

Toward a Behavioral Analysis of Eye Contact  
During Language Training:  
A Case Study

Leigh O'Brien

Cynthia Oest

Emily Sweeney-Kerwin

Gina Zecchin

Vincent J. Carbone

Carbone Clinic, Valley Cottage, NY

[www.Carboneclinic.com](http://www.Carboneclinic.com)

New York State Association for Behavior Analysis

Verona, NY

November 1 & 2, 2007

# Typical Development of Eye Contact

- Eye contact behavior (i.e. reciprocal or fixated eye-to-face gaze) first develops in infants as early as 4 weeks (Mirenda, Donnellan, & Yoder, 1983).
- Research also suggests that early eye gaze behavior, specifically in infants, may be a part of the foundation skills required to later build nonverbal and verbal social or communication behaviors (Mirenda et al., 1983).

# Typical Development cont.

- Early in infancy, dyadic eye contact is associated with normal development. It is also speculated that dyadic eye contact helps infants to manage and regulate face-to-face social interactions (Arnold, Semple, Beale, & Fletcher-Flinn, 2000).

# Typical Development cont.

- Dyadic eye contact continues to develop throughout an infant's lifetime. When infants reach about 6 months in age, triadic eye gaze develops. Triadic eye gaze involves joint attention. (Arnold et al., 2000).
- Dyadic eye contact is important to development of other verbal and nonverbal social behaviors, however it is suggested that triadic eye gaze may be vital for the acquisition of language (Arnold et al., 2000).

# Development of Eye Gaze/Contact Behavior in Children with Autism

- Lack of or active avoidance of eye contact or eye-to-face gaze is one of the most noticeable deficits in children with autism (Mirenda et al., 1983).
- It is retrospectively reported by mothers of children with autism that as infants they did not notice a difference in the eye contact of their children (Mirenda et al., 1983).

# Eye Gaze/Contact in Children with Autism cont.

- Only later, as the children aged and eye contact and eye-to-face gaze become necessary to engage in more reciprocal social behaviors, was it apparent that there was a behavior deficit in this area (Mirenda et al., 1983).

# Eye Gaze/Contact in Children with Autism cont.

- Many researchers have hypothesized the source of this behavioral deficit. Mirenda et al. (1983) reviewed some of these hypotheses:
  - Some researchers hypothesized that an avoidance of eye contact is the foremost deficit in autism. The main cause of this deficit is the prevention of social bonding due to parental pressure and anxiety.
  - Other researchers have suggested that due to the high level of arousal in children with autism they may avoid the gaze to keep their level of arousal down.
  - To date only a few studies have offered a behavioral analysis of the development of social communicative eye contact in children with autism.

# Why is Eye Contact Important?

- It has been suggested that eye contact and the control of the gaze of others serves an important social function before vocal responding develops in young children (Stern, 1974, 1985).
- These early communicative behaviors seem to be precursors to language acquisition that ultimately lead to more sophisticated social and verbal responding (Bloom & Lahey, 1978).

# Why is Eye Contact Important? cont.

- Failure to develop eye contact in the early years may ultimately affect the development of language and social behaviors later in life. (Guralnick, Connor, Hammond, Gottman, & Kinnish, 1996)
- Lack of eye contact in children with autism may also affect how others react to the child.
  - For example, low rates of eye contact has led to the conclusions that children with autism are aloof, abnormal, impersonal or detached (Hutt & Ounstead, 1966)

# Why is Eye Contact Important? cont.

- Ultimately, eye contact or gaze behavior serves many functions leading into adulthood.
- For example, eye contact may serve as an indicator of interest, to obtain information about another's reaction, regulation of turn taking during conversation, and to indicate difficulty understanding what is being said. (Mirenda, 1983)

# Why is Eye Contact Important? cont.

- In addition to the social consequences of poor eye contact it appears there are educational concerns associated with poor eye contact.
- Kozloff (1974) suggested that educational gains may be reduced when children with autism fail to attend to their teachers and their instructional demands. He suggested that eye contact should occur before instructional demands are delivered to insure the child is attending to the teacher.
- Lovaas (1977) concurred with this analysis and therefore his early curriculum stressed the development of eye contact mainly for educational reasons.
- Greer and Ross (2007) stress the teaching of eye contact with children with autism as a primary attentional skill early in an instructional program.

# Methods to Teach Eye Contact to Persons with Autism and Developmental Disabilities.

- Since the 1960's, educators and clinicians have generally focused on interventions to teach eye contact behavior before teaching other behaviors (Mirenda et al., 1983).
- Most of the research in this area has relied upon the behavior analytic principles to guide the interventions.

