

TEACHING ADVANCED LANGUAGE SKILLS
TO CHILDREN WITH AUTISM

Presented by

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TEACHING EYE CONTACT AS A
LANGUAGE PRAGMATIC SKILL

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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)

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- 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)

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- 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. (Lieberman & 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; Kylläinen, & 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)

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- 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.

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- **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)

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- 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)

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- **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.**

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- **Until the 1980s, the predominant concern with eye gaze behavior regarded 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.

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- **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)

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- **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.

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- 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.**

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- As suggested by Tiegeman 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 a pragmatic skills.

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- **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.

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- 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.

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- **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.**

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- **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 behaviors 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)

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- 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; Sigafos, Kerr, Roberts, & Couzens, 1994; Sundberg, Loeb, Hall, & 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 (S2) is dependent or conditional upon the presence of some other stimulus condition (S1), 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).

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- **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)**

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- **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.**

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- 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.

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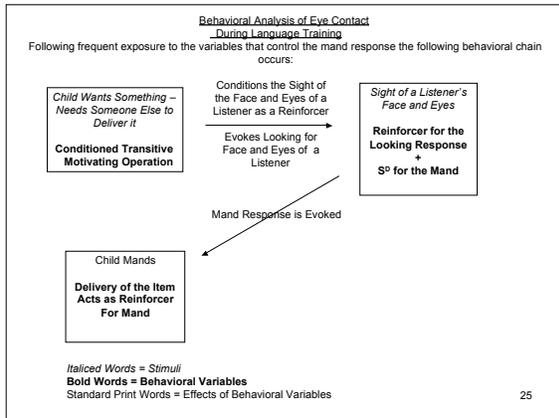
- This subtle set of contingencies does not appear to influence the behavior of many children with autism and therefore the discrepancy between typical children and those with autism.
- To establish the requirement of the eye contact response it appears reasonable that a prompt might be necessary to evoke eye contact while manding.
- However, the risk of bringing the response on the 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).

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- **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

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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.

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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.

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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.

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Method cont.

- **Data Recording**
 - Jack's 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.

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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.

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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.

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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.

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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.

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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 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.

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Method cont.

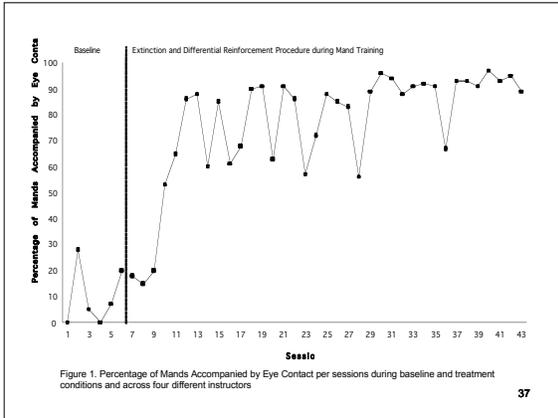
- As anticipated, Jack would sometimes continue to produce the vocal mand without eye contact in this situation and the reinforcer would be withheld for each response of this type.
- However after several mands without eye contact Jack would eventually make eye contact while manding and the reinforcer 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.

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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.

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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 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.

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 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 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.

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Discussion cont.

- Because Jack already had a history of reinforcement for all vocal mands without eye 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.

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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.

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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.

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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.

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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

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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.

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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.

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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 Disability, 25*(3), 207-216.
- Baron-Cohen, S. (1988). Social and pragmatic deficits in autism: Cognitive or affective? *Journal of Autism and Developmental Disorders, 18*(3), 379-402.
- Baron-Cohen, S., Baldwin, D. A., & Crowson, M. (1997). Do children with autism use the speaker's direction of gaze strategy to crack the code of language? *Child Development, 68*(1), 48-57.
- Berger, J., & Cunningham, C. C. (1981). The development of eye contact between mothers and normal versus Down's syndrome infants. *Developmental Psychology, 17*(3), 678-689.
- 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*, John Wiley and Sons: New York.
- Brunisma, Y., Koegel, R. L., & Koegel, L. K. (2004). Joint attention and children with autism: A review of the literature. *Mental Retardation and Developmental Disabilities Research Reviews, 10*, 169-175.
- Burgoon, J. K., Coker, D. A., & Coker, R. A. (1986). Communicative effects of gaze behavior: A test of two contrasting explanations. *Human Communication Research, 12*(4), 495-524.
- Calandrella, A. M., & Wilcox, M. J. (2000). Predicting language outcomes for young prelinguistic children with developmental delay. *Journal of Speech, Language, and Hearing Research, 43*, 1061-1071.
- Charlop, M. H., & Trasowech, J. E. (1991). Increasing autistic children's daily spontaneous speech. *Journal of Applied Behavior Analysis, 24*, 747-761.

51

- Carr, E. G., & Kologinsky, E. (1983). Acquisition of sign language by autistic children II: Spontaneity and generalization effects. *Journal of Applied Behavior Analysis, 16*, 297-314.
- Dawson, G., Toth, K., Abbott, R., Osterling, J., Munson, J., Estes, A., & Liaw, J. (2004). Early social attention impairments in autism: Social orienting, joint attention, and attention to distress. *Developmental Psychology, 40*(2), 271-283.
- Dawson, G., Hill, D., Spencer, A., Galpert, L., & Watson, L. (1990). Affective exchanges between young autistic children and their mothers. *Journal of Abnormal Child Psychology, 18*(3), 335-345.
- Duker, P. C., & van Lent, C. (1991). Inducing variability in communicative gestures used by severely retarded individuals. *Journal of Applied Behavior Analysis, 24*(2), 379-386.
- Farroni, T., Csibra, G., Simion, F., & Johnson, M. H. (2002). Eye contact detection in humans from birth. *Proceedings of the national academy of sciences, USA, 99*(14), 9602-9605.
- Fox, R. M. (1977). 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.
- Greer, D. R., & Ross, D. E. (2007). *Verbal Behavior Analysis*. U.S.A.: Pearson Education, Inc.
- Hall, G., & Sundberg, M. L. (1987). Teaching mands by manipulating conditioned establishing operations. *The Analysis of Verbal Behavior, 5*, 41-53.
- Harding, J. W., Wacker, D. P., Berg, W. K., Rick, G., & Lee, J. F. (2004). Promoting response variability and stimulus generalization in martial arts training. *Journal of Applied Behavior Analysis, 37*(2), 185-195.

