

ANALYSIS OF THREE COMPONENTS OF AFFECTIVE BEHAVIOR
IN CHILDREN WITH AUTISM

by

NIDAL K. NAJJAR

A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment of
the requirements for the degree of Doctor of Philosophy,
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Abstract

ANALYSIS OF THREE COMPONENTS OF AFFECTIVE BEHAVIOR
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The term *affect* refers to a person's facial expression, postures, gestures, and verbal productions that are emitted in response to a complex set of discriminative stimuli that evoke the observer's use of terms that draw inferences about a person's emotional or physiological state. People with autism have deficits in social interaction that are apparent in nonverbal behavior, including difficulty responding in an affectively appropriate manner. Behavioral procedures have been used successfully to train people with autism to emit appropriate social responses. Based on the reviewed literature, however, only two published studies (Gena, Couloura, & Kymissis, 2005; Gena, Krantz, McClannahan, & Poulson, 1996) have applied such procedures to increase appropriate affective responding in people with autism. The present study adds to that literature by increasing precision of measurement and by using explicitly defined shaping procedures. This study used a behavioral intervention package consisting of modeling, shaping, and script-fading to increase appropriate affective responding. A multiple-baseline experimental design across affective categories was used to evaluate the effects of the treatment package on the percentage of appropriate affective responding emitted by three

children with autism following teacher-presented statements designed to evoke an affective response. Affective responding consisted of vocal intonation, facial expressions, and verbalizations. The percentage of appropriate affective responding emitted by all participants across categories increased systematically with the introduction of treatment. Nonreinforced probe responding also improved following treatment.

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Table of Contents

| | Page |
|---|------|
| Approval Page..... | iii |
| Abstract | iv |
| Acknowledgements | vi |
| Table of Contents | vii |
| List of Tables | ix |
| List of Figures..... | xii |
| Introduction | 1 |
| I- Social Behavior from a Behavior-Analytic Perspective | 2 |
| II- Affective Behavior in Children with Typical Development | 5 |
| a. Discrimination and Expression of Affective Responses | 5 |
| b. Appropriate Affective Responding | 8 |
| III- Affective Behavior in Children with Autism | 9 |
| Method | 14 |
| I- Participants | 14 |
| II- Setting | 15 |
| III- Stimuli | 16 |
| IV- General Procedures | 18 |
| V- Measurement Procedures: Independent Variable | 19 |
| a. Modeling the Target Responses | 19 |
| b. Scripts and Script Fading | 19 |
| c. Shaping and Reinforcement | 20 |
| d. Multiple-Exemplar Training | 22 |
| e. Error-Correction Procedures | 22 |
| VI- Measurement Procedures: Dependent Variable | 23 |
| VII- Measurement Procedures: Response Definitions | 23 |
| a. Interobserver Agreement | 26 |
| b. Procedural Integrity | 27 |
| VIII- Experimental Procedures | 27 |
| a. Baseline Sessions | 27 |
| b. Treatment Sessions | 28 |
| c. Follow-Up Sessions | 28 |
| IX- Experimental Design | 29 |
| X- Social Validity Measure | 29 |

| | Page |
|--|------|
| Results and Conclusion | 31 |
| I- Results for Andy | 31 |
| a. Verbal Responding | 31 |
| b. Vocal Intonation | 32 |
| c. Facial Expression | 32 |
| d. The Three Responses Together during Training Trials | 33 |
| e. The Three Responses Together during Probe Trials | 33 |
| f. Some Irregularities in Verbal Responding with Andy in Baseline. | 34 |
| II- Results for Carl | 35 |
| a. Verbal Responding | 35 |
| b. Vocal Intonation | 37 |
| c. Facial Expression | 37 |
| d. The Three Responses Together during Training Trials | 38 |
| e. The Three Responses Together during Probe Trials | 38 |
| III- Results for Marc | 39 |
| a. Verbal Responding | 39 |
| b. Vocal Intonation | 40 |
| c. Facial Expression | 40 |
| d. The Three Responses Together during Training Trials | 41 |
| e. The Three Responses Together during Probe Trials | 41 |
| IV- A Measure of Acquisition of Affective Responding | 42 |
| V- Follow-up Sessions | 42 |
| a. Follow-Up Sessions with Andy | 42 |
| b. Follow-Up Sessions with Carl | 43 |
| c. Follow-Up Sessions with Marc | 43 |
| VI- Levels of Script Fading | 44 |
| VII- Shaping Steps for Andy and Marc | 45 |
| VIII- Scripted and Unscripted Verbalizations | 45 |
| IX- Social Validity | 47 |
| Discussion | 48 |
| Tables | 56 |
| Figures | 101 |
| Appendix A: A Review Paper by the Author on Affective Behavior and Stimulus Control | 122 |
| Appendix B: Instructions that were Provided to Social-Validity Scorers | 153 |
| References for Appendix A | 156 |
| Bibliography | 161 |

List of Tables

| | Page | |
|-----------|---|----|
| Table 1. | An Outline that Lists Steps and Rules Followed by the Experimenter in a Typical Experimental Session | 56 |
| Table 2. | Responses that Approximated Target Facial Expressions as Specified by the Experimenter | 59 |
| Table 3. | Verbal and Nonverbal Discriminative Stimuli Presented by the Experimenter in the Absurdities Category | 61 |
| Table 4. | Verbal and Nonverbal Discriminative Stimuli Presented by the Experimenter in the Empathy Category | 62 |
| Table 5. | Verbal and Nonverbal Discriminative Stimuli Presented by the Experimenter in the Excitement Category | 63 |
| Table 6. | Verbal and Nonverbal Discriminative Stimuli Presented by the Experimenter in the Gratitude and Appreciation Category | 64 |
| Table 7. | Verbal and Nonverbal Responses Taught in the Treatment Condition | 65 |
| Table 8. | Summary of Interobserver Agreement Data Obtained in the Baseline, Treatment, and Follow-Up Phases for Andy | 66 |
| Table 9. | Summary of Interobserver Agreement Data Obtained in the Baseline, Treatment, and Follow-Up Phases for Carl | 67 |
| Table 10. | Summary of Interobserver Agreement Data Obtained in the Baseline, Treatment, and Follow-Up Phases for Marc | 68 |
| Table 11. | Summary of Interobserver Agreement Data and Ranges of Scores Obtained in the Baseline, Treatment, and Follow-Up Phases across Participants | 69 |
| Table 12. | An Outline that Provides an Index for Figures 1 through 21 and Tables 13 through 30 | 70 |
| Table 13. | The Number of Sessions that was Required for Each Participant to Meet the Mastery Criterion of 89% Correct on Three Consecutive Sessions for Each Measure of Affective Responding, on Training and Probe Trials, across Four Affective Categories | 73 |

| | Page |
|---|------|
| Table 14. Percentage of Accurate Performance on Training and Probe Trials in (a) All Baseline Sessions, and (b) the Two Follow-Up Sessions Following Treatment for Andy | 74 |
| Table 15. Percentage of Accurate Performance on Training and Probe Trials in (a) All Baseline Sessions, and (b) the Two Follow-Up Sessions Following Treatment for Carl | 75 |
| Table 16. Percentage of Accurate Performance on Training and Probe Trials in (a) All Baseline Sessions, and (b) the Two Follow-Up Sessions Following Treatment for Marc | 76 |
| Table 17. Levels of Script-Fading and Graduated Removal of Script Sheet Used with Andy during Treatment of the Absurdities Category | 77 |
| Table 18. Levels of Script-Fading and Graduated Removal of Script Sheet Used with Andy during Treatment of the Empathy Category | 78 |
| Table 19. Levels of Script-Fading and Graduated Removal of Script Sheet Used with Andy during Treatment of the Excitement Category | 80 |
| Table 20. Levels of Script-Fading and Graduated Removal of Script Sheet Used with Andy during Treatment of the Gratitude and Appreciation Category | 81 |
| Table 21. Levels of Script-Fading and Graduated Removal of Script Sheet Used with Carl during Treatment of the Absurdities Category | 83 |
| Table 22. Levels of Script-Fading and Graduated Removal of Script Sheet Used with Carl during Treatment of the Empathy Category | 85 |
| Table 23. Levels of Script-Fading and Graduated Removal of Script Sheet Used with Carl during Treatment of the Excitement Category | 87 |
| Table 24. Levels of Script-Fading and Graduated Removal of Script Sheet Used with Carl during Treatment of the Gratitude and Appreciation Category | 89 |

| | | Page |
|-----------|--|------|
| Table 25. | Levels of Script-Fading and Graduated Removal of Script Sheet Used with Marc during Treatment of the Absurdities Category | 91 |
| Table 26. | Levels of Script-Fading and Graduated Removal of Script Sheet Used with Marc during Treatment of the Empathy Category | 93 |
| Table 27. | Levels of Script-Fading and Graduated Removal of Script Sheet Used with Marc during Treatment of the Excitement Category | 95 |
| Table 28. | Levels of Script-Fading and Graduated Removal of Script Sheet Used with Marc during Treatment of the Gratitude and Appreciation Category | 97 |
| Table 29. | Shaping Procedure: Steps Used to Train Andy to Engage in Appropriate Smiling | 99 |
| Table 30. | Shaping Procedure: Steps Used to Train Marc to Display a Sad Facial Expression | 100 |

List of Figures

| | Page |
|---|------|
| Figure 1. | 101 |
| <p>The percentage of training (filled squares) and probe trials (open squares) during which Andy emitted appropriate <i>Verbal Responding</i> to affective statements presented by the experimenter, across the four affective categories, <i>Empathy</i>, <i>Absurdities</i>, <i>Gratitude</i>, and <i>Excitement</i>, in the baseline, treatment, and follow-up phases of the study.</p> | |
| Figure 2. | 102 |
| <p>The percentage of training (filled triangles) and probe trials (open triangles) during which Andy emitted appropriate <i>Vocal Intonation</i> when responding to affective statements presented by the experimenter, across the four affective categories, <i>Empathy</i>, <i>Absurdities</i>, <i>Gratitude</i>, and <i>Excitement</i>, in the baseline, treatment, and follow-up phases of the study.</p> | |
| Figure 3. | 103 |
| <p>The percentage of training (filled circles) and probe trials (open circles) during which Andy emitted appropriate <i>Facial Expression</i> when responding to affective statements presented by the experimenter, across the four affective categories, <i>Empathy</i>, <i>Absurdities</i>, <i>Gratitude</i>, and <i>Excitement</i>, in the baseline, treatment, and follow-up phases of the study.</p> | |
| Figure 4. | 104 |
| <p>The percentage of training trials during which Andy emitted appropriate <i>Verbalizations</i> (filled squares), <i>Vocal Intonation</i> (filled triangles), and <i>Facial Expression</i> (filled circles) when responding to affective statements presented by the experimenter, across the four affective categories, <i>Empathy</i>, <i>Absurdities</i>, <i>Gratitude</i>, and <i>Excitement</i>, in the baseline, treatment, and follow-up phases of the study.</p> | |
| Figure 5. | 105 |
| <p>The percentage of probe trials during which Andy emitted appropriate <i>Verbalizations</i> (open squares), <i>Vocal Intonation</i> (open triangles), and <i>Facial Expression</i> (open circles) when responding to affective statements presented by the experimenter, across the four affective categories, <i>Empathy</i>, <i>Absurdities</i>, <i>Gratitude</i>, and <i>Excitement</i>, in the baseline, treatment, and follow-up phases of the study.</p> | |

| | Page | |
|------------|--|-----|
| Figure 6. | The percentage of training (filled squares) and probe trials (open squares) during which Carl emitted appropriate <i>Verbal Responding</i> to affective statements presented by the experimenter, across the four affective categories, <i>Gratitude</i> , <i>Empathy</i> , <i>Absurdities</i> , and <i>Excitement</i> , in the baseline, treatment, and follow-up phases of the study. | 106 |
| Figure 7. | The percentage of training (filled triangles) and probe trials (open triangles) during which Carl emitted appropriate <i>Vocal Intonation</i> when responding to affective statements presented by the experimenter, across the four affective categories, <i>Gratitude</i> , <i>Empathy</i> , <i>Absurdities</i> , and <i>Excitement</i> , in the baseline, treatment, and follow-up phases of the study. | 107 |
| Figure 8. | The percentage of training (filled circles) and probe trials (open circles) during which Carl emitted appropriate <i>Facial Expression</i> when responding to affective statements presented by the experimenter, across the four affective categories, <i>Gratitude</i> , <i>Empathy</i> , <i>Absurdities</i> , and <i>Excitement</i> , in the baseline, treatment, and follow-up phases of the study. | 108 |
| Figure 9. | The percentage of training trials during which Carl emitted appropriate <i>Verbalizations</i> (filled squares), <i>Vocal Intonation</i> (filled triangles), and <i>Facial Expression</i> (filled circles) when responding to affective statements presented by the experimenter, across the four affective categories, <i>Gratitude</i> , <i>Empathy</i> , <i>Absurdities</i> , and <i>Excitement</i> , in the baseline, treatment, and follow-up phases of the study. | 109 |
| Figure 10. | The percentage of probe trials during which Carl emitted appropriate <i>Verbalizations</i> (open squares), <i>Vocal Intonation</i> (open triangles), and <i>Facial Expression</i> (open circles) when responding to affective statements presented by the experimenter, across the four affective categories, <i>Gratitude</i> , <i>Empathy</i> , <i>Absurdities</i> , and <i>Excitement</i> , in the baseline, treatment, and follow-up phases of the study. | 110 |
| Figure 11. | The percentage of training (filled squares) and probe trials (open squares) during which Marc emitted appropriate <i>Verbal Responding</i> to affective statements presented by the experimenter, across the four affective categories, <i>Absurdities</i> , <i>Empathy</i> , <i>Gratitude</i> , and <i>Excitement</i> , in the baseline, treatment, and follow-up phases of the study. | 111 |

| | Page | |
|------------|--|-----|
| Figure 12. | The percentage of training (filled triangles) and probe trials (open triangles) during which Marc emitted appropriate <i>Vocal Intonation</i> when responding to affective statements presented by the experimenter, across the four affective categories, <i>Absurdities</i> , <i>Empathy</i> , <i>Gratitude</i> , and <i>Excitement</i> , in the baseline, treatment, and follow-up phases of the study. | 112 |
| Figure 13. | The percentage of training (filled circles) and probe trials (open circles) during which Marc emitted appropriate <i>Facial Expression</i> when responding to affective statements presented by the experimenter, across the four affective categories, <i>Absurdities</i> , <i>Empathy</i> , <i>Gratitude</i> , and <i>Excitement</i> , in the baseline, treatment, and follow-up phases of the study. | 113 |
| Figure 14. | The percentage of training trials during which Marc emitted appropriate <i>Verbalizations</i> (filled squares), <i>Vocal Intonation</i> (filled triangles), and <i>Facial Expression</i> (filled circles) when responding to affective statements presented by the experimenter, across the four affective categories, <i>Absurdities</i> , <i>Empathy</i> , <i>Gratitude</i> , and <i>Excitement</i> , in the baseline, treatment, and follow-up phases of the study. | 114 |
| Figure 15. | The percentage of probe trials during which Marc emitted appropriate <i>Verbalizations</i> (open squares), <i>Vocal Intonation</i> (open triangles), and <i>Facial Expression</i> (open circles) when responding to affective statements presented by the experimenter, across the four affective categories, <i>Absurdities</i> , <i>Empathy</i> , <i>Gratitude</i> , and <i>Excitement</i> , in the baseline, treatment, and follow-up phases of the study. | 115 |
| Figure 16. | The percentage of <i>training trials</i> during which Andy emitted appropriate scripted (filled squares) and unscripted (open squares) responses to affective statements presented by the experimenter, across the four affective categories, <i>Empathy</i> , <i>Absurdities</i> , <i>Gratitude</i> , and <i>Excitement</i> , in the baseline, treatment, and follow-up phases of the study. | 116 |
| Figure 17. | The percentage of <i>probe trials</i> during which Andy emitted appropriate scripted (filled squares) and unscripted (open squares) responses to affective statements presented by the experimenter, across the four affective categories, <i>Empathy</i> , <i>Absurdities</i> , <i>Gratitude</i> , and <i>Excitement</i> , in the baseline, treatment, and follow-up phases of the study. | 117 |

| | Page |
|---|------|
| Figure 18. | 118 |
| The percentage of <i>training trials</i> during which Carl emitted appropriate scripted (filled squares) and unscripted (open squares) responses to affective statements presented by the experimenter, across the four affective categories, <i>Gratitude</i> , <i>Empathy</i> , <i>Absurdities</i> , and <i>Excitement</i> , in the baseline, treatment, and follow-up phases of the study. | |
| Figure 19. | 119 |
| The percentage of <i>probe trials</i> during which Carl emitted appropriate scripted (filled squares) and unscripted (open squares) responses to affective statements presented by the experimenter, across the four affective categories, <i>Gratitude</i> , <i>Empathy</i> , <i>Absurdities</i> , and <i>Excitement</i> , in the baseline, treatment, and follow-up phases of the study. | |
| Figure 20. | 120 |
| The percentage of <i>training trials</i> during which Marc emitted appropriate scripted (filled squares) and unscripted (open squares) responses to affective statements presented by the experimenter, across the four affective categories, <i>Absurdities</i> , <i>Empathy</i> , <i>Gratitude</i> , and <i>Excitement</i> , in the baseline, treatment, and follow-up phases of the study. | |
| Figure 21. | 121 |
| The percentage of <i>probe trials</i> during which Marc emitted appropriate scripted (filled squares) and unscripted (open squares) responses to affective statements presented by the experimenter, across the four affective categories, <i>Absurdities</i> , <i>Empathy</i> , <i>Gratitude</i> , and <i>Excitement</i> , in the baseline, treatment, and follow-up phases of the study. | |

According to the DSM-IV (American Psychiatric Association, 1994) criteria, individuals with autism have deficits in social interaction and communication. Such deficits are apparent in nonverbal behavior (e.g., facial expressions), which includes difficulty forming peer relationships that involve sharing and reciprocity.

Rutter (1966) provided an account of the behavioral and cognitive characteristics of children with autism. Rutter indicated that children with autism have deficits in interpersonal relationships. Rutter noted that they tend to avoid eye-to-eye contact with others and show little or no interest in people as evidenced by the fact that they often look past or away from them. These responses present children with autism as “markedly aloof and [emotionally] distant” (Rutter, 1966, p. 57).

Such deficits and others that are characteristic of autism have been addressed using applied behavior analysis, which, as Baer, Wolf, and Risley (1968) put it, “makes obvious the importance of the behavior changed, its quantitative characteristics, the experimental manipulations which analyze with clarity what was responsible for the change, the technologically exact description of all procedures contributing to that change, the effectiveness of those procedures in making sufficient change for value, and the generality of that change” (p. 97). Behavioral methods have been used successfully to modify the behavior of various populations, including that of the autistic population. For example, McClannahan and Krantz (1999) used behavioral principles to develop a new technology that equips children with autism with the skills to initiate and complete academic, leisure, and self-care tasks with minimal adult supervision.

Behavioral methods also have been used successfully to modify behavior that helps promote social interaction. For example, Gaylord-Ross, Haring, Breen, and Pitts-

Conway (1984) taught youths with autism to make initiations to their typically developing peers, and to increase the duration of their social interactions. In their second experiment, Gaylord-Ross et al. taught a youth with autism to make similar initiations with a peer who had autism as well. Targeting the same behavior, but using a new technology, Krantz and McClannahan (1993) taught youths with autism to initiate social interactions with peers using scripts and script-fading procedures.

Social Behavior from a Behavior-Analytic Perspective

Skinner (1953) defined social behavior as “the behavior of two or more people with respect to one another or in concert with respect to a common environment” (p. 297). In discussions of social behavior, the topic of social stimuli becomes especially relevant. As Skinner (1953) described them, social stimuli play an important role in controlling behavior. An individual’s history determines what stimuli come to function as social stimuli. Furthermore, an individual’s history determines exactly what function a particular social stimulus would have, be it discriminative, eliciting, motivational, or consequential (Schlinger, 1995).

Schlinger (1995) examined attachment relations and moral behavior, in which he included an examination of prosocial behavior and empathy, from a behavioral viewpoint. That is to say, Schlinger (1995) examined social-psychological topics that are traditionally studied from a cognitive-developmental perspective by examining the contingencies of reinforcement that form these categories of social behavior. For this reason, Schlinger’s (1995) discussion of empathy as an affective response is of particular relevance to the present paper.

Schlinger (1995) pointed out the circular nature of many of the statements made in the traditional psychological literature about prosocial behavior, such as empathy. Schlinger (1995) stated that in that literature, empathy is described as the underlying motivation in several categories of prosocial behavior, such as sharing, helping, protecting, and nurturing. Yet, as Schlinger pointed out, “the only evidence for the underlying motivation – empathy – or the lack of it, is the very behavior the empathy is said to explain... [In addition], the empathy itself can never be tested directly; rather, it must always be inferred from other, more direct data” (p. 231). One might argue that this “inference” describes the degree of stimulus control of this affective behavior on another individual. Gena, Krantz, McClannahan, and Poulson (1996) noted that, “When considered within the broader context in which they are emitted, affective responses can serve as discriminative stimuli [for other people] for the use of such modifiers as *happy*, *sad*, *surprised*, *dismayed*, and *puzzled* – terms that are used to draw inferences about a person’s emotional or physiological state” (p. 291). Whereas the term *emotion* refers to an unobservable private event, the term *affect* refers to behavior that “includes observable aspects of a person’s facial, verbal, postural, and gestural response repertoires” (Gena et al., 1996, p. 291).

In applied research, it is important to reinforce and maintain appropriate social responding under the appropriate stimulus conditions (Stokes & Baer, 1977; Sulzer-Azaroff & Mayer, 1991). Multiple-exemplar training is one of several procedures that have been used to program for the transfer of training effects to novel conditions. Stokes and Baer (1977) stressed the use of multiple-exemplar training as a technique to promote generalization. Training sufficient exemplars has been successful in the generalization of

greeting responses (Stokes, Baer, & Jackson, 1974) and conversational speech (Garcia, 1974) across experimenters in children with mental retardation. Multiple-exemplar training was also used to teach children with mental retardation (Baer, Peterson, & Sherman, 1967) and infants under two years of age (Poulson & Kymissis, 1988) to imitate untrained motor stimulus models, which were presented as probe trials interspersed among other stimulus models that were trained.

Reeve (2001; Reeve, Reeve, Townsend, & Poulson, 2007) used multiple-exemplar training, modeling, and reinforcement to address a social-psychological phenomenon, namely prosocial behavior. Reeve (2001) used stimulus classes that were clearly defined and provided conditions that were explicitly stated. Specifically, Reeve used three stimulus components to set the occasion for helping behavior to occur, thus increasing the probability of generalization to a wide range of stimuli. Reeve referred to these stimulus components as (a) *nonverbal* discriminative stimuli, which designate a variety of age-appropriate materials (e.g., toys, art supplies); (b) *verbal* discriminative stimuli, which designate verbalizations emitted by the experimenter, such as “Oops, I dropped them” (p. 93); and (c) *affective* discriminative stimuli, which Reeve did not define, but provided examples for. Using those examples, the *affective* component category could be distinguished from the *nonverbal* category in that the affective discriminative stimuli consisted of nonverbal facial and gestural expressions emitted by the experimenter (e.g., opening the eyes wide), whereas what Reeve referred to as the nonverbal discriminative stimuli consisted of objects made available in the experimental setting and used by the experimenter to set the occasion for helping behavior to occur. Each of these three component categories (i.e., *nonverbal*, *verbal*, and *affective*) had five

stimuli particular to the category. For example, the affective category consisted of the following five discriminative stimuli, all of which were nonverbal: (a) shaking the head, (b) rolling the eyes, (c) sighing, (d) wrinkling the brow, and (e) opening the eyes wide. These stimuli were not presented in isolation, but rather, they were presented together with discriminative stimuli that belonged to each of the nonverbal and verbal components. The three-component stimulus compound (verbal-nonverbal-affective) was set to signal the helping response correlated with reinforcement. Reeve's study showed that the following procedures were sufficient to produce generalization: (a) multiple-exemplar training within and across response categories; and (b) training across instructors and settings.

In their respective studies, Buffington (1996) and Brim (2002) also used behavior-analytic principles to address nonverbal communication and social referencing in children with autism. As with prosocial behavior, such skills might be important in helping people with autism establish, improve upon, and maintain appropriate social behavior. Acquiring appropriate affective responding is especially important, because it is a relevant component in mostly all social skills. It is, therefore, not surprising that Reeve's (2001; Reeve et al., 2007) discriminative stimuli consisted of not only a verbal component, but also an affective component, to set the occasion for helping responses to be emitted.

Affective Behavior in Children with Typical Development

Discrimination and Expression of Affective Responses

At two or three months of age, babies start to discriminate several affective expressions and facial features displayed by their parents (Bee, 1995; Haviland & Lelwica, 1987). In a study by Haviland and Lelwica (1987), 12 mothers presented happy,

sad, and angry facial expressions, each to her 10-week-old infant. Simultaneously with the presentation of these facial expressions, mothers were asked to continuously say to the infants, “You make me so happy (sad or mad)” (p. 98). These affect-specific statements emitted by the mothers matched the facial expression they were to display at a given trial. Infants’ facial expressions, gazing, and vocalizations were recorded using videotapes, audio tapes, and a system especially designed to record facial expressions. The results showed that the infants discriminated each of the three facial expressions displayed by their mothers at varying levels of accuracy. The infants displayed facial expressions that matched those of their mothers in two of the four trials in which the mothers presented facial expressions associated with happiness, in three of the four trials in which the mothers presented facial expressions associated with anger, and in all four trials in which the mothers presented facial expressions associated with sadness. According to the authors, this finding was of particular importance, because it not only provided evidence that the infants discriminated the facial and vocal cues associated with anger, sadness, and happiness, but that they do so under three months of age. Haviland and Lelwica noted that earlier research had shown that infants could make such discriminations only at six months of age.

Infants’ discrimination of other people’s emotions is not limited to those emotions displayed by the parents. At five or six months of age, infants start to discriminate those expressions and features displayed by strangers as well (Caron, Caron, & Myers, 1982; Nelson, 1987). Caron et al. presented four-, five-, and seven-month-old infants with photographs of their mothers displaying facial expressions that were either familiar (e.g., happy) or novel (e.g., surprise). The study consisted of two conditions. The first consisted

of (a) a training phase, which the authors called *the four-exemplar condition*, because it included the serial presentation of four different faces (stimuli), all of which displayed what came to be the familiar facial expression (i.e., happy); and (b) a test phase, in which two novel faces were presented, each displaying the familiar facial expression and the novel facial expression. The second condition was identical to the first, except that the training phase of the second condition consisted of *single-exemplar training*, because the familiar facial expression was displayed using only one face, rather than four. Caron et al. measured infants' ability to discriminate between familiar and novel expressions in terms of the extent to which they *fixated* on familiar and novel stimuli. The results demonstrated that only seven-month-old infants successfully discriminated familiar and novel expressions across different models.

Infants learn not only to discriminate among the various affective responses expressed by other people in their environment, but they also learn to express affective responses, themselves (Bee, 1995). In a study by Zahn-Waxler and Radke-Yarrow (1982), mothers were trained to observe and record the behavior their children emitted in response to other people's affective displays. The children had an age range of nine months to two-and-a-half years. The results showed that, whereas the younger children responded to distress by engaging in distressful behavior (e.g., crying), the older children displayed empathetic responses (e.g., providing hugs and kisses to the victim).

Furthermore, research has shown that, early on, children develop their social skills as they form relationships not only with their parents and other adults, but also with their siblings and peers (Rubin, Bukowski, & Parker, 1998). At four years of age, children engage in "sociodramatic" or "pretend" play, which involves collaboration and sharing

during playing behavior, thus strengthening the relationship between the playmates. Whereas parallel play involves playing side by side, and occasional sharing of toys, but without an effort to collaborate or interact with one another, sociodramatic play involves communication and interaction between players (Rubin et al., 1998). It is at this age that children's understanding of affect expands, and this "ability to grasp others' emotions is... no doubt an important ingredient in the preschooler's emerging ability to form individual friendships" (Bee, 1995, p. 241). In fact, Rubin et al. (1998) argued that those children who are among the most popular members of their group are those who understand and interpret their peers' perspectives the best. Upon reviewing the cognitive-developmental literature on peer interactions and relationships, and their long-term effects, Rubin et al. concluded that without these skills that are essential in social interaction, children tend to be neglected or rejected from peer groups.

Appropriate Affective Responding

It is in the context of social interaction that discussion of appropriate affective responding becomes especially relevant, because affective responses (e.g., facial, verbal, or gestural) have important social-communicative functions. Affective displays help the viewer make inferences about a person's emotional state, and they can set the occasion for social interactions to occur. In fact, nonverbal behavior, specifically facial expressions, seems to be so indispensable that people communicating with one another electronically often use "emoticons" (emotion icons) that are symbols that help the writer communicate better what he or she means (Sanderson, as cited in Brehm, Kassin, & Fein, 2002). Affective displays can include gestures as well. As Buffington (1996) described, "Gestural behavior, like spoken languages, serves a multitude of purposes. The use of

gestures can serve as either a complement to, or substitute for, spoken language... Gestural behavior... plays an integral role in the development and maintenance of social relationships” (pp. 1-2).

Affective Behavior in Children with Autism

People with autism have profound deficits in nonverbal behavior (e.g., facial expressions) that hinder or prevent appropriate responding that is essential for the initiation and maintenance of social interactions (Gaylord-Ross et al., 1984; Krantz & McClannahan, 1993; McEvoy, Nordquist, Twardosz, Heckaman, Wehby, & Denny, 1988; Rutter & Schopler, 1987; Yirmiya, Kasari, Sigman, & Mundy, 1989). One factor that seems to be a crucial ingredient for appropriate, sustainable social interactions is affective behavior. Indeed, Feldman, Philippot, and Custrini (1991) showed that deficits in displaying contextually appropriate affective behavior can have adverse effects on a person’s social development. The present study is specifically concerned with affective behavior in children with autism.

A literature search using the PsychInfo database (from 1950 to 2004) and the Journal of Applied Behavior Analysis (from 1968 to 2004) determined that Gena’s (1994) study, published as Gena et al. (1996), seemed to be the only study that used behavioral procedures to address the problem of affective behavior in people with autism. Search terms included *affect*, *emotion*, and *affective behavior* or *displays*. In the course of data collection for the present study, a study by Gena, Couloura, and Kymissis (2005), also addressing affective behavior in people with autism from a behavioral perspective, was published.

A study by Cooke and Apolloni (1976) used the behavior-analytic procedures of modeling, praise, and verbal instructions to increase the rates of smiling, sharing, positive physical contact, and complimenting. The children who participated in that study, however, did not have a diagnosis of autism, but rather were students with learning disabilities. Although the authors indicated that the children's academic failures were precipitated by their "inappropriate social-emotional behavior in the company of peers" (p.66), they did not specify what they meant by "inappropriate social-emotional behavior." Furthermore, the authors did not observe or measure that behavior themselves, but, rather, relied on reports made by the parents and teachers. Moreover, the authors indicated that the children were verbally prompted to smile while in the playroom, but they did not specify the stimulus conditions provided for the children to engage in social or affective responding. It was also not clear whether the opportunities for displaying socially appropriate affect were provided by the experimenter or whether they occurred incidentally and were thus reinforced. Despite these limitations, however, Cooke and Apolloni's (1976) study provided a starting point for further investigations of social behavior from a behavioral perspective.

In both of her studies, Gena discussed the role appropriate affect plays in achieving social interactions among youths with autism at their school setting (Gena et al., 1996) and among pre-schoolers with autism at their homes (Gena et al., 2005). Gena et al. (1996) emphasized the relations between the appropriateness of affective behavior (i.e., displaying affect that is contextually and topographically appropriate) and the achievement of effective social communication. Gena et al.'s (1996) study pointed out

that individuals with autism do emit affective responses, such as laughing, smiling, and crying, but that they often do so non-contextually.

Gena et al. (1996) used in-vivo modeling, verbal prompting, reinforcement, and multiple-exemplar training to teach four youths with autism to emit affective behavior in a contextually appropriate manner. Gena et al. (2005) used the same behavioral procedures used in the earlier study with the addition of video-modeling to teach preschoolers with autism to engage in appropriate affective responding. In both studies, Gena referred to sets of discriminative stimuli as a “scenario,” which she defined as a question or a statement provided by the therapist to the participant (Gena et al., 1996). In her original study, the statement or question corresponded to one of five response categories that were used in that study. Namely, the response categories were: (a) Talking about favorite subjects with animation, (b) Responding to absurdities, (c) Showing sympathy, (d) Showing appreciation, and (e) Indicating dislike (Gena, 1994). In the 2005 study, the response categories were: (a) Showing sympathy, (b) Showing appreciation, and (c) Showing disapproval. To respond to a given set of affective stimuli in Gena’s (1994) study, four youths with autism were trained to (a) make eye contact with the therapist providing the affective stimuli; (b) make an appropriate, experimenter-specified verbal statement that was contextual with the affective stimuli provided; and (c) emit a nonverbal response that was contextual with the affective stimuli as specified by the experimenter.

The results of Gena’s (1994; Gena et al., 2005) experiments demonstrated that operant procedures, namely, reinforcement, modeling, and error-correction procedures, as they were presented together in the treatment package, were effective in training youths

and pre-schoolers with autism to emit appropriate affective responses of various categories. In addition, because tests of generalization (Keller & Schoenfeld, 1950) would help determine the extent to which trained responses transfer to new situations, Gena (1994) withheld reinforcement and correction during tests of generalization to determine the extent to which appropriate nonverbal and verbal affective responding transferred to conditions that had not been trained before. Gena tested for appropriate affective responding emitted by the participants following the presentation of affective stimuli made (a) by three therapists who were not involved in training, and (b) in settings outside the training classroom (e.g., recreational area). In her subsequent study (Gena et al., 2005), generalization from teaching to test conditions was assessed across different therapists as well as the mothers of the pre-schoolers. This assessment was conducted following the conclusion of the treatment condition. In addition, Gena conducted follow-up sessions one month following the completion of treatment for three of the four participants (1994) and one and three months following the completion of treatment with all participants (Gena et al., 2005).

