beginning the session. After Bryan had put

away 11 items, the observer saw that Bryan did not have the salad dressing in any of his bags. The researcher quickly, albeit conspicuously, put the salad dressing into one of Bryan's bags. Bryan subsequently put the dressing away correctly. The other instance of deviation from the procedural protocols occurred in one of Nathan's Post-Test sessions. One item was accidentally left out of his bag (the orange juice) and an item from another stimulus set for which he was not receiving training and which was not part of his control set was included (a box of spinach). This was discovered after Nathan put away the box of frozen spinach and a quick count of the remaining items was taken. The orange juice was quickly placed into Nathan's bags. He then proceeded to correctly place the orange juice and the box of spinach. Even with these procedural errors, the procedural reliability for Bryan and Nathan equaled 88%.

As discussed earlier, inter-observer reliability was not calculated for the computer-based sessions (PC Probe and Priming). To ensure the integrity of the program and adherence to intervention protocols, procedural reliability was gathered daily on a checklist (see Appendix E). These out of the total 974 daily steps for PC Probe and Priming, complete adherence to the protocols was recorded for 964 of the steps. Note that step seven was only recorded when the student engaged in two sessions in one day. Four deviations from the procedures occurred for Chris, Allison, Justin and Bryan when the computer could not locate a media file during their first set of PC Probes; this was scored on step six of the protocol "PC Probes without error". This issue was remedied and no further problems occurred. On six occasions (two each for Nathan and Bryan and one each for Justin and Allison) sessions were conducted without a full 1hr break in between sessions. The total procedural reliability was then calculated to be 98.9%. For Justin,



98.8% of procedural steps were done correctly, for Allison 98.9%, for Chris 99.3%, for Bryan 98.0% and for Nathan, 96.8%.

### *Acquisition*

Analysis of the data for all students indicated acquisition of the target behavior (See Figures 7-11). The figures depict four phases of the study: Pre-Test In Vivo, PC Probe, Priming Comparison, Post-Test In Vivo. Open triangles on the graphs represent the data set for which students received first person priming, open circles represent the data set for which students received third person priming, and closed squares represent the control set of data. Data are presented in treatment “pairs” to better allow comparison of data points. Thus the visual analyst is presented two data points depicted along each value of the “X” axis, one for each intervention condition. Probes for the control set are interspersed through the Priming Comparison. Post-Test data are discussed in the generalization section. Mean summary data for each student are shown in Figures 12-16.

*Justin.* During the Pre-Test, Justin was able to correctly store some of the grocery items (see Figure 7). The mean response levels across sets during the pretest were consistent with a mean of 3.00 correct for the control set, 2.0 for the first person set, and 2.67 for the third person set (See Figure 12). Justin’s data during the PC Probes are variable with means across the condition of 2.40 correct for the control set, 2.80 for the first person set and 2.60 for the third person set. Upon introduction of intervention, the data for his first person stimulus set rose to 5 correct responses and on the second session of first person priming, Justin correctly responded to all stimuli. He maintained this performance and reached criterion in a total of four sessions. The data set receiving third person probes did not make an immediate change following introduction of priming. On

the second session of third person priming, the trend in Justin's data accelerated to 5 correct before dropping. By the fourth session he was responding to all stimuli correctly and met criterion in a total of six sessions.

*Allison.* Allison demonstrated high levels of accurate responding for stimuli the first person set during the Pre-Test (Figure 8) with a mean of 4.67 correct (Figure 13). Data for the third person and control set were slightly lower with means of 3.67 and 2.33 respectively. Her PC Probe data for her control set were very similar to her Pre-Test with a mean of 2.33. On both her first and third person sets she had a mean of 1.67 correct with data showing variable performance. Her correct responses ranged from 0 to 4 correct with her first person set and from 0 to 3 with her third person set. Her first intervention session was with her third person data set. While overlapping slightly with the PC Probe condition, her data rapidly accelerated and peaked at 6 correct responses in her second third person priming session. She maintained this level to reach criterion in four total third person priming sessions. Data for her first person set began at 0 correct responses when intervention was introduced then accelerated rapidly hitting 6 correct responses in her 4 session with first person priming and maintaining this to reach criterion in 6 sessions. Her control data climbed slightly from 0 to 3 correct responses possibly indicating generalization.

*Chris.* Chris's variable data during Pre-Test sessions show that he could correctly store some grocery items from each of his stimulus sets (Figure 9). With the first person stimulus set, he had a mean of 3.33 correct responses (Figure 14) compared to slightly lower means of 2.67 correct responses for his third person set and 3.00 correct responses for his control set. His data during PC Probes appeared more stable and more uniform

across sets with a mean of 2.50 correct responses for his third person set and 2.75 correct responses for both his first person and control sets. When intervention began, Chris first viewed first person primes and his performance data in the first intervention session appeared at approximately the same level as his PC Probes for his first person set (3 correct responses). His next first person session shows a level change (5 correct responses) before stabilizing at 6 correct responses in his third session of first person video. When Chris viewed his first series of primes from the third person perspective (in the session following his first viewing of first person primes), he made an immediate increase in level, accurately identifying the storage location for all items. Subsequently he mastered the third person stimuli in a total of 3 sessions. Data for his control set also increased to 6 correct responses on the first time the set was probed during intervention.

*Bryan.* Bryan began the Pre-Test sessions by showing stable performance on his first and third stimulus sets (Figure 10). He correctly placed 4 items from the first person set and 2 items from his third person set in all Pre-Test sessions. The errors he made with these sets were consistent across sessions. With his control set he averaged 5.5 correct per session (Figure 15) and was able to correctly place all of the items in their correct location during one session. His data for all sets during the PC Probes indicated a slightly declining trend. He averaged 3.33 correct responses for his control set and his first person stimulus set. For his third person set, Bryan averaged slightly lower with 2 correct responses per session. He immediately responded to intervention, and for all stimulus sets (including his control set for which he did not receive any primes) he correctly responded to 100% of the stimuli thus reaching criterion in the minimum of three intervention sessions for both the first and third stimulus sets.

*Nathan.* Nathan's Pre-Test sessions were stable and even across groups. He was able to correctly place 5 of 6 items for all of his stimulus sets in every session. During the PC Probe condition, Nathan's performance for his first person stimulus set and his third person set were stable at 5 of 6 correct responses and 4 of 6 correct responses respectively. He correctly placed all items in his control set in his initial session and then finished the final two sessions placing five of the items correctly. Immediately upon introduction of intervention, Nathan began placing all items correctly for both his first and third person sets. He met criterion for both sets after three sessions. He also was able to correctly identify the storage location of all items in his control set in a single probe that took place at the end of the intervention phase.

#### *Generalization*

Generalization data, primarily measured by the Post-Test In Vivo probes, allowed the opportunity to evaluate whether or not these students were able to acquire the targeted skill in a computer based environment and then transfer that skill to the real world setting. In the current study, trends in the targeted data indicate that levels of generalization varied amongst the students. While some students seemed to carry over levels of accurate responding from the intervention phase to the Post-Test phased and evidenced performance higher than the Pre-Test, other students performed at about the same levels or worse than their Pre-Test.

*Justin.* During the Post-Test phase, Justin's data were stable. He performed at approximately the same level on all three data sets. His mean score for the control group was 4.0 and for first and third person data sets the means were 4.67 and 5.00 respectively. Compared to his intervention data, these numbers are slightly lower; however, compared

to his Pre-Test data, Justin demonstrated overall improvements with a mean difference of 2.33 for his third person data set and 2.67 for his first person data set. The mean of his control data set also increased by one.

*Allison.* Post-Test In Vivo data for Allison show stable performance for stimuli in all three stimulus sets. Her means for her first person were slightly lower (mean of 4) than her third person set (mean of 5) and neither set was as high as her performance on the computer. Her control set during the Post Test was approximately equal to the last data point probed during the intervention phase for the control data set. Compared to her Pre-Test In-Vivo probes, Allison's control data were identical with a mean of 2.33 correct responses. She showed a slight increase over the Pre-Test with her third person stimulus set moving from a mean of 3.67 correct responses in baseline to a mean of 5 correct responses in the Post Test. Data for her first person data set declined from a mean of 4.67 in the Pre-Test to a mean of 4.0 in the Post test.

*Chris.* Compared to his intervention data, Chris's Post Test In vivo data were lower for all stimulus sets. Where he demonstrated mastery of all sets during intervention, the performance did not generalize to the natural setting. He averaged 1.75 correct responses for his control data set compared to his 3.00 mean performance in baseline for the same set. His first and third person stimulus sets, while lower than during intervention, were marginally higher than during the Pre-Test. Chris averaged 4.00 correct responses for his first person set during the Post Test compared to an average 3.33 correct the Pre-Test phase and for his third person set, he averaged 3.0 correct response during Post Test versus a mean of 2.67 correct responses during Pre-Test.

*Bryan.* Bryan's Post test data is high but slightly variable. He correctly responds to all of his third and first person stimuli in separate sessions but does not maintain that performance. His mean performance for his third person stimulus set was 5.33 correct responses per session and for his first person set, he averaged 5.0 correct responses per session. Data for his control set are slightly lower overall than the other stimulus sets, averaging 4.67 correct responses per session. These figures are lower than his performance on the computer. When compared to his Pre-Test data, Bryan appears to have improved his mean performance on his third person stimulus set by 3.33 correct response per session and his first person set by 1 correct response per session. Data for his control set show a small decline of .66 correct responses.

*Nathan.* During Pre-Test probes, Nathan consistently misplaced one item from each of his stimulus sets averaging 5 correct responses for each set per session. In the Post-Test sessions, he correctly placed all of his items for three consecutive sessions thus averaging six correct responses per session. This performance is at an identical level to that of his data during intervention.

### *Comparative Measures*

While a functional relationship cannot be clearly illustrated indicating that either intervention was alone responsible for changes in student behavior, data comparing intervention effects are presented here to fully report study outcomes. The implications of these results are outlined in the discussion chapter of this document. Because this study was developed to evaluate relative efficacy of instruction, several comparative measures were important for determining whether one intervention was superior to the other. Three primary variables were measured: number of sessions to reach criterion, number of errors

to reach criterion, and the total amount of time to reach criterion. All things being equal, if one intervention took less time, required fewer training trials, and resulted in fewer overall errors, that intervention would be a superior choice for use. The data on these comparative measures, depicted in Table 6, show inconsistency across students. Table 7 shows the lengths of all videos and while the total time of the videos appears to vary, but no major differences would influence the amount of time students spent engaged with the intervention.

*Justin.* Comparing Justin's first person to third person data show that he required two fewer sessions to reach criterion with first person priming and he made six fewer errors. He averaged .25 errors per session to criterion with first person video compared to 1.16 errors per session to criterion with third person video. Though he required fewer sessions with first person video, the first person training sessions took 29s more time overall. He averaged 2 min 50 s per session to reach criterion with first person video versus an average of 1 min 48s per session to reach criterion with third person priming. For Justin, data indicates that no single measure of efficiency clearly suggests the superiority of one intervention to the other.

*Allison.* In contrast to Justin, Allison took fewer session to reach criterion with third person video. She met criterion in only four sessions with third person compared to six session with first person. She made 7 fewer errors with third person priming (averaging .75 errors per session to criterion with third person and 1.67 errors per session to criterion with third person). The difference in training time to criterion for Allison was comparatively large. She required an additional 11 min and 40s to reach criterion with first person priming compared to third person priming. This resulted in an average

session time of 2 min 22s with third person priming and 3 min 53s with first person priming. These comparative data, taken alone, indicate that third person video is more efficient for Allison.

*Chris.* Similar to Allison, Chris's comparative data were consistent across measures. He met criterion with third person priming in three sessions versus five sessions with first person priming. In addition, he did not make any errors with third person priming; whereas with first person priming, he made three errors while reaching criterion (averaging .6 errors per session to criterion). The total time that Chris spent in priming for third person priming was 2min and 46s less than what he required to reach criterion with first person priming. The average session length in third person priming was slightly higher (2min 41s) compared to first person priming (1min 48s). Based on these measures, third person video appeared to be more efficient for Chris.

*Bryan.* Most of the comparative measures for Bryan are equivalent. He required 3 sessions in each intervention to reach criterion. He did not make any errors with either intervention. Third person priming required 1min and 41s more time for him to reach criterion. His average session time for third person priming was 2 min and 23s compared to 1min and 52s with first person priming. Aside from the time advantage with first person, the two interventions appear approximately equal in terms of instructional efficiency for Bryan.

*Nathan.* Similar to Bryan, most comparative measures of Nathan's performance are equivalent. Once entering intervention he did not make any errors with any of the stimulus sets and he only required three sessions with each set to reach criterion. The



total amount of time in intervention is the only measure for which there is difference. He required an additional 1 min 7s to reach criterion with third person video,

### *Errors*

The student who participated in the study varied considerably in their number of errors and the objects with which they made errors. Table 6, which depicts the number of errors to criterion, only displays the number of errors a student made once they began intervention. Analyzing all student errors across conditions and examining where those errors occurred could reveal differences in difficulty between stimulus sets or suggest weakness in the instructional program. Results for errors are broken into two sections, first, an overview of individual student errors and then second a presentation of the percentage of errors aggregated across students.

*Errors by student.* Figures 17 through 21 show the percentage of errors students made with each stimuli. This percentage was calculated by dividing the total number of errors students made with a stimulus and dividing it by the total number of presentations of that stimulus and then multiplying by 100. The figures are set up with three primary sections. Reading from left to right the reader will first see how the percentage of errors students made with stimuli in each of the three storage locations. Then, the percentage of errors for each item, sorted into the stimuli groupings is presented. Finally, the percentage of errors students made with each stimulus set are totaled.

While individual student errors on by stimulus item are best examined by reviewing the Figures 17-21, some trends in group performance are worth noting. All students except for Nathan made more errors with items that are stored in the freezer than with any other item. Nathan made the most errors with items stored in the refrigerator.

Student performance based on stimulus sets shows that Justin, Allison, Chris all made a higher percentage of errors with stimuli from their control set. Nathan and Bryan, with their low overall percentage of errors did not follow that trend. They both made a higher percentage of errors with items from their intervention stimulus sets. For Nathan and Bryan, this was stimulus set five (for which Nathan received first person primes and Bryan received third person primes). Both students appeared to have the greatest difficulty correctly placing the ketchup.

*Concentrations of errors.* Table 8 shows an overall view of the percentage of errors across students. For stimulus sets one through three, the percentages of errors are very close to one another: 42.59, 41.09, and 39.53% respectively. Similarly, stimulus sets four and six have approximately the same percentage of errors 15.87 and 15.43% respectively. This would logically indicate some equivalence of difficulty for sets one through three (to which Justin, Allison and Chris were exposed) and then sets four and six (to which Bryan and Nathan were exposed). Set five, which served as Bryan's third person set and Nathan's first person set) had slightly more total errors than their other two sets (22.84%). Overall, the highest error percentage across stimulus sets and students was for items stored in the freezer.

### *Social Validity*

To assess the social context of the intervention, interviews were conducted with the classroom teacher implementing intervention, the parents of the participants and the participants themselves. Parent interviews were sent home with students and returned within a few days. The teacher was interviewed by the researcher. Students were interviewed by the classroom teacher rather than the researcher because the researcher

and teacher agreed that the students were more likely to provide the teacher with detailed responses than the researcher.