52

- Helgeson, D. C., Fanluzzo, J. W., Smith, C., & Barr, D. (1989). Eye-contact skill training for adolescents with developmental disabilities and severe behavior problems. *Education and Training in Mental Retardation, 24*(1), 56-62.
- Hoth, P. (2005). An operant analysis of joint attention skills. *Journal of early intensive behavioral intervention, 2*, 160-175.
- Hwang, B., & Hughes, C. (1995). Effects of social interactive strategies on early social-communicative skills of a preschool child with developmental disabilities. *Education and Training in Mental Retardation and Developmental Disabilities, 30*(4), 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*(1), 18-28.
- Hwang, B., & Hughes, C. (2000). The effects of social interactive training on early social communicative skills of children with autism. *Journal of Autism and Developmental Disorders, 30*(4), 331-343.
- Kleinke, C. L. (1986). Gaze and eye contact: A research review. *Psychological Bulletin, 100*(1), 78-100.
- Koegel, R. L., & Frea, W. D. (1993). Treatment of social behavior in autism through the modification of pivotal social skills. *Journal of Applied Behavior Analysis, 26*, 369-377.
- Kylläinen, A., & Hietanen, J. K. (2004). Attention orienting by another's gaze direction in children with autism. *Journal of Child Psychology and Psychiatry, 45*(3), 435-444.
- Lalli, J. S., Zanotti, K., & Wahn, T. (1994). Using extinction to promote response variability in toy play. *Journal of applied behavior analysis, 27*(4), 735-736.
- Lerman, D. C., & Iwata, B. A. (1996). Developing a technology for the use of operant extinction in clinical settings: An examination of basic and applied research. *Journal of Applied Behavior Analysis, 29*(3), 345-382.
- Lovaas, O. I. (1977). *The autistic child: Language development through behavior modification*. New York: Irvington.

53

- Lovaas, O. I. (1981). *Teaching developmentally disabled children. The "Me" Book*. Austin, TX: PRO-ED, Inc.
- McCathren, R. B., Yoder, P. J., & Warren, S. F. (1999). Prelinguistic pragmatic functions as predictors of later expressive vocabulary. *Journal of Early Intervention, 22*(3), 205-216.
- Michael, J. (1993). Establishing operations. *The Behavior Analyst, 6*, 3-9.
- Michael, J. (2004). *Concepts and Principles of Behavior Analysis*. Kalamazoo, MI: Association for Behavior Analysis International.
- Michael, J. (2007). Motivating Operations. In J. O. Cooper, T. W. Heron, & W. Heward (Eds.), *Applied Behavior Analysis* (pp.374-391). Upper Saddle River, NJ: Pearson.
- Mirenda, P. L., Donnellan, A. M., & Ponder, D. E. (1983). Gaze behavior: A new look at an old problem. *Journal of Autism and Developmental Disorders, 13*(4), 397-409.
- Morgan, D. L., & Lee, K. (1996). Extinction-induced response variability in humans. *Psychological Record, 46*(1), 145-159.
- Mundy, P., & Kasari, C. (1995). Nonverbal communication and early language acquisition in children with Down syndrome and in normally developing children. *Journal of Speech & Hearing Research, 38*(1), 157-175.
- Mundy, P., Sigman, M., & Kasari, C. (1990). A longitudinal study of joint attention and language development in autistic children. *Journal of Autism and Developmental Disorders, 20*(1), 115-128.

54

Mundy, P., Sigman, M., Ungerer, J., & Sherman, T. (1986). Defining the social deficits of autism: The contribution of non-verbal communication measures. *Journal of Child Psychiatry, 27*(5), 657-669.

Mundy, P., Sigman, M., Ungerer, J., & Sherman, T. (1987). Nonverbal communication and play correlates of language development in autistic children. *Journal of Autism and Developmental Disorders, 17*(3), 349-364.

Neuringer, A., Kornell, N., & Olufs, M. (2001). Stability and variability in extinction. *Journal of Experimental Psychology: Animal Behavior Processes, 27*(1), 79-94.

Ornitz, E. M., Guthrie, D., & Farley, A. H. (1977). The early development of autistic children. *Journal of Autism and Childhood Schizophrenia, 7*(3), 207-228.

Osterling, J., & Dawson, G. (1994). Early recognition of children with autism: A study of first birthday home videotapes. *Journal of Autism and Developmental Disorders, 24*(3), 247-257.

Pierce, K., & Schreibman, L. (1995). Increasing complex social behaviors in children with autism: Effects of peer-implemented pivotal response training. *Journal of Applied Behavior Analysis, 28*, 285-295.

Prutting, C. A. (1982). Pragmatics as social competence. *Journal of Speech and Hearing Disorders, 47*, 123-134.

Pryor, K. W., Haag, R., O'Reilly, J. (1969). The creative porpoise: Training for novel behavior. *Journal of the Experimental Analysis of Behavior, 12*(4), 653-661.

Rollins, P. R. (1999). Early pragmatic accomplishments and vocabulary development in preschool children with autism. *American Journal of Speech-Language Pathology, 8*, 181-190.

