

Teaching Eye Contact as a Language Pragmatic Skill to Children with Autism

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- From infancy and throughout development, eye gaze behavior is commonly recognized to serve a variety of social-communicative functions. (Mirenda, Donnellan, & Poder, 1983)
- Beginning with an infant's eye contact with a nurturing parent, eye contact is regarded as an intimate communicative connection intended to convey information, indicate interest, share emotion, and exert an early form of social control. (Kleinke, 1986; Farroni, Csibra, Simion, & Johnson, 2002)

- As development progresses, eye gaze may also facilitate incidental vocabulary acquisition and serve as an indicator of social competence. (Burgoon, Coker, & Coker, 1986; Baron-Cohen, Baldwin, & Crowson, 1997)
- Most importantly, perhaps, the development of socially typical eye gaze behavior influences how others perceive and relate to each other, determining social acceptance and ratings of attraction, credibility, and communication. (Burgoon et al., 1986)
- Deficits in various nonverbal social-communicative behaviors, particularly in dyadic (i.e. eye-to-face) and triadic (i.e. joint attention) eye gaze, are commonly identified as the earliest indicators of developmental delay, of autistic spectrum disorder in particular. (Wimpory, Hobson, Williams, & Nash, 2000; Woods, & Wetherby, 2003)

- Whereas a typically developing child is observed to demonstrate preference for direct versus averted eye gaze by 2 to 5 days of age (Farroni, Csibra, Simion, & Johnson, 2002) and to engage in mutual eye gaze (i.e. dyadic eye gaze) by the age of 4 weeks (Berger, & Cunningham, 1981; Mirenda et al., 1983), **children with autism have been found to engage in significantly less eye contact than their typically developing peers**, not infrequently in more pronounced gaze aversion. (Tiegerman, & Primavera, 1984; Osterling, & Dawson, 1994; Stone, Ousley, Yoder, Hogan, & Hepburn, 1997; Dawson, Toth, Abbott, Osterling, Munson, Estes, & Liaw, 2004)
- Notwithstanding these data **some have reported no substantial difference in eye contact between children with autism and their typical peers**. (Mirenda et al., 1983; Kylliäinen, & Hietanen, 2004; Senju, Tojo, Dairoku, & Hasegawa, 2004)
- It is possible that the **differing operational definitions of eye contact** across these studies accounts for the mixed findings. (Kleinke, 1986; Arnold, Semple, Beale, & Fletcher-Flinn, 2000)
- **In addition, children with autism may exhibit a more significant qualitative rather than quantitative deficit as compared to their typically developing peers**. Several studies have yielded data to suggest this very conclusion. (Mirenda et al., 1983; Mundy, Sigman, Ungerer, & Sherman, 1986; Dawson, Hill, Spencer, Galpert, & Watson, 1990; Arnold, Semple, Beale, & Fletcher-Flinn, 2000)

- From their early development, despite exhibiting a quantity of eye contact comparable to typically developing peers, **children with autism are significantly less likely to pair smiles with eye contact when engaging with their mothers.** (Dawson et al., 1990)
- In their 1983 study, **Mirenda et al. found that, while typically developing children tended to engage in eye contact during dialogues, children with autism demonstrated significantly lower percentages of eye contact during dialogues and significantly higher percentages during monologues.**
- In another study, illustrating qualitative rather than quantitative differences between the eye gaze behaviors of autistic and typical children, Mundy et al. (1986) **found that children with autism engaged in significantly less eye contact during requesting than did their typical cohorts.**
- Finally, it may also be that a more advanced form of eye gaze behavior, known **as joint attention (i.e. triadic eye gaze), is the form of eye gaze behavior in which there is a more significant disparity** and that this second form plays an even more pronounced predictive role in typical development.

