THE EFFECTS OF HORTICULTURE INSTRUCTION ON ABERRANT BEHAVIOR IN ADULTS WITH SEVERE/PROFOUND MENTAL RETARDATION

by

MARTHA ROBERTS DeHART

(under the direction of Jay W. Rojewski)

ABSTRACT

This investigation examined the effects of horticultural instruction on aberrant behavior in adults with mental retardation. Four participants were taught simple gardening activities in two settings using an alternating treatments design. Three behaviors per participant were identified as requiring adjustment to satisfy staff concerns at the ICF-MR where they attended/worked daily. Results indicated that two individuals learned horticultural skills well enough to become possible employees and/or volunteers in the horticultural industry while reducing maladaptive behaviors. The other two participants also learned gardening skills although proficiency levels were more closely related to performing simple recreational activities. Generalization and maintenance phases were conducted on two participants and skill retention was evident up to six weeks after the interventions were completed. Implications for using public gardens for education and training for persons with disabilities are addressed.

INDEX WORDS: Horticultural Therapy, Recreation and Leisure, Single Subject Design, Special Education, Social Validity

THE EFFECTS OF HORTICULTURE INSTRUCTION ON ABERRANT BEHAVIOR IN ADULTS WITH SEVERE/PROFOUND MENTAL RETARDATION

by

MARTHA ROBERTS DeHART

B.S., Texas A&M University, 1989

M.S., Texas A&M University, 1992

A Dissertation Submitted to the Graduate Faculty of the

University of Georgia in Partial Fulfillment

of the

Requirements of the Degree

DOCTOR OF EDUCATION

ATHENS, GEORGIA

2006

THE EFFECTS OF HORTICULTURE INSTRUCTION ON ABERRANT BEHAVIOR IN ADULTS WITH SEVERE/PROFOUND MENTAL RETARDATION

BY

MARTHA ROBERTS DeHART

Major Professor: Jay W. Rojewski

Committee: Roger B. Hill
Marguerite Koepke

Electronic Version Approved:

Maureen Grasso
Dean of the Graduate School
The University of Georgia
August 2006

DEDICATION

This dissertation must be dedicated to the one individual who made completion possible – my major professor: Dr. Jay W. Rojewski. His unconditional support and encouragement, leadership and professionalism, guidance and nurturing throughout this lengthy process never waivered. It is because of him that I reached this personal and academic goal.

ACKNOWLEDGEMENTS

There are numerous people who contributed in thought, word, and deed to facilitate my finishing this degree. First, I must mention my beloved parents: Agnes M. R. DeHart and Turner B. DeHart. They never lost faith in my ability to earn a doctoral degree despite my grumpy moods and blank pages. Second, my spouse: Dr. Jeffrey C. Rapp who provided constant emotional and financial support as well as incredible last minute technical/computer support. Third, the other committee members provided strength when I needed it most: Dr. Roger Hill and Ms. Marguerite Koepke. I owe them a lot for sticking with me. Also, local friends and family kept me smiling when I saw no reason for it and laughing when I wanted to cry…and more importantly kept my glass full when I was thirsty! The OIT at UGA gave out endless information at dire times. The employees of GOS continue to remind me how important the 2nd amendment is and how good it is to be outdoors. Throughout this endeavor my faith was tested numerous times but I am thankful that God never gave up on me and remained with me always.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Rationale

Aberrant behaviors such as self-stimulation, self-injurious behavior, and vocal outbursts are common among persons with severe mental retardation (Duscharme, 1993; Lalli, Casey, & Kates, 1995; Zarcone, Iwata, Hughes, & Vollmer, 1993). When present these maladaptive behaviors are often detrimental to individual health and safety, as well as disruptive in vocational or recreational settings (Sisson, VanHasselt, & Hersen, 1993). Thus, the goal of many behavioral treatments for individuals with mental retardation is to reduce challenging behaviors such as self-injury, aggression, property destruction, and stereotypy (Sigafoos, Tucker, & Bushnell, 1997). Since behavior is a diverse and complex issue of establishing cause and effect variables (Alberto & Troutman, 1986), determining specific operational definitions of maladaptive behavior are recommended prior to administering any treatment (Van Houten, Axelrod, Bailey, Favell, Foxx, & Iwata, et al., 1988).

Examples of improper conduct within the class of behaviors known as self-stimulation include excessive rubbing or touching a specific area of the body (handmouthing), or manipulation of objects in a repetitive way (banging on wall or floor), or altering the setting (switching lights on and off). These ways of achieving sensory, auditory, and visual stimulation are usually construed as socially maladaptive behaviors and serve to add to a person's inappropriate demeanor (Hardman, Drew, Eagan, & Wolf, 1993). Self-injurious behaviors are

dangerous, self-inflicted actions causing tissue damage or bleeding (Derby, Wacker, Sasso, Steege, Sigrand, & Asmus, 1992) such as forceful headbanging or severe self-biting and hitting (Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993). Further, certain inappropriate vocal outbursts and other forms of noncompliance may illicit such negative reactions from nondisabled peers that it becomes impossible for successful community-based training to occur (Horner, Albin, & Mank, 1989). Therefore, it is not difficult to understand how these aberrant behaviors can interfere with instructional programming for persons with severe disabilities.

According to Evans and Fredericks (1991), persons displaying a high rate of maladalptive behavior might benefit from receiving instruction based on functional curricula. Fewer inappropriate behaviors are exhibited by persons with disabilities during lessons taught in functional contexts. Successful outcomes have also been attributed to behavior management techniques. Howell and Nolet (2000) suggested that some teachers place more emphasis on decreasing disruptive behaviors than on teaching social skills which might be generalized to other settings. While various instructional strategies are reported to decrease inappropriate behavior (Munk & Repp, 1994), it is imperative to recognize the environmental conditions surrounding both positive and negative behaviors when selecting strategies to administer or discontinue (Kazdin, 1994).