55

Seibert, J. M., & Oller, D. K. (1981). Linguistic pragmatics and language intervention strategies. *Journal of Autism and Developmental Disorders, 11*(1), 75-88.

Senju, A., Tojo, Y., Dairaku, H., & Hasegawa, T. (2004). Reflexive orienting in response to eye gaze and an arrow in children with and without autism. *Journal of Child Psychology and Psychiatry, 45*(3), 445-456.

Sigalfoos, J., Kerr, M., Roberts, D., & Couzens, D. (1994). Increasing opportunities for requesting in classrooms serving children with developmental disabilities. *Journal of Autism and Developmental Disorders, 24*(5), 631-645.

Skinner, B. F. (1957). *Verbal Behavior*. Acton, MA: Copley Publishing Group.

Stone, W. L., Ousley, O. Y., Yoder, P. J., Hogan, K. L., & Hepburn, S. L. (1997). Nonverbal communication in two- and three-year-old children with autism. *Journal of Autism and Developmental Disorders, 27*(6), 677-696.

Sundberg, M. L., Loeb, M., Hail, L., & Eigenheer, P. (2002). Contriving establishing operations to teach mands for information. *The Analysis of Verbal Behavior, 18*, 14-28.

Tieganman, E., & Primavera, L. H. (1984). Imitating the autistic child: Facilitating communicative gaze behavior. *Journal of Autism and Developmental Disorders, 14*(1), 27-38.

Turkstra, L. S. (2005). Looking while listening and speaking: Eye-to-face gaze in adolescents with and without traumatic brain injury. *Journal of Speech, Language, and Hearing Research, 48*, 1429-1441.

Wimporoy, D. C., Hobson, R. P., Williams, M. G., & Nash, S. (2000). Are infants with autism socially engaged? A study of recent retrospective parental reports. *Journal of Autism and Developmental Disorders, 30*(6), 525-536.

Woods, J. J., & Wetherby, A. M. (2003). Early identification of and intervention for infants and toddlers who are at risk for autism spectrum disorder. *Language, Speech, and Hearing Services in Schools, 34*, 180-193.

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HOW AND WHEN TO INCREASE THE LENGTH OF UTTERANCE WHEN TEACHING VERBAL BEHAVIOR TO CHILDREN WITH AUTISM

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- In language programs for children with autism and related disorders parents and others frequently want to teach learners to produce sentences that contain increasing number of words (Mean Length of Utterance) consistent with the child's age.
- The rules for how and when to start this important process have been drawn from the psycholinguistic literature (Brown, 1973) and not the behavior analytic literature. (Skinner, 1957)
- Therefore, one purpose of this presentation is to provide an overview of the psycholinguistic approach since it is frequently relied upon in language programs and even within ABA programs for children with autism.
- Next, a behavioral analysis of the length of utterance issue will be presented as an alternative conceptual guide for teaching increased linguistic structure to children with autism.
- Video illustrations and recommendations for clinical practice will be offered.

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TRADITIONAL ANALYSIS OF LANGUAGE

One of the best overviews of traditional language development is provided by Jay Moore, 2007. What follows is a paraphrasing of his account on pages 166-169 in his book [Conceptual Foundations of Radical Behaviorism](#) (2007).

1. Verbal behavior is explained in terms of underlying mental causes and activities
2. Persons use words in order to express themselves, convey ideas or to expressing meaning. For example, when I say "that is a book" I am using a word as a symbol to refer to my conceptual understanding of "bookness".
3. The word is regarded as a symbol that is used to represent the ideas it is designed to convey.
4. The meaning of the word is defined by its referent. The referent in the above example is the "book".

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5. The meanings of words are stored in the lexicon which is accessed prior to speech.
6. Language is regarded as the output of various "cognitive mechanisms" that manipulate the symbols and generate the language according to rules.
7. There are various aspects of speech (nouns, verbs, adjectives, adverbs, prepositions, etc.) and various rules of grammar and syntax regarding the usage and manipulation of these parts of speech.
8. These rules are thought to be mental and innate. This includes Chomsky's idea of innately acquired universal transformational grammar that resides in the Language Acquisition Device.

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9. What a person says emerges when various rules are applied to the underlying grammatical structure.

10. All people are born with these universal underlying structures that account for the development of language.

11. The language one ultimately speaks results from exposure to the sounds of a language early on in life which then trigger the underlying structures to enable the individual to speak consistent with the rules of grammar. Moore, 2008 (p. 166)

- We will contrast this approach with a behavioral analysis a little later.
- First, let's describe how the traditionalists describes the evolving sophistication of language that leads to production of sentences of many words.

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MEAN LENGTH OF UTTERANCE

- The Mean Length of Utterance (MLU) has been used as a measure of the sophistication of language development of young children since the 1920's. (Brown, 1973)
- It has been thought to be an important index of grammatical development up to the ages of five or six.
- At first Mean Length of Utterance (MLUw) was calculated by computing an average of the number of words per utterance within a sample of about 100 utterances. (Parker & Brorson, 2005)
- The index was later changed to measure the production of morphemes not merely words (MLUm).

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- Through his observations of 3 children, Adam, Eve and Sarah, over several years Brown provided a developmental schematic of language development predicated mainly on MLUm.
- His assumptions were that language develops through identifiable stages as a result of the development of innate and cognitive processes.
- The stages therefore correspond to the underlying development and unfolding of these innate and cognitive mechanisms.

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- Brown (1973) in his seminal work *A First Language: The Early Stages*, suggested that instead of using average number words, syllables or age for that matter, to index language development it would be more useful to measure the Mean Length of Utterance in terms of morphemes (MLUm).
- Morphemes are the smallest unit of language that conveys meaning.
- They can be both bound and unbound. For example in the sentence:

I wanted to eat the cookies
1 2 3 4 5 6 7 8

There are 8 morphemes in this sentence. There are 6 unbound morphemes corresponding to each word and 2 bound morphemes as shown in red and underlined. Note that the bound morphemes can not be said alone and still convey meaning to a listener.