- **Observed in typical developing children by the age of 6 weeks, joint attention consists of the coordination of visual attention between another individual in the environment and an object of interest, presumably serving to direct the other's gaze to the item of interest.** (Arnold, Semple, Beale, & Fletcher-Flinn, 2000)
- **Compared to the typical onset at 6 weeks, numerous studies report statistically significant and protracted deficits in the joint attention of children with autism.** (Mundy et al., 1986; Osterling, & Dawson, 1994; Dawson, Toth, Abbott, Osterling, Munson, Estes, & Liaw, 2004)
- This response deficit in children with autism appears to be important since levels of triadic eye gaze during early development are **significantly correlated with subsequent vocabulary development, expressive language outcome measures, and social-communicative functioning more so even than initial language performance and IQ.** (Kleinke, 1986; Mundy et al. 1986; Mundy, Sigman, & Kasari, 1990; Mundy, & Kasari, 1995; Mccathren, Yoder, & Warren, 1999; Rollins, 1999; Calandrella, & Wilcox, 2000; Hwang, & Hughes, 2000; Bruinsma, Koegel, & Koegel, 2004)

- Further, the diversity of prelinguistic pragmatic skills exhibited (e.g., eye contact, joint attention) have been shown to be **predictive of the rate of subsequent vocabulary acquisition.** (Kleinke, 1986)
- Whether the deficit in eye gaze behavior is more pronounced as a quantitative or qualitative measure, it is clearly an area of legitimate interest and concern.
- Accordingly, **numerous non-behavioral theories, including the cognitive theory, affective theory, social meaning model, nonverbal expectancy violations model, and theory of mind have been offered to account for the development of eye gaze behavior** and for this characteristic deficit in autistic children. (Burgoon et al., 1986; Baron-Cohen, 1988)

- A **limited number of behavior analytic studies** have addressed this important problem.
- Even though early assessment of atypical eye contact may serve as an invaluable diagnostic tool permitting early identification of children at risk for developing autism. (Ornitz, Guthrie, & Farley, 1977; Osterling, & Dawson, 1994; Dawson et al., 2004)
- Despite indications that **eye gaze behavior contributes to the development of expressive language, vocabulary, and social-communicative functioning** (Kleinke, 1986; Mundy et al. 1987; Mundy, Sigman, & Kasari, 1990; Mundy, & Kasari, 1995; Mccathren, Yoder, & Warren, 1999; Rollins, 1999; Calandrella, & Wilcox, 2000; Hwang, & Hughes, 2000; Bruinsma, Koegel, & Koegel, 2004), **early behavioral studies were not principally concerned with these functions.**

- **Until the 1980s, the predominant concern with eye gaze behavior was its role as a supposed prerequisite to intensive instruction of other skills** (Foxx, 1977; Lovaas, 1977; Lovaas, 1981; Helgeson, Fantuzzo, Smith, & Barr, 1989). The argument was that a child who did not orient toward an instructor would be unable to learn and respond. (Foxx, 1977; Lovaas, 1977; Lovaas, 1981; Helgeson, Fantuzzo, Smith, & Barr, 1989)
- For the most part, behavioral programs designed to increase eye contact, as an instructional prerequisite, involved similar procedures. **A child with autism was seated at a small table across from a therapist who held a preferred edible at eye level and stated the command, “[child’s name], look at me.”**
- Though the duration of eye gaze scored as a correct response and the latency permitted between the demand and the demonstration of the target behavior varied across interventions, **generally ranging from a requirement of a 1- to 2-sec period of eye contact within 2 to 5 sec of the command**, the overall procedures differed minimally.