Several reasons have been cited for the expression of maladaptive behavior in persons with severe mental retardation including a desire to be alone, escape of undesirable circumstances, to gain attention, to eliminate demands,

and to receive tangibles such as food or drink (Derby et al., 1992). The display of maladaptive behaviors has also been reported to prohibit positive social interactions, cause physical harm, and expedite failure to acquire new skills (Calvert, Redell, Jacobs, & Baltzer, 1972; Ferro, Foster-Johnson, & Dunlap, 1996; Lenske, Rotatori, & Kapperman, 1980; Mira & Hoffman, 1974). Thus, aberrant behaviors are frequently targeted for reduction in persons with mental retardation, and functional assessments are recommended (Wacker et al., 1990).

Behavior Change

The first step in reducing problem behavior is the assessment of words and actions deemed inappropriate. It is only after target behaviors (those which need to be reduced) are properly identified that intervention strategies may be applied. Incorrect selection of target behaviors may negatively influence performance and overall treatment (Maag, 1989). As programs for persons with disabilities become more oriented toward teaching, as opposed to merely providing care, developing an understanding of and treatment approaches for noncompliance become more important (Walker, Colvin, & Ramsey, 1995). Several studies have demonstrated a reduction in aberrant behavior displays and nonadaptive behaviors when applied behavior analysis techniques are incorporated into instructional situations (Alberto & Troutman, 1986; Datillo & Murphy, 1987; Deitz, Repp, & Deitz, 1976; Pace, Iwata, Cowdery, Andree, & MacIntyre, 1993; Vollmer, Marcus, & Ringdahl, 1995).

Behavior modification encompasses several instructional strategies that employ the use of *reinforcers*. This term is described as “any stimulus that

strengthens a behavior" (Dattilo & Murphy, 1987, p. 168). There are two kinds of reinforcement, positive and negative. A positive reinforcer increases the likelihood that a certain behavior will occur again contingent upon the presentation of a certain consequence. A negative reinforcer increases the likelihood that a certain behavior will occur again contingent upon the removal of a certain stimulus (Baldwin & Baldwin,1981). Reinforcer sampling (the presentation of a variety of reinforcing agents to determine their effectiveness) and reinforcer scheduling (the delivery sequence and timing of reinforcers) also play a significant role in behavior change (Alberto & Troutman, 1986).

Before selecting specific reinforcers, it is necessary to examine the behavioral outcomes offered through effective behavior interventions used with special populations. Horner, Sprague, and Flannery (1993) claimed that the primary reason for altering behavior is to promote the availability of more opportunities for persons with disabilities. They suggested five preferred outcomes or desired results of programs aimed at changing a behavioral repertoire. The first outcome of behavior support plans (i.e., a series of behavioral interventions designed with specific antecedents and consequences) is to reduce problem behaviors. A second goal is to increase health and safety standards of individuals with mental retardation by reducing the incidence of dangerous activities such as self-mutilation. The acquisition of new skills is a third goal of behavior modification plans. Strengthening, as well as expanding current communication skills and social competence, has positive effects on the self-concept of individuals with disabilities (Lombana, 1992). The fourth

recommended outcome involves changing the activity patterns of persons with disabilities while attending to their personal preferences.

The fifth and final goal of effective behavioral support plans as described by Horner et al. (1993) is to link reduction in maladaptive behaviors with an improved lifestyle. For example, if a student ceases to bang his/her head on the floor, yet remains in isolation from teachers and peers at mealtime, neither the fourth or fifth goal has been achieved. On the other hand, if a student is given a choice between two meals and taps on the desired tray instead of banging his/her head, a change in both activity patterns and choice offerings has occurred. The success of an intervention strategy must be evaluated by the impact it has on the quality of life and not based solely on decreases of aberrant behavior displays (Kozloff, 1994). Further, opportunities for engaging in a structured leisure activity may prove to be an effective alternative to challenging behavior (Schleien & Ray, 1988). The following section provides a brief historical overview of special education legislation. It illustrates the tremendous strides made in the last 30 years by proactive politicians and grassroots activists regarding the treatment of and instruction for persons with severe disabilities. Today's success stories are a direct result of the legislative changes from decades passed.

Legislation

In the 1970s, the most consistent academic similarity among states was the use of the mandated Individual Education Plan (IEP). The IEP was supposed to include both long-range goals and short-term objectives designed specifically

for children with disabilities. Since there was frequently limited relevance in the content of this plan for the future, students exited the public school system having learned academic skills with little or no vocational value. Fortunately, the Education Handicapped Act Amendments passed in 1983 (P.L. 98-199) demanded a certain accountability level on the part of those responsible for educating special populations. This accountability was translated into a requirement for data collection to document the outcomes of students graduating from the special education system (Berkall & Brown, 1989) and enacted a focus on transition from school to work.

Along with student follow-up information, schools are now required to incorporate a transition plan into the secondary curriculum for special populations. The idea is to prepare students for some level of employment or postsecondary education after completion of their high school education. School-to-work-transition plans were supposed to be individualized yet possess common services including academic support, employability skills, community-based instruction, psychological assistance, and vocational training (Sarkees-Wircenski & Scott, 1995). Despite this obvious shift in educational philosophy, students still leave school without the necessary skills for community integration.