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- Note also the difference in complexity of the sentence when it contains the inflectional morphemes.
- Note that the bound morphemes assist the listener to understand that the desire for cookie was in the past and that more than one cookies was wanted.
- The learner who informs the listener that his "want" was an event in the past (ed) related to "more than one" cookie (s) is a more sophisticated speaker and therefore demonstrates, for the psycholinguist, more advanced application of the "rules of language" by the child.
- Consequently Brown concluded that MLUm is "an excellent simple index of grammatical development because every new kind of knowledge increases length..." (1973, p.53)
- Beyond about 5 or 6 years of age, given the wide variety of sentence constructions of children, MLUm loses its value in measuring knowledge and complexity. Context and type of interaction then determine the complexity.

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- Brown's (1973) research culminated in the development of a five (5) stage framework to understand typical language development according to the rules of grammar related to syntax and morphology.
- Each stage is referenced to MLUm as the index of the progression of language complexity through morpheme combining.
- Brown identified 14 different obligatory grammatical morphemes that he used as markers of the progression of language complexity across his stages 2-5.
- Some examples are "in" as a preposition, plurals, past tense, possessives, contractions, articles, etc.

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Brown's Stages of Language Development

Stage 1: 15-30 Months MLU 1.75 (Two Word Stage after 50-60 single word utterances)

Examples: birdie go; daddy car; give ball; water hot

Stage 2: 28-36 Months MLU 2.25

Examples: Bound and unbound Morphemes- falling ("ing" endings on words); in box; birdie on head; cars (regular plurals)

Stage 3: 36-42 Months MLU 2.75

Examples: mommy's hat (s possessive); Is she coming? (verb to be); not a ball (negation)

Stage 4: 40-46 Months MLU 3.50

Examples: the book (articles); she jumped (regular past tense)

Stage 5: 42-53 Months MLU 4.00

Examples: he does (third person irregular); They're here (contractions)

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- As you can see the words that occur in Stage 1 refer mainly to objects, people, actions, in the environment. These words are mainly content words. Agent-action or Agent-Object sequence is the typical form.

- It isn't until Stage 2 that grammatical morphemes emerge.

- For Brown, it is not until the child is about 2.5 - 3 years old that language that "modulates the meaning" begins to develop. The child begins to use more functor or function words.

- In other words, during Stage 1 the meaning of the language may be obscured because the child is not using unbound morphemes such as articles, auxiliary verbs (is, has), irregular verb tenses, negation (not that one), conjunctions, etc. Moreover, the "vocabulary" of the learner is limited as well.

- In addition bound morpheme markers related to tense and plurality, etc. are absent from the speech production of 2.5 year old children.

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- During the second stage and then those stages that follow the child begins to produce combinations of bound and unbound morphemes that support understanding by the listener.

- These are all words, phrases and inflections (endings) that can not occur without other content words in order to convey meaning.

Use of Brown's formulation of MLU has been widely accepted since its introduction (Parker & Brorson, 2005)

Since its introduction MLU has been used to:

1. Determine overall level of language development
2. Identify children who require further assessment
3. To diagnose or identify a language impairment
4. To guide further language assessment
5. And, to measure changes in language skills. (Parker & Brorson, 2005)

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- Most ABA programs for children with autism recommend increasing the length of utterance (MLU) as a way of increasing grammatical complexity. (Bondy & Frost (2007) Maurice, Green & Luce, 1996; McEachin and Leaf, 1997; Partington & Sundberg, 1998; Lovaas, 2003)

The program recommendations are frequently for children to add:

- "I want" to requests,
- "I have", "I see", to comments, etc.)
- Teaching regular tenses (adding "ed" to past tense, "ing" to progressive tense, etc.
- Teaching pronouns (he, she, it)
- Adding auxiliary verbs such as: is, will, shall, may, might, can, could, must, ought to, should, would, need, etc.

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- These types of program recommendations may be appropriate.
- However the decision as to when in the child's development of language to begin this process, if at all, might best be guided by a behavioral analysis of language instead of Brown's and other's structural analyses.
- Lets now do a brief review of a functional or natural science analysis of language using B.F. Skinner's (1957) writings on the topic.
- We will use this analysis to help us to determine when and how we should increase the complexity of the verbal behavior of language disordered children.

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The Analysis of Verbal Behavior

- For Skinner, verbal behavior is behavior that is reinforced through the actions of another person.

- Some behaviors act on the physical world; verbal behavior acts on the social world.

- Moreover, the analysis is merely an extension of the same behavioral principles applied to nonverbal behaviors.

- He suggests that no new principles or concepts are needed beyond the ones we already know and accept, e.g. reinforcement, extinction, stimulus control, etc.

- Therefore "... language is simply a name for a set of contingencies and conventional practices that prevail within a verbal community, as opposed to some system of mental rules and representations..." (Moore, 2008, pp. 163-164)

- This analysis goes beyond describing the development of language but also provides an analysis of what determines its expansion from simple to complex grammatical structure.

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- In other words, Skinner's analysis provides an explanatory guide for the development of language through Brown's 5 stages.
- First of all, vocal behavior is movements of the vocal musculature that produce acoustic stimuli that affect a listener in a special way so as to produce reinforcement for the speaker.
- Skinner classified the primary responses according to the controlling variables for each.
- In the case of the echoic and intraverbal the controlling variables include a verbal stimulus and social reinforcement.
- In the case of the mand the motivating operation (MO) is implicated and specific reinforcement.
- The tact is controlled by a nonverbal stimulus and social reinforcement.