- **If eye contact was made within and for the specified period, the promised edible was delivered along with a phrase of social praise. If the target behavior was not demonstrated,** the edible would be lowered and the instructor would avert her gaze for a specified period of time before representing the instruction. (Foxx, 1977; Lovaas, 1981; Helgeson et al., 1989)
- In one variation, Foxx (1977) introduced an experimental condition that **combined the use of reinforcement and punishment in the form of an overcorrection procedure;** if a child did not perform the target behavior, an unspecified period would follow during which the child was prompted through a random rotation of any of three head positions each of which he maintained for 15 sec.
- In another variation (Helgeson et al., 1989), children were prompted to maintain eye contact as they responded to a series of questions. **In some reports the authors also prompted the eye contact responses 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; Helgeson, Fantuzzo, Smith & Barr, 1989)

- **While each of these interventions reported increases in eye contact, neither generalization to novel therapists nor generalization to novel settings was achieved,** though Lovaas (1981) did stress the importance of programming for generalization.
- A study by Tiegerman and Primavera (1984) provides an interesting **transition from studies emphasizing the importance of eye contact within the instructional setting to those concerned with its relevance within social contexts.** Although their emphasis was on the importance of eye contact as a prerequisite to intensive instruction, Tiegerman and Primavera (1984) incorporated methodological elements that would later become more characteristic of various social interactive strategies designed to increase eye contact.

- Each of three experimental conditions involved seating a child across from an experimenter at a table on which two arrays of matching stimuli were placed, one set in front of the child and the other in front of the experimenter.
- The experimental **conditions then varied in the precision of the experimenter's imitation of a child's actions with an item**; these included precise imitation of a child's action with an identical item, less accurate imitation in which an alternative action was performed with a matching item, and performance of an unrelated action with a dissimilar object.
- Increases in frequency and duration of eye contact were found to be significant for the first and second conditions **and were most pronounced in the condition involving exact imitation.**

- As suggested by Tiegerman and Primavera (1984), and beginning in the 1980's to the present day, **studies targeting eye contact have departed from the rigid instructional models of earlier research to targeting eye contact within social contexts through various social-interactive strategies.**
- **An array of procedures, including peer modeling, peer implemented pivotal response training, role playing, contingent imitation, and time delay have all been shown to affect modest increases in a variety of social behaviors (e.g., eye contact, joint attention).** A few of these interventions have also achieved moderately improved generalization over earlier studies that concentrated on eye contact as an instructional tool. (Berler, Gross, & Drabman, 1982; Koegel, & Frea, 1993; Hwang, & Hughes, 1995; Pierce, & Schreibman, 1995; Hwang, & Hughes, 2000)
- **Many of the studies that followed were conducted with children or adolescents with mild disabilities** (Berler, Gross, and Drabman, 1982; Koegel and Frea, 1993) and therefore the methods are not easily transferred to many children with autism with limited verbal behavior and virtually no language or pragmatic skills.

- **A more relevant study by Hwang, & Hughes, (1995), utilized social-interactive strategies to increase social-communicative behaviors (e.g. eye contact, joint attention, imitation), with a non-vocal preschooler (age of 2.58 years) diagnosed with developmental disabilities.**
- **Among the strategies included in the intervention package were imitation, contingent reinforcement, and 5-sec time delay prior to reinforcement of requests.** Throughout intervention, the experimenter implemented a combination of these techniques at random.
- **For the imitation element, the experimenter positioned his face directly behind the items used to imitate the participant's actions, the contingent reinforcement portion consisted of reinforcing gestural requests** (i.e. the child received those items in which she demonstrated interest), and a 5-sec time delay was periodically implemented before delivering requested items.
- Eye contact, defined as a sustained 2-sec period of mutual eye gaze, was shown to increase to the target level of 30% of intervals, though programming for generalization was not incorporated into the intervention.

- In a subsequent study, **Hwang and Hughes (2000) implemented their multi-component social-interactive intervention** (Hwang, & Hughes (1995) with three non-vocal children, between the ages of 2.67 and 3.58 years, during daily classroom activities.
- **Consistent with their previous findings (Hwang, & Hughes, 1995), eye contact was found to increase in each participant following intervention. Additionally, social validation measures reported perceived improvement and generalization across untrained individuals and settings was achieved.**
- Though it is unclear which elements of the Hwang and Hughes (1995, 2000) intervention may be primarily responsible for increases in eye contact, certain components of this intervention package may prove particularly promising to future investigations.