*Parents.* Parents had all signed consent forms for their student to participate so this validated the acceptability of the intervention and goals of the study therefore the parent survey (Appendix E) focused primarily on the level student participation with putting away groceries in the home. Bryan and Allison both had siblings who assisted with putting away groceries but Allison was the only student who had prior experience helping her parents put away groceries. Parents for all other participants indicated that their student exhibited an increased interest in helping to put away groceries since the study began.

*Teacher.* At the conclusion of data collection, the cooperating teacher responded to four questions (see Appendix F for exact wording). In regard to the effectiveness of the interventions, she rated the intervention as 9 on a scale of 1-10 with 10 being most effective and 1 being least effective. When asked to respond to the likelihood she would use a similar intervention again if provided the materials she responded that she most likely would (rating a 10 on a scale of 1 to 10 with 10 being most likely to use the intervention). Two questions to which the teacher responded related to the differences between in the video perspectives. She reported not seeing a difference in student performance between first and third person perspectives. However, when asked what she judged as the student's preferred perspective she noted that many of the students mentioned or talked about watching Courtney (the actor in the third person videos) and she believed they preferred this format.

*Student.* According to their interviews (Appendix H), all students were able to identify the purpose for working on the computer and all of the students indicated that they enjoyed the experience. Without exception, the students believed that the program was “easy.” Justin reported that he liked the program because he liked working on the computer. Chris, Bryan, Nathan, and Allison all likened the experience to watching television. All students identified specifically what the videos depicted, with Allison and Bryan even indicating that it “showed Courtney putting away groceries.” Students were presented with two pairs of videos from the program. Each pair consisted of videos showing the same food being stored but one video was from the first person perspective and the other from the third person perspective. No students could identify a difference in the videos.

Table 6. Comparative Measures

| Student | First Person          |                     |                                   | Third Person          |                     |                                   |
|---------|-----------------------|---------------------|-----------------------------------|-----------------------|---------------------|-----------------------------------|
|         | Sessions to Criterion | Errors to Criterion | Time in Intervention to Criterion | Sessions to Criterion | Errors to Criterion | Time in Intervention to Criterion |
| Justin  | 4                     | 1                   | 11:23                             | 6                     | 7                   | 10:54                             |
| Allison | 6                     | 10                  | 21:13                             | 4                     | 3                   | 9:33                              |
| Chris   | 5                     | 3                   | 10:51                             | 3                     | 0                   | 8:05                              |
| Bryan   | 3                     | 0                   | 5:39                              | 3                     | 0                   | 7:10                              |
| Nathan  | 3                     | 0                   | 7:45                              | 3                     | 0                   | 9:52                              |

Shaded cells indicate the comparative value that demonstrates greater efficiency.

Table 7. Video Times

| Video | Stimulus Set | Item           | Time in Seconds        |                        |
|-------|--------------|----------------|------------------------|------------------------|
|       |              |                | 1 <sup>st</sup> Person | 3 <sup>rd</sup> Person |
| 1     | Set 1        | crackers       | 13                     | 16                     |
| 2     |              | lettuce        | 19                     | 16                     |
| 3     |              | oatmeal        | 16                     | 13                     |
| 4     |              | pie            | 15                     | 11                     |
| 5     |              | pizza          | 15                     | 12                     |
| 6     |              | yogurt         | 14                     | 18                     |
| 7     | Set 2        | burrito        | 14                     | 13                     |
| 8     |              | box ice cream  | 16                     | 11                     |
| 9     |              | jelly          | 14                     | 15                     |
| 10    |              | milk           | 14                     | 11                     |
| 11    |              | rice           | 14                     | 20                     |
| 12    |              | soup           | 13                     | 23                     |
| 13    | Set 3        | chips          | 18                     | 17                     |
| 14    |              | eggs           | 14                     | 14                     |
| 15    |              | oil            | 12                     | 14                     |
| 16    |              | salsa          | 17                     | 11                     |
| 17    |              | spinach        | 16                     | 12                     |
| 18    |              | strawberries   | 15                     | 16                     |
| 19    | Set 4        | apple juice    | 12                     | 12                     |
| 20    |              | biscuit        | 16                     | 14                     |
| 21    |              | Fresh carrots  | 17                     | 12                     |
| 22    |              | coco           | 14                     | 16                     |
| 23    |              | oj             | 16                     | 11                     |
| 24    |              | sugar          | 16                     | 19                     |
| 25    | Set 5        | butter         | 16                     | 15                     |
| 26    |              | cereal         | 15                     | 15                     |
| 27    |              | cookie         | 11                     | 15                     |
| 28    |              | ice cream tub  | 13                     | 13                     |
| 29    |              | ketchup        | 14                     | 14                     |
| 30    |              | popsicle       | 12                     | 15                     |
| 31    | Set 6        | garden burger  | 15                     | 49                     |
| 32    |              | cheese         | 11                     | 12                     |
| 33    |              | frozen carrots | 15                     | 16                     |
| 34    |              | peanuts        | 16                     | 16                     |
| 35    |              | popcorn        | 17                     | 18                     |
| 36    |              | salad          | 15                     | 20                     |

Table 8. Item errors

|                                | Food/Location   | Total Errors | Total Presentations | Percentage of Errors | Percentage Errors Per Set |
|--------------------------------|-----------------|--------------|---------------------|----------------------|---------------------------|
| Locations<br>Stimulus Sets 1-3 | freezer         | 147          | 262                 | 56.11%               |                           |
|                                | refrigerator    | 93           | 262                 | 35.50%               |                           |
|                                | pantry          | 83           | 262                 | 31.68%               |                           |
| Stimulus Set 1                 | cracker         | 10           | 45                  | 22.22%               | 42.59%                    |
|                                | oatmeal         | 13           | 45                  | 28.89%               |                           |
|                                | lettuce         | 19           | 45                  | 42.22%               |                           |
|                                | yogurt          | 13           | 45                  | 28.89%               |                           |
|                                | pizza           | 29           | 45                  | 64.44%               |                           |
|                                | pie             | 31           | 45                  | 68.89%               |                           |
| Stimulus Set 2                 | chips           | 7            | 43                  | 16.28%               | 41.09%                    |
|                                | oil             | 13           | 43                  | 30.23%               |                           |
|                                | salsa           | 19           | 43                  | 44.19%               |                           |
|                                | eggs            | 18           | 43                  | 41.86%               |                           |
|                                | boxed vegetable | 22           | 43                  | 51.16%               |                           |
|                                | fruit bag       | 27           | 43                  | 62.79%               |                           |
| Stimulus Set 3                 | soup            | 19           | 43                  | 44.19%               | 39.53%                    |
|                                | rice            | 21           | 43                  | 48.84%               |                           |
|                                | jelly           | 18           | 43                  | 41.86%               |                           |
|                                | milk            | 6            | 43                  | 13.95%               |                           |
|                                | box Ice Cream   | 18           | 43                  | 41.86%               |                           |
|                                | burrito         | 20           | 43                  | 46.51%               |                           |
| Locations<br>Stimulus Sets 4-6 | freezer         | 39           | 150                 | 26.00%               |                           |
|                                | refrigerator    | 37           | 150                 | 24.67%               |                           |
|                                | pantry          | 6            | 150                 | 4.00%                |                           |
| Stimulus Set 4                 | sugar           | 0            | 21                  | 0.00%                | 15.87%                    |
|                                | frozen juice    | 8            | 21                  | 38.10%               |                           |
|                                | fresh carrots   | 4            | 21                  | 19.05%               |                           |
|                                | coco            | 2            | 21                  | 9.52%                |                           |
|                                | OJ              | 1            | 21                  | 4.76%                |                           |
|                                | biscuit         | 5            | 21                  | 23.81%               |                           |
| Stimulus Set 5                 | popsicle        | 7            | 27                  | 25.93%               | 22.84%                    |
|                                | butter          | 6            | 27                  | 22.22%               |                           |
|                                | cereal          | 3            | 27                  | 11.11%               |                           |
|                                | ice cream       | 7            | 27                  | 25.93%               |                           |
|                                | cookies         | 0            | 27                  | 0.00%                |                           |
|                                | ketchup         | 14           | 27                  | 51.85%               |                           |
| Stimulus Set 6                 | popcorn         | 1            | 27                  | 3.70%                | 15.43%                    |
|                                | peanuts         | 0            | 27                  | 0.00%                |                           |
|                                | dressing        | 11           | 27                  | 40.74%               |                           |
|                                | frozen Carrot   | 4            | 27                  | 14.81%               |                           |
|                                | cheese          | 1            | 27                  | 3.70%                |                           |
|                                | burger          | 8            | 27                  | 29.63%               |                           |