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- These primary verbal operants are the building blocks of language that usually develop from about 12 months until about 30 months.
- These responses occur during Brown's Stage 1, or the "two word" stage.
- The verbal behavior in this stage usually takes the form of one and two word utterances that occur across all operant categories and therefore are a mix of mands, tacts, echoics and even some early intraverbals.
- The responses are usually controlled by fairly clear antecedents both verbal and nonverbal in the environment, e.g. what is seen and heard.
- These utterances usually do not include the more complex inflections of complex grammar (plural "s", "ed" for past tense) or sophisticated unbound morphemes (a, the, is, was, may, might, etc.).

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- A typical child may have up to 300-400 words in one and two word form before the utterances expand to include the more complex morphosyntactical structure found in Stages 2-5.
- For example, a typical child's verbal behavior in Brown's Stage 1, described as verbal operants, would include many of the following skills:

Mands- for many objects and items, for many items in natural environment several times per hour, mand for actions

Examples- push truck, close door, give ball, give candy, go pool, pick up

Stage 1 Translation "Give ball" for "Give me the ball".

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Tacts: items, actions, objects, people, picture of items, some body parts, etc.

- Examples- car, truck, table, chair, pencil, bike, Doggie bite, daddy car, mommy go, Sam run, Daniel hit

Stage 1 Translation- "daddy car" = Daddy is in the car.

Intraverbals: Fill-in responses to songs and nursery rhymes and later some one word responses to simple questions and fill-ins.

Examples- A kitty says.... The itsy bitsy, What's your name?, You brush your...., Shoes and, etc.

Stage 1 Translation- The itsy bitsy.... Child says spider = Tell me the story of the Itsy Bitsy Spider? - Child says the rhyme.

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- As you recall, Stages 2-5 demonstrate the progression of language complexity in which vocabulary and MLUm increase.
- Brown suggests that these added dimensions of language that occur in the speaker's language during Stages 2-5 assist in "modulating the meaning" (p.54).
- In other words, listeners are better able to comprehend the message when these additional morphemes are added to the language.

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BEHAVIORAL ANALYSIS OF INCREASING COMPLEXITY OF VERBAL BEHAVIOR

- Let's now turn to a behavioral analysis of syntax and production of morphemes, bound and unbound.
- Skinner addressed these issues in the Part IV of his book Verbal Behavior titled "The Manipulation of Verbal Behavior".
- This section included three (3) chapters 12, 13 and 14, The Autoclitic, Grammar and Syntax as Autoclitic Processes and Composition and Its Effects, respectively.
- In these chapters he provides a behavioral analysis of the development of the two word stage and all 14 "obligatory" morphemes outlined in Brown's stages.
- Skinner provided an analysis of tense, word order, plurals, prepositions, pronouns, conjunctions, articles, assertion, negation, etc.
- Autoclitics can take the form of specific words, tags (prefix or suffixes) and order.
- There is limited empirical research on this topic (Howard & Rice, 1988). Therefore what follows is an interpretive analysis based upon an extension of the basic principles to language development.

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- Beginning with Chapter 12 "The Autoclitic" Skinner begins his analysis of a developing speaker who "constructs" sentences with all the formal properties of syntax and grammar described by Brown in Stages 2-5.
- In this chapter he differentiates the primary verbal operants, e.g. mand, tact, intraverbal, etc. from secondary verbal operants.
- He calls these secondary responses autoclitic responses. He stated "The term autoclitic is intended to suggest behavior which is based upon or depends upon other verbal behavior." (1957, p.315)
- Peterson (1978) called the autoclitic "verbal behavior about verbal behavior." (p.164)
- Skinner went on to say " Parts of the behavior of an organism becomes in turn one of the variables controlling another part." (p.313)
- Consequently, a child must first acquire a strong verbal repertoire of primary operants before autoclitic behavior will occur.

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- Skinner stated: "It is only when verbal operants of the sort discussed in Part II (e.g. mands, tacts, intraverbals, etc.) have been established in strength that the speaker finds himself subject to the additional contingencies which establish autoclitic behavior". (p. 330)
- "In the absence of any other verbal behavior whatsoever autoclitics cannot occur." (Skinner, 1957, p.330)
- He says, "There are at least two systems of responses, one is based upon the other. The upper level (autoclitics) can only be understood in terms of its relations to the lower". (Skinner, 1957, p.313)
- In other words, a child first acquires one word utterances under the control of the contingencies that produce the primary verbal operants, mands, tacts, intraverbals.
- Over time the verbal community requires the speaker to inform the listener of additional information about the reasons for the verbal utterances and more details of the verbal responses.

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Example of Autoclitic

- Lets look at an example and analysis of this autoclitic process.
 - Here is a sentence that might be produced during Stage 4 by a typical 4 year old child and first analyzed in terms of Brown's structural analysis. This sentence was produced in response to the question "What did you see?"
- Black = content words red = function words
- "I saw Mommy's shoe."
- | | | | | |
|---------|---------------------|----------|-------------------|----------|
| Pronoun | Irregular pat tense | Noun | Poss. Contraction | Noun |
| (Agent) | (Action) | (Object) | | (Object) |
- Length of Utterance in morphemes = 5

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- Let's analyze this sentence in terms of primary and autoclitic responses
- Black = primary operant red = autoclitics
- "I saw mommy's shoe."
- (Autoclitic) (Intraverbal) (Autoclitic) (Intraverbal)
- In this sentence there are 2 related but different sources of control for the primary and autoclitic verbal responses.
- Behavioral Analysis of the Intraverbals (Primary)
- | | | |
|------------------------|-----------------|--------------------|
| Verbal Stimulus | Response | Consequence |
| (What did you see?) | Mommy + Shoe | Social Sr+ |
- In other words, the verbal stimulus "What did you see?" evoked 2 responses that were strong in this context; mommy and shoe.

