The Journal of
Speech - Language Pathology and Applied Behavior Analysis

Volume Number 1 Summer, 2006 Issue Number 2

ISSN Pending

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The Journal of
Speech - Language Pathology and Applied Behavior Analysis

VOLUME NO. 1, ISSUE NO. 2

ISSN: Pending

Published: June 20, 2006

Publisher's Statement

The Journal of Speech-Language Pathology and Applied Behavior Analysis (JSLP-ABA) is published by Dr. Joseph Cautilli. It is a peer-reviewed, electronic journal intended for general circulation in the scientific community.

The mission of this journal is to provide a forum for SLP and ABA professionals to exchange information on topics of mutual interest. These topics may include, but are not necessarily limited to support for disorders of prelinguistic communication, speech perception/production, oral language and literacy, speech fluency, and voice. They may also address issues pertaining to accent reduction, culturally-based language variations, and augmentative-alternative communication. JSLP-ABA welcomes articles describing assessment and treatment efficacy research based on detailed case studies, single-subject designs, and group designs. Also encouraged are literature reviews that synthesize a body of information, highlight areas in need of further research, or reconsider previous information in a new light. Additionally, this journal welcomes papers describing theoretical frameworks and papers that address issues pertaining to SLP-ABA collaboration.

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Mission Statement

The mission of the Journal of Speech-Language Pathology and Applied Behavior Analysis (JSLP-ABA) is to provide a forum for SLP and ABA professionals to exchange information on topics of mutual interest. These topics may include (but are not necessarily limited to) support for disorders of prelinguistic communication, speech perception/production, oral language and literacy, speech fluency, and voice. They may also address issues related to accent reduction, culturally-based language variations and augmentative-alternative communication. JSLP-ABA welcomes articles describing assessment and treatment efficacy data based on detailed case studies, single-subject research design, and group designs. Also encouraged are literature reviews that synthesize a body of information, highlight areas in need of further research, or reconsider previous information in a new light. Additionally, this journal welcomes papers describing theoretical frameworks and papers that address issues pertaining to SLP-ABA collaboration.

JSLP-ABA is viewed as a primary source of information for speech-language pathology (SLP) professionals and professionals in applied behavior analysis (ABA) who support individuals of all ages with communicative disorders. The contents of this journal are intended to meet the interest of these professionals for information to support evidence-based practice. JSLP-ABA is also intended to serve as a vehicle to encourage collaboration between these SLP and ABA professionals.

Submission Information for Authors

Overview

All papers must be submitted in RFT format to the Lead Editor (Dr. Joseph Cautilli) via e-mail at jcautilli2003@yahoo.com. Papers may be submitted at the initiative of an author or in response to an invitation from the Lead or Associate Editors. All submissions are peer-reviewed and must be accompanied by a signed Assignment of Rights (AOR) form. A link to the AOR form is at the bottom of this page. After peer review and follow-up, all articles are copyedited. Authors have an opportunity to review and approve their manuscript prior to publication. Once approved, authors are responsible for all statements made in their work, including changes made by the copy editor prior to approval.

Content

To be considered for publication, articles must address topics of mutual interest to SLP and ABA professionals. These topics may include (but are not necessarily limited to) support for disorders of prelinguistic communication, speech perception/production, oral language and literacy, speech fluency, and voice. They may also address issues related to accent reduction, culturally-based language variations and augmentative-alternative communication, SLP-ABA collaboration. Articles may report original research, descriptions of theoretical frameworks, literature reviews, treatment critiques, and tutorials.

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All submitted manuscripts are reviewed initially by the Lead Editor. Manuscripts with insufficient priority for publication will be rejected promptly. Other manuscripts will be sent to the Senior Associate Editor, who will distribute them to editorial consultants with relevant expertise. The editorial consultants will read the papers and evaluate (1) the importance of the topic addressed by the paper; (2) the paper's conformity to standards of evidence and scholarship; and (3) the clarity of writing style. Comments provided by the editorial consultants will then be provided to the author(s) for follow up.

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- Manuscripts must be submitted as one continuous document rather than in sections or sub-documents.
- Each manuscript must include 7 elements in the following order: title, name(s) of author(s), abstract, key words, body, references, author(s)' contact information.
- **Do not** insert pagination, headers, or footers. (These are inserted in the copy-editing process)
- The use of headings is encouraged and should be structured according to the guidelines described in the *Publication Manual of the American Psychological Association* (5th edition).

- If graphics, figures and tables are used, they must be created in *.jpg or *.bmp format. No Excel graphs will be accepted.
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- Author contact information must include the following 4 elements for each author: name, mailing address, phone, and e-mail.
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- When there is a conflict between the requirements of *APA* style (see below) and the formatting rules listed here, the **formatting rules will supersede the *APA* requirements**.

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The following general guidelines must be honored to insure that JSLP-ABA will be accepted into the major psych databases. (See PsychINFO website: http://www.apa.org/psycinfo/about/covinfo.html)

- An abstract may not exceed 960 characters and spaces (approximately 120 words). Characters can be conserved by using digits for numbers (except at the beginning of sentences); by using well-known abbreviations; and by using the active voice.
- Begin the abstract with the most important information, but don't repeat the title.
- Include only the four or five most important concepts, findings, or implications.
- Embed as many key words and phrases in the abstract as possible.
- Include in the abstract only information that appears in the body of the manuscript.
- For the sake of clarity, define all acronyms and abbreviations except for measurements; spell out the names of tests; use generic names for drugs (when possible); and define unique terms.
- Use the present tense to describe results with continuing applicability or conclusions drawn and the past tense to describe variables manipulated or tests applied.

- As much as possible, use the third person rather than the first person.

Abstracts for Empirical Studies: Abstracts for empirical studies are also generally about 100 to 120 words in length. They should include the following information:

- Problem under investigation (in one sentence)
- Pertinent characteristics of participants (e.g., number, type, age, sex, genus and species)
- Experimental method, including apparatus, data-gathering procedures, and complete test
- Names and complete generic names and dosage and routes of administration of any drugs (particularly if the drugs are novel or important to the study)
- Findings, including statistical significance levels
- Conclusions and implications or applications

Abstracts for Literature Reviews and Theoretical Articles

Abstracts for review or theoretical articles are generally about 75 to 100 words in length, and they include the following information:

- The topic (in one sentence)
- The purpose, thesis, or organizing construct and the scope (comprehensive or selective) of the article
- Sources used (e.g., personal observation, published literature)
- Conclusions

Thank you!

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Editorial

Joe Cautilli and Mareile Koenig

Over the past several months, we have received many positive comments from readers of JSLP-ABA about the first issue, and we thank you for sharing this information with us. At this time, we are pleased to bring you the second issue. Consistent with the journal's mission, the papers in this issue address different topics of interest to both SLP and ABA professionals. Moreover, each paper offers information with the potential to enhance both collaborative and independent clinical work by professionals in both fields.

The first article by Conelea, Rice, and Woods' addresses current research on regulated breathing to support clients with fluency disorders. Charles Van Riper once characterized stuttering as a problem wrapped within a mystery. Behavioral interventions represent a strong, evidenced-based approach to treatment. Conelea et al extend this tradition.

In the second article, Frost and Bondy present an excellent summary of Skinner's (1957) functional analysis of verbal behavior. Their presentation includes a consideration of the relative advantages offered by Skinner's framework as compared to traditional linguistic categories, and they illustrate these advantages in reference to clinical examples.

Greer and Keohane address a related topic by tracing the trajectory of verbal behavior through a sequence of behavior developmental "cusps", including listener, speaker, speaker-listener, speaker-as-own-listener, reader, writer, writer-as-own-reader, and advanced verbal mediation. They support this comprehensive framework by empirical evidence and conceptual analysis.

Selective mutism is addressed by two papers in this issue. In one, Kearney and Vecchio address the value of functional analysis as a tool for specifying the conditions under which symptoms of selective mutism are observed. In the other, Schum provides a summary of intervention approaches based on the literature and on his own extensive experience. Together, these papers offer important insights to enhance the assessment and treatment of children with selective mutism.

The last paper, by McCullough, McCullough, Ruark, and Rainey, summarizes research into the relationship between the pragmatic performance and functional communication skills of adults with aphasia. This information has important clinical implications.

We believe that this selection of papers provides useful information, expanded perspectives, and suggestions for further research. We hope you enjoy this issue of JSLP-ABA and we invite your comments. We also invite you to submit papers consistent with the mission of JSLP-ABA, which is being expanded to include public policy issues. Specifically, we welcome papers that address the impact of behavior analytic, evidenced based practices in SLP on public policy.

Joseph Cautilli, Lead Editor
jcautilli2003@yahoo.com
Mareile Koenig, Senior Associate Editor
MareileKoenig@comcast.net
June 18, 2006

Regulated Breathing as a Treatment for Stuttering: A Review of the Empirical Evidence

Christine A. Conelea, B.A., Kevin A. Rice and Douglas W. Woods, Ph.D.
University of Wisconsin-Milwaukee

Abstract

Regulated Breathing (RB) is a behavioral treatment for stuttering designed to address airflow irregularities by teaching breathing patterns that are incompatible with stuttering. The current paper describes the RB procedure and reviews published literature to examine the empirical support for the efficacy of RB. Existing data indicate that RB is an effective treatment for stuttering and could be considered a "probably efficacious" treatment according to the criteria described by Chambless and Ollendick (2001). Limitations of the present literature are discussed, as well as suggestions and possible directions for future research.
Keywords: Regulated Breathing, Stuttering.

Introduction

Stuttering is characterized by a disturbance in the normal fluency and time patterning of speech (APA, 2000). Speech disturbances include frequent occurrences of sound, syllable, and whole-word repetitions; sound prolongations or hesitations; interjections; broken words; or circumlocutions. The *Diagnostic and Statistical Manual of Mental Disorders* includes the criterion that stuttering interferes with academic, occupational or social functioning and must not be better accounted for by a speech-motor or sensory deficit (APA, 2000). However, a diagnosis of stuttering in young children is often given even in the absence of functional impairment. When young children are diagnosed, speech patterns are usually evaluated and compared to the normal fluency for their age group (APA, 2000). Clinicians also take into consideration developmental and emotional factors that can disrupt a child's speech (Williams, 1985).

Prevalence rates of stuttering are approximately 1% (Bloodstein, 1995) but can be as high as 5% during childhood (Leung & Robson, 1990). The onset of stuttering usually occurs between the ages of 2 and 6 (Andrews et al., 1983; Homzie & Lindsay, 1984) and is more common in males. The male-to-female gender ratio is 3 to 1 during childhood and increases to 5 to 1 in adulthood (APA, 2000, Bloodstein, 1995). Although a specific cause for stuttering is not known, it is believed to be a heritable disorder (Felsenfeld et al., 2000; Andrews, Morris-Yates, Howie, & Martin, 1991).

Stuttering is associated with various airflow irregularities. Healey (1991) suggested that stuttering is primarily associated with the tightening of the laryngeal muscles in the throat, resulting in a disruption of airflow and speech production, and Bloodstein (1995) noted that in some cases a complete cessation of breathing or an irregularity of the respiratory cycle occurs during stuttering. Also, people who stutter tend to have less airflow during speech difficulties involving the coordination of laryngeal muscles, which results in decreased air volume in the lungs before speech initiation (Stager, Denman, and Ludlow, 1997). To address the issue of airflow irregularities in stuttering, modification of speech-related respiratory behavior is believed to be useful in the treatment of the disorder.

Description of Regulated Breathing

Regulated Breathing (RB) is a multicomponent behavioral treatment that attempts to inhibit stuttering by teaching a speech-related breathing pattern that is incompatible with stuttering (Azrin & Nunn, 1973). RB consists of several different treatment components, including awareness training,

relaxation, competing response training, motivation training, and generalization training. It shows significant overlap with habit reversal, a procedure designed to treat nervous habits and motor tics.

Awareness Training. Awareness training is comprised of four techniques. During r*esponse description*, the client deliberately stutters and provides a detailed verbal description of physical movements, sounds, and sensations (tension) associated with his or her stuttering. The second awareness technique, *response detection*, requires a client to point out a stutter when it occurs. The clinician either praises the client for correct identification or stops the patient and points out occurrences of a stutter. In *situation awareness training*, the client identifies words, situations and persons which provoke stuttering. If the client is a child, this report is generally confirmed by a knowledgeable person such as a parent. During the fourth technique, called *anticipation awareness* or *early warning*, the client is taught to identify somatic cues that may predict stuttering.

Relaxation Training. During relaxation training, the client learns three relaxation procedures to counter feelings of tension. The client first learns the *relaxed posture procedure*, which consists of sitting and standing in a comfortable posture conducive to relaxing chest and abdomen muscles. Diaphragmatic breathing is taught as part of the *relaxed breathing procedure*. Finally, the *self-directed relaxation procedure* enables the client to facilitate his or her own relaxation.

Competing Response Training. After a client is aware of stuttering and environmental and somatic precursors to stuttering, he or she is trained to engage in behaviors that are incompatible with stuttering. Competing response training focuses on regulating breathing patterns. Upon stuttering or upon anticipation of a stutter, the client is told to stop speaking and engage in diaphragmatic breathing while consciously relaxing chest and throat muscles, to think about what needs to be said, and to start speaking following a small exhale. In addition, clients are taught to do the breathing exercises at the beginnings of sentences and to initially speak for short durations until speech is fluent, at which time speech duration is increased. The competing responses are practiced with the clinician until the client is able to engage in the responses independently.

Motivation Training. Three motivation training techniques are used to reinforce proper use of the competing response. First, a client gives an *inconvenience review* of the past frustrations with stuttering. Second, family and friends are taught to praise a person for correctly using a competing response and learn to point out when competing responses should be used. This *social support technique* also helps to enhance client awareness of stuttering. Lastly, clients should be encouraged and praised for putting themselves in situations where they are prone to stuttering and effectively use the competing response; Azrin and Nunn (1974) called this *public display*.

Generalization Training. Generalization training enhances the likelihood that treatment gains will generalize to non-clinic settings. In an attempt to generalize the treatment, the clinician uses *symbolic rehearsal*, in which a client is asked to imagine stuttering-prone situations, while demonstrating the correct competing response. *Positive practice* is also used to generalize treatment effects, and involves the client reading one sentence at a time to the clinician, while doing regulated breaths between each word; later taking such a breath after two words, then three words, and continuing this pattern until fluent speech is formed. A clinician instructs the patient to use this technique in multiple settings, including phone conversations with friends or at home with family. As a client progresses, speech rate is gradually increased until fluent speech is formed without stuttering.

Original RB

RB and slightly modified versions of the treatment have been examined in several studies (Andrews & Tanner, 1982; Azrin & Nunn, 1974; Azrin, Nunn, & Frantz, 1979; Ladouceur & Saint-Laurent, 1986; Waterloo & Gotestam, 1988; Williamson, Epstein & Coburn, 1981).

In the original evaluation of RB, Azrin and Nunn (1974) examined 14 people who stuttered, 13 of whom had previously received unsuccessful stuttering treatment. Pre and post-treatment self-reports of stuttering frequency were recorded by participants. Self-reports were validated by corroborating friend or family member reports and post-treatment telephone contact between the therapist and client. Treatment was given in a single 2 hour session, and stuttering reductions of 94% were reported the day after treatment. Treatment gains were maintained for at least one month for all clients, regardless of the severity of pre-treatment stuttering. Azrin et al. (1979) then compared RB to an abbreviated Systematic Desensitization control condition. At a 3-month follow-up, average stuttering reductions were approximately 95% for the regulated breathing group compared to the 7% reduction found in control group.

Recognizing the limitations of self-report data, Williamson et al. (1981) incorporated direct observation measures to assess stuttering. Specifically, speech rate, dysfluency rate, and facial masseter EMG activity were assessed in several situations (while reading aloud, being interviewed, role playing a social situation, and speaking over the telephone). Treatment resulted in reductions of stuttering and facial muscle tension and an increase in speech rate. Furthermore, social validation data were collected by independent raters. These data suggested that following treatment, the treated person was easier to understand, more desirable to interact with, and made a better social impression. Treatment gains were maintained through the 3 month follow-up.

Andrews and Tanner (1982) also found treatment gains following RB, but did not reach as favorable conclusions. RB was applied to six participants who received two sessions of group treatment. Each session was 6 hours long and consisted of 2 hours of individual attention per participant. Stuttering frequency and speech rate were assessed using 3-min. recordings of speech obtained 5 times (2 pre-treatment, 1 post-treatment, and 2 follow-up). Stuttering frequency decreased 45% from pretreatment levels; however, the authors concluded that the gains were not clinically significant.

Ladouceur and Saint-Laurent (1986) attempted to evaluate the clinical validity of improvement by comparing RB in a group of people who stuttered to a matched non-stuttering criterion group. In addition to collecting subjective improvement measures, behavioral assessment of stuttering was conducted by obtrusively and unobtrusively recording participants' speech during telephone, interview, and public speaking situations. Stuttering was significantly reduced from pre-treatment to post-treatment, and treatment gains were maintained at 1- and 6-month follow-ups. Furthermore, the stuttering group did not significantly differ from the non-stuttering criterion group at the 6-month follow-up, supporting the clinical efficacy of RB.

In another study, Waterloo and Gotestam (1988) randomly assigned 32 participants to either a single, 2-3 hour session of Regulated Breathing or to a waiting-list control group. Stuttering frequency and speech rate were measured 4 and 2 weeks before treatment, and follow-up measures were taken 2, 3, and 8 months after treatment completion. Recorded speech samples were obtained during conditions of phrase reading and spontaneous speech, and the dependent variables were measured by assessing the first 200 words of each sample. Although the two groups did not differ prior to treatment, significant improvements in speech fluency and rate were found only for the RB group at the 8-month follow-up.

Since the development of the original RB procedure, various studies have sought to enhance treatment efficacy. Components of the treatment were expanded by further enhancing awareness of stuttering (Ladouceur, Boudreau, & Theberge, 1981; Ladouceur, Cote, Leblond, & Bouchard, 1982) and

increasing social support (Cote & Ladouceur, 1982). Likewise, attempts have been made to improve treatment efficiency by implementing the treatment with trained parents (Ladouceur & Martineau, 1982) and in a massed versus distributed fashion (Saint-Laurent & Ladouceur, 1987). In nearly all studies, RB has proven to be a robust treatment in producing substantial reductions in stuttering regardless of treatment modality or attempts at enhancement.

Researchers have also attempted to simplify RB in various ways (Caron & Lacouceur, 1989; Elliott, Miltenberger, Rapp, Long, & McDonald, 1998; Gagnon & Ladouceur, 1992; Miltenberger, Wagaman, & Arndorfer, 1996; Wagaman, Miltenberger, & Arndorfer, 1993). A RB procedure consisting of awareness training, competing response training, and "gentle contact" was examined by Caron and Lacouceur (1989). The procedure was evaluated with 4 children using a multiple baseline across subjects design. During the "gentle contact" component, participants were taught to voluntarily tense and relax facial muscles. Participants first practiced the competing response and "gentle contact" techniques while using single-syllable words until stuttering reached a criterion of less than 3% of syllables stuttered (% SS). Practice with progressively more complex speech continued until participants were speaking in full sentences, and treatment ended when a 3%SS or fewer criterions was reached. Decreases in %SS and increases in speech rate were maintained by all participants through a 6-month follow-up. Furthermore, measurements of parental attitudes towards stuttering indicated that all parents were more accepting as the treatment progressed.

Gagnon and Ladouceur (1992) conducted a series of three studies examining the effectiveness of a simplified RB procedure for children who stutter. In the first experiment, four children learned the procedure described by Caron and Ladouceur (1989) in a group format. One-hour treatment sessions were conducted twice per week and included parental involvement and structured group practice designed to aid in generalization of skills. Participants showed clinically significant improvements in %SS (less than 3% SS) after an average of 7 sessions, and treatment gains were maintained at 1-month and 6-month follow-up assessments. In addition, audiotape speech samples were assessed by independent raters to measure social validation. Although raters were able to distinguish between participants who stuttered and participants who did not stutter at pretreatment, they were unable to differentiate between the two following treatment.

To examine treatment efficacy in younger children, Experiment 1 was replicated with 4 younger participants. All participants reached the 3% SS or less criterion at post-treatment, although the number of sessions needed to reduce stuttering to that level varied from 5 to 41 sessions. Stuttering reductions were maintained through 1-month follow-up for 3 participants and through 6-month follow-up for 2 participants; however, all participants were still stuttering far below baseline levels and were speaking at an increased rate. Social validation measures at post-test also indicated that the independent observers could not differentiate the participants from people who did not stutter.

Experiment 3 combined the aforementioned procedures with parental participation and booster sessions. Three children and their parents participated in treatment sessions. Parents performed exercises with their children, provided encouragement and reinforcement for correct implementation of the procedures, and supervised daily home practice. After stuttering was reduced to 3% SS or less, parents directed treatment sessions and met with the therapist every 3 weeks for booster sessions. Stuttering was reduced to 3% SS or less for all participants after a mean of four sessions, and SPM was in the normal range. Treatment gains were maintained through a 6-month follow-up for all 3 participants.

In the most simplified version of RB, consisting of awareness training, competing response training, and social support, participants received an initial 2-hour treatment session and approximately 3 sessions per week thereafter until the criterion level of 3% SS or less was consistently reached (Wagaman et al., 1993). Post-treatment booster sessions occurred when the % SS exceeded 3% for two consecutive

sessions. Based on speech recordings and generalization probes, the authors observed a stuttering reduction of 89% from baseline to post-treatment. Stuttering continued to remain below the criterion level through 10 to 13 month follow-up. In addition, parents and speech pathologists rated social validity. The post-treatment ratings suggested that the children's speech was unimpaired and that no further stuttering intervention was needed.

Elliott et al. (1998) attained similar results using this protocol with 4 of 5 children who stuttered and by Miltenberger et al. (1996), who examined the procedure in a multiple baseline across participants design with adult participants. This latter study also highlighted the importance of compliance, as one subject appeared to experience a mild relapse after failing to maintain treatment compliance.

de Kinkelder and Boelens (1998) combined a simplified procedure of awareness training, RB and social support with training designed to enhance parents' positive attitudes. Speech samples were recorded in a speech clinic and in the child's home and school. A list of suggestions for increasing positive attitudes was given to parents, and included statements such as "I speak slowly" and "I do not interrupt my child when he talks" (Caron & Ladouceur, 1989). The suggestions were practiced by the parents during the treatment sessions. Parents also reminded their children to complete homework assignments and praised correct homework. Parents also gave tangible reinforcers on four occasions as new skills were acquired. After an average of 21 treatment sessions, stuttering was reduced to 3% SS or less both in the clinic and at home, speech rates increased, and speech was judged to sound more natural by independent raters.

In a recent case study, Freeman and Friman (2004) applied a simplified RB procedure to treat stuttering in an older adolescent living in residential care. To analyze environmental variables affecting stuttering, the participant's stuttering was assessed in three conditions: during reading, neutral conversation, and emotional conversation. Following treatment, stuttering frequency was reduced in all conditions and speech was rated as more socially acceptable. However, treatment gains were not identical in all conditions, highlighting the author's notion that analysis of environmental contingencies may improve treatment gains.

Conclusions

Stuttering can be a socially debilitating condition, and behavior analytically derived treatments appear to be effective in its management. RB appears to have a relatively large amount of data to support its efficacy. In a review of the Regulated Breathing literature, Woods, Twohig, Fuqua, and Hanley (2000) summarized the effectiveness of the simplified and original procedures and available control groups. As a common metric across studies, the mean percent change in stuttering frequency and speech rate from pretest to posttest and follow-up were calculated. Original or enhanced RB resulted in a mean stuttering reduction of 68%, and at an average of 3.5 months follow-up, stuttering was 59.5% below baseline levels. Of the studies that reported speech rate, a mean increase of 29.3% was maintained at a mean of 3.7 months follow-up.

Following the simplified procedure, stuttering was an average of 74% below pretreatment levels, and 78.8% below baseline at an average of 7.8 months follow-up. Mean speech rate increased by 38% at an average of 9.8 months follow-up. In comparison, the mean percent changes for control groups in the four studies that included such groups (Ladouceur & Martineau, 1982; Ladouceur & Saint-Laurent, 1986; Saint-Laurent & Ladouceur, 1987; and Waterloo & Gotestam, 1988) showed that stuttering decreased by a mean of 9.2% and speech rate increased by a mean of 6.1% at post-treatment. Stuttering was reduced by 14.8% at follow-up. Combined, these results suggest that gains seen following RB treatment are not simply due to the passage of time.

RB appears to be an effective treatment for stuttering and fits the criteria described by Chambless and Ollendick (2001) to be considered a "probably efficacious" treatment (Woods et al., 2000). However, to be considered a "well-established" treatment, there are several issues that must be addressed. First, many of the group studies of RB have not included control groups. Of the studies that did include control groups, the groups were wait-list controls. "Well-established" treatment criteria specify that the treatment must demonstrate efficacy by showing its superiority to alternative treatments or to a psychotherapy placebo (Chambless & Ollendick, 2001). Accordingly, Woods et al. (2000) recommend comparing Regulated Breathing to placebo control groups to control for expectancy effects. In addition, simplified, expanded and original versions of the treatment should be compared directly, and the procedure should also be compared to other fluency-enhancing procedures, such as Prolonged Speech (Ingham, 1984) and the Precision Fluency Shaping Program (Webster, 1980).

Second, the workgroup criteria for a "well-established" treatment state that the characteristics of research samples must be specified (Chambless & Ollendick, 2001). Woods et al. (2000) point out that the studies examining Regulated Breathing have not clearly specified participant characteristics. Cognitive ability and the global severity of stuttering, including stuttering frequency, speech rates, functional impairments, and physical movement accompanying stuttering, should be assessed and reported. It would also be beneficial to further examine treatment outcome differences for adults and children who stutter. For example, of the research on the simplified treatment, only one study sample (Miltenberger et al., 1996) was comprised of adults.

Third, a component analysis of the RB treatment package would help to identify effective treatment components and thereby increase treatment efficiency. The original RB package described by Azrin and Nunn (1974) included awareness, relaxation, competing response, motivation and generalization training. Studies examining simplified versions of Azrin and Nunn's (1974) treatment procedure have resulted in stuttering improvements, suggesting that one or more of the original treatment components may not be necessary. However, no direct attempt at isolating effective RB treatment components has been made. For example, it is possible that the contingent corrective feedback given during breathing pattern modification produces awareness of stuttering, thereby rendering a separate awareness training component unnecessary. Future research addressing such issues would help to identify the active RB treatment components.