Figure 7. Justin acquisition



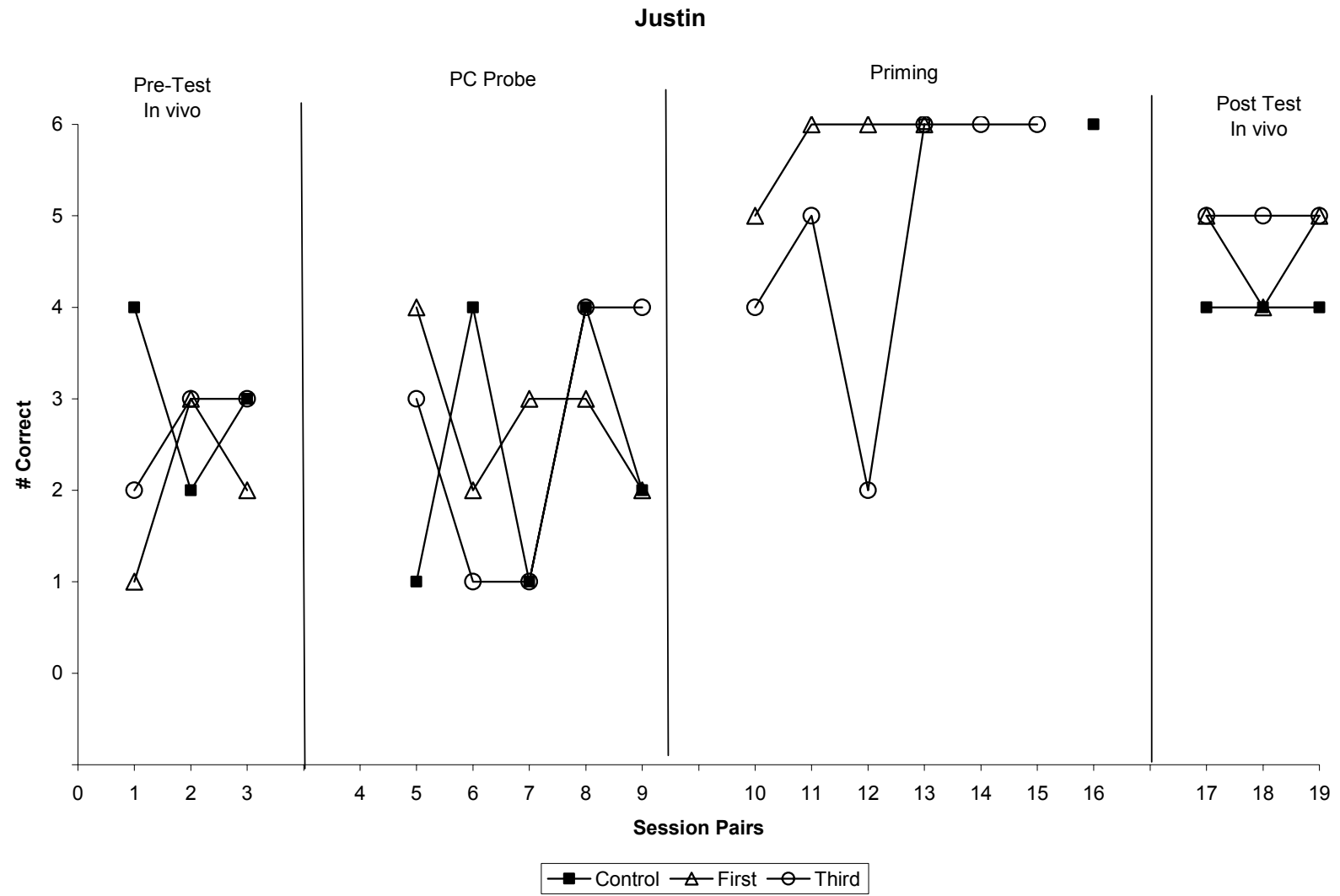


Figure 8. Allison acquisition

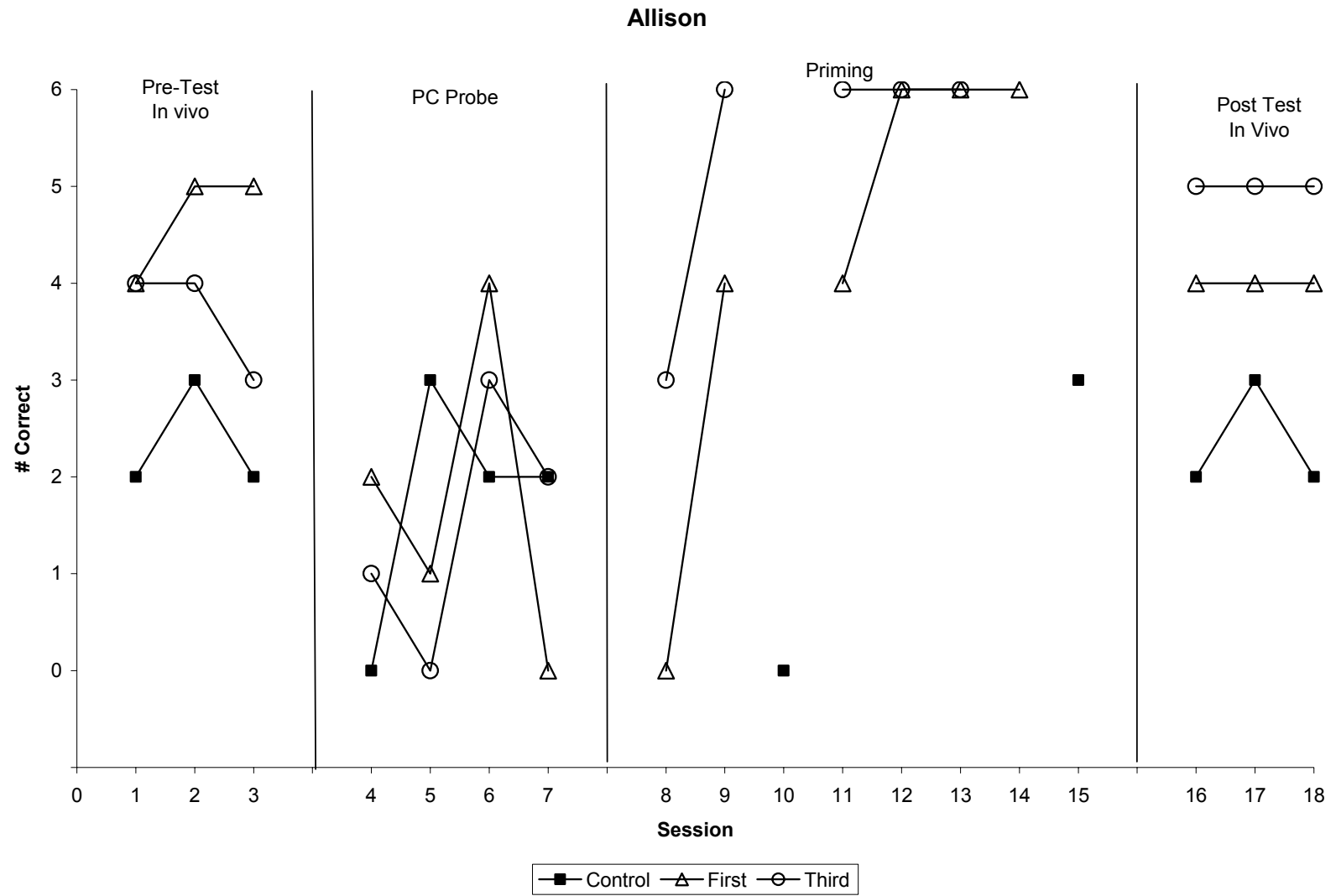


Figure 9. Chris acquisition

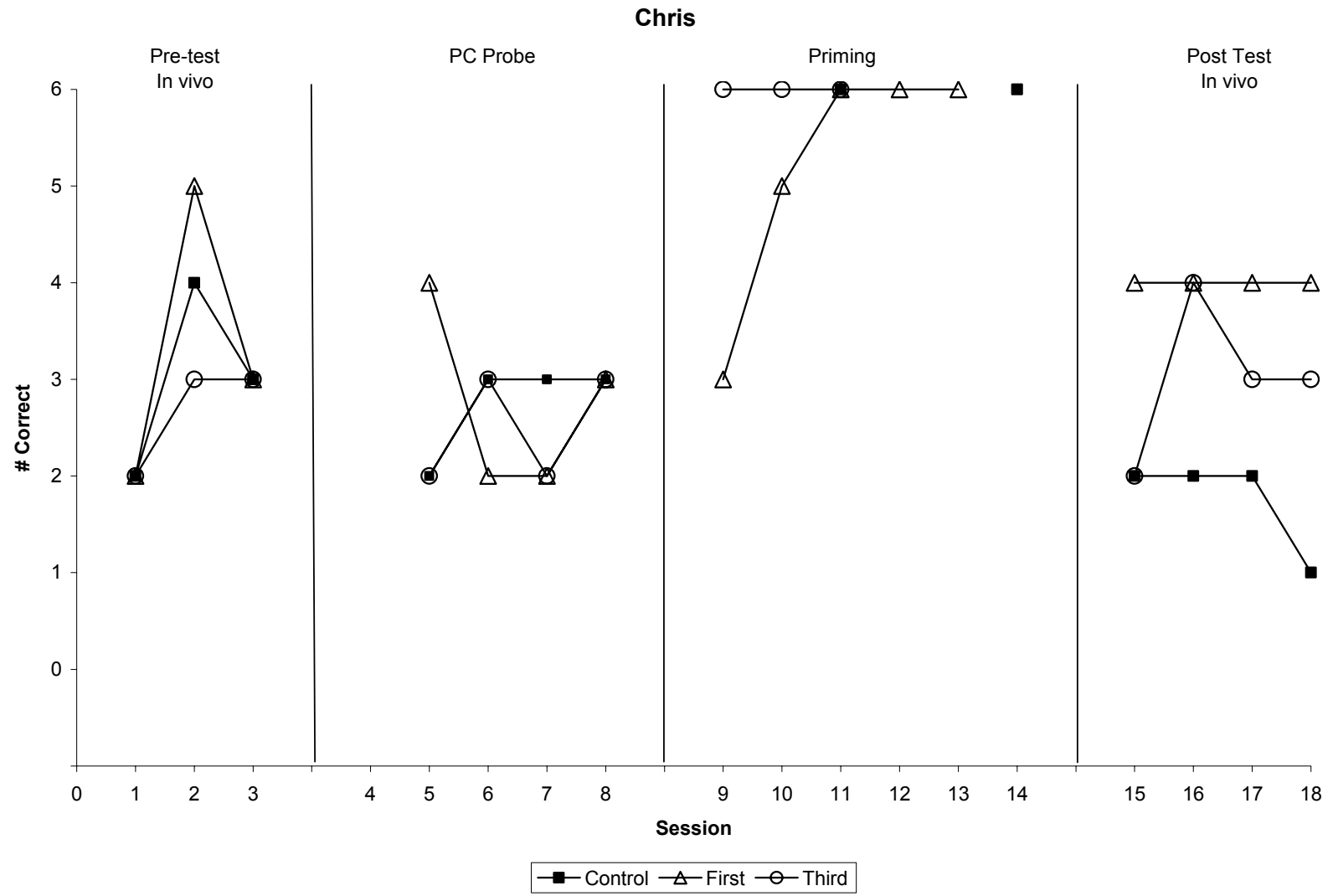


Figure 10. Bryan acquisition

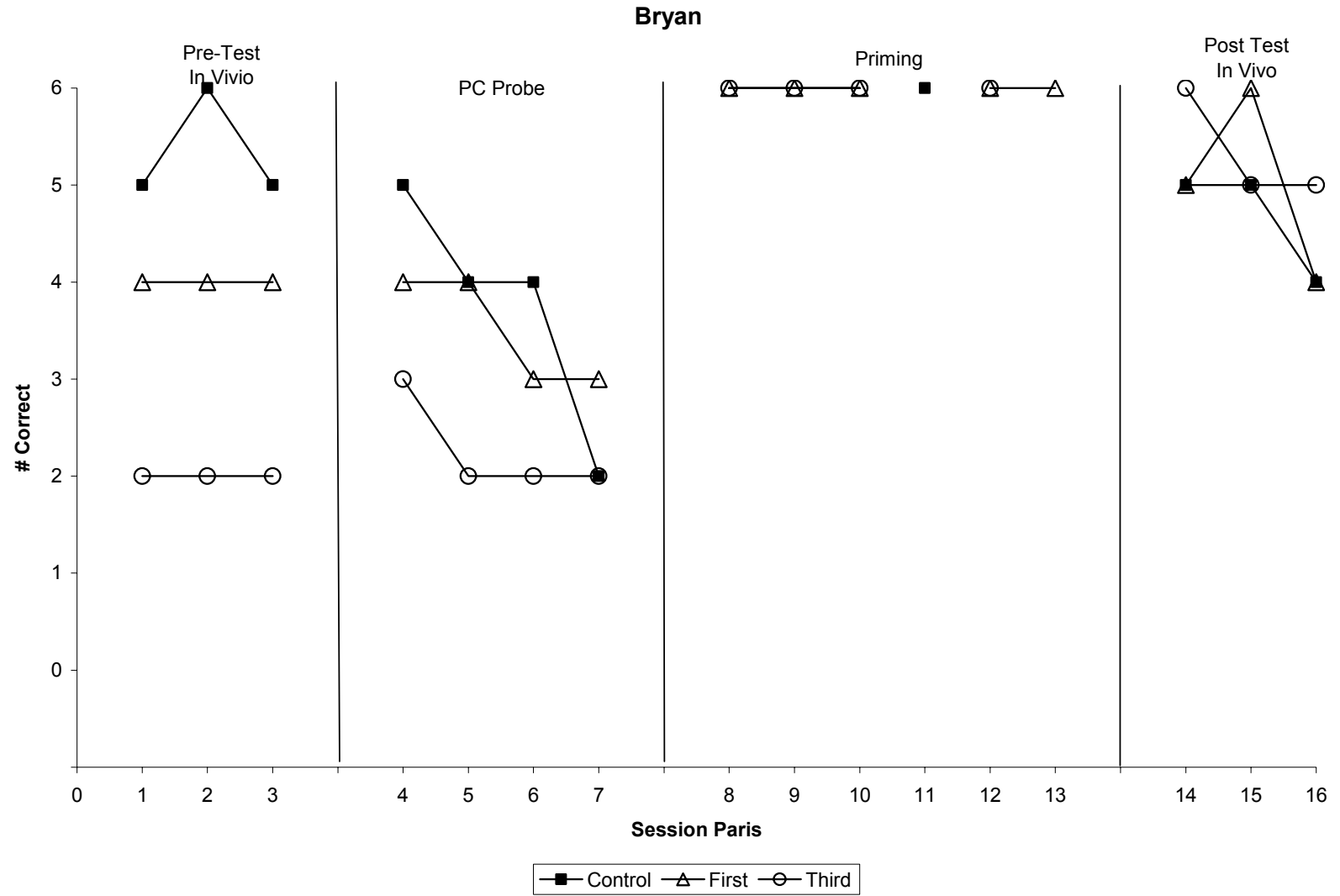


Figure 11. Nathan acquisition



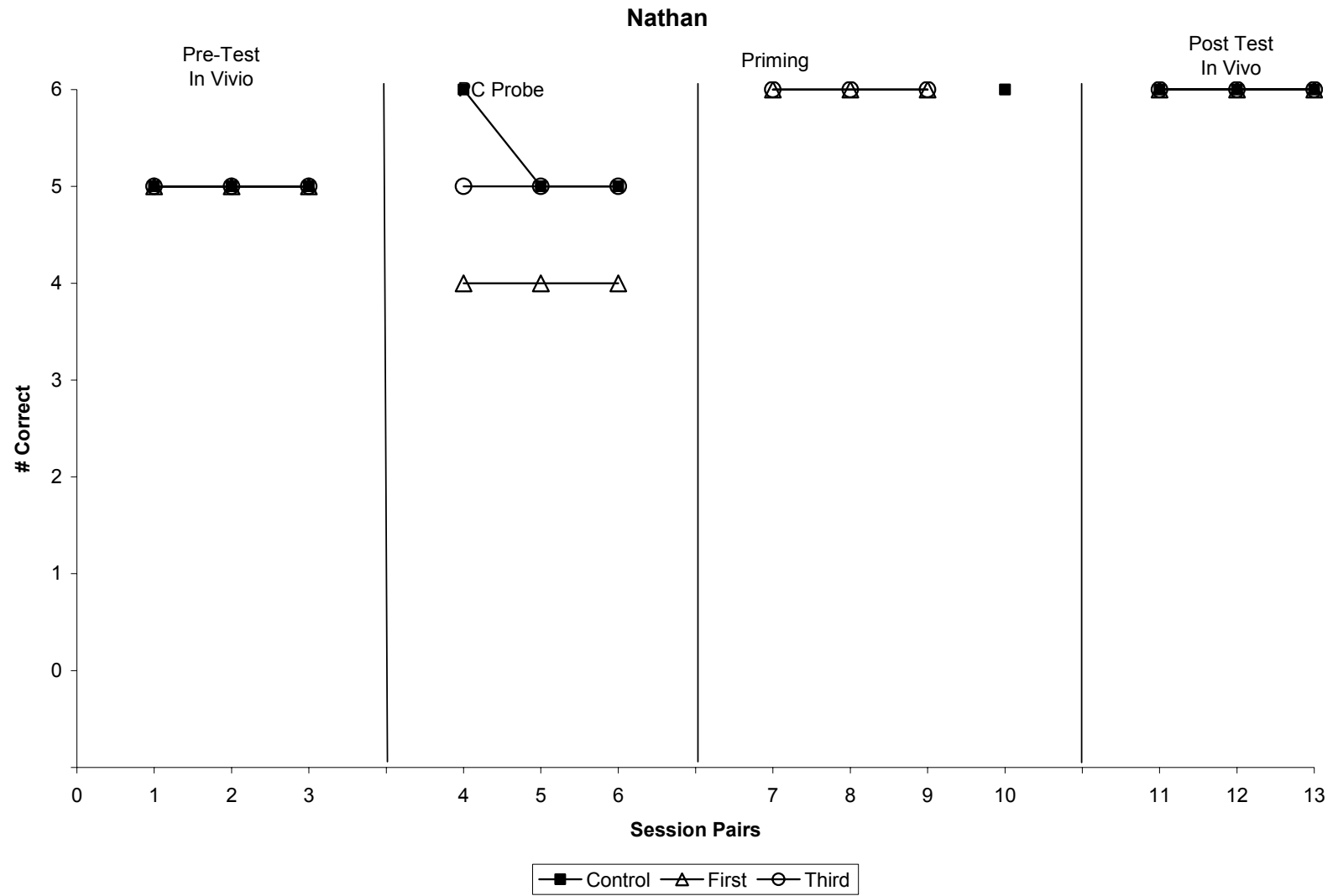