As Green (2001) emphasized, stimulus control principles play an important role in teaching procedures that have been developed for learners with autism. Stimulus control plays a role in affective behavior in particular. As Gena (1994) noted, people with autism do emit a wide range of affective responses, but not under the appropriate stimulus conditions. One might solve this problem by teaching the discrimination between contextually appropriate and inappropriate affective responses, and by strengthening the contingency between those stimulus conditions and the appropriate affective responses that one would expect to see in typically developing people. Appendix A is a review

paper by the author that provides a closer look at affective behavior and the stimulus control literature with respect to its potential use to promote appropriate affective behavior in children with autism.

The purpose of the present study was to expand on the study conducted by Gena (1994) to teach children with autism to display affect in a contextually appropriate manner. Consistent with Gena's experiment, the present study used behavioral procedures implemented in that study, such as modeling, error-correction, reinforcement, and multiple-exemplar training. The present study expanded upon the Gena (1994) study in three ways. First, Gena's (1994) study examined matching responses only; two observers judged whether there was a similarity between the responses emitted by the model and the participant. The present study measured the affective behavior of the participants directly and independently of that displayed by the model.

Second, in the Gena (1994) study, "scenarios" were presented to evoke matching affect. Observers recorded whether there was a match between some behavior of the model and some behavior of the participant, but there was not attempt to measure the responses of the participants. In the present study, specific facial, vocal, and verbal discriminative stimuli were defined and measured directly on each trial.

Finally, during the last two decades, more researchers in experimental behavior analysis have attended to the topography of responses, not just their quantitative properties (e.g., Midgley, Lea, & Kirby, 1989); Pear & Legris, 1987; Stokes & Balsam, 1994). The present study used a shaping procedure to help determine exactly when the criterion for reinforcement needed to be shifted to more difficult responses that approximated terminal affective responding.

Method

Participants

The participants were three male children enrolled at the New York Child Learning Institute (NYCLI), which is a private school with a behavior analytic orientation for children and youths with autism. The participants, Andy, Carl, and Marc, had a diagnosis of autism, which was given by an independent agency prior to their enrollment at NYCLI. On the first baseline session, Andy was 13 years and 4 months of age, Carl was 9 years and 5 months of age, and Marc was 12 years and 2 months of age. On the last treatment session, Andy was 14 years and 4 months of age, Carl was 10 years and 5 months of age, and Marc was 12 years and 10 months of age. At the time of his second follow-up session, Andy was 14 years and 10 months of age, Carl was 10 years and 7 months of age, and Marc was 13 years of age. They had all been enrolled at NYCLI for at least 6 years, during which time they received educational intervention, and all participants resided with their natural families. All participants were responsive to their individualized motivational systems (described below); they responded well to therapist-directed instructions; and they engaged in minimal stereotypic behavior. Before this study started, the parents of all three participants provided written consent for their child's participation in the study.

When the study began, Andy had been enrolled at NYCLI for 10 years. He spoke in full sentences with clear articulation. Andy's facial expression was often a neutral, serious one. Andy did not display a sad facial expression when a situation should have evoked empathy or sympathy. In fact, Andy typically smiled or laughed during such occasions. Andy's vocal intonation was monotonous.

At the beginning of the study, Carl had been enrolled at NYCLI for 6 years. He spoke in full sentences with clear articulation. Carl's facial expression was often a neutral, serious one. Though he engaged in appropriate smiling and laughing, it was often noncontextual (e.g., when a peer engaged in disruptive behavior). On certain occasions, Carl engaged in appropriate, contextual smiling and laughing. Such contextual affective responding, however, occurred during preferred activities with peers, such as having a race. Carl did not smile during social interactions, when given a compliment, when offered a preferred stimulus, or when greeted by a teacher or visitor to the classroom. During verbal interactions, Carl used an unnatural, stereotypic vocal intonation.

At the time of his participation in this study, Marc had been enrolled at NYCLI for 9 years. He spoke in full sentences with clear articulation. Marc's facial expression was often a neutral, serious one. Rarely, Marc engaged in appropriate, contextual smiling and laughing. Such contextual affective responding, however, occurred during social interactions with some of his caregivers in a manner that was not age-appropriate. Marc did not consistently smile during social interactions, when given a compliment, when offered a preferred stimulus, or when greeted by a teacher or visitor to the classroom. During verbal interactions, Marc used an unnatural, stereotypic vocal intonation.

Setting

All sessions were conducted in a classroom at NYCLI. The classroom was furnished with desks and chairs, bookcases, computers, printers, and television sets. At any point during an experimental session, the number of children in the classroom, including a given participant, varied from one to nine. In addition, the number of teachers in the classroom, including the experimenter and secondary observer(s), varied from one

to seven during an experimental session. During a session, a participant sat at a table across from the experimenter. The experimenter placed on the table data sheets, the participant's motivational system, and, during the treatment condition, a sheet that included written scripts, on the table. A video camera was used to videotape approximately one-half of all experimental sessions. The camera recorded a front view of the participant. A second camera was used to videotape approximately one-quarter of all experimental sessions. This camera was used to record a front view of the experimenter.

Stimuli

Table 1 provides an outline that lists the steps and rules followed by the experimenter in a typical experimental session. Four affective categories were used during training for each participant, namely, (a) *Responding to Absurdities*, (b) *Expressing Empathy*, (c) *Expressing Excitement*, and (d) *Expressing Gratitude and Appreciation*. Each affective category included a total of 18 verbal discriminative stimuli or statements. Of the 18 statements, nine were designated by the experimenter as *training trials*. The remaining nine statements were designated as *untrained probe trials*, three of which were used in a given session. Whereas the nine statements designated as *training trials* remained the same across all experimental sessions, the three statements designated as *untrained probe trials* varied across sessions. Each of the nine statements used as probes had an equal probability of occurring in a given session. The differences between the baseline, treatment, and follow-up phases of this study are described in detail below. With respect to the differences between *training trials* and *probe trials*, in the baseline and follow-up phases, only the experimenter-based designations distinguished the two trial types. In the treatment phase, however, a training trial was followed with the

implementation of an affect-training program, using experimental procedures, such as modeling and reinforcement, described in further detail below. The affect-training program was not implemented following probe trials in the treatment phase. Hence, probe trials were the same throughout the study.

In a given session, statements from affective categories were presented in rotated sets of three for Andy and Carl, and an average of three-statement sets for Marc. That is to say, for Andy and Carl, three statements from each affective category were presented successively prior to the presentation of another set of three statements for a different affective category. For Marc, an *average* of three statements constituted a set that was presented prior to the presentation of another set from another affective category.

Additionally, the following two rules were used when planning and conducting a session:

(a) A session always started with a training trial, and (b) During the running of a given session, if a participant earned an opportunity to consume a reinforcer, only a training trial would resume the session. That is to say, a probe trial never started or resumed a session.

The sequence of affective categories presented varied from one session to the next. For example, statements from the *Empathy* category might have been presented first in a given session, followed by statements from the *Gratitude and Appreciation* category, followed by *Excitement*, and *Absurdities*. In the following session, *Excitement* might have been presented first, followed by *Empathy*, then by *Absurdities*, and finally by *Gratitude and Appreciation*. The experimenter paused for approximately 5 s between affective categories. In addition to using different combinations of probes in each session, the

sequence of statements used varied across sessions. That is to say, a different order was used to present the statements from session to session.

General Procedures

The experimenter, who served as the primary therapist and observer, conducted all sessions with all three participants. To assess generalization of treatment effects across people, three other therapists conducted several experimental sessions with Carl and Marc.

Experimental sessions were conducted an average of four times a week for Andy and Carl, and an average of seven times a week for Marc. At the start of each experimental session, the participant was seated at a table in the classroom. An experimental session began when the experimenter presented an affective stimulus and ended after 48 trials. The experimenter initiated the session by providing the nonverbal and verbal discriminative stimuli for the specific affective trial. A trial consisted of the presentation of a statement that belonged to one of the four affective categories. The experimenter presented the statement, which was the verbal discriminative stimulus, using the vocal intonation and facial expression appropriate for that affective category. For example, the experimenter smiled broadly, baring her teeth (i.e., the experimenter presented the components of the nonverbal discriminative stimulus: facial expression), and the experimenter used a lively intonation and a loud and clear voice to say, "My parents are taking me to the movies tonight!" (i.e., the experimenter presented the verbal discriminative stimulus, with the components of the nonverbal discriminative stimulus: vocal intonation). The instructor waited for 5 s for the child to emit the appropriate verbal and motor responses. What followed depended on whether the trial was a training or

probe trial, and whether the baseline or treatment phase was in effect for that trial (described below). A session lasted between 15 and 45 minutes, depending on the phases of the experiment. Towards the end of the treatment phases, when the participants were no longer receiving extensive training and had mastered the target responses, sessions lasted approximately 15 minutes. Sessions lasted the longest, approximately 45 minutes, when a new category entered the treatment phase.

Measurement Procedures: Independent Variable

The independent variable was the implementation of an affect training program, consisting of modeling, script-fading, shaping, reinforcement, and multiple-exemplar training.

Modeling the target responses. As described above, during all trials, the experimenter modeled appropriate affect while presenting all affective stimuli during baseline, treatment, and follow-up phases of the study. In addition, during the treatment phase, the experimenter also modeled the appropriate set of nonverbal responses to be emitted by the participant following the presentation of the discriminative stimuli associated with an affective category. Modeling the target responses was systematically faded as appropriate affective responding, with all verbal and motor components, increased. The fading steps were tailored to the needs of each participant, and will be described later in the Results and Conclusions section of the paper.

Scripts and script fading. A written script and script-fading procedure were used to teach appropriate verbal responses, or *scripted verbalizations*. Written scripts were faded from end to beginning until there were no more words on the paper. Subsequently, the presence of the paper was faded out gradually for Carl and Marc. For these two

participants, after the last script-fading level was reached during the treatment condition, the sheet was present on 100% of training trials, then on 67%, 56%, 44%, 33%, 22%, and 11% of training trials. Finally, the paper, itself, was removed.

An *unscripted verbalization* was defined as a verbalization that a participant provided in response to an affective stimulus initiated by the experimenter. An unscripted verbalization had two features that distinguished it from a scripted one. First, an unscripted verbalization was emitted when scripts were partially or completely faded. Second, an unscripted verbalization differed from a scripted verbalization, at minimum, by a noun, a verb, or an adjective. For example, whereas the verbalizations “You are too kind to ask” and “It is nice of you to ask” are scripted, “It is kind of you to ask” is unscripted.

Shaping and reinforcement. For certain responses, such as smiling in response to a statement that was designed to evoke excitement, behavior-specific praise and reinforcers were provided based on the shaping procedure that was used. During a given session, the experimenter recorded affective responses across (a) facial expression, (b) vocal intonation, and (c) verbal productions. The experimenter used a shaping procedure based on the extent to which a child’s responses across the two nonverbal responses approximated the terminal affective responses. The shaping procedure was individualized.

Experimenter-based criteria were used for providing and withholding reinforcement during the shaping procedure. These criteria will be specified later, but the information provided in this section was generally in effect for all participants. Behavior-specific praise and reinforcers were provided during a given session in the following two

ways. First, regardless of performance on specific trials, throughout the study, behavior-specific praise statements and other reinforcers were provided for appropriate orienting responses and for participation in the sessions, based on the child's individualized motivational system. An individualized motivational system is a token system of reinforcement through which a participant earns tokens in the form of checks or yeses, exchangeable for preferred activities. For each participant, the same motivational system was used throughout the school day. Two points concerning reinforcement are worth mentioning here. First, the experimenter used a dense schedule of reinforcement at the start of treatment for a given affective category, and a lean schedule towards the end of the treatment phases, when the participants had mastered the target responses. Typically, experimental sessions lasted longer towards the beginning of treatment phases than towards the end. The longer a session lasted, the more likely a participant was to earn all of his tokens and consume a reinforcer. Second, when the experimenter reinforced appropriate orienting responses during probe trials across all phases of the study and during baseline and follow-up sessions, the reinforcer-delivery occurred 5 s following a given trial, thus ensuring that reinforcement was not inadvertently provided contingent upon affective responding during nonreinforced trials.

Second, during each training session, the experimenter used a *decision tree* to determine whether reinforcement should be provided or withheld contingent upon a given response. The decision tree consisted of a list of target (terminal) affective responses that were appropriate to facial expressions. For each target response (e.g., smiling or laughing ironically at an *absurd* statement), a list of approximations to the target response were specified, and experimenter-based criteria were provided to help the experimenter

determine, during an experimental session, whether a response is an approximation to the terminal behavior and whether reinforcement should be provided or withheld. Such decisions were based on performance on the previous session. Table 2 provides a list of responses that approximated target facial expressions that were specified by the experimenter in the present study.

Multiple-exemplar training. This study programmed for generalization by using multiple-exemplar training. Each of the four affective categories consisted of a pool of 18 statements. In addition, different nouns were used across different experimental sessions. For example, rather than saying, “My parents are taking me to the movies tonight!” in each session, the experimenter varied the statement by substituting one or two nouns (e.g., “My parents are taking me out to dinner tonight!”).

Error-correction procedures. Error-correction procedures in the form of verbal prompts were used as well to train appropriate responding (e.g., “This is a sad sentence. Please show me a sad face.”). Error-correction procedures were used when a participant erred by (a) not responding to an initiation; or (b) responding incorrectly or correctly, but below the criterion level, on one or more of the three components that constituted the dependent variable described below, namely, *vocal intonation*, *facial expressions*, and *verbalizations*. Error-correction procedures were used, as needed, but only following responding on training trials in the treatment phase. Verbal prompts were faded quickly. When a participant erred on a trial following extensive treatment sessions (e.g., after a participant had achieved a minimum of 78% correct on a given component), the experimenter provided an expectant look or the verbal instruction, “Try again,” to prompt

him to respond appropriately, rather than specifying the affective category and the particular set of responses that correspond to it.

Measurement Procedures: Dependent Variable

The dependent variable was appropriate affective responding. The dependent measure was the percentage of trials during which appropriate affective responding occurred. For all experimental sessions, data were collected separately for motor and verbal responses emitted by the participants. The percentage of appropriate facial expressions alone, appropriate vocal intonation alone, and appropriate verbal responses alone were calculated for training and probe trials for each baseline and training session for each participant.

Measurement Procedures: Response Definitions

Tables 3 through 6 list the specific verbal discriminative stimuli that were presented as training trials and as generalization probes for each participant across the four affective categories, *Absurdities*, *Empathy*, *Excitement*, and *Gratitude*, respectively. Also listed in each table are the nonverbal discriminative stimuli, consisting of facial expression and vocal intonation, that correspond to each affective category. It is important to note that, in this study, vocal intonation is considered a nonverbal component of affective behavior because, whereas a verbalization provides the *content* of a response, vocal intonation provides a separate measure of the *quality* or *appropriateness* of a response.

Table 3, concerning *Absurdities*, lists the verbal discriminative stimuli that were presented by the experimenter as training trials and as generalization probes in this affective category. Also listed are the nonverbal discriminative stimuli presented by the

experimenter. The nonverbal stimuli consisted of (a) Vocal intonation, and (b) Facial expressions. In the *Absurdities* category, the stimuli that defined vocal intonation were (a) a moderate-to-high pitch, (b) a lively intonation, and (c) a loud and clear voice. The experimenter used these nonverbal stimuli to present statements that were designed to evoke an appropriate response. In addition, the experimenter displayed an ironic facial expression, which involved (a) smiling broadly, baring the experimenter's teeth; (b) wrinkling the experimenter's eyes; and (c) moving the experimenter's head slightly backwards, while stretching her neck, thus suggesting to the participant that the verbal statement was not a serious one. For Marc, however, rather than displaying an ironic smile, which he might have confused with a smile expressing excitement or appreciation, which will be described below, the experimenter displayed a facial expression that involved (a) turning the experimenter's head slightly obliquely; (b) gazing at the participant from the corners of the experimenter's eyes; and (c) smiling in a controlled way, without baring the experimenter's teeth. Later in the study, when Marc had received extensive training on the *Absurdities* category, the experimenter displayed an ironic smile while presenting the absurd statements.

Table 4, concerning *Empathy*, lists the verbal discriminative stimuli that were presented by the experimenter as training trials and as generalization probes in this affective category. Also listed are the nonverbal discriminative stimuli presented by the experimenter. In the *Empathy* category, the stimuli that defined vocal intonation were (a) a sad intonation, and (b) a low voice. The experimenter used these nonverbal stimuli to present statements that were designed to evoke an empathetic response. In addition, the experimenter displayed a sad facial expression, which involved (a) slightly tilting the

experimenter's head; and (b) wrinkling the experimenter's eyebrows, thus suggesting to the participant that the verbal statement bore sad news.

Table 5, concerning *Excitement*, lists the verbal discriminative stimuli that were presented by the experimenter as training trials and as generalization probes in this affective category. Also listed are the nonverbal discriminative stimuli presented by the experimenter. In the *Excitement* category, the stimuli that defined vocal intonation were (a) a lively intonation, and (b) a loud and clear voice. In addition, the experimenter displayed a happy facial expression, which involved smiling broadly, baring the experimenter's teeth, thus suggesting to the participant that the verbal statement bore exciting news.

Table 6, concerning *Gratitude and Appreciation*, lists the verbal discriminative stimuli that were presented by the experimenter as training trials and as generalization probes in this affective category. Also listed are the nonverbal discriminative stimuli presented by the experimenter. In the *Gratitude and Appreciation* category, the stimuli that defined vocal intonation were (a) a moderate-to-lively pitch, (b) a moderate-to-lively intonation, and (c) a loud and clear voice. In addition, the experimenter displayed a facial expression that involved smiling without necessarily baring the experimenter's teeth, thus suggesting to the participant that the verbal statement was a friendly one.

Table 7 lists the verbal and nonverbal responses that were taught across the four affective categories that were used in this study: (a) *Responding to Absurdities*, (b) *Expressing Empathy*, (c) *Expressing Excitement*, and (d) *Expressing Gratitude and Appreciation*. The verbal responses were designed to teach the participants to express the affect that corresponded to the category to which the statement presented by the

experimenter belonged. Similar to the nonverbal discriminative stimuli, the nonverbal responses consisted of (a) Vocal intonation, and (b) Facial expressions. The definitions of the nonverbal responses were consistent with those used to define the nonverbal discriminative stimuli.

In the preliminary stages of this study, the primary and secondary observers attempted to include *gestures* and *postures* as two additional components to the dependent variable. These components were dropped, however, because the observers failed to obtain agreement on their occurrence and appropriateness. Whereas additional observer training and editing of the response definitions of these components would have improved interobserver agreement, it was decided that addressing facial expressions and vocal intonation would be more important for the purposes of this study.

Interobserver agreement. The experimenter, who served as the primary therapist, and five secondary observers obtained point-by-point interobserver agreement on 46% of the sessions corresponding to each experimental condition for Andy and Marc, and on 64% of the sessions corresponding to each experimental condition for Carl. Before their data could be used, observers were trained to a criterion of at least 80% interobserver agreement on two consecutive sessions. The percentage of interobserver agreement was calculated by dividing the number of agreements by the total number of agreements and disagreements, then multiplying the quotient by 100.

Tables 8, 9, and 10 summarize interobserver-agreement data obtained for Andy, Carl, and Marc, respectively, in the baseline, treatment, and follow-up phases of the study. Data that fell below the 80% agreement criterion are shaded. Overall, the agreement data were high. They were the highest in baseline, followed by the treatment

phase and follow-up sessions. Agreement data were higher for verbal than for nonverbal responses. Among the nonverbal responses, agreement data were higher for vocal intonation than facial expressions. Fractions were included in these tables because the numbers on which the percentages were based varied greatly. Providing the fractions might allow the reader to judge the reliability of the data.

Table 11 provides a summary of interobserver agreement data and ranges of scores obtained on appropriate *vocal intonation*, *facial expression*, and *verbal responding* in the baseline, treatment, and follow-up phases across participants.

Procedural integrity. Procedural-integrity measures were obtained also on 46% of the sessions for Andy and Marc, and 64% of the sessions for Carl. Reliability measures were obtained on the presentation of all the discriminative stimuli associated with a given affective trial under each affective category, and on the delivery or withholding of consequences following each trial. The score for this measure was 92% reliability across all experimental conditions for all participants. Interobserver agreement obtained for procedural integrity was 98%.

Experimental Procedures

Baseline sessions. Training and probe trials were presented during baseline sessions, but neither trial type was followed with reinforcement or treatment of affective behavior. Reinforcement in the form of behavior-specific praise and tokens, based on the existing individualized motivational system for each child, was provided contingent upon appropriate orienting responses (e.g., establishing eye contact with the experimenter) that were independent of the target affective responses.

A trial was terminated 5 s after the presentation of the discriminative stimuli. The baseline phase was concluded for each participant when stable performance was observed upon visual inspection of the data for the percentage of trials in which appropriate affective responding occurred.

Treatment sessions. During treatment sessions, both training and probe trials were presented. Training trials were followed with the treatment, but probe trials were not. During training trials, if the child emitted the correct verbal and motor responses within 5 s of the presentation of the discriminative stimuli used in the trial, the experimenter reinforced the appropriate affective responding using behavior-specific praise and the child's individualized motivational system. An affective response was considered incorrect if one or more of the nonverbal and/or verbal responses was missing from a child's response to a given affective stimulus, or if the child did not respond within 5 s following the presentation of the discriminative stimuli used for that trial. If the child emitted an incorrect affective response, the experimenter implemented an error-correction procedure in the form of modeling, prompting, and using scripts and script-fading.

Follow-up sessions. Two follow-up sessions were conducted for each participant. For Andy, the first follow-up session was conducted 7 weeks after treatment was concluded. The second follow-up session was conducted 25 weeks after treatment. For Carl, the follow-up sessions were conducted 6 and 13 weeks following the conclusion of treatment, respectively. For Marc, the follow-up sessions were conducted 7 and 11 weeks after treatment concluded. During following-up sessions, training and probe trials were presented as they were during baseline sessions; neither trial type was followed with reinforcement or treatment of affective behavior. Reinforcement in the form of behavior-

specific praise and tokens, based on the existing individualized motivational system for each child, was provided contingent upon appropriate orienting responses (e.g., establishing eye contact with the experimenter). A trial was terminated 5 s after the presentation of the discriminative stimuli.

Experimental Design

A multiple-baseline-across-affective-categories experimental design was used to assess the effects of an affect training program on increasing the occurrence of contextually appropriate affective responding in three children with autism. The sequence that was used for a category to enter the treatment condition varied based on the skills and needs of each child, as judged by a team of therapists along with the experimenter.

Social Validity Measure

A measure of social validity was obtained in the present study. Eight students enrolled in a graduate-level Applied Behavior Analysis course in the Department of Psychology at Queens College were asked to make a judgment on the effectiveness of the affect-training program upon viewing segments of videotapes of affective responding emitted during nine trials in baseline and nine in treatment, resulting in nine pairs of segments. The order of presentation of the paired segments was randomly assigned across participants, affective categories, and experimental phases. In addition, the sequence of presentation of segments within each pair was randomly assigned across phases. The scorers were asked to determine whether the participants' affective behavior was judged as more appropriate following treatment than during baseline conditions. In addition, the scorers were asked to judge the appropriateness of the verbal responses that were taught

in the present study. A copy of the instructions that were provided for scorers is included in Appendix B.

Results and Conclusions

Individual results for each participant are graphically plotted and presented in Figures 1 through 15, as outlined in Table 12. The reader is encouraged to examine the table before reading further. The results on training and probe trials across baseline and treatment phases of the study will be described in detail and separately for each participant starting in the next paragraph. A description of performance during follow-up sessions will be presented later in this section. For each participant, appropriate affective responding was displayed in three functions: (a) verbal responding, represented by squares; (b) vocal intonation, represented by triangles; and (c) facial expressions, represented by circles. Responding was represented by filled symbols during training trials, and by open symbols during probe trials. The vertical, dashed lines show the points at which different phases were introduced. The first dashed line from the left indicates the end of baseline and the start of treatment across categories. The second vertical dashed line separates the treatment phase from the follow-up sessions conducted. Also presented on the figures are arrows that indicate key fading steps for each participant, and shaping steps that were used to shape appropriate facial expressions for Andy (for smiling) and Marc (for displaying a sad facial expression). The shaping steps will be described and presented in a table later in this section.

Results for Andy

Verbal responding. As shown in Figure 1, there was a systematic increase in the percentage of training trials during which Andy emitted appropriate verbal responding with the introduction of the affect-training program. Therefore, the affect-training program was successful in producing appropriate verbal responding to affective

statements. Furthermore, there was a systematic increase in the percentage of nonreinforced probe trials in which Andy emitted appropriate verbal responding following the introduction of the affect-training program during the training trials. Thus, the effects of the affect-training program generalized from the training trials to the probe trials.

It should be noted that Andy did not remain silent during the baseline phase of the study. Aside from irregularities in his verbal responding, described in detail below, Andy typically responded to the initiations made by the experimenter by reiterating those initiations, except that he would use different nouns, verbs, and/or pronouns. For example, to the initiation “I woke up with a terrible headache,” Andy would respond by saying “I woke up with the flu this morning.”

Vocal intonation. As shown in Figure 2, the same functions that were observed for Andy’s verbal responding were observed for his vocal intonation. Irrespective of the affective category, Andy’s vocal intonation was, for the most part, neutral and monotonous during the baseline phase. The systematic change in vocal intonation with the introduction of the affect-training program permits the observer to conclude that the intervention package was effective in causing the change during training trials. In addition, generalization from training to probe trials on vocal intonation was observed.

Facial expression. Andy displayed a flat, neutral facial expression during the baseline phase of the study, across affective categories. Facial expression was clearly more difficult for Andy to learn than were verbal responding and vocal intonation, as shown by the longer acquisition curves in Figure 3. Nevertheless, the affect-training program was successful for both training and probe responding.

The three responses together during training trials. Figure 4 shows the percentage of *training* trials during which Andy emitted appropriate affective responding, as displayed in three functions: (a) verbal responding, represented by filled squares; (b) vocal intonation, represented by filled triangles; and, (c) facial expression, represented by filled circles. When presented all together, the three functions in Figure 4 show the extent to which the implementation of the affect training program was effective in increasing appropriate affective responding with respect to verbalization, vocal intonation, and facial expression. More importantly, Figure 4 makes more visible the difference in the acquisition of each of the three responses, highlighting that, for Andy, displaying appropriate facial expressions was the hardest response to learn.

The three responses together during probe trials. Figure 5 shows the percentage of *probe* trials during which Andy emitted appropriate affective responding, as displayed in three functions: (a) verbal responding, represented by open squares; (b) vocal intonation, represented by open triangles; and, (c) facial expression, represented by open circles. When presented all together, the three functions in Figure 5 show the extent to which the implementation of the affect training program was effective not only in increasing appropriate affective responding with respect to verbalization, vocal intonation, and facial expression on training trials, on which treatment was implemented, but also in the generalization of treatment effects from training to probe trials. In addition, Figure 5 makes more visible the difference in the generalization of each of the three responses, highlighting that, for Andy, appropriate facial expressions was the hardest response to display under probe conditions.

Some irregularities in verbal responding with Andy in baseline. It should be noted that, as seen in Figure 1, there were some irregularities with respect to verbalizations in baseline for Andy. There were two instances in which Andy emitted appropriate verbal responding to statements initiated by the instructor during baseline. The first started on the seventh session, when treatment was introduced for *Empathy*. During the first two *Empathy* treatment sessions, the experimenter kept the sheet with the written scripts on the table even when presenting statements that belonged to the remaining three affective categories still in baseline. In fact, the sheet not only included the written scripts for *Empathy*, but it also included labels of the four affective categories using adjectives that would be easily understood by the participants. *Sad Talk*, *Funny Talk*, *Kind Talk*, and *Happy Talk*, were written on the sheet, with scripts for *Sad Talk* (i.e., *Empathy*) presented below that label. Following the presentation of *Excitement* statements, Andy modified the written scripts intended for *Empathy* by replacing adjectives such as “sad” with “happy,” “funny,” or “kind,” and used those scripts to respond to *Excitement*, *Absurdities*, and *Gratitude* statements, respectively. The percentage of appropriate verbal responding was the highest for *Excitement*. Andy emitted appropriate verbal responding on 78% of the trials on the seventh and eighth sessions (i.e., the first two sessions following the start of treatment for *Empathy*). As of the ninth session, the experimenter removed the sheet with the category labels and scripts from Andy’s view when presenting statements that belonged to the other three affective categories still in baseline. Andy’s appropriate verbalizations declined systematically, stabilizing at 0% correct.

The second instance in which Andy emitted appropriate verbal responding to statements initiated by the instructor during baseline occurred towards the end of that

phase for *Excitement*. During the first 40 sessions of his participation, Andy happened to be scheduled to engage in non-research related, education programming outside the classroom as the experimenter had research sessions with another participant, Carl. The results obtained with Carl will be described later in this section, but suffice it to say that, throughout the baseline phase, Carl responded to statements in *Excitement* by saying “That’s great.” Due to a change in the classroom schedule, on the day of Andy’s 41st session, Andy was present in the classroom when Carl had his session. Even though Andy was working at his desk, which was located approximately 20 m away from Carl and the experimenter, it seems that Andy overheard the exchanges made between them. At that point, only *Excitement* was still in baseline for Andy. Starting with the next session, Andy used the appropriate verbal response, “That’s great,” and variations of it (e.g., “That’s good”) to respond to initiations in the *Excitement* condition. With the introduction of treatment, however, the increase in appropriate verbal responding was markedly higher than that observed in baseline.

Results for Carl

Verbal responding. As shown in Figure 6, there was a systematic increase in the percentage of training trials during which Carl emitted appropriate verbal responding with the introduction of the affect-training program. Therefore, the affect-training program was successful in producing appropriate verbal responding to affective statements. Furthermore, there was an increase in the percentage of nonreinforced probe trials in which Carl emitted appropriate verbal responding following the introduction of the affect-training program during the training trials. Thus, the effects of the affect-training program generalized from the training trials to the probe trials. Similar effects

were observed when the affective stimuli were presented by the experimenter as well as other therapists

It is important to note, however, that the increase in appropriate verbal responding during probe trials in *Gratitude* did not occur immediately following the introduction of the affect-training program during the training trials, but rather 16 sessions following its introduction. This is because during the first 15 sessions of treatment, Carl seemed to have discriminated between the two trial types, based on the presence (during training trials) or absence (during probe trials) of the sheet with the written scripts, and he responded accordingly. Carl emitted appropriate affective responding during training trials, but not during probe trials. With the introduction of Fading Level 4 (displayed as “F4” on the figure), which will be described later in this section, there was a systematic increase in the percentage of appropriate verbal responding during probe trials. This is also true for appropriate verbal responding during the probe trials in *Absurdities*.

As far as the *Empathy* and *Excitement* categories are concerned, Carl’s appropriate verbal responding in baseline was *not* absent. In fact, Carl emitted appropriate verbal responding throughout the baseline phases in both categories. Nonetheless, there was very little variety in the verbalizations that he emitted. For example, to initiations in *Empathy*, Carl reliably responded by saying “That’s not good.” To initiations in *Excitement*, he used up to four variations: “That’s great,” “That’s good,” “That’s cool,” and “That’s nice.” Very rarely did Carl use the last two variations; this was true since the early experimental sessions in the baseline condition. A verbalization was judged as appropriate if emitted not more than twice in a given session. It is important to note that once the affect-training program was introduced and prior to the systematic

fading of the sheet with the scripts during training trials for *Empathy* and *Excitement*, the only appropriate verbalizations that Carl emitted during probes were those he had emitted in baseline (e.g., “That’s not good” and “That’s great”).

Vocal intonation. Across affective categories, Carl’s vocal intonation was, for the most part, unnatural and stereotypic during the baseline phase. As shown in Figure 7, there was a systematic increase in appropriate vocal intonation for Carl with the introduction of the affect-training program. In addition, generalization from training to probe trials on vocal intonation was observed, similar to that observed with verbal responding. Again here, there was a delay in the onset of the systematic increase of appropriate vocal intonation during probe trials. The systematic increase across categories coincided with the gradual fading of the sheet with the written scripts during training, not with the start of the affect-training program. These results were true when different therapists other than the experimenter presented the discriminative stimuli.

Facial expression. As shown in Figure 8, the same functions that were observed in vocal intonation were observed for Carl’s facial expression, with the experimenter and different therapists presenting the discriminative stimuli. The same pattern of generalization from training to probe trials was observed on facial expression as with vocal intonation, as it coincided with the gradual fading of the sheet with the written scripts during training, not with the start of the affect-training program.

In addition, Figure 8 shows that Carl emitted appropriate facial expressions when responding to affective stimuli presented in the baseline conditions of the *Absurdities* and *Excitement* categories. Furthermore, these increases in the display of appropriate facial expressions became more apparent when the affect-training program was implemented on

the *Empathy* category. It is possible that this was a coincidence. Alternatively, it could be that Carl's receiving affect training in the *Empathy* category taught him to respond appropriately not only to that category, but also to the two other categories still in baseline. It might be relevant to indicate here that the experimenter relied on the verbal error-correction procedure to prompt Carl to display a *sad* facial expression, and specifically to abstain from smiling during the *Empathy* category. This kind of prompting might have inadvertently taught Carl the following discrimination: *Display a sad facial expression during the Empathy category, and smile during the "non-Empathy" categories*. Nonetheless, Carl's use of appropriate facial expressions increased further and systematically when treatment was implemented across categories. It is also possible that the implementation of the affect-training program in the second affective category, *Empathy*, caused Carl to attend to the fact that his task was to *imitate the experimenter's facial expression*. Subsequently, he imitated the experimenter's facial expression during the baseline phase of *Absurdities* and *Excitement*.