In a survey conducted on adults with mental retardation, it was found that many of whom were high school graduates were often underemployed and did not live independently (Haring & Lovett, 1990). One public school follow-up study revealed that a majority of participants who were employed earned very low wages. Still, as a result of changing legislation, efforts were heightened to make

the special education track within the public school system more student-centered. Parents and teachers began advocating for an improved quality of life for students with disabilities (McCleary, Hardman, & Thomas as cited in Hardman et al., 1993). Parents and advocates realized that special education must reach beyond school walls by providing skills to assist students in reaching their full potential as productive citizens. This progressive notion meant including more than job-training in high school curricula. Additional training in domains such as self-care, independent living, transportation, recreation and leisure are now typically incorporated into transition plans for students with disabilities (Hardman et al., 1993). An area of instruction receiving major attention is occupational training. Many secondary vocational programs reflect the interest of the individual rather than the traditional placements stemming from convenience.

Occupational Research

Vocational training takes many forms when a prospective employee has severe disabilities. Hill (1977) suggested that “learning is most effective when the learner is motivated but not threatened” (p. 254). The range of support services available to special populations are a function of the background, experience, and current social skills of the individual (Snell, 1993). Given that on-the-job-training has been so successful in vocational education for severe populations, *train and place* models have typically been discarded in favor of *place and train* models (Falvey, Bishop, & Gage, 1995). Also, more attention has been given to career guidance for persons with disabilities through the administration of interest inventories (Masters & Mori, 1986) and adaptive behavior assessments

(Sternberg, 1994), as well as evaluating the potential for modifications on the job (Baumgart et al.,1982). However, the unemployment and underemployment rate of individuals with severe disabilities remains high (Hasazi, Johnson, Hasazi, & Gordon, 1990) and job dismissal is directly connected to inappropriate and maladaptive behaviors (Storey, Sandow, & Rhodes, 1990; Wehman, 1981). Therefore, “when developing task sequences for employment or for learning leisure and recreation skills, teachers should include subskills relating specifically to socially appropriate behavior” (Langone, 1990, p. 368).

Work provides people with financial gains and opportunities to experience a sense of security, belonging, and self-esteem (Carney & Wells, 1987). For those without a job, there appears to be fewer chances to derive these secondary affective benefits and other advantages including cognitive skills (e.g., decision-making, physical benefits (e.g., motor coordination), and socialization opportunities (e.g., making friends; Sternberg, 1994). According to Evans and Scotti (1989), some individuals are so severely disabled that they should be exempt from performing work duties, but not to the extent that they are eliminated from attaining a dignified lifestyle. To comply with Medicaid waivers, social service providers (e.g., ICF-MR centers, sheltered workshops, group homes) receiving Federal monies arrange for clients to receive required *day-hab* hours through prevocational training and community volunteering at nonprofit agencies (Hope Haven Brochure: Our Programs, 2004). However, exclusion from paid work experiences, for whatever reason, is not synonymous with isolation. In

fact, the term *work* must be expanded to include self-help and recreational behavior (Brawner-Jones, 1994.)

Behavior modification techniques have been shown to increase motivation towards task completion rates in persons with disabilities (Kazdin, 1994). Becker, Englemann, and Thomas (1971) reported that behavioral improvements should be expected as a result of specific instructional activities. The field of horticulture lends itself well to behavioral interventions and specialized teaching strategies such as task analyses (Priest, 1984), social reinforcement (Krell, 1983), modeling (Shoemaker, 1982), and self-monitoring (Doxon, Mattson, & Jurich, 1987). According to Stoneham (1997), horticulture is also an excellent medium through which a variety of services may be delivered to persons with disabilities: (a) horticultural activities are usually familiar in that trees and flowers are recognized as such, even in deprived environments; (b) it is age-appropriate and relevant since gardening is the number one hobby in the United States; (c) it offers social interactions, with dialogues and activities; (d) it offers physical benefits through mild exertion; (e) it has a variety of manageable tasks; (f) it offers mental/sensory stimulation through assorted colors, shapes, sizes, and textures; (g) it instills feelings of accomplishments while observing daily plant growth; and (h) it allows for the nourishing of a living organism by feeding and watering. Perhaps one of the most significant effects of engaging in horticulture is the distractions from pain and compulsive behaviors (Kaplan, 1973).

The potential exists for vocational training using horticultural settings (Schleien, Rynders, Mustonen, Heyne, & Kaase, 1991). Many therapeutic

activities derived from horticultural instruction are also performed in work-related environments. Potting, repotting, cleaning, labeling, fertilizing, harvesting, and watering plants on a large scale are common tasks in commercial growing horticulture settings (Pike Nursery Handbook, 1993). These activities may be performed in a wholesale greenhouse, a retail garden center, or a public arboretum. However, it is difficult to adjust the speed and accuracy required in mass production situations (Frick, 1993) and competitively-paid employment is often not attainable for severe populations (Snell, 1993). Moreover, high-paced busy settings scarcely allow workers to derive the therapeutic benefits inherent in horticulture (Kay,1990).

These same repetitive and sensory-stimulating skills performed at a different pace, for different reasons, become a form of recreation and leisure for many people with and without disabilities. Planting one pack of seeds instead of 50, taking cuttings from one stock plant instead of a row of 20, or watering a half dozen trays rather than 10 dozen may lower expectations of precision performance, may reduce the number of instructional demands, may decrease the need for excessive prompts, and still provide some employment training (Kay, 1990). The simple aims of issuing directions, reinforcing completion, increasing attention, improving dexterity, and raising levels of enjoyment for persons with disabilities are readily achieved when pressure and stress are removed from training (Kazdin, 1994).