Figure 12. Justin mean correct

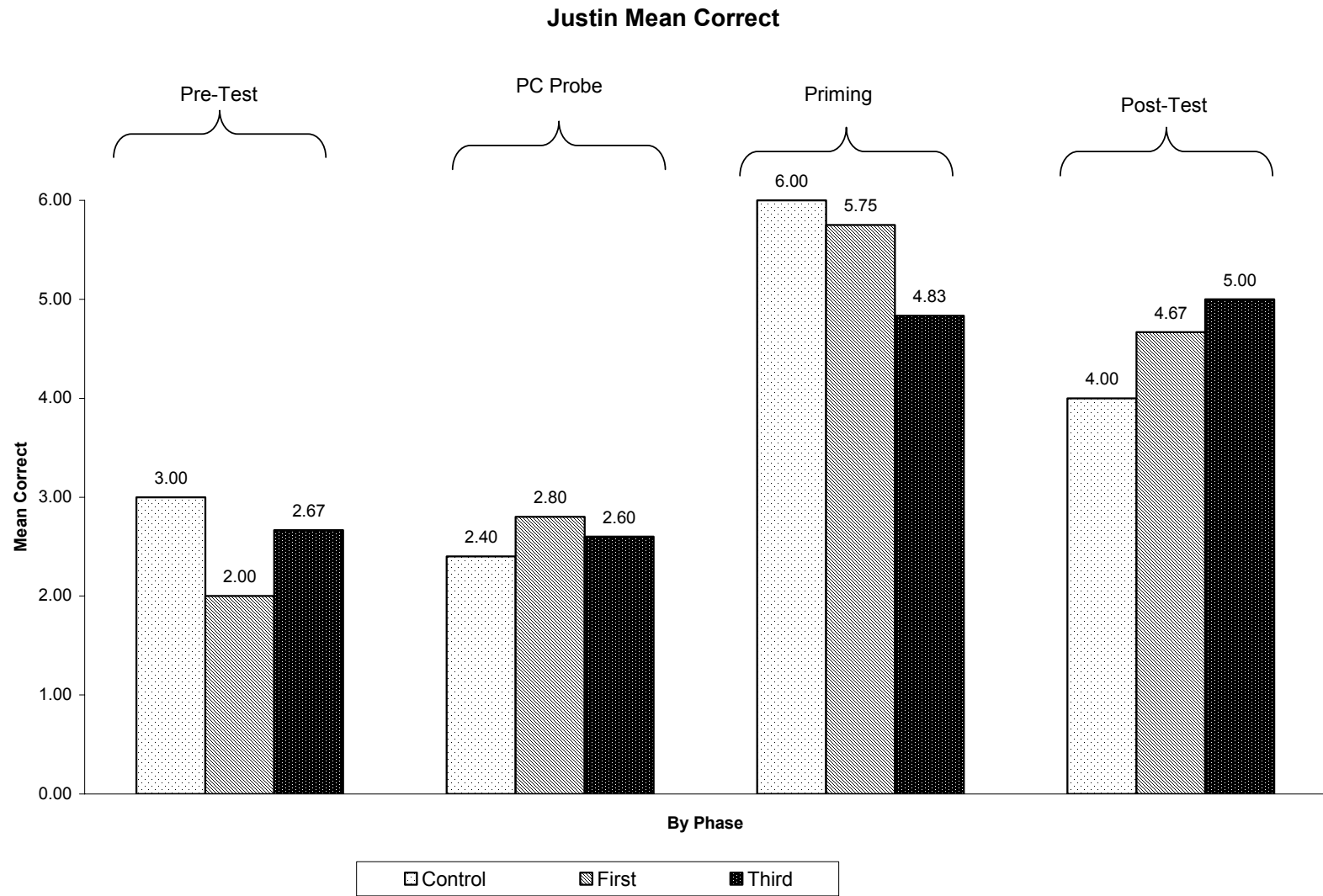


Figure 13. Allison mean correct

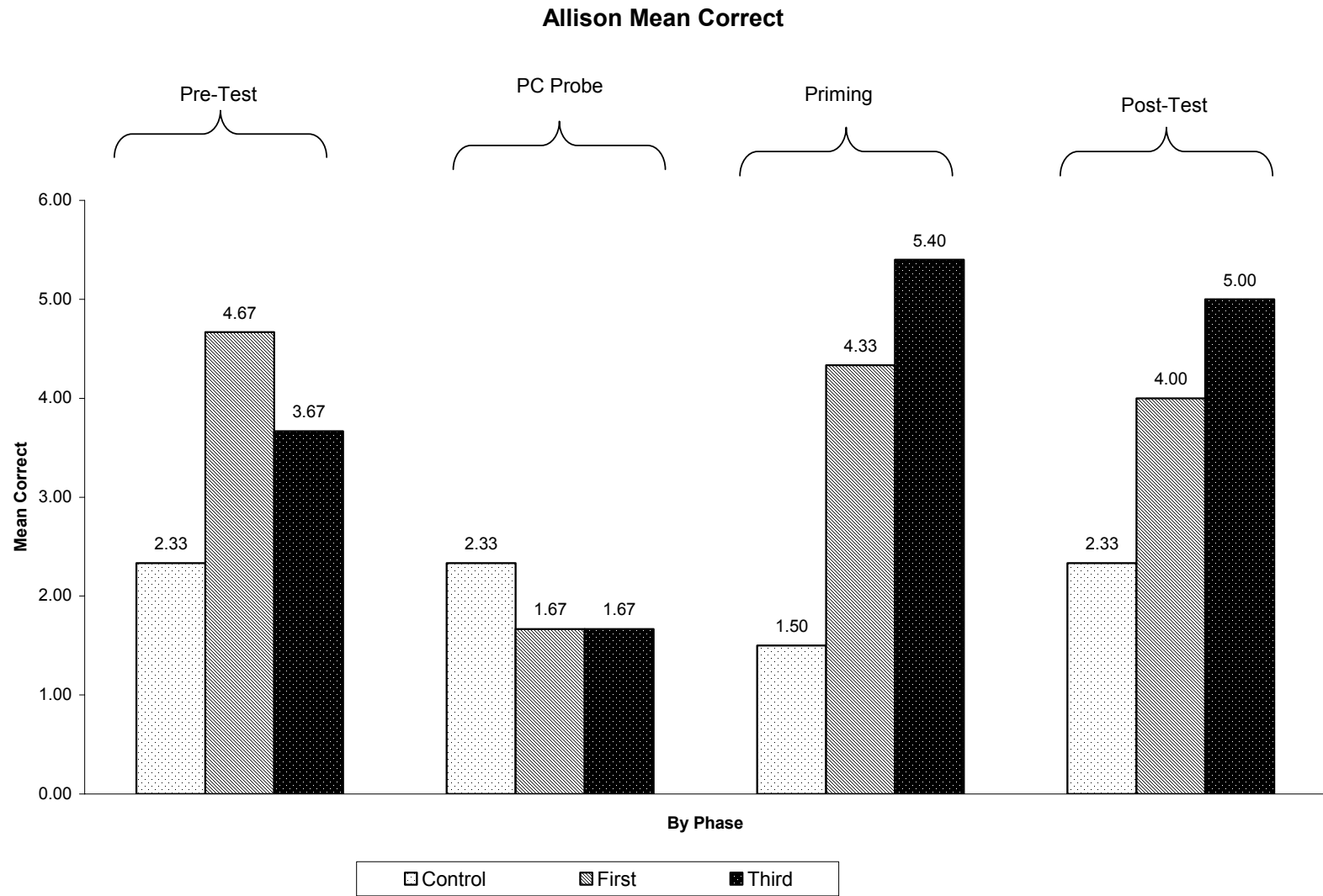


Figure 14. Chris mean correct

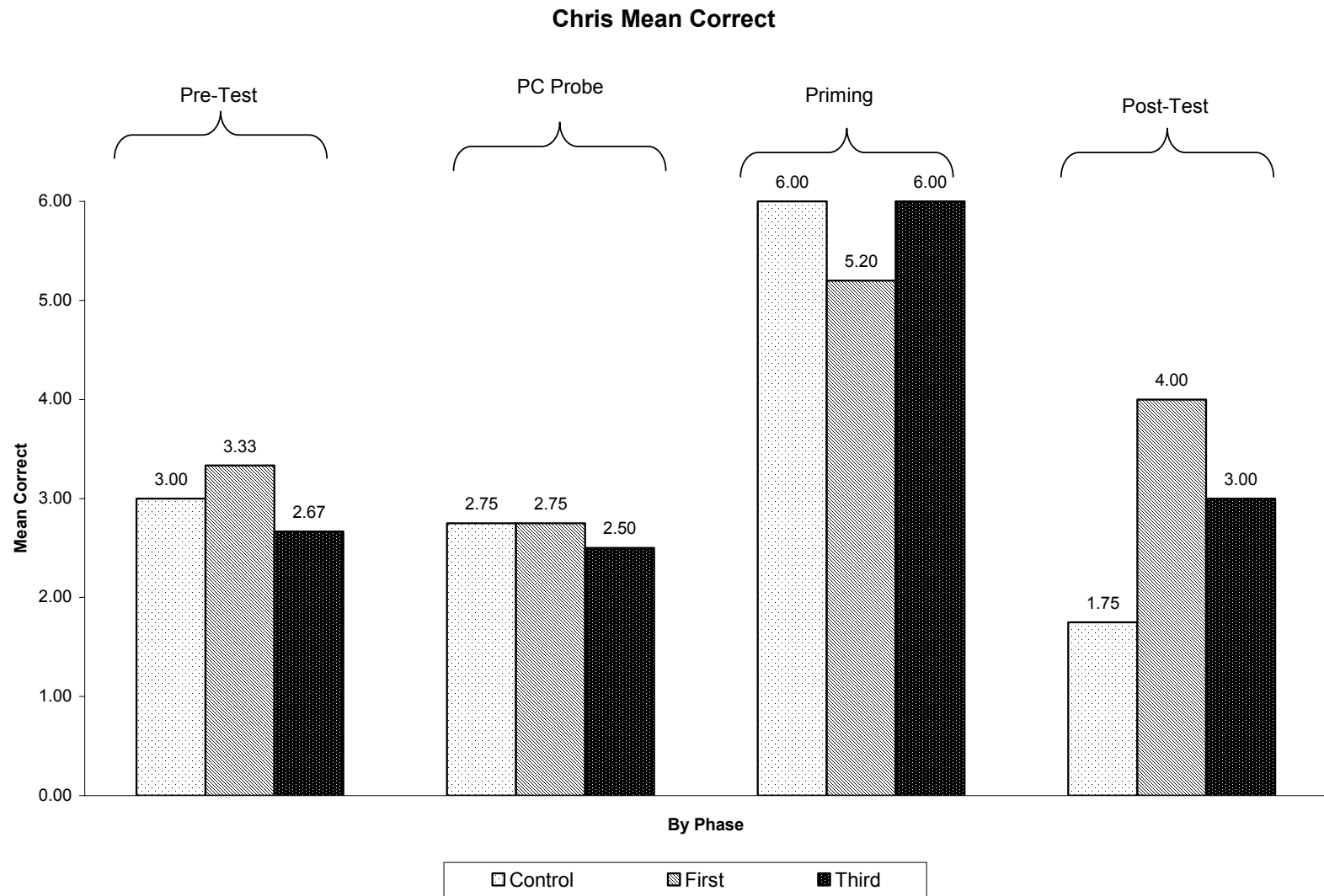


Figure 15. Bryan mean correct



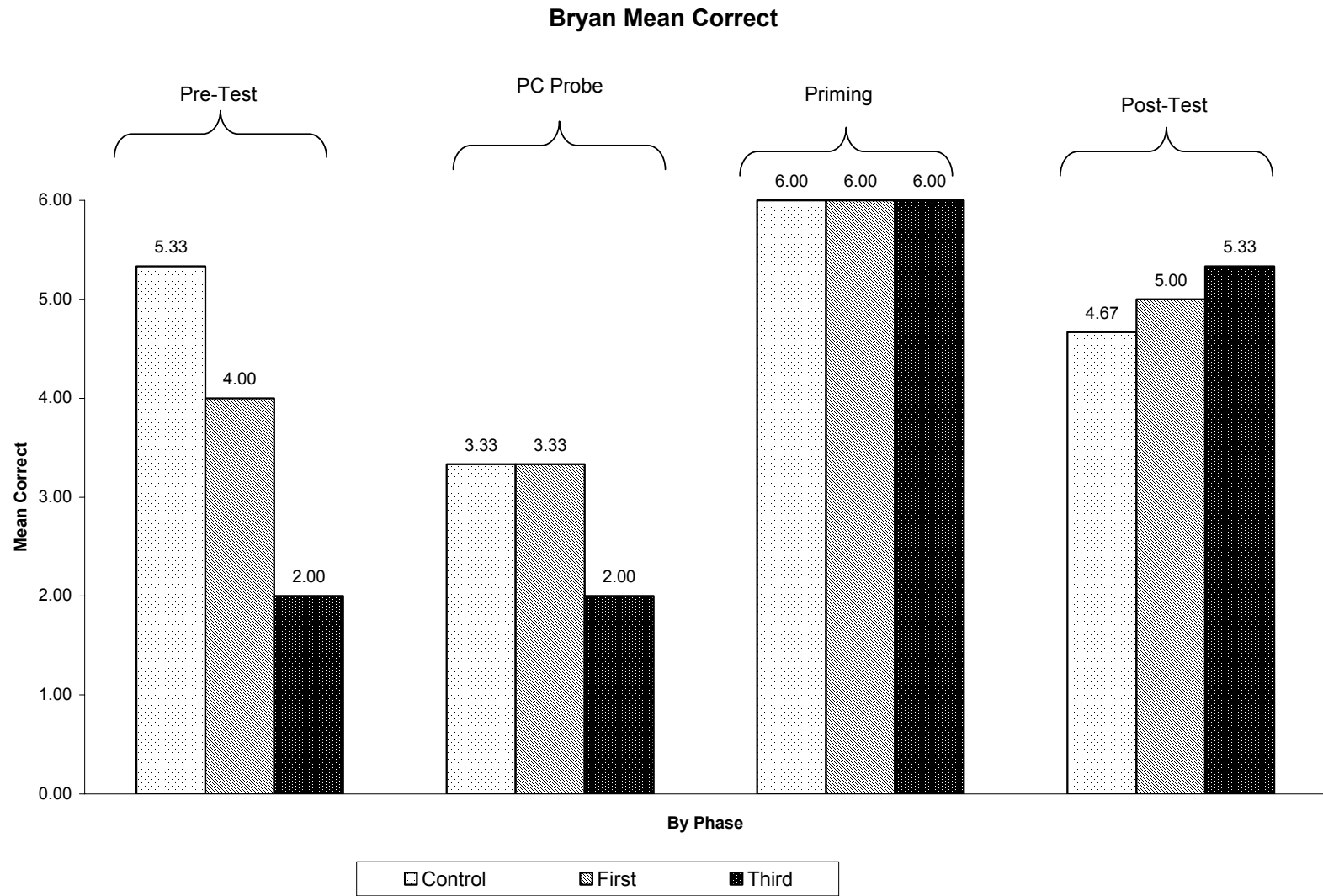


Figure 16. Nathan mean correct

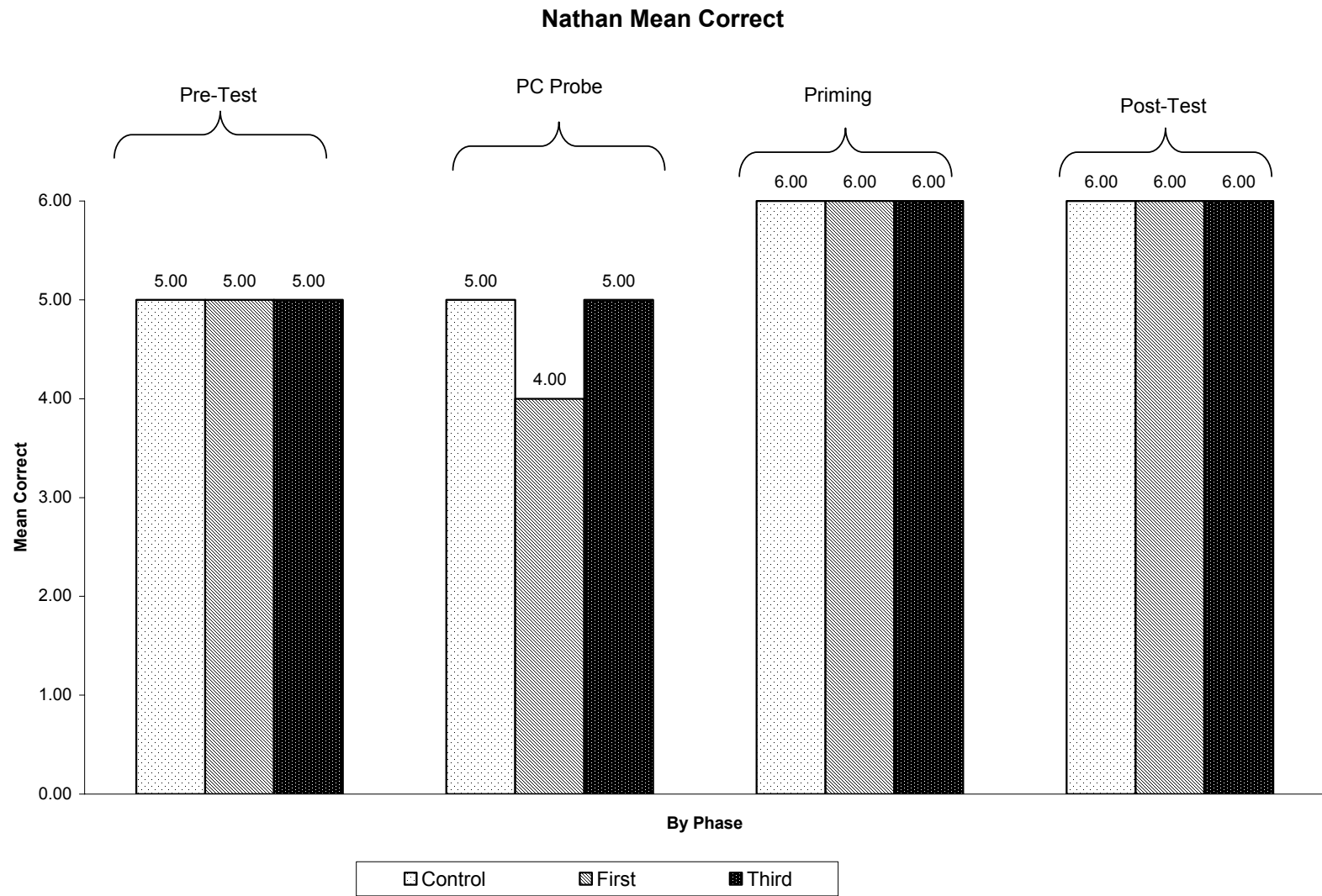