The three responses together during training trials. Figure 9 shows the percentage of *training* trials during which Carl emitted appropriate affective responding, as displayed in three functions: (a) verbal responding, (b) vocal intonation, and (c) facial expression. Figure 9 makes more visible the difference in the acquisition of each of the three responses, highlighting that, for Carl, displaying appropriate facial expressions was the hardest response to learn during the *Empathy* category, and using appropriate vocal intonation was the hardest response to learn in the *Absurdities* category.

The three responses together during probe trials. Figure 10 shows the percentage of *probe* trials during which Carl emitted appropriate affective responding, as displayed

in three functions: (a) verbal responding, (b) vocal intonation, and (c) facial expression. The three functions in Figure 10 show the extent to which the fading procedure was effective not only in increasing appropriate affective responding with respect to verbalization, vocal intonation, and facial expression on training trials, on which treatment was implemented, but also in the generalization of treatment effects from training to probe trials.

Results for Marc

Verbal responding. As shown in Figure 11, there was a systematic increase in the percentage of training trials during which Marc emitted appropriate verbal responding with the introduction of the affect-training program. In addition, there was an eventual increase in the percentage of nonreinforced probe trials in which Marc emitted appropriate verbal responding following the introduction of the affect-training program during the training trials. Thus, the effects of the affect-training program generalized from the training trials to the probe trials. These effects were consistent irrespective of whether the experimenter or other therapists presented the affective stimuli.

The increase in appropriate verbal responding during probe trials across three of the four affective categories did not occur immediately following the introduction of the affect-training program during the training trials, but rather following the introduction of Fading Level 5 towards the end of the treatment conditions. This is because, as was observed with Carl, Marc discriminated between the two trial types, based on the presence (during training trials) or absence (during probe trials) of the sheet with the written scripts, and he responded accordingly. Marc emitted appropriate affective responding during training trials, but not during probe trials. With the introduction of

Fading Level 4 (displayed as “F4” on the figure), which will be described later in this section, there was an increase in the percentage of appropriate verbal responding during probe trials. This was true for appropriate verbal responding during all affective categories, except *Gratitude*, because the appropriate verbal responses that Marc emitted during probe trials in both baseline and treatment phases were limited to polite verbalizations, such as “No, thank you,” which was in his language repertoire before this study began. A verbalization was judged as appropriate if emitted not more than twice in a given session. These results were consistent even when different therapists presented the affective stimuli.

Vocal intonation. Like Carl, and across affective categories, Marc’s vocal intonation was judged as unnatural and stereotypic during the baseline phase. As shown in Figure 12, there was a systematic change in vocal intonation with the introduction of the affect-training program for Marc. In addition, the same generalization from training to probe trials observed with vocal intonation was observed with verbal responding. Here, too, there was a delay in the onset of the systematic increase of appropriate vocal intonation during probe trials. The systematic increase across categories coincided with the gradual fading of the sheet with the written scripts during training, not with the start of the affect-training program. These results were consistent across different therapists presenting the affective stimuli.

Facial expression. As shown in Figure 13, the same functions that were observed in vocal intonation were observed for Marc’s facial expression. Even though Marc’s appropriate facial responding was not at zero during the baseline phases across the *Gratitude* and *Excitement* categories, there was a systematic increase in facial expression

with the introduction of the affect-training program, not only with those two categories, but also across *Absurdities* and *Empathy*. In addition, the same generalization from training to probe trials observed with facial expression was observed with vocal intonation. There was a delay in the onset of the systematic increase of appropriate facial expression during probe trials across categories, as it coincided with the gradual fading of the sheet with the written scripts during training, not with the start of the affect-training program.

The three responses together during training trials. Figure 14 shows the percentage of *training* trials during which Marc emitted appropriate affective responding, as displayed in three functions: (a) verbal responding, (b) vocal intonation, and (c) facial expression. Figure 14 shows the extent to which the implementation of the affect training program was effective in increasing appropriate affective responding with respect to verbalization, vocal intonation, and facial expression. Figure 14 highlights that, for Marc, displaying appropriate facial expressions was the hardest response to learn during the *Empathy* category, and using appropriate vocal intonation was the hardest response to learn in the *Excitement* category.

The three responses together during probe trials. Figure 15 shows the percentage of *probe* trials during which Marc emitted appropriate affective responding, as displayed in three functions: (a) verbal responding, (b) vocal intonation, and (c) facial expression. Figure 15 highlights that the fading procedure was effective not only in increasing appropriate affective responding on training trials, but also in the generalization of treatment effects from training to probe trials.

A Measure of Acquisition of Affective Responding

One measure of acquisition of affective responding can be obtained from the number of sessions that was required for each participant to meet the mastery criterion of 89% correct on three consecutive sessions for each measure of affective responding, on training and probe trials, across the four affective categories (Buffington, 1996). As can be seen in Table 13, which summarizes these results, in most cases, across participants, trial types, and affective categories, *verbal responding* seemed to be acquired faster than both forms of nonverbal affective responding. Therefore, verbalizations were very easily evoked by the presentation of the scripts with the start of the treatment condition. *Vocal intonation* and *facial expressions* were acquired more gradually, with more difficulty for both training and probe trials. Furthermore, the data for facial expressions show that it was more difficult for Andy to smile, be it for *Absurdities*, *Gratitude*, or *Excitement*, than it was for him to display a sad facial expression for *Empathy*. The opposite was true for Carl and Marc; it was substantially more difficult for them to display a sad facial expression for *Empathy* than it was to smile during the other three affective categories. The difficulty lay in the fact that Carl and Marc tended to smile when presented with *Empathy* statements.

Follow-up Sessions

Tables 14, 15, and 16 show the percentage of accurate performance on training and probe trials across all baseline and the two follow-up sessions for Andy, Carl, and Marc, respectively.

Follow-up sessions with Andy. As shown in Table 14, the percentage of appropriate affective responding emitted by Andy across all three components –

verbalization, vocal intonation, and facial expression – and across all four affective categories and both trial types, was better on follow-up sessions than in baseline. This was not true for facial expression during probe trials in the *Excitement* category, however, in which appropriate responding was at 0% during both phases. Moreover, despite the otherwise improved performance across the board, the extent to which appropriate affective behavior was maintained through the follow-up sessions varied for Andy. Maintenance of appropriate affective responding was the highest for *Empathy*, then for *Gratitude*, then for *Absurdities*, and the lowest for *Excitement*.

Follow-up sessions with Carl. As shown in Table 15, the percentage of appropriate affective responding emitted by Carl with respect to the three components of affective behavior, across all four affective categories, and across both trial types, was better on follow-up sessions than in baseline. For Carl, maintenance of appropriate affective responding was very high during training trials in the *Absurdities*, *Excitement*, and *Gratitude*. It was the lowest in *Empathy*. During probe trials, maintenance of appropriate affective responding was the highest in *Empathy* and the lowest in *Absurdities*. Overall, however, Carl engaged in appropriate affective responding through both follow-up sessions.

Follow-up sessions with Marc. As shown in Table 16, the percentage of appropriate affective responding emitted by Marc with respect to the three components of affective behavior, across all four affective categories, and across both trial types, was better on follow-up sessions than during baseline. For Marc, maintenance of appropriate affective responding was very high irrespective of affective category or trial type. It was lower, however, for facial expressions than for the other two components of affective

behavior. Nonetheless, Marc's affective responding improved substantially following the implementation of the affect-training program, and the effects of that program lasted beyond its conclusion.

Levels of Script Fading

Tables 17 through 20 show the levels of script fading that were used for Andy during the *Absurdities*, *Empathy*, *Excitement*, and *Gratitude* categories, respectively. These tables also indicate the point at which the script sheet, itself, was removed from Andy's view during treatment. It is important to note that, unlike Carl and Marc, who failed to generalize from training to probe trials until a later fading step was implemented, Andy did freely generalize from training to probe trials from the beginning of the affect-training program. Hence, Andy was the only participant whose performance on probe trials, as shown in Figures 1 through 5, described earlier in this section, generalized systematically with the introduction of treatment across affective categories.

Tables 21 through 24 show the levels of script fading and graduated removal of the script sheet used with Carl during the *Absurdities*, *Empathy*, *Excitement*, and *Gratitude* categories, respectively. Tables 25 through 28 show the levels of script fading and sheet removal used with Marc during the four affective categories, respectively. For both of these participants, the start of the graduated removal of the script sheet played a crucial role in the generalization of appropriate affective responding from training to probe conditions, thus increasing the percentage of appropriate responding during probe trials. As detailed in the tables, the fading of the script sheets was carried out systematically across affective categories for Carl. For Marc, however, the presentation of the script sheets was faded simultaneously across all four categories following the

introduction of treatment in the final category. Earlier in the study, when treatment was introduced only in *Absurdities* for Marc, the experimenter attempted to fade the script sheet gradually (displayed as Fading Level “F4*” on Marc’s figures and in Table 25). At the time, all other categories were in baseline. Marc started to use verbalizations that were appropriate for *Absurdities* to respond to affective stimuli that belonged to the other three categories. For example, to the statement “I am having a terrible headache,” which belonged to the *Empathy* category, Marc would respond by saying “That’s so silly!”. Because of this inappropriate generalization of affective responding across categories, the experimenter reinstated the script sheet for *Absurdities* and the decision was made to delay the fading of script sheets until treatment has been implemented with all categories.

Shaping Steps for Andy and Marc

Tables 29 and 30 identify the steps that were used in the shaping procedure implemented for Andy and Marc, respectively. These tables present performance-based, explicitly defined responses, from initial to appropriate facial expressions Andy and Marc emitted. This detailed analysis was carried out for this particular component of affective behavior, and particularly for *smiling* with Andy and for *displaying a sad facial expression* with Marc, because these responses proved most challenging for them.

Scripted and Unscripted Verbalizations

Figures 16 through 21 show percentages of trials during which participants emitted scripted (filled squares) and appropriate unscripted (open squares) verbalizations when responding to affective stimuli. Figures 16, 18, and 20 depict scripted and unscripted verbalizations during *training* trials for Andy, Carl, and Marc, respectively. Figures 17, 19, and 21 depict scripted and unscripted verbalizations during *probe* trials. A

visual inspection of these data shows that, in general, there was a slight increase in the percentage of unscripted verbalizations from baseline to treatment conditions across affective categories. This was true for Andy and Marc, but not for Carl.

Figure 16, which depicts scripted and unscripted verbalizations during training trials for Andy, shows that the percentage of unscripted verbalizations increased following the introduction of the affect-training program in all affective categories, except *Absurdities*. Figure 17, which depicts these data during probe trials for Andy, shows that the percentage of unscripted verbalizations increased following the introduction of the affect-training program across two of the affective categories, *Empathy* and *Excitement*.

Figures 18 and 19, which display the percentage of scripted and unscripted verbalizations during training and probe trials for Carl, respectively, show that there was virtually no increase in the percentage of unscripted verbalizations as a function of the implementation of the affect-training program. It was only during the probe trials in the *Empathy* category that there was an initial increase in unscripted verbalizations. As noted earlier, however, these were repetitive in nature. Possible explanations for this failure will be presented in the Discussion.

Figures 20 and 21, depicting the percentage of scripted and unscripted verbalizations during training and probe trials for Marc, respectively, show that there was an increase in unscripted interactions in two affective categories, *Absurdities* and *Excitement*, across both trial types, following the introduction of the affect-training program. Figure 21, however, shows a decrease in unscripted verbalizations produced in *Gratitude*.

Social Validity

With respect to the social validity measure addressing the appropriateness of the affect-training program, the scorers correctly identified trials that were obtained following the implementation of the affect-training program across affective categories and participants in 98% of the trials presented. With respect to the appropriateness of the verbal responses that were taught across categories, *prior* to viewing the video footage, the scorers provided verbal responses that they deemed appropriate for each affective category. The verbalizations they provided for *Absurdities* were the same as five of the nine verbalizations used in this study. The verbalizations provided for *Empathy* were similar to four of the nine used in this study. The verbalizations provided for *Excitement* and *Gratitude* were similar to three of the nine used for each.

Discussion

This study demonstrated that, with the successive introduction of treatment across affective categories, systematic increases in appropriate verbalizations, vocal intonation, and facial expression were observed during training trials with all three participants. Therefore, one may conclude that the affect-training program was effective in increasing contextual affective behavior. The effects of the affect-training program generalized from the training trials to the probe trials, when different, nonreinforced affective stimuli were presented by the experimenter. In addition, with two of the three participants, Carl and Marc, the effects of the affect-training program generalized when affective stimuli, both training trials and nonreinforced probes, were presented by different therapists. These results were consistent with those obtained in Gena's experiments (1994; Gena et al., 2005).

The diagnosis of autism is largely based on deficits in social interaction and communication (American Psychiatric Association, 1994), be it verbal or nonverbal communication. Krantz and McClannahan (e.g., Krantz & McClannahan, 1993; McClannahan & Krantz, 2005) developed a new technology to increase the frequency and complexity of social initiations emitted by children and youths with autism, thus addressing the *verbal* aspect of social communication. It is important to note that Krantz and McClannahan included a *nonverbal* requirement in their definition of appropriate interaction. A verbal interaction was deemed appropriate when it was emitted with an appropriate orienting response. Furthermore, other aspects of *nonverbal* social communication have been addressed during the past decade by a number of studies. These have included topics such as social referencing (e.g., Brim, 2002), the use of

gestures in nonverbal communication (e.g., Buffington, 1996), affective behavior (Gena, 1994; Gena et al., 2005), and pro-social behavior (Reeve et al., 2007). The present study contributed to that literature.

Prior to the implementation of the affect-training program in the present study, nonverbal affective responding, be it in the form of vocal intonation or facial expression, emitted by the participants was consistent with Rutter's (1966) description. Rutter indicated that most children with autism "showed little variation in their facial expression, appearing deep in thought, or solemn, or serious. They did not exhibit their feelings and showed little warmth or affection. They rarely appreciated humour and failed to show sympathy or empathy for other people" (p. 57).

With respect to appropriate nonverbal responding in the form of vocal intonation, Andy's use of appropriate vocal intonation was virtually absent during baseline conditions across affective categories. Furthermore, very rarely did Carl or Marc emit appropriate vocal intonation when responding to affective stimuli during baseline conditions across categories. As for the occurrence of appropriate facial expressions, none of the participants emitted a sad facial expression during baseline conditions to show empathy. This was true even when appropriate verbal responding occurred, as in the case with Carl, who repetitively responded to empathy-evoking statements by saying "That's not good." Furthermore, very rarely did a participant emit an appropriate facial expression during baseline in response to absurd statements and statements that were designed to evoke gratitude and appreciation, and very rarely did Andy emit an appropriate smile when responding to excitement-evoking statements. In the cases of Carl and Marc, however, appropriate smiling *did* occur during baseline in the *Excitement*

category. The percentage and appropriateness of smiling increased substantially with the introduction of the affect-training program, but it was nonetheless present consistently through the baseline conditions for these two participants.

It is unlikely for the observed increase in appropriate smiling to have been the result of reinforcement because reinforcement was not provided contingent upon appropriate affective behavior during baseline conditions. Two possible explanations are offered instead. First, it is conceivable that the fact that three of the four affective categories involved smiling – albeit different types of smiles – contributed to a spread of effects from treatment conditions in the *Absurdities* and *Gratitude* categories to baseline conditions in the *Excitement* category. Second, it is possible that Carl and Marc emitted appropriate facial responding during this category because the statements presented during *Excitement* were similar to social interactions that had been taught in their education programming. The latter explanation is consistent with one offered by Rutter (1966), in which he suggested that failures of comprehension could be responsible for perceived aloofness when describing affective behavior of children with autism. Carl and Marc's contact with social interactions designed to evoke excitement through their education programming at NYCLI might have contributed to their non-zero baseline during *Excitement* in the present study.

With respect to the *irregularities in verbal responding* observed with Andy during baseline, the percentage of appropriate verbal responding was the highest for *Excitement*, perhaps because more verbalizations made sense when Andy used adjectives that expressed excitement instead of empathy than when he used adjectives that expressed gratitude or responded to absurdities. Andy's appropriate verbalizations declined

systematically perhaps because of the environmental change that was imposed (the removal of the sheet with the category labels and scripts from Andy's view during the presentation of the affective categories still in baseline) and because no reinforcement was provided following appropriate verbalizations to statements in baseline.

As in Gena's (1994; Gena et al., 2005) studies, the present study demonstrated that applied-behavior-analytic procedures could change the affective behavior of children with autism, teaching them to display appropriate facial expressions and to use expressive vocal intonation, which, in turn, might change the manner in which others perceive them.

Gena's (1994) study showed that students with autism could learn appropriate affective responding. In that study, however, the student behavior was not directly measured. Instead, observers scored whether they thought there was a match between the students' behavior and the imitative stimuli presented by the model. In the present study, the observers directly measured the responses emitted by the student, independently of the imitative stimuli presented by the model. This study presented and analyzed each of the three components separately, thus examining the extent to which each response changed with the successive implementation of the treatment package. Separating affective components might help the affect-training programmer or therapist understand the relative ease with which components would be taught. This bears on the use of shaping, which helped increase the appropriateness of affective responding, particularly with one component: facial expression.

While the main contribution of the present study pertained to the components of nonverbal communication, another contribution pertained to verbal communication. The literature on social initiations among people with autism (e.g., McClannahan & Krantz,

2005) demonstrated that the use of scripts and a script-fading procedure increased not only the number of social initiations emitted by learners, but also increased the variety and complexity of such initiations. The present study used scripts and script fading to teach the participants to emit contextual verbalizations when responding to affective statements. Using this procedure resulted in the emergence of unscripted verbalizations that, by definition, differed from the scripted responses taught prior to the start of the fading process. In the present study, the nonverbal components of affective responding were considerably more challenging than the verbal component. It was more challenging for both parties, the participants and the experimenter, to increase the occurrence of contextual facial expression and vocal intonation, and to improve their quality. This might have contributed to the scarcity of unscripted verbalizations in the present study, because providing differential contingencies for the more difficult unscripted utterances and the less difficult scripted utterances might have adversely affected performance on the nonverbal components. This is an empirical question, however, that could be asked in a subsequent study. Future research might also help integrate affect-training programs in education programming, targeting affective behavior during social interactions – those that are initiated by students, or those with which students respond to initiations made by conversation partners.

Procedures that encourage unscripted interaction (e.g., McClannahan & Krantz, 2005) typically would require participants to *initiate* social interactions and to engage in *extended* interactions that help to sustain a conversation. It is very likely that the tight stimulus control, forced by the trial-by-trial procedure used in this study, might have

inhibited the development of unscripted verbalizations. A future study might require extended conversation after each affective initiation.

Another limitation of the present study was its failure to demonstrate that the effects of the affect-training program maintained through time for all target components of affective responding, and with all three participants. It would be important for future research to use leaner schedules of reinforcement before concluding treatment conditions, to ensure longer maintenance of affective behavior.

In addition, the present study failed to program for generalization from trained to untrained settings. Gena's (1994) experiment conducted post-treatment tests of generalization across settings. The present study did not do so. Future research might find it beneficial to program for generalization across settings, through the different phases of the study, from baseline to treatment to post-treatment.

Another interesting question that this study failed to ask is concerned with identifying which component or combination of components were needed for the acquisition of appropriate affective responding. The time it took to complete the treatment phases of this study did not allow the experimenter to perform a component analysis. It is possible, however, that all components of the affect-training program were needed, given the difficulty and complexity associated with the target affective responses, especially the non-verbal ones. For future research, it might be informative to perform a component analysis of the conditions needed to *maintain* appropriate affective responding. Following the conclusion of treatment, an experimenter could eliminate one or more sources of stimulus control from the treatment package. For example, facial discriminative stimuli could be eliminated if an experimenter presents the remaining

discriminative stimuli (i.e., vocal intonation and verbal statement) in a telephone conversation.

Gena (1994) noted the difficulty associated with the assessment of the *appropriateness* of the affective displays that the youths in her study were trained to use. Gena indicated that “it is difficult to separate affective deficits from other deficits associated with autism” (p. 61). Gena reported a personal communication with D. M. Baer, in which he suggested that parents and experimentally naïve observers be asked to indicate “whether and to what extent they considered those changes [in affective responding from baseline to treatment conditions] to be important for the participants” (p. 61).

The social validity measures obtained for the present study showed that affective responding emitted by the participants was judged as more appropriate following treatment when compared to baseline conditions. In addition, the results obtained with respect to verbalizations showed that most of the verbal responses that were taught in the present study were judged as appropriate. This was an important finding because one might argue that children or youths typically would not use sophisticated or proper verbalizations, such as “It is so kind of you to ask,” or “That’s so upsetting,” when responding to questions or statements that are designed to evoke gratitude or empathy. Such proper verbalizations were used in this study, particularly in the *Empathy*, *Excitement*, and *Gratitude* categories. The present study targeted social interactions that occurred between students and their teachers. It was, therefore, appropriate to encourage the use of proper, polite verbalizations. Less formal and more casual responses might be

appropriate when teaching students to engage in social interactions with their peers or siblings.

The use of sophisticated verbalizations that consist of three or more words, such as those taught in the present study, might be beneficial to these students. Longer verbalizations might compensate for a deficit in nonverbal affective responding by placing the power of expression on the verbal component of the response. This premise assumes that a deficit in nonverbal affective responding might be apparent even after the conclusion of affect-training programs that had reversed it during the course of treatment, but not beyond its implementation.

In his discussion of the traditional literature on affective behavior, Schlinger (1995) noted that cognitive-developmental psychologists were interested not in an examination of the observable characteristics of affective behavior and the contingencies of reinforcement that form and maintain it, but rather in internal processes and events that cannot be observed or measured. Schlinger (1995) demonstrated that behavior-analytic principles can be successfully used to examine the responses that are relevant to empathy and other affective responses, because these principles parsimoniously “look at the specific behaviors from which these concepts are inferred and . . . ask about their controlling variables” (p. 242). The results obtained in the present study further supplement Schlinger’s conclusion. In this study, three components of affective responding in children with autism were experimentally analyzed, and specific affective responses from which concepts such as *empathy*, *excitement*, *gratitude* and *irony* can be inferred were appropriately emitted.

Table 1

An Outline that Lists Steps and Rules Followed by the Experimenter in a Typical Experimental Session

I- Experimental Sessions across All Phases of the Study

- a. A trial was defined as the presentation of a verbal discriminative stimulus, or statement, along with the nonverbal discriminative stimuli of facial expression and vocal intonation.
- b. The experimenter presented 48 trials in each experimental session.
- c. The 48 trials had the following arrangement:
 - i. Twelve trials belonged to the each of the four affective categories.
 1. Nine were designated by the experimenter as *training trials*.
 2. Three were designated by the experimenter as *probe trials*.

II- Experimental Sessions during the *Baseline Phase*

- a. The experimenter presented all 48 trials in each experimental session.
- b. The affect-training program was *not* implemented on either trial type.
- c. The only distinguishing feature between the trial types was the experimenter-based designations.

III- Experimental Sessions during the *Treatment Phase*

- a. The experimenter presented all 48 trials in each experimental session.
- b. The affect-training program was implemented following the presentation of *training trials*.
- c. The affect-training program was *not* implemented following the presentation of *probe trials*.

Table 1

An Outline that Lists Steps and Rules Followed by the Experimenter in a Typical Experimental Session

(Continued)

IV- Experimental Sessions during the *Follow-Up Sessions* (Identical to *Baseline Conditions*)

- a. The experimenter presented all 48 trials in each experimental session.
- b. The affect-training program was *not* implemented on either trial type.
- c. The only distinguishing feature between the trial types was the experimenter-based designations.

V- Additional Rules Followed by the Experimenter in a Typical Experimental Session

- a. For Andy and Carl, the experimenter presented trials from affective categories in rotated sets of three (e.g., Three trials from *Empathy* were followed by three trials from *Absurdities*, and so on, until 16 three-trial sets – a total of 48 trials – were presented.).
- b. For Marc, the experimenter presented trials from affective categories in rotated sets that consisted of an *average* of three trials (e.g., *Four* trials from *Empathy* were followed by *two* trials from *Absurdities*, and so on, until all 48 trials were presented.).
- c. For all participants, an experimental session always started with a *training trial*.

Table 1

An Outline that Lists Steps and Rules Followed by the Experimenter in a Typical Experimental Session

(Continued)

- d. During a given experimental session, if a participant earned an opportunity to consume a reinforcer, only a *training trial* would resume the session.
- e. The sequence of affective categories presented varied across sessions.
- f. The sequence of statements (i.e., verbal discriminative stimuli) used varied across sessions.

Table 2

Responses that Approximated Target Facial Expressions as Specified by the Experimenter

- I- Approximations to Target Facial Expressions Following *Absurdities*:
 - a. Displaying a neutral facial expression
 - b. Displaying a small smile by slightly stretching one's sealed lips upwards
 - c. Displaying a broad smile by considerably stretching one's sealed lips upwards
 - d. Displaying a broad smile while baring one's teeth, and possibly laughing as well [Target Response]

- II- Approximations to Target Facial Expressions Following *Empathy*:
 - a. Displaying a neutral facial expression
 - b. Displaying a serious facial expression
 - c. Displaying a serious facial expression while tilting or shaking one's head
 - d. Displaying a sad facial expression (stretching one's sealed lips downwards) while tilting or shaking one's head [Target Response]

- III- Approximations to Target Facial Expressions Following *Excitement*:
 - a. Displaying a neutral facial expression
 - b. Displaying a small smile by slightly stretching one's sealed lips upwards
 - c. Displaying a broad smile by considerably stretching one's sealed lips upwards
 - d. Displaying a broad smile while baring one's teeth [Target Response]

Table 2

Responses that Approximated Target Facial Expressions as Specified by the

Experimenter

(Continued)

- IV- Approximations to Target Facial Expressions Following *Gratitude and Appreciation*:
- a. Displaying a neutral facial expression
 - b. Displaying a small smile by slightly stretching one's sealed lips upwards
 - c. Displaying a broad smile by considerably stretching one's sealed lips upwards [Target Response]

Table 3

Verbal and Nonverbal Discriminative Stimuli Presented by the Experimenter in the Absurdities Category

| | Verbal Discriminative Stimuli Presented by the Experimenter | | Nonverbal Discriminative Stimuli | |
|------|---|--|--|-----------------------|
| | Used as Training Trials (All Were Used in Each Session) | Used as Generalization Probes (Rotated Sets of Three Were Used in Each Session) | Vocal Intonation | Facial Expressions |
| Andy | 1- I look like Nemo the fish! 2- My dog can read and write! 3- You hair just turned green! 4- My cat will start going to school next year! 5- I wear my shoes on my ears on weekends! 6- I have an apartment on the moon! 7- I come to school by plane everyday! 8- I turned 250 last December! 9- I can make my nose grow so long and touch the ceiling! | I have five legs! My neighbor has 50 kids! I go swimming at the library! I spent a million dollars on my lunch yesterday! My sister can make a cow fly! My name is Funkalose di Okra! Every year, it snows in July and August in New York! Oops, I forgot my nose at home! My brother drank a 100 gallons of orange juice for breakfast! | 1- Moderate-to-high pitch 2- Lively intonation 3- Loud and clear voice | Ironic smile or laugh |
| Carl | 1- I look like Nemo the fish! 2- My dog can read and write! 3- I have five legs! 4- You hair just turned green! 5- My cat will start going to school next year! 6- My neighbor has 50 kids! 7- I go swimming at the library! 8- I have an apartment on the moon! 9- I turned 250 last December! | I can make my nose grow so long and touch the ceiling! I wear my shoes on my ears on weekends! I come to school by plane everyday! Oops, I forgot my nose at home! I spent a million dollars on my lunch yesterday! My sister can make a cow fly! My name is Funkalose di Okra! Every year, it snows in July and August in New York! My brother drank a 100 gallons of orange juice for breakfast! | | |
| Marc | 1- I have five legs! 2- I have three eyes on my forehead! 3- My dog flies! 4- My cat has 10 legs! 5- I have purple eyes! 6- My sister can make a cow fly! 7- My name is Mother Goose! 8- Cats bark all the time! 9- Oops, I forgot my nose at home! | I look like Thomas the Tank Engine! I can make my nose grow so long and touch the ceiling! You look like Abby Yo Yo! You hair just turned green! My cat sleeps in the fridge! I wear my shoes on my ears! Thomas the Tank Engine looks just like Cinderella! I come to school on weekends! I swim in the snow! | | |

Table 4

Verbal and Nonverbal Discriminative Stimuli Presented by the Experimenter in the Empathy Category

| | Verbal Discriminative Stimuli Presented by the Experimenter | | Nonverbal Discriminative Stimuli | |
|------|--|--|---|--------------------|
| | Used as Training Trials (All Were Used in Each Session) | Used as Generalization Probes (Rotated Sets of Three Were Used in Each Session) | Vocal Intonation | Facial Expressions |
| Andy | <ol style="list-style-type: none"> 1- I woke up with a terrible headache. 2- I forgot to bring my lunch with me. 3- Someone stole my purse on the bus. 4- My tummy hurts so much. 5- I fell on my way back home yesterday. 6- My neighbor twisted her ankle very badly. 7- The door slammed on my baby nephew's hand. 8- My feet hurt so much; they're killing me. 9- Someone stole my brand new bicycle from the garage. | <ol style="list-style-type: none"> My mom is very sick today. The airline canceled my flight. I'll miss my sister's wedding. My grandma's puppy died yesterday. A man stepped on my toe; it hurts terribly. I miss my dad terribly; I have seen him since August. My dad called yesterday to tell me that my rabbit died. My sister & her family are moving to CA; I won't see them for another year. I cry every time I think of my grandpa, because I miss him so much. I mistakenly shut the door on my little brother's tiny hand. He cried a lot. | <ol style="list-style-type: none"> 1- Sad intonation 2- Low voice | Sad |
| Carl | <ol style="list-style-type: none"> 1- I woke up with a terrible headache. 2- Someone stole my purse on the bus. 3- My mom is very sick today. 4- My tummy hurts so much. 5- I fell on my way back home yesterday. 6- My grandma's puppy died yesterday. 7- The door slammed on my baby nephew's hand. 8- My feet hurt so much; they're killing me. 9- The airline canceled my flight. I'll miss my sister's wedding. | <ol style="list-style-type: none"> I forgot to bring my lunch with me. My neighbor twisted her ankle very badly. Someone stole my brand new bicycle from the garage. I miss my dad terribly; I have seen him since August. My dad called yesterday to tell me that my rabbit died. A man stepped on my toe; it hurts terribly. I cry every time I think of my grandpa, because I miss him so much. My sister & her family are moving to CA; I won't see them for another year. I mistakenly shut the door on my little brother's tiny hand. He cried a lot. | | |
| Marc | <ol style="list-style-type: none"> 1- My mom is very sick today. 2- I missed my sister's birthday party. 3- My grandma's puppy died yesterday. 4- I miss my dad terribly. 5- I miss my mom so much. 6- My rabbit died. 7- A man stepped on my toe; it hurts terribly. 8- My sister is moving to another city; I'm gonna miss her. 9- I shut the door on my little brother's hand. He cried a lot. | <ol style="list-style-type: none"> I woke up with a terrible headache. I forgot to bring my lunch with me. I lost my bag on the bus. My tummy hurts so much. I fell on my way back home yesterday. My neighbor twisted her ankle very badly. My brother hurt his hand so badly. Someone stole my brand new bicycle from the garage. My feet hurt so much; they're killing me. | | |

Table 5

Verbal and Nonverbal Discriminative Stimuli Presented by the Experimenter in the Excitement Category

| | Verbal Discriminative Stimuli Presented by the Experimenter | | Nonverbal Discriminative Stimuli | |
|------|---|--|--|--------------------|
| | Used as Training Trials (All Were Used in Each Session) | Used as Generalization Probes (Rotated Sets of Three Were Used in Each Session) | Vocal Intonation | Facial Expressions |
| Andy | 1- I'm ordering Sushi Ginza for dinner! 2- I had spaghetti with clams from Cascarino's! 3- My parents are taking me to the movies tonight! 4- I'm going for dinner at my friend's house on Saturday! 5- I saw Marta's baby girl! She's so cute! 6- My mom cooks the best meals just for me! 7- We're getting a huge trampoline for the backyard! 8- My dad takes me out to dinner every weekend, and he lets me choose the restaurant! 9- I'm going shopping for new clothes and new toys this weekend! | I might go swimming tomorrow! My brother makes me laugh the most! I'm going to the beach this weekend! I won \$5,000 in the lottery! My dad got me a brand new bike for my birthday! I'm going to Disneyland with my family! My brother and I play video games every weekend! My friend is having a party this weekend and I'm invited! My mom got a brand new car & she's taking me for a ride tomorrow! | 1- Lively intonation 2- Loud and clear voice | Smile |
| Carl | 1- I'm ordering KFC for dinner! 2- My parents are taking me to the movies tonight! 3- I might go swimming tomorrow! 4- I'm going for dinner at my friend's house on Saturday! 5- I saw Abby's baby boy! He's so cute! 6- My friend is having a party this weekend and I'm invited! 7- My brother makes me laugh the most! 8- My mom cooks the best meals just for me! 9- We're getting a huge trampoline for the backyard! | I had pizza from Pizza Hut last night! I'm going to the beach this weekend! I won \$5,000 in the lottery! My dad got me a brand new bike for my birthday! I'm going to Disneyland with my family! My brother and I play video games every weekend! I'm going shopping for new clothes and new toys this weekend! My dad takes me out to dinner every weekend, and he lets me choose the restaurant! My mom got a brand new car & she's taking me for a ride tomorrow! | | |
| Marc | 1- I might go swimming tomorrow! 2- My brother makes me laugh the most! 3- I'm going to the beach this weekend! 4- My mom got me a brand new computer game! 5- My dad got me a brand new bike for my birthday! 6- I'm going to Disneyland with my family! 7- My brother and I play video games every weekend! 8- My friend is having a party this weekend and I'm invited! 9- My mom got a brand new car and she's taking me for a ride tomorrow! | I had doughnuts for breakfast this morning! My mom made my favorite dinner! My parents are taking me to the movies tonight! I'm going for dinner at my friend's house on Saturday! My mom cooks the best meals just for me! We're getting a huge trampoline for the backyard! I watched my favorite show on TV last night. It was so much fun! I'm going shopping for new clothes and new toys this weekend! My dad takes me out to dinner every weekend, and he lets me choose the restaurant! | | |