Fourth, study methodology could be improved upon in several ways. Dependent variables have typically only included stuttering frequency, speech rate, and social validity ratings. Since the targeted change in Regulated Breathing is a person's breathing pattern, physiological measures of breathing patterns could be a more accurate measure of treatment effectiveness (Woods et al., 2000). Stuttering frequency and speech rate assessments could also be improved. Most of the studies summarized in this paper assessed stuttering based on short samples of speech, generally only 1-3 minutes long. Longer, more frequent samples taken in multiple environmental settings might better capture baseline and posttreatment levels of stuttering and speech rate. With methodological improvements such as these, future research might better determine if Regulated Breathing should be considered a "well-established" treatment for stuttering.

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Author contact information:

Christine A. Conelea, B.A.
Department of Psychology
P.O. Box 5075
Milwaukee, WI 53211
Telephone: (414) 229-2830
Email: cconelea@uwm.edu

Kevin A. Rice
Department of Psychology
P.O. Box 5075
Milwaukee, WI 53211
Telephone: (414) 229-2830
Email: karice@uwm.edu

Douglas W. Woods, Ph.D.
Department of Psychology
P.O. Box 5075
Milwaukee, WI 53211
Telephone: (414) 229-5335
Email: dwoods@uwm.edu

A Common Language: Using B.F. Skinner's Verbal Behavior for Assessment and Treatment of Communication Disabilities in SLP-ABA

Lori Frost and Andy Bondy

Abstract

Professionals in the field of speech-language pathology (SLP) and applied behavior analysis (ABA) share a common goal in the treatment of communication disorders. The two fields, however, do not share a common language. Skinner's definition of verbal behavior and his classification of verbal operants provide interventionists with a valuable tool for classifying verbal behavior based on controlling variables. An understanding of the primary verbal operants and operants under multiple control are essential for planning efficient verbal behavior intervention. This paper presents a primer on B.F. Skinner's 1957 publication, *Verbal Behavior*, a description of the primary verbal operants, verbal operants under multiple control, and a discussion of using this taxonomy for writing precise communication goals for effective intervention.
Keywords: Speech-Language Pathology, Applied Behavior Analysis, B.F. Skinner, verbal behavior, verbal operants, communication intervention.

Introduction

During the last decade there has been a growing trend for direct collaboration between the fields of speech-language pathology (SLP) and applied behavior analysis (ABA). A common overlap between the focus of the two fields is in the area of communication assessment and intervention for the purposes of enhanced interaction skills and management of inappropriate behaviors resulting from inadequate communication skills (Koenig and Gerenser, 2006). Disagreements among professionals from both fields often can be a result of a difference in terminology. Take for example, the definition of the term "communication." A definition adopted by the American Speech-Language Hearing Association was developed by the National Joint Committee for the Communicative needs of Persons with Severe Disabilities (1991, p. 2).

> *Any act by which one person gives to or receives from another person information about that person's needs, desires, perceptions, knowledge or affective states. Communication may be intentional or unintentional, may involve conventional or unconventional signals, may take linguistic or nonlinguistic forms, and may occur through spoken or other modes.*

This definition emphasizes the shared meaning established between a speaker and a listener. The Joint Committee concluded, "Thus, all persons do communicate in some way." Additionally, the success of a communicative exchange could depend on the listener happening to witness the speaker's behavior and interpreting that behavior as communicative.

The 1957 publication of B.F. Skinner's *Verbal Behavior* provided the field of ABA with a definition of communication. Skinner refers to "verbal behavior" as "…behavior reinforced through the mediation of other people…(p.2)" and specified that "…the 'listener' must be responding in ways which have been conditioned *precisely in order to reinforce the behavior of the speaker* [by the verbal community]…" In other words, a speaker acts in a manner that is under the stimulus control of an

audience (a listener) and the listener then provides the reinforcing consequence. It is through reinforcement of a specific verbal community (the French, the English, the Spanish) that a child learns the grammar and vocabulary of a particular community.

The definitions from both fields emphasize that communication can occur in many modalities, not just the spoken modality. A source of confusion in the field of SLP has been in defining the terms "speech," "language," "communication," and "verbal." Reports of a student including phrases such as "not verbal," or "non-verbal," can lead to erroneous conclusions. A speech pathologist might assume that this means that the student is not yet speaking. A person using Skinner's definition would conclude that the student has no communication skills at all in any modality. The less ambiguous terminology to describe the student who is not speaking would be "non-speaking" or "non-vocal." This could mean that the student has a sophisticated language system in a non-speech modality such as pictures, sign language, or writing.

Skinner's definition also helps us to identify behaviors of a student that are *not* verbal behavior. Behaviors that lead to direct access to reinforcing consequences are not communicative because access to those consequences is not dependent upon another person. For example if a student goes to a table and picks up a book, we would say that this behavior is not communicative as the action was aimed directly at the book. On the other hand, if the student says to the teacher sitting at the table, "I want that book," and the teacher hands it to the student, we would say that this behavior is verbal behavior.

The purpose of this paper is to provide an overview of Skinner's analysis of verbal behavior and its application to assessment and remediation of communication deficits. A description of Skinner's primary verbal operants will be provided. Then we will discuss analyzing more complex verbal behavior affected by multiple sources of control. Finally, we will describe how an understanding of Skinner's analysis can lead to more effective and efficient teaching strategies.

Historical Overview

Skinner developed the study of operant behaviors- behaviors defined by their impact upon the environment rather than by their form. He initially studied fairly simple non-human animals, such as pigeons, in order to see how systematic changes in consequences (i.e., reinforcers) and antecedents (i.e., state of deprivation, discriminative-stimuli, etc.) can lead to systematic changes in behaviors. He took all of his understanding of how learning occurs and began to apply it to language within a graduate level course for his students at Harvard University. His notes for this class became the basis for the book, *Verbal Behavior (1957)*. After the publication of *Verbal* Behavior**,** ABA as a treatment methodology became more accepted in the field of SLP, especially in the area of speech production. Many early training protocols for articulation disorders, stuttering, or voice disorders (see Ogletree and Oren, 2001 for a review) used teaching strategies from the field of ABA. Throughout the recent history of the field of SLP and ABA few training protocols have used Skinner's terminology. A review of the literature a decade ago also yielded few publications using Skinner's analysis (Tarleton and Bondy, 1991).

In recent years training protocols have begun to use Skinner's terminology (Sundberg and Partington, 1998) and a plethora of "verbal behavior" or "applied verbal behavior" treatment programs are now widely available. *Verbal Behavior* does not directly address intervention, but many practitioners use Skinner's analysis to guide the development of their training protocol (Frost and Bondy, 2002). Additionally, assessment protocols based on Skinner's primary verbal operants are available (Partington and Sundberg, 1998).

Skinner considered it is more useful to understand the functional control of verbal behavior than to focus attention upon its form, stating that, "In defining **verbal behavior** as behavior reinforced through

the mediation of other persons, we do not, and cannot, specify any one form, mode, or medium. Any movement capable of affecting another organism may be verbal (*p. 14).*" In other words, Skinner's analysis was based on defining what he called verbal operants in terms of their consequences and relatively narrowly defined stimulus conditions.

Skinner identified four controlling antecedent variables of verbal behavior: some state of deprivation or aversive stimulation, some aspect of the environment, other verbal behavior, and one's own verbal behavior. He also identified two consequence conditions: something related to the state of deprivation/aversive stimulation or social (what Skinner referred to as "educational") consequences. His analysis was based on these variables as they occur in isolation or in combination. In describing these operants, he developed new terminology to describe these functional relations to minimize confusion with lay terminology or vocabulary from other professions.

The Primary Verbal Operants

The *mand* (from com*mand*, de*mand* and *countermand*) is a verbal operant "in which the response is reinforced by a characteristic consequence and is therefore under the functional control of relevant conditions of deprivation or aversive stimulation" (p. 35-36). The mand does not occur in response to a specific stimulus. Rather, the mand is under the control of motivational operations (MO), which increase the power or effectiveness of the reinforcer and is under the stimulus control of the presence of the audience which is necessary for all verbal behavior. An MO may momentarily increase the value of a specific reinforcer and thus increase the likelihood of behaviors that have produced a specific reinforcer in the past. For example, extreme thirst would serve as an MO for requesting a drink. Fear of snakes would serve as an MO for asking to leave the reptile house at the zoo. Examples of mands include requesting food and toys, requesting information, saying "no" or "yes" to an offered item, asking for a break, and asking for assistance.

The *tact* is evoked by "a particular object or event or property of an object or event (p. 82)." Skinner was referring to some con*tact* with the stimulating environment as the evoking stimulus. This operant is commonly referred to as a comment or a label.

Skinner coined the term *intraverbal* to refer to verbal behavior that is produced in response to other verbal behavior but is not similar in form to the preceding verbalization. Early in development, intraverbals occur in response to verbalizations produced by someone else. As a child's verbal repertoire matures, intraverbals may also occur in response to the child's own prior verbalizations. Common examples of intraverbals would include answering questions such as "Where do you live?" "What's two plus two?" or filling in the blank as when children respond, "farm" after hearing "Old McDonald had a…"

The *echoic* is similar to the intraverbal in that it occurs in response to other verbal behavior, but the resulting verbal behavior matches the form of the verbal stimulus. For example, imitation of sounds, words, or entire phrases would be considered echoics.

The *autoclitic* is the most complex of the verbal operants. The autoclitic is under the control of the speaker's own verbal behavior ('auto-clitic' means 'self-leaning') and serves to cause a subtle impact on the listener. For example in the phrase, "I think it's going to rain," versus "I'm sure it's going to rain," the speaker is not referring to some aspect of the rain, but rather is referring to some aspect of himself or something that controls his verbal response. The phrases "I think" and "I'm sure" tell the listener about the intensity of the speaker's conviction regarding the impending rain. If it doesn't rain, the potential negative response from the listener is less severe in response to the autoclitic "I think," than it would be in response to "I'm sure."

Skinner defined two broad categories of reinforcement. The mand is unique in that it specifies its own consequence. In other words, the speaker makes clear what the reinforcer should be. The other operants are established and maintained by the verbal community through what Skinner called "educational reinforcers" such as "Right!" "Good job." These reinforcers are commonly referred to as social reinforcers. Table 1 presents a summary of the three-term contingency for each of the primary verbal operants.

Table 1. Elementary Verbal Operants and Controlling Variables

Antecedent	Consequence	Verbal Operant	Example
X MO ? Environment ? Verbal behavior	X direct ? educational/social	Mand	Mary walks into kitchen where Mom is sitting and says, "***I want some milk***!" Mom opens the refrigerator and gives Mary some milk
? MO X Environment ? Verbal behavior	? direct X educational/social	Tact	Johnny, looking out the window, turns to his teacher and says, "***It's hot today***." His teacher says, "It sure is!"
? MO ? Environment X Verbal behavior	? direct X educational/social	Intraverbal	Mom asks Tomasina, "How'd you do on your project?" Tomasina says "***I got a B***." Mom says, "Great!"
? MO ? Environment X Verbal behavior	? direct X educational/social	Echoic	Mrs. Thompson says to Mary, "The capital of New Jersey is Trenton." Mary says, "***The capital of New Jersey is Trenton***." Mrs. Thompson says, "Yes!"
? MO ? Environment X Verbal behavior	X direct ? educational/social	Autoclitic	Michael wakes his dad up during the night and says, "***I think*** I'm going to be sick." His dad rushes him to the bathroom."

MO= Motivational Operation
Environment= Stimulating aspect of the environment
Verbal behavior= verbal behavior of someone else
Direct= Related to MO
Educational/social= social consequence provided by a listener

Multiply Controlled Verbal Operants

The primary verbal operants described above are specifically defined by the controlling variables. When only those stimulus and consequence conditions are present, Skinner refers to these operants as "pure." Skinner also describes these operants in terms of multiple control. When there is "…a mixture of controlling relations…We might speak of [these as] 'impure'… (p.151)." For example, if a teacher were to hold up a picture of a house and say, "What's this?" the student's response, "house" would be under the control of two antecedent conditions- the teacher's question and the picture. Similarly, if the teacher routinely held up items and said, "What's this?" and then gave those items to the student after he answered, then the source of the mixed control is in the ambiguous consequences the teacher provides.

Many potential sources of "impurity" exist, depending on various combinations of stimulus and consequence factors. A variety of multiply controlled verbal operants controlled by combinations of both stimuli and controlling consequences are listed in Table 2. It is this multiple control that often sets the stage for a student's "failure" to master a particular communication objective. For example, a common complaint of teachers about their students is that the students are not "spontaneous" or that they are "prompt dependent." Rather than a symptom of a disability or a student's level of intellectual functioning, a lack of spontaneity may be directly related to the teacher's use of controlling variables during training. A teacher might report that a student only asks for desired items upon hearing, "What do you want?" or when the available items are in sight. If the only lesson a teacher has arranged is one in which the question is asked and the items are shown, then the student will learn to ask for items only in response to these two variables (in addition to the MO). It is the teacher's responsibility to manipulate the controlling variables at play during a lesson.

Table 2. Complex Verbal Operants and Controlling Variables

Antecedent	Consequence	Verbal Operant	Example
X MO X Environment ? Verbal behavior	X direct X educational/social	Mand-Tact	Terrence walks into the classroom, sees cupcakes and shouts "***Cake***!" His teacher gives him cake.
X MO ? Environment X Verbal behavior	X direct X educational/social	Intraverbal-Mand	At the store while looking at school supplies, Mom asks, "What color note book do you want? Sam answers "***Blue***." Mom buys blue.
X MO X Environment X Verbal behavior	X direct X educational/social	Intraverbal-Mand-Tact	Holding a ball, Mr. Johnson says, "What do you want?" and Nathan responds, "***Ball***." Mr. Johnson gives the ball.
? MO ? Environment X Verbal behavior	? direct X educational/social	Intraverbal-Tact	Pointing to a picture on the wall, Ms. Baker asks, "Who's that?" and Sue responds, "***Mom***."
? MO ? Environment X Verbal behavior	? direct X educational/social	Echoic Tact	Standing next to a window and observing a rain shower, Ms. Reed, says, "rain," and Amanda responds, "***rain***."
? MO ? Environment X Verbal behavior	? direct X educational/social	Intraverbal-Echoic	Ms. Tuil says, "What's two plus two? Say 'four" and Julie responds "***Four***," and Ms. Tuil says, "That's right."
? MO X Environment X Verbal behavior	? direct X educational/social	Echoic-Intraverbal-Tact	Mr. Ryan holds up a pencil and says, "Say 'pencil.'" John responds, "***Pencil***." Mr. Ryan says, "Great!"

MO= Motivational Operation
Environment= Stimulating aspect of the environment
Verbal behavior= verbal behavior of someone else
Direct= Related to MO
Educational/social= social consequence provided by a listener

A Skinnerian analysis of the generic treatment goal, "Student will request desired items," identifies a variety of stimulus conditions that could result in the student engaging in this behavior as depicted in Table 3.

Table 3. Potential Sources of Multiple Control of the Mand

Operant	Antecedent	Student Behavior:
Pure Mand	MO- no cookie around	"Cookie"
Tact/Mand	Cookie in sight	"Cookie"
Echoic/Mand	MO + teacher says "Cookie"	"Cookie"
Intraverbal/Mand	Teacher says, "What do you want?"	"Cookie"
Intraverbal/Mand/Tact	Cookie in sight, Teacher says, "What do you want?"	"Cookie"

Finding the source of the student's lack of spontaneity involves analyzing the antecedent conditions present during training. If a teacher routinely shows a student available items while asking "What do you want?" then we should not expect the student to ask for a cookie in the absence of the cookie or the question. The same problem arises when teachers report that a student has "failed to generalized" from treatment to more naturalistic settings. For example, if the treatment goal is "name items" a variety of stimulus combinations could yield this outcome (Table 4).

Table 4. Multiple Control of the Tact

Operant	Antecedent	Student Behavior
Pure Tact	Sound of fire truck	"Fire truck"
Intraverbal/Tact	Sound of fire truck and teacher asking, "What do you hear?"	"Fire truck"
Echoic/Tact	Sound of fire truck, Teacher saying, "Fire truck"	"Fire truck"
Intraverbal/Echoic/Tact	Sound of fire truck and teacher asking, "What do you hear? Say, 'fire truck.'"	"Fire truck"

A more precise description of the original goal of training would be important in identifying the specific operant to teach. For example, "Student will request desired items," could be rewritten as "Student will respond to "What do you want?" when the item is present." The intended final operant in this case would be the intraverbal/mand/tact. If the intention is for the student to use a pure mand (spontaneously request), then the goal should be written as follows: "Student will ask for desired items without the item in sight and without questions/prompts from the teacher." In this case, the teacher must ensure that the MO is the only controlling antecedent variable and that the appropriate reinforcement (direct) is supplied. If the teacher initially teaches this goal by asking the question, "What do you want?" and by showing the student the available items, then the teacher's verbal behavior and the presence of the items also influence the student's behavior. Across training opportunities the teacher must eliminate these additional sources of control using various stimulus transfer or stimulus fading procedures.

Efficient teaching involves establishing a goal to teach a specific verbal operant and then designing lessons that will require the fewest number of steps to reach that goal. If the final goal is a pure mand, the most effective teaching strategy would involve beginning with the fewest possible sources of control so that there are fewer to eliminate. For a more complete description of this type of analysis of communication training protocols, see Bondy, Tincani, and Frost, 2004.

Conclusion

The benefit of a common system of analysis with precise labels for specific behaviors across both the SLP and ABA disciplines is in the impact on teaching verbal behavior to children in a therapeutic

setting. Table 5 demonstrates how using the specific vocabulary of Skinner's verbal operants can help clarify some of the ambiguous terminology in use within the SLP literature.

Table 5. Terminology for Verbal Behavior and Speech Language Pathology

VB terms	SLP terms
Pure Mand	Request
Tact-Mand	Request
Echoic-Mand	Request
Intraverbal-Mand	Request
Intraverbal-Mand-Tact	Request
Pure Tact	Comment
Intraverbal Tact	Comment
Echoic Tact	Comment

The power behind the book *Verbal Behavior* lies in its systematic analysis of factors that influence communication. By identifying the controlling factors for a child's current communication skill we can begin to plan how to move from the current situation to our teaching goal. In this manner, we can see the steps (and how many may be needed) between what the child currently can do and what we would like to see the child perform. With the beginning and end of our lessons clearly identified we will be able to design and implement more effective lessons using any modality.

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Author contact information:

Lori Frost, M.S., CCC-SLP
Pyramid Educational Consultants, Inc.
226 W. Park Place
Suite 1
Newark, DE 19711
Phone: 302-368-2515
E-mail: lfrost@pecs.com

Andy Bondy, Ph.D.
Pyramid Educational Consultants, Inc.
226 W. Park Place
Suite 1
Newark, DE 19711
Phone: (302) 368-2515
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The Evolution of Verbal Behavior in Children

R. Douglas Greer and Dolleen-Day Keohane

Reprinted with permission from the 2005 issue of *Behavioral Development, 1,* 31-48. The references were updated from the original publication, relevant quotations were added, and minor editorial changes were made.

Abstract

Research guided by Skinner's verbal behavior in schools using scientific practices provided evidence of a developmental trajectory for "generative" verbal capabilities or behavioral developmental cusps. The broad verbal developmental fractures include: listener, speaker, speaker-listener, speaker as own listener (self-talk, conversational units and naming), reader, writer, writer as own reader exchanges, and advanced verbal mediation. First, we identified missing verbal capabilities (higher order operants) in children and then induced the pre-and co-requisite repertoires. Once the capabilities were acquired, children could learn new operants and emergent relations. We speculate on the relation of these capabilities to linguistic, neuroscientific, cognitive, and anthropological suppositions concerning the evolution of language function in both an individual's lifespan and in the species.
Keywords: Verbal Behavior, Verbal Development, Developmental Behavioral Cusps, Verbal Capabilities, Emergent Verbal Behavior, Productive Verbal Behavior

Introduction

Complex language is one of the unique repertoires of the human species. Others include teaching and certain "types of imitation" (Premack, 2004), although these too may be pre-or co-requisites for certain functional uses of language. Over the last 40 years linguists have proposed theories and provided evidence related to their interpretation of the *structure* of language (Chomsky, 1959; Chomsky & Place, 2000, MacCorquodale, 1970; Pinker, 1999). Neuroscientists have identified neurological correlates associated with some aspects of language (Deacon, 1979, Holden, 2004). Behavior analysts have focused on the source of and controlling variables for the function of language as behavior *per se* (Catania, Mathews, & Shimoff, 1990; Greer & Ross, 2005; Michael, 1984; Skinner, 1957).

More recently, scholars have come to view human language as a product of evolution; "Linguists and neuroscientists armed with new types of data are moving beyond the non-evolutionary paradigm once suggested by Noam Chomsky and tackling the origins of speech head-on." (Culotta & Brooks-Hanson, 2004, p. 1315). The current work focuses on the evolution of both the non-oral motor and oral components of speech (Deacon, 1997; Holden, 2004), although some arguments are characterized necessarily more by theory than data.

Despite the evidence that primates and pigeons can be taught certain features of verbal behavior (D. Premack & A. Premack; 2003; Savage-Rumbaugh, Rumbaugh, & Boysen, 1978; Epstein, Lanza, & Skinner, 1980), the speaker-as-own listener capability makes complex verbal behavior possible and may represent what is most unique about human verbal functions (Barnes-Holmes, Barnes-Holmes, & Cullinan, 2001; Lodhi & Greer, 1989; Horne & Lowe, 1996). Some suggest that oral communication evolved from clicking sounds to sounds of phonemes, and cite the extant clicking languages as evidence (Pennisi, 2004). It is likely that sign language and gesture predated both vocal forms; but it is the evolution of the spoken and auditory components of language that are seen as critical to the evolution of language. Some of these include changes in the anatomy of the jaw—Homo sapiens have more flexible jaw than did Neanderthals. Also, the location of the larynx relative to the trachea is different for Homo sapiens, and this anatomical feature made it possible for the humans to emit a wider range of speech sounds (Deacon, 1997). The combination of these anatomical changes, together with the identification of

separate, but proximate, sites in the brain for speaking, listening, and imitation seem to be critical parts of what made spoken language possible (Deacon, 1997). The presence of these anatomical and physiological properties made it possible for the *evolution of verbal functions through the process of cultural selection* (Catania, 2001). The functional effects of speech sounds were acquired by the consequences provided within verbal communities. This latter focus is what constitutes the subject matter of verbal behavior.

The new foci on language, as an evolved anatomical and physiological capacity, do not necessarily suggest the existence of a universal grammar; nor, in fact, does it *eliminate* the possibility of an evolved universal grammar, as some argue (Pinker, 1999). Some of the linguistic neuropsychological searches for an evolved universal grammar now follow the PET and MRI trails and focus on identifying blood flow associated with the speech and hearing centers in the brain (Holden, 2004). Interesting and as important as this work may be, little, if any, is devoted to the *function of language as behavior per se*. Nor is it concerned with the biological or cultural evolution of verbal *function* in our species or in the lifespan of the individual, although anthropological linguists point to functions as the initial source. Only the research associated with Skinner's (1957) theory of verbal behavior as behavior *per se*, and expansions of the theory by contemporary behavior analysts, provide the means for analyzing how cultural selection gave rise to the function of language (Greer, 2002; Greer & Ross, in press; Hayes, Barnes-Holmes, & Roche, 2000; Lowe, Horne, Harris, & Randle, 2002). Currently, the linguistic, neuropsychological, and behavior analytic foci remain separate sciences, though they need not remain so (Catania, 1998). While the role of cultural selection in the evolution verbal behavior for the species remains theoretical, the development of verbal behavior within the ontogeny of the individual is empirically verifiable.

From Theory to Research

For decades after the publication of Skinner's (1957) book on verbal behavior, the majority of the publications on the theory remained theoretical. There is now a significant body of research supporting and expanding Skinner's theory of verbal behavior. We have identified over 100 experiments devoted to testing the theory and utility for educational purposes. There is an additional significant body of related work in relational frame theory that includes at least an equal number of studies (Hayes et al., 2000). In our program of research alone, we have completed at least 48 experiments (25 published papers, several in press, and recent dissertations) and a number of replications. Our particular research program was driven by our efforts to develop schools that provide all of the components of education based solely on teaching and schooling as a scientific endeavor. While the existing work in the entire corpus of behavior analysis provided a strong foundation for a science of schooling, much was still missing. Cognitive psychology offered a plethora of theories and findings, and when they were germane to our efforts, these findings proved to be operationally synonymous to those identified in behavior analysis. However Skinner's (1957) *Verbal Behavior* showed the way for a research program to fill in much of what was missing in the literature in a manner that allowed us to operationalize complex cognitive repertoires.

In our commitment to a thoroughgoing scientific approach to schooling, we needed functional curricula that identified repertoires of verbal operants or higher order operants, including "generative" or "productive" verbal behavior. Our efforts included using pre-existing conceptual and applied verbal behavior research, identifying the needs of children who were missing certain repertoires, and identifying the validity of untested components of Skinner's theory through new experiments done by others and us (Greer, McCorkle, & Williams, 1989; Selinske, Greer, & Lodhi, 1991). Through this process we have been able to meet real educational needs, or at least the most pressing needs—the recognition of which were missing in the existing science of behavior and cognitive psychology. Of course, these educational voids were also apparent in normative practices in education based on pre-scientific approaches that treat teaching as an art. We needed findings that worked in the day-to-day operation of our schools, if we were

to educate the "whole child." Along the way, we discovered some interesting aspects of verbal behavior that may prove useful to a behavioral developmental psychology (Baer, 1970; Bijou & Baer, 1978; Gewirtz, Baer, Roth, 1958). Indeed, the evidence suggests that we have identified what Rosales-Ruiz and Baer (1996) described as "behavioral cusps"-- in our case verbal behavior cusps. Rosales-Ruiz and Baer stated that,

> A cusp is a change *[a change in the capability of the child]* that (1) is often difficult, tedious, subtle, or otherwise problematic to accomplish, yet (2) if not made, means little or no further development is possible in its realm (and perhaps in several realms); but (3) once it is made, a significant set of subsequent developments suddenly becomes easy or otherwise highly probable which (4) brings the developing organism into contact with other cusps crucial to further, more complex, or more refined development in a thereby steadily expanding, steadily more interactive realm. (Rosales-Ruiz & Baer, 1996, p. 166). [The italics in brackets were inserted into the quotation.]