Figure 17. Justin's errors

## Justin's Errors

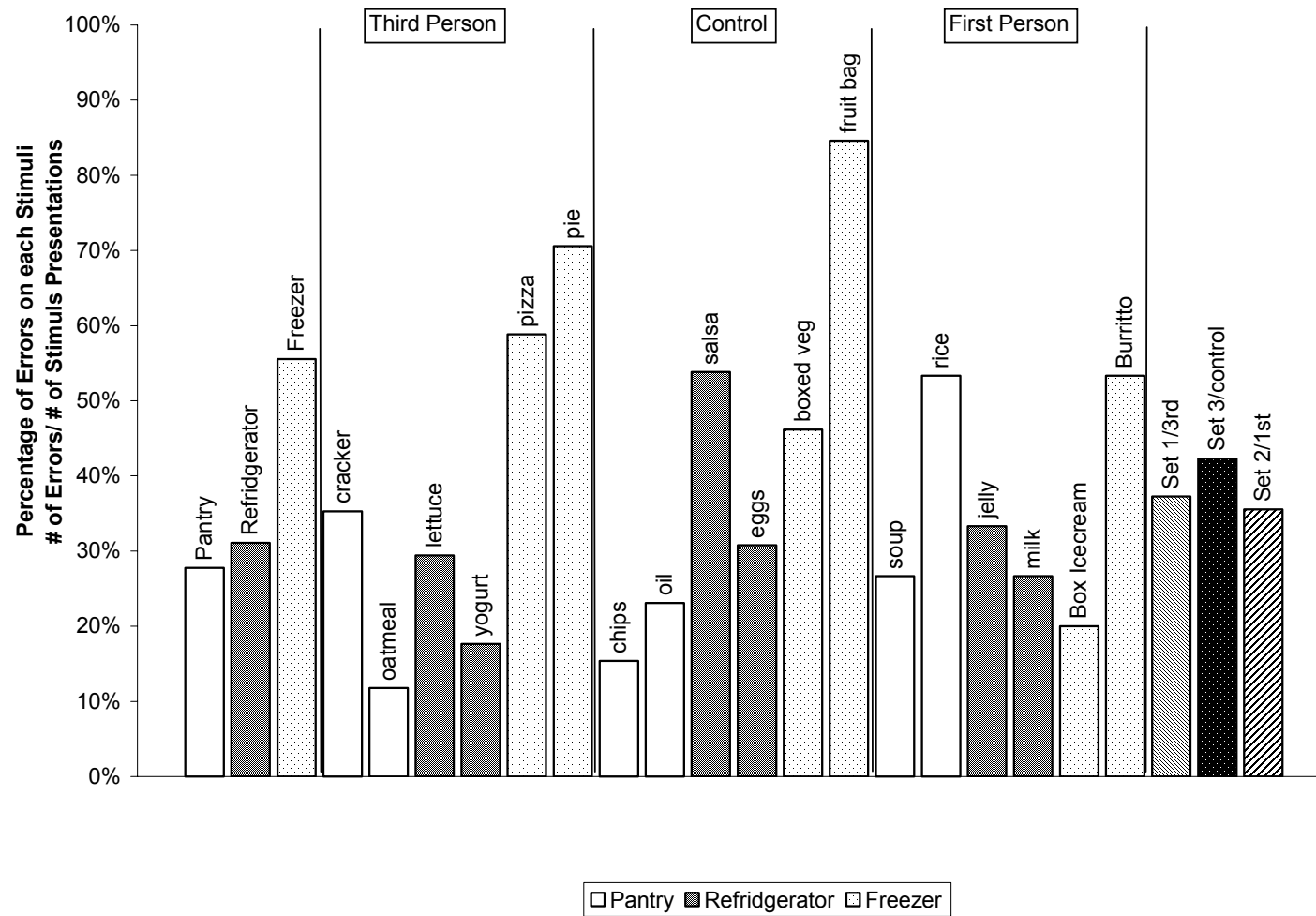


Figure 18. Allison's errors

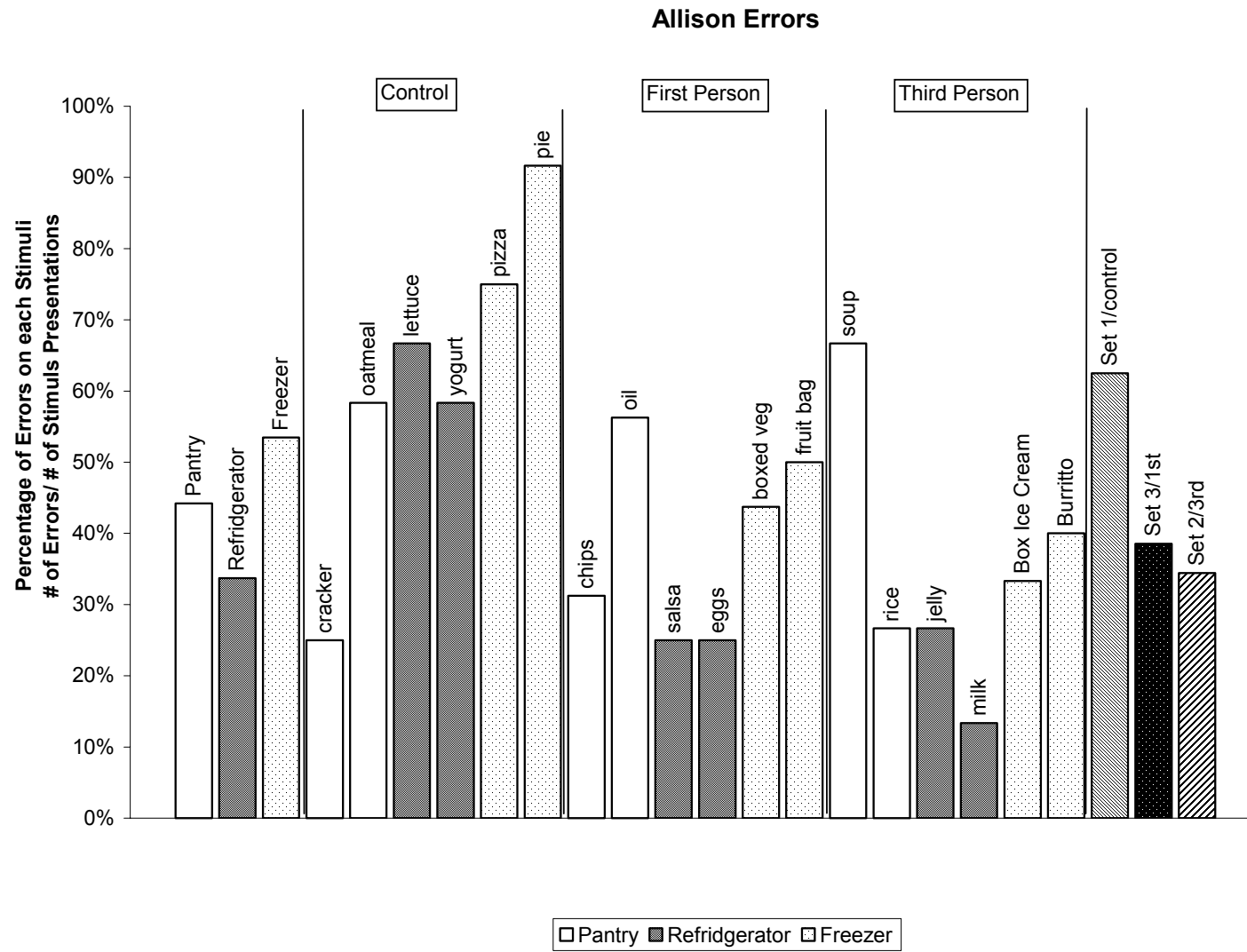


Figure 19. Chris's errors



### Chris's Errors

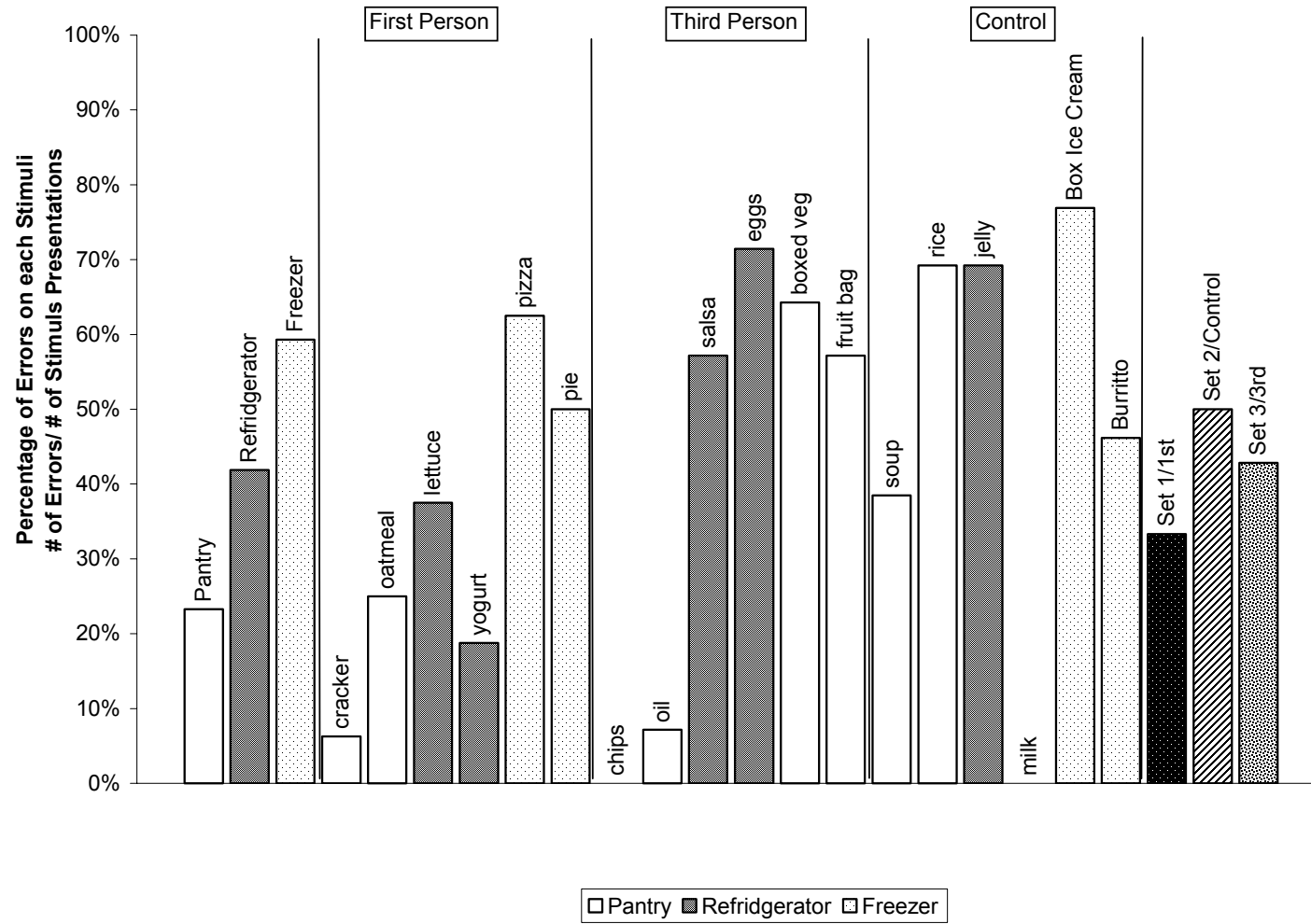


Figure 20. Bryan's errors

### Bryan's Errors

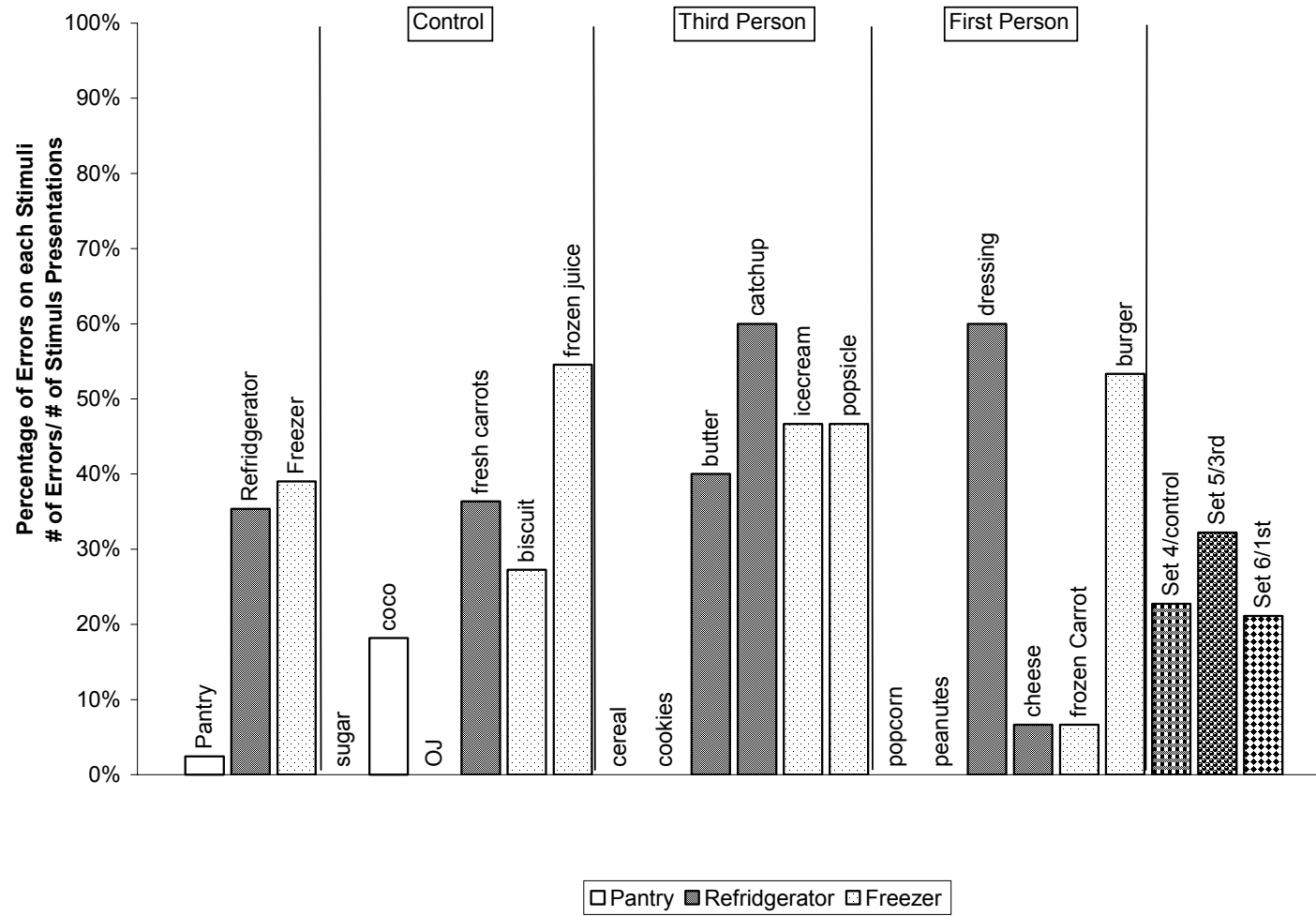
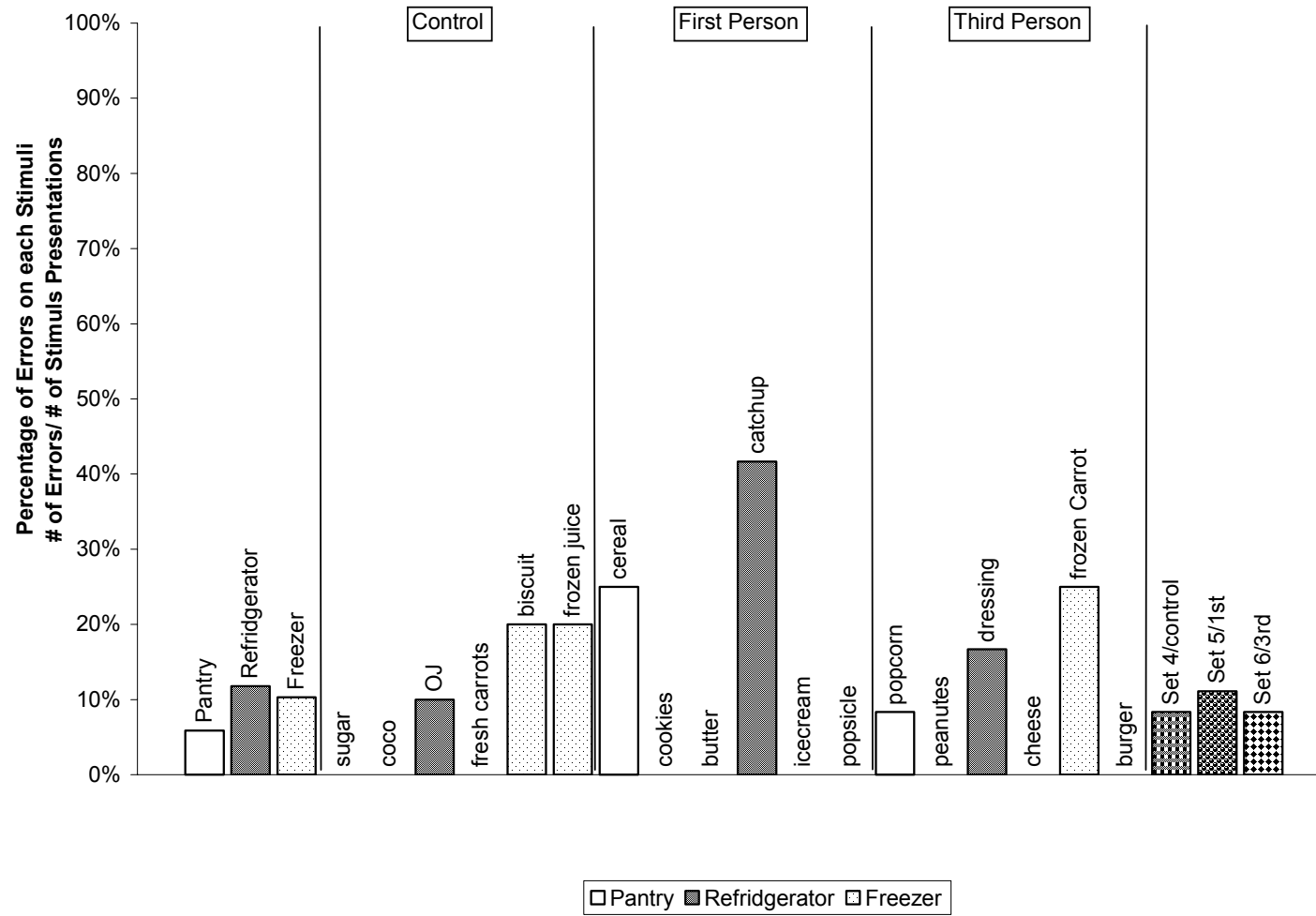