# Methods to Teach Eye Contact cont.

- Early attempts to develop eye contact in children with autism using behavior analytic methods generally included the presentation of nonverbal and verbal prompts to look at the experimenter for a designated period of time followed by the delivery of a putative reinforcer for the eye contact behavior (Greer & Ross, 2007; Lovaas, 1981; Maurice, Green & Luce, 1996) and overcorrection for failure to make eye contact following a verbal prompt (Foxx, 1977).
- These procedures were usually implemented while sitting at an instructional table and using the methods of discrete trial instruction.

# Methods to Teach Eye Contact cont.

- In some reports the authors also prompted the eye contact response by holding a reinforcing item at eye level (Greer & Ross, 2007; Hwang & Hughes, 1995).
- Other prompting procedures included physically guiding the child's head to look at the researcher (Greer & Ross, 2007; Hegelson, Fantuzzo, Smith & Barr, 1989).
- While these early studies clearly increased eye contact in children with autism there appeared to be limited generality to other persons and settings (Fay & Schuler, 1980; Wing, 1976).

# Methods to Teach Eye Contact cont.

- Other researchers have attempted to teach eye contact within the context of social interaction.
- Klinger and Dawson (1992) were one of the first researchers to use a social interactive training model to increase eye contact. This model did not use verbal or nonverbal prompts to increase eye contact but instead attempted to increase within the context of social activities.
  - This model included a package of treatments that included time delay, contingent imitation, use of relevant reinforcers, and environmental arrangements of enjoyable activities.
- Hwang & Hughes (1995,2000) demonstrated that this method successfully increased eye contact in children with autism.

# Methods to Teach Eye Contact cont.

- Other researchers including Berler, Gross and Drabman, 1982; Charlop and Walsh, 1986; Goldstein, Kaczmarek, Pennington and Shafer, 1992; Hegelson et al., 1989; Koegel and Frea, 1993; and Tiegerman and Primavera, 1983 demonstrated that eye contact could be increased through modified forms of social interactive training.
- Despite these efforts the social interactive methods have produced at best minimal and somewhat mixed effects in developing eye contact with children with autism (Hwang & Hughes, 2000).
- These researchers suggested that the reinforcers programmed for the eye contact response may have been too weak to maintain the response.

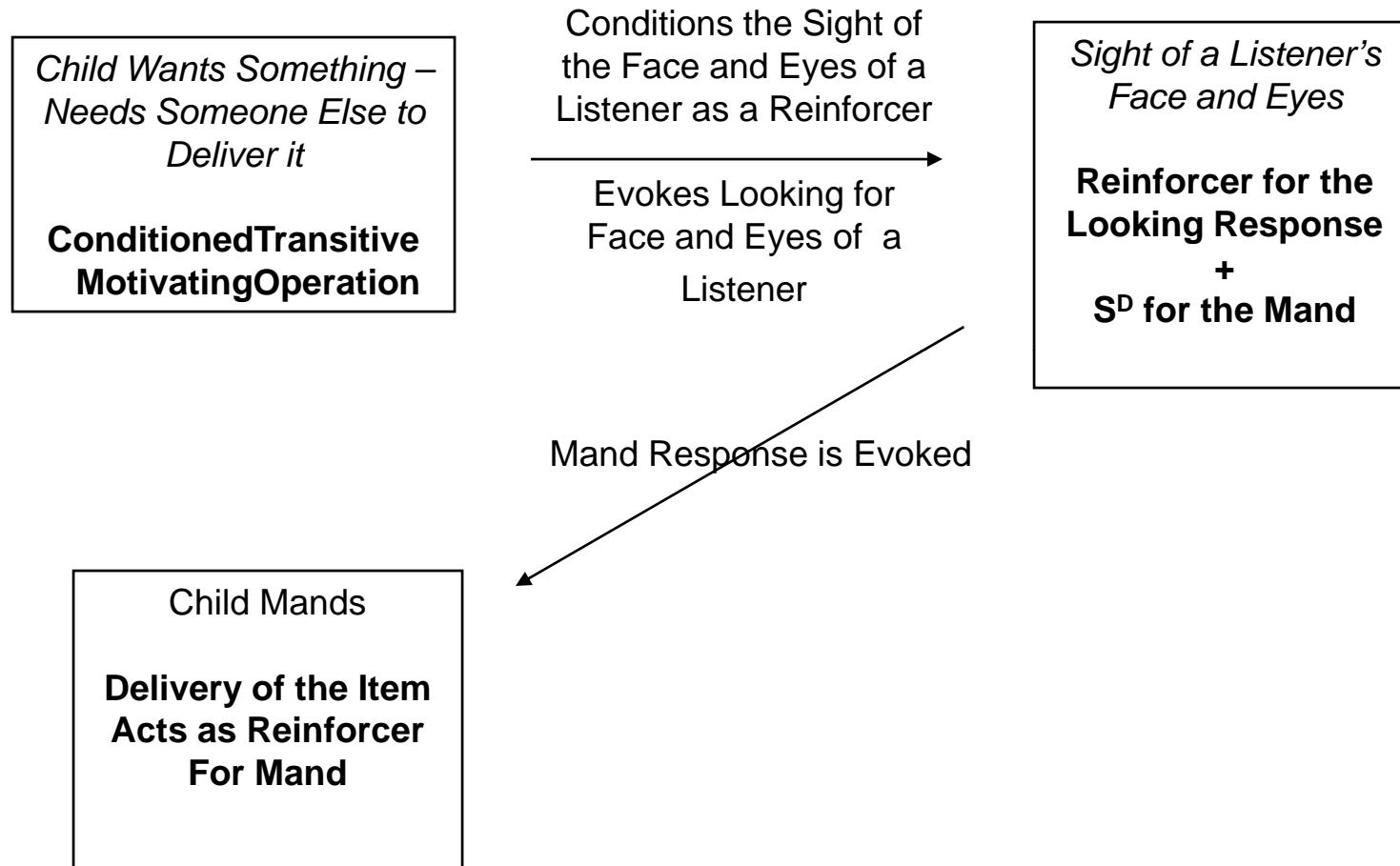
# A Behavioral Analysis of Eye Contact During Language Training