Repertoires of Verbal Behavior for Instructional Purposes

First, applications of the research findings in verbal behavior in our CABAS® schools led to the categorization of children for instructional purposes according to levels of verbal behavior or verbal capabilities that we extrapolated from Skinner's analysis of the components of verbal behavior (Greer, 2002).[1] Traditional diagnoses or developmental constructs are useful for some inquiries, but they are not very useful for instructional purposes. The identification of the functional verbal capabilities of children, however, that we extrapolated from Skinner's work was very helpful. Skinner described the different verbal repertoires of the speaker and the relation of the speaker and listener in terms of his observations of highly literate individuals. These repertoires seemed to constitute what individuals needed to posses if they were to be verbally competent. Moreover, those verbal functions provided operational descriptions for most of the complex educational goals that had been prescribed by educational departments throughout the western world (Greer & Keohane, 2004; Greer & McCorkle, 2003). For educational purposes, the capabilities or cusps provided us with behavioral functions for a curriculum for listening, speaking, reading, writing, and the combinations that made up complex cognitive functions.

The verbal categorization proved useful in: (a) determining the ratio of instructors to students that would produce the best outcomes for students (Table 1), (b) identifying what existing tactics from the research worked for children with and without particular verbal capabilities (See Greer, 2002, Chapters 5 and 6), isolating the specific repertoires children could be taught given what each child initially brought to the table, and the development of a curricula composed of functional repertoires for complex human behavior. Most importantly, we identified the verbal "developmental cusps" (Rosales-Ruiz & Baer, 1996) or specific *verbal capabilities* we needed to induce, if we were to make real progress with our children. The categories provided a continuum of instructional sequences and developmental interventions that provided a functional approach to cognitive academic repertoires, and the recasting of state and international educational standards into functional repertoires of operants or higher order operants rather than structural categories alone (Greer, 1987, 2002; Greer & McCorkle, 2003). Each of the major verbal categories also identified levels of learner independence (i.e., operational definitions of autonomy) as well as what we argue are valid measures of socialization. Table 1 lists the broad verbal stages as we have related them to independence and social function.

Table 1. Evolution of Verbal Milestones and Independence

Verbal Milestones	Effects on Independent Functioning
1) Pre Listener Status	Humans without listener repertoires are entirely dependent on others for their lives. Interdependency is not possible. Entrance to the social community is not possible.
2) Listener Status	Humans with basic listener literacy can perform verbally governed behavior (e.g., come here, stop, eat). They can comply with instructions, track tasks (e.g., do this, now do this), and avoid deleterious consequences while gaining habilitative responses. The individual is still dependent, but direct physical or visual contact can be replaced somewhat by indirect verbal governance. Contributions to the well being of society become possible since some interdependency is feasible and the child enters the social community.
3) Speaker Status	Humans who are speakers and who are in the in the presence of a listener can govern consequences in their environment by using another individual to mediate the contingencies (e.g., eat now, toilet, coat, help). They emit mands and tacts and relevant autoclitics to govern others. This is a significant step towards controlling the contingencies by the speaker. The culture benefits proportionately too and the capacity to be part of the social community is greatly expanded.
4) Speaker Listener Exchanges with Others (Sequelics and Conversational Units)	a) Sequelics. Humans with this repertoire can responds as a listener-speaker to intraverbals, including impure tacts and impure mands. Individuals can respond to questions for mand or tact functions or to intraverbals that do not have mand or tact functions. The individual can respond as a speaker to verbal antecedents and can answer the queries of others such as, "what hurts?" "What do you want?" "What's that?" "What do you see, hear or feel?" One is reinforced as a listener with the effects of the speaker response. b) Conversational Units. Humans with this repertoire carry on conversational units in which they are reinforced as both speaker and listener. The individual engages in interlocking verbal operants of speaker and listener. The individual is reinforced both as a listener for sensory extensions, and also as a speaker in the effects speaking has on having a listener mediate the environment for the speaker.
5) Speaker as Own Listener Status Say Do Conversational Units Naming	a) Say and Do. Individuals with this repertoire can function as a listener to their own verbal behavior (e.g., first I do this, then I do that), reconstructing the verbal behavior given by another or eventually constructing verbal speaker-listener behavior). At this stage, the person achieves significant independence. The level of independence is dependent on the level of the person's listener and speaker sophistication. b) Self-talk. When a human functions as a reinforced listener and speaker within the same skin they have one of the repertoires of speaker-as-own-listener. The early evidence of this function is self-talk; young children emit such repertoires when playing with toys, for example (Lodhi & Greer, 1990). c) Naming. When an individual hears a speaker's vocal term for a nonverbal stimulus as a listener and can use it both as a speaker and listener without direct instruction, the individual has another repertoire of speaker as own listener. This stage provides the means to expand verbal forms and functions through incidental exposure.
6) Reader Status	Humans who have reading repertoires can supply useful, entertaining, and necessary responses to setting events and environmental contingencies that are obtainable by written text. The reader may use the verbal material without the time constraints controlling the speaker-listener relationship. The advice of the writer is under greater reader control than the advice of a speaker for a listener; that is, one is not limited by time or distance. Advice is accessible as needed independent of the presence of a speaker.
7) Writer Status	A competent writer may control environmental contingencies through the mediation of a reader across seconds or centuries in the immediate vicinity of a reader on a remote continent. This stage represents an expansion of the speaker repertoires such that a listener need not be present at the time or at the same location as the writer. The writer affects the behavior of a reader.
8) Writer as Own Reader: The Self-Editing Status	As writers increase their ability to read their own writing from the perspective of the eventual audience, writers grow increasingly independent of frequent reliance on prosthetic audiences (e.g., teachers, supervisors, colleagues). A more finished and more effective behavior-evoking repertoire provides the writer with wide-ranging control over environmental contingencies such that time and distance can be virtually eliminated. Writing can be geared to affect different audiences without immediate responses from the target audience
9) Verbal Mediation for Solving Problems:	A sophisticated self-editor under the verbal expertise associated with formal approaches to problem solving (e.g., methods of science, logic, authority) can solve complex problems in progressively independent fashion under the control of verbal stimuli (spoken or written). The characterization of the problem is done with precise verbal descriptions. The verbal descriptions occasion other verbal behavior that can in turn direct the action of the person to solve the particular problem. A particular verbal community (i.e., a discipline) is based on verbal expertise and modes of inquiry are made possible.

Much of our work as teacher scientists is devoted to experimentally identifying prerequisites or co-requisites repertoires needed by each child to progress through the capabilities listed in Table 1. Once

these were identified, we used or developed scientifically based tactics for moving children with the lack of a particular verbal capability from one level of *verbal capability* to the next level in the continuum. When we found it necessary, and were able to teach the missing repertoires, the children made logarithmic increases in learning and emergent relations ensued. That is they acquired what has been characterized in the literature as behavioral cusps. As the evidence accumulated with individual children across numerous experiments, we also began to identify critical subcomponents of the verbal capabilities. As we identified more subcomponents, we worked our way inductively to the identification of the developmental components within the verbal capabilities suggested by Skinner. The quest led serendipitously to increased attention on the listener and speaker-as-own listener repertoires, a focus that began to be evident in the work of others also (Catania, Mathews, & Shimoff, 1990; Hayes, et al., 2000; Horne & Lowe, 1996). Table 2 lists the verbal capabilities and the components and prerequisites that we are beginning to identify as well as some of the related research.

Table 2. Verbal Milestones and Components

Mile-stones	**Components (Does the Child Have These Capabilities?)**
Pre-listener	• Conditioned reinforcement for voices (voices of others controls prolonged auditory observation and can set the stage for visual or other sensory discriminations) (Decasper & Spence, 1987) • Visual tracking (visual stimuli control prolonged observation) (Keohane, Greer, & Ackerman, 2005a) • Capacity for "sameness" across senses (multiple exemplar experiences across matching across olfactory, auditory, visual, gustatory, tactile results in capacity for sameness across senses) (Keohane, Greer, & Ackerman, 2005b) • Basic compliance based on visual contexts and the teacher or parent as a source of reinforcement (The child need not be under any verbal control.)
Listener	• Discrimination between words and sounds that are not words (Conditioned reinforcement for voices occasions further distinctions for auditory vocal stimuli) • Auditory matching of certain words (as a selection/listener response) (Chavez-Brown, 2005; Greer & Chavez-Brown, 2003) • Generalized auditory matching of words (as a selection/listener response) (Chavez-Brown, 2005) • Basic listener literacy with non-speaker responses (Greer, Chavez-Brown, Nirgudkar, Stolfi, & Rivera-Valdes, 2005) • Visual discrimination instruction to occasion opportunities for instruction in naming (Greer & Ross, in press) • Naming (Greer, Stolfi, Chavez-Brown, & Rivera-Valdes, 2005) • Observational naming and observational learning prerequisites (Greer, Keohane, Meincke, Gautreaux, Pereira, Chavez-Brown, & Yuan, 2004) • Reinforcement as a listener (A listener is reinforced by the effect the speaker has on extending the listener's sensory experience; the listener avoids deleterious consequences and obtains vicarious sensory reinforcement.) (Donley & Greer, 1993) • Listening to one's own speaking (the listener is speaker) (Lodhi & Greer, 1989) • Listening to one's own textual responses in joining print to the naming relation (Park, 2005) • Listening and changing perspectives: Mine, yours, here, there, empathy (extension of listener reinforcement joins speaker) (Heagle & Rehfeldt, 2006)
Speaker.	• Vocalizations • Parroting (Pre-echoic vocalizations with point-to-point correspondence, here-say joins see-do as a higher order operant), auditory matching as a production response (Sundberg, Michael, Partington, & Sundberg, 1996) • Echoics that occur when see-do (imitation) joins hear-say (echoic) as a higher order duplic operant (Ross & Greer, 2003; Tsiouri & Greer, 2003) • [Faulty echoics of echolalia and palilalia related to faulty stimulus control or establishing operation control] (Karmali, Greer, Nuzzolo-Gomez, Ross, & Rivera-Valdes, 2005) • Basic Echoic-to-mand function (a consequence is specified in and out of sight, here-say attains function for a few verbalizations leading to rapid expansion of echoics for functions mediated by a listener) (Ross & Greer, 2003; Yoon, 1996) • Echoic-to–tact function (generalized reinforcement control, the child must have conditioned reinforcement for social attention) (Tsiouri & Greer, 2003) • Mand and tacts and related autoclitics are independent (learning a form in one function does not result in use in another without direct instruction) (Twyman, 1996a, 1996b) • Mands and tacts with basic adjective-object acquire autoclitic functions (a response learned in one function results in usage in another under the control of the relevant establishing operation) (Nuzzolo-Gomez & Greer, 2005). This Transformation of establishing operations across mands and tacts replicated by Greer, Nirgudkar, & Park (2003)

Table 2. Verbal Milestones and Components, continued

Speaker, cont.	• Impure mands (mands under multiple control—deprivation plus verbal stimuli of others, visual, olfactory, tactile, gustatory stimuli) (Carr & Durand, 1985) • Impure tacts (tacts under multiple controls—deprivation of generalized reinforcers plus verbal stimuli of others, visual, olfactory, tactile, gustatory stimuli) (Tsiouri & Greer, 2003) • Tacts and mands emerging from incidental experience (naming and the speaker repertoires) (Fiorile, 2004; Fiorile & Greer, 2006; Greer, et al, 2005b; Gilic, 2005) • Comparatives: smaller/larger, shorter/longer, taller/shorter, warmer/colder in mand and tact functions as generative function (Speckman, 2005) • Generative tense usage (Greer & Yuan, 2004) • "Wh" questions in mand and tact function (i.e., what, who, why, where, when, which) (Pistoljevic & Greer, 2006) • Expansion of tact repertoires resulting in greater "spontaneous" speech (Pistoljevic & Greer, 2006; Schauffler & Greer, 2006) • Speaker Listener Exchanges with Others: Does the Child Have These Capabilities? • Sequelics as speaker (Becker, 1989) • Sequelics as listener-speaker (Becker, 1989; Donley & Greer, 1993) • Conversational units (reciprocal speaker and listener control) (Donley & Greer, 1993)
Speaker as Own Listener	• Basic naming from the speaker perspective (learns tact and has listener response) (Fiorile & Greer, 2006; Horne & Lowe, 1996) • Observational naming from the speaker perspective (hears others learn tact and has tact) (Fiorile & Greer, 2006; Greer, et al., 2004b) • Verbal governance of own speaker responses (say and do correspondence as extension of listener literacy for correspondence for what others say and nonverbal correspondence that is reinforced) (Rosales-Ruiz & Baer, 1996) • Conversational units in self-talk (listener and speaker functions within one's own skin in mutually reinforcing exchanges) (Lodhi & Greer 1989)
Early Reader	• Conditioned reinforcement for observing books (Tsai & Greer, 2006) • Textual responses: see word-say word at adequate rate improved by prior conditioning of print stimuli as conditioned reinforcement for observing (Tsai & Greer, 2006) • Match printed word, spoken word by others and self and printed word, spoken word and picture/object, printed word and picture/action (Park, 2005) • Responds as listener to own textual responding (vocal verbalization results in "comprehension" if the verbalizations are in the tact repertoire, e.g., hearing tact occasions match of speech with nonverbal stimuli)
Writer	• Effortless component motor skills of printing or typing (see-write as extension of see-do) • Acquisition of joint stimulus control across written and spoken responding (learning one response either vocal or written results in the other) (Greer, Yuan, & Gautreaux, 2005) • Writer affects the behavior of a reader for technical functions (mand, tact, autoclitic functions) (Reilly-Lawson & Greer, 2006) • Transformation of stimulus function for metaphoric functions (word used metaphorically such as in, "she is sharp as a pin") (Meincke-Mathews, 2005; Meincke, Greer, Keohane & Mariano-Lapidus, 2003) • Writes to affect the emotions of a reader for aesthetic functions (mand, tact, autoclitic functions as well as simile and metaphor for prose, poetry, and drama and meter and rhyme scheme for poetry)
Writer as Own Reader	• Is verbally governed by own writing for revision functions (finds discrepancies between what she reads and what she has written, writer and reader in the same skin) (Madho, 1997; Reilly-Lawson & Greer, 2006) • Verbally governs a technical audience by reading what is written as would the target audience (editing without assistance from others, acquire listener function of target audience requiring joint stimulus control between the writer and the listener audience) (Reilly-Lawson & Greer, 2006) • Verbally governs an aesthetic audience as a function of reading what is written as would the target audience (editing without assistance from others, acquire aesthetic listener function of target audience with tolerance for ambiguity) (Meincke-Mathews, 2005)
Verbal Mediation for Problem Solving	• (Is verbally governed by print to perform simple operations (verbal stimuli control operations) (Marsico, 1998) • Is verbally governed by print to learn new stimulus control and multiple step operations (the characterization of the problem is done with precise verbal descriptions). The verbal descriptions occasion other verbal behavior that can in turn direct the action of the person to solve the particular problem (Keohane & Greer, 2005). A particular verbal community, or discipline, is based on verbal expertise tied to the environment and modes of inquiry are made possible.)

It was evident that without the expertise to move children with language delays through a sequence of ever more sophisticated verbal capabilities or cusps, we could make only minimal progress.

As we began to identify ways to provide missing capabilities, the children began to make substantial gains. As the magnitude of the differences became apparent in what the children were capable of learning following the attainment of missing repertoires, we came to consider the possibility that these verbal repertoires represented developmental verbal capabilities or verbal behavior cusps.

We have shown that certain environmental experiences evoked the capabilities for our children. However, we are mindful that providing particular prerequisite repertoires that are effective in evoking more sophisticated verbal capabilities in children with language disabilities or language delays does not *necessarily* demonstrate that the prerequisites are component stages in all children's verbal or cognitive development. While Gilic (2005) demonstrated that typically developing 2-year old children develop naming through the same experiences that produced changes in our children with verbal delays, others can argue effectively that typically developing children *do not require* specially arranged environmental events to evoke new verbal capabilities. A definitive rejoinder to this criticism awaits further research, as does the theory that incidental experiences are not required. See Pinker (1999) for the argument that such experiences are not necessary.

Milestones of the Development of Verbal Function: Fundamental Speaker and Listener Repertoires

Our rudimentary classifications of children's verbal development adhered to Skinner's (1957) focus on the verbal function of language as distinguished from a structural or linguistic focus. Skinner focused on antecedent and consequent effects of language for an individual as a means of identifying function, as distinguished from structure (Catania, 1998). Eventually, his theory led to a research program devoted to the experimental analyses of verbal behavior with humans. In a recent paper (Greer, & Ross, 2004) and a book in progress (Greer & Ross, in press), we have suggested that this research effort might be best described as *verbal behavior analysis*, often without distinction between its basic or applied focus. We have incorporated the listener role in our work, in addition to the speaker functions. While Skinner's self-avowed focus was the speaker, a careful reading of *Verbal Behavior* (Skinner, 1957/92, 1989) suggests much of his work necessarily incorporated the function of listening (e.g., the source of reinforcement for the listener, the speaker as listener). Our research on the role of the listener *was necessitated by the problems encountered in teaching children and adolescents with language delays*, of both native and environmental origin, to achieve increasingly complex cognitive repertoires of behavior. Without a listener repertoire many of our children could not truly enter the verbal community. We needed to provide the listener roles that were missing, but that were necessary if the repertoires of the speaker were to advance. Skinner made the point that a complete understanding of verbal behavior required the inclusion of the role of the listener (See the appendix to the reprint edition of *Verbal Behavior*, published by the B. F. Skinner Foundation, 1992, pp.461-470). Moreover, new research and theories based on Skinner's work have led to a more complete theory of verbal behavior that incorporates the role of the listener repertoire. These efforts include, but are not limited to:

- Research done by relational frame theorists (Barnes-Holmes, Barnes-Holmes, & Cullinan, 1999; Hayes, Barnes-Holmes, & Roche, B., 2000),
- Naming research by Horne and Lowe and their colleagues (Horne & Lowe, 1996; Lowe, Horne, Harris, & Randle 2002),
- Research on auditory matching and echoics (Chavez-Brown & Greer, 2004)
- Research on the development of naming (Greer, et al., 2005b)
- Research on conversational units and speaker-as-own-listener (Donley & Greer, 1993; Lodhi & Greer, 1989), and
- Research on learn units (Greer & McDonough, 1999).

Our levels of verbal capability incorporate the listener as part of our verbal behavior scheme (Skinner, 1989). The broad categories that we have identified to date are: (a) the pre listener stage (the

child is dependent on visual cues, or, indeed, may not even be under the control of visual stimuli), (b) the listener stage (the child is verbally governed as in doing as others say) (c) the speaker stage (the child emits mands, tacts, autoclitics, intraverbal operants), (d1) the stage of rotating speaker-listener verbal episodes with others (the child emits conversational units and related components of learn units in interlocking operants between individuals), (d2) the speaker-as-own listener stage (the child engages in self talk, naming, speaker-as-own-listener editing function, and say-do correspondence), (e) reader (the child emits textual responding, textual responding as a listener and emergent joint stimulus control, and the child is verbally governed by text), (f) the writer stage (the child verbally governs the behavior of a reader for aesthetic and technical effects), (g) writer-as-own reader (the child reads and revises writing based on a target audience), and uses verbal mediation to solve problems (the child solves problems by performing operations form text or speech). Each of these has critical subcomponents and the subcomponents of the categories that we have identified to date are shown in Table 2.

The Listener Repertoire

In the verbal community a pre-listener is totally dependent on others for her care, nourishment, and very survival. Pre-listeners often learn to respond to a visual and tactile environment; but if they do not come under the control of the auditory properties of speech they remain pre-listeners. For example, in some situations they learn to sit when certain visual cues are present. It is often not the spoken stimuli such as "sit still, "look at me," or do this" to which they respond, but rather certain instructional sequences or unintentional visual cues given by teachers and caretakers. They do no respond to, or differentiate among, the auditory properties of speech as stimuli that evoke specific responses. When the basic listener repertoire is missing, children cannot progress beyond visual or other non-auditory stimulus control. However, substantial gains accrue when children achieve the listener capability, as we shall describe.

Auditory Matching. It is increasingly apparent, that children need to match word sounds with word sounds as a basic step in learning to discriminate between words, and even distinguish words from non-word sounds. While most infants acquire auditory matching with apparent ease, some children do not acquire this repertoire incidentally. Adults experience similar difficulties in echoing a new language.

Chavez-Brown & Greer (2003) and Chavez-Brown (2005) taught children who could not emit vocal verbal behavior or whose vocal speech was flawed to match pictures using BigMack® buttons as a pre-training procedure to teach them to use the apparatus. The teacher touched a single button set before her that had a picture on it and then touched each of the two buttons the students had in front of them (one with the target picture and one with a foil picture). Then students responded by depressing the button in front of them that matched the picture of the button in front of the teacher that had been touched by the teacher. Once the children mastered the visual matching task, used as a means to introduce them to the apparatus, we removed the pictures. In the next phase the children were taught to match the sound generated by the teacher's button (the buttons produced individual pre-recorded words or sounds). At this second stage, the depression of one of the students' buttons produced a sound and the depression of one of their buttons had no sound. Once they mastered matching sounds contrasted with no sound buttons, they learned to match words with non-word sounds as foils. Next, they learned to match particular words contrasted with different words. Finally, they learned generalized matching for words produced by pushing the buttons (i.e., they learned to match novel word sets with no errors). Our findings showed that children, who had never vocalized before, began to approximate or emit echoic responses under mand and tact-establishing operations when they mastered generalized word matching. Moreover, a second set of children, who had only approximations (i.e., faulty articulations), learned full echoics that graduated to independent mands and tacts. This matching repertoire may be an early and necessary step in the acquisition of speaking and may also be key to more advanced listening. See also correlations between

auditory matching and the emissions of verbal operants identified by Marion et al. (2003) that suggested the auditory matching research we described above.

The Emersion of Basic Listener Literacy. When children have "auditory word matching" they can be taught the discriminative function needed to become verbally governed. Over the past few years, we found that children without listener repertoires reached a learning plateau and were no longer making progress in instruction beyond extensions of visual matching. We believe that children around the world who have these deficits are not making progress in early and intensive behavioral interventions. These children require inordinate numbers of instructional presentations, or learn units, and still do not make progress in acquiring repertoires that require verbal functions that are the very basic building blocks of learning. In an attempt to help these children become listeners, we developed an intervention that we call *listener emersion* (Greer, et al. 2005a). During *listener emersion*, we suspend all of the children's instructional programs and provide intensive instruction in responding to the discriminative acoustical properties of speech. This instruction continues until children's listener responses are fluent.[2]

In the *listener emersion* procedure, children learned to respond to words (i.e., vowel-consonant relations) spoken in person by a variety of individual voices as well as to voices recorded on tapes and other sources. By "fluent," we mean that the children learned to respond to four or more sets composed of five instructions such as "point to ___," "match ___", "do this," "stand up," and "turn around." The children also learned *not to respond to nonsensical, impossible, or non-word vowel-consonant combinations* that were inserted into the program as part of each set (i.e., "jump out the window," "blah-blah-blah"). These sets were presented in a counterbalanced format with criterion set at 100% accuracy. Next the children learned to complete the tasks at specified rates of accurate responding ranging from 12 to 30 per minute. Finally, they learned to respond to audio taped, mobile phone, or computer generated instructions across a variety of adult voices. Once the children's basic listener literacy emerged (i.e., the children met the listener emersion criteria), we compared the numbers of learn units required by each student to meet major instructional goals before and after listener emersion. The achievement of the objectives for the listener emersion procedure constitutes our empirical definition of basic listener literacy. This step insures that the student is controlled by vowel-consonant speech patterns of speakers. After acquiring basic listener literacy, the numbers of instructional trials or learn units the children required to achieve instructional objectives across the range of his or her instructional objectives decreased from four to ten times that which had been required prior to their obtaining basic listener literacy.

The Speaker Stage

Acquisition of Rudimentary Speaker Operants. In the late eighties, we identified procedures for inducing first instances of vocal speech that proved more effective than the operant shaping of spoken words as linguistic requests (Williams & Greer, 1989). That is, rather than teaching parts of words as vowel consonant blends, as had been the existing behavioral procedure (Lovaas, 1977), we arranged the basic establishing operations and obtained true mands and tacts using echoic-to-mand and echoic-to-tact procedures (Williams & Greer, 1989). Once true verbal operants were taught, the children used "spontaneous speech." The children came under the relevant establishing operations and antecedent stimuli (Michael, 1982, 1984, 1993) associated with mand and tact operants and related autoclitics, rather than verbal antecedent such as, "What do you want?" They did not require intraverbal prompts as a means of teaching pure tacts. In another procedure Sundberg, Loeb, Hale, and Eighenheer (2000/2001) evoked the emission of impure tacts and the emission of impure tacts and mands; these are necessary repertoires as well. In still other work Pistoljevic and Greer (2006) and Schauffler and Greer (2006) demonstrated that intensive tact instruction led to the emission of novel tacts and appropriate audience control.

Children who do not speak can be taught verbal behavior through the use of signs, pictures, or electronic speaking devices. Even so, we submit that speech is simply more useful; speech works in the community at large. When we are unable teach speech, we too, use these substitutes, although as our research has progressed there have been fewer children that we cannot teach to speak. The second choice for topography for us is electronic speaking devices as such devices supply the possibilities for speaker as own listener. The importance of speech becomes apparent when we reach the critical verbal repertoires of speaker-as own-listener and reader.

Although the use of the above procedures significantly increased the numbers of children we could teach vocal verbal operants, there were some children we still could not teach to speak. While we could teach these children to use substitute topographies for speech, the development of speech is critical for subsequent verbal capabilities. For those children who did not learn to speak using our basic echoic-to-mand and echoic-to-tact procedures (Williams & Greer, 1989), others and we, designed and tested several tactics to induce first instances of speech. We taught children who had acquired fluent generalized imitation, but who could not speak, to perform chains of generalized imitation of large and small movement responses at a rate of approximately 30 correct per minute at 100% accuracy. These children were then *deprived of preferred items* for varying periods of time and were only able to obtain the items contingent on speech under conditions in which they first performed a rapid chain of generalized imitation (moving from large motor movements to fine motor movements related to touching their lips and tongue). As soon as the last motor movement step in the teaching chain was completed we offered the item under deprivation as we spoke its name. After several presentations as described, the children spoke their first echoic mands. Some of these children were as old as nine years of age and their first words were not separate phonemes but were mands like "baseball card," "Coke," or "popcorn." Once the echoic-to-mand was induced for a single word or words, other echoic responses were made possible and their independent mand repertoire was expanded—they acquired function. Follow-ups done years after these children spoke their first words showed that they maintained and expanded their mand and eventually their tact repertoires extensively (Ross & Greer, 2003). We currently think that the procedure acted to induce joint stimulus control across the two independent behaviors of imitating and echoing (see Skinner, 1957 for the important distinction between imitation and echoic responding). See-do joined a higher order class and a new behavioral cusp was acquired.

In a replication and an extension of this work, Tsiouri & Greer (2003) found that the same procedure could be used to develop tact repertoires, when the establishing operation was deprivation of generalized reinforcers. See Skinner (1957, page 229) for a source for the establishing operations for the tact. Moreover, tacts and mands could be evoked in tandem fashion when emission of the tact operants resulted in an opportunity to mand as a result of using the tandem procedures developed in Williams & Greer (1989) (Tsiouri & Greer, 2003).