Figure 21. Nathan's errors

### Nathan's Errors



## CHAPTER 5

### DISCUSSION

The results of this study provide marginal information in regard to how to best use video modeling with students who have autism. Unarguably, all students acquired the target behaviors on the computer but the attribution of this improvement to intervention can only be partially or minimally supported by this data. This discussion chapter begins with an overview of the results particularly focused on acquisition and a critical evaluation of how the research design and other procedures, most notably the stimulus selection process should be considered more closely in future related research to improve outcomes. Following the discussion of the research design and potential threats to internal validity, the focus shifts to examining the comparative measures related to efficiency of instruction.

After a general discussion of the results and limitations, the chapter continues with a discussion focused on how the current study fits into the existing body of literature and the future areas of research importance related to video based instruction. Further, issues of research design are addressed relative to how research on video based instruction can and should begin to isolate components of effective video instruction. Finally, the chapter concludes with a rationale suggesting a critical need for research in this domain. While a rationale is often thought of as introductory element, this rationale attempts to place the current study in context amid a broader field of technology related supports for individuals with disabilities and explain those who work with individuals with disabilities have an opportunity to shape the future of assistive technology. The discussion will culminate with a call for a careful, planned, systematic study about how

individuals learn with technology and how new technologies can begin to offer greater support to individuals with disabilities.

### *Results and Limitations*

While all students demonstrated acquisition of the target behavior on the computer, the question remains as to what variable was responsible for acquisition. During video priming for Chris, Justin and Allison, their data for first and third person primes moved in a therapeutic direction and showed some spread between data for the two treatment conditions, thus suggesting superiority of one video perspective over the other. However, intermittent probing on the control set of stimuli also shows acquisition of these stimuli. The control set could be conceived of as the “second tier” in a multiple probe design. Ideally, that data should remain at baseline levels until intervention is applied with that behavior. With students making improvement on stimuli from the control set, one cannot draw the conclusion that the intervention alone was responsible for the changes in behavior. Therefore, it is not tenable to conclude that one intervention was more potent than the other.

Tempering this situation on the other hand, is that during PC Probes, all students showed low stable to moderate performance levels. This changed for all students upon introduction of video priming. The careful consideration of including a control set of stimuli in the design has protected against drawing false conclusions with these data (a Type I Error in this case). In other words, if the control set of stimuli were not used, one might be led to believe that conclusions could legitimately be drawn from the data (even though there was no intra-subject replication nor time lag for introduction of intervention). Several external variables could have threatened the internal validity of the

study. This discussion of limitations will focus primarily on design issues and improvements that could be incorporated to improve studies similar to this.

*Research design issues.* An AATD design was selected for this study because it allows for the comparison of two or more interventions. The application of the design in this case also included a pre/post test for generalization following intervention. In relation to other comparative single subject designs (alternating treatment/multi-element, multitreatment), this design is well suited to answering the research questions about relative efficacy of intervention because it allows for the evaluation of behaviors that are not reversible. Other design possibilities such as a parallel treatments [PTD] (Gast & Wolery, 1988) would also be useful in this case. Jones and Schwartz (2004) effectively used this design to compare effects of three different types of in vivo third person models (peer, sibling and adult). PTD has some drawbacks however, while the design offers an advantage of controlling for maturation and history through a series of time-lagged multiple probe or baseline designs, the execution of this design would have posed logistical difficulties in this study related to selection of stimuli (i. e. would have required adding to the pool of stimuli to have sufficient different stimuli). Further, because of the need to stagger intervention, scheduling problems would have been possible and the total length of time required may have exceeded the school year. In the end though, a PTD design would at least of given the opportunity for documentation of a functional relationship between the intervention(s) and changes in student behavior.

Because of the nature of the AATD and the application of the design in this case, the visual analyst is presented with the option of comparing data points within the Priming phase and between the Priming phase and the PC Probe Phase. The later



comparison amounts to an evaluation of an A-B design and therefore does not provide an opportunity to draw a functional relationship between intervention and the dependent measure. However, since the focus of this study was on a comparison between interventions that have been empirically documented as effective, the primary focus should be on the comparison of data points during the treatment phase. These acquisition data unfortunately do not support any strong conclusions about the effects of intervention and are confounded by the acceleration of data for the control sets. Further, because of the nature of the design, it is not possible to even draw conclusion about a functional relationship between the dependent and independent variables. Had a PTD design been used or some other overlay of a multiple probe/baseline design, more definitive conclusions could be drawn concerning functional relationships.

*Screening of stimuli.* Considering that an AATD design could still be appropriate for answering the research questions asked in this study, an analysis of implementation reveals how this same study can be improved using the same design. The primary issue of interest is the selection process for selecting instructional stimuli. Holcombe, Wolery and Gast (1994) provide guidelines for identifying instructional behaviors when using and AATD: the behaviors should be functionally independent, of the same difficulty and irrelevant characteristics/stimuli of the instructional situation should be controlled. The target behavior for this study was essentially a match to sample behavior. The stimulus sets developed were designed to be analogous to groups of spelling words for example. More clearly, one would not anticipate a student's improvement on one set of six random spelling words to improve their performance on another set of six random words without

the students first receiving instruction on the new set. Assumptions based on this analogy did not hold true for this study.

Great effort was made to select a pool of stimuli that were social valid and then divide that pool into sets to control irrelevant characteristics of the stimuli. For example, to make sure that students did not infer a “rule” that food items in boxes were always stored in the refrigerator, stimuli sets were generated to counterbalance irrelevant stimuli related to shape (boxed, cylindrical, and free form). The variety of package labels made it logically unlikely that students would infer any rule from the images or colors. These last steps may have caused an inadvertent violation of Holcombe et al.’s recommendation for equivalence of difficulty.

Pre-Test probes as well as PC Probes prior to intervention reveal that difficulty levels for all sets were not identical. More directly, if Set 1 were of equal difficulty as Set 2 or Set 3, then one would assume that students would have scored equally well across the three sets before intervention. This did not occur. Rather, a great deal of inter-participant variability existed with some students scoring much better on one set or another. On the other hand, the error analysis that spanned the entire study shows that the number of errors in stimulus sets one through three was similar and the number of errors in sets four and six was similar (see Table 8) thus suggesting some degree of equivalence of difficulty. Regardless, one way to improve stimulus selection in the future would be to have a more systematic screening procedure whereby all students would engage in PC Probes to identify baseline levels of performance on the available stimuli. These stimuli could then be distributed amongst sets to equalize the difficulty level of each set. This strategy would likely result in each student having a set of stimuli unique from other

participants but would ensure that for each student difficulty and baseline levels across sets was equal. This approach was attempted with the current group of students following initial intervention.

With a pool of 36 total stimuli for which videos primes had been developed and because each student in the current study only received intervention for 18 of these stimuli, an attempt was made to replicate the study with the current participants with some refinement to the stimulus selection and division process. Four of the initial participants, Justin, Chris, Allison, and Bryan were able to participate in the attempted replication. Justin, Chris and Allison had all been exposed to stimulus sets 1-3 so in the replication, they were exposed to sets 4-6. Bryan had been exposed to sets 4-6 already so he used sets 1-3.

The replication attempt was to mirror the initial experiment with two exceptions. First, for expedience, no Pre/Post testing to evaluate generalization was conducted. Second, after students received PC Probes, each student's pool of 18 stimuli were going to be redistributed for that student to create unique stimulus sets that controlled for difficulty. This was to be done by distributing stimuli to different groups to balance the error rates. After the PC Probes however, student data indicated that all students correctly and consistently responded to 16-18 out of 18 stimuli. This high level of performance would not allow a useful distribution of stimuli because students would have already effectively mastered most possible sets or be within one or two correct responses. Had all 36 stimuli had been evaluated for each student in the beginning of the study, the "untreated" 18 re-evaluated again at the end for stimulus generalization (this assumes

acquisition and a functional relationship). Without the initial baseline on all of these data little comparison is possible.

Beyond questions of screening stimuli, the question remains why or how did students improve on the control sets in the first experiment. No empirical reason is evident for this change however one can posit a few possibilities. All participants were high functioning students who were able to verbalize what they were being asked to do (i. e. when they saw the researcher several would ask “are we going to go put away groceries?”). The possibility exists that as students became aware that they were being presented learning trials at school related to putting away groceries that they began to take greater notice of where food was stored at home or in grocery stores. While the likelihood of this explaining the increase in the control group performance for all students seems implausible, the possibility exists that it may have contributed to the change.

Perhaps a more likely reason for the change in student performance with control sets involved some overlooked characteristic(s) of the stimulus sets that would have given students the opportunity to identify a “rule” as to where to place items. Analysis of the stimulus sets though reveals no readily apparent rule. Further, it would seem unlikely that students would generalize some sort of rule to an untrained set of stimuli if they have never received any program reinforcement for the acquisition of the trained set (programmed reinforcement was explicitly omitted from intervention to allow the isolation of video priming as an independent variable).

One might also consider that students had some history with one or more of the items in their control sets and therefore this caused a change in their behavior. While logical, this seems somewhat unlikely since the PC Probe condition should have revealed

this and student performance on control sets did not increase until after intervention began. There was also no risk that the computer inadvertently presented students with the control sets during training. The program was designed to track every session and every trial. Even if a session were not completed, a student logging into the system would create an individual data file that would log what student saw what files at what time. With these multitude of possibilities and each possibility seeming unlikely to completely explain the outcome, the largest question to come out of the initial portion of the study appears is concerns the control stimuli.

On a related issue, student data for the different stimulus sets (1<sup>st</sup> and 3<sup>rd</sup>) tended to converge rapidly once intervention began. For example, Chris's data for his first person stimulus set converges with his data for his third person stimulus set after he has seen both sets of primes three times. Granted, the data converge at the ceiling (likewise for Justin after four sessions) but this raises the possibility that one intervention may have influenced the effects of the other (i. e. carryover). While an AATD is supposed to control for sequencing effects through the rapid alternation of treatments, the possibility exists that one of two things occurred. First, students may have become more attuned to the stimuli following the very first presentation of one of the priming sequences and were better prepared when they subsequently viewed a similar set of video primes. For instance, Justin's initial primes were third person primes and he demonstrated better performance during his first, first person stimulus set. Similarly, Chris and Allison received first person primes prior to receiving third person primes and performed at higher levels during their initial third person priming sessions. Therefore after students received primes on their first stimulus set, they may have been more keenly aware of the

instructional situation and been able to focus their attention more intensely. The second existing possibility, and one which is supported in part by the social validity survey of the students, is that students could not discriminate the differences between the two video formats. This would indicate that, from the student's perspective, they were viewing videos that were identical except for the stimuli depicted in the videos. Therefore, if the intervention(s) influenced or changed student behavior, the combination of perspectives essentially led to the change.

### *Future Directions*

The results of this study could lead in many directions. The most immediate and obvious course of action is to replicate the study with revisions to the research design and stimuli selection discussed above. Other comparative evaluations would need to follow to allow for the isolation of critical characteristics of video (or in vivo) priming. This isolation process and subsequent recombination of the most potent characteristics would hopefully then provide a more efficient means of instruction.

Some comparisons that may be of interest include issues related to characteristics of the model. While some researchers have made comparisons in characteristics, the studies have been isolated and with replication. For example, Biederman, Stepaniuk, Davey, Raven and Ahn (1999) compared three different paces of a video model to see if one or the other resulted in better outcomes for a group of individuals with Down's syndrome and found students performed significantly better with slower speed videos.

Sherer, Pierce, Paredes, Kisacky, Ingersoll, and Schreibman (2001) compared video self-modeling to third person modeling and reported no significant differences. The addition of first person video to this comparison might yield different results. Similarly,

the inclusion of first person video in Charlop-Christy, Le, and Freeman's (2000) demonstration of the superiority of third person video modeling over in-vivo modeling could lead to potentially different results. Jones and Schwartz (2004) found that children acquired target behaviors with three different types of third person models (peers, siblings, and adults) and concluded that child models are at least as effective as adult models (part of their rationale was to demonstrate the importance of inclusive settings). Including first person modeling in this comparison would have been a challenge and may have detracted from the focus of the study, but it would allow a greater breadth of analysis.