- Children with autism frequently fail to develop eye contact as an important social communicative behavior. (Koegel & Frea, 1993)  
Social communicative behaviors are those that typically accompany a speaker's verbal behavior, e.g. eye contact, facial expressions, etc.
- A behavioral analysis of eye contact during some verbal exchanges suggests that the sight of another's face and eyes in particular, may act as a reinforcer for behaviors that precede it and a discriminative stimulus for responses that follow it.
- For example, many verbal and nonverbal responses are reinforced, punished, or extinguished by the facial responses or eye contact of others.
- Moreover, the occasion of eye contact evokes many responses. For example, we generally don't make a request of another person when they are not looking at us.

- Skinner (1957) defined verbal behavior as behavior whose reinforcement is mediated by another person or a listener.
- Consequently most audible verbal behavior quickly comes under the stimulus control of a listener since the presence of a listener is correlated with the availability of reinforcement for the response.
- In addition, subtle aspects of the behavior of a listener may come to control the emission of some verbal responses.
- For example, the mand is reinforced when a listener's behavior is effectively controlled to produce reinforcement specific to the relevant motivating operation for the speaker.
- A mand for water is only reinforced when a listener's behavior is effectively controlled to deliver water to the speaker.
- Consequently, listener's who appear to be "attending" to a speaker are more likely to have their behavior more controlled by the verbal behavior of a speaker.
- Therefore, mands that are accompanied by an attending response by a listener in the form of eye contact are more likely to result in reinforcement for a speaker.
- The history of a successful "mander" may account for the sequence of<sup>18</sup> events presented in the following diagram:

Behavioral Analysis of Eye Contact  
During Language Training

Following frequent exposure to the variables that control the mand response the following behavioral chain occurs:



*Italicized Words = Stimuli*

**Bold Words = Behavioral Variables**

Standard Print Words = Effects of Behavioral Variables

As described in the diagram, the history of a successful “mander” may account for the following sequence of events:

- When an MO occurs and a mand response is about to be emitted eye contact with another person may be momentarily conditioned as a reinforcer and therefore evoke movements of the head and eyes of speaker so as to produce eye contact with a listener.
- The occurrence of the MO within a context in which eye contact is not occurring is a transitive conditioned motivating operation (CMO-T) that momentarily and conditionally conditions the sight of the listener’s eyes as a form of reinforcement. (Michael, 1993)
- Consequently, head and eye movements of the speaker that produced eye contact will be strengthened.
- The eye contact with a listener is now discriminative for the availability of reinforcement for certain verbal responses and therefore evokes the mand response.
- In everyday language, speakers learn that when a listener is making eye contact with them they are more likely to get what they ask for. Therefore, they will attempt to make eye contact before manding.

## A Behavioral Analysis of Eye Contact, cont.

- It may be that the repertoire of children with autism does not easily come under the control of these contingencies during early language acquisition.
- Therefore, eye contact of others serves neither the reinforcing nor discriminative functions for children with autism.
- It would seem that procedures that alter the reinforcing and discriminative functions of eye contact for children with autism might effectively address this important social deficit.