Table 6
Verbal and Nonverbal Discriminative Stimuli Presented by the Experimenter in the Gratitude and Appreciation Category

| | | Verbal Discriminative Stimuli Presented by the Experimenter | | Nonverbal Discriminative Stimuli | |
|------|--|---|--|----------------------------------|--------------------|
| | | Used as Training Trials (All Were Used in Each Session) | Used as Generalization Probes (Rotated Sets of Three Were Used in Each Session) | Vocal Intonation | Facial Expressions |
| Andy | 1- How is your mom doing? 2- Did you have a nice weekend/night? 3- Are you enjoying your day so far? 4- Are you doing anything special tonight/tomorrow? 5- Can I get you something to drink? 6- Is everything okay with you? 7- Would you like to take a break? 8- Can I get you anything from the fridge? 9- Let me know if you need anything to drink. | How are your brothers doing? Are you feeling alright? Would you like to have a snack? If you're tired, we finish talking a little later. How are you doing today? Would you like to have one of the doughnuts I got? Would you like to have a drink of water? Let me know if you'd like to have a snack. Would you like to go to the water cooler on the third floor? | 1- Moderate-to-lively pitch 2- Moderate-to-lively intonation 3- Loud and clear voice | Smile | |
| Carl | 1- How is your mom doing? 2- Are you enjoying your day so far? 3- How are your cousins doing? 4- Are you doing anything special tonight/tomorrow? 5- Can I get you something to drink? 6- Are you feeling alright? 7- Would you like to have a snack? 8- Would you like to take a break? 9- Let me know if you need anything to drink. | Did you have a nice weekend/night? Is everything okay with you? Can I get you anything from the fridge? If you're tired, we finish talking a little later. How are you doing today? Would you like to have one of the doughnuts I got? Would you like to have a drink of water? Let me know if you'd like to have a snack. Would you like to go to the water cooler on the third floor? | | | |
| Marc | 1- How's Ali doing? 2- Are you feeling alright? 3- Would you like to have a snack? 4- If you're tired, we finish talking a little later. 5- Would you like to have one of the doughnuts I got? 6- Would you like to have a drink of water? 7- Let me know if you'd like to have a snack. 8- How are you doing today? 9- Would you like to go to the water cooler on the third floor? | How is your mom doing? Did you have a nice weekend/night? Are you enjoying your day so far? Are you doing anything special after school? Can I get you something to drink? Is everything okay with you? Would you like to take a break? Can I get you anything from the kitchen? Let me know if you need anything to drink. | | | |

Table 7
Verbal and Nonverbal Responses Taught in the Treatment Condition

| Affective Category | Verbal Responses | Nonverbal Responses | |
|---------------------------------------|---|--|--------------------------|
| | | Vocal Intonation | Facial Expressions |
| Responding to Absurdities | 1- That's so silly! 2- I can't believe that! 3- You're too funny! 4- No way! 5- Oh, this is ridiculous! 6- That's impossible! 7- There's no way that's true! 8- Very funny, Nidal! 9- My gosh, that can't be true! | 1- Moderate-to-high pitch 2- Lively intonation 3- Loud and clear voice | 1- Ironic smile or laugh |
| Expressing Empathy | 1- That's too terrible. 2- I'm sorry to hear that. 3- That's really sad. 4- What a shame. 5- Gosh, I'm so sorry. 6- That's so upsetting. 7- This is sad news. 8- It's too bad. 9- Oh no. That's terrible. | 1- Sad intonation 2- Low voice | 1- Sad |
| Expressing Excitement | 1- Oh, that's wonderful! 2- That's so exciting! 3- I absolutely love that! 4- That's fabulous! 5- So glad to hear that! 6- I'm so happy for you! 7- Wow! That's great news! 8- Wonderful! That's so good! 9- My gosh, that's amazing! | 1- Lively intonation 2- Loud and clear voice | 1- Smile |
| Expressing Gratitude and Appreciation | 1- Thanks for asking. 2- It's nice of you to ask. 3- You're too kind to ask. 4- Fine/Good/Yes/No. Thank you. 5- Thank you for caring. 6- Actually, ____. Thanks. 7- You're so thoughtful to ask. 8- I appreciate your asking. 9- It's so sweet of you to ask. | 1- Moderate-to-lively pitch 2- Moderate-to-lively intonation 3- Loud and clear voice | 1- Smile |

Table 8
Summary of Interobserver Agreement Data Obtained in the Baseline, Treatment, and Follow-Up Phases for Andy

| Trial Type | Baseline Phase | | | Treatment Phase | | | Follow-Up Sessions | | | |
|-------------|------------------|------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|-------------------|-----------------|---------------|
| | Vocal Intonation | Facial Expression | Verbal Response | Vocal Intonation | Facial Expression | Verbal Response | Vocal Intonation | Facial Expression | Verbal Response | |
| Absurdities | Training | 96.30% (26/27) | 96.30% (26/27) | 96.30% (26/27) | 95.83% (322/336) | 91.67% (308/336) | 98.21% (330/336) | 100% (9/9) | 88.89% (8/9) | 100% (9/9) |
| | Probes | 88.89% (8/9) | 88.89% (8/9) | 88.89% (8/9) | 95.37% (103/108) | 76.85% (83/108) | 96.33% (105/109) | 100% (3/3) | 100% (3/3) | 100% (3/3) |
| Empathy | Training | 100% (27/27) ¹ | 100% (36/36) | 100% (36/36) | 92.31% (312/338) | 97.34% (329/338) | 99.41% (335/337) | 100% (9/9) | 88.89% (8/9) | 100% (9/9) |
| | Probes | 100% (9/9) | 100% (12/12) | 100% (12/12) | 90.18% (101/112) | 100% (112/112) | 98.21% (110/112) | 100% (3/3) | 100% (3/3) | 100% (3/3) |
| Excitement | Training | 95.06% (231/243) | 99.60% (251/252) | 99.60% (251/252) | 95.04% (115/121) | 100% (121/121) | 100% (121/121) | 66.67% (6/9) | 100% (9/9) | 100% (9/9) |
| | Probes | 93.83% (76/81) | 97.62% (82/84) | 100% (84/84) | 67.50% (27/40) | 80.00% (32/40) | 97.50% (39/40) | 100% (3/3) | 100% (3/3) | 100% (3/3) |
| Gratitude | Training | 98.61% (142/144) | 97.92% (141/144) | 98.61% (142/144) | 96.83% (214/221) | 91.86% (203/221) | 97.29% (215/221) | 88.89% (8/9) | 77.78% (7/9) | 100% (9/9) |
| | Probes | 91.67% (44/48) | 100% (48/48) | 97.92% (47/48) | 90.41% (66/73) | 87.67% (64/73) | 95.83% (69/72) | 100% (3/3) | 100% (3/3) | 100% (3/3) |

¹When the secondary observer missed an opportunity to score a given trial or an affective component within a trial, interobserver agreement was not taken on that trial or component. As a result, denominators were not always the same even when they were within the same phase, but across affective components.

Table 9

Summary of Interobserver Agreement Data Obtained in the Baseline, Treatment, and Follow-Up Phases for Carl

| Trial Type | Baseline Phase | | | Treatment Phase | | | Follow-Up Sessions | | | |
|-------------|------------------|----------------------------------|---------------------|-------------------|---------------------|---------------------|---------------------|-------------------|-------------------|-----------------|
| | Vocal Intonation | Facial Expression | Verbal Response | Vocal Intonation | Facial Expression | Verbal Response | Vocal Intonation | Facial Expression | Verbal Response | |
| Absurdities | Training | 98.21% (329/335) ¹ | 97.35% (330/339) | 100% (339/339) | 97.04% (262/270) | 99.26% (267/269) | 100% (269/270) | 94.44% (17/18) | 94.44% (17/18) | 100% (18/18) |
| | Probes | 99.12% (113/114) | 97.37% (111/114) | 100% (114/114) | 98.89% (89/90) | 98.89% (89/90) | 100% (90/90) | 100% (6/6) | 100% (6/6) | 100% (6/6) |
| Empathy | Training | 97.55% (239/245) | 100% (247/247) | 100% (249/249) | 98.61% (355/360) | 96.94% (349/360) | 99.17% (357/360) | 61.11% (11/18) | 83.33% (15/18) | 100% (18/18) |
| | Probes | 98.81% (83/84) | 100% (84/84) | 100% (84/84) | 95.00% (114/120) | 98.33% (118/120) | 100% (120/120) | 83.33% (5/6) | 100% (6/6) | 100% (6/6) |
| Excitement | Training | 98.89% (447/452) | 93.16% (422/453) | 100% (454/456) | 97.62% (123/126) | 96.03% (121/126) | 98.41% (124/126) | 94.44% (17/18) | 100% (18/18) | 100% (18/18) |
| | Probes | 98.04% (150/153) | 93.46% (143/153) | 100% (153/153) | 100% (42/42) | 95.24% (40/42) | 100% (42/42) | 83.33% (5/6) | 83.33% (5/6) | 100% (6/6) |
| Gratitude | Training | 100% (78/78) | 98.72% (77/78) | 100% (78/78) | 98.98% (484/489) | 97.70% (467/478) | 98.76% (479/485) | 83.33% (15/18) | 88.89% (16/18) | 100% (18/18) |
| | Probes | 100% (27/27) | 100% (27/27) | 100% (27/27) | 96.91% (157/162) | 95.03% (153/161) | 98.77% (160/162) | 83.33% (5/6) | 83.33% (5/6) | 100% (6/6) |

¹When the secondary observer missed an opportunity to score a given trial or an affective component within a trial, interobserver agreement was not taken on that trial or component. As a result, denominators were not always the same even when they were within the same phase, but across affective components.

Table 10

Summary of Interobserver Agreement Data Obtained in the Baseline, Treatment, and Follow-Up Phases for Marc

| Trial Type | Baseline Phase | | | Treatment Phase | | | Follow-Up Sessions | | | |
|-------------|------------------|---------------------|---------------------|-------------------|----------------------------------|---------------------|---------------------|-------------------|-------------------|-----------------|
| | Vocal Intonation | Facial Expression | Verbal Response | Vocal Intonation | Facial Expression | Verbal Response | Vocal Intonation | Facial Expression | Verbal Response | |
| Absurdities | Training | 100% (54/54) | 100% (54/54) | 100% (54/54) | 97.91% (421/430) ¹ | 95.36% (411/431) | 99.54% (431/433) | 100% (18/18) | 100% (18/18) | 100% (18/18) |
| | Probes | 100% (18/18) | 100% (18/18) | 100% (18/18) | 99.31% (143/144) | 95.14% (137/144) | 100% (143/143) | 100% (6/6) | 100% (6/6) | 100% (6/6) |
| Empathy | Training | 91.27% (115/126) | 100% (126/126) | 100% (126/126) | 94.99% (341/359) | 95.24% (340/357) | 100% (357/357) | 83.33% (15/18) | 88.89% (16/18) | 100% (18/18) |
| | Probes | 97.62% (41/42) | 100% (42/42) | 100% (42/42) | 95.00% (114/120) | 96.67% (116/120) | 100% (120/120) | 100% (6/6) | 100% (6/6) | 100% (6/6) |
| Excitement | Training | 99.68% (307/308) | 97.72% (300/307) | 100% (308/308) | 97.18% (172/177) | 98.33% (177/180) | 98.89% (178/180) | 100% (18/18) | 100% (18/18) | 100% (18/18) |
| | Probes | 100% (101/101) | 97.03% (98/101) | 100% (101/101) | 94.92% (56/59) | 96.61% (57/59) | 100% (59/59) | 100% (6/6) | 100% (6/6) | 100% (6/6) |
| Gratitude | Training | 99.53% (211/212) | 95.75% (203/212) | 100% (211/211) | 95.72% (246/257) | 93.75% (240/256) | 99.61% (256/257) | 100% (18/18) | 88.89% (16/18) | 100% (18/18) |
| | Probes | 100% (69/69) | 100% (69/69) | 98.55% (68/69) | 89.53% (77/86) | 97.67% (84/86) | 98.84% (85/86) | 100% (6/6) | 66.67% (4/6) | 100% (6/6) |

¹When the secondary observer missed an opportunity to score a given trial or an affective component within a trial, interobserver agreement was not taken on that trial or component. As a result, denominators were not always the same even when they were within the same phase, but across affective components.

Table 11
*Summary of Interobserver Agreement Data and Ranges of Scores Obtained in the
 Baseline, Treatment, and Follow-Up Phases across Participants*

| Baseline Phase | | | | |
|--------------------|-----------------|------------------|-------------------|-----------------|
| Trial Type | Measure | Vocal Intonation | Facial Expression | Verbal Response |
| Training | IOA | 98% | 97% | 99.74% |
| | Range of Scores | 67 to 100% | 44 to 100% | 78 to 100% |
| Probes | IOA | 89% | 98% | 99.61% |
| | Range of Scores | 33 to 100% | 33 to 100% | 67 to 100% |
| Treatment Phase | | | | |
| Trial Type | Measure | Vocal Intonation | Facial Expression | Verbal Response |
| Training | IOA | 97% | 96% | 99% |
| | Range of Scores | 67 to 100% | 40 to 100% | 78 to 100% |
| Probes | IOA | 94% | 94% | 99% |
| | Range of Scores | 33 to 100% | 0 to 100% | 67 to 100% |
| Follow-Up Sessions | | | | |
| Trial Type | Measure | Vocal Intonation | Facial Expression | Verbal Response |
| Training | IOA | 91% | 92% | 100% |
| | Range of Scores | 33 to 100% | 78 to 100% | |
| Probes | IOA | 95% | 93% | 100% |
| | Range of Scores | 67 to 100% | 33 to 100% | |

Table 12

An Outline that Provides an Index for Figures 1 through 21 and Tables 13 through 30

I- Results for Andy

- a. Verbal responding alone, during training and probe trials (Figure 1).
- b. Vocal intonation alone, during training and probe trials (Figure 2).
- c. Facial expression alone, during training and probe trials (Figure 3).
- d. Verbal responding, vocal intonation, and facial expression, presented as three separate functions in one graph, during training trials only (Figure 4).
- e. Verbal responding, vocal intonation, and facial expression, presented as three separate functions in one graph, during probe trials only (Figure 5).
- f. Some irregularities in verbal responding.

II- Results for Carl

- a. Verbal responding alone, during training and probe trials (Figure 6).
- b. Vocal intonation alone, during training and probe trials (Figure 7).
- c. Facial expression alone, during training and probe trials (Figure 8).
- d. Verbal responding, vocal intonation, and facial expression, during training trials only (Figure 9).
- e. Verbal responding, vocal intonation, and facial expression, during probe trials only (Figure 10).

Table 12

An Outline that Provides an Index for Figures 1 through 21 and Tables 13 through 30

(Continued)

III- Results for Marc

- a. Verbal responding alone, during training and probe trials (Figure 11).
- b. Vocal intonation alone, during training and probe trials (Figure 12).
- c. Facial expression alone, during training and probe trials (Figure 13).
- d. Verbal responding, vocal intonation, and facial expression, during training trials only (Figure 14).
- e. Verbal responding, vocal intonation, and facial expression, during probe trials only (Figure 15).

IV- The number of sessions required for each participant to meet the mastery criterion (Table 13).

V- The percentage of accurate performance in follow-up sessions for each participant (Tables 14, 15, and 16).

VI- Levels of Script-Fading (for all participants) and Graduated Removal of Script Sheet (for Carl and Marc)

- a. For Andy (Tables 17, 18, 19, and 20)
- b. For Carl (Tables 21, 22, 23, and 24)
- c. For Marc (Tables 25, 26, 27, and 28)

VII- Shaping Steps

- a. For Andy (Table 29)
- b. For Marc (Table 30)

Table 12

An Outline that Provides an Index for Figures 1 through 21 and Tables 13 through 30

(Continued)

VIII- Percentage of Trials during which Scripted and Unscripted Responding Occurred

- a. With Andy during Training Trials (Figure 16)
- b. With Andy during Probe Trials (Figure 17)
- c. With Carl during Training Trials (Figure 18)
- d. With Carl during Probe Trials (Figure 19)
- e. With Marc during Training Trials (Figure 20)
- f. With Marc during Probe Trials (Figure 21)

Table 13

The Number of Sessions that was Required for Each Participant to Meet the Mastery Criterion of 89% Correct on Three Consecutive Sessions for Each Measure of Affective Responding, on Training and Probe Trials, across Four Affective Categories:

| | | Andy | | Carl | | Marc | |
|--------------------------|-------------------|-----------------|--------|-----------------|--------|-----------------|-------------------------------------|
| | | Training Trials | Probes | Training Trials | Probes | Training Trials | Probes |
| Absurdities | Vocal Intonation | 8 | 9 | 27 | 23 | 10 | 81 |
| | Facial Expression | 43 | 45 | 3 | 23 | 15 | 81 |
| | Verbal Responses | 3 | 4 | 3 | 27 | 9 | 81 |
| Empathy | Vocal Intonation | 11 | 24 | 9 | 23 | 20 | 67 |
| | Facial Expression | 10 | 25 | 21 | 23 | 59 | 80 |
| | Verbal Responses | 6 | 7 | 3 | 23 | 3 | 71 |
| Excitement | Vocal Intonation | 25 | 18 | 8 | 13 | 22 | 29 |
| | Facial Expression | 10 | 15 | 7 | 13 | 21 | 28 |
| | Verbal Responses | 5 | 3 | 3 | 14 | 9 | 28 |
| Gratitude & Appreciation | Vocal Intonation | 8 | 6 | 6 | 29 | 23 | 49 |
| | Facial Expression | 29 | 27 | 6 | 20 | 23 | 46 |
| | Verbal Responses | 4 | 17 | 10 | 46 | 32 | Did not meet criterion ¹ |

¹The treatment phase was concluded before Marc met the mastery criterion of 89% or above on three consecutive sessions. Two factors might have contributed to this result: (a) For probe trials, the mastery criterion could be met only if a participant responded appropriately on all three probe trials in a given session, thus the criterion for probes was, in effect, 100% correct on three consecutive sessions; and (b) A verbal response might have been appropriate, but could be counted as correct only if a participant did not use a given verbalization more than twice in a given session.

Table 14
Percentage of Accurate Performance on Training and Probe Trials in (a) All Baseline Sessions, and (b) the Two Follow-Up Sessions Following Treatment for Andy

| | | Training Trials | | Probe Trials | |
|--------------------------|------------|-----------------------|------------------------|--------------|-----------|
| | | Baseline ¹ | Follow-Up ² | Baseline | Follow-Up |
| Absurdities | Vocal | 0% | 50% | 0% | 50% |
| | Intonation | (0/180) | (9/18) | (0/60) | (3/6) |
| | Facial | 0% | 39% | 0% | 50% |
| | Expression | (0/180) | (7/18) | (0/60) | (3/6) |
| | Verbal | 3.89% | 39% | 0% | 33% |
| | Responses | (7/180) | (7/18) | (0/60) | (2/6) |
| Empathy | Vocal | 0% | 78% | 0% | 67% |
| | Intonation | (0/54) | (14/18) | (0/18) | (4/6) |
| | Facial | 0% | 83% | 0% | 67% |
| | Expression | (0/54) | (15/18) | (0/18) | (4/6) |
| | Verbal | 0% | 83% | 0% | 67% |
| | Responses | (0/54) | (15/18) | (0/18) | (4/6) |
| Excitement | Vocal | 0.40% | 22% | 0% | 50% |
| | Intonation | (2/495) | (4/18) | (0/165) | (3/6) |
| | Facial | 1.21% | 17% | 0% | 0% |
| | Expression | (6/495) | (3/18) | (0/165) | (0/6) |
| | Verbal | 13.33% | 22% | 5.45% | 17% |
| | Responses | (66/495) | (4/18) | (9/165) | (1/6) |
| Gratitude & Appreciation | Vocal | 0.28% | 56% | 0% | 50% |
| | Intonation | (1/360) | (10/18) | (0/120) | (3/6) |
| | Facial | 0% | 56% | 0% | 33% |
| | Expression | (0/360) | (10/18) | (0/120) | (2/6) |
| | Verbal | 4.44% | 72% | 2.50% | 83% |
| | Responses | (16/360) | (13/18) | (3/120) | (5/6) |

¹The total number of baseline sessions varied across categories. There were 20 baseline sessions for Absurdities, 6 baseline sessions for Empathy, 55 sessions for Excitement, and 40 sessions for Gratitude and Appreciation.

²The first follow-up session was conducted 7 weeks after treatment was concluded. The second (and last) session was conducted 5½ months (25 weeks) after treatment.

Table 15
Percentage of Accurate Performance on Training and Probe Trials in (a) All Baseline Sessions, and (b) the Two Follow-Up Sessions Following Treatment for Carl

| | | Training Trials | | Probe Trials | |
|--------------------------|------------|-----------------------|------------------------|--------------|-----------|
| | | Baseline ¹ | Follow-Up ² | Baseline | Follow-Up |
| Absurdities | Vocal | 1.69% | 89% | 0.56% | 83% |
| | Intonation | (9/531) | (16/18) | (1/177) | (5/6) |
| | Facial | 3.58% | 89% | 2.82% | 83% |
| | Expression | (19/531) | (16/18) | (5/177) | (5/6) |
| | Verbal | 0% | 78% | 0% | 50% |
| | Responses | (0/531) | (14/18) | (0/177) | (3/6) |
| Empathy | Vocal | 1.54% | 44% | 0.93% | 83% |
| | Intonation | (5/324) | (8/18) | (1/108) | (5/6) |
| | Facial | 0% | 83% | 0% | 83% |
| | Expression | (0/324) | (15/18) | (0/108) | (5/6) |
| | Verbal | 17% | 78% | 24.07% | 100% |
| | Responses | (55/324) | (14/18) | (26/108) | (6/6) |
| Excitement | Vocal | 1.20% | 94% | 2.81% | 83% |
| | Intonation | (9/747) | (17/18) | (7/249) | (5/6) |
| | Facial | 9.91% | 94% | 9.24% | 83% |
| | Expression | (74/747) | (17/18) | (23/249) | (5/6) |
| | Verbal | 21.15% | 78% | 22.09% | 67% |
| | Responses | (158/747) | (14/18) | (55/249) | (4/6) |
| Gratitude & Appreciation | Vocal | 0% | 89% | 0% | 83% |
| | Intonation | (0/90) | (16/18) | (0/30) | (5/6) |
| | Facial | 2.22% | 94% | 0% | 100% |
| | Expression | (2/90) | (17/18) | (0/30) | (6/6) |
| | Verbal | 0% | 83% | 0% | 67% |
| | Responses | (0/90) | (15/18) | (0/30) | (4/6) |

¹The total number of baseline sessions varied across categories. There were 59 baseline sessions for Absurdities, 36 baseline sessions for Empathy, 83 sessions for Excitement, and 10 sessions for Gratitude and Appreciation.

²The first follow-up session was conducted 6 weeks after treatment was concluded. The second (and last) session was conducted 3 months (13 weeks) after treatment.

Table 16
Percentage of Accurate Performance on Training and Probe Trials in (a) All Baseline Sessions, and (b) the Two Follow-Up Sessions Following Treatment for Marc

| | | Training Trials | | Probe Trials | |
|--------------------------|------------|-----------------------|------------------------|--------------|-----------|
| | | Baseline ¹ | Follow-Up ² | Baseline | Follow-Up |
| Absurdities | Vocal | 0% | 94% | 0% | 83% |
| | Intonation | (0/126) | (17/18) | (0/42) | (5/6) |
| | Facial | 0.79% | 94% | 0% | 83% |
| | Expression | (1/126) | (17/18) | (0/42) | (5/6) |
| | Verbal | 0.79% | 94% | 0% | 67% |
| | Responses | (1/126) | (17/18) | (0/42) | (4/6) |
| Empathy | Vocal | 11% | 94% | 2.22% | 83% |
| | Intonation | (31/270) | (17/18) | (2/90) | (5/6) |
| | Facial | 0% | 78% | 0% | 83% |
| | Expression | (0/270) | (14/18) | (0/90) | (5/6) |
| | Verbal | 0% | 83% | 0% | 100% |
| | Responses | (0/270) | (15/18) | (0/90) | (6/6) |
| Excitement | Vocal | 0.32% | 100% | 0% | 100% |
| | Intonation | (2/630) | (18/18) | (0/210) | (6/6) |
| | Facial | 5.08% | 78% | 8.57% | 50% |
| | Expression | (32/630) | (14/18) | (18/210) | (3/6) |
| | Verbal | 0% | 89% | 0% | 100% |
| | Responses | (0/630) | (16/18) | (0/210) | (6/6) |
| Gratitude & Appreciation | Vocal | 0.87% | 100% | 0% | 100% |
| | Intonation | (4/459) | (18/18) | (0/153) | (6/6) |
| | Facial | 3.05% | 83% | 1.96% | 33% |
| | Expression | (14/459) | (15/18) | (3/153) | (2/6) |
| | Verbal | 5.88% | 83% | 15.03% | 100% |
| | Responses | (27/459) | (15/18) | (23/153) | (6/6) |

¹The total number of baseline sessions varied across categories. There were 14 baseline sessions for Absurdities, 30 baseline sessions for Empathy, 70 sessions for Excitement, and 51 sessions for Gratitude and Appreciation.

²The first follow-up session was conducted 7 weeks after treatment was concluded. The second (and last) session was conducted 2½ months (11 weeks) after treatment.

Table 17

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Andy during Treatment of the Absurdities Category

Prior to the Start of Script-Fading: Full scripts were provided on a letter-size paper (22 cm x 28 cm), with a space provided for the participant to draw a check (✓) once he has used a script.

- 1. I can't believe that! _____
- 2. My gosh; that can't be true! _____
- 3. No way! _____
- 4. Oh, this is ridiculous! _____
- 5. That's impossible! _____
- 6. That's so silly! _____
- 7. There's no way that's true! _____
- 8. Very funny, Nidal! _____
- 9. You're too funny! _____

Level 1 of Script-Fading: One or two words were faded from the ending of each script.

- 1. I can't believe ! _____
- 2. My gosh; that can't be ! _____
- 3. No ! _____
- 4. Oh, this is ! _____
- 5. That's ! _____
- 6. That's so ! _____
- 7. There's no way that's ! _____
- 8. Very funny, ! _____
- 9. You're too ! _____

Level 2 of Script-Fading: More words were faded from the ending of each script.

- 1. I can't ! _____
- 2. My gosh; that ! _____
- 3. No ! _____
- 4. Oh, this ! _____
- 5. That's ! _____
- 6. That's ! _____
- 7. There's no ! _____
- 8. Very ! _____
- 9. You're ! _____

Level 3 of Script-Fading: Only the first word from each script remained; with the exception of scripts 5 and 6, from which not the entire word ("That's"), but only the first two letters ("Th") remained on the sheet.

Level 4 of Script-Fading: The scripts were completely faded, but the dashes continued to be available for the participant to check off.

Level 5 of Script-Fading: The sheet was no longer presented.

Table 18

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Andy during Treatment of the Empathy Category

Prior to the Start of Script-Fading: Full scripts were provided on a letter-size paper (22 cm x 28 cm), with a space provided for the participant to draw a check (✓) once he has used a script.

- 1. Gosh; I'm so sorry. _____
- 2. I'm sorry to hear that. _____
- 3. It's too bad. _____
- 4. Oh no; that's terrible. _____
- 5. That's really sad. _____
- 6. That's so upsetting. _____
- 7. That's too terrible. _____
- 8. This is sad news. _____
- 9. What a shame. _____

Level 1 of Script-Fading: The last word or two from each script were faded.

- 1. Gosh; I'm . _____
- 2. I'm sorry to hear . _____
- 3. It's too . _____
- 4. Oh no; that's . _____
- 5. That's really . _____
- 6. That's so . _____
- 7. That's too . _____
- 8. This is sad . _____
- 9. What a . _____

Level 2 of Script-Fading: Only the first word or two from each script were provided.

- 1. Gosh; . _____
- 2. I'm . _____
- 3. It's too . _____
- 4. Oh . _____
- 5. That's really . _____
- 6. That's so . _____
- 7. That's too . _____
- 8. This . _____
- 9. What . _____

Level 3a of Script-Fading: More letters were faded from each script, leaving only one full word from each script.

- 1. Gosh; . _____
- 2. I'm . _____
- 3. It's t . _____
- 4. Oh . _____
- 5. That's r . _____
- 6. That's s . _____
- 7. That's t . _____
- 8. This . _____
- 9. What . _____

Level 3b of Script-Fading: More letters were faded from each script.

- 1. Go . _____
- 2. I'm . _____
- 3. It . _____
- 4. Oh . _____
- 5. Th . _____
- 6. Th . _____
- 7. Th . _____
- 8. This . _____
- 9. Wh . _____

Table 18

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Andy during Treatment of the Empathy Category

(Continued)

Level 4a of Script-Fading: The scripts were completely faded, but the dashes continued to be available for the participant to check off.

Level 4b of Script-Fading: Same as Level 4a, but the dashes have been deleted.

Level 5 of Script-Fading: The sheet was no longer presented.

Table 19

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Andy during Treatment of the Excitement Category

Prior to the Start of Script-Fading: Full scripts were provided on a letter-size paper (22 cm x 28 cm), with a space provided for the participant to draw a check (✓) once he has used a script.

- 1. I absolutely love that! _____
- 2. I'm so happy for you! _____
- 3. My gosh; that's amazing! _____
- 4. Oh, that's wonderful! _____
- 5. So glad to hear that! _____
- 6. That's fabulous! _____
- 7. That's so exciting! _____
- 8. Wonderful! That's so good! _____
- 9. Wow! That's great news! _____

Level 1 of Script-Fading: The last word or two from each script were faded.

- 1. I absolutely ! _____
- 2. I'm so happy ! _____
- 3. My gosh; that's ! _____
- 4. Oh, that's ! _____
- 5. So glad to ! _____
- 6. That's ! _____
- 7. That's so ! _____
- 8. Wonderful! That's ! _____
- 9. Wow! That's ! _____

Level 2 of Script-Fading: More words were faded, and a smaller sheet (approximately 9 cm x 9 cm) was used.

- 1. I ! _____
- 2. I'm so ! _____
- 3. My gosh; ! _____
- 4. Oh, ! _____
- 5. So glad ! _____
- 6. That's ! _____
- 7. That's s ! _____
- 8. Wonderful! _____
- 9. Wow! ! _____

Level 3 of Script-Fading: Only the first word from each script was provided.

Level 4 of Script-Fading: The scripts were completely faded, but the dashes continued to be available for the participant to check off.

Level 5 of Script-Fading: The sheet was no longer presented.

Table 20

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Andy during Treatment of the Gratitude and Appreciation Category

Prior to the Start of Script-Fading: Full scripts were provided on a letter-size paper (22 cm x 28 cm), with a space provided for the participant to draw a check (✓) once he has used a script.

1. Actually, I/my _____. _____
2. Fine/Yes/No, thank you. _____
3. I appreciate your asking. I/My _____. _____
4. It's nice of you to ask. I/My _____. _____
5. It's so sweet of you to ask. I/My _____. _____
6. Thank you for caring. I/My _____. _____
7. Thanks for asking. I/My _____. _____
8. You're so thoughtful to ask. I/My _____. _____
9. You're too kind to ask. I/My _____. _____

Level 3 of Script-Fading: More words were faded from the ending of each script.

1. Actually, . _____
2. Fine/Yes/No, . _____
3. I appreciate . _____
4. It's nice . _____
5. It's so sweet . _____
6. Thank . _____
7. Thanks . _____
8. You're so . _____
9. You're too . _____

Level 1 of Script-Fading: The latter part of each script – “I/My _____” – was faded.

Level 2 of Script-Fading: The last word or two from the ending of each script were faded.

1. Actually, . _____
2. Fine/Yes/No, . _____
3. I appreciate your . _____
4. It's nice of you . _____
5. It's so sweet of you . _____
6. Thank you for . _____
7. Thanks for . _____
8. You're so thoughtful . _____
9. You're too kind . _____

Table 20

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Andy during Treatment of the Gratitude and Appreciation Category (Continued)

Level 4 of Script-Fading: The scripts were completely faded, but the dashes continued to be available for the participant to check off.

Level 5 of Script-Fading: The sheet was no longer presented.

Table 21

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Carl during Treatment of the Absurdities Category

Prior to the Start of Script-Fading: Full scripts were provided on a letter-size paper (22 cm x 28 cm), with a space provided for the participant to draw a check (✓) once he has used a script.

- 1. I can't believe that! _____
- 2. My gosh; that can't be true! _____
- 3. No way! _____
- 4. Oh, this is ridiculous! _____
- 5. That's impossible! _____
- 6. That's so silly! _____
- 7. There's no way that's true! _____
- 8. Very funny, Nidal! _____
- 9. You're too funny! _____

Level 1 of Script-Fading: The last one or two words were faded from each script.

- 1. I can't believe ! _____
- 2. My gosh; that can't ! _____
- 3. No ! _____
- 4. Oh, this is ! _____
- 5. That's ! _____
- 6. That's so ! _____
- 7. There's no way ! _____
- 8. Very funny, ! _____
- 9. You're too ! _____

Level 2 of Script-Fading: Only the first word from each script was provided.

- 1. I ! _____
- 2. My ! _____
- 3. No ! _____
- 4. Oh, ! _____
- 5. That's ! _____
- 6. That's ! _____
- 7. There's ! _____
- 8. Very ! _____
- 9. You're ! _____

Table 21

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Carl during Treatment of the Absurdities Category

(Continued)

Level 3 of Script-Fading: Same as Level 2, but on a smaller sheet (approximately 9 cm x 9 cm), and with no opportunity to draw a check (✓) next to a script that the participant has used.

Level 4 of Script-Fading: Same as Level 3, but rather than presenting the sheet with the faded scripts on all 9 training trials, the sheet was presented only on 5 trials.

Level 5 of Script-Fading: Same as Level 4, but rather than presenting the sheet with the faded scripts on 5 of the 9 training trials, the sheet was presented only on 3 trials.