Beyond the perspective and pace, researchers might begin to identify the optimum combination of in-vivo training to video based training. Haring, Kennedy, Adams, & Pitts-Conway (1987) began the foundation for this by evaluating a practice of teaching students in-vivo to 90% of mastery before using video modeling to assist in the completion of acquisition. Another question focuses on whether the type of skill (e. g. functional vs. social) matter targeted for instruction influences which type of modeling is more effective. This question suggest that in-vivo nor video modeling are superior in their own but may be most successful when combined appropriately. Related, the target skill may influence the type of video model or ratio of in vivo to vide modeling required. For instance, video modeling in the first person may be more powerful for teaching functional skills (e. g. setting the kitchen table) where students would see in the video what the they would actually see when performing the skill. On the other hand, third person video modeling might be more effective for teaching social skills because the

student would need to see the body language and facial expressions of all individuals in the social situation and not just the actor modeling the target behavior.

All of the questions above relate to video modeling or priming and the effects of these as interventions for people with disabilities as a broad category of individuals. The possibility exists that the sort of model or prime that is most powerful for a student varies by their disability or some other characteristic. For example, children with autism may benefit most from first person models presented via video but children with intellectual disabilities might benefit more from in-vivo models of peers. If differences do exist, the next step is to identify those important differences but, perhaps more interesting, is to ask why the difference exist. The fact may be that the type of model does not vary by diagnosis but by individual student (notice the slight inter-student differences in this study) and therefore practitioners may need to begin including model preference assessment in their programs in the same way they include reinforcer preference assessments.

Most of the comparisons described above can be evaluated using single research designs. Either AATD or PTD would be suitable choices and would allow practitioners and researchers alike to observe student progress over time. Group designs employing inferential statistics could also be used provided that large enough samples of participants would be available to provide sufficient statistical power to detect changes. A group design would further allow the evaluation of a “trait-by-treatment” comparison of intervention options to student diagnosis/characteristics For example, .g first person versus third person video for students with autism versus those with intellectual disabilities or students with high functioning autism versus low functioning autism. Comparative



research like that described above will allow practitioners to make the most informed choices about the best possible intervention for their students.

### *Technology and the Future*

Finding the best possible interventions, technology related or not, is of paramount importance in special education research. By identifying best instructional practices, researchers can help to shape the way education is implemented. Likewise, researchers can help to shape what technologies are developed. Trying to forecast technology advancement has more in common with reading tea leaves than truly suggesting what new innovation will change the way humans live. However, given empirical data for effective practices, researchers will not have to react to what happens with technology, rather they can take an active role and drive the technology development.

Related to this study for instance, the individualization of instruction through perspectives in video modeling may improve part of the educational experience for students (with and without disabilities) and therefore deserves consideration to the extent of exploring what is possible. This is just one small area of technology related instruction. The boundary of what is possible with technology is difficult to conceive. Integration of technology supports into the lives of individuals with disabilities can reshape the way they live. Ogden Lindsley wrote that “Children are not retarded. Only their behavior in average environments is sometimes retarded. In fact, it is modern science’s ability to design suitable environments for these children that is sometimes retarded. We design environments to maintain life, but not to maintain dignified behavior” (1964, p. 62). He continues to talk about how society can arrange environments to better support individuals with disabilities. He even speaks specifically about computer technology.

Assistive technology can play a roll in making the environment less retarded. Careful consideration to the planned advancement of these technologies can and will lead to more powerful tools for teachers and students.

Consider the advancements of personal digital assistants and cellular telephones. A user can now download video on demand to their cellular telephone, store schedules, telephone numbers, pictures, and even play games. While these things will have more widespread commercial than educational use, these technologies could become a component in a network of supports for adults (and children) with disabilities. Davies, Stock & Wehmeyer have evaluated the use of palm-top computers to increase independent decision making (Davies, Stock & Wehmeyer, 2003a), improve money management skills (Davies, Stock, and Wehmeyer, 2003b) and improve vocational performance of individuals with intellectual disabilities (Davies, Stock & Wehmeyer, 2002). Integration of video into these tools to provide task related instructional assistance, communication assistance (defining signs and words with a video based dictionary), could all improve independent functioning in the community. This technology could incorporate other features to further increase independence (from caregivers). Some things that could be included: navigational assistance (combined with global positioning systems), augmentative communication (already being done on Pocket PC's), and self-monitoring or self-management systems (reminders to take medication, feed the dog etc). An individual's device could also provide instructional video for care staff to assist care givers with proper positioning techniques, feeding techniques, or behavioral protocols.

To make this advance in technology for individuals with disabilities will require a market force beyond the current consumer audience of individuals with intellectual

disabilities. Widening that market to encompass a broader range of cognitive disabilities like individuals who have had a stroke or individuals with Alzheimer's may allow for an influx of capital and interest necessary to make these advances. This later group is likely to increase as the population in the United States ages and therefore increase the needs for assistive technology to support those with cognitive disabilities (Braddock, Rizzolo, Thompson & Bell, 2004 citing Braddock, 2001). Researchers in the areas of assistive technology and universal design need to position themselves and their research to drive and inform innovation and subsequent manufacturing rather than waiting to see what new technology arrives and then trying to figure out how to use or adapt it.

Refocusing on schools, special educators spend instructional time helping students to adapt to society's structure that is often inhospitable (or at least unsupportive). Teachers spend time working with students on community based instruction, social skills, and leisure skills trying to help students increase the size of their behavioral repertoire to a point that will allow them to live as independently as possible in their current and future environments.

The problem with this process, the one in which special educators engage, is that it stops at 21. If the rest of society has yet to structure a more suitable community for individuals with disabilities, students in special education leave school with a set of skills appropriate for their community at that specific place in time. This education is stagnant but Technology can change it. If educators take a different tact, approach the problem in part from the perspective of universal design, perhaps a new and better way to prepare students will emerge that will allow them to continue learning and adapting long after they leave our classrooms. Integrating learning into computer networks and held held

devices that can dynamically shift as a student's community changes would allow them to continue learning in a systematic, structured way long after formal schooling has ended.

How many discrete behaviors are required of the average person to function in their daily environment: work, home, community etc? The vast majority of people in our society have acquired a sufficient number of these behaviors to function independently or mostly independently. Others, because of poor opportunities for learning do not possess all the requisite behaviors to live happily and successfully in society. Of these individuals, some have specific disabilities which are characterized by difficulties with learning. Some have sensory deficits or physical impairments while others have cognitive and neurological problems. In the area of cognitive disabilities, people with intellectual disabilities from the mild to severe ends of the spectrum, people with autism or related disorders, demonstrate obvious capacities to learn but these capacities are, for what ever reason, restricted. Too often people who have not mastered all of the behaviors required to function independently in society are marginalized. They have to depend on other people for basic needs and cannot fully experience their community.

Not all people, when they are in school are given the opportunity to learn the functional skills that they will need to be successful in the community. Subsequently, when they turn 21 and school systems are released of their obligation to provide educational services to them, the educational process ends. Progressive systematic research can lead to a blending of technology, learning theory and universal design that would function as a tool for independence and life long learning. Simple component analyses of a single aspect of instruction like the one in this study (perspectives of video

modeling) can ultimately inform the design of future technologies. Small studies with technology will allow researchers and designers to craft useful technology to make the environment less retarded and allow people greater freedoms.

## References

- Alcantara, P. R. (1994). Effects of videotape instructional package on the purchasing skills of children with autism. *Exceptional Children*, 61, 40-55.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4<sup>th</sup>-TR ed.). Washington, DC: Author.
- Ayres, K. M. & Langone, J. (in press). Intervention and instruction with video for students with autism: A review of the literature. *Education and Training in Developmental Disabilities*.
- Ayres, K.M. & Langone, J. (2002). Acquisition and generalization of purchasing skills using video enhanced computer-based instructional program. *Journal of Special education Technology*, 17, 15-28.
- Baer, D. & Wolf, M. M. (1970). Recent examples of behavior modification in preschool settings. In C. Neuringer & J.L. Michale (Eds.), *Behavior modification in clinical psychology* (pp.5-12). New York: Appelton-Century-Crofts.
- Baer, D., Wolf, M.M., & Risley, T. (1968). Some current dimensions of applied behavior analysis. *Journal of Applied Behavior Analysis*, 1, 91-97.
- Bandura, A. (1969). Social learning theory of indentificatory processes. In D. A. Goslin (Ed.), *Handbook of socialization theory and research* (pp. 213-262). Chicago: Rand McNally.
- Bandura, A. (1977 ). *Social learning theory*. Upper Saddle River, NJ: Prentice Hall.
- Bandura, A., Ross, D., & Ross, S. A. (1963). Imitation of film-mediated aggressive models. *Journal of Abnormal & Social Psychology*, 66, 3-11.
- Barry, L. M., & Burlew, S. B. (2004). Using social stories to teach choice and play skills

to children with autism. *Focus on Autism & Other Developmental Disabilities*, 19, 45-51.

Biederman, G. B., Stepaniuk, S., Davey, V. A., Raven, K., & Ahn, D. (1999).

Observational learning in children with Down syndrome and developmental delays: The effect of presentation speed in videotaped modeling. *Down Syndrome: Research and Practice*, 6, 12-18.

Braddock, D. (2001, November 1). *Emerging research frontiers and partnerships in developmental disabilities*. Keynote Address at Annual Conference, Association of University Centers on Disabilities, Bethesda, MD.

Braddock, D., Rizzolo, M. C., Thompson, M., & Bell, R. (2004). Emerging technologies and cognitive disability. *Journal of Special Education Technology*, 19, 49-56.

Brownell, M.D. (2002). Musically adapted social stories to modify behaviors in students with autism: Four case studies. *Journal of Music Therapy*, 39, 117-144.

Bryan, L. C., & Gast, D. L. (2000). Teaching on-task and on-schedule behaviors to high-functioning children with autism via picture activity schedules. *Journal of Autism and Developmental Disorders*, 30, 553-567.

Carpentieri, S., & Morgan, S. B. (1996). Adaptive and intellectual functioning in autistic and non-autistic retarded children. *Journal of Autism and Developmental Disorders*, 26, 611-620.

Charlop, M. H., & Milstein, J. P. (1989). *Teaching autistic children conversational speech using video modeling*. *Journal of Applied Behavior Analysis*, 22, 275-285.

Charlop-Christy, M. H.; Daneshvar, S. (2003). Using video modeling to teach perspective taking to children with autism. *Journal of Positive Behavior Interventions*, 5, 12-

21.

- Charlop-Christy, M. H., Le, L., & Freeman, K. A. (2000). A Comparison of Video Modeling with In-vivo Modeling for Teaching Children with Autism. *Journal of Autism and Developmental Disorders, 30*, 537-552.
- Davies, D. K., Stock, S. E., & Wehmeyer, M. L. (2003a). A palmtop computer-based intelligent aid for individuals with intellectual disabilities to increase independent decision making. *Research and Practice for Persons with Severe Disabilities, 28*, 182-193.
- Davies, D. K., Stock, S. E., & Wehmeyer, M. L. (2003b). Utilization of computer technology to facilitate money management by individuals with mental retardation. *Education and Training in Developmental Disabilities, 38*, 106-120.
- Davies, D. K., Stock, S. E., & Wehmeyer, M. L. (2002). Enhancing independent task performance for individuals with mental retardation through use of a handheld self-directed visual and audio prompting device. *Education and Training in Mental Retardation and Developmental Disabilities, 37*, 209-218.
- Fischer, J. B. & Schumaker, J. B. (1995). Searching for validated inclusive practices: A review of the literature. *Focus on Exceptional Children, 28*, 1-21.
- Gast, D. & Wolery, M. (1988). Parallel treatments design: A nexted single subject design for comparing instructional procedures. *Education and Treatment of Children, 11*, 270-285.
- Gray, C. (1995). Teaching children with autism to “read” social situations. In K. A. Quill (Ed.), *Teaching children with autism to: Strategies to enhance communication and socialization* (pp. 219-241). New York: Delmar.



- Haring, T. Kennedy, C., Adams, M., and Pitts-Conway, V. (1987). Teaching generalization of purchasing skills across community settings to autistic youth using videotape modeling. *Journal of Applied Behavioral Analysis*, 20, 89-96.
- Hagiwara, T., & Myles, B. S. (1999). A multimedia social story intervention: Teaching skills to children with autism. *Focus on Autism and Other Developmental Disabilities*, 14, 82-95.
- Hogdgon, L. A. (1995). *Visual strategies for improving communication: Practical supports for school and home*: Troy, MI: Quick Roberts Publishing.
- Holcombe, A. & Wolery, M. (1994). Comparative single subject research: Description of designs and discussion of problems. *Topics in Early Childhood Special Education*, 14, (119-130).
- Hosford, R. E. (1981). Self-as-models: A cognitive social-learning technique. *The Counseling Psychologist*, 9, 45-62.
- Ihrig, K. & Wolchik, S. A. (1988). Peer versus adult models and autistic children's learning: Acquisition, generalizations, and maintenance. *Journal of Autism and Developmental Disorders*, 18, 67-79.
- Jones, C. D. & Schwartz, I. S. (2004). Siblings, peers, and adults: Differential effects of models for children with autism. *Topics in Early Childhood Special Education*, 24, 187-198.
- Jones, E. A. & Carr, E. G. (2004). Joint attention in children with autism: Theory and intervention. *Focus on Autism & Other Developmental Disabilities*, 19, 13-26.
- Keeling, K., Myles, B. S. & Gagnon, E. (2003). Using the power card strategy to teach

- sportsmanship skills to a child with autism. *Focus on Autism & Other Developmental Disabilities*, 18, 105-111.
- Koegel, L. K., Koegel, R. L., Frea, W., & Green-Hopkins, I. (2003). Priming as a method of coordinating educational services for students with autism. *Language, Speech, & Hearing Services in Schools*, 34, 228-235.
- Kuttler, S., Myles, B. S., & Carlson, J. K. (1998). The use of social stories to reduce precursors to tantrum behavior in a student with autism. *Focus on Autism and Other Developmental Disabilities*, 13, 176-182 .
- Lasater, M. W., & Brady, M. P. (1995) Effects of video self-modeling and feedback on task fluency: A home-based intervention. *Education and Treatment of Children*, 18, 389-408.
- Lewy, A. L. & Dawson, G. (1992). Social stimulation and joint attention in young autistic children. *Journal of Abnormal Child Psychology*, 20, 555-566.
- Lindsley, O. R. (1964). Direct measurement and prosthesis of retarded behavior. *Journal of Education*, 147, 62-81.
- Lorimer, P. A., Simpson, R. L., Myles, B. S. (2002) The use of social stories as a preventative behavioral intervention in a home setting with a child with autism. *Journal of Positive Behavior Interventions*, 4, 53-60.
- McDougall, D. (1998). Research on self-management techniques used by students with disabilities in general education settings: A descriptive review. *Remedial and Special Education*, 19, 310-321.
- National Research Council. (2001). *Educating children with autism*. Washington, DC: National Academy Press.