# The Potential Role of the Mand In Teaching Eye Contact

- One of the first social initiated verbal responses by all children is the mand (Skinner, 1957)
- Mand responses tend to produce the strongest form of reinforcement since the response is only strengthened by reinforcement specific to the relevant MO.
- Consequently the mand response may be the appropriate response with which to begin the process of teaching eye contact.

# The Role of Time Delay Procedures

- Time delay has been successfully implemented to increase the spontaneous responding of children with autism (Charlop, Schreibman, & Thibodeau, 1985; Charlop & Trasowech, 1991; Charlop & Walsh, 1986; Halle, Baer, & Spradlin, 1981; Halle, Marshall, & Spradlin 1979; Ingenmey & Van Houten, 1991; Matson, Sevin, Box, & Francis, 1993; Matson, Sevin, Fridley, & Love, 1990; Tincani, 2004).
- This procedure has been effective in mainly increasing the spontaneous requesting repertoire of children with language delays and disorders.
- It is an effective method of stimulus control transfer since it helps to eliminate the use of prompts for the desired response.

# Time Delay cont.

- Consequently, time delay procedures might be useful in decreasing the need for verbal and nonverbal prompts for eye contact responses.

## Purpose of the Study

- While there are potentially many functions to eye contact this study focused on the social communicative aspects. The purpose of this study was to increase the frequency of eye contact with a 3-year-old child with autism within the context of everyday social environments that included preferred activities and toys during mand training.
- Eye contact training occurred during manding sessions with an adult partner who used time delay and differential reinforcement to increase the target response.

# Method

- *Participant*
  - The participant was a 3-year-old boy, Jack, with a primary diagnosis of autism.
  - Jack's manding repertoire was multiply controlled by the presence of items and his motivation. He acquired over 327 vocal mands by the start of this study.
  - His tact and intraverbal repertoires were limited as compared to his typically developing peers.
  - When denied access to a reinforcer or transitioned from a highly preferred to less preferred activity, Jack would at times engage in problem behavior in the form of crying, whining, or flopping.
  - Jack was selected to participate in this study due to the low frequency of his response related to reciprocating eye contact with adults or peers across all environments.

# Method cont.

- *Setting*

- Jack was enrolled for three, 3-hour sessions per week at a private educational setting offering one-on-one intensive teaching in the form of discrete trial instruction and natural environment training. Mand training was conducted across all settings for 2 hours during the 3 hour sessions.
- Four different instructors delivered instruction during baseline and treatment conditions.
- During mand training the play environment was enriched with food items, toys and activities that provided motivation for the mand response.
- Prior to the treatment condition whenever Jack emitted a vocal mand for the item it was delivered immediately by the teacher who was managing the session.

# Method cont.

- *Response Definition*
  - Eye contact was defined as movement by Jack's head and eyes so as to make direct contact with the eyes of the person from whom he is manding and simultaneous with the vocal mand response.
  - The dependent variable in this study was the percentage of mands accompanied by eye contact during a 3-hour session.

# Method cont.

- *Data Recording*
  - Jacks instructor served as the data recorder throughout the study. The instructor was seated in close proximity (no more than 2 ft away) to Jack, either on the floor or across a table, with a data sheet on a clip board.
  - Trial by trial mand data, across reinforcers and prompt levels, were recorded throughout the session.
  - The occurrence of an eye contact response was recorded by circling a “yes” on a data sheet when the vocal mand was accompanied by eye contact.
  - A non-occurrence of eye contact was recorded by circling a “no” when a vocal mand occurred without eye contact.
  - Eye contact data were calculated and plotted on the graph in Figure 1.

# Method cont.

## *Inter-observer Agreement*

- Some of the pre-treatment and post treatment sessions were video taped and therefore were used as records from which to record agreements and non-agreements on the occurrences of the target response.
- Two individuals independently viewed about 20 minutes of video recorded during sessions that occurred in pre-treatment and treatment conditions.
- For each vocal mand produced by Jack the observer scored whether or not an occurrence of eye contact occurred simultaneously.

## Method cont.

- The records were compared and the inter-observer agreement was calculated by dividing agreements by agreements plus disagreements and multiplying X 100.
- The interobserver agreement was calculated as 89 percent during the baseline observation and 92 percent during treatment.

# Method cont.

- *Design*
  - An AB or non-experimental design was used to demonstrate the effectiveness of the independent variables.
  - This type of design will not allow one to suggest there is a functional relationship between the dependent and independent variables. It may instead demonstrate a correlation between the independent and dependent variables.