Horticulture has an endless supply of associated settings where inclusive activities are available, e.g., national parks, private garden tours, local garden

clubs, plants societies, floral design classes, decorating workshops, lectures, book signings, field trips, botanical art appreciation, professional meetings, plant sales, church groundskeeping, extension gatherings, volunteerism at non-profit gardens, flower judging, specimen competitions, grape stomping, vineyard/orchard prunings, canning vegetables, pick-your-own farms, cooking summer harvests, drying herbs, community gardening, and rose exhibits (Moore, 1989). While it is possible to earn wages in these leisure-based climates, some individuals with severe disabilities find it rarer and more valuable to be empowered with dignity skills to fully join the community, express personal living and activity preferences, and share common interests with nondisabled peers (Snell, 1993).

Therefore, alternative interventions are needed that reduce aberrant behavior, do not employ the use of aversive techniques, incorporate both leisure and occupational instruction and transfer across settings. This type of well-constructed treatment could have a significant impact on the quality of life for adults with severe mental retardation.

Purpose of Study

This study examined the effects of horticultural instruction on aberrant behavior, leisure skills acquisition, and employment potential of adults with severe mental retardation. In addition, generalization and maintenance of gardening tasks to a naturally inclusive environment were assessed. Using a single-subject research design, functional assessments were performed while simple horticultural sequences were taught via behavior modification techniques.

The independent variable was horticulture instruction while the dependent variables were aberrant behavior, leisure skills acquisition, employment potential, generalization of skills to another setting, and maintenance of skills over a set time period. Results of this study provide additional information to human service personnel and special educators who develop, administer and promote leisure, recreation, and vocational agricultural programs geared toward individuals with severe disabilities.

Research Questions

- Will adults with severe mental retardation learn basic horticulture skills?
- Will horticulture instruction in a greenhouse setting reduce aberrant behavior?
- Will horticulture instruction in an outdoor garden setting reduce aberrant behavior?
- Does a greenhouse setting reduce the frequency and intensity of aberrant behavior more often or more effectively than an outdoor garden setting?
- Will horticulture skills learned in a greenhouse setting be generalized and maintained to an outdoor garden setting?

Theoretical Framework

Social learning theory is a field that lends itself well to research with individuals with severe disabilities as it includes topics pertinent to behavioral interventions such as imitation, modeling, and response elicitation. Also, the connection that Bandura (1977) made between an individual witnessing aggressive behavior and then subsequently performing it may answer many

questions for teachers and parents about various stimuli that induces behavioral change. However, the notion of concepts and behaviors being learned and open to unlearning remains in question by researchers entertaining different philosophies. According to social learning theorists, individuals who observe disruptive or dangerous activities are more likely to copy the behavior if they learn that the expected response is appealing (Miller, 1989). Still, episodes of modeling aggressive reactions may be extinguished through unlearning or by canceling the benefits of imitation (Hill, 1977).

Behaviorism, an extension of social learning theory, employs the use of operant conditioning principles which suggest that learning is the result of the application of consequences; that is, learners begin to connect certain responses with certain stimuli (Huitt & Hummel, 1997). This connection causes the probability of the response to change and relies heavily upon the notion of reinforcement. Reinforcement is a reward (e.g., praise, friendship, money, pleasure) resulting from engaging in specific behaviors that maintain said behaviors whether they are prosocial or antisocial (Juntunen & Atkinson, 2002). Behavior modification initiates behavior change by altering reinforcement contingencies such that desirable behaviors are reinforced and maintained, while undesirable behaviors are ignored and weakened (Miller, 1989). Since contemporary applied behavior analysis is an outgrowth of both classical and operant conditioning, the same origins and justifications hold true today: all behavior may be explained in terms of external environments; certain behavioral responses are dictated by specific stimuli and predictable reinforcement;

unconditioned stimuli yield conditioned responses when pairing occurs; manipulated antecedents and consequences can shape behavior; and ignoring behavior may first intensify it, then extinguish it (Baldwin, 1981). Each of these behavior modification tenets, in various combinations, have been referenced extensively and used successfully in research studies targeted toward reducing aberrant behavior in special populations (Kelly & Matson, 1989).

Classical and operant conditioning are frequently the primary instructional strategies used with individuals who have mental retardation in academic/educational settings (Alberto & Troutman, 1986), assessment/evaluation settings (Taylor, 1993) employment/vocational settings (Wehman, Moon, Everson, Wood, & Barcus, 1988), recreation/leisure settings (Dattilo & Murphy, 1987), community/home settings (Kazdin, 1994), and health/safety settings (Lombard, Neubauer, Canfield, & Winett, 1991). Behavioral deficits or excesses in any of these areas may cause interruptions in participation and skill acquisition. Therefore, an increase in adaptive behavior and a decrease in aberrant behavior are goals common to every intervention plan (Sternberg, 1994).

Reid, Phillips, and Green (1991) reviewed the research literature to determine if more than behavioral changes occurred in severe populations as a result of therapeutic interventions. They also wanted to determine if typical treatment plans included teaching meaningful skills such as ones with immediate uses. Their inquiry indicated that very few interventions yielded the acquisition of immediate-use skills. Most studies attempted significant behavioral changes but

lacked sufficient time and resources to leave a lasting impression. Several studies paid little attention to generalization and maintenance of newly acquired behavioral repertoires. Thus, while most researchers intended to improve the quality of life of persons with severe disabilities, limits in instrumentation and methodology often prohibited the attainment of meaningful skills. This is not to say that all interventions reviewed were ineffective, rather that additional research using current behavioral technology needs to be conducted. A critically important suggestion made by Reid et al. was that future behavioral interventions look beyond the development of traditional independent or adaptive skills. Instead, treatment plans should focus on outcomes directed at maintaining present behaviors, avoiding regression, and furnishing enjoyment.