- **Despite the capacity of behavioral interventions to increase eye contact, there has been increasing concern regarding the functionality of such interventions.** (Seibert, & Oller, 1981; Mirenda et al., 1983; Rollins, 1999; Arnold, Semple, Beale, & Fletcher-Flinn, 2000; Turkstra, 2005)
- Although some studies employed behavior analytic principles to increase the eye contact of autistic children, **each neglected to present a behavioral analysis of eye contact to guide their methods to teach this important social and language pragmatic behavior.**
- **The purpose of this study is to first, offer a behavioral analysis of eye contact as a language pragmatic skill of a speaker and then to use the analysis to design and implement procedures to teach children with autism to accompany their verbal behavior with eye contact.**

- This study differs with others that have used behavior analytic principles to teach topographically correct behavior but without regard to the social function served by the eye contact of a speaker when talking to another person.
- A functional analysis of eye contact within the context of talking to someone suggests it is accompanying nonverbal behavior that serves to more effectively control the social environment by influencing the behavior of a listener (Seibert, & Oller, 1981; Prutting, 1982; Kleinke, 1986; Rollins, 1999; Arnold et al., 2000). In other words, the verbal behavior of an individual is made more effective when accompanied by language pragmatic skills such as body posture, gestures, physical proximity and of course eye contact. (Bloom & Lahey, 1978)
- A behavior analysis suggests that these responses are all nonverbal operants under the precise stimulus control of a listener and other contextual stimuli. This is especially clear in the case of eye contact as a form of attention to another's face. Hoth (2005) explains "In an operant analysis, 'attention' boils down to stimulus control." (6.163)

- **The question then becomes how can we teach children with autism to “attend” to the face of others when speaking to them?**
- **The answer to this question involves the conditioning of the sight of the face of another person, e.g. eye contact, as a reinforcer.** The conceptual analysis (Michael, 2007) and empirical literature (Hall, & Sundberg, 1987; Sigafoos, Kerr, Roberts, & Couzens, 1994; Sundberg, Loeb, Hail, & Eigenheer, 2002) on the **conditioned transitive motivating operation (CMO-T) provides us with a useful body of information about how to condition previously neutral environmental events as reinforcers.**
- Michael (2004) explains:
Whenever the conditioned reinforcing effectiveness of some stimulus condition (S1) is dependent or conditional upon the presence of some other stimulus condition (S2), the onset of S1 increases the reinforcing effectiveness of S2, and also causes an increase in the current frequency of all behavior that has been reinforced by S2. S1 is thus functioning as an CMO-T with respect to S2 and any behavior that has obtained S2 (p. 56).

- **Thus, when a child “wants” an item (S1) but the contingencies have been arranged so that asking for the item is only reinforced when eye contact accompanies the response, the reinforcing effectiveness of the sight of another’s eyes (S2) is established.**
- Through this arrangement the child’s “looking” behavior will be reinforced by the sight of the listener’s face and eyes. The resulting sight of another’ eyes then serves as a discriminative stimuli for the asking response which is subsequently reinforced by the delivery of the specified item. Speakers, therefore, learn that when eye contact occurs, they are more likely to effectively control that listener’s behavior.
- **The following comment by Hoth (2005) makes this very point about requests by children “However, protoimperatives (mands) usually work more smoothly and reliably when the child engages in observing behavior that establishes another person’s attention to what the child is pointing at”. (p167)**

- **It therefore appears that the selection of the mand (Skinner, 1957) as the verbal response to be accompanied by eye contact may be the place to begin.** This may be true for at least a couple reasons.
- First of all, Mundy (1986) found a large discrepancy between children with autism and typical peers in the occurrence of eye contact when requesting. Secondly, by definition the mand response is reinforced through the mediation of another person under the control of a motivating operation that has conditioned a specific reinforcer. (Skinner, 1957)
- **Choosing a response that provides strong and specific reinforcement may make it easier to condition the sight of the face of another as reinforcer, especially when the “attending” response is required to produce the specific reinforcement for the mand.**