# Method cont.

- *Conditions*

- *Baseline*

- During baseline, a wide variety of items and activities that functioned as reinforcers in the past were available to the participant. Jack could mand for any item or activity throughout the session.
    - Trial by trial data were recorded for all mands throughout the session. On the data sheet a yes or no was recorded for any mand accompanied by eye contact.
    - Mands were reinforced with the delivery of the item or activity immediately.

# Method cont.

## – *Time Delay and Differential Reinforcement During Mand Training*

- Identical to the baseline condition, a wide variety of items and activities that have functioned as reinforcers in the past were available to Jack. The participant could mand for any item or activity throughout the session.
- If Jack manded for an item or activity and eye contact also occurred reinforcement was delivered immediately. The instructor then recorded this response as a mand with eye contact.
- When Jack manded and the response was not accompanied by eye contact a time delay was implemented and the reinforcer specific to the vocal mand was withheld. This was recorded as a mand without eye contact by circling “no” on the data sheet.

# Method cont.

- As anticipated, Jack would sometimes continue to produce the vocal mand without eye contact in this situation and the reinforcer would be withheld for each response of this type.
- However after several mands without eye contact Jack would eventually make eye contact while manding and the reinforcer would be delivered.
- The magnitude of the reinforcer was decreased for these responses as a means of providing differential reinforcement for mand responses with eye contact.

# Results

- The frequency of targeted responses during baseline and treatment conditions is displayed in Figure 1.
- The Y axis displays the percentage of mands that were accompanied by eye contact during the first occasion of the mand. Repeated mands that eventually resulted in eye contact were not recorded as an eye contact response.
- The X axis is scaled by sessions