Recreation is defined by Dattilo and Schleien (1994) as an activity performed for the purposes of enjoyment and satisfaction. The term *leisure* indicates that a person is free to choose to participate in meaningful, enjoyable, and satisfying experiences. One of the ways to empower individuals, especially those with mental retardation, is to enable them to make decisions for themselves (Henderson, 1994). Schleien and Ray (1988) claim that participation in integrated recreation programs provides adults with mental retardation opportunities to acquire a variety of functional leisure and social skills. Many people engaged in leisure activities realize the affective benefits such as accomplishment in one's environment, self-confidence, mental relaxation, intellectual stimulation, excitement, and anticipation (Datillo & St. Peter, 1991).

Thus, recreation refers to the activity itself, while leisure indicates a connection to feelings associated to the activity.

A variety of motivating factors encourage individuals to begin and maintain involvement in some form of leisure. Ferro et al. (1996) confirmed the relationship between engaging in preferred activities and low levels of problem behaviors for persons with developmental disabilities. Wolfensberger (1972) has written extensively on the *normalization principle* concerning societal attitudes toward and treatment of persons with mental retardation. He argues strongly for the "utilization of means which are as culturally normative as possible, in order to establish or maintain personal behaviors and characteristics which are as culturally as normative as possible" (p. 28). The promotion of partial participation through individualized adaptations is an effective method for including persons with mental retardation in normalizing leisure activities (Crawford & Mendell, 1987). Further, partial participation is a fundamental component of ensuring that students are not excluded from activities simply because of their inability to complete them independently (Ferguson & Baumgart, 1991).

One common focus of recreation and leisure education programs is to create intrinsic rewards for participants versus providing them with mere tangible or external outcomes (Datillo & St. Peter, 1991). However, for certain severe populations, it is the tangible outcomes of leisure activities which provide strong reinforcement to continue participating (Relf, 1990). Belfiore, Browder, and Mace (1994) found that a higher percentage of adaptive behaviors than nonadaptive behaviors occurred for persons with severe mental retardation in high-stimulation

settings. In addition, it is typical for task completion rates to increase as self-stimulation, self-injurious behavior, and vocal outbursts are decreased (Kazdin, 1994). Therefore, “the normalization principle requires that recreational personnel ask these two central questions about their prescribed activities: Does the service maximize the person’s development of skills? Does the service foster a positive image of the person?” (Crawford & Mendell, 1987, p. 77). Further, by shifting recreational activities out of isolated and contrived settings into typically inclusive surroundings, leisure skills have the potential to become normalizing (accessible and age-appropriate) as well as naturally supported (maintained).

Definition of Terms

Mental Retardation: Onset before 18 years of age; subaverage intellectual functioning existing concurrently with limitations in two or more adaptive skills (American Association on Mental Retardation, 1992).

Horticulture Therapy: A process utilizing plants & horticultural activities to improve social, educational, psychological, and physical adjustment of persons (American Horticultural Therapy Association, 1990).

Behavior Modification: A systematic, performance-based, evaluative method for changing behavior using social/token reinforcers, fading, chaining, physical prompts, visual cues, and/or extinction (Sarason & Sarason, 1987).

Aberrant Behavior: Inappropriate, disruptive or dangerous behavior interfering with social, academic, and occupational goals; targeted for reduction (Baroff & Olley,1999).

Significance of Study

The results of this study add to existing theory concerning effective instructional strategies for persons with severe disabilities designed to improve their quality of life. Lack of ability to make informed decisions regarding choices in leisure and recreation contributes to social barriers such as isolation and inactivity (Dattilo, 1995). Specific quality of life areas addressed by this study are (a) access to age-appropriate, community-based inclusive settings for leisure, (b) opportunities to experience a diverse range of occupational training, and (c) potential procurement of lifelong leisure skills. Behavior therapy techniques were employed in several new ways not previously documented in either horticulture or exceptional education fields.

The significance of this study for practice involves the potential for employment in the horticulture industry. Gardening as a possible vocation was addressed through simple verbal queries presented to botanical garden staff at the data collection site. “Would you hire this person? Why or why not?” Environmental characteristics are important factors to successful outcomes in both employment and recreational settings. Vollmer et al. (1993) examined the results of exposing individuals with self-injurious behavior to a series of test and control conditions to determine behavioral sensitivity. They looked at the effects of environmental variables such as barren versus enriched settings. By identifying reinforcers for self-injury in each setting, the researchers suggested they could further manipulate behavior by either withholding or offering these contingencies when alternate appropriate behaviors were displayed instead.

Employers and job coaches could be instructed in similar techniques to attain compliance on the job.

Practical application of this study revolves around the acquisition, generalization, and maintenance of newly acquired adaptive skills from a training session to a natural environment. While most researchers have tried to include these features in their designs (Alberto & Troutman, 1999, Emshoff, Redd, & Davidson, 1976; Engleman & Carmine, 1982;), few studies of severe populations have demonstrated consistent maintenance of new skills or behavioral changes over time, or in different settings. However, it is unrealistic to expect that lifelong maladaptive behaviors exhibited by institutionalized adults with a history of reinforcement would be extinguished in a few weeks.