The establishing operation is key to the development of these rudimentary operants (Michael, 1982, 1984, 1993). There appear to be three tested establishing operation tactics: (a) the interrupted chain (Sundberg, et al., 2001/2002), the incidental teaching procedure in which the incidental establishing operations opportunities are captured (Hart & Risely, 1975), and the momentary deprivation procedure (Williams & Greer, 1989). Schwartz (1994) compared the three procedures. She found them equally effective, although the momentary deprivation procedure resulted in slightly greater maintenance and required significantly less time. It is suggested that more powerful results may accrue if each of these establishing operations are taught in a multiple exemplar fashion providing the child with a range of establishing operations for controlling the emission of rudimentary operants. Still, other establishing operation tactics are needed, such as identification of establishing operations for tacts described in Tsiouri and Greer (2003). Indeed, what is characterized in the literature as "naturalistic language" interventions, derived from Hart and Risely's incidental procedure, are essentially suggestions for capturing establishing operations as they occur *in situ* (McDuff, Krantz, McDuff, & McClannahan, 1988). The difficulty with

relying solely on the capture of incidental establishing operations is that there are simply not enough opportunities to respond. There are now an abundance of tested tactics for evoking establishing operations in instructional sessions that can be used without waiting for an incidental occasion, *although it is critical to capture incidental opportunities as well*.

From Parroting to Verbal Operants. The stimulus-stimulus pairing procedure of Sundberg et al. (1996) evoked first instances of parroting of words as a source of automatic reinforcement. These investigators paired preferred events, such as tickling the children while the experimenters said words; the children began to parrot the words or sounds. Moreover, the children emitted the words in free play, suggesting that the saying of the words had acquired automatic reinforcement status. Yoon (1998) replicated the Sundberg et al. procedure, and after the parroting was present for her students, used the echoic-to-mand tactic described above (Williams & Greer, 1989), to evoke true echoics that, in turn, became independent mands. Until the parroted words were under the echoic to mand contingencies, the children were simply parroting as defined by Skinner (1957); however, obtaining the parroting as an automatic reinforcer made the development of true echoics possible. The emission of a parroting response may be a crucial first step in developing echoic responses and may be an early higher order verbal operant[3]. The children in these studies moved from the listener to the speaker stage as a result of the implementation of extraordinary instructional procedures (See Sundberg & Partington, 1998 for an assessment and curriculum). Once a child has acquired a speaker repertoire the speaker-listener repertoire becomes possible. Speaker capabilities opened up extraordinary new possibilities for these children, as they did for our ancestors in the combined evolution of phylogenic capabilities in the context of capabilities evoked by cultural selection.

Transformation of Establishing Operations across Mand and Tact Functions. Initially, learning one form (e.g., word or words) in a mand or tact function does not result in usage of the form in the untaught function without direct instruction (Lamarre & Holland, 1985, Twyman, 1996). For example, a child may emit a word as a mand (e.g., "milk") under conditions of deprivation, such that the emission of "milk" results in the delivery of milk. But, the child cannot use the same form ("milk") under tact conditions (i.e., the emission of the word in the presence of the milk when the reinforcement is a social or other generalized reinforcement probability). The independence of these two functions has been reliably replicated in young typically and non-typically developing children; however, at some point most children can use forms acquired initially as mands and use the same forms as tacts, or *vice versa*. Some see this as evidence of something like a neurologically based universal grammar that makes such language phenomena possible (Pinker, 1999). Clearly, neural capacities must be present just as the acoustic nerve must be intact to hear. But, the unequivocal existence of a universal grammar does not necessarily follow; the source is at least as likely to lie in the contingencies of reinforcement and punishment and the capacity to be affected by these contingencies in the formation of relational frames/higher order operants. One example of the acquisition of this verbal cusp or higher order operant is the acquisition of joint establishing operation control of a form in either mand or tact functions after learning only one function. When this verbal cusp is achieved, a child can use a form in an untaught function without direct instruction.

Nuzzolo-Gomez and Greer (2004) found that children who could not use a form learned in a mand function as a tact, or *vice versa* without direct instruction in the alternate function (Lamarre & Holland, 1985; Twyman, 1996a, 1996b), could be taught to do so when they were provided with relevant multiple exemplar experiences across establishing operations for a subset of forms. Greer, et al. (2003b) replicated these findings and we have used the procedure effectively with numerous children in CABAS schools. The new verbal capability doubled both incidental and direct instructional outcomes.

Speaker Immersion. Even after the children we taught had acquired a number of rudimentary speaker operants, some did not use them as frequently as we would have liked. Speaking had emerged;

but it was not being used frequently, perhaps because the children had not received an adequate number of opportunities of incidental establishing operations. We designed a procedure for evoking increases in speaker behavior that we called *speaker immersion* (Ross, Nuzzolo, Stolfi, & Natarelli, 2006). In this procedure we immersed the children for whom the operants had already emerged in instruction devoted to the continuous use of establishing operations requiring speaking responses. All reinforcement was related to speaking and opportunities were provided throughout the day. As a result, the children's use of verbal operants dramatically increased as they learned to maximize gain with minimal effort. The children learned that it was easier and more efficient to get things done by speaking pure tacts and mands than by emitting responses that required the expenditure of more effort, thereby extending Carr and Durand's (1985) findings.

Milestones of Speaker and Listener Episodes: Interlocking Verbal Operants between Individuals

Verbal Episodes between Individuals

Verbal behavior is social as Skinner proclaimed, and perhaps *one cannot be truly social* without verbal behavior. A major developmental stage for children is the acquisition of the repertoire of exchanging speaker and listener roles with others—what Skinner (1957) called *verbal episodes*. A marker and a measure of one type of verbal episode is the conversational unit, while another type of verbal episode is a learn unit. We developed these measures as indices of interlocking verbal operants. No account of verbal behavior can be complete without the incorporation of interlocking verbal operants.

Epstein, et al. (1980) demonstrated verbal episodes between two pigeons. We argue that they demonstrated a particular kind of interlocking verbal operant that we identify as a learn unit. In that study, after extensive training, the researchers had two pigeons, Jack and Jill, respond as both speaker and listener in exchanges that simulated verbal episodes between individuals. Each pigeon responded as both speaker and listener and they exchanged roles under the relevant discriminative stimuli as well as under the conditions of reinforcement provided by each other's speaker and listener responses (a procedure also used in part by Savage-Rumbaugh, Rumbaugh, & Boysen, 1978). The pigeon that began the episode, the teacher pigeon, controlled the reinforcement in the same way that teachers deliver effective instruction (Greer & McDonough, 1999). That is, the teacher pigeon had to observe the responses of the student pigeon, judge its accuracy, and consequate the student pigeon's response. Premack (2004) argued that the lack of this kind of teaching observation in primates is evidence that this is one of the repertoires unique to humans. In the Epstein et al. study, special contingencies were arranged in adjacent operant chambers to evoke or simulate the teaching repertoire. Note that the pigeon that acted as a student did not emit the reciprocal observation that we argue needs to be present in the verbal episode we characterize as a conversational unit. In a conversational unit both parties must observe, judge, and consequate each other's verbal behavior.

Conversational Units

We used the determination of verbal episodes as measures in studies by Becker (1989), Donley & Greer (1993), and Chu (1998) as well as related research by Lodhi and Greer (1989) and Schauffler and Greer (2006). The verbal episodes in these studies were measured in units and included a rotation of initiating episodes between individuals as well as a reciprocal observation accruing from reinforcement received as both a speaker and a listener. We called these episodes *conversational units*. A conversational unit begins when a speaker responds to the presence of a listener with a speaker operant that is then reinforced by the listener. This first piece of the verbal interaction is what Vargas (1982) identified as a *sequelic*. Next, the listener assumes a speaker role, under the control of the initial speaker who is now a listener. That is, the listener function results in the extension of sensory experiences from the speaker to the listener as evidenced by the speaker response from the individual who was the initial

listener. The initial speaker then functions as a listener who must be reinforced in a listener function (i.e., the initial listener as speaker extends the sensory capacities of the initial speaker as a listener). A new unit begins when either party emits another speaker operant. Interestingly, in the cases of children with diagnoses like autism, we can now teach them a sequelic speaker function in fairly straightforward fashion using procedures described above. However, these children often have little interest in what the speaker has to say. The reinforcement function for listening is absent. We are currently working on procedures to address this problem.

Conversational units are essential markers and measures of social behavior and, we argue, their presence is a critical developmental milestone in the evolution of verbal behavior. By arranging natural establishing operations, Donley and Greer (1993) induced first instances of conversation between several severely delayed adolescents who had never before been known to emit conversation with their peers. Coming under the contingencies of reinforcement related to the exchange of roles of listener and speaker is the basic component of being social. Chu (1998) found that embedding mand operant training within a social skills package led to first instances of, and prolonged use of, conversational units between children with autism and their typically developing peers. Moreover, the use of conversational units resulted in the extinction of assaultive behavior between the siblings thereby extending Carr and Durand's (1985) finding.

Learn Units

Learn units are verbal episodes in which the teacher, or preprogrammed teaching device (Emurian, Hu, Wang & Durham, 2000), controls the onset of the interactions, the nature of the interactions, and most of the sources of reinforcement for the student. The teacher bases her responses on the behavior of the student by reinforcing correct responses or correcting incorrect response. The interactions provided in the Epstein et al. (1980) and the Savage-Rumbaugh et al. (1978) studies are learn units rather than conversational units as we described above. (See Greer, 2002, Chapter 2, for a thorough discussion of the learn unit and Greer & McDonough, 1999 for a review of the research).

Milestone of Speaker as Own Listener: Verbal Episodes "Within the Skin"

As Skinner pointed out, the speaker may function as her own listener as in the case of "self-talk." Lodhi and Greer empirically identified speaker as own listener in young typically developing children who engaged in self-talk while playing alone (Lodhi & Greer, 1989). This appears to be an early, if not the first, identification of conversational units in self-talk emitted by individuals under controlled experimental conditions. The developmental literature is replete with research on self-talk and its importance, but until the functional components defining self-talk were identified, self-talk remained essentially a topographical measure because the speaker and listener *functions* were not identified. It is very likely that speaker as own listener types of learn units are detectable also, although we have not formally tested for them except in our studies on print control that resulted in students acquiring self administration of learn units (Marsico, 1998).

We agree with Horne and Lowe (1996) that a speaker as own listener interchange occurs in the phenomenon that they identified as *naming*. Naming occurs when an individual hears a speaker emit a tact, and that listener experience allows the individual to emit the tact in a speaker function without direct instruction and further to respond as a listener without direct instruction. Horne and Lowe (1996) identified the phenomenon with typically developing children. Naming is a basic capability that allows children to acquire verbal functions by observation. It is a bi-directional speaker listener episode.

But what if the child does not have the repertoire? For example, matching, pointing to (both listener responses, although the point to is a pure listener response), tacting, and responding intraverbally

to multiple controls for the same stimulus (the speaker response as an impure tact) are commonly independent at early instructional stages. This is the case because, although the stimulus is the same, the behaviors are very different. The child learns to point to red but does not tact (i.e., does not say "red" in the presence of red objects, or tacts and does not intraverbally respond to "What color?"). This, of course, is a phenomenon not understood well by linguists because they operate on the assumption that *understanding* is an automatic given—a human example of generative verbal behavior, if you will. It is a source of many problems in learning for typically developing and non-typically developing children, as well as college students who demonstrate differences in their responses to multiple-choice questions (selection responding) versus their responses to short answer or essay questions (production responding). At some point children can learn a match or point-to response and can emit a tact or intraverbal response without direct training. This is not, however, automatic for some children. Thus, we asked ourselves this question: If naming were not in a child's repertoire, could it be taught?

Induction of One Component of Naming. Greer, et al. (2005a) found that one could isolate experimentally a particular instructional history that led to naming for 2-dimensional stimuli (pictures) in children who did not initially have the repertoire. After demonstrating that the children did not have the repertoire for tacts, we provided a multiple exemplar instructional intervention with a subset of stimuli involving rotating match, point to, tact, and intraverbal responding to stimuli until the children could accurately do all of the responses related to the subset. We then returned to the initial set and a novel set as well and showed that the untaught speaker and listener repertoires had emerged.

These data suggested that the acquisition of naming, or one component of naming (i.e., going from listener to speaker) could be induced with multiple exemplar experiences. Naming is a generative verbal repertoire that Catania (1998) has called a "higher order class." The Relational Frame Theorists described this particular higher order operant as an incidence of transformation of stimulus function (Hayes, et al., 2000). Skinner referred to the phenomenon as responding in different media to the same stimulus (i.e., thematic grouping) and Relational Frame Theorists provided feasible environmental sources for this and related phenomena (i.e., multiple exemplar experiences). That is, a particular response to a single stimulus or category of stimuli when learned either as a listener repertoire or as a speaker repertoire is immediately available to the individual as a response without direct instruction once the individual has stimulus transformation across speaker and listener functions. We found that the naming repertoire emerged as a function of specific instructional experiences. This represents another case of the emergence of generative verbal behavior that is traceable to environmental circumstances. Fiorile and Greer (2006) replicated this finding. Naming also represents the acquisition of *one of the speaker as own listener stages***.** When children have acquired it they have new verbal capabilities. Other types of generative behavior are traceable to multiple exemplar experiences, as we will discuss later.

Induction of Untaught Irregular and Regular Past Tense Responding. Still another case of speaker as own listener repertoires probably occurs in the emission of verb endings colloquially often associated with the cliché "kids say the darnedest things" (Pinker, 1992). We recently found that we could evoke untaught correct usage of regular and incorrect but "spontaneous" emission of irregular verbs (i.e., "he singed last night") as a result of multiple exemplar instruction with young children with developmental disabilities who could not emit either regular or irregular novel past tense forms without direct instruction (Greer & Yuan, 2004). The children learned to emit novel regular past tense forms without direct instruction and this abstraction was extended to irregular verbs. That is, they emitted incorrect irregular forms such as "he singed" as do young typically developing children. In a related study, Speckman (2005) found that multiple exemplar experiences also resulted in the emission of untaught suffixes as autoclitic frames for tacts. However, it is important to recognize that Pinker (1999) says the fact that children begin to use the correct irregular forms at some point and stop using the incorrect forms is a more important capability. He argues that there is no direct instruction leading to this revision in verb usage by typically developing children. But just as the initial incorrect usage has been

traced to a sufficient set of experiences, it is possible that there are incidental sources of experience that make this change possible. We suspect that multiple experiences could induce this capability too, although further research remains to be done.

Milestones of Reading, Writing, Self-Editing: Extensions of the Speaker and Listener Repertoires

Reading

Reading involves textually responding (seeing a printed word and saying the word), matching various responses to the text as comprehension (printed stimulus to picture or actions, the spoken sound and all of the permutations and combinations of this relationship) (Sidman, 1994). At first glance, the reader stage appears to be simply an extension of the listener repertoire; however, on closer scrutiny, reading is necessarily an advanced speaker-as-own-listener repertoire because the reader must listen to what is read. Reading consists of speaker-listener relationships under the control of print stimuli, actions or pictures. Textually responding requires effortless rates of responding to print stimuli in order to "hear" the spoken word. After all, it was only after the Middle Ages that we began to read silently, and many religious and other ancient cultural practices still adhere to ceremonies in which one person reads aloud to an audience while the audience views the text.

The capacity to hear what one reads is important because the acoustical physical properties of sound allow more "bits" to be transmitted by sound than is possible with signs. For example, children who are deaf from birth have extreme difficulty developing reading comprehension beyond Grade 6 (Karchmer & Mitchell, 2003). There are special auditory properties of speech that allow a great deal of information or bits to be used for the benefits of the reader (aesthetic or functional), or at least this was the case before computers. Good phonetic instruction results in children textually emitting untaught combinations of morphemes and if those words are in their listener repertoire they can comprehend (See Becker, 1992 for the relevant research on multiple exemplar instruction and the emission of abstracted textual responses to untaught morphemes). However, even if a child can respond textually and thereby emit an accurate response to printed stimuli, and she does not have listener comprehension, the child "will not understand" what she has read (i.e., the child will be unable to match the sounds to a picture or action). We can textually respond to foreign language print aloud and have no idea about what we are saying. Thus, the listener component is key. For example, adolescents with multiple year delays in their reading achievement may not comprehend because they can not emit a textual response to a particular word or group of words, but once they hear a spoken version they immediately comprehend, because their listener vocabulary exceeds their textual repertoire. The listener component of reading is as important as the textual speaking component. Thus, a reader must be a reader-as-own listener, so to speak.

There is still a more basic component of reading that we identify as conditioned reinforcement for observing print and pictures in books. Tsai & Greer (2006) found that when they conditioned books such that 2 and 3 year old children chose to look at books in free time, with toys as alternate choices, the children required significantly fewer learn units to acquire textual responses. The book stimuli selected out the children's observing responses, and once the children were observing they were already closer to acquiring print stimuli as discriminative stimuli for textual responses. Thus, an early predictor for children's success in textually responding appears to be the conditioned reinforcement for observing book stimuli. Conditioned reinforcement for books may constitute a new capability. We currently also believe that pre-listener children who do not orient toward speakers and who are having listening and speaking difficulties may need to have unfamiliar and familiar adult voices acquire conditioned stimulus control for observing (Decasper & Spence, 1987). This too may be a crucial stage in the acquisition of listener repertoires.

Writing

Writing is a separate behavior from reading, and like the repertoire of speaking, represents a movement up the verbal scale. But writing from a functional verbal perspective requires that the writer affect the behavior of the reader; that is they must observe the effects of their writing and in turn modify their writing until the writing affects the behavior of the reader. In the case of technical writing the writer must provide technical information that affects the reader's behavior, ranging from influencing a shopper through the provision of a shopping list, to the provision of an algorithm that affects complex scientific decisions. Writing, as in the case of speaking, needs to be under the control of the relevant establishing operations if the writing is to be truly verbal. In several experiments we provided establishing operations for writing for students whose writing did not affect the behavior of the reader, using a tactic we call *writer immersion*. In the *writer immersion* procedure, all communication is done in written form for extended periods throughout the day. Written responses are revised until the reader responds as the writer requires. This procedure resulted in functionally effective writing, measured in effects on the behavior of readers, and improvements in the structural components of writing for the writer (grammar, syntax, vocabulary, punctuation, spelling) (Greer, Gifaldi & Pereira, 2003a; Keohane, Greer, & Mariano-Lapidus, 2004; Jadlowski, 2000; Madho, 1997; Reilly-Lawson & Greer, 2006). The experience taught the students to write such that they read as the target readers would read. The editing experience appears to evoke writer as own reader outcomes of self-editing, not unlike speaker as own listener (Jadlowski, 2000). This repertoire then appears to be an advanced speaker as own listener stage—one that requires one to read what one writes from the perspective of the target audience whose behavior the writer seeks to influence. Thus, like the reader function, the writer function builds on the speaker as own listener. Some individuals have difficulties in writing and reading that are probably traceable to missing components of the speaker, listener, or speaker as own listener components.

Complex Verbally Governed and Verbally Governing Behavior

Technical Writing. Another key component of the complex cognitive repertoires of individuals involves reading or being verbally governed by print for technical outcomes. Marsico (1998) found that teaching students to follow scripts under conditions that allowed the investigators to observe the control of the print over the students' responses resulted in students "learning to learn" new concepts in math and more complex reading repertoires by acquiring verbally governed responding from print sources**.** This repertoire allowed the students to be verbally governed by print. As this repertoire becomes more sophisticated it leads to the more complex repertoire of solving complex problems from algorithms as in the case of the following of decision protocols. Keohane and Greer (2005) showed that teacher scientists could perform complex data decision steps using algorithms based on the verbal behavior of the science, and this new repertoire resulted in significant improvements in the outcomes of the teachers' students. Verbal rules guided measurable responses involving data analysis, complex strategic analyses, and tactical decisions that were implemented with the teachers' students.

Nuzzolo-Gomez (2002) found that teachers who received direct learn units on describing tactics, or observed other teachers receive learn units on accurately describing tactics, required significantly fewer learn units to teach their children to achieve instructional objectives. Observations showed that the teachers' instruction was reliably driven by the verbal descriptions of the tactics they learned by direct or indirect instruction. These studies are analyses of the verbal behavior of scientists and the verbal stimulus control involved in either scientific complex problem solving repertoires suggested by Skinner (1957) and demonstrated in Keohane & Greer (2005), or the control of verbal behavior about the science over teacher performance as identified in Nuzzolo-Gomez (2002). We argue that these studies investigated observable responses that are both verbal and nonverbal and that such responses are directly observed instances of thinking.

While neuroscientists could probably locate electrical activity in the brain associated with our putative thinking responses, it is only the behavior outside the skin that distinguishes the electrical

activity as thinking as opposed to some other event that might be correlated with the activity. Verbal stimuli control the complex problem solving, not the electrical activity. The electrical activity, although interesting, may be necessary, and important, but is not thinking per se. One might argue that the electrical activity is light in a black box; although we see within "the black box" we do not see outside of the black box. This is an interesting reversal of the black box puzzle. If the electrical activity were to begin before the relevant contingencies in the environment were to be in place the problem in the environment would not be solved.

One of the key components in writing is the process of spelling. Spelling involves two different and initially independent responses: (1) saying the letters for a dictated word and (2) writing the letters. At some point we do emit an untaught response after learning a single one of these behaviors (See Skinner, 1957, 1992, p.99). How does a single stimulus (i.e., hearing the word) come to control these two very different behavioral topographies of writing and orally saying the letters? Recently we found that for children who initially could not perform the untaught function, providing multiple exemplar instruction for a subset of words across the two responses under a single audited vocal stimulus resulted in these students acquiring the repertoire with novel stimuli (Greer, et al.2004c). Like transformation of establishing operations for mands and tacts, and transformation of stimulus functions across speaker and listener in naming, the transformation of writing and saying in the spelling repertoires is still another environmental source for generative verbal behavior as an overarching operant or a higher order operant (Catania, 1998; Hayes et al., 2000). These repertoires consist of learned arbitrary relations between listening, speaking, and writing. It is not too far-fetched to infer that typically developing children acquire this joint stimulus control across independent responses as higher order operants or relational frames through multiple exemplar experiences. Such multiple exemplar experiences involve the rotation of writing and saying opportunities may occur incidentally rather than as a result of the programmed experiences we provided our children. Once the child has transformation of stimulus control over written and spoken spelling, only a single response need be taught.

In related research, Gautreaux, Keohane, & Greer (2003) found that multiple exemplar instruction also resulted in transformation of selection and production topographies in geometry. That is, middle school children who could not go from multiple-choice responding to production responding prior to multiple exemplar instruction, did so after an instructional history was created by multiple exemplar instruction across a subset of selection and production experiences. This study highlighted the difficulties experienced by some older children that may be due to a lack of prior verbal instructional histories. The replacement of missing verbal capabilities may be the key to solving instructional difficulties experienced later in life by individuals as they encounter more complex subjects. When an individual has difficulty with aspects of reading and writing, it is possible that the remediation of the difficulty only truly occurs when the missing capability is put in place. In effect, they have a missing or inadequate verbal developmental cusp. Inducing that cusp may solve the learning problems.

Aesthetic Writing. In an earlier section we described writing repertoires that were of a technical nature. Aesthetic writing has a different function than technical writing (Skinner, 1957). Aesthetic writing seeks to affect the emotions of the reader. To date, little empirical work has been accomplished with the aesthetic writing repertoire. A critical, if not the most basic component of aesthetic writing, is the writer's use of metaphors as extended tacts. Meincke (2005) and Meincke, Keohane, Gifaldi, and Greer (2003) identified the emergence of novel metaphorical extensions resulting from multiple exemplar instruction. This effort points to the importance of isolating and experimentally analyzing experiential components of aesthetic writing and suggests the role of metaphorical comprehension in reading for aesthetic effects. This also suggests that rather than teaching the aesthetics of reading through literary analysis as an algorithm, a student should have the relevant metaphoric experiences and perhaps these may be pedagogically simulated. It is likely that these metaphoric experiences provide the basis for the aesthetic effects for the reader. In order for the exchange to occur the target audience for the writer must

have the repertoires necessary to respond to the emotional effects. Of course, the analysis of aesthetic writing functions is probably more complex than the analysis of technical repertoires, but we believe empirical analyses like the one done by Meincke et al. are becoming increasingly feasible. If so, the aesthetic and functional writer and reader repertoire may be revealed as new stages of verbal behavior.

From Experimental Effects to a Theory of Verbal Development

We believe we have identified several verbal repertoires that are key in children's development of successively complex repertoires of verbal behavior. Providing several of these repertoires to children who did not have them allowed these students to advance in their cognitive, social, technical, and aesthetic capabilities. As a result of this work we were increasingly persuaded that these levels of verbal capabilities did, in fact, represent empirically identifiable developmental cusps.

For our children the capabilities that they acquired were not tied to tautological relationships associated with age (Baer, 1970; Bijou & Baer, 1978; Morris, 2002). Age may simply provide a coincidental relation between experiences that bring about verbal capabilities and the probabilities of increased opportunities for those experiences. Hart and Risely (1996) showed that impoverished children who had no native disabilities, but who had significantly fewer language experiences than their more better off peers, demonstrated significant delays by the time they reached kindergarten. When children with these deficits in experience with language continued in schools that did not or could not compensate for their sparse vocabulary, these children were diagnosed as developmentally disabled by grade 4 (Greenwood, Delquadri, & Hall, 1984). It is not too farfetched to suggest that absence of the kinds of experiences necessary to evoke the higher order verbal operants or cusps that we have identified may also be part of the reason for these delays. We suggest that the presence of incidental multiple exemplar experiences provide the wherewithal for most typically developing children to seamlessly acquire the verbal milestones we described, probably because they have *both the environmental experiences and neural capabilities* (Gilic, 2004). For children without native disabilities who lack multiple exemplar experiences (Hart & Risely, 1996), as well as children with native disabilities who lack the necessary verbal capabilities, intensive multiple exemplar instruction has induced missing repertoires (Nuzzolo-Gomez & Greer, 2004). Such experiences probably result in changes in behavior both within and outside of the skin. Indeed biological evidence suggests that, "DNA is both inherited and environmentally responsive" (Robinson, 2004, p. 397. Also see Dugatkin, 1996 for research on the influence of the environment on changes in genetically programmed behavior affected by environmental events). What may be an arbitrary isolation of behavior beneath and outside the skin may dissolve with increased research in the environmental effects on both types of behavior.