- In the case of typical children this conditioning process during manding occurs without parent or teacher planned programming.
- Typical children quickly learn that their mands are more reliably reinforced if they first insure the attention of the person who can provide the specific reinforcement that they are requesting.
- For example, when you are waiting in a line for service at a deli counter the mand for food may be strong.
- However, your mand does not occur until you make eye contact with the clerk
- Moreover, in this situation the sight of the eyes of the clerk will act as a reinforcer and therefore throughout the waiting process you position yourself so that the first opportunity for eye contact will not be missed. This suggests the reinforcing effects of the eye contact.
- Finally, once the eye contact occurs you immediately mand. This suggests the discriminative control over the verbal response by the eye contact experience.

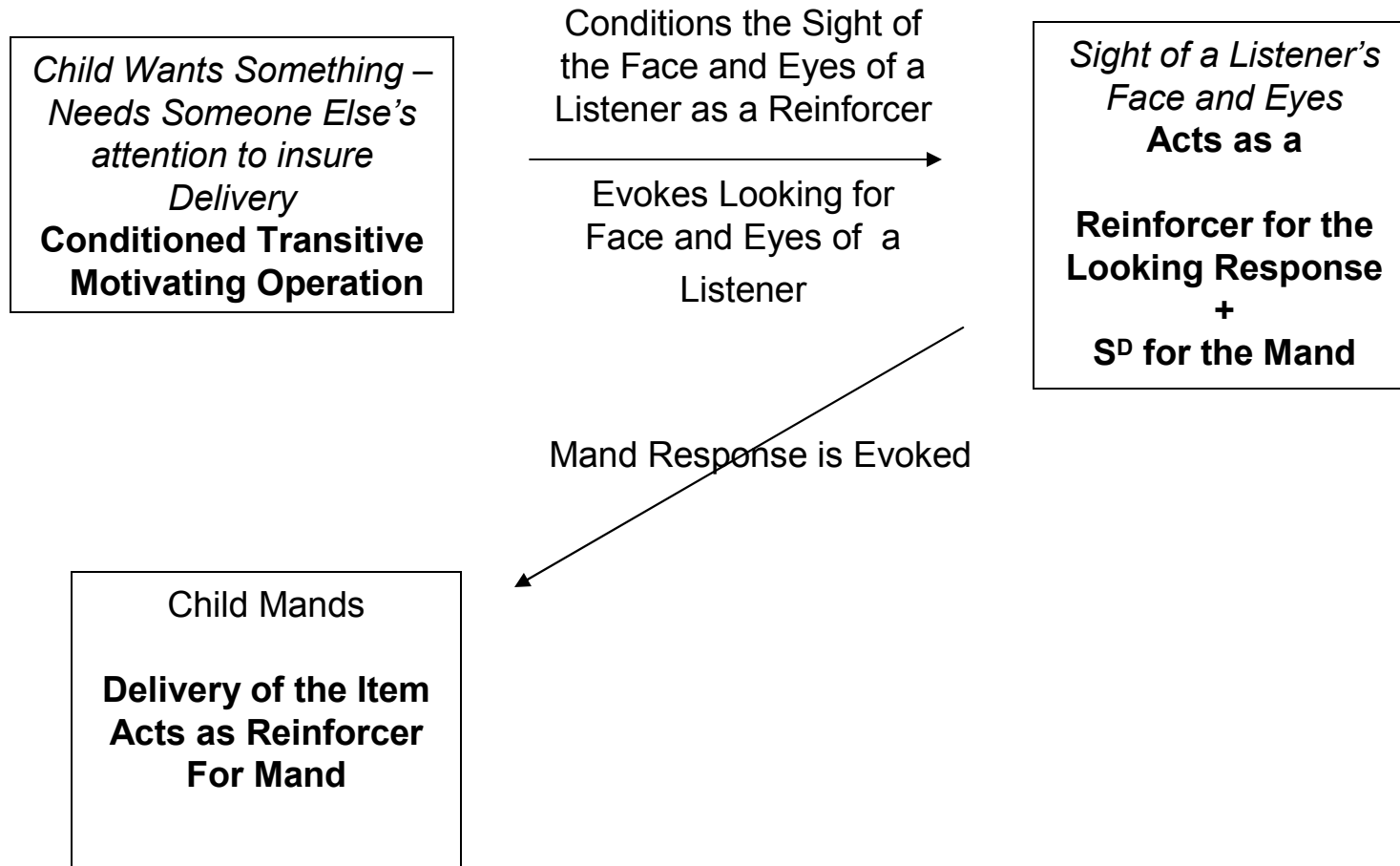
- This subtle set of contingencies does not appear to influence the behavior of many children with autism and therefore the discrepancy between typical children and those with autism.
- To establish the requirement of the eye contact response it appears reasonable that a prompt might be necessary to evoke eye contact while manding.
- However, the risk of bringing the response under strict stimulus control of the prompt makes it an undesirable method. Instead, it may be possible to take advantage of one of the by-products of extinction.
- When a reinforcer is withheld for a previously reinforced response variability in the response repertoire may occur (Lerman, & Iwata, 1996).