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- However, the speaker has been taught, without explicit programming that additional "information" is necessary to adequately control the behavior of a listener who will then reinforce the speaker for greater clarity.
- Behavioral Analysis of the Autoclitics (Secondary)
- | | | |
|---|-----------------|-----------------------------------|
| Non-Verbal Stimulus | Response | Consequence |
| Source of control for primary response "shoe" is visual | "I saw" | More effective action by listener |
-
- | | | |
|----------------------------|-----------------|-----------------------------------|
| Non-Verbal Stimulus | Response | Consequence |
| Shoe belongs to mommy | 's | More effective action by listener |
- In the first example above Skinner called these secondary responses descriptive autoclitics. They are responses that inform the listener of the sources of control for the primary response. In this case, the speaker was first inclined to say "shoe" but a learning history led him to add "I see" to inform the listener that he was being affected by the visual stimulation of the shoe, he didn't hear it drop, someone didn't tell him about it, etc., it was visual stimulus control.
 - In the second example above, the contracted "s", is considered a relational autoclitic. When the inclination to say mommy was strong there was increased inclination to add "s" to inform the listener that shoe and mommy are related to the mom by possession.

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- There is actually another relational autoclitic process here.
- The speaker ordered the words according to the prevailing contingencies of reinforcement (grammatical conventions) because he/she has been reinforced by the benefit to the listener. For example, "Shoe saw I mommy's" would produce no reinforcement from the verbal community.
- Consequently, sophisticated speakers learn to order the words they say to have a specific effect upon a listener. Each word said may be discriminative for the next.
- The reinforcement for syntactical correctness may well be automatic, e.g. some orders "sound" better than others and these differ across verbal communities. (Palmer, 1996)
- This supports the notion that we don't have to hear every possible word order to produce novel arrangements of words. Autoclitic frames represent generalized responses to untrained situations.

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- However, the functional unity of an autoclitic frame only occurs after initial control by the variables that control all aspects of the autoclitic.
- Note that the benefit results in the listener reinforcing the speaker for using autoclitic processes.
- Skinner (1986) explained that listeners who are precisely controlled by speakers "... behave in ways that are more likely to have reinforcing consequences, and hence more likely to promote reciprocally reinforcing consequences for the speaker". (p. 120)

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EXAMPLES OF TYPES OF AUTOCLITICS

Skinner (1957) described five (5) types of autoclitics. Below are examples of some of them that correspond to the 14 obligatory morphemes described by Brown.

1. **Descriptive Autoclitics:** I think; I see; I doubt; I heard;
 "I think"- when the stimulus control for a tact is weak the weakness becomes the controlling variable for saying "I think" to inform the listener of the weak stimulus control. *I think it's green.*
2. **Quantifying Autoclitics:** a; the; this; that; few; many; all; almost;
 "the"- when I am about to emit a mand or tact, but I want to insure that the listener understands I am talking about a specific item I add "the". *I want the book.*
3. **Qualifying Autoclitics:** No; Not; Yes; Iy; -like
 "not"- when I am about to emit a tact because the inclination is strong but I inform the listener that he/she shouldn't react to it as a tact. *It was not a car.*
4. **Relational Autoclitics:** above, below, far, is, are, was, 's, -ed,
 "-ed" – when I am talking about something that happened in the past I add "ed" to some verbs to inform the listener of when the events occurred.
I wanted to eat the ice cream.

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- Some autoclitics occur as frames that conform to the conventional sequences for emitting verbal behavior, for example, Agent-Action-Object.
- If a child learns the frame "the boy's (hat, shoe and coat) he may be able to when appropriate say "the boy's glove" with no teaching. (Moore, 2008)
- In addition, the use of auxiliary verbs such as "to be" assist in showing relations between operants. "The car is blue". The "is" indicates that it is the car that is blue.

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TEACHING CHILDREN WITH AUTISM

- Both Brown and Skinner appear to be describing the same process regarding the development of increased length of utterance. (Segal, 1975)
- Notwithstanding these similarities, Skinner and Brown differ dramatically in terms of their descriptions of the mechanisms that account for the progression toward complex verbal utterances in children.
- The question confronted by clinicians serving children with autism is which analysis should guide clinical decision making related to when and how to increase the length of verbal utterances?

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- Many ABA programs have failed to make much use of Skinner's analysis of verbal behavior. (Sundberg & Michael, 2001)
- As a consequence "In most of the current programs the technical vocabulary of the instructor with respect to language is essentially that found in general language instruction as it occurs in elementary education, special education, speech and language instruction, and to some extent in linguistics." (Sundberg & Michael, 2001, p.3)
- Given the influence of speech and language instruction and linguistics, Brown's stage model is frequently relied upon to make decisions about when and how to increase length of utterance in programs for children with autism.
- Since Brown's stages nicely correlate with age during early development his model serves as a convenient standard with which to compare the linguistic complexity of children with autism to their typical peers.

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- Consequently, when a 5 year old child with autism is producing only one (1) word responses he is producing 3-4 less morphemes per utterance compared to his typical peers.
- Program supervisors will often suggest requiring an increase in length of utterance to move the child toward more age appropriate speech production.
- This may occur after the child has acquired only a few 1 word utterances and without regard for any other verbal skills.
- For example, by Level IV of PECS training and without clear prerequisite criteria of complexity of verbal behavior children are required to use the "I want" strip to increase their length of utterance.