Level 6 of Script-Fading: Same as Level 5, but the sheet was presented only on 2 trials.

Level 7 of Script-Fading: Same as Level 6, but the sheet was presented only on 1 trial.

Level 8 of Script-Fading: The sheet was no longer presented.

Table 22

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Carl during Treatment of the Empathy Category

Prior to the Start of Script-Fading: Full scripts were provided on a letter-size paper (22 cm x 28 cm), with a space provided for the participant to draw a check (✓) once he has used a script.

- 1. Gosh; I'm so sorry. _____
- 2. I'm sorry to hear that. _____
- 3. It's too bad. _____
- 4. Oh no; that's terrible. _____
- 5. That's really sad. _____
- 6. That's so upsetting. _____
- 7. That's too terrible. _____
- 8. This is sad news. _____
- 9. What a shame. _____

Level 1 of Script-Fading: The last word was faded from each script.

- 1. Gosh; I'm so . _____
- 2. I'm sorry to hear . _____
- 3. It's too . _____
- 4. Oh no; that's . _____
- 5. That's really . _____
- 6. That's so . _____
- 7. That's too . _____
- 8. This is sad . _____
- 9. What a . _____

Level 2a of Script-Fading: Only the first 1 or 2 words from each script were provided.

- 1. Gosh; I'm . _____
- 2. I'm sorry . _____
- 3. It's . _____
- 4. Oh no; . _____
- 5. That's r . _____
- 6. That's s . _____
- 7. That's t . _____
- 8. This is . _____
- 9. What . _____

Level 2b of Script-Fading: Same as Level 2a, but a smaller sheet (approximately 9 cm x 9 cm) was used.

Level 2c of Script-Fading: Same as Level 2b, but the participant no longer has the opportunity to draw a check (✓) next to a script that he has used.

Level 3 of Script-Fading: Only the first word was provided.

- 1. Gosh; . _____
- 2. I'm . _____
- 3. It's . _____
- 4. Oh . _____
- 5. That's . _____
- 6. That's . _____
- 7. That's . _____
- 8. This . _____
- 9. What . _____

Table 22

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Carl during Treatment of the Empathy Category

(Continued)

Level 4 of Script-Fading: Same as Level 3, but rather than presenting the sheet with the faded scripts on all 9 training trials, the sheet was presented only on 5 trials.

Level 5 of Script-Fading: Same as Level 4, but the sheet was presented only on 3 trials.

Level 6 of Script-Fading: Same as Level 5, but the sheet was presented only on 2 trials.

Level 7 of Script-Fading: Same as Level 6, but the sheet was presented only on 1 trial.

Level 8 of Script-Fading: The sheet was no longer presented.

Table 23

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Carl during Treatment of the Excitement Category

Prior to the Start of Script-Fading: Full scripts were provided on a letter-size paper (22 cm x 28 cm), with a space provided for the participant to draw a check (✓) once he has used a script.

1. I absolutely love that! _____
2. I'm so happy for you! _____
3. My gosh; that's amazing! _____
4. Oh, that's wonderful! _____
5. So glad to hear that! _____
6. That's fabulous! _____
7. That's so exciting! _____
8. Wonderful! That's so good! _____
9. Wow! That's great news! _____

Level 2 of Script-Fading: Only the first 1 or 2 words from each script were provided, and a smaller sheet (approximately 9 cm x 9 cm) was used.

1. I absolutely ! _____
2. I'm so ! _____
3. My gosh; ! _____
4. Oh, ! _____
5. So glad ! _____
6. That's ! _____
7. That's ! _____
8. Wonderful! That's ! _____
9. Wow! That's ! _____

Level 1 of Script-Fading: The last word was faded from each script.

1. I absolutely love ! _____
2. I'm so happy for ! _____
3. My gosh; that's ! _____
4. Oh, that's ! _____
5. So glad to hear ! _____
6. That's ! _____
7. That's so ! _____
8. Wonderful! That's so ! _____
9. Wow! That's great ! _____

Level 3 of Script-Fading: Same as Level 2, but only the first word from each script was provided, and there was no opportunity to draw a check (✓) next to a script that was used.

1. I !
2. I'm !
3. My !
4. Oh, !
5. So !
6. That's !
7. That's !
8. Wonderful! !
9. Wow! !

Table 23

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Carl during Treatment of the Excitement Category

(Continued)

Level 4 of Script-Fading: Same as Level 3, but rather than presenting the sheet with the faded scripts on all 9 training trials, the sheet was presented only on 5 trials.

Level 5 of Script-Fading: Same as Level 4, but the sheet was presented only on 3 trials.

Level 6 of Script-Fading: Same as Level 5, but the sheet was presented only on 2 trials.

Level 7 of Script-Fading: Same as Level 6, but the sheet was presented only on 1 trial.

Level 8 of Script-Fading: The sheet was no longer presented.

Table 24

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Carl during Treatment of Gratitude and Appreciation

Prior to the Start of Script-Fading: Full scripts were provided on a letter-size paper (22 cm x 28 cm), with a space provided for the participant to draw a check (✓) once he has used a script.

1. Actually, I/my ____.
2. Fine/Yes/No, thank you.
3. I appreciate your asking. I/My ____.
4. It's nice of you to ask. I/My ____.
5. It's so sweet of you to ask. I/My ____.
6. Thank you for caring. I/My ____.
7. Thanks for asking. I/My ____.
8. You're so thoughtful to ask. I/My ____.
9. You're too kind to ask. I/My ____.

Level 1b of Script-Fading: Same as Level 1a, but a smaller sheet (approximately 9 cm x 9 cm) was used.

Level 2 of Script-Fading: More words were faded from the ending of each script, and there was no opportunity to draw a check (✓) next to a script that was used.

1. Actually, .
2. Fine/Yes/No, .
3. I appreciate .
4. It's nice of .
5. It's so sweet .
6. Thank .
7. Thanks for .
8. You're so .
9. You're too .

Level 1a of Script-Fading: The last 1 or 2 words were faded from each script.

1. Actually, . _____
2. Fine/Yes/No, thank . _____
3. I appreciate your . _____
4. It's nice of you to . _____
5. It's so sweet of you to . _____
6. Thank you for . _____
7. Thanks for asking . _____
8. You're so thoughtful to . _____
9. You're too kind to . _____

Level 3 of Script-Fading: More words were faded from the ending of each script.

1. Actually, .
2. Fine/Yes/No, .
3. I .
4. It's .
5. It's so .
6. Thank .
7. Thanks .
8. You're .
9. You're .

Table 24

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Carl during Treatment of Gratitude and Appreciation (Continued)

Level 4 of Script-Fading: Same as Level 3, but rather than presenting the sheet with the faded scripts on all 9 training trials, the sheet was presented only on 5 trials.

Level 5 of Script-Fading: Same as Level 4, but the sheet was presented only on 3 trials.

Level 6 of Script-Fading: Same as Level 5, but the sheet was presented only on 2 trials.

Level 7 of Script-Fading: Same as Level 6, but the sheet was presented only on 1 trial.

Level 8 of Script-Fading: The sheet was no longer presented.

Table 25

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Marc during Treatment of the Absurdities Category

Prior to the Start of Script-Fading: Full scripts were provided on a letter-size paper (22 cm x 28 cm), with a space provided for the participant to draw a check (✓) once he has used a script.

1. I can't believe that! _____
2. My gosh; that can't be true! _____
3. No way! _____
4. Oh, this is ridiculous! _____
5. That's impossible! _____
6. That's so silly! _____
7. There's no way that's true! _____
8. Very funny, Nidal! _____
9. You're too funny! _____

Level 4* of Script-Fading: Full scripts were provided, as described in the pre-script-fading level above, but rather than presenting the sheet with the full scripts on all 9 training trials, the sheet was presented only on 5 trials.

Level 1* of Script-Fading: *In addition* to presenting the sheet only on 5 of the 9 training trials, the last one or two words were faded from each script, and the lines on which the participant could draw a check (✓) next to a script that he has used were deleted.

1. I can't believe !
2. My gosh; that can't !
3. No !
4. Oh, this is !
5. That's !
6. That's so !
7. There's no way !
8. Very funny, !
9. You're too !

Level 5*: Same as Level 1*, but rather than presenting the sheet with the faded scripts on 5 of the 9 training trials, the sheet was presented only on 3 trials.

Level 1 of Script-Fading: The last one or two words were faded from each script, and the lines on which the participant could draw a check (✓) next to a script that he has used were deleted, as shown under "Level 1*" above. The sheet, however, was presented on *all 9 training trials*.

Level 2 of Script-Fading: Same as Level 1, but more words were faded.

1. I can't !
2. My gosh; that !
3. No !
4. Oh, this !
5. That's !
6. That's !
7. There's no way !
8. Very !
9. You're !

Table 25

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Marc during Treatment of the Absurdities Category

(Continued)

Level 3 of Script-Fading: The scripts were completely faded.

Level 4 of Script-Fading: Same as Level 3, but rather than presenting the sheet with the faded scripts on all 9 training trials, the sheet was presented only on 5 trials.

Level 5 of Script-Fading: Same as Level 4, but rather than presenting the sheet with the faded scripts on 5 of the 9 training trials, the sheet was presented only on 3 trials.

Level 6 of Script-Fading: Same as Level 5, but the sheet was presented only on 2 trials.

Level 7 of Script-Fading: The sheet was no longer presented.

Table 26

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Marc during Treatment of the Empathy Category

Prior to the Start of Script-Fading: Full scripts were provided on a letter-size paper (22 cm x 28 cm), with a space provided for the participant to draw a check (✓) once he has used a script.

1. Gosh; I'm so sorry. _____
2. I'm sorry to hear that. _____
3. It's too bad. _____
4. Oh no; that's terrible. _____
5. That's really sad. _____
6. That's so upsetting. _____
7. That's too terrible. _____
8. This is sad news. _____
9. What a shame. _____

Level 1a of Script-Fading: The last word or two from each script were faded, and the lines on which the participant could draw a check (✓) next to a script that he has used were deleted.

1. Gosh; I'm .
2. I'm sorry to hear .
3. It's too .
4. Oh no; that's .
5. That's really .
6. That's so .
7. That's too .
8. This is sad .
9. What a .

Level 1b of Script-Fading: Only the first word or two from each script were provided.

1. Gosh; .
2. I'm sorry .
3. It's .
4. Oh no; .
5. That's .
6. That's .
7. That's .
8. This is .
9. What .

Table 26

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Marc during Treatment of the Empathy Category

(Continued)

Level 2 of Script-Fading: Only the first word from each script was provided.

Level 3 of Script-Fading: The scripts were completely faded.

Level 4 of Script-Fading: Same as Level 3, but rather than presenting the sheet with the faded scripts on all 9 training trials, the sheet was presented only on 5 trials.

Level 5 of Script-Fading: Same as Level 4, but the sheet was presented only on 3 trials.

Level 6 of Script-Fading: Same as Level 5, but the sheet was presented only on 2 trials.

Level 7 of Script-Fading: The sheet was no longer presented.

Table 27

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Marc during Treatment of the Excitement Category

Prior to the Start of Script-Fading: Full scripts were provided on a letter-size paper (22 cm x 28 cm), with a space provided for the participant to draw a check (✓) once he has used a script.

1. I absolutely love that! _____
2. I'm so happy for you! _____
3. My gosh; that's amazing! _____
4. Oh, that's wonderful! _____
5. So glad to hear that! _____
6. That's fabulous! _____
7. That's so exciting! _____
8. Wonderful! That's so good! _____
9. Wow! That's great news! _____

Level 1 of Script-Fading: The last word from each script was faded, and the lines on which the participant could draw a check (✓) next to a script that he has used were deleted.

1. I absolutely love !
2. I'm so happy for !
3. My gosh; that's !
4. Oh, that's !
5. So glad to hear !
6. That's !
7. That's so !
8. Wonderful! That's so !
9. Wow! That's great !

Level 2a of Script-Fading: More words were faded.

1. I absolutely !
2. I'm so !
3. My gosh; !
4. Oh, !
5. So glad to !
6. That's !
7. That's !
8. Wonderful! !
9. Wow! !

Table 27

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Marc during Treatment of the Excitement Category

(Continued)

Level 2b of Script-Fading: Only the first word from each script was provided.

Level 3 of Script-Fading: The scripts were completely faded.

Level 4 of Script-Fading: Same as Level 3, but rather than presenting the sheet with the faded scripts on all 9 training trials, the sheet was presented only on 5 trials.

Level 5 of Script-Fading: Same as Level 4, but the sheet was presented only on 3 trials.

Level 6 of Script-Fading: Same as Level 5, but the sheet was presented only on 2 trials.

Level 7 of Script-Fading: The sheet was no longer presented.

Table 28

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Marc during Treatment of Gratitude and Appreciation

Prior to the Start of Script-Fading: Full scripts were provided on a letter-size paper (22 cm x 28 cm), with a space provided for the participant to draw a check (✓) once he has used a script.

1. Actually, I/my _____. Thank you. _____
2. Fine/Yes/No, thank you. _____
3. I appreciate your asking. I/My _____. _____
4. It's nice of you to ask. I/My _____. _____
5. It's so sweet of you to ask. I/My _____. _____
6. Thank you for caring. I/My _____. _____
7. Thanks for asking. I/My _____. _____
8. You're so thoughtful to ask. I/My _____. _____
9. You're too kind to ask. I/My _____. _____

Level 1 of Script-Fading: The last word or two from each script were faded, and the lines on which the participant could draw a check (✓) next to a script that he has used were deleted.

1. Actually, _____. Thank .
2. _____, thank .
3. I appreciate your .
4. It's nice of you to .
5. It's so sweet of you to .
6. Thank you for .
7. Thanks for .
8. You're so thoughtful to .
9. You're too kind to .

Level 2a of Script-Fading: More words were faded from the ending of each script.

1. Actually, _____ .
2. _____, .
3. I appreciate .
4. It's nice of .
5. It's so sweet of .
6. Thank you .
7. Thanks .
8. You're so .
9. You're too .

Level 2b of Script-Fading: More words were faded from the ending of each script.

1. Actually, .
2. _____, .
3. I .
4. It's .
5. It's so .
6. Thank .
7. Thanks .
8. You're .
9. You're .

Table 28

Levels of Script-Fading and Graduated Removal of Script Sheet Used with Marc during Treatment of Gratitude and Appreciation (Continued)

Level 3 of Script-Fading: The scripts were completely faded.

Level 4 of Script-Fading: Same as Level 3, but rather than presenting the sheet with the faded scripts on all 9 training trials, the sheet was presented only on 5 trials.

Level 5 of Script-Fading: Same as Level 4, but the sheet was presented only on 3 trials.

Level 6 of Script-Fading: Same as Level 5, but the sheet was presented only on 2 trials.

Level 7 of Script-Fading: The sheet was no longer presented.

Table 29

Shaping Procedure: Steps Used to Train Andy to Engage in Appropriate Smiling

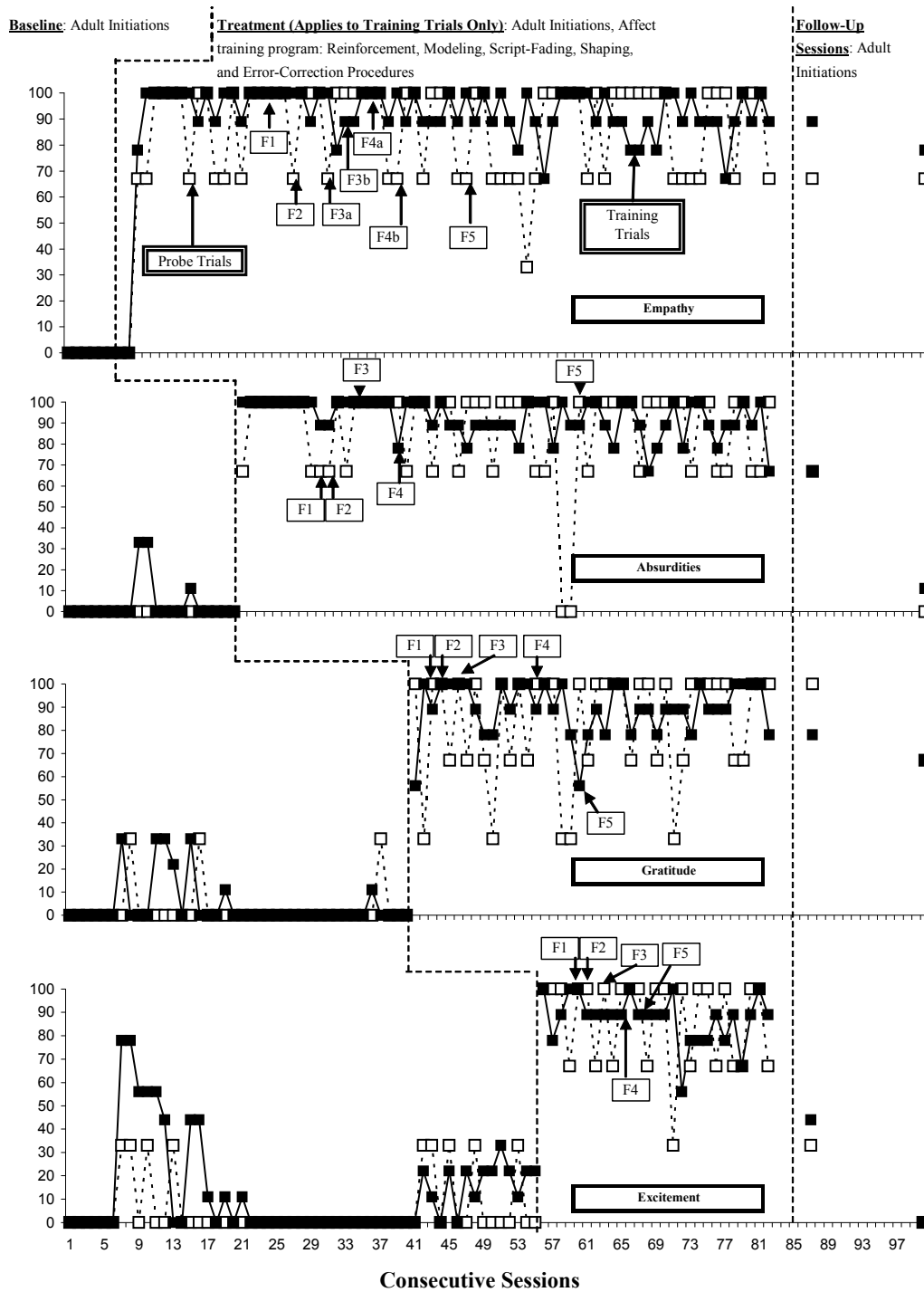
1. Reinforcement was provided for maintaining a neutral facial expression (i.e., the absence of a frown or tense facial expression).
2. Reinforcement was provided for displaying a “small” smile (i.e., slightly stretching his lips, without opening his mouth or baring his teeth).
3. Reinforcement was provided for slightly opening his mouth while displaying a “small” smile (i.e., slightly stretching his lips, without necessarily baring his teeth).
4. Reinforcement was provided for engaging in each of the following steps separately, starting with two of the nine training trials per category, and gradually increasing the target number of training trials to nine per category (all there was):
 - a. Relax
 - b. Breathe
 - c. Smile
 - d. Say _____ (Scripted Verbalization)
 - e. Continue to smile
5. Same as Step 4, but the task analysis for smiling was modified:
 - a. Relax
 - b. Smile before talking
 - c. Relax eyes (do not frown)
 - d. Smile while saying _____ (Scripted Verbalization)
 - e. Continue to smile after completing statement
6. Task analysis was faded.

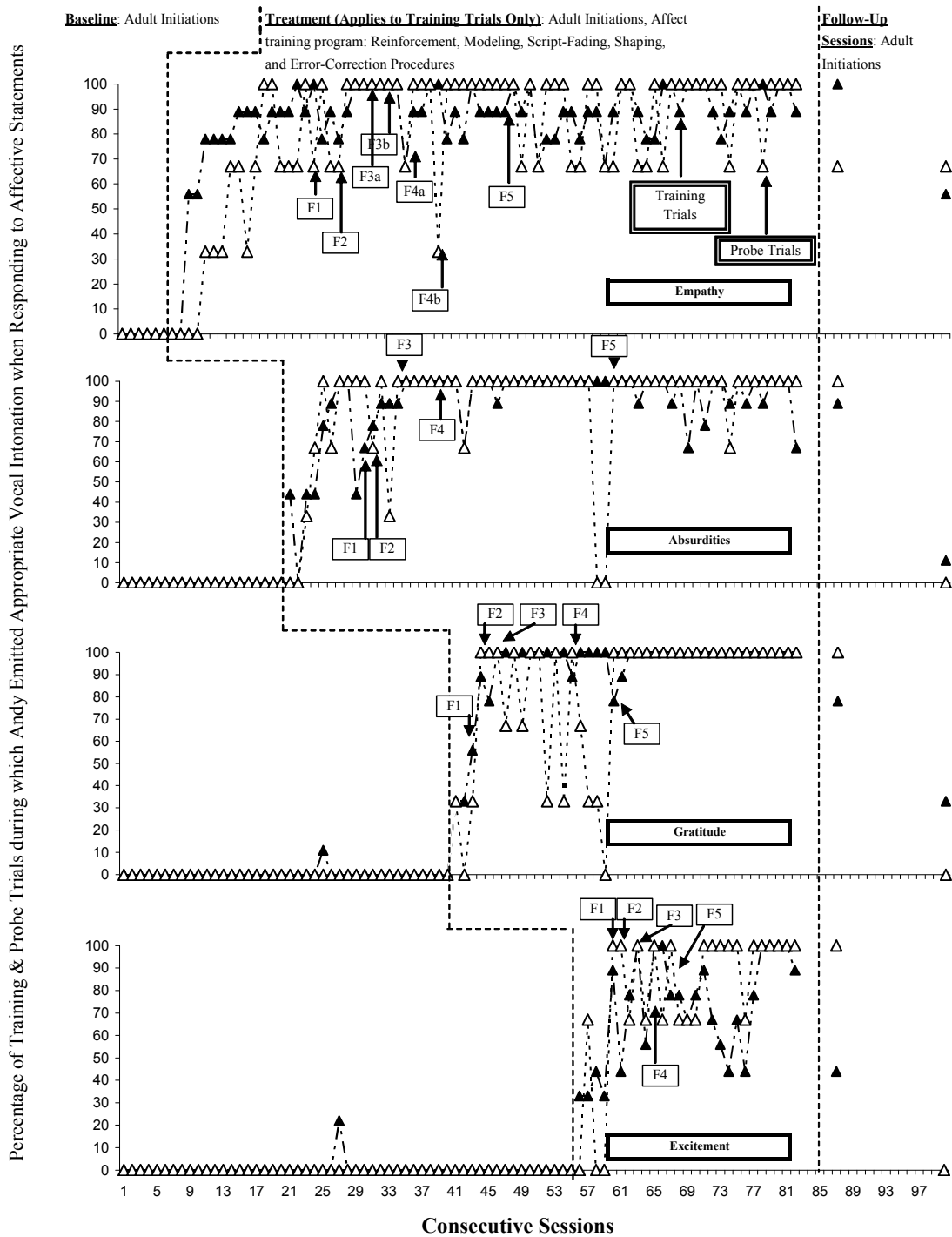
Table 30

Shaping Procedure: Steps Used to Train Marc to Display a Sad Facial Expression

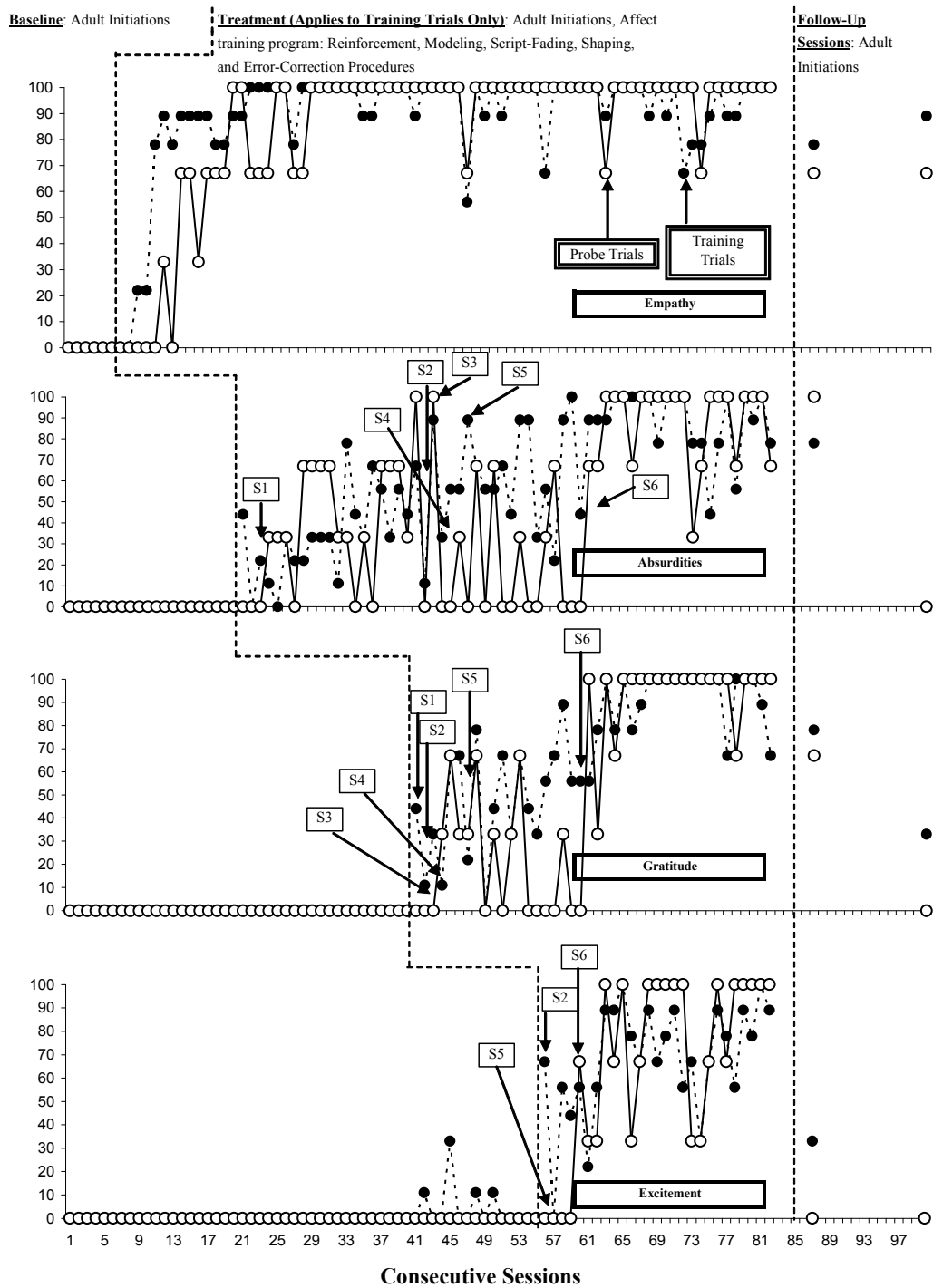
1. Reinforcement was provided for maintaining a serious facial expression (i.e., the absence of a smile).
2. Reinforcement was provided for maintaining a serious facial expression while tilting his head.
3. Reinforcement was provided for displaying a sad facial expression (i.e., slightly stretching his sealed lips downwards) *either* before *or* after emitting verbalization, while tilting his head.
4. Reinforcement was provided for displaying a sad facial expression (i.e., slightly stretching his sealed lips downwards) before *and* after emitting verbalization, while tilting his head.

Percentage of Training & Probe Trials during which Andy Emitted Appropriate Verbal Responding to Affective Statements

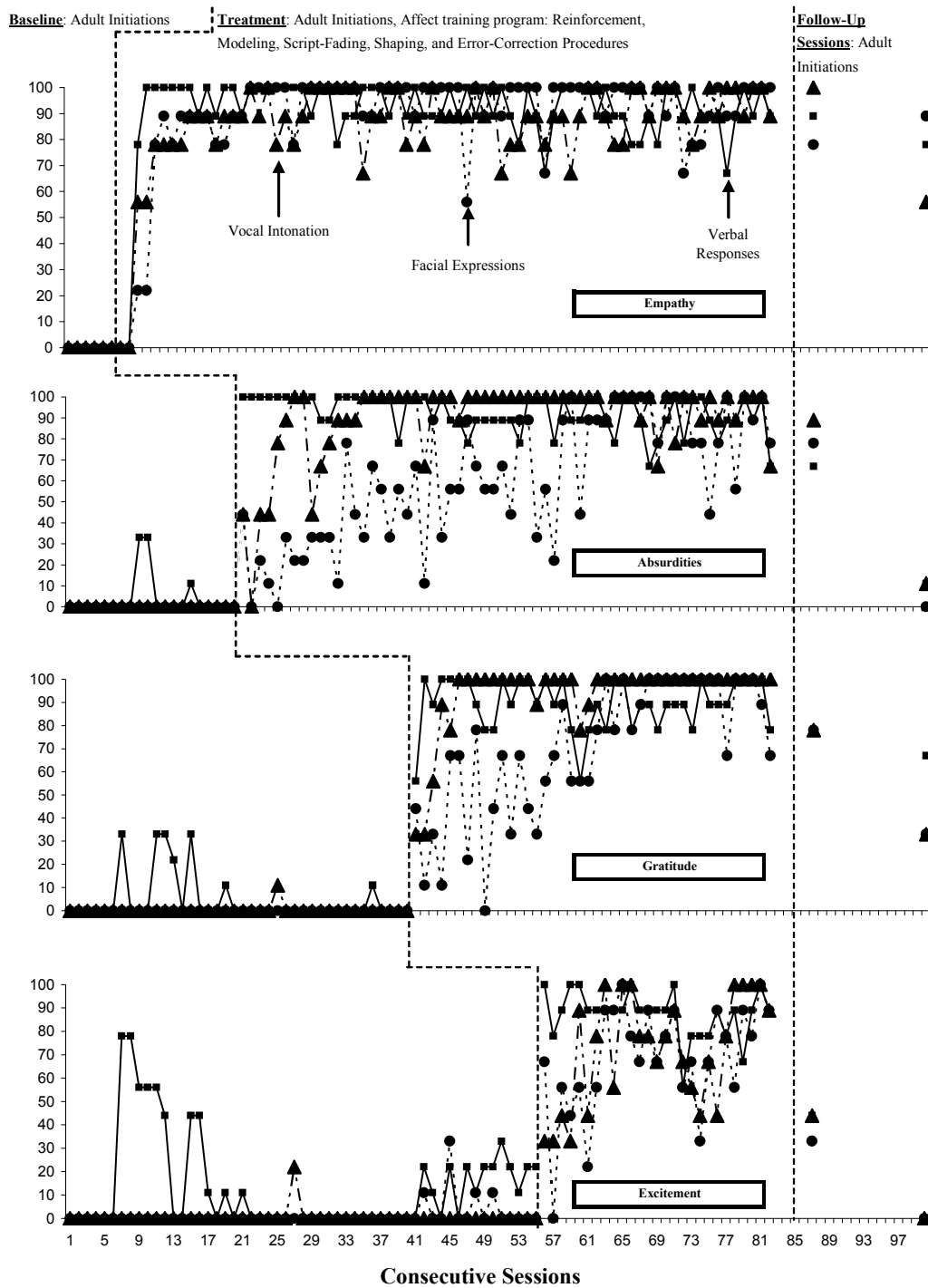


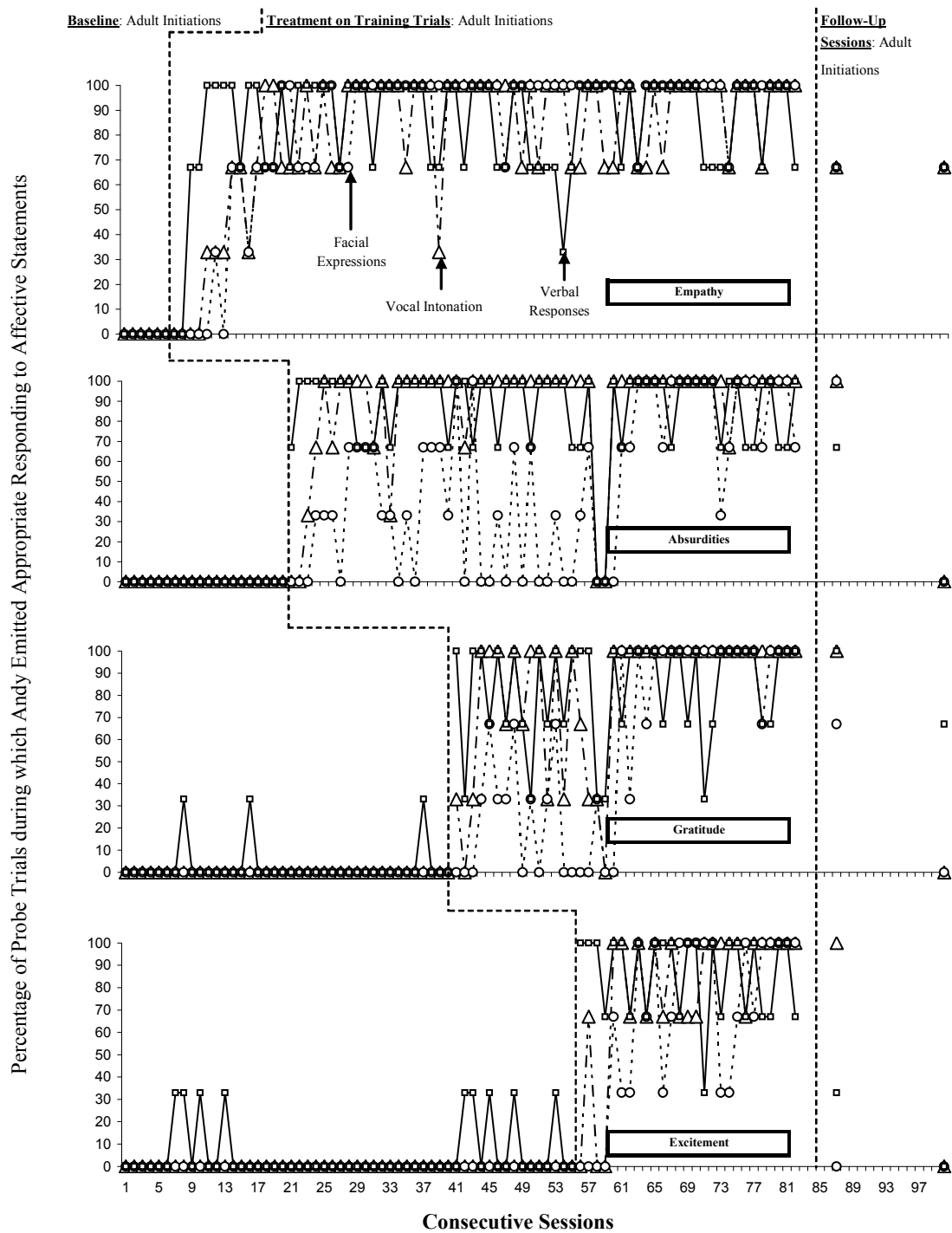


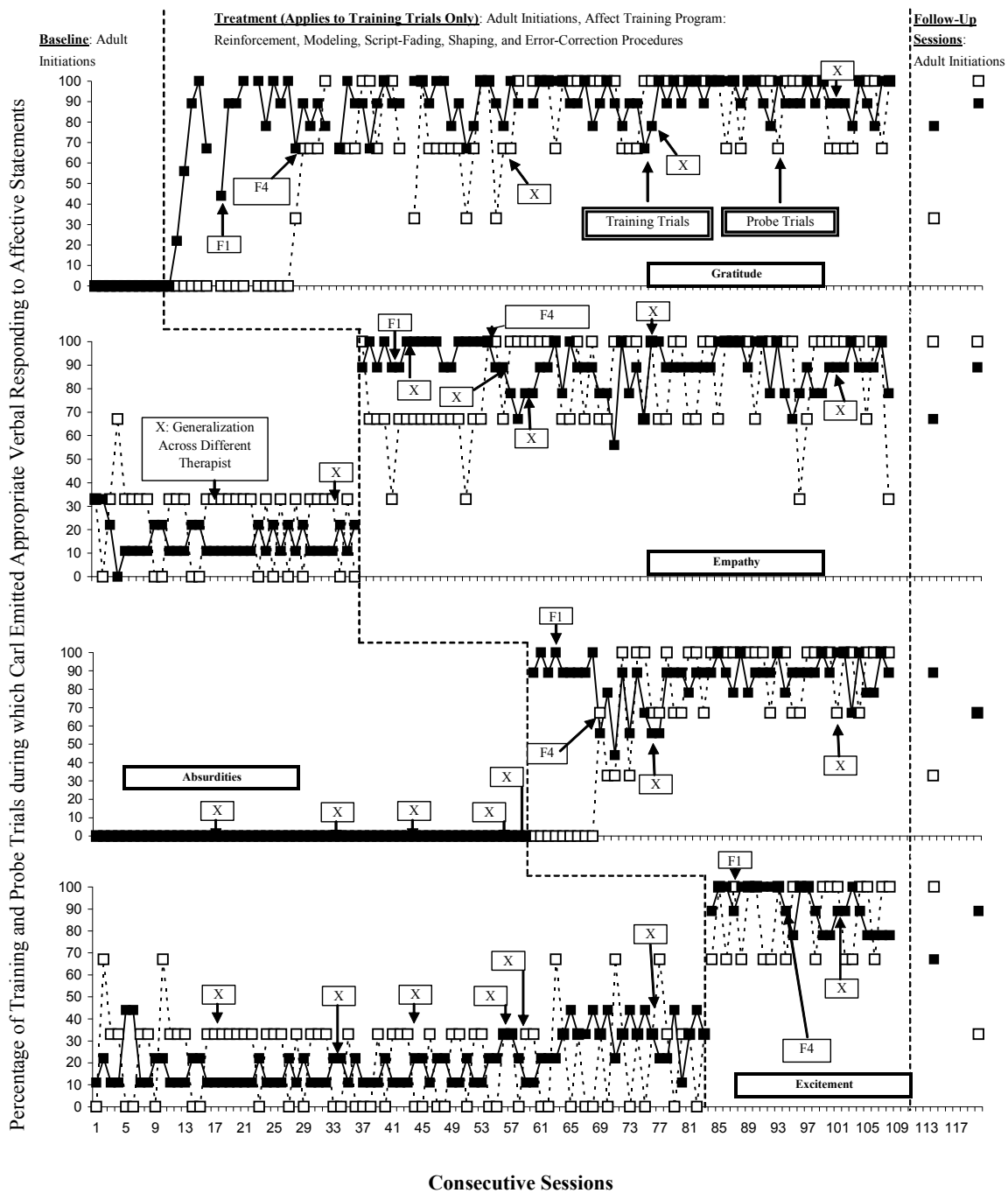
Percentage of Training & Probe Trials during which Andy Emitted Appropriate Facial Expressions when Responding to Affective Statements