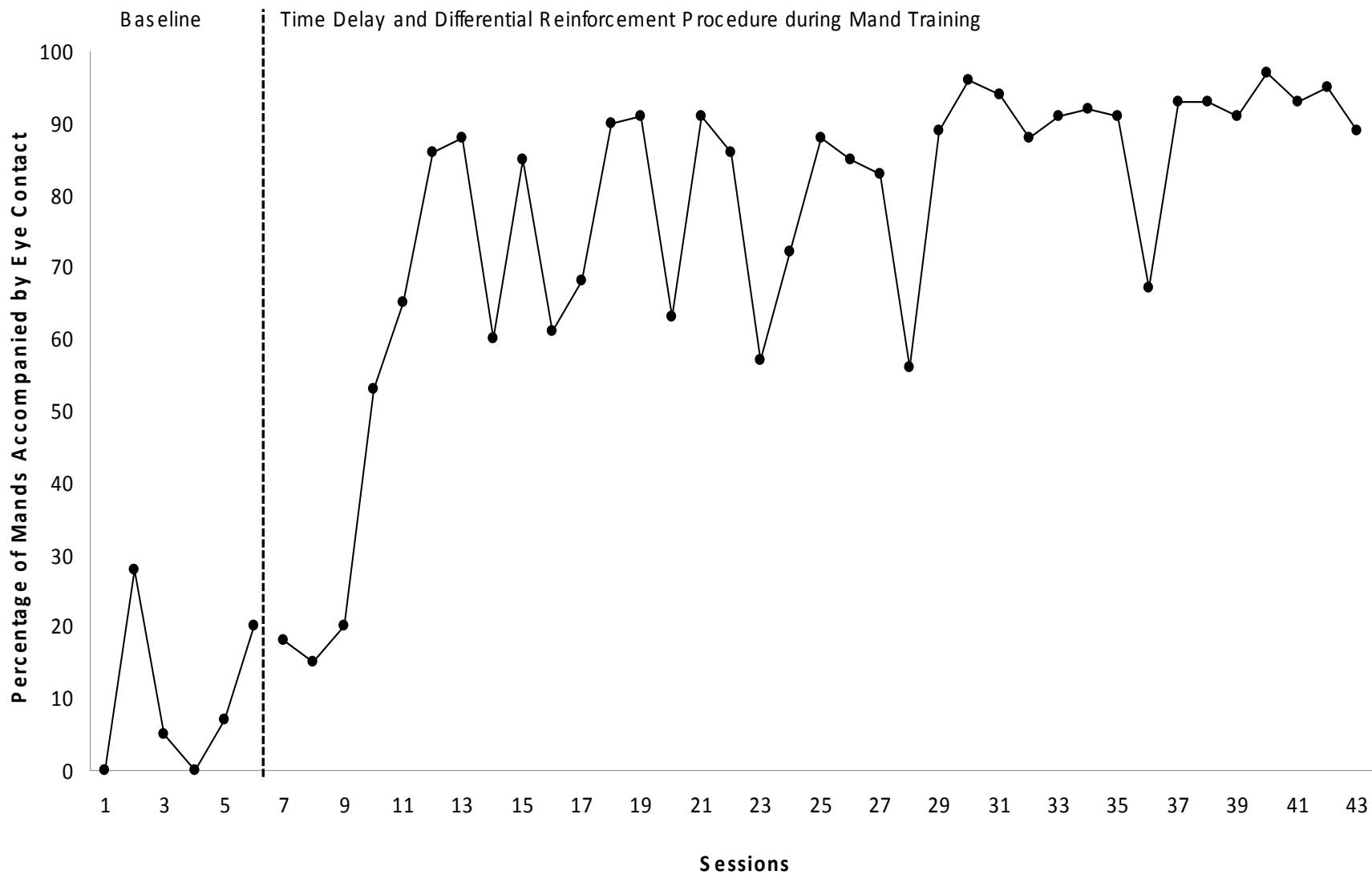


Figure 1. Percentage of Mands Accompanied by Eye Contact per sessions during baseline and treatment conditions and across four different instructors

# Results cont.

- During the baseline sessions Jack manded for approximately 55 different items or activities with a frequency of about 115 mands for the 3 hour sessions.
- During the treatment condition Jack manded for about 70 different items or activities per session with a frequency of about 140 per 3 hour session.
- The average percentage of mands accompanied with eye contact during baseline was about 10 percent across six sessions
- The treatment condition was implemented on the seventh session. During the first three sessions of treatment the average percentage of mands accompanied with eye contact was about 18 percent.

# Results cont.

- This means that about 82 percent of Jack's mands were not accompanied by eye contact and therefore were not immediately reinforced.
- This also means that early in the treatment phase his behavior frequently contacted the time delay and differential reinforcement contingency related to the target response while manding.

# Results cont.

- Between sessions 11 and 14 there was a steady increase in eye contact while manding. ‘
- By the 7<sup>th</sup> treatment session eye contact was accompanying about 90 percent of Jack’s vocal mands.
- Over the next 20 sessions the target response accompanied 60 to 95 percent of the mand responses per session
- During the last 7 sessions the average percentage of mands accompanied by eye contact was about 93 percent.

# Discussion

- The results of the current report have suggested that the use of a time delay and differential reinforcement procedures during mand training appear to have been correlated with an increasing eye contact in one learner with autism.
- The baseline percentage of mands accompanied with eye contact displayed in Figure 1 illustrated the significance of Jack's deficit in this skill area.
- Following the implementation of the time delay and differential reinforcement procedures there was a steady increase in the percentage of eye contact and a substantially higher frequency of manding with eye contact during treatment as compared to baseline.

# Discussion cont.

- These results suggest that by teaching eye contact during mand training, where the reinforcement for the response is specific to the child's motivation may be an effective intervention.
- An analysis of the behavioral variables that account for the treatment effect implicate the conditioned transitive motivating operation (CMO-T), the strong reinforcement associated with the mand and the effects of extinction produced by the time delay procedure.
- During typical development when the motivation for something is strong AND when it can not be obtained except through the behavior of another person the sight of another person and in particular eye contact with that person may now function as a form of reinforcement.

# Discussion cont.

- The conditional conditioning of the sight of another's eyes as a form of reinforcement in this situation is accounted for by the behavioral variable of the conditioned transitive motivating operation (CMO-T) (Michael, 1993)
- The procedures in this study took advantage of this important behavioral variable to condition the sight of someone's eyes as a form of reinforcement and therefore evoke the responses that produced this reinforcer, e.g. movements necessary to produce eye contact.
- The arrangement of the contingency that required eye contact in order to obtain the reinforcer specified by the mand evoked all responses that have in the past produced the reinforcer.
- In everyday terms, Jack learned to look at someone when he talked to them because they were more responsive when he did.

# Discussion cont.

- A time delay procedure was used to avoid the use of a prompt to produce the first instances of eye contact.
- Because Jack already had a history of reinforcement for all vocal mands without eye contact the time delay procedure functioned as a form of extinction when eye contact was required for reinforcement of the mand.
- One of the products of extinction is that the previously reinforced response may continue to occur and sometimes with greater intensity during the extinction phase. (Lerman & Iwata, 1996). This did occur in that Jack continued to produce the vocal mand and with greater intensity in terms of an increase in volume during extinction.

# Discussion cont.

- In addition, extinction may also produce response variability in the repertoire. (Lerman & Iwata, 1996) As a result, extinction of the mands during the early phases of the treatment phase of this report produced the novel response of moving of the head and eyes in the direction of the teacher's producing a clear occasion of eye contact. This response occurred while Jack was producing the vocal mand.
- As soon as this occurred the teacher immediately delivered the reinforcer and maintained the vocal mand and simultaneously selected the eye contact response through direct reinforcement.
- After several occurrences of this sequence early in the treatment phase sight of the face of the teacher appeared to become a reinforcer when a motivating operation was in effect for an item or activity that could not be obtained without eye contact and a mand.