The ethical significance or social validity of this study stems from improving the quality of life of an individual. Even if improvements last only a short time, one might stop self-injury long enough to engage in satisfying hobbies. Normalization principles were exercised throughout the study to achieve social validity. Functional analysis procedures were performed including the process of gathering information such that therapeutic interventions may occur (Lennox & Miltenberger, 1989). These a priori techniques are highly beneficial in identifying individual contingency variables which maintain aberrant behavior (Vollmer et al.,1993). An alternating treatments design was used and has the potential to assist in behavior generalizability and, thus, participants may enjoy both short-term and long-term benefits of gardening.

CHAPTER 2

LITERATURE REVIEW

This chapter reviews current and historical literature regarding the use of horticulture with special populations. A broad spectrum of literature including historical, cultural, educational, and recreational perspectives toward individuals with disabilities is presented in the first section. The second section includes general information about the fields of horticulture and healing, and provides a synopsis about horticultural therapy. A third section addresses various aspects of vocational opportunities regarding special education and the horticulture/agriculture industry. Applied behavior analysis, single-subject research, reinforcement theory, functional assessment, and generalization and maintenance is the focus of section four.

Special Populations

Two main categories are used to describe individuals with special needs (a) physical disabilities or orthopedic impairments, and (b) cognitive disabilities also called intellectual impairments. A physical disability is defined as any impairment to a person's mobility or coordination (Sarkees-Wircenski & Scott, 1995) such as blindness, deafness, paraplegia, quadriplegia, amputation, speech impairments, skeletal, muscular and neurological diseases. A mental disability is defined by substantial limitations in present intellectual functioning i.e., subaverage intelligence and limitations in adaptive skills (AAMR, 1992), or an inability to discern reality from fantasy and maintain normal relationships, or the presence of chronic irrational thoughts or behaviors (Sarason & Sarason, 1987).

Examples of these disabilities include, but are not limited to, mental retardation, personality disorders, emotional disturbances, autism, schizophrenia, and depression.

Historical and Cultural Perspectives on Disability

Differing explanations of why certain individuals are afflicted with disabilities have greatly influenced treatment. During prehistoric times, human survival was a function of how much or how hard people worked, either by hunting, collecting food, or by protecting themselves from the elements. In early civilizations, individuals with any type of malady were rarely construed as a controversial political issue or drain on society since they often did not survive birth. When humans did finally develop the ability to produce a surplus of goods, work was no longer considered an absolute necessity (Neff, 1985). This shift in philosophy spurred a great and continuing debate over the notion of work being either positive or negative. For example, Spartans viewed work with disdain while Puritans equated work with God's grace (Chubon, 1994). Such discrepancies surrounding the meaning of work forced a value judgement on individuals who, for various reasons, could not work. Thus, individuals with special needs began to experience an array of reactions from nondisabled people including sympathy, blame, curiosity, disgust, compassion, and abuse.

The preferences of families who had members with disabilities were rarely solicited or honored regarding placement or handling of their impaired relative. Treatment decisions were typically made by a physician who had little or no knowledge of any particular disabling condition (Obermann, 1965). For several

centuries, institutionalization was deemed the best choice for special populations (Johnson, 1990). Blindness and deafness were met with both compassion and ridicule. Citations from the Old Testament Bible indicate that blindness was believed to be a form of extreme punishment from God (Lowenfeld, 1975). Likewise, deafness was construed to be a reason for denial of adult rights and responsibilities by the Hebrews (Bender, 1970). Still, different approaches to defining special populations have been advanced over the years. In Austria, advocates for educating blind children in regular schools existed as early as 1810 (Chubon, 1994). At the turn of the 20th century, an attempt to utilize the public school system to educate children with mental retardation occurred in the United States (Gearheart & Weishahn, 1984). Labeling the deficits of these individuals served as the primary source for classification. Fortunately, more contemporary methods of assessment exist to accurately portray the abilities, strengths, and talents of people with intellectual disability.

Varying the levels of restrictiveness for persons with disabilities is not a new concept. Early historical records indicate that persons with mental retardation were often subject to ridicule, abuse, and kept for amusement by wealthy families during the 1500s. However, these kept fools were usually more privileged than their nondisabled counterparts (Kanner, 1964). In Colonial America, children and adults with mental retardation were sent to poorhouses or jails (Chubon, 1994). It was not until 1896 that the first school for children with mental disabilities was established in Rhode Island (Heward & Orlansky, 1984).

Unfortunately, this progressive perspective was held only by a few enlightened individuals so the mistreatment continued.

A negative attitude toward feeble-mindedness prevailed at the turn of the 20th century. Assumed to be full of bad genes, people with mental retardation and mental illness were viewed as potential criminals. Training and rehabilitation remained unavailable to this population. According to Chubon (1994), many people feared that the procreation of people with disabilities might weaken the human species. Even during more contemporary times through the 1960s, most asylums maintained a philosophy that extreme isolation and intrusive interventions were the best solutions to the treatment dilemma of severe disabilities (Valenstein, 1986). A quick response to the heightened awareness of abusive environments in mental hospitals was the deinstitutionalization movement of the 1970s (Sarason & Sarason, 1987). However, lack of adequate transitional facilities for ill-equipped, discharged patients proved to be a major setback in the moral treatment of people with mental and psychiatric disabilities (Johnson, 1990).