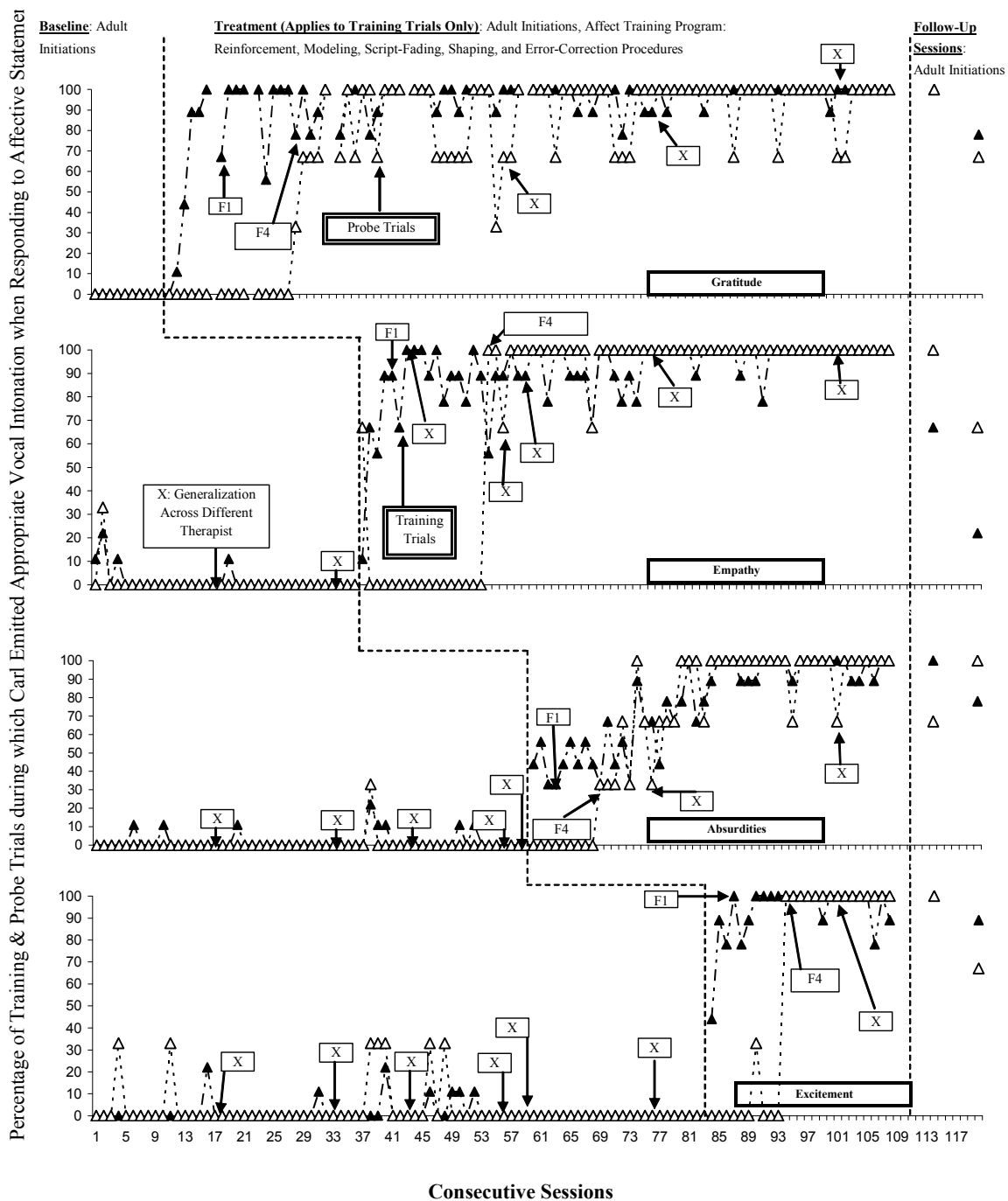


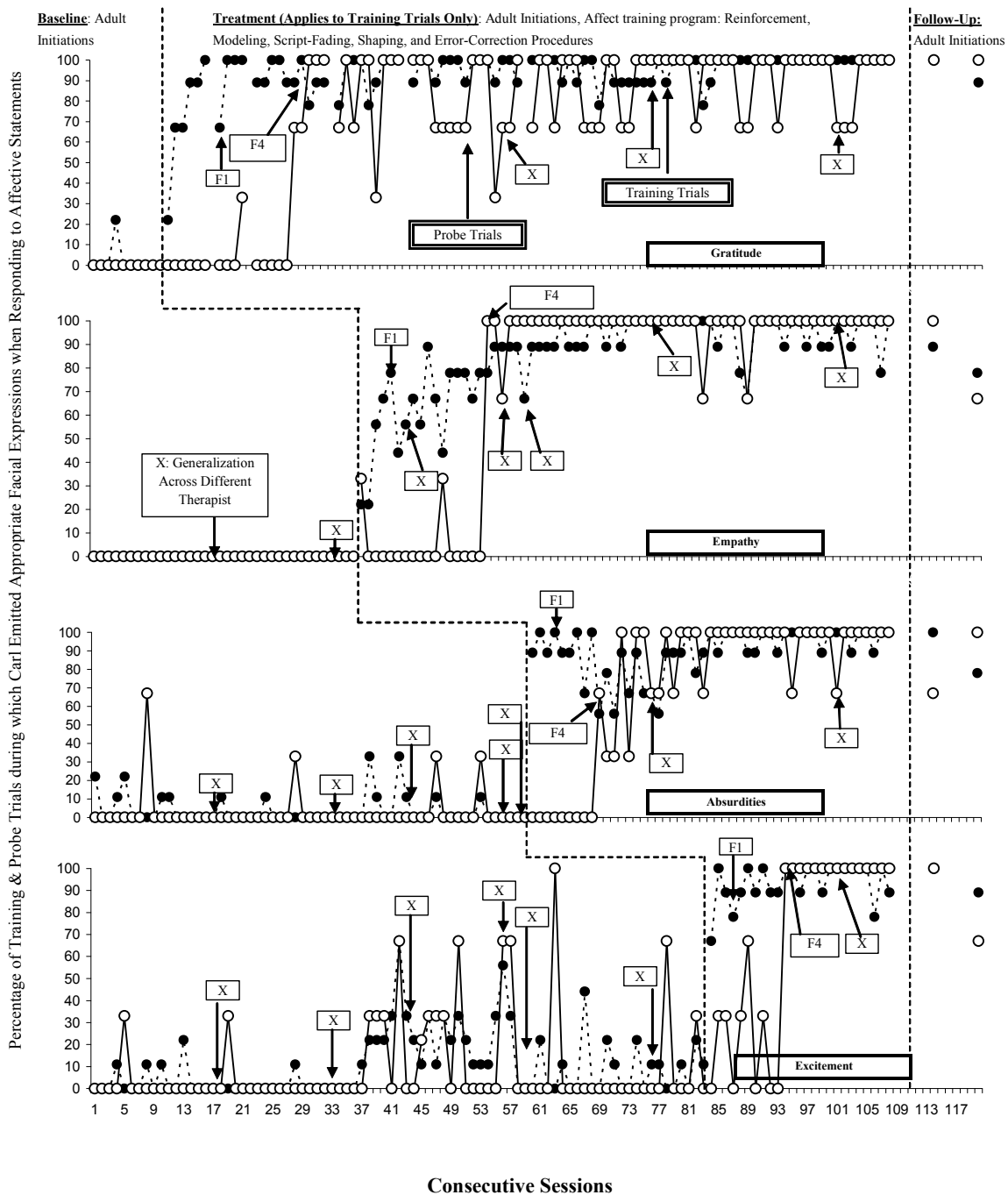
Percentage of Training Trials during which Andy Emitted Appropriate Responding to Affective Statements