- Norman, J. M., Collins, B. C., & Schuster, J. W. (2001). Using an instructional package including video technology to teach self-help skills to elementary students with mental disabilities. *Journal of Special Education Technology, 16*, 5-18.
- Ogletree, B. T., & Fischer, M. A. (1995). An Innovative Language Treatment for a Child with High-Functioning Autism. *Focus on Autistic Behavior, 10*, 1-10.
- Rowe, C. (1999). The Stanley Segal Award: Do Social Stories Benefit Children with Autism in Mainstream Primary Schools? *British Journal of Special Education, 26*, 12-14.
- Scattone, D., Wilczynski, S. M., Edwards, R. P., & Rabian, B. (2002). Decreasing disruptive behaviors of children with autism using social stories. *Journal of Autism and Developmental Disorders, 32*, 535-43.
- Schreibman, L., Whalen, C., & Stahmer, A. C. (2000). The use of video priming to reduce disruptive transition behavior in children with autism. *Journal of Positive Behavior Interventions, 2*, 3-11.
- Schwartz, I., (1999). Controversy or lack of consensus? Another way to examine treatment alternatives. *Topics in Early Childhood Special Education, 19*, 189-194.
- Schwartz, I. S. & Baer, D. M. (1991). Social validity assessments: Is current practice state of the art? *Journal of Applied Behavior Analysis, 24*, 189-204.
- Sherer, M., Pierce, K. L., Paredes, S., Kisacky, K. L., Ingersoll, B., & Schreibman, L. (2001). Enhancing conversation skills in children with autism via video technology: Which is better, "Self" or "Other" as a model? *Behavior Modification, 25*, 140-148.
- Shipley-Benamou, R., Lutzker, J. R., & Taubman, M. (2002). Teaching daily living skills

- to children with autism through instructional video modeling. *Journal of Positive Behavioral Interventions*, 4, 165-175.
- Sidman, M. (1960). *Tactics of scientific research-Evaluating experimental data in psychology*. New York: Basic Books.
- Simpson, A., Langone, J., & Ayres, K.M. (In press). Embedded video and computer based instruction to improve social skills for students with autism. *Education and Training in Developmental Disabilities*.
- Smith, C. (2001). Using social stories to enhance behaviour in children with autistic spectrum difficulties. *Educational Psychology in Practice*, 17, 337-345.
- Swaggart, B.L., Gagnon, E., Bock, S.J., Earles, T.L., Quinn, C., Myles, B.S., & Simpson, R.L., (1995). Using social stories to teach social and behavioral skills to children with autism. *Focus on Autistic Behavior*, 10, 1-16.
- Tawney, J.W. & Gast, D.L. (1984). *Single subject research in special education*. Columbus, OH: Merrill.
- Taylor, B.A., Levin, L. & Jasper, S. (1999). Increasing play-related statements in children with autism toward their siblings: Effects of video modeling. *Journal of Developmental and Physical Disabilities*, 11, 253-264.
- Thelen, M. H., Fry, R. A., Fehrenbach, P. A. & Frautschi, N. M. (1979). Therapeutic videotape and film modeling: A review. *Psychological Bulletin*, 86, 701-720.
- Thiemann, K. S., & Goldstein, H. (2001) Social stories, written text cues, and video feedback: Effects on social communication of children with autism. *Journal of Applied Behavior Analysis*, 34, 425-446.
- Wert, B. Y. & Neisworth, J. T. Effects of video self-modeling on spontaneous requesting

- in children with autism. *Journal of Positive Behavioral Interventions*, 5, 30-34.
- Wilde, L. D., Koegel, L. K., & Koegel, R. L., (1992). *Increasing success in school through priming: A training manual*. Santa Barbra: University of California.
- Wissick, C. A., Gardner, J. E., & Langone, J. (1999). Video-based simulations: Considerations for teaching students with developmental disabilities. *Career Development for Exceptional Individuals*, 22, 233-249.
- Wolf, M. M. (1978). Social validity: The case for subjective measurement or how applied behavior analysis is finding its heart. 11, 203-214.
- Wolery, M., Ault, M. J., & Doyle, P. M. (1992). *Teaching Students with Moderate to Severe Disabilities: Use of response prompting strategies*. White Plains, NY: Longman Publishing Group.
- Wolery, M. & Ezell, H.K. (1993). Subject descriptions and single subject research. *Journal of Learning Disabilities*, 10, 642-6.
- Wolery, M. & Garfinkle, A.N. (2002). Measures in intervention research with young children who have autism. *Journal of Developmental Disorders*, 32, 463-478.
- Zanolli, K. Daggett, J. & Adams, (1996). Teaching preschool age autistic children to make spontaneous initiations to peers using priming. *Journal of Autism & Developmental Disorders*, 26, 407-422.

Appendix A  
PARENTAL CONSENT

To whom it may concern:

I agree to allow my child, \_\_\_\_\_, to take part in a research study titled, "Effects of two forms of video modeling on daily living skills \_\_\_\_\_ school. The research will be carried out by Kevin Ayres under the supervision of Dr. John Langone from the Special Education Department at the University of Georgia. I do not have to allow my child to be in this study if I do not want to. My child can stop taking part at any time without giving any reason, and without penalty. I can ask to have the information related to my child returned to me, removed from the research records, or destroyed.

The following points have been explained to me:

- The reason for the research is to teach students daily living skills related to grocery shopping. Specifically where to store food when returning from the store.
- The procedures will consist of students using a computer program to view different adults returning from a shopping trip and putting away groceries. In some videos the students will see the adult model, in other videos, the student will see video that would be shot from the perspective of the person putting away the groceries.
- Students will have an opportunity to demonstrate on the computer and in the school how they learn from the two different video presentations.
- No immediate psychological, social, legal, economic or physical discomfort, stress, or harm is expected for the participants. Furthermore, participation in this study is confidential and pseudonyms will be used. Results of this study will only be released with the consent of the parents unless otherwise required by law.
- The investigator will answer any questions about the research, now or during the course of the project. Kevin Ayres can be reached at (678)407-5374. Dr. John Langone can be reached at (706)542-4588.
- I understand the study procedures described above. My questions have been answered to my satisfaction, and I agree to allow my child to take part in this study. I have been given a copy of this form to keep.

Kevin Ayres, Investigator

Telephone: 678-407-5374

Email: kayres@uga.edu

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name of Parent or Guardian

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

**Please sign both copies, keep one and return one to the researcher.**

Additional questions or problems regarding your child's rights as a research participant should be addressed to Chris A. Joseph, Ph.D. Human Subjects Office, University of Georgia, 606A Boyd Graduate Studies Research Center, Athens, Georgia 30602-7411; Telephone (706) 542-3199; E-Mail Address IRB@uga.edu

Appendix B  
PRE/POST DATA SHEETS



## Pre-Test/Post-Test Data Sheet

| Student:           |                         |           |      | Condition: |           |     |      |
|--------------------|-------------------------|-----------|------|------------|-----------|-----|------|
| Date:              |                         |           |      |            |           |     |      |
| Item <sup>14</sup> | Placement <sup>15</sup> | +/-<br>16 | Time | Item       | Placement | +/- | Time |
| 1.                 |                         |           |      | 13.        |           |     |      |
| 2.                 |                         |           |      | 14.        |           |     |      |
| 3.                 |                         |           |      | 15.        |           |     |      |
| 4.                 |                         |           |      | 16.        |           |     |      |
| 5.                 |                         |           |      | Totals     |           |     |      |
| 6.                 |                         |           |      | Notes:     |           |     |      |
| 7.                 |                         |           |      |            |           |     |      |
| 8.                 |                         |           |      |            |           |     |      |
| 9.                 |                         |           |      |            |           |     |      |
| 10.                |                         |           |      |            |           |     |      |
| 11.                |                         |           |      |            |           |     |      |
| 12.                |                         |           |      |            |           |     |      |
|                    |                         |           |      |            |           |     |      |

<sup>14</sup> Write the name of the item<sup>15</sup> Write where the student placed the item (R= Refrigerator, F= Freezer, P=Pantry)<sup>16</sup> Mark + if the student placed the item in the correct location according to the item key and a – if they did not

## Appendix C

### SCREEN CAPTURE OF COMPUTER DATA

Microsoft Excel - Kevin\_8\_5\_13\_59.txt

File Edit View Insert Format Tools Data Window Help Acrobat

Type a question for help

A1 Student

| 1  | Student     | Kevin            |          |                 |  |  |  |  |  |  |  |  |  |  |  |
|----|-------------|------------------|----------|-----------------|--|--|--|--|--|--|--|--|--|--|--|
| 2  | SessionTime | 0:00             |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 3  | SessionID   | SetA             |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 4  | Trial       | Student Selected | Response | StudentResponse |  |  |  |  |  |  |  |  |  |  |  |
| 5  | 1           | 11IceCream.jpg   | Freezer  | 1               |  |  |  |  |  |  |  |  |  |  |  |
| 6  | 2           | 33Crackers.jpg   | Other    | 0               |  |  |  |  |  |  |  |  |  |  |  |
| 7  | 3           | 22Eggs.jpg       | Fridge   | 1               |  |  |  |  |  |  |  |  |  |  |  |
| 8  |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 9  |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 10 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 11 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 12 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 13 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 14 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 15 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 16 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 17 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 18 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 19 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 20 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 21 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 22 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 23 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 24 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 25 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 26 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 27 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 28 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 29 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 30 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 31 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 32 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |
| 33 |             |                  |          |                 |  |  |  |  |  |  |  |  |  |  |  |

Kevin\_8\_5\_13\_59/

Ready NUM

start

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Microsoft Excel - Kevi...

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## Appendix D

### PROCEDURAL CHECKLIST: PRIMING

## Pre-Test Post Test Procedural Checklist

|                                                                                                            | Pre-Test | Post Test |
|------------------------------------------------------------------------------------------------------------|----------|-----------|
| 1. Student is brought to a quiet room with a kitchen or the classroom kitchen is made distraction free.    |          |           |
| 2. The student is placed within 1m of the refrigerator, freezer and pantry.                                |          |           |
| 3. The student is handed a set of grocery bags containing 18 items from his or her target stimuli list.    |          |           |
| 4. The teacher gives the student the direction: "Please put away the groceries"                            |          |           |
| 5. The teacher backs at least 2m away from the student                                                     |          |           |
| 6. The teacher provides no prompts to the student aside from "keep working" if the student slows or stops. |          |           |
| 7. The teacher provides no specific feedback to the student in regard to accuracy of performance.          |          |           |
| 8. When the student finishes, the teacher thanks the student for working hard.                             |          |           |
| 9. The student transitions to the next activity.                                                           |          |           |
| Total Steps Correct                                                                                        |          |           |

## Appendix E

### PROCEDURAL CHECKLIST: PRE/POST-TEST

## **Procedural Protocol PRIMING**

- 1. Log student into computer or monitor students they log themselves into the program. This will require the student or teacher typing in the student's name on the first log in and on subsequent logins it will require the student or teacher to select the student's name from a list.**
- 2. To the greatest extent possible try to ensure that the room is quiet and if possible that the student wears earphones. If the student will wear earphones, make sure that the volume is adjusted to a level where you can hear the computer when you wear the earphones. If the student will not tolerate earphones, make sure the volume is adjusted to a reasonable level and make sure, to the greatest extent possible that the room is quiet.**
- 3. To the greatest extent possible, make sure that the computer is oriented in a fashion to reduce all external distraction. Try to face the student toward a wall with some barrier between the student and the rest of class. During the computer sessions, the most important factor for adherence to this step is that the classroom environment does not distract the student from the computer primes or probes.**
- 4. Periodically monitor the computer program to make sure that the computer does not "stall" and that it continues through the entire sequence.**
- 5. The computer will record what stimuli set it primes and probes, but try to identify at least one or two items from the priming sessions and see if they appear in the probe session. This will ensure that the students are receiving primes on the same material on which they are receiving probes.**
- 6. Same as step 4**
- 7. On days when more than one session is possible (2 session max), make sure at least one hour separates the two sessions. The greater the separation the better.**

### Procedural Checklist<sup>17</sup>

Student Name \_\_\_\_\_

|                         |                                              |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|----------------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|
|                         | Date:                                        |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 <sup>st</sup> Session | 1. Session Type <sup>18</sup>                |  |  |  |  |  |  |  |  |  |  |  |  |
|                         | 2. Log student into computer                 |  |  |  |  |  |  |  |  |  |  |  |  |
|                         | 3. Room quiet?                               |  |  |  |  |  |  |  |  |  |  |  |  |
|                         | 4. Computer area distraction free?           |  |  |  |  |  |  |  |  |  |  |  |  |
|                         | 5. Computer presents primes without error?   |  |  |  |  |  |  |  |  |  |  |  |  |
|                         | 6. PC Probes set of stimuli primed?          |  |  |  |  |  |  |  |  |  |  |  |  |
|                         | 7. PC Probes without error?                  |  |  |  |  |  |  |  |  |  |  |  |  |
|                         | 8. At least 1 hour passes between sessions?  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 <sup>nd</sup> Session | 9. Session Type                              |  |  |  |  |  |  |  |  |  |  |  |  |
|                         | 10. Log student into computer                |  |  |  |  |  |  |  |  |  |  |  |  |
|                         | 11. Room quiet?                              |  |  |  |  |  |  |  |  |  |  |  |  |
|                         | 12. Computer area distraction free?          |  |  |  |  |  |  |  |  |  |  |  |  |
|                         | 13. Computer presents primes without error?  |  |  |  |  |  |  |  |  |  |  |  |  |
|                         | 14. PC Probes set of stimuli primed?         |  |  |  |  |  |  |  |  |  |  |  |  |
|                         | 15. PC Probes without error?                 |  |  |  |  |  |  |  |  |  |  |  |  |
|                         | 16. At least 1 hour passes between sessions? |  |  |  |  |  |  |  |  |  |  |  |  |
|                         | Total Steps Correct                          |  |  |  |  |  |  |  |  |  |  |  |  |
|                         | Total Steps                                  |  |  |  |  |  |  |  |  |  |  |  |  |
|                         | % Adherence to procedural protocol           |  |  |  |  |  |  |  |  |  |  |  |  |

<sup>17</sup> Next to each step, score a + if the event occurs as listed in the procedural protocol, score a – if the event does not occur or if there is a violation of the procedural protocol

<sup>18</sup> Log 1 for first person, 3 for third person and C for control probe.



## Appendix F

### SOCIAL VALIDITY: PARENT

### Parent Survey

1. Prior to participating in this study, did your son/daughter help with putting away groceries? \_\_\_\_\_
  
2. Has your son/daughter shown any interest (or increase in interest) in helping to put away groceries since the study began? \_\_\_\_\_
  
3. Did the student seem to prefer one intervention greater than the other. If so, which one and how do you know? \_\_\_\_\_
  
4. If this sort of intervention or teaching method were available to you to use in the home, would you consider using it to teach your child new skills or improve current skills? \_\_\_\_\_

## Appendix G

### SOCIAL VALIDITY: TEACHER

## Teacher Survey

1. How would you rate the effectiveness of this intervention on a scale of 1-10 with 1 being completely ineffective and 10 being highly effective? \_\_\_\_\_
  
2. Did you notice that one intervention was more effective than the other? If so, which one and describe how you know? \_\_\_\_\_
  
3. Did the student seem to prefer one intervention greater than the other. If so, which one and how do you know? \_\_\_\_\_
  
4. If this sort of intervention or teaching method were available to you to use to teach other skills, how likely would you be to use it on a scale of 1-10 with 1 being you would never use it and 10 being you would definitely use it? \_\_\_\_\_

## Appendix H

### SOCIAL VALIDITY: STUDENT

### Student Survey

1. What did the computer try to teach you?
2. Did you like working on the computer?
3. Was it easy or hard?
4. Why was it hard/easy?
5. What kinds of videos did it show you?
6. (Show video samples) What is different about these two videos?
7. Did you like one kind of video better than the other?