- **The principle of extinction-induced variability has been used to promote spontaneity and variability in a variety of target behaviors across populations** (Carr, & Kologinsky, 1983; Duker, & van Lent, 1991; Lalli, Zanolli, & Wohn, 1994; Morgan, & Lee, 1996; Harding, Wacker, Berg, Rick, & Lee, 2004) albeit more extensively documented in the basic behavior analytic literature (Pryor, Haag, & O'Reilly, 1969; Neuringer, Kornell, & Olufs, 2001)
- Consequently, extinction for mand responses that occur without the eye contact response may lead to novel and variable responses such as eye contact.
- When the eye contact response occurs with the mand it will then be reinforced.
- Consequently, the sight of the eyes will be simultaneously conditioned as a form of reinforcement for the “attending” response through the CMO-T process and a discriminative stimulus for the mand.
- The purpose of this study was to offer a behavioral analysis of the variables that control eye contact as a language pragmatic skill within the context of verbal responding. And then, to submit this analysis to empirical testing with a child with autism.

See diagram on following slide

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

Method cont.

Participant and 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

- *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.

- *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 clipboard.
 - Trial by trial mand data, across reinforcers and prompt levels, were recorded throughout the session.
 - The occurrence of eye contact response was recorded by circling a yes on a data sheet next to the recording of the mand response that was accompanied by the target response.
 - A non-occurrence of eye contact was recorded by circling a “no”.
 - 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.

Extinction 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 (extinction) 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.