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- Following mastery of this skill the PECS learner is required to again increase the length of utterance by also adding descriptive vocabulary in the form of attributes, e.g. red, big, little, etc.
 - This child is now required to exhibit the linguistic competence of a 4 year old yet it is unlikely he/she has acquired all of the other skills of a similar aged child.
 - Finally, this same child is required by Level VI to increase the length of utterance while "commenting" to produce sentence structures that include "I have", "I see", "I hear", and auxiliary verb predication such as "is".
 - All of this occurs without recognition or identification of the pre-requisite skills demonstrated by typical learners who produce this level of linguistic competence.
 - In other words, these children are being prompted to add autoclitic-like words to increase the appearance of linguistic complexity without regard for the controlling variables for these responses.
 - As mentioned earlier a similar set of practices are recommended within well respected ABA training manuals. (Maurice et al, 1996, McEachin & Leaf, 1997, Partington & Sundberg, 1999; Lovaas, 1981, 2003)
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- ### POTENTIAL PROBLEMS
- First of all, if typical sentence structure is not developing without teaching it, then requiring it may not improve the communicative effectiveness of the child.
 - For example, children who have limited manding repertoires and use only one (1) word utterances don't seem to need the "I want" phrase to insure that listeners will respond to their requests.
 - It appears in this case that the increase in length of utterance is more valuable to a concerned parent or therapist than to the child.
 - Secondly, increasing the length of utterance also increases the response effort.
 - Increasing response effort has been shown to decrease the efficiency of the response and either reduce the emission of the response or increase some other less effortful but less desirable form of response.
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- Third, children with poor articulation may produce even less intelligible responses when they are required to string together several words.
 - Finally, and maybe more importantly, requiring an increase in length of utterance without regard for pre-requisite skills or the controlling variables for the autoclitic can lead to disordered language that may lead to negative reactions by listeners and may even lead to decreased communication effectiveness.
 - Here are some examples of disordered language that sometimes occur when increased length of utterance is prompted without regard to pre-requisite skills or the appropriate controlling variables.
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- #### Mand Problems
- Child has only one word utterances as mands and teacher requires addition of "more" before saying the item desired. Results are:
 - More up
 - More go
 - More open
 - More stop
 - More home
 - "More" is said alone as request without proper context
 - Child has only one word utterances as mands and teacher requires addition of "I want" before saying item desired
 - I want up
 - I want go
 - I want stop
 - I want home
 - I want no
 - I want yes
 - "I want" is said when tacting – Asked what is it? Child says "I want table".
- This can happen with any other autoclitic frames such as "give me", "I would like", "may I have", "will you give me", "I would like"

- Adding words such as "like some" to increase the linguistic complexity can lead to
 - "I would like some go"
 - Adding articles can lead to:
 - I want a play
 - I want the go
 - Adding the word "Please" to mands can lead to tacts that include it:
 - "What is this?" Child says, "lamp, please"
 - Requiring the child to say the name of the person from whom he is manding can result in:
 - "I want cookie, mommy." Occurs when asking for a cookie from his teacher.
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- ### Tact Problems
- Attempts to increase length of utterance of tacts by adding "I see", "I hear", "I have", "I like" sometimes leads to:
 - I see the ball - when it is a mand
 - I hear the cookie - when it is a mand
 - I have the popcorn - when it is a mand
 - I like up - when manding to be picked up.
 - When these phrases are used with a true tact you can see these kinds of problems:
 - I hear red - when child is seeing red
 - I see bell - when child hears bell ring
 - I have daddy - when child sees daddy.
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Some Examples Heard

1. I want more big spin, please.
2. I need go.
3. I want turn it on, please.
4. I want yes ok.
5. Can I want one
6. Mommy, I need to want the meat.
7. I like to chip.
8. I want hungry

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What Causes These Problems ?

- These types of language problems develop when chunks of words that have the appearance of autoclitics are taught by prompting and required to receive reinforcement for the verbal response but before a child has the pre-requisite skills.
- Remember, during typical development a child has at least 300-400 one and two word utterances that include mainly primary verbal operants, e.g. "push car" "Daddy go" before most of the autoclitics are acquired, e.g. I want, I have, I see, I hear, I need, a, the, some, few, many, all, etc.
- As Skinner (1957) explained the autoclitic responses that enhance the meaning of the utterance don't occur until there are an abundance of strong primary verbal operants.
- In other words, the secondary control by one's own verbal behavior does not affect a speaker until they are relatively adept speakers under the control of environmental auditory and visual stimuli.

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- When a child says "I see the toy" he or she is tacting a toy, but the autoclitic responses "I see" informs the listener that the tact is controlled by a visual stimulus and the response "the" is controlled by not any toy but a specific one.
- These two responses are tacts of certain relations that exist relative to the tact of the "toy" and are stimulated by it and other stimuli.
- Without the pre-requisite skills and history this repertoire will not occur.
- Attempts to produce these responses through prompting when the appropriate control is not affecting the speaker will only produce imitations of autoclitics.
- These responses will have autoclitic form without autoclitic function.

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- Consequently, the child learns to produce these responses but not under the control of appropriate secondary contingencies.
- "I want" becomes an utterance the child says as part of the primary mand response when the relevant MO is established.
- Sometimes the response conforms to the verbal communities' conventions – I want a cookie- and sometimes it doesn't – I want a up.
- When a child is required to say "I see" in front of a tact response it is not be controlled by a history of reinforcement from a listener who "thanks" the speaker for using "I see" as a way of informing them that what follows is a tact under visual control.
- Consequently, the "I see" is merely a response upon which reinforcement is delivered and therefore occurs as part of a primary response and sometimes the mand.

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- The name of a person becomes an utterance I must say when I am manding without regard to whom I am speaking.
- It is merely something I must say to get what I want.
- In all of these cases, the responses are not autoclitic but merely imitate autoclitics.
- Skinner (1957) frequently warned against defining responses by their appearance as opposed to their function.
- Because they look like more advanced autoclitics does not mean they are.
- And when they have only the form and not the function they may ultimately obscure the meaning of the verbal behavior of the child.