# Discussion cont.

- Consequently, eye contact and simultaneous production of a vocal mand began to occur at high frequency as shown in figure 1.
- In this report the face of the teacher was conditioned as a conditional reinforcer through this process.
- In other words after several treatment sessions when the conditions necessary for a mand are in place and the desired stimulus could not be obtained without the assistance of the instructor AND eye contact is a necessary condition for reinforcement of a vocal mand the sight of the face of the instructor is momentarily conditioned as a form of reinforcement and evokes movements that produce the sight of the teacher's eyes.

# Discussion cont.

- This effect is more easily produced in the context of manding and therefore provides support for initially teaching eye contact during manding opportunities.
- Moreover, teaching within the context of manding brings a learner's functional behavior of social initiation under the discriminative control of eye contact.
- This procedure may suggest a starting point for teaching important social pragmatic skills to children with autism.
- This analysis and procedures extend the behavior analytic literature on this topic.

# Discussion cont.

- One of the advantages of this research is the demonstration that eye contact can be increased within the context of social interaction during every day experiences of a young child.
- Previous attempts to do so have produced minimal benefits as reported in the introduction of this report.
- In addition, the fact that the response was taught outside the discrete trial instruction context without reliance on instructor prompts and without reinforcers that are unrelated to the responses of the learner may insure greater functionality of the target response.
- Both of these promising aspects of the procedures outlined in this report await further experimentation.

# Discussion cont.

- The results of this study also include some limitations.
- The first limitation is that this report includes only one participant. Further investigation with other children with autism will be necessary to verify the effectiveness of this procedure.
- In addition, this is a case study report and not an experimental demonstration. The pre-post design used in this study only allows for claims of a correlation between the dependent and independent variables.
- The findings of this case study await experimental analysis with other participants with autism.

# Discussion cont.

- Direct measures of generality were not gathered however there were anecdotal reports of transfer of the target skill to others in the home environment.
- In addition, the instructor anecdotally reported an increase in eye contact during instructional sessions.
- Future research will improve upon this report with direct measures of generality across persons, time and settings.
- In addition, this study focused on only one function of eye contact during mand training. Consequently, the response may not occur under different circumstances when eye contact serves a different function although anecdotal reports suggested it may.
- Notwithstanding substantial limitations this report provides future researchers with a tentative behavioral analysis of the controlling variables for the eye contact response in children with autism as a social communicative behavior.
- Moreover, it suggests some evidence-based methods that may be effective in teaching this important functional skill.

## References

- Arnold, A., Semple, R. J., Beale, I., & Fletcher-Flinn, C. M. (2000). Eye contact in children's social interactions: What is normal behavior? *Journal of Intellectual & Developmental Disabilities, 25*, 207-216.
- Berler, E. S., Gross, A. M., & Drabman, R. S. (1982). Social skills training with children: Proceed with caution. *Journal of Applied Behavior Analysis, 15*, 41-53.
- Bloom, L., & Lahey, M. (1978). *Language development and language disorders*. New York: Wiley.
- Charlop-Christy, M., Carpenter, M. L., LeBlanc, L. A., & Kellet, K. (2002). Using the picture exchange communication system (PECS) with children with autism: Assessment of PECS acquisition, speech, social-communicative behavior, and problem behavior. *Journal of Applied Behavior Analysis, 3*, 213-232.
- Charlop, M. H., Schreibman, L., & Thibodeau, M. G. (1985). Increasing spontaneous verbal responding in autistic children using a time delay procedure. *Journal of Applied Behavioral Analysis, 18*, 155-166.
- Charlop, M. H. & Trasowech, J. E. (1991). Increasing autistic children's daily spontaneous speech. *Journal of Applied Behavioral Analysis, 24*, 747-761.
- Charlop, M. H., & Walsh, M. E. (1986). Increasing autistic children's spontaneous verbalizations of affection: An assessment of time delay and peer modeling procedures. *Journal of Applied Behavior Analysis, 19*, 307-314.
- Fay, W. H., & Schuler, A. L. (1980). *Emerging language in autistic children*. Baltimore: University Park Press.
- Fox, R. M. (1997). Attention training: The use of overcorrection avoidance to increase the eye contact of autistic and retarded children. *Journal of Applied Behavior Analysis, 10*, 489-499.
- Goldstein, H., Kaczmarek, L., Pennington, R., & Shafer, K. (1992). Peer-mediated intervention: Attending to, commenting on, and acknowledging the behavior of preschoolers with autism. *Journal of Applied Behavior Analysis, 25*, 289-305.
- Greer, D. R., & Ross, D. E. (2007). *Verbal Behavior Analysis*. U.S.A.: Pearson Education, Inc.
- Guralnick, M. J., Connor, R. T., Hammond, M. A., Gottman, J. M., & Kinnish, K. (1996). The peer relations of preschool children with communication disorders. *Child Development, 67*, 471-489.
- Halle, J. W., Baer, D. M., & Spradline, J. E. (1981). Teacher's generalized use of delay as a stimulus control procedure to increase language use in handicapped children. *Journal of Applied Behavioral Analysis, 14*, 389-409.
- Halle, J. W., Marshall, A. M., & Spradline, J. E. (1979). Time Delay: A technique to increase language use and facilitate generalization in retarded children. *Journal of Applied Behavior Analysis, 12*, 431-439.
- Helgeson, D. G., Fantuzzo, J. W., Smith, C. & Barr, D. (1989). Eye-contact skill training for adolescents with developmental disabilities and severe behavior problems. *Education & Training in Mental Retardation, 24*, 56-62. 50
- Hutt, C., & Ounsted, C. (1966). The biological significance of gaze aversion with particular reference to the syndrome of infantile autism. *Behavioral Science, 11*, 346-356.