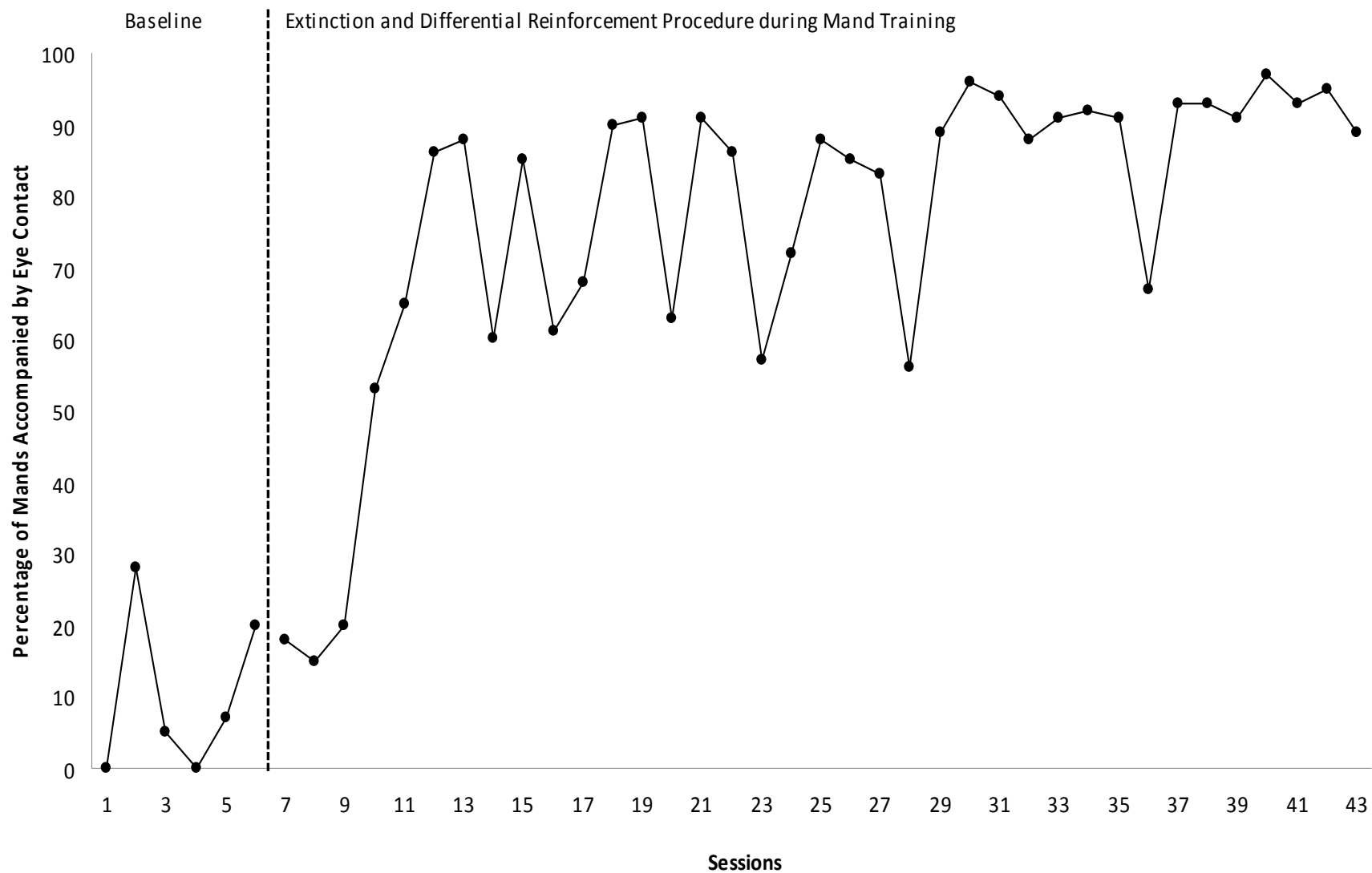


Figure 1. Percentage of Mands Accompanied by Eye Contact per sessions during baseline and treatment conditions and across four different instructors

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 extinction and the 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 7th 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.

Video of Jack

Discussion

- The results of the current report have suggested that the use of extinction and differential reinforcement procedures during mand training appear to have been correlated with an increase in 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 extinction 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 teaching eye contact as a language pragmatic skill 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.
- 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. The behaviors that resulted in the sight of the listener's eye were then reinforced by the sight of the other's eyes.

Discussion cont.

- Because Jack already had a history of reinforcement for all vocal mands without eye contact the withholding of the reinforcer when eye contact did not occur acted as a form of extinction.
- 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.
- When eye contact occurred the teacher immediately delivered the reinforcer and thereby 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 evocative 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 "attention" of another person.
- This procedure may suggest a starting point for teaching important social/language 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 instruction of a young with autism 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 may insure greater functionality of the target response.
- Moreover, eye contact within this context seems to be associated with the subsequent development of several important social and language skills

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. 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.

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