Our induction of these repertories in children, who did not have them prior to instruction, suggests it is not just age (time) but particular experiences (i.e., environmental contingencies including contingencies that evoke higher order operants) that make certain types of verbal development possible, at least for the children that we studied. Intensive instruction magnified or exaggerated these experiences and provided our children with the wherewithal (i.e., verbal developmental cusps) to achieve new verbal capabilities. We speculate also that the induction of these verbal capabilities in children who do not have them prior to special experiences creates changes in neural activity. Of course, a test of this is the real challenge facing developmental neuroscience (Pinker, 1999). A joint analysis using the science of verbal behavior combined with instrumentation of the neurosciences might prove very useful in assisting children. Incidentally, such an analysis might also act to enrich academic debate towards more useful outcomes.

Tables 1 and 2 showed the levels of verbal functions for the pre-listener through the early reader stages in summary form. We described the evidence that has proved useful in our efforts to induce and expand progressively sophisticated verbal functions. The capabilities that we addressed were originally

identified based on the responses of individual children; specifically they were based on our empirical tests for the presence or absence of the repertoires for individual children. In our educational work, when a particular repertoire was missing, we applied the existing research based tactics to provide the child with the repertoire. When we encountered children for whom the existing tactics were not effective, we researched new tactics or *investigated potential prerequisite repertoires* and related experiences that appeared to be missing for the child. The searches for possible prerequisite repertoires led to the identification of several subcomponents which when taught by providing subcomponent repertoires led to the emergence of verbal capabilities that were not present prior to our having provided the prerequisite instructional experience.

Summary of Identified and Induced Verbal Capabilities

We continue to locate other prerequisites and believe that there are many others that remain to be identified. Examples of rudimentary verbal functions that have been identified in the research include: (a) the emergence of better acquisition rates across all instructional areas as a function of teaching basic listening (Greer et al., 2005a), (b) the induction of parroting (Sundberg, et al., 1996) and then echoics that led to independent mand and tact functions (Yoon, 1996), and relevant autoclitics, for children with no speech or other verbal functions (Ross & Greer, 2003; Tsiouri & Greer, 2003), (c) transformation of establishing operations across the mand and tact function for children for whom a form taught in one function could not be used in an untaught function prior to multiple exemplar instruction (Nuzzolo & Greer, 2004), (d) the identification of interlocking speaker as own listener operants in self-talk with typically developing children (Lodhi & Greer, 1989), (e) induction of conversational units with children who had no history of peer conversational units (Donley & Greer, 1993), (f) the induction of naming in children who did not have naming prior to multiple exemplar instructional experience (Fiorile, 2005; Fiorile & Greer, 2006; Greer, et al., 2005b), (g) the emission of untaught past tenses for regular and irregular verbs as a function of multiple exemplar instruction (Greer & Yuan, 2004), (h) the emission of untaught contractions, morphemes and suffix endings as a function of multiple exemplar experiences or having children tutor using multiple exemplar experiences (i.e., observational learning through multiple exemplars) (Greer, et al., 2004a; Speckman, 2004), (i) faster acquisition rates for textual responses as a function of conditioning books as preferred stimuli for observing (Longano & Greer, 2006; Tsai & Greer, 2003), (j) and the induction or expansion of echoic responding a function of the acquisition of generalized auditory matching (Chavez-Brown, 2004).

The more advanced writer, writer as own reader or self-editing milestones are key complex cognitive repertoires. Research in this area includes: (a) teaching more effective writer effects on readers and structural responses of writing as a function of establishing operations for writing (Madho, 1997. Greer & Gifaldi, 2003; Reilly-Lawson & Greer, 2006), (b) the induction of rule governed or verbally governed responding and its effects on the verbal stimulus control of algorithms (Keohane & Greer, 2005; Marsico, 1998; Nuzzolo-Gomez, 2002), (c) the role of multiple exemplar instruction on the emergence of metaphors (Meincke et al., 2003), (d) transformation of stimulus function across vocal and written responding (Greer, et al., 2004c), and (e) the acquisition of joint stimulus control across selection and production topographies (Gautreaux, et al., 2003). These more complex repertoires appear to build on the presence of speaker as own listener capabilities.

While we are not ready to declare emphatically that the capabilities that we have identified experimentally, or by extrapolation from experiments, have been definitively identified as verbal developmental stages, the evidence to date shows that they are useful for instructional functions. Furthermore, they suggest *possible natural fractures* in the development of verbal function[4]. For typically developing children, these fractures may occur as a result of brief experiences with exemplars. For some typically developing 2-year old children that we have studied, simply having a few experiences with exemplars going from listener to speaker, followed by single exemplars going from speaker to listener

resulted in bidirectional naming for 3-dimensional stimuli that they did not have prior to those experiences that were separate and juxtaposed (Gilic, 2004). While our children with language delays required the rapid rotation across listener and speaker exemplars to induce naming, typically developing children may need only the incidental rotation of speaker listener experiences with single stimuli. It would appear that now that these generative or productive verbal capabilities have been traced to experiences for the children we have studied, the claim by some (Pinker, 1999) that productive or generative verbal capabilities is not traceable to learning experience is no longer credible.

Some of the research we described is not yet published and our references include papers presented at conferences or unpublished dissertations not yet submitted for publication. Thus, these are early days in our work on some of the stages. But it is important to note also that we have been on a quest for the last 20 years to remediate learning problems based on verbal behavior deficits in children with and without disabilities. The quest has moved forward based on progressively more complex strategic analyses as we stumbled on what we now believe may be developmental milestones in verbal behavior. We have replicated most of the effects we have identified with numerous children in our CABAS schools in the USA, England, and Ireland (Greer & Keohane, 2004; Greer, Keohane, & Healey, 2002). Thus, we believe that the evidence is robust and we hope that it can be useful to behavior analysts, neuroscientists, and linguists interested in a thorough analysis of the evolution of verbal behavior in children's development.

We have also speculated on the cultural evolution of verbal functions for our species relative to our proposed verbal developmental scheme (i.e., the role of cultural selection). Of course theories on the evolution of language are so extensive that some linguistic societies have banned their proliferation; yet, anthropologists and linguists are now suggesting there is new evidence to support the evolution of language (Holden, 2004). Some linguistic anthropologists may find the evolution of cultural selection of verbal operants and higher order verbal operants useful. It is even possible that the capacity for higher order operants and relational frames constitutes that which has been heretofore attributed to a universal grammar. Speaker and listener responses could have evolved from basic verbal operants to interlocking speaker and listener responding between individuals and within the skin of individuals (self-talk and naming)—an evolution made possible by our anatomical and physiological capacities to acquire higher order operants combined with cultural selection. Moreover, reading and writing functions also probably evolved as an extension of the basic speaker and listener functions; without them reading and writing would not have been possible, at least in the way it has evolved for the species.

> "The human species, at its current level of evolution, is basically verbal, but it was not always so. …A verbal behavior could have arisen from nonverbal sources and its transmission from generation to generation, would have been subject to influences which account for the multiplication of norms and controlling relations and the increasing effectiveness of verbal behavior as a whole." (Skinner, 1992, p.470)

Speaker/writer operants and listener/reader responses constitute an important if not the most important aspect of human behavior as adaptation to what is increasingly a verbal environment. Simply speaking, *verbal behavior analysis* is the most important subject of a science of behavior. We hope it is not too presumptuous of us to suggest that verbal behavior analysis can contribute to a developmental psychology that treats environmental contributions as seriously as it treats the non-environmental contributions. After all, biology has come to do so (Dugatkin, 1996; Robison, 2004).

While we can simulate human listener and human speaker functions with nonhuman species (Epstein, et al., 1980; Savage-Rumbaugh et al., 1978), the simulation of naming and other speaker-as own listener functions with nonhuman species remains to be demonstrated. Premack (2004) argues from the data that nonhumans lack the capacity for recursion. "Recursion makes it possible for words in a sentence

to be widely separated yet be dependent on one another." (Premack, 2004, p. 320). We suggest that recursion may have made possible by the evolution of speaker as own listener capabilities in humans as a function of both neural capabilities and cultural selection. Premack (2204) also presents evidence that teaching is a strictly human endeavor. "Unlike imitation, in which the novice observes the expert, the teacher observes the novice—and not only observes, but judges and modifies." (Premack, 2004, p. 320; D. Premack & A. Premack, 2003). This describes the interaction we have characterized as what takes place in a learn unit. The conversational unit differs from the learn unit in that the conversational unit requires a reciprocal observation. Observational repertoires like those Premack (2004) described may be fundamental components that underlie and presage the evolution of nonverbal to verbal behavior.

While observation has been studied as a phenomenon, few if any studies have sought the possible environmental source for *observational learning*. We argue that observational learning differs from other indirect effects on behavior in that, observational learning results in the acquisition of new operants. Other types of observational effects on behavior result in the emission of operants that were already in the observer's repertoire. The kind of behavior change identified by Bandura (1986) was most likely of the latter sort since the presence or absence of the operants was not determined prior to the observational experience. Imitation results from a history that reinforces correspondence between the imitator and a model's behavior.

Some children do not have observational learning or have weak observational repertoires. In cases where observational learning has been missing we have induced it by providing certain experiences. It also may be possible that children do not have observational learning until they have certain experiences. In one study, we increased observational learning as a function of having individuals function as tutors using learn units that required tutors to reinforce or correct the responses of their tutees. It was the application of the learn unit per se, specifically the consequence component that produced the new observational repertoire (Greer, et al., 2004a). In another case with children who did not learn by observing peers, we taught them to monitor learn unit responses of their peers and observational learning emerged (Greer et al., 2004b; Pereira-Delgado, 2005).

This observing phenomenon involves a kind of consequent benefit similar to what the listener gains —specifically the extension of sensory reinforcement. Perhaps the teaching capacity involving reinforcement of the observed behavior of the learner is related to particular listener capabilities, while the recursion phenomenon is related to the interlocking speaker-listener capability. It is the interlocking speaker-listener-as-own-listener functions that make the more sophisticated milestones of verbal function possible. These functions make thinking, problem solving, and true social discourse possible. They also support the development of repertoires compellingly described in relational frame theory (Hayes, et al., 2000). Speech, and we argue, the compression of information through auditory stimuli in the human species, makes possible the more advanced speaker as own listener or textual responder as own listener and perhaps by extension the phenomenon of recursion. Regardless of whether our interpretations of the evidence is compelling, the evidence does reveal that a more complete picture of verbal behavior is evolving and that the role of the listener, and particularly the interrelationship between speaker and listener, is key to further advances in our understanding of verbal functions and their development within the individual.

Verbal Behavior Analysis, Comparative Psychology and the Neuroscience of Language

None of the work that we have described or related work in verbal behavior obviates the role of genetically evolved brain functions as neurology correlated with the presence of our suggested milestones of verbal behavior and the generative aspects of behavior cum language. The research in verbal behavior does not question, or eliminate, the importance or usefulness of neuropsychological researches. Alternately, the work in the neuroscience of language does not obviate the environmental verbal functions

of language as behavior *per se* and as higher order operants that are increasingly identified in verbal behavior analysis. They are simply different sciences involved with different aspects of language. On the one hand, work in verbal behavior analysis is beginning to identify key environmental experiences in cultural selection and to suggest how neuropsychology can make the journey from MRI analyses to real verbal function—behaving with language outside of the skin. On the other hand, the work in the neurosciences of language is beginning to identify the behavior beneath the skin. It is compelling to consider the mutual benefit to obtaining a more comprehensive understanding of language by relating the efforts. Most importantly, combining the evidence and types of inquiry from both fields can help us teach a few more children to be truly verbal.

Behavior analysts have simulated language functions in non-humans (Epstein, et al. 1980; Savage-Rumbaugh, et al., 1978) and comparative psychologists have identified differences between the verbal behavior of primates and the verbal behavior of humans (Premack, 2004). Non-human species have not demonstrated a speaker-as-own-listener status. However, research in verbal behavior analysis has led to the acquisition of listener repertoires, speaker repertoires, speaker as own listener repertoires, and generative verbal behavior in humans who did not have those repertoires prior to special environmental experiences. Perhaps work in verbal behavior analysis with individuals who can acquire verbal repertoires as a result of special interventions provides a bridge. While our particular work is driven by applied concerns, it may have some relevance to the basic science of behavior, comparative psychology, and the neuroscience of language.

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Footnotes

1. For information on and the evidence base for teaching as a science in CABAS schools and the CABAS® system see Greer (2002), Greer, Keohane, & Healy (2002), Selinski, Greer, & Lodhi (1991), Greer, McCorkle, & Williams, 1989, and http:/www.cabas.com. The findings of the research we describe have been replicated extensively with children and adolescents in CABAS® Schools in the USA, Ireland, Argentina and England and we believe they are robust. A book that describes the verbal behavior research and procedures in detail is in progress for publication in 2006 (Greer & Ross, in progress).
2. We chose the term listener emersion because it seemed particularly appropriate. The Oxford English Dictionary 2nd Edition, Volume V describes one usage of the term emersion as follows, "The action of coming out or issuing (from concealment or confinement). Somewhat rare." (OED, p. 177) Thus, once a child has acquired the listener repertoire, the child may be said to have come out of confinement to a pre-listener status. They have acquired an essential component of what is necessary to progress along the verbal behavior continuum—a verbal behavior development cusp.
3. It would seem that a certain history must transpire in order for a point-to-point correspondence between a word spoken by a parent and the repetition of the word by a child to qualify as an echoic operant rather than parroting. The child needs to say the word under the relevant deprivation conditions associated with the mand or the tact and then have that echoic evolve into either a mand or a tact. Once at least one of these events transpires, the parroting can move to an echoic. While more sophisticated operants and higher order operants or relational frames are basic to many sophisticated aspects of verbal behavior, the move from parroting is probably just as complex. The acquisition of echoing is the fundamental speech component of verbal functioning. One wonders how long, and under what conditions, it took for the echoic repertoire to evolve in our species. To evoke true echoics in children who have never spoken is probably one of the major accomplishments of the behavioral sciences. Indeed, the procedures we now use in verbal behavior analysis to induce first instances of vocal verbal operants have never been tried with primates, nor has the procedure to induce parroting.

However, procedures for inducing parroting and echoics and other first instances of vocal verbal behavior have been successful in developing functional vocal verbal behavior in individuals who probably would have never spoken without these procedures. Amazing! There are even more fundamental components underlying even these response capabilities and aspects of observation show rich potential (Premack, 2004).

4. We use the term *natural fracture* to differentiate numerically scaled hypothetical relations from relations that are absolute natural events as in the determination of geological time by the identification of strata. To further illustrate our point, "receptive speech" is a hypothetical construct based on an analogy made between the computer "receiving inputs" to auditory speech events. It is an analogy, not a behavior or response class. Measures of receptive behavior are *scaled* measures tied to that analogy, as in test *scores* on "receptive" speech. However, listener behavior is composed of actual natural fractures (i.e., the child does or does not respond to spoken speech by another). In still another example, operants are natural fractures, whereas an IQ is a scaled measure of a hypothetical construct. Moreover, acquisitions of higher order operants such as the acquisition of joint stimulus control for spelling are also natural fractures.

Authors Notes

We would like to dedicate this paper to the memory of B. F. Skinner who would have been 100 years old at its writing. His mentorship and encouragement to the first author served to motivate our efforts to master his complex book and engage in our experimental inquires. We are also indebted to others who kept verbal behavior alive in times when the critics were harsh and the audience was narrow. Among these are Jack Michael, Charles Catania, Ernest Vargas, Julie Vargas, Mark Sundberg, U. T. Place, Kurt Salzinger, Joe Spradlin, Joel Greenspoon, and the children we worked with who needed what verbal behavior could offer in order for them to become social and more cognitively capable. While the audience remains narrow, we are confident that the effects of research in verbal behavior will select out a larger audience.

Author Contact Information:

R. Douglas Greer, Ph.D., SBA, SRS
Graduate School of Arts & Sciences and Columbia University Teachers College
Box 76 Teachers College Columbia University
525 West 120th
New York NY, 10027
E-mail: dgreer3872@aol.com
Phone: (212) 678-3880
Fax (212) 678-4034

Dolleen-Day Keohane, Ph.D., SBA, Asst.RS
CABAS Schools and Columbia University Teachers College
2728 Henry Hudson Parkway
Riverdale, NY 10463
E-mail: ddkeohane@aol.com
Phone: (914) 588-4844
Fax: (212) 678-4034

Functional Analysis and Treatment of Selective Mutism in Children

Christopher A. Kearney and Jennifer Vecchio

Abstract

Selective mutism refers to a persistent failure to speak in public situations, especially school, where speaking is expected. Researchers have linked selective mutism to social anxiety in many cases. Functional analysis of selective mutism generally involves interviews, questionnaires, behavioral observations, and daily logs. Assessors should look closely for conditions under which selective mutism commonly occurs, especially directives from others, lack of attention from others, high child anxiety, and lack of interpersonal skills. Treatments for selective mutism often involve exposure-based practices and parent- and teacher-based contingency management.
Keywords: Mutism; social anxiety; functional assessment; interviews; scales; questionnaires; behavioral observations; treatment; contingency management.

Introduction

Selective mutism refers to a persistent failure to speak in public situations where speaking is expected, despite speaking in other situations (American Psychiatric Association, 2000). Children with selective mutism commonly fail to speak in situations outside their home and especially in places such as school, restaurants, stores, and recreational settings. From a diagnostic perspective, selective mutism must last at least one month. This excludes children who are naturally reticent about speaking during the first month of school. Selective mutism is not diagnosed in cases where a child simply lacks knowledge or comfort with the language that is spoken in the public situation. A child whose parents speak only Spanish, for example, would likely not be diagnosed with selective mutism during his or her first year of school unless the child was already quite familiar with English. Furthermore, selective mutism is not due specifically to difficulties in communication such as stuttering or specifically to a developmental disorder, though these problems may co-occur. Many children with selective mutism do try to communicate in public situations via nonverbal means such as nodding, pointing, mouthing, or writing letters in the air (APA, 2000).

Failure to speak in public situations, especially school, can hinder a child's academic progress because teachers are less likely to call upon these children for answers and because many of these children cannot undergo intelligence and other testing (Bergman, Piacentini, & McCracken, 2002). In addition, some of these children are teased or disliked by their peers, which further affects their social-communication development. Speech and language development may be delayed as well (Krysanski, 2003; Kumpulainen, Rasanen, Raaska, & Somppi, 1998).

The prevalence of selective mutism is not well known because of the furtive nature of the disorder and lack of literature regarding this population. Prevalence estimates range from 0.2-2.0%, but the actual rate may be higher because many parents attribute the problem to simple shyness that the child will eventually outgrow (Bergman et al., 2002; Kopp & Gillberg, 1997; Kumpulainen et al., 1998). In addition, because many of these children speak freely at home, parents often delay seeking treatment. An overt speech or language problem does not seem evident to them.

Initial studies on selective mutism indicated the prevalence of selective mutism to be higher for girls than boys, but recent evidence suggests a more equal gender distribution (Andersson & Thomsen, 1998; Hayden, 1980; Remschmidt, Poller, Herpertz-Dahlmann, Hennighausen, & Gutenbrunner, 2001;

Wilkens, 1985). Age of onset for the disorder is typically 3-6 years but the problem is usually not recognized until school entry or later (i.e., age 6-8 years) (Black & Uhde, 1992; Ford et al., 1998). Selective mutism appears to have a variable but sometimes chronic course that can persist for years (Krysanski, 2003). In one study of second-graders with selective mutism, most (53%) had been mute since kindergarten and a substantial portion (18%) had been mute since preschool (Kumpulainen et al., 1998).

The conceptualization of selective mutism has been controversial, with some researchers contending that the problem is primarily due to oppositional behavior (Paez & Hirsch, 1998). Most researchers in this area, however, have linked selective mutism to anxiety and shyness in general and to social anxiety in particular (Steinhausen & Juzi, 1996). Vecchio and Kearney (2005) compared 15 children with selective mutism, 15 children with anxiety disorders without selective mutism, and 15 children without selective mutism or anxiety disorders. Youths and their families were compared via structured diagnostic interview, parent and teacher measures of internalizing and externalizing behavior, and family environment. All children with selective mutism met criteria for social anxiety disorder. No differences were found between the selective mutism group and the anxiety disorders group with respect to parent- and teacher-reported internalizing behavior problems. However, both groups were significantly higher than controls. Finally, parents rated the families of control children as significantly more socially active than families of children with selective mutism or anxiety disorders.

Children with selective mutism are commonly described by researchers as shy, timid, sensitive, withdrawn, fearful, inhibited, reticent, clingy, compulsive, anxious, and depressed (Bergman et al., 2002; Ford et al., 1998; Kopp & Gillberg, 1997; Kristensen, 2001; Kumpulainen et al., 1998; Lesser-Katz, 1986; Steinhausen & Juzi, 1996). Developmental disorders and delays are also common to this population, in particular articulation and communication problems. In one study, 68.5% of children with selective mutism met criteria for a developmental disorder or delay (Kristensen, 2000).

Given the seriousness and understudied nature of selective mutism, researchers have begun to delineate assessment and treatment strategies for this population. Given the relatively behavioral nature of the disorders, such as number of words spoken in public situations, a behavioral assessment strategy for functional analysis has drawn considerable support (Schill, Kratochwill, & Gardner, 1996). In addition, given the relationship between selective mutism and social anxiety, and given that children with selective mutism tend to be quite young, a treatment approach that coalesces exposure-based practices with contingency management seems reasonable as well. The purposes of the remainder of this article will thus be to provide a succinct protocol for assessment and treatment of selective mutism based on these behavioral principles.

Functional assessment of selective mutism

Given the intricate and unique nature of selective mutism, a traditional assessment approach that relies heavily on formal testing is inadequate unless nonverbal tests can be given or if a child is willing to engage an examiner verbally in his or her home. Given the infeasibility of this approach, a behavioral assessment approach is usually recommended. Such an approach typically involves detailed discussions with parents and teachers and others who are knowledgeable of a child's status, though attempts may be made as well to speak to the child in some truncated fashion. The primary measures for this population include structured diagnostic interview, parent- and teacher-based instruments, and behavioral observations and daily logs. Information from these measures can be synthesized in an attempt to understand the antecedents of a particular child's failure to speak and the consequences that follow such behavior.

Interviews

Structured interviews for functional analysis have been used for this population, particularly the *Anxiety Disorders Interview Schedule for DSM-IV-TR* (child and parent versions) and *Functional Diagnostic Profile* adapted for selective mutism (Schill et al., 1996; Vecchio & Kearney, 2005). A related measure, the *Children's Global Assessment Scale for Children-Non-Clinician Version* has been used as well to measure general severity of disturbance in this population (Bergman et al., 2002).

The *Anxiety Disorders Interview Schedule for DSM-IV-TR* (Silverman & Albano, 1996) can be administered to parents and children to assess for a wide range of anxiety-related disorders, including selective mutism. The interview has excellent psychometric properties and is particularly useful for determining whether a particular child has selective mutism and whether such mutism is primarily related to social anxiety, oppositional behavior, or some other difficulty such as depression. In our study that utilized this measure, all parents and one-third of youths with selective mutism completed the interview process. Some youths with selective mutism may be able to participate in this type of assessment either by responding nonverbally in a clinic setting or by responding verbally or nonverbally during a home visit. The following key supplemental questions should be asked during this interview:

- What settings occasion a child's mutism (e.g., home, school, community settings, etc.)?
- How is the child's mutism manifested in each setting?
- How long has the mutism occurred in each setting?
- When mutism occurs in each situation, is the child alone or with others?
- With whom will the child speak freely or become mute?
- What are the specific antecedents and circumstances that surround each instance of a child's mutism?
- Can the child be enticed to speak audibly in these situations in any way?
- What compensatory behaviors does the child show to communicate with others?
- How do significant others respond to a child's mutism (e.g., ordering food or completing tasks for the child; allowing whispers in the ear or pointing; rearranging a setting to accommodate a child's mutism)?

The *Functional Diagnostic Profile* is designed to gather information about psychosocial and physical events that could contribute to a child's mutism; child characteristics (e.g., affect, cognition, personality, skills development); setting events; and consequences of behavior (Schill et al., 1996). For example, parents are asked if selective mutism is more likely to occur during periods of low stimulation or social attention or if the mutism is more likely following a specific adult request or directive. The measure also assesses whether a child with selective mutism fails to speak to decrease anxiety, to increase social or sensory feedback from others, because alternative speaking skills are inefficient or underdeveloped, or to avoid aversive directives from others. Each of these potential functions of selective mutism should be explored in depth for each public situation that the child remains mute.

Questionnaires

No behavioral questionnaires are available for selective mutism per se, though many measures of constructs related to selective mutism have been used for this population. The most common measures involve social anxiety and most notably the *Social Anxiety Scale for Children-Revised*, a 26-item instrument that focuses on fear of negative evaluation from peers, social avoidance and distress related to new situations, and generalized social avoidance and distress (La Greca & Stone, 1993). The *Social Phobia and Anxiety Inventory for Children*, which focuses on assertiveness, general conversation,

physical and cognitive symptoms, avoidance, and public performance, may be useful as well (Beidel, Turner, & Fink, 1996). Other measures of general anxiety and depression can also be applied to children with selective mutism, though the child's compliance and understanding with respect to these measures must be considered closely.

Parent- and teacher-based questionnaires of behavior are also commonly used for this population, given each party's detailed knowledge of a child's behavior in general and refusal to speak in particular. *The Child Behavior Checklist and Teacher Report Form* are especially useful for examining a wide range of internalizing, externalizing, and mixed (social/thought/attention) problems relevant to a particular child (Achenbach & Rescorla, 2001). Special attention should be paid to the anxious/depressed and withdrawn/depressed scales in general and to the item "Refuses to talk" in particular.

Behavioral observations and daily logs

Behavioral observations are a key linchpin for assessing children with selective mutism. Such observations can and should be done in a clinical setting, at the child's home, over the telephone, in various public places, and at the child's school. No formal rating systems have been designed for this population, but clinicians should pay special attention to the following in each situation:

- Number of words spoken
- Volume level of spoken words (e.g., audible or inaudible)
- To whom a child is willing to speak
- Key antecedents (e.g., demands or social approaches from others; boredom)
- Key consequences (e.g., parent or teacher acquiescence; accommodation of a child's mutism)
- Child's social and communicative skills
- Child's level of anxiety as indicated by escape, withdrawal, or avoidance
- Child's compensatory behaviors (e.g., whispering, pointing, nodding, mouthing, crying, frowning, stomping, temper tantrum, pushing, or pulling)

Daily logs should follow this process as well so that clinicians have a good sense of fluctuations in a child's behavior and whether treatment procedures are effective. Our daily logs, for example, are relatively simple and completed by children, parents, and teachers. These parties complete daily records of child's level of anxiety on a 0-10 scale as well as key behaviors such as number of words spoken, whispered, and mouthed. Audibility of statements is also rated on a 0-10 scale (10=completely audible). In addition, each party records on a daily basis to whom the child spoke, whispered, or mouthed any particular word.