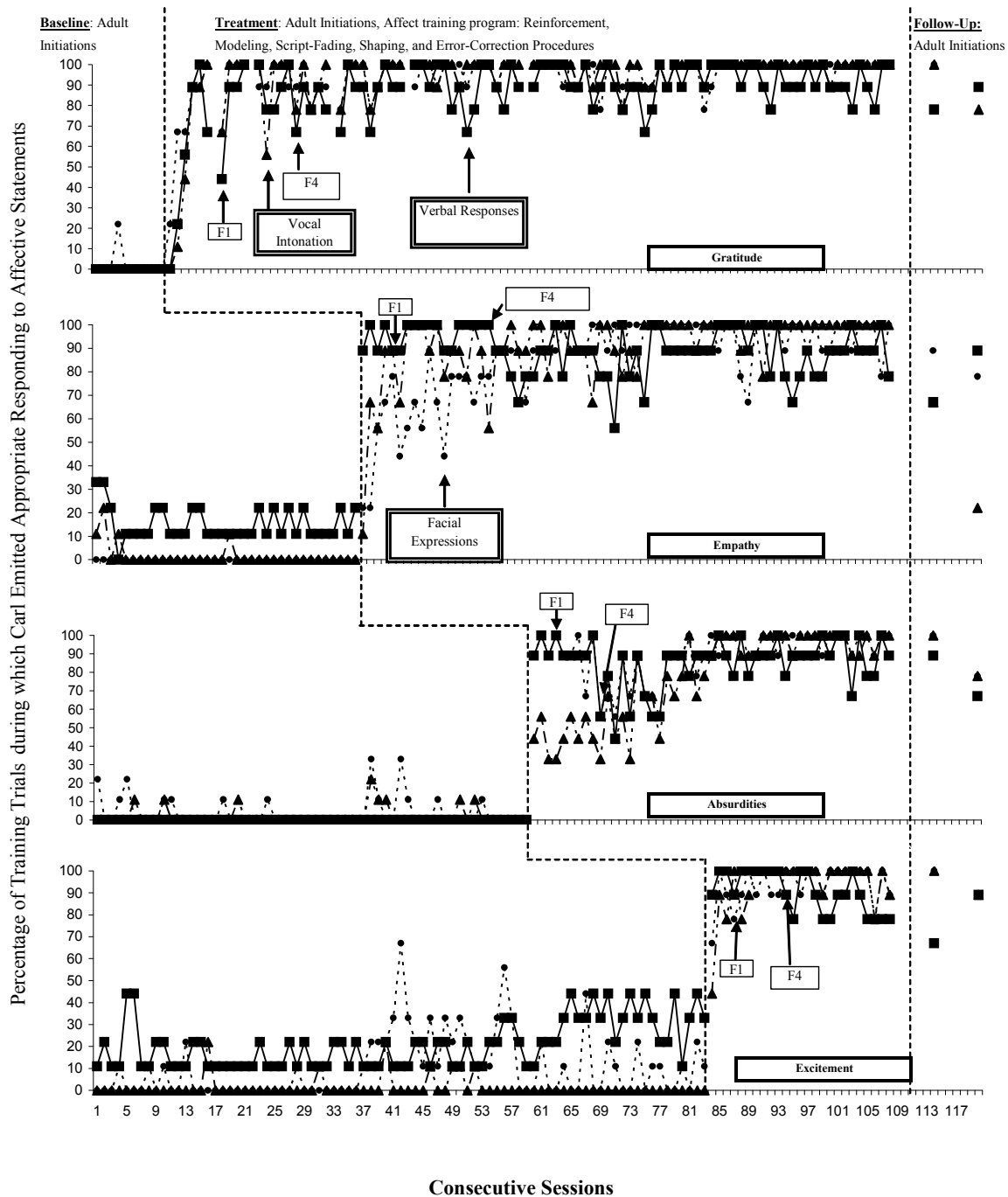


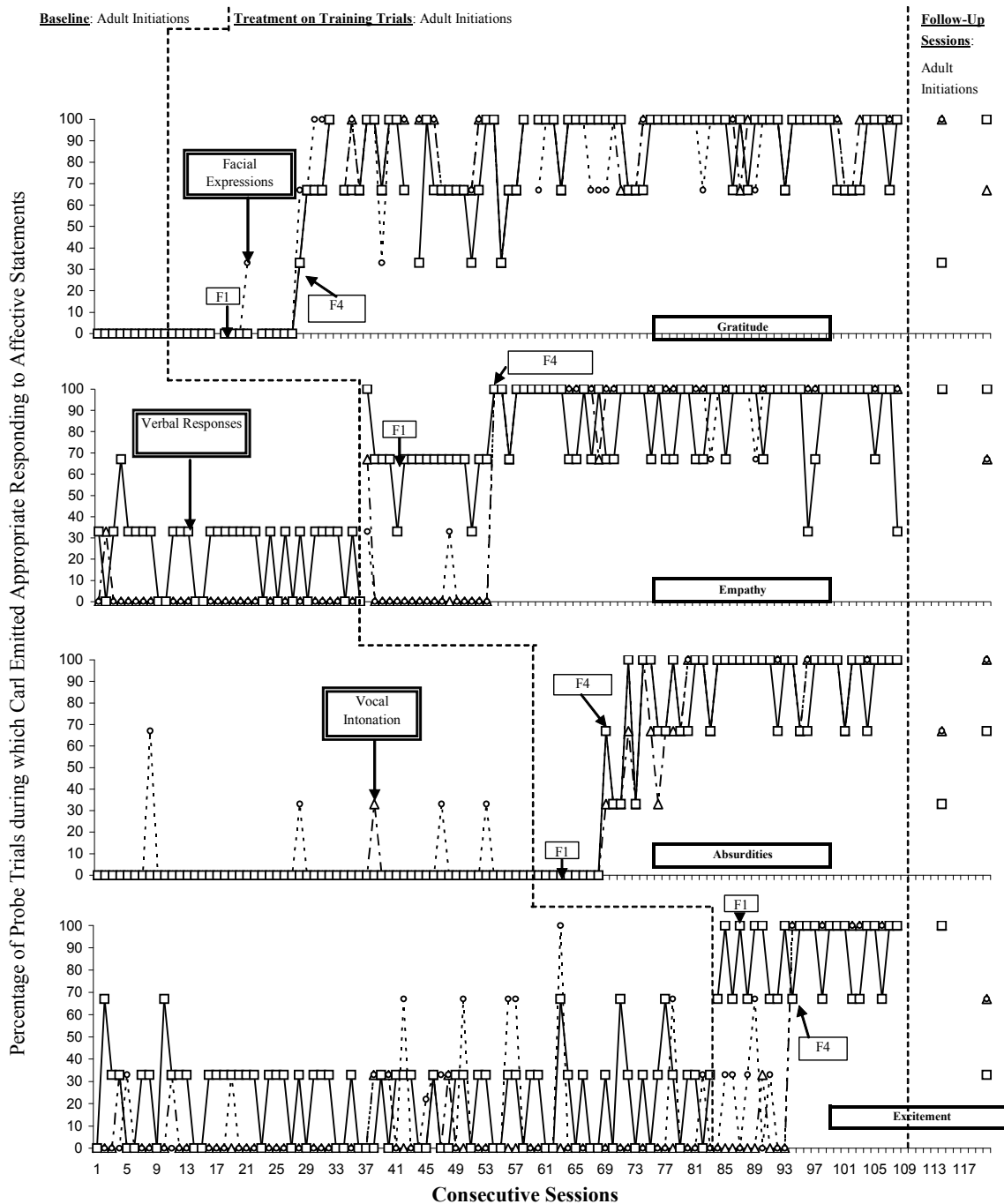


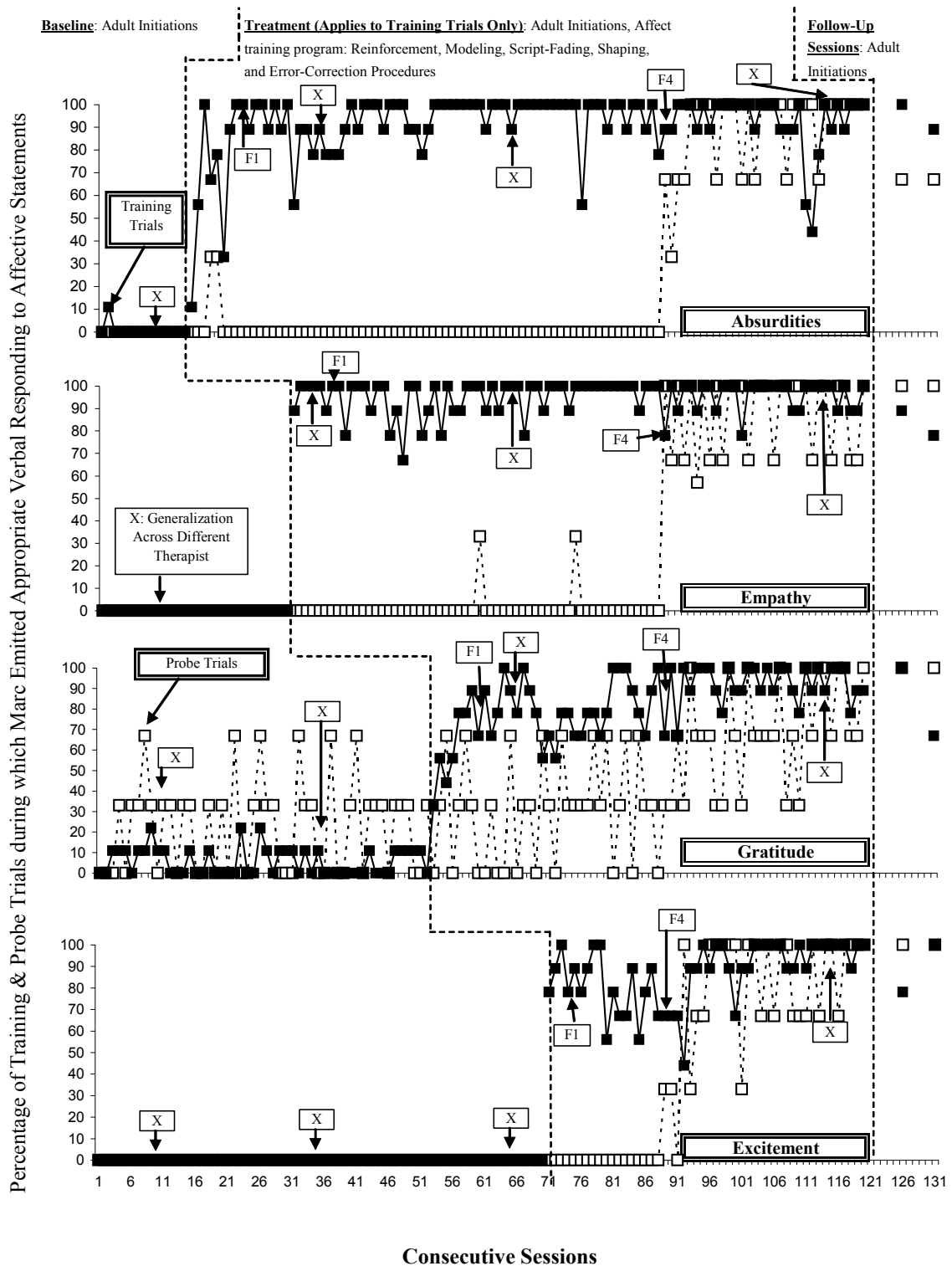


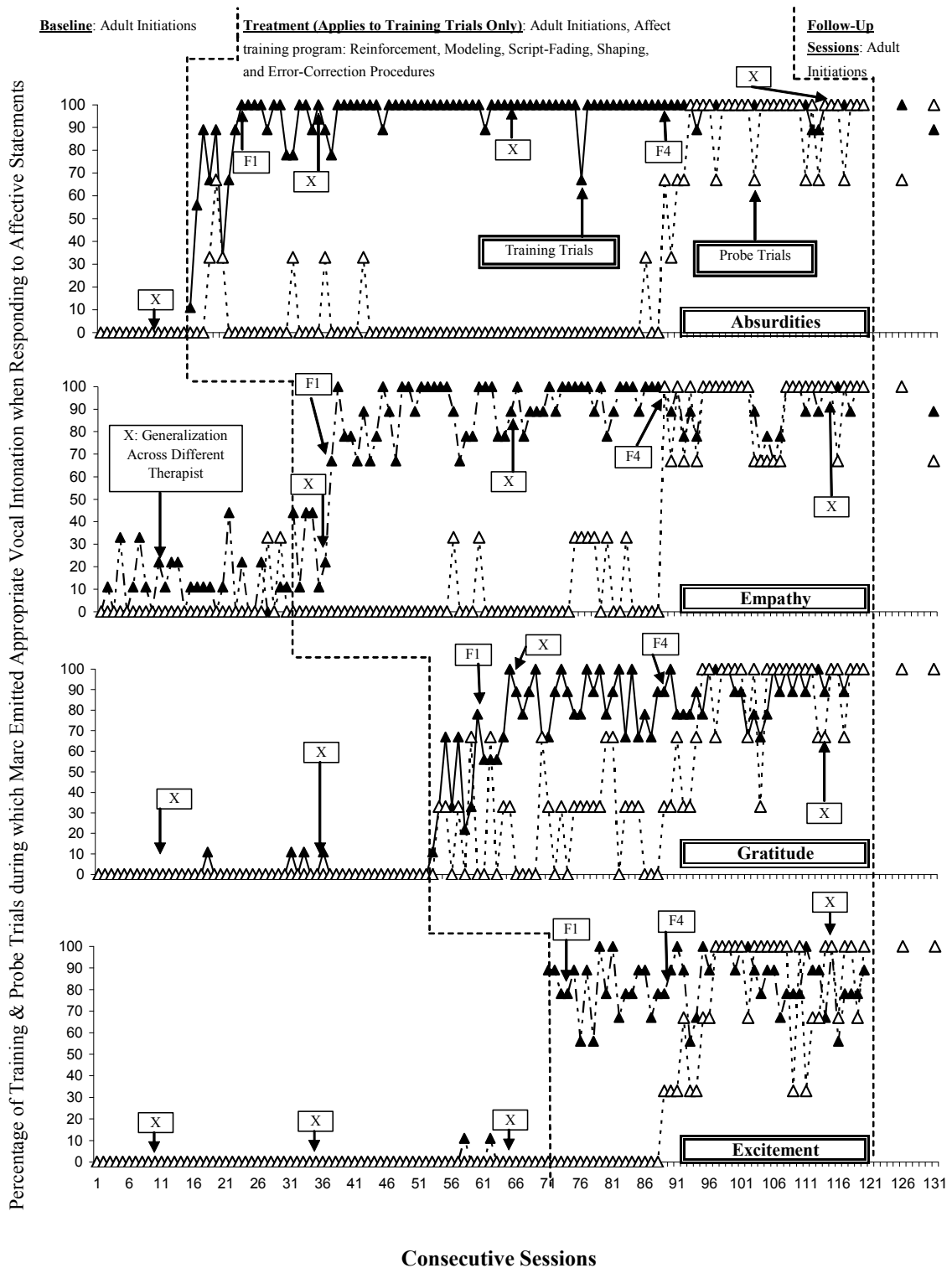


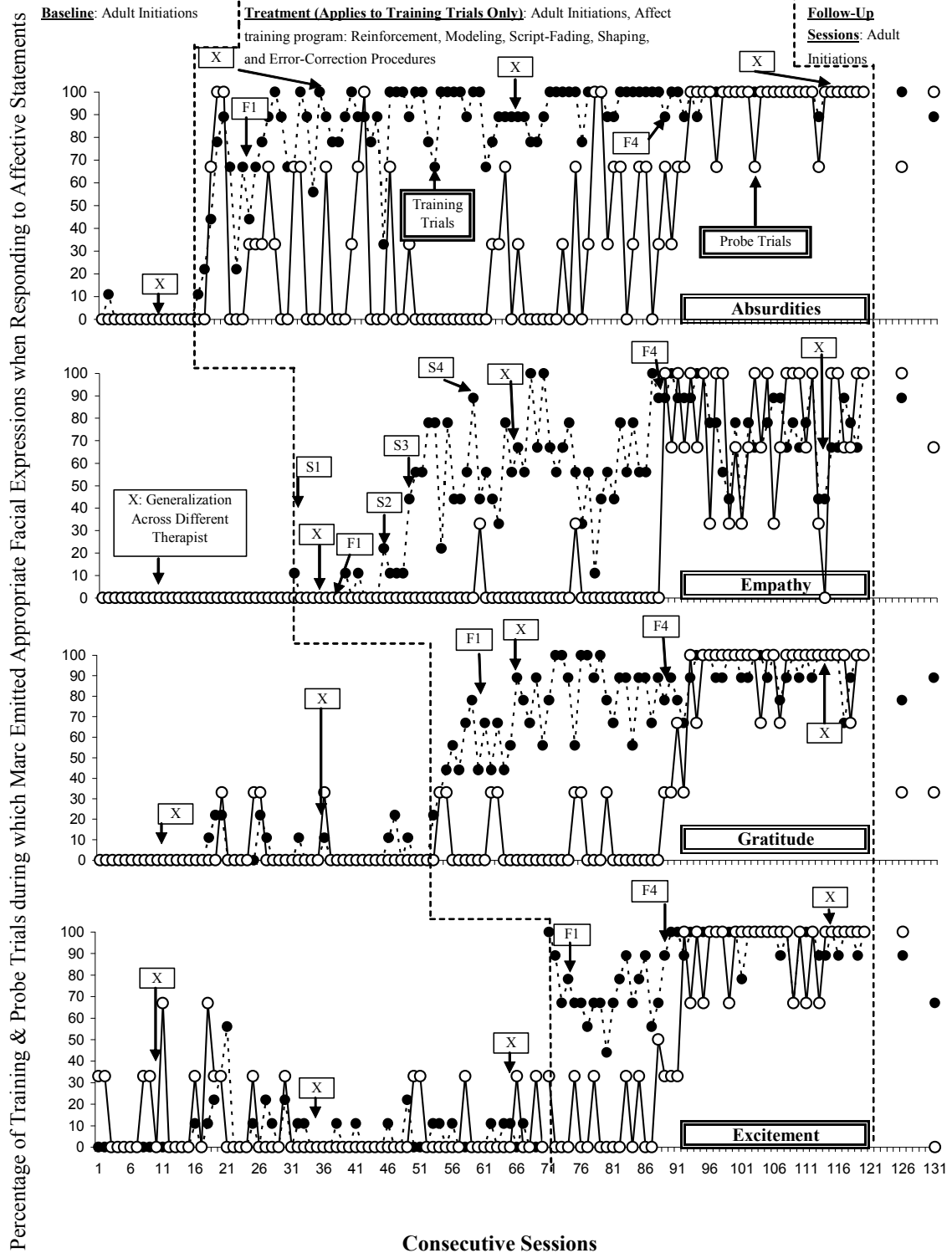


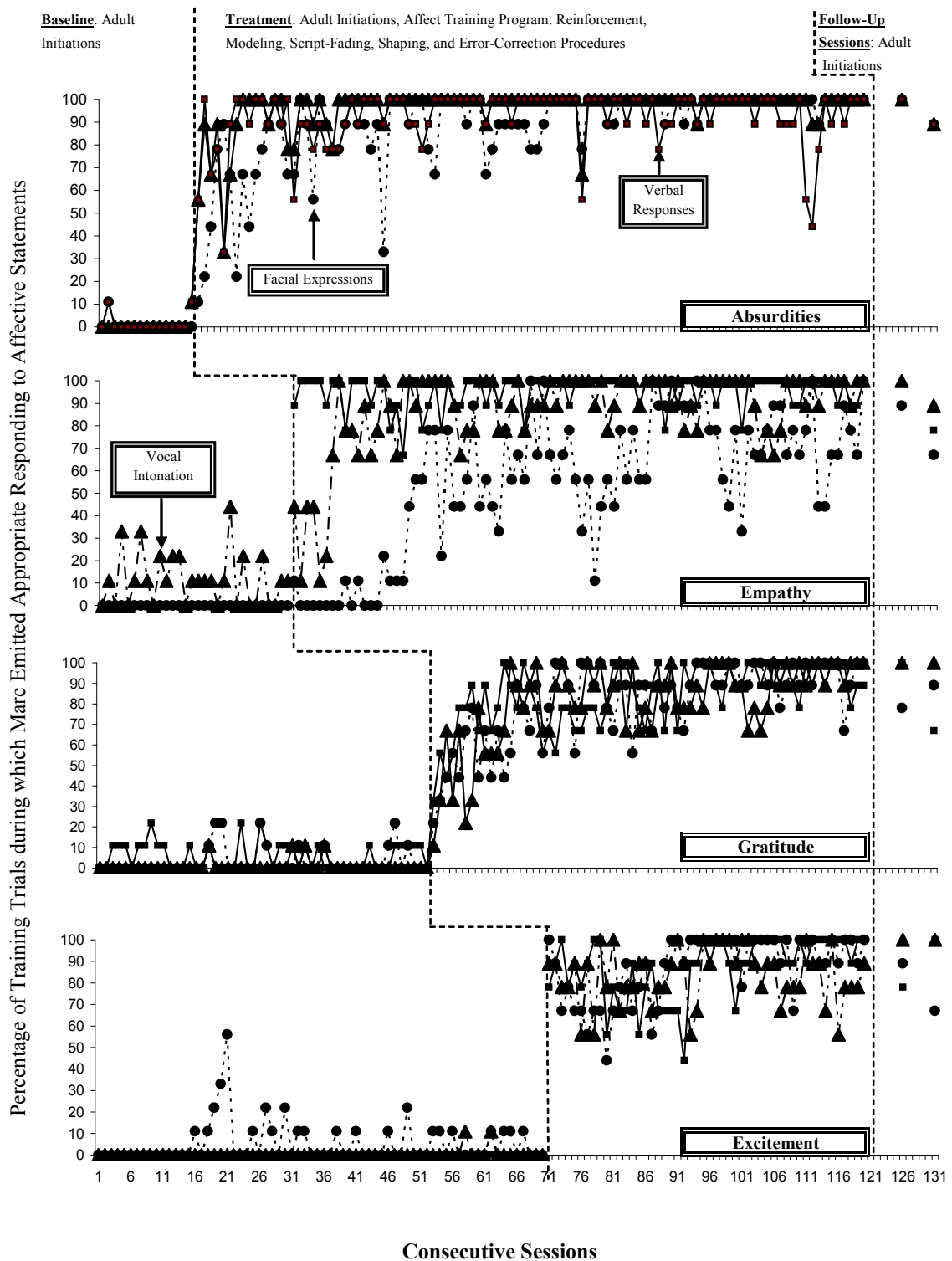


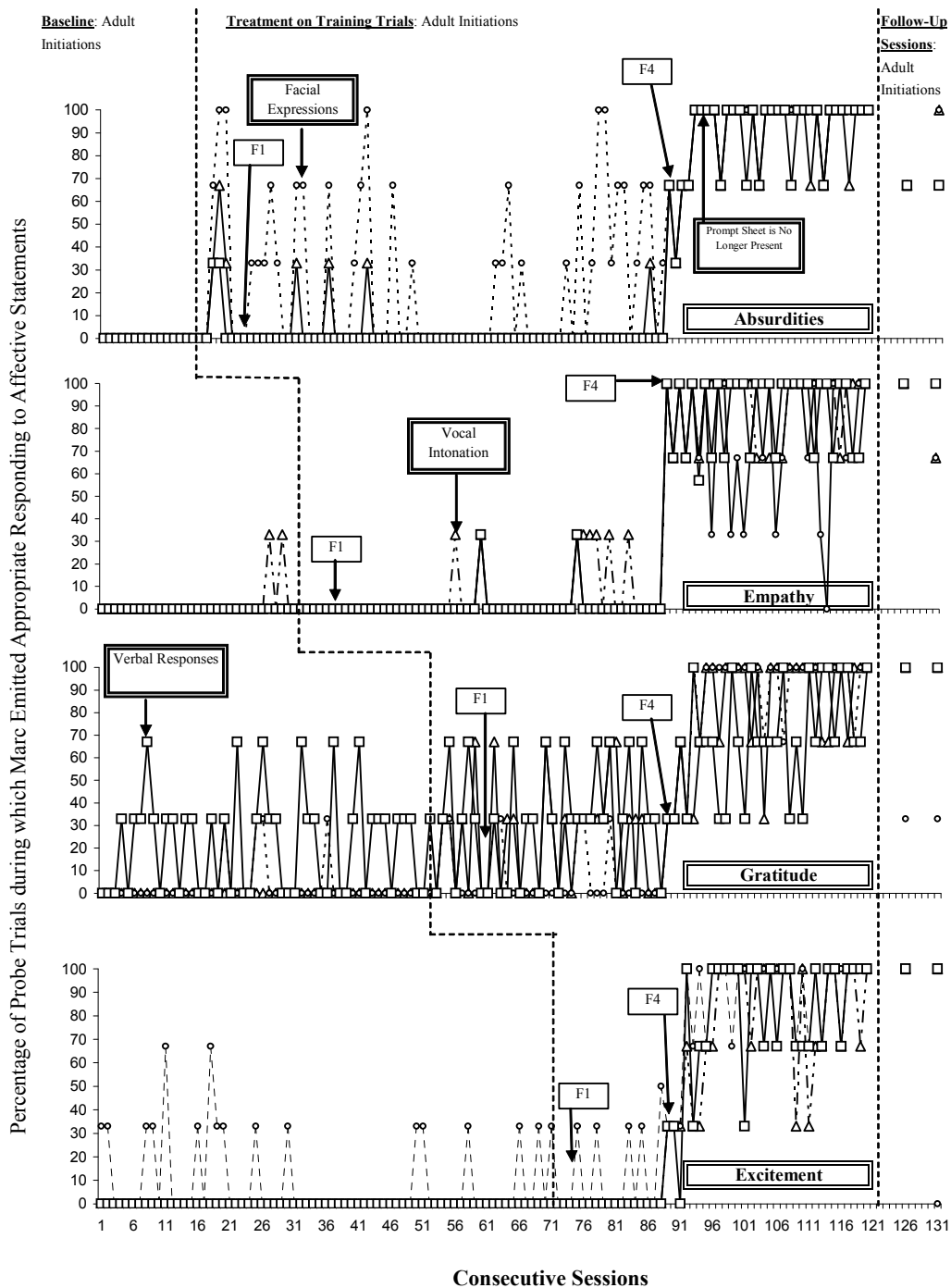




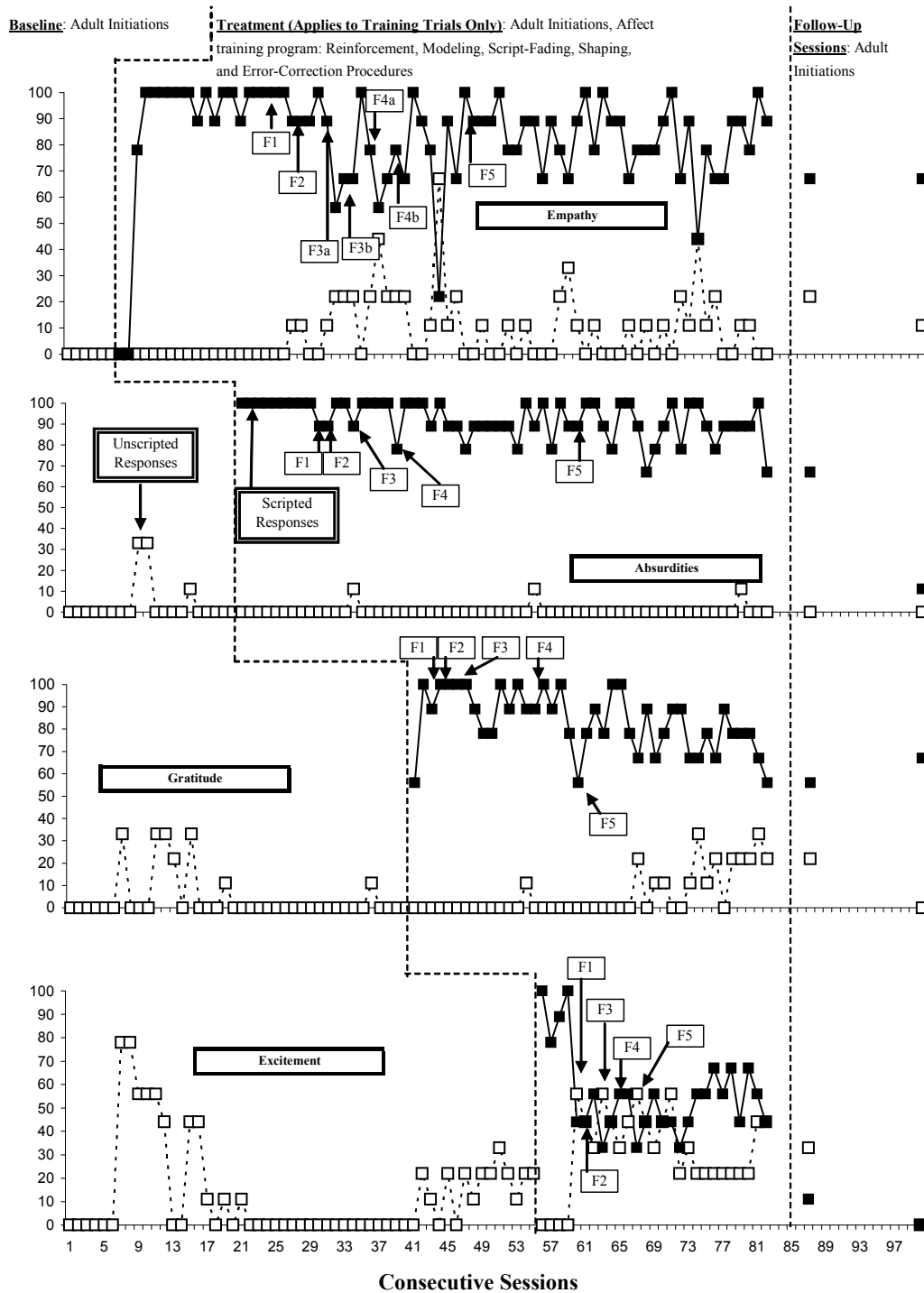




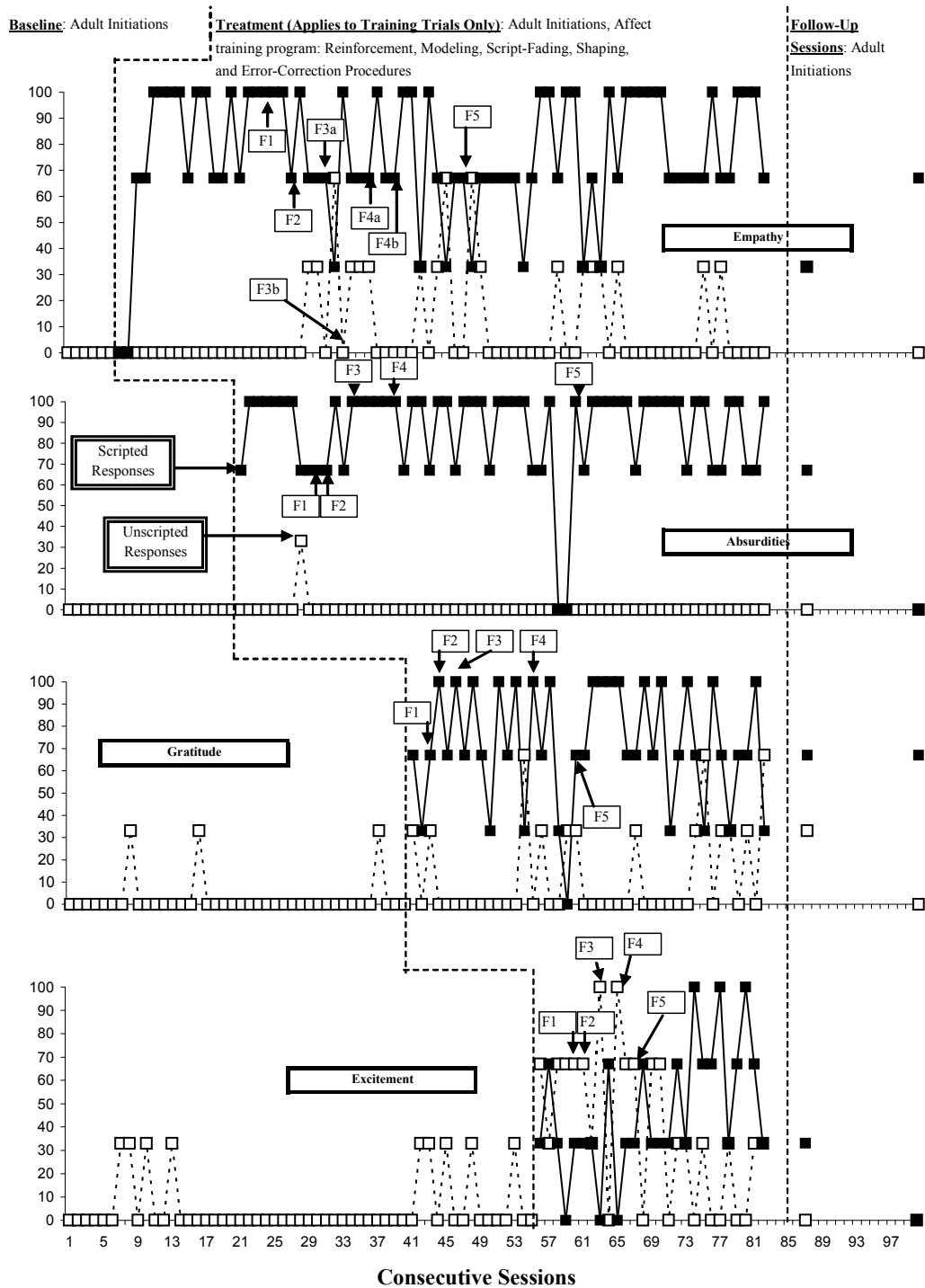


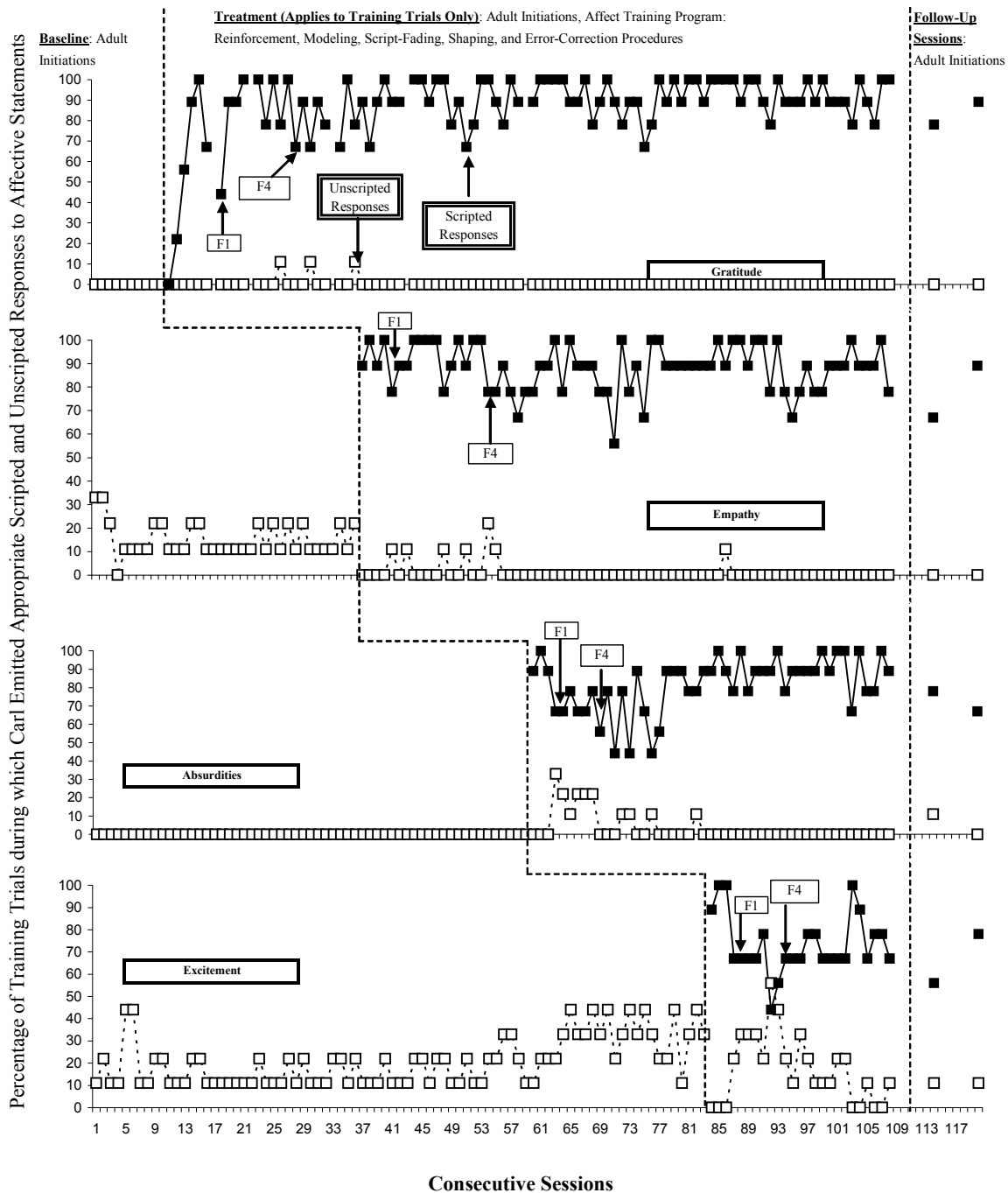


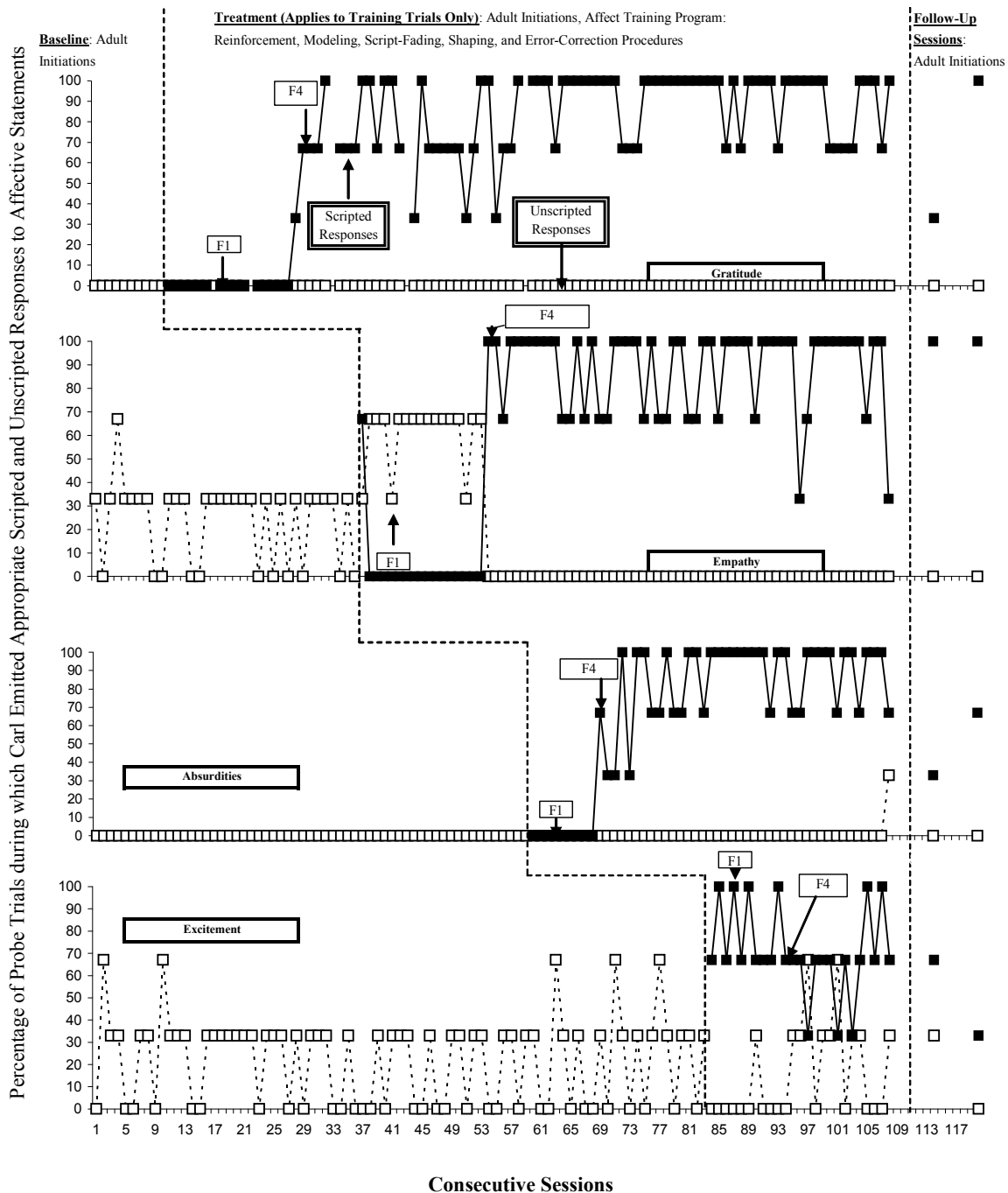
Percentage of Training Trials during which Andy Emitted Appropriate Scripted and Unscripted Responses to Affective Statements

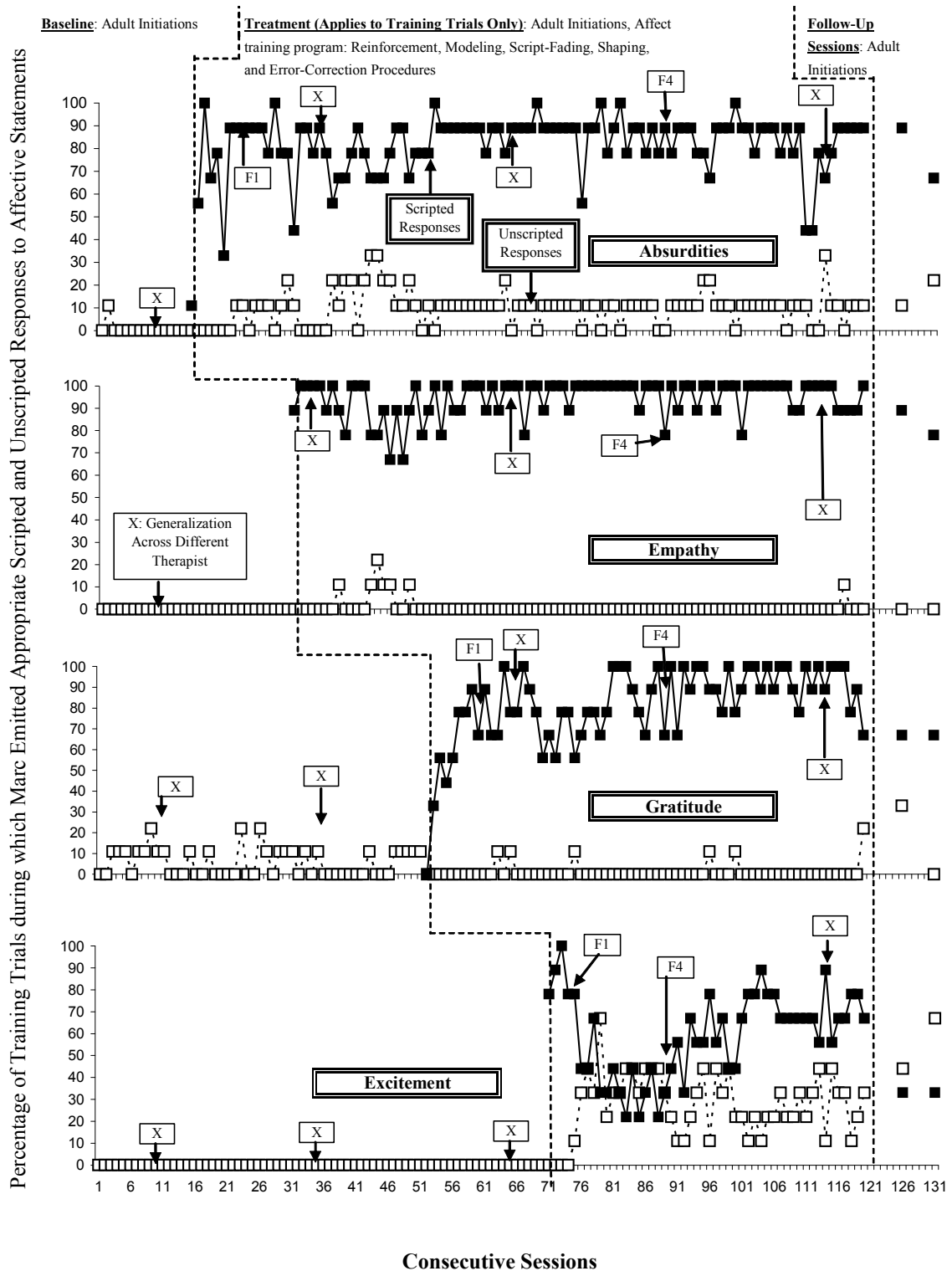


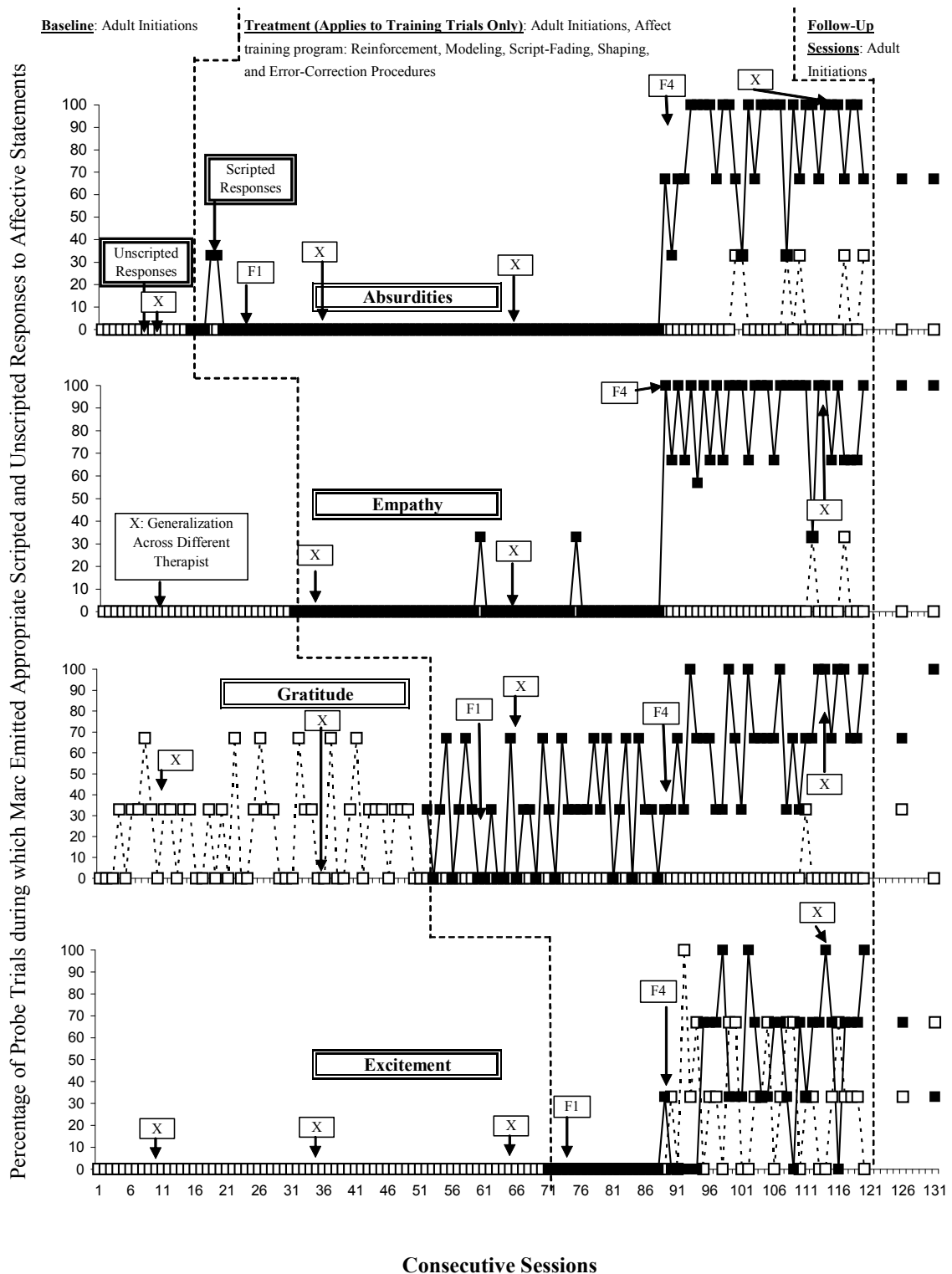
Percentage of Probe Trials during which Andy Emitted Appropriate Scripted and Unscripted Responses to Affective Statements











Appendix A

A Review Paper by the Author on Affective Behavior and Stimulus Control

Running Head: AUTISM AND AFFECT

Affective Behavior in Individuals with Autism

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Abstract

People with autism have deficits in social interaction that are apparent in nonverbal behavior and in difficulty forming relationships with others. Children with autism show little or no interest in people as evidenced by the fact that they often look past or away from them. Such deficits have been addressed using applied-behavior-analytic methods that have been successful in promoting social interaction, which is emphasized in the present review. This review examines (a) affective behavior in children of typical development; (b) affective behavior in children with autism; and (c) the stimulus control literature with respect to its potential use to promote appropriate affective behavior in children with autism. The review concludes that applied-behavior-analytic methods can be and have been successfully used to teach people with autism to emit appropriate affective responses. It is finally suggested that more studies are needed to explore the problem of affect in people with autism, given that Gena's (1994) study seems to be the only behavioral study addressing this problem.

Affective Behavior in Individuals with Autism

According to the DSM-IV (American Psychiatric Association, 1994) criteria, individuals with autism have deficits in social interaction and communication. Such deficits are apparent in nonverbal behavior (e.g., eye-to-eye gaze and gestures) and in difficulty forming peer relationships that involve sharing and reciprocity.

Rutter (1966) provided an account of the behavioral and cognitive characteristics of children with autism. He described five categories of behavioral characteristics, the first of which was “relationships with people.” Under that category, Rutter indicated that children with autism have deficits in interpersonal relationships. Specifically, Rutter noted that children with autism tend to avoid eye-to-eye contact with others, and that they show little or no interest in people as evidenced by the fact that they often look past or away from them. These responses present children with autism as “markedly aloof and [emotionally] distant” (Rutter, 1966, p. 57).

In addition, in his description of the manner in which children with autism relate to people, Rutter (1966) indicated that most children with autism “showed little variation in their facial expression, appearing deep in thought, or solemn, or serious. They did not exhibit their feelings and showed little warmth or affection. They rarely appreciated humour and failed to show sympathy or empathy for other people” (p. 57). Rutter (1966) suggested that failures of comprehension could be responsible for such aloofness.

Such deficits and others that are characteristic of autism have been addressed using applied behavior analysis, which, as Baer, Wolf, and Risley (1968) put it, “make[s] obvious the importance of the behavior changed, its quantitative characteristics, the experimental manipulations which analyze with clarity what was responsible for the

change, the technologically exact description of all procedures contributing to that change, the effectiveness of those procedures in making sufficient change for value, and the generality of that change” (p. 97). Applied-behavior-analytic methods have been successfully used to modify the behavior of various populations, including that of the autism population. For example, McClannahan and Krantz (1999) used behavior-analytic principles to develop a new technology that equips children with autism with the skills to accomplish academic, leisure, and self-care tasks with minimal adult supervision. Haring, Kennedy, Adams, and Pitts-Conway (1987) used video modeling to teach youths with autism purchasing behavior in one setting, and successfully demonstrated generalization of that behavior across community settings.

Applied-behavior-analytic methods also have been successfully used to modify behavior that helps promote social interaction. For example, Gaylord-Ross, Haring, Breen, and Pitts-Conway (1984) taught youths with autism to make initiations to their typically developing peers, and to increase the duration of their social interactions. In their second experiment, Gaylord-Ross et al. taught a youth with autism to make similar initiations with a peer who had autism as well. Targeting the same behavior, but using a new technology, Krantz and McClannahan (1993) taught youths with autism to initiate to peers during social interactions using scripts and script-fading procedures.

Such procedures and others have emerged as a result of advances in stimulus-control technology, which has benefited applied-behavior-analytic intervention for the autism population (e.g., Green, 2001). For this type of intervention alone, stimulus-control techniques have been used in numerous ways for numerous purposes (e.g., conditional-discrimination training, incidental teaching, and prompt and prompt-fading

procedures). For the purpose of promoting social interaction, however, only recently has there been a burst of interest in putting stimulus-control techniques into use (e.g., Krantz & McClannahan, 1993; Reeve, 2001).

This focus on social interaction is emphasized and explored in the present review, whose purpose is threefold: (1) To examine affective behavior in children of typical development; (2) To examine affective behavior in children with autism; and (3) To examine the stimulus control literature with respect to its potential use to promote appropriate affective behavior in children with autism. It is important to note first that affective behavior is but one of several response classes that are concerned with the study of social interaction. Social interaction, in turn, is but one of several classes of social behavior.

Social Behavior from a Behavior-Analytic Perspective

Skinner (1953) defined social behavior as “the behavior of two or more people with respect to one another or in concert with respect to a common environment” (p. 297). In discussions of social behavior, the topic of social stimuli becomes especially relevant. As Skinner (1953) described it, “A social stimulus, like any other stimulus, becomes important in controlling behavior because of the contingencies into which it enters” (pp. 301-302). An individual’s history determines what stimuli come to function as social stimuli. Furthermore, an individual’s history determines exactly what function a particular social stimulus would have, be it discriminative, eliciting, motivational, or consequential (Schlinger, 1995).

Schlinger (1995) examined attachment relations and moral behavior, in which he included an examination of prosocial behavior and empathy, from a behavior analytic

viewpoint. That is to say, Schlinger (1995) examined these social-psychological topics that are traditionally studied from a cognitive-developmental perspective by examining the contingencies of reinforcement that form these categories of social behavior. For this reason, Schlinger's (1995) discussion of empathy as an affective response is of particular relevance to the present paper.

Schlinger (1995) stated that empathy is the underlying motivation in several categories of prosocial behavior, such as sharing, helping, protecting, and nurturing. Yet, he noted that "the only evidence for the underlying motivation – empathy – or the lack of it, is the very behavior the empathy is said to explain... [In addition], the empathy itself can never be tested directly; rather, it must always be inferred from other, more direct data" (Schlinger, 1995, p. 231). One might argue that this "inference" describes the degree of stimulus control of this affective behavior on another individual. Schlinger's (1995) point was that traditional cognitive-developmental psychologists were interested not in an examination of the observable characteristics of affective behavior and the contingencies of reinforcement that form and maintain it, but rather in processes and events that cannot be observed or measured. Schlinger (1995) demonstrated that behavior-analytic principles can be successfully used to examine the responses that are relevant to empathy and other affective responses, because these principles parsimoniously "look at the specific behaviors from which these concepts are inferred and ... ask about their controlling variables" (p. 242). Gena, Krantz, McClannahan, and Poulson (1996) noted that, "When considered within the broader context in which they are emitted, affective responses can serve as discriminative stimuli for the use of such modifiers as *happy*, *sad*, *surprised*, *dismayed*, and *puzzled* – terms that are used to draw

inferences about a person's emotional or physiological state" (p. 291). Whereas the term *emotion* refers to an unobservable private event, the term *affect* refers to behavior that "includes observable aspects of a person's facial, verbal, postural, and gestural response repertoires" (Gena et al., 1996, p. 291).