Previous means of treating and modifying behavior for institutionalized persons with mental retardation took several forms, many of which are now viewed as unethical. These highly intrusive interventions are often referred to as aversive techniques (Alberto & Troutman, 1986). Fortunately, the model for treating special populations slowly shifted from a medical focus to a humanizing one (Brodwin, Tellez, & Brodwin, 1995). Typically, behavioral treatments are now administered on a continuum described by Hile and DesRoachers (1993), where

only the last two of the four categories listed are considered aversive: Level 1 - positive reinforcement, verbal prompts, physical prompts, self-management, ecological manipulation, skills training, and differential reinforcements; Level 2 - extinction, social disapproval, social time-out, overcorrection, contingent observation, response cost, required exercise, brief physical restraint, visual screening, protective clothing, and restitution; Level 3 - exclusionary time-out, mechanical restraint, lengthy physical restraint, finger pressure, spray mist, noxious chemicals/tastes, and movement suppression; and Level 4 - contingent shock and psychotropic medications.

Another group of individuals who benefit from a continuum of behavioral interventions is that of the dually-diagnosed. The concept of dual-diagnosis is recent among mental health professionals. Some experts say the term is a media-driven answer to the widespread problem of individuals with more than one disability not receiving adequate care (Johnson, 1990). The most common definition of dual-diagnosis is the existence of a mental health disorder in conjunction with mental retardation (Reiss, 1990). In addition to this clinical definition, many individuals possess two or more disabling conditions resulting in a multiple-handicapped label. Accurate identification of mental illness in persons with mental retardation is difficult due to the frequency of severe behavior problems which may resemble emotional disturbances (Borthwick-Duffy & Eyman, 1990). Other examples of the presence of secondary disabilities might include persons who are homeless and also substance abusers, incarcerated individuals who are also mentally ill, or paralyzed individuals who have brain

damage. The presence of more than one disability is common enough to warrant the establishment of special hospitals and treatment programs that cater to the needs of dually-diagnosed individuals (Chubon, 1994). However, since the primary disability often masks the symptoms of additional infirmities, precise diagnoses are rare. Expanding mental health definitions to include any characteristic that constitutes special need will ensure the availability of more services to more individuals (Hardman, Drew, Egan, & Wolf, 1993). Due to reported increases in the number of cases labeled dual-diagnosis, discovering new ways to serve and treat persons with mental illness inevitably helps improve and expand services for individuals with mental retardation.

Education and Recreation

Formal and informal training opportunities eventually improved throughout decades of vacillating opinions towards persons with disabilities. The phrase *school-to-work* describes a series of purposeful steps in secondary education where students actively plan for employment and receive on-site job training. Ideally, it is a transition stage that links academic instruction with work-based learning. Kochlar and Deschamps (1992) encouraged educational systems to combine their efforts towards securing public access to schools and the community for special populations. They suggested that students with disabilities require and deserve a wide range of academic and vocational options in order to complete the school-to-work transition successfully.

Many persons with severe disabilities do not attend or exit public schools in a traditional sense. Instead, they reside in institutions or are taught in special

classes or schools that attempt to provide an appropriate education that meets their particular needs. These individuals deserve to reach their full potential by receiving some version of academic and/or vocational training, in addition to occupational therapy, socialization activities, and community living skills. According to a study by Gallivan-Fenlon (1994), young adults who participate in community-based vocational training hold these experiences in high regard. Family members of participants stated that the job, although unpaid, improved the individual's self-esteem and sense of worth. However, some transition plans examined in the study involved agencies and providers who held limited vocational expectations and narrow ideas about community living for students with disabilities.

The humanistic perspective to treatment was emphasized by Murphy (1975), who claimed that all human beings had a fundamental right to some measure of freedom, autonomy, choice, and self-determination. Nevertheless, some school personnel tend to overlook the importance of providing families with accurate information needed to assist them in decision-making about transition for their child. A lack of knowledge often translates into an absence of empowerment on the part of the families in the transition process (Gallivan-Fenlon, 1994). When school-to-work transitions are implemented correctly, the process should accomplish the following: promote progressive changes in school and adult service provision; facilitate inclusion of people with disabilities in all facets of community life, especially education, employment, recreation, and living arrangements; and improve the quality of life after graduation. Indeed,

participation in recreation and leisure activities is an appropriate avenue in which to achieve or approximate these developmental milestones. Yet, for persons with severe disabilities, many barriers such as accessibility and transportation still exist with respect to providing such transition opportunities (Brawner-Jones, 1994).

Human service agencies continue to administer services that are segregated and encourage dependency by presenting limited options for community participation in adult ways (Gallivan-Fenlon, 1994). An important question posed by researchers is whether or not individuals at day centers have the ability and opportunity to communicate accurately detailed information regarding their leisure patterns, as well as their preferences within a given range of activities. The inability to make choices about leisure and recreation involvement is considered an isolating and limiting barrier (Dattilo, 1995). Richardson, Katz, and Koller (1993) discovered that if leisure activities exist for individuals with mental retardation in day centers, they tended to be solitary, passive, and family-oriented. Still, many adults with mental retardation are not regularly involved in leisure activities (Dattilo & Murphy, 1991.) nor are they offered activities except ones that are inadequate, incomplete, or contrived (Hawkins, 1996).

Active participation in recreation and leisure activities has often been denied to individuals with disabilities due to assumptions that they simply can not or will not benefit from such programs (Schleien, Kiernan, & Wehman, 1981), or that the costs of therapeutic rehabilitative programs are too high (Chubon, 1994).

These opinions exacerbate the skepticism towards delivering age-appropriate leisure services (Sharpton & West, 1992). However, these are the same arguments used decades ago that delayed employment training from being offered to populations with severe disabilities (Sternberg, 1994). Even partial participation in vocational and recreational settings has a positive influence on the typically negative image projected on persons with disabilities (Dattilo & Schleien, 1994). Demonstration of competence also elicits a more favorable response from persons without disabilities due to the verified presence of normalized behavior (Langone, 1990).