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Implications and Recommendations

1. Avoid attempts to increase the MLUm or teach autoclitic functions, e.g. I want, I see, I have, etc. before a child emits about 300-400 words that are produced without specific training.
2. In addition, another pre-requisite might include production of the types of two word utterances that occur during Stage 1 of Brown's structural analysis of language.
3. Avoid using chronological age as a reference for increasing the MLUm.
4. The initial language training program during this period should focus on functional communication with one word utterances across the verbal operant classes.
5. MLUm may not be the most appropriate method for evaluating the strength of language development and complexity during early language training.
6. Instead, clarity of the response, latency of the response, variety of responses across operant classes and occurrence of responses across environments and listeners may be the more sensitive measures of early language progress.

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- In the only empirical study of the teaching of the autoclitic Howard & Rice (1988) concur with the recommendation that training on the autoclitic should not occur until the primary verbal operant is strong.
- In his writings Sundberg has made several references to this issue.
- Sundberg and Michael (2001) wrote the following "One implication is that the focus on developing verbal behavior in children with autism should be on communicative effectiveness, and not impaired by a focus on grammatical correctness that can be expected to develop without instruction as the child's functional verbal repertoire increases" (p.13).
- These authors are suggesting that the language trainer may want to completely forego the training of autoclitics since the response will ultimately develop without training if the child develops a sufficient verbal repertoire.
- Those who follow this recommendation will avoid the language problems that may develop when the repertoire is trained specifically.

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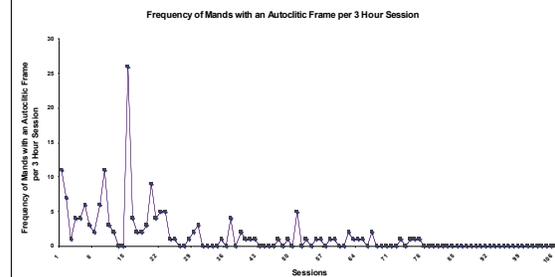
- Sundberg (2007) recently repeated this advice by stating "Thus, early language intervention programs should not include autoclitic training." (p.540)
- How to teach autoclitic behavior ultimately awaits further experimental investigation.
- Issues such as which autoclitics to teach and in which order needs to be informed by empirical findings.
- Moreover, the question as to whether autoclitic behavior should be taught at all is one of the questions that needs to be answered.
- The current interpretive behavioral analysis favors allowing the MLUm to develop without any prompting or teaching and thereby avoiding the language problems that are associated teaching increased length of utterance.

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How to Correct the Problem

- If you believe that the disordered language that has developed is interfering with a child's ability to communicate or is bringing negative reactions from communication partners then you may want to consider implementing methods to modify it.
- The best solution may be to re-teach the one word utterance by doing the following:
 - When the disordered phrase occurs do not provide any form of reinforcement.
 - After a 3-5 second pause in responding, prompt the one word response and reinforce the prompted response.
 - Attempt to contrive the motivation for the same response to immediately occur again to test the immediate affect of this procedure.
 - If the one word response occurs without prompting this second time provide a greater magnitude of the relevant reinforcer for the unprompted response.

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REFERENCES

- Frost, L. & Bondy, A. (2007) PECS: Picture exchange communication system. Newark, DE: Pyramid Educational Consultants.
- Brown, R. (1973) A first language: The early stages. Cambridge, MA : Harvard University Press
- Howard, J. & Rice, D., (1988) *Establishing a generalized autoclitic repertoire in preschool children*, *The Analysis of Verbal Behavior*, 6, 45-60.
- Lovaas, O. I. (1981). *Teaching developmentally disabled children: The ME book*. Austin, TX: PRO-ED.
- Lovaas, O. I. (2003). *Teaching individuals with developmental delays: Basic intervention techniques*. Austin, TX: PRO-ED.
- Maurice, C., Green, G., & Luce, S. C. (1996). *Behavioral interventions for young children with autism: A manual for parents and professionals*. Austin, TX: PRO-ED.
- McEachin, J. & Leaf, R. (1997) A work in progress. DRL Books: NY.
- Moore, J. (2008) *Conceptual foundations of radical behaviorism*. Cornwall on Hudson, NY: Sloan Publishing.

107

- Palmer, D. (1996) Achieving parity: The role of automatic reinforcement. *Journal of the Experimental Analysis of Behavior*, 65, 289-290.
- Parker, M.D. & Brorson, K (2005) A comparative study between mean length of utterance in morphemes (MLUm) and mean length of utterance in words (MLUw). *First Language*, 25, 365-376.
- Peterson, N. (1978) An introduction to verbal behavior. Grand Rapids, MI: Behavior Associates, Inc.
- Segal, E. (1975) Psycholinguistics discover the operant. A review of Roger Brown's A first language: The early stages. *Journal of the Experimental Analysis of Behavior*, 23, 149-158.
- Skinner, B. F. (1957). *Verbal behavior*. New York: Appleton-Century-Crofts.
- Skinner B. F. (1986) The evolution of verbal behavior. *Journal of the Experimental Analysis of Behavior*, 45, 115-122.
- Sundberg, M. L. & Partington, J. W. (1998). *Teaching language to children with autism or other developmental disabilities*. Pleasant Hill, CA: Behavior Analysts, Inc.

108

Sundberg, M. L. & Michael, J. (2001). The benefits of Skinner's analysis of verbal behavior for children with autism. *Behavior Modification*, 25, 698-724.

Sundberg, M. (2007) Verbal Behavior . In J. Cooper, T. Heron, & W. Heward. *Applied Behavior Analysis*. (pp.525-548) Upper Saddle River, New Jersey: Behavior Associates, Inc