In applied research, it is crucial to prompt, reinforce, and maintain appropriate social responding under the appropriate stimulus conditions (Stokes & Baer, 1977; Sulzer-Azaroff & Mayer, 1991). Multiple-exemplar training is one of several procedures that have been used to program for the transfer of training effects to novel conditions. Sulzer-Azaroff and Mayer (1991) defined *exemplars* as "examples containing the critical stimulus or response features," and they emphasized that as more exemplars are provided, a learner is expected to "become increasingly capable of *generalizing* to others containing the same critical features, in the absence of formal programming" (p. 508). Stokes and Baer (1977) stressed the use of *sufficient* exemplars as a technique to promote generalization. Training sufficient exemplars has been successful in the generalization of greeting responses (Stokes, Baer, & Jackson, 1974) and conversational speech form (Garcia, 1974) across experimenters in children with mental retardation. Multiple-exemplar training was also used to teach children with mental retardation (Baer, Peterson, & Sherman, 1967) and infants under two years of age (Poulson & Kymissis, 1988) to imitate untrained motor responses, which were presented as probe trials interspersed among other motor responses that were trained.

A recent study by Reeve (2001) used multiple-exemplar training, modeling, prompting, and reinforcement to address a social-psychological phenomenon, namely prosocial behavior. Furthermore, Reeve (2001) used stimulus classes that were clearly

defined and provided conditions that were explicitly stated. Specifically, Reeve used three stimulus components to set the occasion for helping behavior to occur, thus maximizing the probability of generalization to a wide range of stimuli. Reeve referred to these stimulus components as (1) *nonverbal* discriminative stimuli, which designate “an assortment of art materials, toys, common objects, and activities that were appropriate discriminative stimuli for each response category” (Reeve, 2001, p. 34); (2) *verbal* discriminative stimuli, which designate verbalizations emitted by the experimenter, such as “Oops, I dropped them” (p. 93); and (3) *affective* discriminative stimuli, which Reeve did not define, but provided examples for. Using those examples, the *affective* component category could be distinguished from the *nonverbal* category in that the affective discriminative stimuli consisted of nonverbal facial and gestural expressions emitted by the experimenter (e.g., opening the eyes wide), whereas what Reeve referred to as the nonverbal discriminative stimuli consisted of objects made available in the experimental setting and used by the experimenter to set the occasion for helping behavior to occur. Each of these three component categories (i.e., *nonverbal*, *verbal*, and *affective*) had five stimuli particular to the category. For example, the affective category consisted of the following five discriminative stimuli, all of which were nonverbal: (1) shaking the head, (2) rolling the eyes, (3) sighing, (4) wrinkling the brow, and (5) opening the eyes wide. These stimuli were not presented in isolation, but rather, they were presented together with discriminative stimuli that belonged to each of the nonverbal and verbal components. The three-component stimulus compound (verbal-nonverbal-affective) was set to signal the helping response correlated with reinforcement. Because the *affective* category, like the *nonverbal* category as used by Reeve (2001), was itself nonverbal, it

might have been clearer to have referred to these categories instead as *affective* and *motor*.

Be that as it may, using three different discriminative stimulus categories (*nonverbal*, *verbal*, and *affective*, as Reeve (2001) did) might have increased the likelihood of generalization of results from trained to novel conditions. Furthermore, Reeve's multifarious use of multiple-exemplar training maximized the likelihood of generalization. Specifically, that study (1) provided each learner with four training categories of helping, as well as two novel categories, to promote the likelihood of generalization from trained to novel helping categories; (2) provided four generalization probes within each category of 20 nonverbal discriminative stimuli within each learner's trained categories to promote the likelihood of generalization from trained to novel stimuli within a given category; and (3) had different instructors conduct experimental sessions in different settings, to promote the likelihood of generalization from trained to novel instructors and settings. Hence, Reeve's study programmed for generalization using multiple-exemplar training across and within response categories and across instructors and settings.

In their respective studies, Buffington (1996) and Brim (2002) also used behavior-analytic principles to address the social-psychological phenomena of nonverbal communication and social referencing in children with autism. As with prosocial behavior, these phenomena are integral in helping people with autism establish, improve upon, and maintain appropriate social behavior. Acquiring appropriate affective responding is especially important, because it is a relevant component in mostly all social skills. It is, therefore, not surprising that Reeve's (2001) discriminative stimuli consisted

of not only a verbal component, but also an affective component, to set the occasion for helping responses to be emitted.

Affective Behavior in Children with Typical Development

Discrimination and Expression of Affective Responses

At two or three months of age, babies start to discriminate several affective expressions and facial features displayed by their parents (Bee, 1995; Haviland & Lelwica, 1987). In a study by Haviland and Lelwica (1987), 12 mothers presented happy, sad, and angry facial expressions, each to her 10-week-old infant. Simultaneously with the presentation of these facial expressions, mothers were asked to continuously say to the infants, "You make me so happy (sad or mad)" (p. 98). These affect-specific statements emitted by the mothers matched the facial expression they were to display at a given trial. Infants' facial expressions, gazing, and vocalizations were recorded using videotapes, audio tapes, and a "Maximally Discriminative Facial Movement Coding System," which is a system especially designed to record facial expressions (Izard, as cited in Haviland & Lelwica, 1987, p. 98). The results showed that the infants discriminated each of the three facial expressions displayed by their mothers at varying levels of accuracy. The infants displayed facial expressions that matched their mothers' in two of the four trials in which the mothers presented facial expressions associated with happiness, in three of the four trials in which the mothers presented facial expressions associated with anger, and in all four trials in which the mothers presented facial expressions associated with sadness. According to the authors, this finding was of particular importance, because it not only provided evidence that the infants discriminated the facial and vocal cues associated with anger, sadness, and happiness, but

that they do so under three months of age. Haviland and Lelwica noted that earlier research had shown that infants could make such discriminations only at six months of age.

Infants' discrimination of other people's emotions is not limited to those emotions displayed by the parents. At five or six months of age, infants start to discriminate those expressions and features displayed by strangers as well (Caron, Caron, & Myers, 1982; Nelson, 1987). Caron et al. presented four-, five-, and seven-month-old infants with photographs of mothers displaying facial expressions that were either familiar (e.g., happy) or novel (e.g., surprise). The study consisted of two conditions. The first condition consisted of (1) a training phase, which the authors called *the four-exemplar condition*, because it included the presentation of four different faces (stimuli), all of which displayed what came to be the familiar facial expression (i.e., happy); and (2) a test phase, in which two novel faces were presented, each displaying the familiar facial expression and the novel facial expression. The second condition was identical to the first, except that the training phase of the second condition consisted of *single-exemplar training*, because the familiar facial expression was displayed using only one face, rather than four. Caron et al. measured infants' ability to discriminate between familiar and novel expressions in terms of the extent to which they were *fixated* on familiar and novel stimuli. The results demonstrated that only seven-month-old infants successfully discriminated familiar and novel expressions across different models.

Ten-month-old infants use the affective cues that distinguish "happy," "surprised," "sad," and "fearful" voices and faces from one another to help determine how to respond in a novel situation, such as on a visit to the doctor's office (Hirshberg &

Svejda, 1990). Researchers have explored the process of using a parent's facial expression or body language as a basis to determine what one's own response ought to be, a process known as "social referencing" (Brim, 2002; Hirshberg & Svejda, 1990). In an experiment by Hirshberg and Svejda (1990), one-year-old babies were presented with novel toys. Together with each presentation, each baby's mother and father provided a happy, fearful, or neutral facial expression or vocal cue. The experiment consisted of three conditions, which varied based on parent presence or absence, and on facial expressions and vocal cues emitted by the participating parent(s). In one condition, both parents were present, but they were silent and maintained a neutral facial expression. In the second condition, one parent participated at a time and displayed what the authors called *positive* or *negative* signals. If the mother displayed a positive signal, the father subsequently displayed a negative signal, and vice versa. The parents' conflicting expression pertained to different toys, however. Hirshberg and Svejda (1990) explained that *positive* signals designated *happiness*, and *negative* signals designated *fear*. The authors, however, did not define *happiness* or *fear*. The third condition was identical to the second, except that the signals emitted by each parent pertained to the same toy. Therefore, the expressions emitted by a baby's parents were not only conflicting, but also in reference to the same toy their child was presented with. Hirshberg and Svejda measured the number of five-second intervals in which babies had a proximity of at least two feet to a target toy, the duration of an infant's eye contact with the parent providing a cue, and the number of approaches an infant made to a particular toy. In addition, the authors obtained measures of infant affective behavior. Specifically, the authors obtained measures of what they called *positive affect*, *negative affect*, and *affect lability*. They

defined positive affect as the amount of *pleasure* the babies displayed, negative affect as the amount of *distress* displayed, and affect lability as a measure calculated “by summing the total number of shifts in scale points from strong pleasure to extreme distress and dividing by the number of scoreable intervals” (Hirshberg & Svejda, 1990, p. 1178). The authors, however, did not provide response definitions for *pleasure* or *distress*. The results demonstrated that children’s social referencing responses to mothers and fathers are similar.

Infants learn not only to discriminate among the various affective responses expressed by other people in their environment, but they also learn to express affective responses, themselves (Bee, 1995). In a study by Zahn-Waxler and Radke-Yarrow (1982), mothers were trained to observe and record the behavior their children emitted in response to other people’s affective displays. The children had an age range of nine months to two-and-a-half years. The results showed that, whereas the younger children responded to distress by engaging in distressful behavior (e.g., crying), the older children displayed empathetic responses (e.g., providing hugs and kisses to the victim).

Furthermore, research has shown that, early on, children develop their social skills as they form relationships not only with their parents and other adults, but also with their siblings and peers (Rubin, Bukowski, & Parker, 1998). At four years of age, children engage in “sociodramatic” or “pretend” play, which involves collaboration and sharing during playing behavior, thus strengthening the relationship between the playmates. Whereas parallel play involves playing side by side, and occasional sharing of toys, but without an effort to collaborate or interact with one another, sociodramatic play involves communication and interaction between players (Rubin et al., 1998). It is at this age that

children's understanding of affect expands, and this "ability to grasp others' emotions is... no doubt an important ingredient in the preschooler's emerging ability to form individual friendships" (Bee, 1995, p. 241). In fact, Rubin et al. (1998) argued that those children who are among the most popular members of their group are those who understand and interpret their peers' perspectives the best. Upon reviewing the cognitive-developmental literature on peer interactions and relationships, and their long-term effects, Rubin et al. concluded that without these skills that are essential in social interaction, children tend to be neglected or rejected from peer groups.

Appropriate Affective Responding

It is in the context of social interaction that discussion of appropriate affective responding becomes especially relevant, because affective responses (e.g., facial, verbal, or gestural) have important social-communicative functions. Affective displays help the viewer make inferences about a person's emotional state, and they can set the occasion for social interactions to occur. As Buffington (1996) described, "Gestural behavior, like spoken language, serves a multitude of purposes. The use of gestures can serve as either a complement to, or substitute for, spoken language... Gestural behavior... plays an integral role in the development and maintenance of social relationships" (pp. 1-2). In fact, nonverbal behavior, specifically facial expressions, seems to be so indispensable that people communicating with one another electronically often use "emoticons" (emotion icons) that are symbols that help the writer communicate better what he or she means (Sanderson, as cited in Brehm, Kassin, & Fein, 2002).

People with autism have profound deficits in nonverbal behavior (e.g., gestural communication) that hinder or prevent appropriate responding that is essential for the initiation and maintenance of social interactions (Gaylord-Ross, et al., 1984; Krantz & McClannahan, 1993; McEvoy, Nordquist, Twardosz, Heckaman, Wehby, & Kenton, 1988; Rutter & Schopler, 1987; Yirmiya, Kasari, Sigman, & Mundy, 1989). Numerous studies have been conducted to address social interactions in people with autism, but a discussion of the particulars of these studies goes beyond the scope of this paper. This review is concerned with one factor that seems to be a crucial ingredient for appropriate, sustainable social interactions. Specifically, this section focuses on affective behavior in children with autism. According to Feldman, Philippot, and Custrini (1991), deficits in displaying contextually appropriate affective behavior can have adverse effects on a person's social development.

A search conducted using the PsychInfo database (from 1950 to 2004) and the Journal of Applied Behavior Analysis (from 1968 to 2004) determined that Gena's (1994; Gena et al., 1996) study seems to be the only study that used applied-behavior-analytic procedures to address the problem of affective behavior in people with autism. Terms other than *affective behavior* were used in the search lest research conducted on the topic did exist but using different terms. Specifically, the search was conducted using the following terms, *affect*, *affective displays*, and, *emotion*, but the search results were the same. Gena's study seems to be the only study that used multiple-exemplar training, reinforcement, modeling, and prompting to teach children with autism to respond to affective stimuli in a contextually appropriate manner.

A study by Cooke and Apolloni (1976) had used the behavior-analytic procedures of modeling, praise, and verbal instructions to increase the rates of smiling, sharing, positive physical contact, and complimenting. The children who participated in that study, however, did not have a diagnosis of autism, but rather were students with learning disabilities. Although the authors indicated that the children's academic failures were precipitated by their "inappropriate social-emotional behavior in the company of peers" (Cooke & Apolloni, 1976, p. 66), they did not specify what they meant by "inappropriate social-emotional behavior." Furthermore, the authors did not observe or measure that behavior themselves but rather, relied on reports made by the parents and teachers. Moreover, the authors indicated that the children were verbally prompted to smile while in the playroom, but they did not specify the stimulus conditions provided for the children to engage in social or affective responding. It was also not clear whether the opportunities for displaying socially appropriate affect were provided by the experimenter or whether they occurred incidentally and were thus reinforced. Despite these limitations, however, Cooke and Apolloni's (1976) study provided a starting point for further investigations of social behavior from a behavioral perspective.

In her study, however, Gena (1994) discussed the role appropriate affect plays in achieving social interactions among people with autism. Gena (1994) emphasized the relation between the appropriateness of affective behavior (i.e., displaying affect that is contextually and topographically appropriate) and the achievement of effective social communication. Gena described observable characteristics of affective behavior, namely, discriminability, range, context, reciprocity (i.e., responding to others), and gestures. Gena contended, for example, that *discriminability* was an important measure, because,

to an observer, facial expressions displayed by children with autism were often not discriminable as were those displayed by typically developing children. As Yirmiya et al. (1989) suggested, it is possible that individuals with autism “simply do not know how to show appropriate affect... [because] when asked to put on a happy and a sad face, [they] were less successful than mentally retarded children in producing a happy face” (p. 726). Yirmiya et al. (1989) concluded that children with autism display expressions that “are idiosyncratic, and therefore less readable by other individuals” (p. 726).

With respect to *range* of affective behavior, Gena (1994) and Yirmiya et al. (1989) noted that children with autism as young as three years of age emitted a wide range of affective responses. These authors reported that affective responses that were associated with private events that they did not explicitly define, but referred to as *happiness*, *surprise*, and *sadness*, were emitted in different modes of expression (e.g., vocally, gesturally, and facially). In fact, Yirmiya et al. held that children with autism displayed a variety of affective responses that was greater than that displayed by children with mental retardation or even that displayed by typically developing children. These authors emphasized, however, that affective displays emitted by children with autism “included expressions of negative and incongruous blends” (Yirmiya et al., 1989, p. 732). Such a finding underscores the importance of *context* as a variable used to analyze the affective behavior of individuals with autism. Unlike children with other developmental disabilities and children of typical development, children with autism, Gena asserted, “displayed positive affective behavior, such as smiling, more often in the context of solitary, rather than interactive activities” (1994, p. 99). Gena also noted that people with autism tended to engage in *reciprocity* minimally during social functions that would

typically require a substantial amount of sharing and reciprocating with others, such as during play time or during social interaction. McEvoy et al. (1988) noted that, more often than not, children with autism interact with and improve upon the relationships they have with adults (e.g., their parents or therapists). Peer relationships, however, tend to be severely impaired (Rutter, 1966). Finally, Gena stated that although people with autism tended to use gestures to make requests, they did not typically use gestures to display affective behavior (e.g., hugging a loved one).

Using Behavioral Procedures to Increase Appropriate Affective Responding in Youths with Autism

Providing further evidence in support of the case made by Schlinger (1995) mentioned above, a study by Gena (1994) pointed out that individuals with autism do emit affective responses, such as laughing, smiling, and crying, but that they often do so noncontextually. That is to say, affective behavior is displayed, but not under the appropriate – or contextually congruent – stimulus control conditions.

Gena (1994; see also, Gena et al., 1996) used multiple-exemplar training, modeling, verbal prompting, and reinforcement to teach four youths with autism to emit affective behavior in a contextually appropriate manner. Specifically, Gena (1994) sought to (1) demonstrate experimentally the effectiveness of the treatment package used to teach appropriate affective behavior; (2) test for generalization of the trained responses to novel settings, stimuli, and therapists; (3) assess the social validity of the results; and (4) present multiple exemplars of discriminative stimuli in the presence of which a particular affective response is appropriate. Gena referred to such a complex set of discriminative stimuli as a “scenario,” which she defined as a question or a statement provided by the

therapist to the participant (Gena, et al., 1996). The statement or question corresponded to one of the five response categories that were used in that study. Namely, the response categories were: (1) Talking about favorite subjects with animation; (2) Identifying and responding to absurdities; (3) Showing sympathy; (4) Showing appreciation; and (5) Indicating dislike (Gena, 1994, pp. 19-20). Although Gena (1994; Gena, et al., 1996) listed the above response categories and specified the participants who received training on each, she did not define these response categories.

Furthermore, it is important to note that, inconsistent with their definition of “scenario,” Gena et al. (1996) did not limit a “scenario” to a verbal statement or question emitted by the therapist. In fact, the therapist additionally modeled the appropriate affect corresponding to the category that was being trained or tested (Gena, et al., 1996). Additional stimuli, props in particular, were used as needed, depending on the response category used. Consider an example of a scenario that corresponded to the identifying and responding to absurdities category. There was a total of 120 scenarios under that category; in one of those scenarios, the therapist put on a pig mask and asked the participant, “What do I look like?” (Gena, 1994, Appendix B). In another scenario, the therapist placed “scary teeth” in her mouth, and then asked the participant whether they looked okay. Such props, however, were not used in each scenario. For example, in one scenario under the same category (identifying and responding to absurdities), the therapist asked the participant whether superman was a girl.

To respond to a given “scenario,” four youths with autism were trained to (1) make eye contact with the therapist providing the scenario; (2) make an appropriate, experimenter-specified verbal statement that was contextual with the scenario provided;

and (3) emit a nonverbal response that was contextual with that scenario as specified by the experimenter. For example, a set of discriminative stimuli provided by the therapist corresponded to the category “showing sympathy.” In addition to making eye contact with the therapist and maintaining a serious face, as opposed to a smiley face, the participant was trained to emit a verbal response that was consistent with the scenario provided. Examples of such a verbal response were “that’s sad,” or “I’m sorry to hear that” (Gena, 1994, p. 19). Training involved (1) modeling the appropriate set of nonverbal responses to be emitted following a given scenario; (2) verbally prompting the use of appropriate verbal responses to be emitted; and (3) reinforcing a participant’s unprompted emission of the appropriate verbal and nonverbal responses following a given scenario. Reinforcement and correction were provided during training trials, but not during probe trials that were interspersed throughout the study.

Tests of generalization (Keller & Schoenfeld, 1950) would help determine the extent to which trained responses transfer to new situations. Hence, Gena (1994) withheld reinforcement and correction during tests of generalization, so as to determine the extent to which appropriate nonverbal and verbal affective responding transferred to conditions that had not been specifically trained before. Specifically, Gena tested for appropriate affective responding emitted by the participants followed by scenario presentations made (1) by three therapists who were not involved in training; and (2) in settings outside the training classroom (e.g., recreational area). In addition, Gena (1994) conducted follow-up sessions one month following the completion of treatment to three of the four participants.

The results of Gena's (1994) experiment demonstrated that operant procedures, namely, reinforcement, modeling, and prompting procedures, as they were presented together in the treatment package, were effective in training youths with autism to emit appropriate affective responses of various categories.

The aforementioned technique used by Reeve (2001) was one such investigation that used behavioral procedures to address a social psychological problem. Furthermore, Reeve's (2001) procedure was an improvement on that used by Gena (1994), because of Reeve's thorough description of (1) all components of the discriminative stimuli used, specifically, the verbal, gestural, and affective components; and (2) both components of the dependent measures, specifically, the verbal and motor components. Following in Reeve's (2001) footsteps, it would be valuable to examine the extent to which invoking stimulus control in a comprehensive manner would help train appropriate affective responding in children with autism. It would be useful to investigate once again the problem of affect in children with autism as Gena (1994) did, but to attempt to address this problem in the manner with which Reeve (2001) addressed the question of helping behavior in children with autism. More specifically, it would be useful to train individuals with autism to emit affective behavior in the presence of contextually congruent conditions, by identifying the sources of stimulus control that could be manipulated to teach the display of affective responses under contextually appropriate conditions.

As Green (2001) emphasized, "all instructional methods [that have been developed for learners with autism] involve manipulations of antecedent stimuli... [and use] *stimulus control* principles and procedures to build skills in learners with autism and

related disorders” (p. 73). Stimulus control plays a role in affective behavior in particular. As Gena (1994) noted, people with autism do emit a wide range of affective responses, but not under the appropriate stimulus control conditions. One might solve this problem by manipulating the right stimulus-control conditions, by teaching the discrimination between contextual and noncontextual affective responses, and by strengthening the contingency between those stimulus conditions and the appropriate affective responses that they typically evoke. This paper proposes a procedure that uses such techniques to teach children with autism to display affective behavior in a contextually appropriate manner; but first, this paper examines some topics in the stimulus-control literature that are relevant here and that have been integrated into applied-behavior-analytic programming for people with autism.

Stimulus Control

Stimulus control is concerned with the environmental context of the relation between behavior and its consequences. Stimulus control is demonstrated by differential responding in the presence of different discriminative stimuli. Stimulus discrimination is but one of many subtopics within stimulus control. This section, however, emphasizes stimulus discrimination, because of its relevance to appropriate displays of affect. As discussed above, affective behavior is social in nature, specifically because it involves social interactions that consist of responding to discriminative stimuli typically provided by another person’s gestures, facial expressions, or verbal statements. As Catania (1998) pointed out, “Discriminating the behavior of other organisms, whether of one’s own or other species, has clear selective advantages” (p. 226). Hence, failing to discriminate other people’s affective responses, and failing to emit discriminated operants in the

presence of affect-laden stimuli, can be quite detrimental. The literature has shown this to be the case in the autism population (e.g., Gena, 1994; Rutter, 1966).

A behavior-analytic approach to the problem of affective responding in people with autism, as with other problems, would consider the elements of the three-term contingency: the antecedent stimulus, the response, and the consequence. Because people with autism display a wide range of affective responses, as discussed in the previous section; and because these responses are often emitted noncontextually; the problem of affective responding in people with autism seems to be a stimulus-control problem. As a result, the focus needs to be on the antecedent stimuli that set the occasion for appropriate affective responding to occur. At the very least, discrimination training is needed to teach a learner to respond in a contextually appropriate manner in the presence of a given antecedent.

Discrimination Training

Behavior analysts frequently provide discrimination training to people with developmental disabilities. Specifically, the discrimination-training procedures discussed next are the (1) conditional-discrimination training, and (2) errorless-discrimination training procedures. These procedures are of particular relevance here, because, since the 1980s, they have been the primary focus of applied-behavioral research that used stimulus-control strategies to train people with developmental disabilities (e.g., Green, 2001).

Conditional-Discrimination Training. As emphasized by Green (2001), “virtually all skills involve discriminating among, or responding differentially to, environmental events” (p. 74). Yet, many skills require learners to respond similarly to different events,

even when these events are physically disparate. Whereas responding differentially to different stimuli exemplifies responses that require simple discriminations, responding similarly to different stimuli exemplifies responses that require complex discriminations, which in turn consist of several simple discriminations. A simple discrimination is established when a response is reinforced only when it is emitted in the presence of a given antecedent stimulus (Catania, 1998). A conditional discrimination is a “three-term relation [that] is placed under *conditional* control” (Sidman, 1986, p. 224), thus producing a four-term contingency.

In her recent review of the stimulus control literature and the manner in which it has been applied to studies involving the autism population, Green (2001) emphasized the use of conditional-discrimination training procedures. Green indicated that these are strictly matching-to-sample procedures that are typically implemented in the format of discrete trials. Such procedures have been used in numerous studies (e.g., Sidman, 1971, 1994) to teach individuals with autism to perform matching tasks (e.g., matching identical stimuli, such as colors, or disparate stimuli, such as picture-object matching). A conditional-discrimination training procedure as such might be used to train appropriate affective responding, just as it has been used to train learners with autism to perform reading-comprehension, listening-comprehension, and receptive-identification tasks (Green, 2001). After all, cognitive psychologists have inferred that, in many ways, responding appropriately to an affective stimulus requires some level of comprehension of the complex social situation (Gnepp, McKee, & Domanic, 1987; Rutter, 1966). If this assumption is true, it should be expected that those procedures that have proven successful in teaching children with autism to perform comprehension tasks (e.g., Green,

2001) will be as successful in teaching them to engage in appropriate affective responding.

One might use a picture-based conditional-discrimination training procedure to train children with autism to emit affective behavior in a contextually appropriate manner. For example, upon viewing a picture of a person whose facial expression displays the experimenter-based criteria for “sadness” (Stimulus A), displaying a facial expression that meets the criteria for “sadness” and/or emitting an empathetic statement (Response A), would be reinforced. Displaying a facial expression that meets the criteria for “happiness” (Response B) upon viewing the same picture (Stimulus A), however, would not be reinforced. Similarly, upon viewing a picture of an expression that meets the experimenter-based criteria for “happiness” (Stimulus B), displaying a facial expression that meets the criteria for “happiness” (Response B) would be reinforced, while displaying a facial expression that meets the criteria for “sadness” (Response A) would not.

Errorless-Discrimination Learning. Most of the literature on discrimination (e.g., Jenkins & Harrison, 1960) involves studies that used trial-and-error responding. Terrace (1963) pointed out some problems that result from discrimination learning that is accomplished using traditional trial-and-error procedures. For example, training a discrimination takes a long time, during which errors are made and thus practiced. Terrace proposed an errorless-discrimination training procedure, which incorporates response shaping, stimulus fading, stimulus superimposition, and combinations of these procedures to train stimulus discrimination with few or no errors. Terrace’s stimulus fading procedure is relevant here. Etzel and LeBlanc (1979) defined stimulus fading as an

errorless-learning procedure that “involves the gradual shifting of control from some dominant stimulus element to a different and criterion stimulus” (p. 369). Touchette (1971) proposed yet another procedure that promotes errorless-discrimination learning. Touchette’s onset-delay procedure consisted of delaying the presentation of the discriminative stimulus associated with nonreinforcement (i.e., the S^A or S^-) to promote errorless responding.

An errorless-learning procedure that trains individuals with autism to respond in a contextually appropriate manner to a set of discriminative stimuli presented by an adult or a peer, could be more beneficial and more efficient than a trial-and-error training procedure. Consider, for example, the presentation of a social statement that would set the occasion for empathy to be expressed by the recipient. Also consider that responding empathetically would include (a) providing an empathetic verbal statement about the situation, such as “I am sorry to hear that.” Rather than presenting the discriminative stimulus to a child with autism and anticipating that he or she will emit an empathetic statement as such, one could present the discriminative stimulus and use stimulus fading to teach the child to emit the appropriate set of responses. Such training would be beneficial, provided that the results of a pretest would have shown that responding empathetically needed to be taught. Specifically, the empathetic statement could be presented in written form, and a script-fading procedure (Krantz & McClannahan, 1993) could be used to fade that prompt. In addition, Touchette’s (1971) onset-delay procedure could be used to train the learner to select the correct statement when presented with the discriminative stimulus that requires a response to be emitted. For example, upon the presentation of the discriminative stimulus indicating that an empathetic response would

be appropriate (and reinforced), the trainer could provide the learner with an index card on which an empathetic statement has been written, rather than making available other index cards that include statements that are associated with experimenter-based criteria for happiness or anger.

Summary and Implications

The present paper reviewed the literature on affective behavior in children with typical development and in children with autism. In addition, this review explored stimulus control literature that might be relevant for conducting applied research in the area of affect training. It seems clear from this review that applied-behavior-analytic methods can be used successfully to teach people with autism to respond appropriately to various social stimuli. This review emphasized appropriate affective responding, in particular. Gena's (1994) study demonstrated that a treatment package that consists of behavior-analytic procedures, such as modeling, prompting, and reinforcement, was successful in teaching youths with autism to emit appropriate affective responses when presented with different sets of discriminative stimuli, each corresponding to one of the five response categories used. More studies are needed, however, to address this problem, which is pronounced in people with autism, yet has not been explored substantially in the field of behavior analysis.

Modeling and imitation procedures were used in the studies by Gena (1994) and Reeve (2001). It is interesting that modeling had a dual-function in these studies. First, modeling was used as a corrective procedure to help the learners to acquire appropriate affective or helping behavior. In addition, modeling was one of the components of the sets of discriminative stimuli. For example, in Gena's (1994) study, the instructor

providing the “scenario” – or complex set of discriminative stimuli, as defined above – was not only providing the learner with a statement or a question, but she was also modeling the affective response that was congruent to the statement she was making. In a scenario under the category of showing sympathy, for instance, the instructor said, “I have a terrible headache,” while maintaining a serious facial expression (Gena, et al., 1996, p. 294). In Reeve’s (2001) study, the nonverbal component of the discriminative stimulus was in fact the modeling of the motor component of the dependent measure. For example, under the response category, “cleaning,” a nonverbal discriminative stimulus might have consisted of wiping a chair. In that case, the motor response that was measured was wiping a chair as well. The only difference between the instructor’s wiping and the child’s wiping was that whereas the former (instructor’s wiping) functioned as one of the discriminative stimuli, the latter (child’s wiping) functioned as one of the dependent measures.

One might argue that the presence of an instructor, himself or herself, is a discriminative stimulus that evokes affective or helping responding. Because such responding is primarily social in nature, it is not likely, and at times inappropriate, for someone to engage in social responding in the absence of another person. Hence, the constant presence of an instructor need not be viewed as an experimental limitation. Nevertheless, using only one instructor to implement these procedures might indeed be a limitation in a study of people with autism, because it would hinder the likelihood of generalization from trained to novel instructors. Studies that used applied-behavior-analytic procedures to teach people with autism to emit appropriate social responses have programmed for generalization from trained to novel conditions by using different

instructors, different response categories, and different settings (e.g., Gena, 1994; Reeve, 2001).

The information presented in this review would lead one to a number of research studies that might use behavior-analytic methods to increase appropriate affective responding. In addition to the use of prompting and modeling as correction procedures when the target response is below the criterion level, and the use of reinforcement contingently upon target responding that is to criterion, it might be beneficial to use modeling, from the outset, as part of the discriminative stimulus, as Gena (1994) and Reeve (2001) did in their respective studies. That is to say, modeling need not be used only as a correction procedure. In real-life affective social interactions, a person typically would display facial expressions and gestures that are appropriate to the context or stimulus control conditions that evoke them. Hence, whereas the facial expression modeled by the instructor in an experimental condition might be contrived, such expression would by definition be present on a person's face in a real-life interaction. Second, it might be beneficial to use specific and elaborate discriminative stimuli with multiple components (e.g., a combination of nonverbal, verbal, and affective discriminative stimuli, as elegantly modeled by Reeve, 2001).

Finally, because the main purpose of research conducted in applied settings is typically focused on experimentally addressing a clinically important question, treatment packages, rather than single independent variables, are often used (e.g., Cooke & Apolloni, 1976; Gena, 1994). It might be useful to perform a component analysis that would help determine the individual effects of some of the components in the treatment

package; i.e., the extent to which the independent variables accounted for the change in the dependent measure(s).

Appendix B

Instructions that were Provided to Social-Validity Scorers

How, in your opinion should a 10-12 year-old child with autism, should respond to affective stimuli such as these? Please provide 3 suggested verbal responses to each statement.

1. I have an apartment on the moon!

☆

☆

☆

2. I woke up with a terrible headache.

☆

☆

☆

3. I am going on vacation soon!

☆

☆

☆

4. How is your mom doing?

☆

☆

☆

You will watch video footage featuring 18 trials, each of which consists of affective stimuli presented by a therapist and a response by a child with autism.

Affective stimuli presented by the therapist include:

- ☆ A statement that is designed to evoke an affective response (verbal component of the discriminative stimulus).
- ☆ A facial expression that matches the statement presented (first of two nonverbal components of the discriminative stimulus).
- ☆ Vocal intonation that matches the statement presented (second of two nonverbal components of the discriminative stimulus).

Affective stimuli belong to one of four affective categories:

- ☆ Responding to Absurdities (e.g., *I have an apartment on the moon!*)
- ☆ Expressing Empathy (e.g., *I woke up with a terrible headache.*)
- ☆ Expressing Excitement (e.g., *I am going on vacation soon!*)
- ☆ Expressing Gratitude (e.g., *How is your mom doing?*)

The 18 trials are arranged into nine pairs, each of which consists of a trial conducted during the baseline phase of the study and another conducted after an affect-training program (i.e., treatment) had been implemented for the same student and the same affective category.

After viewing both trials in a pair, please indicate which of the two trials was conducted in baseline, and which was conducted in treatment.

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