Synthesis of assessment information

Once these data are collected and a baseline is set, clinicians should examine common patterns of a child's mutism by synthesizing information from interviews, questionnaires, and observations. Selective mutism in children does tend to have a relatively stable course without large changes in symptomatology over brief periods of time. Therefore, ample opportunity exists to identify particular antecedent-consequence pathways for a particular child. An especially common pathway is for a child to demonstrate selective mutism and considerable social anxiety following some directive from others and prior to some reward for the mutism. Such rewards often come in the form of special attention, accommodation, and removal of an aversive stimulus such as a teacher directive. Contextual variables that impact this process must also be considered, of course. Given that selective mutism is most commonly associated with social anxiety and with accommodation from others, a combined exposure-

based and contingency management approach is often preferred. A brief outline of this treatment strategy is presented next.

Treatment of selective mutism

Treatment of selective mutism often involves exposure-based practices to increase a child's audible speech in public places as well as parent-based contingency management to enhance these exposures and to establish an expectancy that the child will speak in public situations.

Exposure-based practices

Given that social anxiety is often a core feature of selective mutism, in vivo exposure to various situations is utilized so that a child can practice speaking to others. This usually involves a gradual process including several main stages across different aspects of the child's environment:

- Child's home (with the therapist)
- Clinical setting
- Public situations such as restaurants and home-based situations such as answering the telephone
- School-related situations

To help a child speak with the therapist, home visits are sometimes conducted. If a child is willing to come to the clinic setting, however, this is preferred. Initial sessions often involve playing games and engaging in other recreational activities with the child to build rapport and decrease social anxiety. After a few sessions, the therapist may purposely make mistakes that the child will try to correct nonverbally. These nonverbal attempts are generally ignored or met with a statement that the therapist only understands spoken words. Compensatory behaviors such as mouthing or pointing may be allowed in some circumstances to aid communication and rapport-building. However, whispers in the ear or other barely audible speech are more acceptable.

During these initial exposure sessions, parents may be asked to audiotape or videotape their child at home as he or she engages in good speech. The audiotape or videotape is then played before the therapist and family members in a clinical setting as the child watches and as he or she is reinforced by the therapist for her speech and voice. In addition, early exposures may include telephone conversations between a child with selective mutism and a therapist if the child is willing to do so. Children may also be willing in these early stages to speak to the therapist through a door, from some distance such as 50 feet away, or via cell phone from the car on the way to the clinic setting. All of these are allowed and encouraged. Finally, in some cases, children may be asked to stay with a therapist for an extended period of time until at least one word is uttered.

With practice and exposure, most children with selective mutism eventually speak regularly to the therapist. Once this is accomplished, exposures are scheduled for various public situations such as restaurants, ice cream places, pet stores, malls, parks, and playgrounds. Children are expected to order their own food, ask questions, answer questions from others, and initiate short conversations under the supervision of the therapist and parents. A common scenario involves the therapist and family ordering ice cream under the rule that anyone who orders ice cream loud enough for the counter person to hear may receive ice cream and anyone who cannot do so receives no ice cream. A therapist can accompany the family to help prompt the child to speak and to model appropriate interactions with others.

Once a child can speak regularly and appropriately to others in public situations, he or she should be expected to speak to others near home. This may include answering the telephone or door as appropriate, talking to visiting relatives, and initiating telephone calls to the therapist or others. Often this exposure process to public and home-based places requires several weeks or months.

Once a child can speak regularly and appropriately in public and home-based situations, school-based exposures can begin. These exposures are typically conducted last because school is often the most difficult place for a child to speak. A seamless transition from the previous exposures can be made by first requiring a child to speak to the therapist in an empty classroom. Once this is accomplished, a peer or teacher (whichever is easier for the child to tolerate) may be added to the room at a distance as the child speaks to the therapist or reads a story. Over time more peers may be added, and at a closer distance, to resemble normal classroom activity. Final exposures should involve speaking to others in an audible fashion, initiating contact with peers and teachers, answering questions in class, taking standardized tests that require verbal interaction, and reading stories or otherwise performing before others in class.

Contingency management

Parent-based contingency management is the other key element for treating children with selective mutism. Appropriate consequences are established for successfully (or unsuccessfully) engaging in and practicing therapeutic homework assignments. These assignments typically involve speaking audibly to others in some pre-established way. In addition, parents are asked to establish routines that encourage a child to encounter others and to speak to others appropriately. This may involve accepting a call from the therapist or family members, asking a child to say hello to someone in public, or taking a child to recreational activities that require some social interaction.

Parents are also encouraged to engage in short, specific commands to their children and to ignore inappropriate compensatory behaviors, especially as treatment progresses. Over time as a child with mutism begins to speak more comfortably in public situations, social reinforcers can supplement or replace tangible reinforcers. Parents are encouraged as well, even when a child successfully speaks in all public and school-related situations, to continue placing their child in interactive settings and restrict accommodations for unwillingness to speak. Teachers are also instructed to engage in appropriate contingency management procedures during and following treatment.

Final comments

The treatment of selective mutism in children can be an elongated process that often requires intensive intervention in various public settings. In addition, the nature of the problem demands a molecular, behavioral assessment approach that allows clinicians to determine the exact antecedents and consequences that maintain a child's mutism over time. We have presented here one possible treatment strategy that works well for the children with selective mutism in our specialized clinical setting, but caution readers that any universal approach is not necessarily effective for all children of this population. This may be particularly true for those with co-morbid conditions, extensive family dysfunction, or children whose primary language is not English (Vecchio & Kearney, in press).

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Author contact information:

Christopher A. Kearney
Department of Psychology
University of Nevada
4505 Maryland Parkway
Las Vegas, NV 89154-5030
Phone: (702) 895-0183
e-mail: chris.kearney@unlv.edu

Jennifer Vecchio
Department of Psychology
University of Nevada
4505 Maryland Parkway
Las Vegas, NV 89154-5030
Phone: (702) 895-0183
e-mail: jenneevee@hotmail.com

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Clinical Perspectives on the Treatment of Selective Mutism

Robert L. Schum, Ph.D

Abstract

Selective mutism is a childhood disorder characterized by a failure to speak in some but not all of the contexts where speaking is normally expected. It is commonly associated with co-occurring anxiety, both on the part of the child and on the part of one or more family members. The prevailing opinion on treatment recommends medication, cognitive-behavioral therapy (CBT) and family counseling. However, treatment efficacy research is extremely limited. Further, since selective mutism is often first identified during the preschool years, CBT must be modified to match a child's developmental level. This paper summarizes the nature and prevalence of selective mutism, techniques used to treat this disorder, and issues in need of research. The discussion of behavioral treatment techniques is based on the literature and on the author's clinical experience.
Keywords: Selective Mutism; Operant Conditioning, Cognitive Behavior Therapy, Communication Hierarchy, Talking Scale, Talking Map, Parent Counseling, Collaboration.

Introduction

Selective mutism is an intriguing childhood disorder that presents considerable treatment challenges. The core symptom is that a child persistently and systematically refrains from speaking in some settings where speaking is expected (e.g., school, community) but speaks fluently in other settings (e.g., home.) Often there are additional complicating factors, such as co-occurring anxiety symptoms or oppositional behaviors, as well as a familial history of anxiety. While a number of articles have been written about selective mutism, there is no universally accepted treatment regimen. Following a short summary describing the nature and incidence of selective mutism, this paper will address approaches to treatment based on the literature and on the author's clinical experience with this population. Also presented are recommendations for research.

Definition, Incidence, and Co-Occurring Conditions

According to the DSM-IV-TR (American Psychiatric Association, 2000) the onset of selective mutism usually occurs before the age of five years. However, sometimes it is not recognized as a specific problem until a child enters school, when the systematic and selective failure to talk becomes more noticeable. A clinical diagnosis of selective mutism is made on the basis of five criteria:

A. The child refrains from speaking in specific social situations (e.g., school) while speaking in others (e.g., home)
B. Failure to speak interferes with educational achievement or with social communication
C. Symptoms persist for at least one month (not including the first month of school)
D. The failure to speak can not be attributed to a lack of knowledge or comfort with the spoken language (as might be true for bilingual children who have immigrated from another culture).
E. The symptoms are not better accounted for by a communication disorder, a pervasive developmental disorder, or a psychotic disorder.

Prevalence estimates of selective mutism range from .03 to 2 percent; and it is more common among girls, with ratios ranging from 1.5 to 2.6 girls to 1 boy with the diagnosis (Garcia, Freeman, Francis, Miller, & Leonard, 2004). Current research indicates that children with selective mutism show more anxiety symptoms than do other children (Bergman, Piacenti, & McCracken, 2002; Cunningham,

McHolm, Boyle, & Patel, 2004) and that anxiety symptoms co-occur with selective mutism at a rate of 74 to 100 percent (Garcia et al.; Kristensen, 2000; Vecchio & Kearney, 2005). Oppositional disorder may also co-occur, but there is some dispute in the literature about its co-occurrence rate. Garcia et al., and Vecchio and Kearney reported that the rate of occurrence is quite low. However, Cunningham et al. reported oppositional disorder to co-occur twice as often among children with selective mutism as among children in a control group. Based on the literature and on the author's clinical experience, the conceptualization of selective mutism as a symptom of anxiety is a helpful framework for planning intervention.

In most instances, selective mutism does not appear to be caused by a specific, traumatizing event (Dummit et al., 1997; Steinhausen & Juzi, 1996). It appears instead to emerge within the context of shyness and anxiety. Krohn, Weckstein, and Wright (1992) noted a general pattern of shyness or anxiety among parents and other family members of children diagnosed with selective mutism. In the author's clinical experience, almost every child with selective mutism has had at least one parent with a history of significant shyness or anxiety disorder. This familial pattern of shyness and anxiety can contribute to the development of selective mutism in several ways. Mineka and Zinbarg (2006) have noted that children of parents with anxiety disorders may be at risk for developing their own anxiety disorders due to genetic transmission of temperamental vulnerability, vicarious learning of specific fears, or the use of avoidant coping styles that are supported by their parents.

Treatment

Medication

Published reports describing the medical treatment of children with selective mutism are limited. Only three publications have reported the efficacy of medical intervention based on controlled research (Black & Uhde, 1994; Carlson, Kratochwill, & Johnston, 1999; Dummit, Klein, Tancer, Asche, & Martin, 1996). Other reports are based on individual case studies without controls (e.g., Golwyn & Sevlie, 1999; Golwyn & Weinstock, 1990; Lafferty & Constantino, 1998; Lehman, 2002; Wright, Cuccaro, Leonhardt, Kendall, & Anderson, 1995). The medications used were selective serotonin reuptake inhibitors (SSRI) and monoamine oxidase inhibitors (MAOIs).

The case study reports suggested that medication had a positive effect on the individual children whose behavior was reported. However, these studies are difficult to interpret due to the small numbers of participants and the lack of controls. Moreover, none of the authors indicated whether other children with selective mutism had failed to make progress while taking the medication. Therefore, while case studies suggest that medication can be effective, these reports are anecdotal. In the experience of this author, every anecdotal report of success with medication can be countered with an anecdotal report of a patient whose symptoms failed to improve, given the same medication.

The three controlled studies involved a total of 41 children. Dummit et al. (1996) treated 21 children with fluoxetine (an SSRI) for a 9-week open trial. As a group, the children showed improvements on rating scales of anxiety and social behaviors. Ratings by the treating psychiatrists indicated that 16 of the 21 children had improved on global measures. However, no details were given about the children's specific behaviors pre- or post-intervention. The authors noted that despite treatment response, complete remission of the mutism required more time than the 9-week trial. They did not specify how many (if any) of the children showed complete remission of the mutism or how long it took.

Black and Uhde (1994) reported a double-blind placebo-controlled study also using fluoxetine. Fifteen children who did not respond to 2 weeks of placebo control were randomly assigned to a placebo or fluoxetine condition for 12 weeks. The six children on fluoxetine showed improvement on several measures, compared with the nine children taking placebos. In total, 27 measures were collected from

parents, teachers, and a treating psychiatrist blind to the treatment condition. None of the psychiatrist's post-treatment ratings showed significant differences, including those measuring mutism. Two of the 9 parent ratings and 1 of the 10 teacher ratings showed more improvement in the group receiving fluoxetine. Overall, the children receiving fluoxetine scored significantly better on only 3 of the 27 measures. The authors concluded that treatment effects were modest and most of the participants showed continued impairment at the end of the study.

Carlson et al. (1999) observed five children in a double-blind placebo-controlled trial using sertraline (also an SSRI) within a multiple-baseline single-case design. Each child's mute symptoms were measured for 2 weeks with no medication. Then the children were randomly assigned to a treatment schedule of varying length (2 to 6 weeks), followed by a medication phase of 8 to 12 weeks, so that each child was observed for a total of 16 weeks for symptoms of selective mutism. The target measure for all children was speaking, which was rated several times a week by both teachers and parents. Improvement in talking was observed in the children, but it did not always correspond to the onset of the medication phase. The authors noted that the children might have entered the treatment phase of the research at different stages in their use of non-vocal communicative behaviors (see the discussion of *Initial Presentation* below). This suggests that measures of mutism and anxiety must be broad enough to capture the child's status at the time of treatment, and sensitive enough to measure progress. For example, Carlson et al. suggested that a more thorough examination of nonverbal communicative behaviors might be necessary for measuring progress. They concluded that their study offered "optimistic but guarded impressions" of treatment efficacy (p.304).

In sum, the efficacy of medication in the treatment of selective mutism appears modest, at best. The most enthusiastic efficacy claims come from anecdotal case reports. In contrast, three systematic studies have shown some limited and modest success with the use of SSRIs. These group studies show no consistent and large effects of medication with all children. It is noteworthy that Carlson et al. (1999) and Dummit et al. (1996) both found an inverse correlation between age and improvement following medication. This does not necessarily mean that medication per se is more effective with younger children, but perhaps that any type of early intervention is more advantageous. Furthermore, Carlson et al. suggest that the course of improvement for children with selective mutism seems to have discernable stages, and studies on treatment intervention may need to document the child's use of non-vocal social-communication behaviors at the time when the treatment is introduced.

Following a review of interventions for a number of related conditions (e.g., selective mutism, anxiety disorders, obsessive-compulsive disorder), Nemeroff, Gipson, and Jensen (2004) concluded that medication appears to be effective for treating children with obsessive-compulsive disorders (OCD) but there is only limited evidence for its efficacy in treating children's anxiety disorders or selective mutism. Cognitive-behavioral therapy is the treatment of choice for social phobia.

Behavioral Treatment

As noted above, selective mutism is commonly viewed as a manifestation of social anxiety disorder. Consistent with other manifestations of social anxiety disorder, the recommended treatment for selective mutism is cognitive-behavioral therapy (CBT) (Garcia et al., 2004; Albano & Hayward, 2004). However, many children with selective mutism are first identified at the age of 4 or 5 years when they lack the cognitive insight, self-monitoring, and social awareness needed to participate in CBT. Consequently, intervention may begin with operant and classical conditioning to shape more expanded communication behaviors. CBT can be introduced later as children mature. In other words, the treatment of young children with selective mutism often extends over an age range that requires therapists to adjust their use of interventions (behavioral, CBT) to fit the socio-cognitive capacity of children at different developmental levels.

Co-Morbid Conditions and Individualizing Treatment

As indicated above, selective mutism often exists in conjunction with other co-occurring conditions. In younger children this may include toileting problems (Kristensen, 2000; Steinhausen & Juzi, 1996). Children may resist using toilets in public settings (e.g., school). Occasionally, some (in the absence of any other developmental disability) are even resistant to sitting on the toilet at home. For these children it may be necessary to address the toileting issue first. In fact, parents and teachers are usually more concerned about managing the toileting problems first, because they believe that the public embarrassment of toilet accidents may increase the child's stress or shyness. Moreover, many schools are reluctant to accept a child of this age in a regular classroom if the child is not toilet trained.

Some children with selective mutism also produce behaviors associated with oppositional disorder. In these cases, parents and teachers tend to believe that the child's selective mutism is a form of passive-aggressive opposition. Oppositional behaviors may include deliberate refusal to comply with parent directives and temper tantrums when a preferred activities are not allowed. However, clinical experience suggests that these oppositional behaviors are often an expression of a child's attempts to cope with underlying anxiety since the behaviors often occur in direct proportion to the amount of pressure exerted by adults to encourage talking and socialization. Dummit et al. (1997) reported that a formal diagnosis of oppositional defiant disorder was rare among children with selective mutism and that it occurred in only 1 of the 50 children they studied. They proposed that that oppositional behaviors function to avoid anxiety-producing events, rather than as a primary disorder per se. Similarly, Wright and Cuccaro (1994) proposed that oppositional behavior emerges through the interaction of parent demands and child anxiety. Yeganeh, Beidel, Turner, Pina & Silverman (2003) reported prominent oppositional symptoms among older children, speculating that the oppositional behaviors become more entrenched over time. Following a history of adult pressure and child resistance, oppositional problems can take on a life of their own and become a well-practiced routine requiring therapeutic intervention.

Limitations in socio-cognitive capacity (as described above) combined with the possible presence of co-occurring problems (e.g., toileting or oppositional behaviors) suggest that therapy for selective mutism must be highly individualized. Anstendig (1998) advised that, "Attempts to treat a large sample of selectively mute children using a highly specific method for intervention often yield inconclusive results" (p. 390). The treatment techniques discussed in the remainder of this paper are offered as a repertoire that has been found clinically successful with children who present with selective mutism. However, not all techniques are used with any one child. Different techniques are appropriate depending on a child's symptoms and on a child's developmental level at different points in the therapeutic process. An overarching assumption in the use of these techniques is that selective mutism generally reflects a type of anxiety disorder and that behavioral therapy is the treatment of choice for this disorder.

Initial Presentation

During the initial visit to a therapist, a child with selective mutism will typically refrain from talking to the therapist, be reluctant to establish eye contact, and cling to or hover near his or her parent. For these reasons, it may be best to begin with the least intrusive tasks. The initial evaluation may include a nonverbal assessment to estimate the child's cognitive abilities and to determine the extent of social interaction. Some children will respond by pointing to pictures or placing markers on a receptive vocabulary test or a matrix test. Other children will not make any choices. A frequent theme of selective mutism is that children have difficulty answering specific questions or making choices. Later in therapy, the children often articulate their fear of making mistakes. In the initial evaluation, a child may watch the clinician demonstrate a toy or an activity, but may not respond in a testing mode.

An important goal of the initial evaluation is to determine the frequency and types of nonverbal communication signals produced by the child. The therapist should look for eye contact when talking to the child. Some children will smile if the therapist does something silly, and some will shake or nod their heads. A principle for therapy is that any form of communication is good communication, and the clinician should be sensitive to the signals the child produces during the first meeting.

Occasionally a child will talk to the therapist during the initial meeting (but not to a teacher at school). Occasionally children may dominate a conversation by talking about a favorite cartoon series for example. These children appear to feel secure when they can control the conversational topic with their personal expertise. This reduces the apprehension that they will make a mistake or not know an answer.

Selective mutism is exquisite and highly functional in reducing threats perceived by a child. In this sense, it is an adaptive behavior that serves the child well (Anstendig, 1998). Children will present with variations in the boundaries for their mutism. Some children will never speak if there is someone present who is not a member of their immediate household. Some children will whisper in the parent's ear in front of the therapist. Some children have a distance established in their mind. For example, in a waiting area they may talk to a parent if nobody else is inside a perimeter of 10 feet, 15 feet, or whatever has been established in that child's scheme. Some children will talk to their parents in public if the people around them are unknown and are not attending to the child. Many children show, and later report in therapy, that they do not like to be the center of social attention.

Conditioning Techniques

As indicated above, operant conditioning can be extremely helpful when working with the youngest children. For example, the clinician can reward successive approximations of communication, moving gradually toward fluent speech. Initially, any communication is good communication and should be rewarded. Even though many children with selective mutism dislike being the center of social attention, they tend to respond positively to a warm, supportive approach from the therapist. After assessing the child's initial level of communication in the therapy room, the therapist should arrange opportunities to motivate and shape communicative behaviors. The individual steps need to be quite modest, as these children are extremely anxious and resistant to making big changes, particularly at first.

Some children will start therapy by hiding under a table or behind furniture in the therapy room. If the therapist ignores the hiding (avoidance) and waits patiently, the child will usually try to initiate some form of contact/communication. The child may make noises or extend a toy into the visual range of the therapist. At this point, the therapist can respond in a positive manner to the child's communicative act (e.g., by commenting on the child's presence or by making a remark about the toy). This starts the process of reinforcing any act of communication.

Therapists and teachers who have had previous successful experiences with otherwise-typical shy children sometimes assume that they will be able to use their expertise to quickly encourage a child with selective mutism to talk. This assumption is likely to be false. The symptoms of children with selective mutism are often more entrenched than those of otherwise-typical shy children. The strategies that work successfully to warm up an otherwise-typical shy child are often not effective when applied to children with selective mutism. Therapists should plan to work with a child for a series of sessions, and should determine a sequence of steps to work through with the child. Initially, the therapists should determine if a child will use non-vocal modes of communication (e.g., nod/shake their head, gesture, point, write, draw). If the child will do any of these, the therapist can use activities that call for frequent practice and successful use of these forms of communication.

Children with selective mutism should be encouraged to bring favorite toys or other objects to therapy; and they often do so spontaneously. Even when a child does not talk, he or she often quickly establishes rapport with a supportive therapist who refrains from placing excessive demands on them. In this context, the child may be willing to show the therapist the toys or objects they use outside of therapy; and these things can serve as the topic of communication. Even adolescents with selective mutism are often willing to share personal artifacts with a therapist. At this age, the objects may include such things as favorite videos or pictures of their family and pets, or sports apparel they like to wear.

Within the context of play and communication therapy, the therapist may also use classical conditioning techniques to help the child be more relaxed and spontaneous in the atmosphere of a new and semi-public setting. This occurs when familiar and preferred objects from home are paired with communication activities involving the therapist.

A major goal of therapy is for the child to use successively more conventional forms of communication in therapy and other contexts in which initially resist talking. *Figure 1* illustrates a series of successive approximations established for a child who was treated by the author. The program was coordinated with the child's teachers so that after the communication behaviors emerged in therapy the teachers evoked them at school. Although the child was quite anxious, she was responsive to the therapist's suggestions regarding classroom carry-over. Specifically, the therapist told the child that as she learned to perform target behaviors in therapy with him, he would inform her teacher. Then, the teacher would ask the child to perform the behaviors in class. As shown on Figure 1, the child started with a hierarchy of nonverbal communicative acts including eye contact, nodding/shaking her head, and pointing to choices. During later sessions, the therapist introduced noise makers (e.g., small horns and other party favors) to encourage creativity and variety of expression. Still later, the child began to engage in conversations with the therapist by producing her utterances in written form. This was followed by journal interactions with the teacher in class. Many children with selective mutism seem to enjoy journal interactions with their teachers; and teachers benefit by learning more about the child's personal interests and reactions to classroom events. After learning to engage in journal interactions, the child began to mouth and eventually to whisper single-word clues during therapy while playing picture search games. She then practiced whispering stock phrases during a board game (Guess Who?). This led to whispered answers and conversation in therapy and at school. Later, the child successfully used a microphone to amplify her whispering when giving a reading at a school recital. When whispering was well established, she and the therapist practiced phonating single words from a book. Eventually, she learned to say stock phrases during games, then to read passages in a book, and finally to converse with full phonation. Each child will require a set of approximations tailored to their skills and needs, but *Figure 1* presents a typical therapy sequence.

At about seven years of age, children have more self-awareness and cognitive understanding of who they are and how they fit into a social context. At this time, the therapist can begin to use strategies associated with CBT. One helpful technique is the use of a *talking scale*. The scale itself consists of a hierarchy of speaking situations identified by the therapist in collaboration with the child. *Figure 2* illustrates a talking scale that was created for a particular child (Child A) with selective mutism. This child reported that she could not imagine anything worse than being interviewed on television or radio, which defines the highest level of difficulty on her scale. A talking scale is a dynamic instrument that changes over sessions. The child or therapist can pencil in additions or changes during a therapy session if the child expresses different views or reports changes in her experiences. For example, the therapist's name may drop downward on the scale as the child becomes more comfortable interacting with the therapist. Often the therapist will introduce a *no-talk* line on the scale, to designate concretely the situations in which the child is willing to talk and those in which the child is *not yet ready to talk*. This helps young children to conceptualize talking situations along a continuum of comfort, rather than as two discrete categories—talk, no talk. As the child experiences success in talking in different situations, the

no-talk line starts to move upward. A variation of this procedure involves use two lines across the scale: a *whisper* line and a *no talk* line. This could be used for a child who talks in some situations, whisper in others, and does not talk at all in still others. As therapy continues, whispering and full phonation are introduced during increasingly more challenging situations, and both lines move upward correspondingly.