## References

- Hwang, B. & Hughes, C. (1995). Effects of social interactive strategies on early social-communicative skills of a preschool child with developmental disabilities. *Education & Training in Mental Retardation & Developmental Disabilities, 30*, 336-349
- Hwang, B. & Hughes, C. (2000). Increasing early social-communicative skills of preverbal preschool children with autism through social interactive training. *Journal of the Association for Persons with Severe Handicaps, 25*, 18-28.
- Ingenmey, R. & Houten, R. V. (1991). Using time delay to promote spontaneous speech in an autistic child. *Journal of Applied Behavioral Analysis, 24*, 591-596.
- Klinger, L. G., & Dawson, G. (1992). Facilitating early social and communicative development in children with autism. In S.F. Warren & J. Reichle (Eds.), *Causes and effects in communications and language interventions* (Vol. 1, pp. 157-186). Baltimore: Paul H. Brookes.
- Koegel, R. L., & Frea, W. D. (1993). Treatment of social behavior in autism through the modifications of pivotal social skills. *Journal of Applied Behavior Analysis, 26*, 369-377.
- Kozloff, M. A. (1974). *Educating children with learning and behavior problems*. New York: Holt, Rinehard, and Winston.
- Lerman, D. & Iwata, B. (1996). Developing a technology for the use of operant extinction in clinical settings: An examination of basic and applied research. *Journal of Applied Behavior Analysis, 29*, 345-382.
- Lovaas, O. I. (1977). *The autistic child: Language development through behavior modification*. New York: Irvington.
- Lovaas, O. I. (1981). *Teaching developmentally disabled children. The "Me" book*. Austin, TX: PRO-ED, Inc.
- Matson, J. L., Sevin, J. A., Fridley, D., & Love, S. R. (1990). Increasing spontaneous language in three autistic children. *Journal of Applied Behavioral Analysis, 23*, 227-233.
- Matson, J. L., Sevin, J. A., Box, M. L., Francis, K. L., & Sevin, B. M. (1993). An evaluation of two methods for increasing self-initiated verbalizations in autistic children. *Journal of Applied Behavioral Analysis, 26*, 389-398.
- Maurice, C., Green, G., & Luce, S. C. (1996). *Behavioral intervention for young children with autism*. Austin, TX: PRO-ED, Inc.
- Michael, J. (1993). Establishing operations. *The Behavior Analyst, 16*, 191-206.
- Miranda, P.L., Donnellan, A.M. & Yoder, D.E. (1983). Gaze behavior, A new look at an old problem. *Journal of Autism and Developmental Disorders, 13*, 397-409

## References

- Skinner, B. F. (1957). *Verbal Behavior*. New York: Appleton-Century-Crofts.
- Stern, D. N. (1974). Mother and infant play: The dyadic interactions involving facial, vocal and gaze behaviors. In M. Lewis & L. A. Rosenblum (Eds.), *The effect of the infant on its caretaker* (pp. 187-213). New York: Wiley.
- Stern, D. N. (1985). *The interpersonal world of the infant*. New York: Basic Books.
- Tiegerman, E., & Primavera, L. H. (1984). Imitating the autistic child: Facilitating communicative gaze behavior. *Journal of Autism and Developmental Disorders*, 14, 27-38.
- Wing, L. (Ed.) (1976). *Early childhood autism* (2<sup>nd</sup> ed.). New York: Pergamon Press.