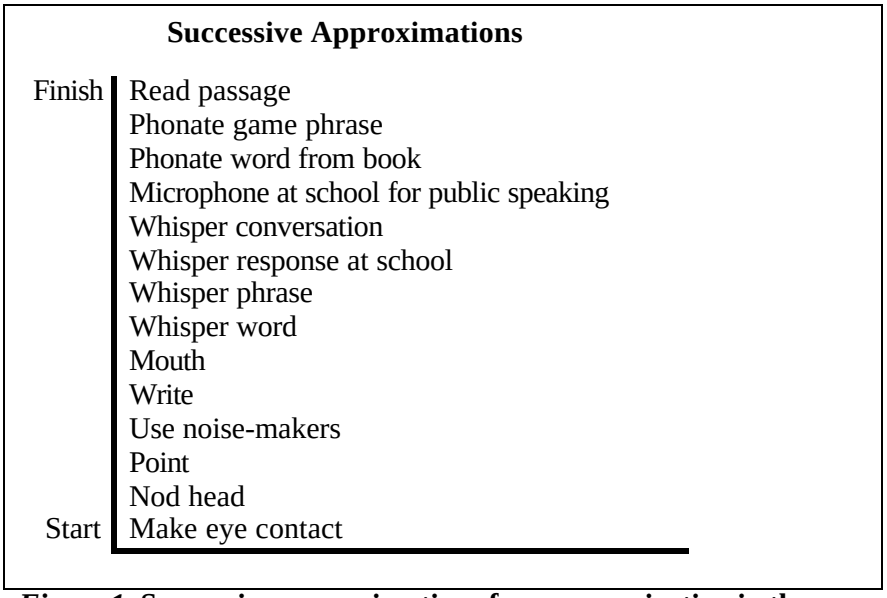

***Figure 1*. Successive approximations for communication in therapy**

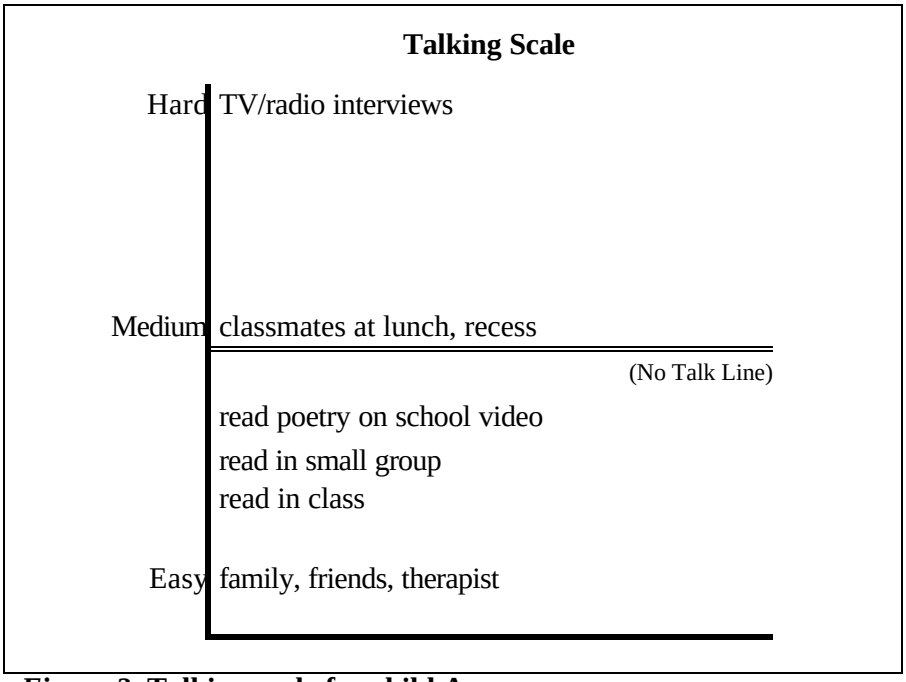

***Figure 2.* Talking scale for child A**

Talking scales help children conceptualize the nuances of their communication and give them a concrete method of discussing their communication with the therapist. It helps them better visualize where they talk and to whom they talk. Some children will even do a variation of this in which they draw a *talking map*, which shows their neighborhood, including their home, the homes of friends, and their school with a circle around areas where they currently feel comfortable talking. At first it might be only inside their home, then in the area around their home, then a friend's home or a neighborhood park. Across sessions they can see the talking circle expand, usually getting closer to school. Some children will show a time variation on their map. For example, they will meet friends on the school playground and talk with them if school is not in session, but will not talk with them at recess during school hours.

Self-perception is an important component of therapy and it can be addressed in several ways. The therapist may introduce it by asking a child to choose words to describe their feelings when they have to communicate. For example, a therapist might begin by asking a child to choose one of three "S words": shy, scared, stubborn. (Few children pick stubborn, but it is included because that is often a concern of parents and teachers. The children have dealt with people who think that they are oppositional, so it is a useful concept to introduce into therapy for the sake of discussion.) The author's clinical experience suggests that it may be useful to use the terms *shy* and *brave* with children to talk about when they are reluctant to speak and when they speak in a new situation, respectively. It can also be helpful to make process comments to the child about his or her performance during a therapy activity. For example, some children grimace when they become anxious during an activity. The therapist can point this out, explaining that it is a cue that something is difficult for the child. That provides a conversation point for understanding how the child is feeling and what alternatives are available to manage the situation.

Children can be encouraged to bring videos from home in which they are talking fluently to family members. Sometimes videos are made to provide a reading or speech sample for school so that teachers can evaluate the child's progress. Many children will sit with the therapist and watch the video together, and the therapist can comment about *brave* or *easy* talking. This is also a vehicle to recognize with the child that she is capable of talking in certain situations (refer to the talking scale), and that the therapist hears and appreciates the child's talking. The video might serve as one step in successive approximations. The child can then be encouraged to call the therapist's phone and leave a voicemail message. If that is successful, the child can be asked to call the therapist and talk live on the telephone. Some children will talk to a therapist or teacher on the telephone, but not face to face. They report that they become anxious when their conversation partner can look at them.

Some children may bring a friend or sibling to therapy session. The friend should be someone with whom the child is quite fluent in other situations. This offers the opportunity to pair a successful communicative situation with a new location. The children can do an activity with the therapist, and the visitor can serve as a model in talking freely with the therapist. Sometimes the child with selective mutism will start talking with her friend and the therapist can discretely enter the conversation.

Relaxation training has been used with limited success. Based on the author's clinical experience, it appears most effective with older children who can specify the situations in which they feel symptoms of anxiety. These children can learn to use relaxation techniques (e.g., deep breathing, imagery) in target situation (e.g., when giving a report in class). However, relaxation techniques are more difficult to use with younger children who have limited capacity for self-reflection. Younger children seem to respond much better when provided with (1) opportunities to practice specific communication behaviors during therapy and (2) encouraging communicative environments at home and school.

The use of alternative or augmentative communication (AAC) methods (e.g., sign language, electronic talkers) is not recommended based on the author's clinical experience. Most children with selective mutism speak fluently in comfortable situations and do not need alternative methods for

communication. Rather, they need support for generalizing their use of perfectly adequate communication signals to an expanded range of contexts. Furthermore, the author's clinical experience has shown that children with selective mutism who were provided with the opportunity to use an AAC (e.g., manual sign) were not particularly interested in doing so.

Parent Counseling

Treatment of children with selective mutism must be accompanied by parent counseling. Parents need support for understanding their child and managing their child's behavior at home. Most parents of children who have behavioral and emotional difficulties are worried about their children. With selective mutism, this worry may be exacerbated by a history of anxiety disorder within the family. These parents may project their own experiences and apprehensions onto the lives of their children. Parents sometimes recount their own negative social experiences and dread the possibility of their children experiencing similar stress. Parents of anxious children may support their children's avoidant responses for coping with stress. Some parents have difficulty trusting that their children can manage more independence, such as weaning from nursing, sleeping alone, going away from their parents to visit relatives, staying with a sitter, or going to school. Parents recount stories of pulling their children in closer if a potential threat appears, even if the threat is not specifically focused on the child (e.g., a national calamity, a crime report in a metropolitan area). As has been suggested by Mineka & Zinbarg (2006), these parents may transmit vicarious learning of anxious behaviors and avoidant coping styles to their children.

Sometimes in an attempt to correct the shyness and mutism, parents of children with selective mutism will try home remedies that exacerbate the problem. For example, a common maneuver of parents with young children who have various communication disorders is to use a "quiz mode" to get the child to speak. The parents will pepper their children with questions, either to get their children to expand their speech repertoire, or in the case of selective mutism, to speak in front of extended family or other persons outside the household. Since many of these children are anxious about being in the spotlight, and are anxious about giving a wrong answer, this pattern of questioning may lead the child to engage in higher levels of avoidant coping behavior (mutism) rather than to talk.

Anxious parents can be overly concerned with the passage of time. For many anxious people, time is the enemy. An anxious person never has enough time to get everything done, is concerned about either external or self-imposed deadlines, and is often impatient for improvement because their current situation is so distressing. Enemy time often stalks parents of children with selective mutism. The parents feel pressure to encourage their child to speak to extended family members, who are perceived to be critical of how the parents are managing the child's problem. Parents may also be concerned that the child will not be promoted to the next level in school or not recognized as a successful student. If a child with selective mutism has a co-morbid condition such as not using the toilet, his or her parents may be further concerned that the child will have humiliating episodes of toileting accidents at school.

In their drive to make their children be as "normal" as possible, parents may try to make their children do things that a socially anxious child is not ready to try. Examples of such activities may include getting a dental exam or a hair cut; sitting on Santa's lap at the mall; participating in a school recital or ceremony; having the child's picture taken for a school photo. These are all situations that prove difficult for young children with social anxiety and selective mutism. It is common for these children to resist, and their parents often view the child's resistance and avoidance as a failure of the child to achieve a social milestone.

Therapists can support parents by helping them with activities to facilitate more confidence and independence in their children. This support should follow the principles of *reassure*, *focus*, and *bind*. The therapist can *reassure* anxious parents by letting them know that they are no longer alone in

attempting to solve their child's problem. They now have the help of a therapist who can lend expertise to the process. Reassurance should be offered continuously throughout the course of the child's therapy as parents cope with challenges requiring them to be patient with the rate of their child's progress. It is also important for the therapist to help parents *focus* on relevant aspects of the child's problem. For example, many parents may not know that selective mutism is part of a more general problem with anxiety and that oppositional behaviors may function as avoidant behavior when anxiety is exacerbated. Parents may also need support in focusing on ways to create comfortable communicative contexts that can reduce the symptoms of anxiety. Finally, the therapist needs to *bind* energy generated by the parents' own anxiety to positive activities that they can do with their child. Well-intentioned but ineffectual strategies should be redirected towards more effective tasks. It is not a good idea for a therapist to counsel an anxious parent *not* to do things with their children. Therapist should bind the parents' energy to positive actions in the home.

Positive parent activities should include the arrangement of appropriate social opportunities for their children. Many children with selective mutism start talking to persons outside their immediate family when those outsiders spend time in the safe environment of the child's home. The parent can arrange opportunities for playmates (e.g., cousins, family friends, neighbors, classmates) to visit the child's home. Children with selective mutism are usually well accepted by their peers when they start school, even if they do not talk at school. Parents can learn the names of their child's favorite classmates by asking their child directly or by talking to the child's teacher. Then, parents can arrange play dates with these peers. A child with selective mutism will often first talk with another child if the other child is visiting his or her home. The next step may be for the child with selective mutism to visit the other child's home. Children with selective mutism may begin to talk in this context if adults are not present in the room.

Children with selective mutism show considerable variation in their willingness to talk with different extended family members. They tend to talk more freely with those extended family members who visit the house more often than with those who visit infrequently. When parents report that their children are not talking to grandparents, this is often accompanied by tension created by the feeling that the grandparents are unhappy or concerned. Parents may be worried about the grandparents passing judgment on their childrearing ability. Therapists can support parents by advising them to arrange more low-keyed contact time with extended family members. This would include coaching extended family members to help them understand that any communication is good communication, and that more advanced communication signals are likely to emerge with time in a paced and step-wise manner.

In most situations, peers accept children with selective mutism and include them in activities at school. They invite them to birthday parties and visits to their home. However, parents of children with selective mutism often have conflicting responses to peer relationships. On the one hand, they fear that their children will be isolated by peers and have no friends, because they do not speak. On the other hand, they are apprehensive about allowing their child to visit another child's home where he or she will experience greater autonomy and be accountable to another adult. This tension between the conflicting fears should be recognized and discussed in the context of parent counseling. Parents may also express other worries about autonomy besides visiting peers or using the school bathroom. For example, they may worry that their child will not be able to negotiate the lunch line at school or the school bus ride. A therapist can help the parent and the school by devising simple techniques that will enable the child to successfully deal with these challenges. The therapist can achieve considerable success in modifying the atmosphere at home by helping the parents learn how to model confidence in the child's ability to negotiate these new social challenges, even if the child is not yet ready to speak.

A therapist can help families expand their children's independence by encouraging them to allow their children to participate in social and recreational activities that interest the children (e.g., scouts,

individual lessons in music or sports, team sports, etc.). Many children are intrinsically interested in trying these activities, especially if they can join with a favorite friend. Based on the author's clinical experience, scouts and individual lessons (e.g., swimming, horseback riding) offer highly successful contexts. However, children should not be forced into these activities if they are not interested; and when children do show an interest, parents should monitor the situation to be sure that the coach or teacher is setting goals that are realistic for the child.

It is important for the therapist to help parents understand three expectations of the overall therapy process. First, therapy may require a considerable length of time for the child to achieve the goal of speaking fluently in social settings, particularly at school. Second, patience is required with the rate of the child's progress and with the sequence of steps in the hierarchy of communication goals. Progress will be tracked, and parents will need to collaborate with the therapist in setting and reviewing goals. It is also important periodically to monitor whether parents are comfortable continuing with therapy. Third, there are various manifestations of anxiety, including avoidance, selective mutism, and opposition. Parent must learn how anxiety can be manifested in these various ways, and have a plan of positive behavioral support for managing anxiety.

Finally, some parents have significant difficulties with their own anxiety that extend beyond a level of apprehension typical of most parents. When this is the case, it should be discussed; and a decision should be made as to whether a parent's anxiety is best addressed during counseling sessions with the child's therapist or whether s/he could benefit from the support of an independent therapist. Each option has merits. One determining factor in making this decision relates to the source of a parent's anxiety. Is it primarily focused on the child's difficulties or is it more widespread? Another factor relates to the parent's ability to function. Can the parent negotiate everyday tasks despite the anxiety or does the anxiety interfere with routine aspects of daily living?

Teachers

Teachers will see the difficulties of selective mutism in full flower, because symptoms are often first manifested when a child enters school. Some of the teachers' concerns are similar to parents' concerns: Will the child be accepted by peers, and can the child be independent in activities during lunch and toileting? Teachers also have concerns specific to their role: Can a child with selective mutism learn? How will the child learn if she cannot communicate in the classroom? How can the teacher evaluate the child's performance if the child will not make oral responses? Should the child be promoted even if he or she is not talking?

Since a teacher is in daily contact with the child, he or she should be invited to collaborate with the therapist in developing a plan to support the child's progress in the classroom. The therapist can help the teacher in this process by providing information about the nature of selective mutism as a manifestation of social anxiety. The therapist should stress that the child is not being deliberately oppositional or passive-aggressive, but rather that she is trying to avoid distress caused by anxiety. The teacher may need support in understanding that, for children with selective mutism, any communication is good communication, and that progress is measured by increasingly more mature communicative acts, even if the child is not talking fluently in the classroom. Initially, the teacher may need verbal reassurance that the child will be accepted by peers. However, this will soon become obvious as the teacher observes the child's acceptance directly in the classroom. The teacher can also be reassured that the typical child with selective mutism learns at an average pace, even if they do not talk, and that the therapist can help the teacher to develop methods of assessing the child's skills. This may include working with the child and parents to use home videos to obtain reading and recitation samples.

The therapist and teacher can collaborate to identify a hierarchy of communication events, and the teacher can be encouraged to reinforce any small improvement in communication. The therapist can offer suggestions for ways to support communicative successes at school. For example, the child with mutism can be paired with a friend in a learning dyad or on school errands (e.g., taking a message to the office or to the library). Sometimes these semi-private interludes offer opportunities for a child with selective mutism to talk to his/her friend on the school premises when out of the earshot of adults. This is particularly effective when pairing the child with a friend who has a history of hearing the child talk, perhaps during visits to the child's home.

The teacher should be counseled not to try to trick or coerce the child into talking, as this is likely to be ineffective. Furthermore, the teacher should be asked to monitor the behavior of classmates who may be tempted to answer for the child. Based on clinical experience, it is preferable to let the child use whatever communication behaviors are currently available in repertoire rather than to allow him or her to dependent upon a friend to talk for them. The therapist can be in regular contact with the teacher, so that the teacher is up-to-date on what behaviors the child is practicing in therapy (e.g., nodding/shaking, pointing to choices, writing answers). The teacher can also be informed about activities that are likely to be stressful for the child, and how those activities could be modified to reduce the stress. For example, some children do not like to be the focus of attention on their birthdays. The therapist should anticipate the child's birthday and try to determine a plan with the child that can be communicated to the teacher. The author collaborated with one child in writing a joint letter to the teacher, requesting permission to forgo a birthday celebration. Some therapists might see this as an example of the child avoiding a social situation. Others would see it as an example of the child using an appropriate communication technique to make a reasonable request.

Collaboration with a school speech-language pathologist (SLP) can also be valuable (Schum, 2002). SLPs are communication experts who can support the child's program in a variety of ways. For example, an SLP could be asked to observe the child in the classroom and document communication attempts which may be difficult for the teacher to notice while teaching the entire class. An SLP may also be able to work with a child directly to encourage and reinforce communication behavior. This may take place during individual sessions at first. Later, the sessions may be expanded to include a small group. Children with selective mutism qualify for speech and language intervention since selective mutism is a pragmatic deficit that interferes with academic progress. The specialized training of SLPs provides them with the tools needed to collaborate with teachers in the development of a communication hierarchy and in working through the hierarchy systematically. Collaboration with a school psychologist and a school counselor may also help to support a child's intervention program.

Treatment Efficacy and Therapy Schedules

The author's clinical experience suggests that young children with selective mutism generally respond well to behavioral therapy and show progress. However, no controlled studies have been conducted to assess this empirically. Clinical experience also suggests that intervention is more effective with younger children than with older children (Wright et al., 1995). This author has received referrals of older children with selective mutism and no previous treatment. These children provided greater challenges for treatment. Part of the challenge could be attributed to many more years of practicing avoidant behaviors when the children were anxious. When patterns are more practiced and entrenched, it is more difficult to effect change.

There is no clear picture of how quickly children with selective mutism can progress from no talking to more fluent talking in selected contexts, particularly school. There are also different definitions of success, and different variations in the complexity of the problem. Clinical experience suggests that the time required to achieve fluency across contexts may be quite variable across children. In the

experience of this author, one kindergarten child started talking in school after 6 biweekly sessions across a 3-month period. The longest therapy course involved a kindergartener who attained fluency in school only after 5 to 6 years of biweekly therapy.

There is no consensus about a therapy schedules. While weekly therapy may be ideal, it is often difficult to maintain. Few families can personally afford to pay at that pace, and few third-party payers will authorize it. Furthermore, most busy families and therapists find it difficult to maintain a weekly schedule. Clinical experience suggests that it is easier to schedule and to obtain payment authorization for biweekly sessions, totaling 20-25 sessions per year. Beyond the constraints of scheduling and payment, it is unclear how fast young children can consolidate their learning from therapy. With younger children, an effective use of time may be for the therapist to introduce communication activities in therapy, and then to ask the parents and school staff to practice these activities during the weeks between treatment sessions. As the child becomes older and develops more insight, the therapist can work more directly on cognitive-behavioral techniques to manage their responses and to develop insight into their shyness and anxiety.

The Need for Clinical Research

While good research exists in defining the demographics of selective mutism, there is little information about its cause. The meager information on cause is typically negative. For example, we know that most instances of selective mutism are not associated with specific trauma. Research on temperament, early manifestations of anxious behavior, and familial precursors would be helpful. This might allow clinicians to work with families to identify high-risk children before they develop the symptoms of selective mutism so that strategies might be implemented to mitigate the risk.

More research is needed regarding efficacy of medication intervention for treatment of selective mutism. While behavioral progress is often seen over years, medication efficacy has only been measured over weeks. Research should focus on more extended periods, varied with and without behavioral therapy, and carefully controlled with homogeneous sets of children matched for age and severity/range of symptoms.

Controlled research is needed to assess the relative impact of different behavioral interventions. While CBT and operant conditioning are recommended based on clinical experience, these methods should be assessed scientifically and compared with other procedures for managing children's anxiety disorders. It would be particularly interesting to compare the treatment of selective mutism as a manifestation of anxiety with treatments based on a view of selective mutism as a symptom of oppositional disorder.

Finally, carefully controlled studies are needed to compare the outcome of children who do and those who do not receive treatment for selective mutism. It is difficult to design a prospective study that is ethical as well as meaningful. Because selective mutism can produce such deleterious effects in social functioning and school participation, clinicians are obligated to recommend treatment to children who are identified with this disorder. However, well-designed retrospective studies may help to shed light on the frequency of spontaneous remission among children with selective mutism who never received treatment. Such studies must document carefully the reasons why participants never received treatment. There may be a self-selecting factor among families that creates this situation. For example, perhaps the level of parental anxiety affects who is comfortable seeking treatment for their child, who is pressed to seek treatment for their child, or who is confident that their child will learn to cope as the parents have done. Other factors that need to be considered are whether teachers advised parents that their child's behavior appeared to reflect more than mere shyness, whether selective mutism was accurately diagnosed, and whether expert therapists were available to the parents who desired help for their child.

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Author contact information:

Robert L. Schum, PhD
Clinical Psychologist
Department of Pediatrics
Medical College of Wisconsin
8701 Watertown Plank Road
Milwaukee, WI 53226
e-mail: rschum@mcw.edu
Phone: (414) 266-6397

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Pragmatic Performance and Functional Communication In Adults with Aphasia

Kimberly C. McCullough, Gary H. McCullough, Jacki L. Ruark and Jacqueline Rainey

Abstract

This study used linear regression to define the relationship between pragmatic performance and functional communication by 27 individuals with aphasia, including 14 with fluent aphasia and 13 with non-fluent aphasia. Pragmatic performance was measured with the *Pragmatic Protocol.* Functional communication was measured using the *ASHA Functional Assessment of Communication Skills (ASHA FACS)*. Results provide support for the relationship between these variables and for their underlying link to linguistic competence. Nonetheless, standard language assessment *(Western Aphasia Battery)* appears insufficient for describing overall communicative competencies and for explaining differences between some participants' functional communication abilities. Implications for assessment and treatment of communicative effectiveness are discussed.
Keywords: Aphasia Pragmatics Functional Communication.

Introduction

With any type of disorder, different assessment measures can be, and have been, constructed to assess different aspects of behavior. For example, numerous assessments for aphasia currently exist. Some assessments, such as the *Western Aphasia Battery (WAB)* (Kertesz, 1982) or the *Boston Diagnostic Aphasia Examination* (Goodglass & Kaplan, 1983) purport to assess type and severity of aphasia. Other assessment tools focus on different aspects of communication. The *Pragmatic Protocol* (Prutting & Kirchner, 1983), for example, examines communication from an entirely different perspective.

Pragmatics is the study of the relationship between language behavior and the contexts in which language is used (Prutting & Kirchner, 1983). It involves the acquisition and use of conversational knowledge and the semantic rules necessary to communicate intent. In addition, pragmatics involves the interactional aspects of communication, including sensitivity to social contexts (Chapey, 1992). Specific pragmatic aspects investigated in adults with aphasia include communication acts (Gurland, Chwat, & Wollner, 1982; Wambaugh, Thompson, Doyle, & Camarata, 1991), speech acts (Doyle, Thompson, Oleyar, Wambaugh, & Jackson, 1994; Prinz, 1980; Wilcox & Davis, 1977), discourse analysis (Armstrong, 1987, 1991; Bottenberg & Lemme, 1991; Guilford & O'Connor, 1982; Mentis & Prutting, 1987) and use of nonverbal communication (Behrmann & Penn, 1984; Cicone, Wapner, Foldi, Zurif, & Gardner, 1979; Glosser, Weiner, & Kaplan, 1986; May, David, & Thomas, 1988). Researchers have investigated pragmatic performance in individuals with aphasia (Avent & Wertz, 1996; Holland, 1982; Prutting & Kirchner, 1987; Wilcox & Davis, 1977), and data suggest that individuals with aphasia maintain a high level of pragmatic appropriateness despite their linguistic impairments (Avent & Wertz, 1996; Prutting & Kirchner, 1987).

Another area of assessment for aphasia has been referred to as "functional communication." Functional communication is defined as "the ability to receive or convey a message, regardless of the mode, to communicate effectively and independently in a given [natural] environment" (p.2)(ASHA,

1990). While profiling specific *pragmatic* strengths and weaknesses may assist in identifying the nature and processes involved in "communication," a *functional communication* assessment should help to outline the consequences of the communication deficit in an individuals' daily interactions. For example, when assessing pragmatic ability with an instrument such as the *Pragmatic Protocol* (Prutting & Kirchner, 1987), speech act usage, turn-taking ability, and lexical selection categories may be rated as appropriate or inappropriate. Using a functional communication measure, such as the *American Speech-Language-Hearing Association Functional Assessment of Communication Skills for Adults* (*ASHA FACS*) (Frattali, Thompson, Holland, Wohl, & Ferketic, 1995), rather than profiling specific deficits, the overall quality of communication in "real-life" activities can be established, as well as the amount of assistance needed during these activities. Thus, ratings are made regarding specific daily activities such as "Participates in a group conversation," "Requests information of others," and "Initiates communication with other people."

Although assumptions regarding communicative effectiveness have been based on pragmatic analyses of conversation (e.g., Wambaugh et al., 1991; Wilcox & Davis, 1977), there is little empirical research suggesting how pragmatic performance actually relates to functional communication. At first glance, the literature regarding pragmatic performance and functional communication in adults with aphasia appears to indicate that these concepts are one and the same. In fact, as Irwin, Wertz, and Avent (2002) so appropriately noted, these terms are often used interchangeably (Davis, 1993). However, as Murray and Chapey (2001) indicate, there are important distinctions between the two assessment approaches. Irwin, Wertz, and Avent (2002) concur, reporting that improvement on a pragmatic performance assessment is not significantly related to improvement on a functional communication assessment and that "these tests may measure different aspects of change in performance" (p.96). The authors report that both pragmatic performance and functional communication correlate well with language ability over time but that they do not correlate well with *each other* over time (i.e., pragmatics and functional communication do not correlate). Thus, these assessments seem to be measuring different underlying constructs. Although there are many overlapping variables within these components of communication, research has not fully demonstrated empirically how pragmatic performance relates to the ability of individuals with aphasia to communicate effectively and independently.

Breaking down aphasia performance into fluent versus non-fluent has not clarified these relationships. Holland (1980, 1982) reported that adults with non-fluent aphasia demonstrated a more 'normal' pattern of communication than adults with fluent aphasia. Busch, Brookshire, and Nicholas (1988) also found adults with non-fluent aphasia to be more efficient in communicating crucial information than adults with fluent aphasia. And, Behrmann and Penn (1984) reported more functional use of gestures in adults with non-fluent aphasia. These data suggest that we can at least feel comfortable stating that non-fluent aphasics are superior in terms of functional communication. On the other hand, standardization data for the *ASHA FACS* (Frattali et al., 1995), a functional communication measure, revealed that adults with fluent aphasia demonstrated a higher level of functional communication than adults with non-fluent aphasia. Some of the differences cited above would likely occur simply because different assessments of functional communication are employed. Still, concerns regarding the relationship between fluency and functional communication appear valid.

Prutting and Kirchner (1987) used the *Pragmatic Protocol* to develop profiles of deficits for individuals with fluent and non-fluent aphasia. Deficits identified were related to the linguistic constraints characteristic of each aphasia subtype. The majority of inappropriate behaviors for both groups were in the categories of specificity/accuracy, fluency, pause time in turn-taking, and quantity/conciseness. Participants with non-fluent aphasia had more difficulty with pause time in turn-taking and

quantity/conciseness than the participants with fluent aphasia. Avent and Wertz (1996) reported no significant differences between adults with fluent aphasia and adults with non-fluent aphasia with regard to pragmatic performance, but did observe that adults with fluent aphasia performed slightly better than adults with non-fluent aphasia. Participants with fluent aphasia, however, entered therapy with a higher level of pragmatic performance.

If pragmatic performance is indicative of an individual with aphasia's functional communication, then similar ratings would be expected on both a pragmatic performance assessment and a functional communication assessment, regardless of fluency. Research has not addressed the interaction of these two variables. If, on the whole, individuals with non-fluent aphasia are considered to be better functional communicators and individuals with fluent aphasia are better or at least equal pragmatically, then an examination of the relationship between pragmatics and functional communication in relationship to language impairment is warranted. Pragmatic performance is often a target in treatment of aphasia. The relationship between one's ability to "understand" the rules of language (pragmatics) and implement the rules of language successfully (functionally communicate) speaks directly to appropriate treatment goals. If functional communication is independent of pragmatic performance, then treating pragmatics may not be the most valuable use of treatment time and dollars. The purpose of this study was to examine the relationship between pragmatic performance and functional communication in light of severity of language impairment and fluency. In doing so, the following questions were posed: 1) Is there a relationship between pragmatic performance and functional communication?; 2) How well do measures of functional communication and pragmatic performance predict type of aphasia (fluent vs. non-fluent)?; and 3) How well do measures of functional communication and pragmatic performance predict the severity of aphasia (mild-moderate or moderate-severe)?

Method

Participants

Twenty-seven individuals with aphasia (14 fluent and 13 non-fluent), who had suffered a single, left-hemisphere stroke participated in this study. All participants met the following inclusion criteria: 1) English speaker; 2) at least two months post-onset to insure medical stability and to allow for adjustment to the aphasia; 3) no evidence of additional neurologic disorders (e.g., dementia, Parkinson's disease); 4) no evidence of psychiatric disorder (as reported by caregiver); and 5)completion of an audiometric screening.

Procedure

For the purpose of this study, pragmatic performance was defined by an overall percentage of pragmatically "appropriate" parameters according to the *Pragmatic Protocol* (Prutting & Kirchner, 1987). The *Pragmatic Protocol* is a reliable measure and has been widely used to profile the pragmatic performance of adults with aphasia (Roberts & Wertz, 1993; Avent & Wertz, 1996). Functional communication was defined by overall quantitative and qualitative ratings from the *ASHA FACS* (Frattali et al., 1995). The *Western Aphasia Battery* (*WAB*) (Kertesz, 1982) was used to determine type and severity of aphasia. Descriptive information for individual participants is provided in Table 1. Descriptive data for participants classified by type of aphasia (fluent and non-fluent) are provided in Table 2; and descriptive data for participants classified by severity are provided in Table 3.

Table 1. Descriptive Data for Individual Participants

Subject	Gender	Age	Education	MPO	AQ	Fluency	PP	CIDS	QCDS
1	M	76	16	114.0	45.3	NF	68.96	4.28	3.13
2	F	65	16	202.0	73.4	NF	93.00	6.70	4.38
3	M	60	16	3.5	82.4	F	93.00	6.49	4.56
4	F	78	12	2.5	64.6	F	80.00	3.98	2.50
5	M	46	12	59.0	68.5	F	86.20	5.73	3.80
6	M	69	14	7.0	88.5	F	100.00	6.27	4.56
7	F	39	13	131.0	88.9	F	96.50	6.60	4.56
8	F	38	12	120.0	67.7	NF	86.20	5.78	3.98
9	M	76	12	6.0	78.7	F	89.65	6.21	4.44
10	M	54	12	108.0	15.3	NF	55.60	4.88	4.06
11	F	70	15	91.0	57.6	NF	82.80	6.54	4.44
12	F	79	12	3.0	35.6	F	68.90	3.37	2.38
13	F	79	12	15.0	27.4	NF	41.38	2.97	2.94
14	M	66	8	8.0	16.6	F	41.38	2.67	1.73
15	F	65	6	10.0	12.4	NF	48.20	2.98	2.63
16	M	68	16	60.0	7.7	NF	48.27	2.70	2.56
17	F	83	18	24.0	58.9	F	86.20	5.21	3.88
18	M	64	9	9.0	10.4	NF	51.70	2.55	2.13
19	F	70	12	2.5	20.3	NF	69.00	3.82	3.06
20	F	57	18	87.0	20.6	NF	75.70	5.92	3.44
21	M	77	14	7.0	89.3	F	100.00	6.91	4.88
22	M	65	12	23.0	72.9	F	86.20	5.85	4.00
23	F	74	13	72.0	39.4	F	89.65	5.64	3.69
24	M	61	9	7.0	45.0	F	45.00	2.90	2.40
25	M	72	11	2.5	81.1	F	93.00	6.56	4.50
26	F	56	16	26.0	61.4	NF	79.30	5.10	3.69
27	M	48	12	4.0	69.0	NF	86.00	6.10	4.33

Age and Education are reported in years.
MPO = months post onset
AQ = aphasia quotient (based on administration of the Western Aphasia Battery)
F = fluent aphasia, NF = non-fluent aphasia
PP = pragmatic protocol
CIDS = quantitative score of ASHA FACS
QDSC = qualitative score of ASHA FACS

Table 2. Descriptive Data for participants classified by type of aphasia

Variable	**Fluent Aphasia (N=14)**	**Non-Fluent Aphasia (N=13)**
Age (years)		
Mean	67.5	62.3
Standard deviation	12.7	11.43
Range	39.0 to 83.0	38.0 to 79.0
MPO (months)		
Mean	25.4	65.3
Standard deviation	37.4	61.3
Range	2.5 to 131.1	2.5 to 202.0
WAB AQ		
Mean	64.64	37.57
Standard deviation	22.51	25.26
Range	16.6 to 89.3	7.7 to 73.4

MPO = months post onset
WBA AQ = Aphasia quotient based on the Western Aphasia Battery

Table 3. Descriptive Data for participants classified by severity of impairment

Variable	Fluent Aphasia (N=14)	Non-Fluent Aphasia (N=13)
Age (years)		
Mean	62.8	67.5
Standard deviation	14.5	8.2
Range	38 ti 83	54 to 79
MPO (months)		
Mean	47.2	41.3
Standard deviation	61.3	43.8
Range	2.5 to 202	2.5 to 114
WAB AQ		
Mean	73.5	24.2
Standard deviation	10.8	13.2
Range	57.6 to 89.3	7.70 to 45.3

MPO = months post onset

WBA AQ = Aphasia quotient based on the Western Aphasia Battery

Participant Assessment

Participation involved one experimental session lasting approximately 1-1½ hours and two additional observation sessions lasting approximately 1-1½ hours each. The initial experimental sessions were conducted in the participants' homes and included administration of portions of the *Western Aphasia Battery* (Kertesz, 1982) necessary to obtain an aphasia quotient (AQ), a fluency classification, an audiometric screening, and an informal 15-20 minute conversation between the participant and principal investigator. Work history and illness were the targeted topics for conversation because they have been found to yield the most complex language (Glosser, Weiner, & Kaplan, 1988). Alternative conversational topics included recent activities, interests, recent life changes, education, and family. Open-ended requests (e.g., "Tell me about your family."), as opposed to yes-no questions, were employed (Terrell & Ripich, 1989). The principal investigator attempted to keep the topics and the form of the conversations similar for all participants; however, the exact content of the conversation depended largely on the participant. All experimental sessions were videotaped for data analysis.

Observational sessions of the participants during everyday activities allowed the principal investigator to observe a representative sample of the individual with aphasias' communicative abilities in typical interactions. Activities observed included attending church, therapy, grocery shopping, and swimming class. The additional observation sessions were necessary to complete the *ASHA FACS* and were not videotaped.

Pragmatic Performance*:* Pragmatic aspects of language were analyzed for each participant using the *Pragmatic Protocol* (Prutting & Kirchner, 1987). This protocol measures 30 pragmatic aspects of language use including verbal (e.g., speech act usage, turn-taking, topic maintenance/initiation), paralinguistic (e.g., prosody, vocal quality/intensity), and nonverbal (e.g., facial expression, eye gaze, gestural usage) parameters. Each of the pragmatic parameters was rated as "appropriate," "inappropriate," or "no opportunity to observe." Appropriate ratings were defined as behaviors that facilitated the communicative interaction. Inappropriate ratings were defined as behaviors that detracted from the communicative interaction and penalized the individual (Prutting & Kirchner, 1987). The percentage of appropriate parameters was then computed and used to determine overall pragmatic appropriateness.

Functional Communication*:* Functional communication abilities were analyzed using the *American Speech-Language-Hearing Association Functional Assessment of Communication Skills for Adults* (*ASHA FACS*) (Frattali et al., 1995). The *ASHA FACS*, which has undergone extensive research and standardization procedures, measures an individual's ability to receive and convey messages effectively and independently, regardless of the mode of communication, in natural contexts. This assessment evaluates how a deficit (e.g., aphasia) affects one's ability to communicate in daily life activities. Forty-three behaviors are assessed across four domains: Social Communication; Communication of Basic Needs; Reading, Writing, and Number Concepts; and Daily Planning. Within each domain, specific functional behaviors are rated both quantitatively and qualitatively. The 7-point quantitative scale measures functional communication performance along a continuum of independence relating to levels of assistance and/or prompting needed to communicate. The 5-point qualitative scale measures a range of response dimensions (i.e., adequacy, appropriateness, promptness, and communication sharing) that characterize the individual's communication abilities for each assessment domain addressed. The *ASHA FACS* employs an observation format in which ratings are based on either the clinician's direct observations or observations made by others who are familiar with the individual with aphasia. The observation allows the clinician to make judgments based on interactions that take place in the individual with aphasia's daily life rather than on artificial testing situations set up by the clinician.

Data Analysis

A standard multiple linear regression analysis was used to answer the research questions. Unless there is a reason to suppose that experimental variables are related in a nonlinear fashion, it is common practice to use linear regression as a tool to determine whether the variables are statistically related. Linear regression relates a single dependent variable, such as a fluency rating, to one or more independent variables, such as pragmatic performance and functional communication ability. It is assumed that a constant difference in an independent variable is associated with a constant difference in the dependent variable. Therefore, linear regression can indicate which variables are significantly related to one another as well as the relative sizes of the effects. The .05 level of significance was used for all tests. Bonferroni corrections were used to control the experiment-wise error rate in correlation matrices. Normal quantile-quantile plots were used to verify that the variables used in correlations and the regression residuals were normally distributed.

Results

Intra- and Inter-judge Agreement

Intra- and inter-judge agreements were determined for both the *Pragmatic Protocol* and the *ASHA FACS*. Intra-judge agreement was determined by having the principal investigator re-score the *Pragmatic Protocol* and the *ASHA FACS* for five randomly selected participants. The principal investigator viewed the videotapes of the conversation samples and completed a second *Pragmatic Protocol* without access to the original ratings. Percent agreement between the principal investigator's first and second ratings was 95.5%. The principal investigator completed a second *ASHA FACS* within two weeks of the original rating. Percent agreement between the principal investigator's first and second ratings was 95.7%.

Inter-judge agreement for the *Pragmatic Protocol* and the *ASHA FACS* was determined for 6 of the 27 participants. These 6 participants were selected randomly. The second judge was a graduate student in speech-language pathology with experience working with individuals with aphasia prior to and throughout her graduate training. The second judge trained to criterion for all measures prior to the initiation of the study. She viewed the videotapes of all six samples and completed an independent *Pragmatic Protocol* for each. Comparisons were then made between these ratings and the original ratings made by the principal investigator. Inter-judge percent agreement for the *Pragmatic Protocol* was 92.1%. The second judge also observed the six participants during the three scheduled sessions in order to complete the *ASHA FACS*. Inter-judge percent agreement for the *ASHA FACS* was 92.4%.

Pragmatics and Functional Communication

The answer to the first research question, "Is there a relationship between pragmatic performance and functional communication?" is yes. The correlations calculated for the regression model were examined. The variables included were the percentage of appropriate pragmatic parameters calculated for the *Pragmatic Protocol* (Prutting & Kirchner, 1987) and both of the overall ratings (qualitative and quantitative) provided by the *ASHA FACS* (Frattali et al., 1995). Results are presented in Table 4. A Bonferroni correction was applied to the alpha level and all three correlations were significant at the .05/3=.017 level, indicating a strong relationship (r = .838 to .916) between pragmatics and functional communication, at least as they are defined by the *Pragmatic Protocol* and *ASHA FACS*.

Table 4. Correlation results for Pragmatic Protocol and ASHA FACS

	PP	**CIDS**	**QDSC**
PP			
Pearson Correlation	1.000	.916	.838
Sig. (2-tailed)	<.001	<.001	
N	27	27	27
CIDS			
Pearson Correlation	.916	1.000	.948
Sig. (2-tailed)	<.001	.	<.001
N	27	27	27
QDSC			
Pearson Correlation	.838	.948	1.000
Sig. (2-tailed)	<.001	<.001	.
N	27	27	27

PP = Pragmatic Protocol
CIDS = Quantitative score of ASHA FACS
QDSC = Qualitative score of ASHA FACS
Correlations are significant at the 0.017 level (2-tailed)

To answer the second question, "How well do measures of functional communication and pragmatic performance predict type of aphasia (fluent vs. non-fluent)?", standard linear regression analysis was used to examine the relationship between fluency type, as measured by the fluency subscale of the *WAB*, the two functional communication ratings, and pragmatic performance. To control for the fact that two regressions were performed (fluency and severity), a .05/2 or .025 level of significance was used. For both models, the influence diagnostics Cook's D and DFBETA were examined and no

participants were found to have undue influence on the model. Residuals were examined and found to be normally distributed.

For fluency, the overall model was significant F(3,23)=5.212, p=.007 and explained 40.5% of the variance. However, the partial t-tests for the quantitative and qualitative measures of the *ASHA FACS* were not significant, indicating that they provided redundant information. This was not surprising since they were highly correlated. Strong correlations between independent variables (i.e., *Pragmatic Protocol* and *ASHA FACS*) often indicate multicollinearity. Since the quantitative measure of the *ASHA FACS* was the least significant, it was dropped from the equation. The resulting model still explained a significant 39.7% of the variance in fluency F (2,24)=7.898, p=.002. Partial t-tests showed a significant result for the *Pragmatic Protocol* rating, t=3.49, p=.002 and a marginally useful level for the qualitative measure of the *ASHA FACS*, t=1.89, p=.070. Since dropping the qualitative measure resulted in a drop in variance of 9%, it was left in the model. The final regression equation was fluency=-.276+.158(*Pragmatic Protocol*)-1.819(qualitative) (see Table 5). Thus, the *Pragmatic Protocol* explained most of the variability in fluency while the *ASHA FACS* was found to only provide redundant information.

Table 5. Summary of multiple linear regression analysis for variables predicting fluency.

Variables	V	SE B	β
Pragmatic Protocol	.158	.045	1.016
QDSC	-1.819	.960	-.551
N=27			
R^2= .397			
QDSC = Qualitative score of ASHA FACS			

In order to answer the third research question, "How well do measures of functional communication and pragmatic performance predict the severity of aphasia (mild-moderate or moderate-severe)?", the same type of regression was employed - - this time examining the relationship between the same independent variables and severity of impairment (as measured by the *WAB*). The overall model for severity of impairment (*WAB* AQ) was significant F(3,23)=24.56, p<.001 and explained 76% of the variance in severity. Again, the partial t-tests for the quantitative and qualitative measures failed to reach statistical significance, thus indicating that they provided redundant information. Since the quantitative measure of the *ASHA FACS* was the least significant, it was dropped from the equation first. In the resulting model, the qualitative measure of the *ASHA FACS* was still not significant so it too was dropped from the equation. The final regression equation contained only the *Pragmatic Protocol* and explained a significant 75% of the variance in severity, F (1,25)=73.39, p<.001. The equation itself was Severity (*WAB*) =-42.86+1.25(*Pragmatic Protocol*) (see Table 6). Thus, the *Pragmatic Protocol* explained most of the variability in severity while the *ASHA FACS* was found to only provide redundant information.

Table 6. Summary of multiple linear regression analysis for variables predicting severity

Variables	B	SE B	β
Pragmatic Protocol	1.249	.146	.864
N = 27			
R^2 = .746			

Discussion

The purpose of the present study was to investigate the relationship between pragmatic performance and functional communication. To do this with any relevance, this study also had to examine how well measures of pragmatic performance and functional communication ability predict the type (fluent or non-fluent) and severity of aphasia.

Pragmatic performance, as measured by the *Pragmatic Protocol* (Prutting & Kirchner, 1987), was found to have a strong, positive correlation with functional communication, as measured by the *ASHA FACS* (Frattali et al., 1995). The most obvious common denominator between pragmatic performance and functional communication, based on our results, appears to be severity of oral expressive language. In most instances, the higher the *WAB* aphasia quotient (i.e., severity of language impairment), the better the pragmatic performance and functional communication ratings. This is consistent with strong correlations. Other investigations have also reported that communicative performance (i.e., *Pragmatic Protocol, ASHA FACS*) correlates well with traditional language measures (Avent et al., 1998; Frattali et al., 1995; Irwin et al., 2002),). And while some investigations (Goldblum, 1985; Guilford & O'Connor, 1982; Penn, 1988) have demonstrated preserved pragmatic abilities with little correlation between traditional language measures and communicative performance, interpretation of pragmatic performance independent of oral-expressive language in this sample would be difficult. The number of pragmatic problems was clearly more abundant in the moderate-severe group than in the mild-moderate group. Moreover, the majority of the pragmatic problems recorded related to behaviors classified as "verbal aspects" in the *Pragmatic Protocol.*

Severity of impairment was found to be a stronger indicator of both pragmatic performance and functional communication than type of aphasia (fluent or non-fluent) in this study. However, severity of impairment within our sample could be a factor in that result, as well. Avent and Wertz (1996) reported that adults with fluent aphasia in their sample demonstrated a slightly higher level of pragmatic appropriateness than did adults with non-fluent aphasia. Although the differences in participants with fluent and non-fluent aphasia were minimal and no differences were observed between more specific types of aphasia, it is interesting to compare their observations to those of Holland (1980, 1982), who reported that adults with non-fluent aphasia demonstrated the most "normal" pattern of communication and were believed to be the most functionally communicative. Results from the current investigation revealed significant differences between fluent and non-fluent groups for pragmatic performance; but the fluent group, as a whole, was less severely impaired than the non-fluent group. Examining individual performance, differences were minimal in the number and type of inappropriate pragmatic behaviors displayed between the fluent and non-fluent subjects within each severity level.

Does this mean that pragmatic performance and functional communication are synonymous (Davis, 1993) and that any differences are based entirely on severity of aphasia? No. Our results demonstrate that *pragmatic performance* is very predictive of severity of aphasia and type of aphasia. Functional communication, however – at least as it is defined by the *ASHA FACS* – did not contribute to or explain any of the variability in type or severity of aphasia. Thus, despite its strong correlation with pragmatic performance, differences must exist in what measures of functional communication actually assess. This supports the findings of Irvin, Wertz, and Avent (2002) that assessments of pragmatic performance and functional communication measure different underlying constructs. They observed more variances in the two measures over time than in initial assessments of individuals with aphasia.

While one may on the surface see that correlations exist (albeit some stronger than others) between linguistic severity, pragmatics, and functional communication, examining differences between participants on a more individual level can provide, perhaps, a more pragmatic endpoint. Traditional language testing (e.g., *WAB*) did not capture all of the communicative competencies observed. For the most part, participants with better linguistic skills performed better pragmatically. However, in participants with similar linguistic ability or severity of impairment (i.e., similar *WAB* aphasia quotient), variances in pragmatic performance appeared to correlate better with variances in functional communication. For example, Participants #1 and #24 presented with similar aphasia quotients (45.3 and 45 respectively). However, participant #1 received a rating of pragmatically appropriate behaviors that was 23 percentage points higher on the *Pragmatic Protocol*, and he received much higher ratings on the quantitative and qualitative portions of the *ASHA FACS*. His superior ability to convey intentions and attitudes may influence his communicative effectiveness and independence in the absence of superior linguistic competence. This is what Holland (1977) meant when she stated that "aphasics probably communicate better than they talk" (p. 173). Thus, evaluation with the *WAB* alone would provide a much worse prognosis for that individual than would be provided by an assessment of pragmatic performance and functional communication.

Other participants with moderate to severe impairments also performed much better than expected based on their linguistic deficits. Although no single factor was significant for producing variability, different factors could produce changes in communicative competence for different individuals without showing statistical significance. For example, although time-post onset was not significantly correlated with pragmatic performance or functional communication, it is important to note that Participant #1 was approximately eight years and five months further post-onset than Participant #24. Thus, individuals with aphasia may continue to show improvement in pragmatic abilities and acquire strategies necessary for successful functional communication despite relatively little improvement in linguistic skills over time. This is consistent with the results of Avent et al. (1998), who also reported that even though there is a relationship between language impairment and pragmatic behavior, improvement in pragmatic performance is not necessarily related to improvement in language ability. Further research is necessary to examine the influence of time-post onset on linguistic competence, pragmatic performance, and functional communication.

The close alignment of pragmatics and functional communication in the absence of linguistic competence could also be influenced by several other factors including: a) age, b) communicative environment, and c) ability to read and write. For example, Participant #13 presented with an aphasia quotient that was clinically similar to Participant #20, but performed much worse on the *Pragmatic Protocol* and the *ASHA FACS*. Upon further examination of the data, several potential factors were identified that could enhance Participant #20's communication abilities. First, Participant #20 was 22 years younger than Participant #13. Although no significant correlations were found between age and the measures employed, age has been previously identified as a variable affecting prognosis (Davis, 1993). Secondly, Participant #13 was essentially confined to bed due to physical limitations, whereas Participant #20 was able to drive a car (with modifications) and do some light shopping on her own. Thus, Participant #20 had the opportunity to engage in a variety of communicative interactions, whereas Participant #13's communicative environment was limited to two aides that stayed with her in her home. Finally, Participant #20's reading and writing skills were far superior to Participant #13's, allowing her to use a communication notebook independently.

While functional communication and pragmatic performance correlate in many patients despite linguistic severity, there are also patients in whom none of the measures seem to align. Some researchers

have stressed the importance of situational context (the physical environment, communication partners, sociolinguistic considerations, etc.) (Ferguson, 1994; Holland, 1991; Lyon, 1992) and it does appear to be relevant to the previous example. However, for other participants in this study (#16 and #18), good environments for promoting communication (i.e., strong family support, ongoing language therapy, opportunities for varied communicative experiences) were not sufficient to overcome severe linguistic deficits. In these participants pragmatic performance was much better than linguistic skill, but their functional communication remained severely limited; thus, the need for "evaluation in natural contexts" (Ferguson, 1994; Holland, 1982) and using measures such as the *Pragmatic Protocol* and the *ASHA FACS* to assess quality of communication, as well as traditional measures of linguistic severity.

While this investigation focused on assessment of pragmatic performance and functional communication, implications for treatment should be considered. While pragmatics appears to have a relationship to functional communication, much of the relationship is tied to linguistic competence, especially when time post-onset is relatively short. Thus, early on, evaluating patients with traditional language measures, such as the *WAB* or the *BDAE* may be most appropriate. Such examinations provide information on linguistic severity and, especially with the *BDAE*, provide information on where to initiate treatment of auditory comprehension and verbal expression. Improving linguistic competence during the period of spontaneous recovery may be most beneficial, since pragmatics and functional communication are both related to linguistic competence and may continue to emerge.

After spontaneous recovery has slowed and individuals are unable to make substantive gains in linguistic competence, improvements may still be made in treatment by targeting "functional communication," or communication in natural contexts. Gains may be more likely when training someone to specifically function within their own communicative environment, a task which may be too difficult to undertake in the constraints of acute care or rehab. But teaching strategies to establish communicative intent and to "get the point across" in the context of daily activities may move a patient's skills beyond the limitations of linguistic competency. While many "pragmatic" behaviors are tied to verbal or linguistic competence, working in the realm of the more non-verbal areas of pragmatics (i.e., eye contact, turn taking, body language) may be very functional in getting across one's message.

Conclusion

Though common sense may suggest that pragmatic performance and functional communication are related to each other and to linguistic competence, different assessments are designed and marketed to test each separately. This investigation examined these relationships and the results provide empirical support for the different types of assessment. Based on the current data, it appears that linguistic competence is an underlying factor influencing the relationship between pragmatic performance and functional communication. Communication includes both linguistic competence and pragmatic competence, and, in most cases, linguistic competence appears to be inseparable from the ability to communicate functionally and in a pragmatically appropriate way. Despite the strong relationship among these communicative parameters, tests designed to examine severity of linguistic impairment (i.e., *WAB*), while valuable, provide an incomplete description of the individual with aphasia's communication ability. Observations made in natural communicative environments were important for identifying communicative strengths. This is evidenced by a number of participants whose pragmatic performance and functional communication abilities were different despite having similar *WAB* aphasia quotients, especially those who were further post-onset and had different opportunities for communication.

Continued research is needed to determine how specific aspects of pragmatic behavior influence specific domains of functional communication. Further investigation is also needed to determine whether tools such as the *Pragmatic Protocol* and the *ASHA FACS* are more sensitive to changes over time in communication skills than traditional standardized measures (e.g., *WAB*). Avent and Wertz (1996) reported that pragmatic performance does improve. Functional communication measures such as the *ASHA FACS* can do more than measure impairment and function. They can provide the clinician with a view of aphasia from the patient's perspective, a means of appreciating the person's daily struggle in adapting to a new life that has been imposed upon them. They can be used to assist in developing meaningful goals, assessing the outcomes of rehabilitation, and in documenting multidimensional benefits of therapy. It is yet to be determined if individuals with aphasia can be taught to utilize preserved pragmatic performance to improve functional communication or whether time and/or environment may, alone, be the true therapists.

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Author contact information:

Gary H. McCullough, Ph.D.
Department of Speech-Language Pathology

University of Central Arkansas
201 Donaghey Avenue
Box 4895
Conway, AR 72035-0001
Phone: (501) 852-7886
Email : gmccullough@uca.edu

Jacki L. Ruark
Department of Speech-Language Pathology
University of Central Arkansas
201 Donaghey Avenue
Box 4895
Conway, AR 72035-0001
Phone: (501) 450-3310
Email : JackiR@uca.edu

Jacqueline Rainey, Dr. PH
Associate Dean
College of Health and Behavioral Sciences
University of Central Arkansas
Doyne Health Science Center 104
Conway, AR 72035-0001
Phone: (501) 450-5509
E-mail: JacquieR@uca.edu