One of the most common characteristics identified as contributing to the quality of life for persons with disabilities is that of control (Sternberg, 1994). As individuals with severe disabilities comprehend their ability to convey their preferences and understand that these communication efforts are valued, they will also realize they have the capacity to alter, modify, and influence their environment. Additionally, as the volume and features of recreational and social interactions for special populations improve, there will be more opportunities for communicative, behavioral, and leisure skills to develop (Guess & Siegel-Causey, 1985).

Richardson et al. (1993) found that persons with mental retardation reported participation in every leisure cluster including competitive sports, noncompetitive physical activities, drinking at pubs/bars, organized entertainment, games at home, games away from home, hobbies, independent reading, class-related reading, classes related to hobbies, domestic activities,

passive activities, and obligation activities. However, social isolation was noted much more frequently in persons with mental retardation than in a nondisabled comparison group. When individuals attending day treatment centers did socialize, it almost always included others at the center, which meant little integration with nondisabled peers (Koller, Richardson, & Katz, 1988).

Schleien et al. (1981) believed that guidance in recreation and leisure skill acquisition is necessary to promote independence and avoid antisocial behaviors. This is a critically important direction for special education services since residents in state facilities are known for performing a high number of aberrant behaviors, thereby disrupting their learning opportunities (Sternberg, 1994). The closure of many state institutions and pending entry restrictions at state hospitals will allow the group home arrangement to become a more viable option for dignified residential services as well as another venue for appropriate instructional activities (Schleien et al.) Furthermore, instruction in leisure settings offers advantages to individuals of all abilities since it may be used as a medium for teaching both vocational and academic skills (Langone, 1990).

Horticulture and Healing

The field of horticulture has been expanded to include not only production agriculture and biological sciences but now represents creative forms of expression. Changing attitudes towards plants, flowers, and gardening are surfacing. Mac Griswold (1996) authored a paper entitled “A History of the Sanctuary Garden,” which traces the origins of garden spaces used as a safe haven. Some sanctuaries have temples, gazebos, water falls, or rock formations

in addition to plant material. Further, a sanctuary may have sunshine or shade, be urban or rural, private or public. All sanctuaries, however, possess boundaries and a sense of divinity in them. The behavior commanded by the design of the place itself such as sitting, looking between two trees, watching shadows develop, and listening to water sounds are what restore power, hope, and psychological stability. Horticulture means much more than gardening and landscaping; it seems to contribute to individual life experiences (Olszowy, 1978).

History of Plants and People

Plants have a multitude of uses; the most obvious one being sustenance (Janick, 1990). Food and medicine have also been gleaned from plant products prior to the times of the ancient Egyptians. Many Babylonian physicians issued prescriptions that contained high doses of toxic herbs in order to heal those ailing from disease or rid the body of evil spirits. Monasteries in the Middle Ages served as centers for medical learning by housing monks who studied and recorded the effects of various plant materials on the human body. Cultivation of such specimens may be attributed to a Holy Roman Empire edict which made the growing of fruits, vegetables, flowers, trees, and herbs compulsory (Bunney, 1990). Hence, botanical gardens often sprung up alongside hospitals associated with monastic orders.

Other religious groups relied heavily upon plants for healing and worship, too. Ancient Hindu philosophy recognized the strong effects of plant derivatives on humans. Since the principle aim of Hindu medicine was to prolong life, the collection and processing of many plants yielded a constant supply of drugs,

herbs, and spices. Herbal cures were meant to clear the head, cleanse the body, treat coughs, and anesthetize (Bunney, 1990). Likewise, the ancient Chinese used pharmacology as often as acupuncture to treat sickness. The Chinese believed that for every ill there was a corresponding natural remedy. Modern medical practices sprung out of the plant knowledge acquired by the Chinese. Today's field of drug therapy is somewhat indebted to the Chinese for its unearthing of various plants and their healing qualities.

Witchcraft also relied heavily on plant materials to cast a spell or deliver affection to whomever requested such services (Reader's Digest, 1990). Witches preserved and secretly used plant lore that Christians called evil. Manuscripts from the heresy trials of witches during Colonial times reported that the accused grew forbidden plants in order to create and administer heathen toxins. Voodoo started as a result of Africans being transported to the Americas for slavery. They brought with them what little they could: music, dance, crafts, and folklore (Londa, 2004). The voodoo doctors performed rootwork, magic from roots, herbs, and other plant parts they harvested from road sides and pastures.

Still another form of plantlore comes from the Ozark and Appalachian mountain regions of the United States. American Indians and White farmers alike practiced similar planting methods, sowing seed by phases of the moon. This practice was widespread through the 1930s until agriculturalists brought statistics and technical data to combat superstitious ignorance. Some faith in the traditional mountain ways exists today and now these old-timers are sought for their historical and anthropological wisdom of the region (Reader's Digest, 1990).

Although plants may not induce miracles, they do assist modern peoples in attaining a variety of knowledge regarding their ancestral connections to mother earth. A key to our past and to human creativity is often found in primitive customs as Thomas & Stermer (1999) reiterates, “Life in a truly human community revolves around close and continuing contact with children, plants, and animals; these ancient relationships provide young and old alike with a pathway to life worth living” (p. 23).

Founded in 1123, St. Bartholomew’s Hospital in London once cared for the sick, aged, pregnant, crippled, and wounded by using plant remedies from its physic (natural) garden. Likewise, the famous Chelsea Physic Garden served as a training place for London’s apothecaries in the 17th century and still actively conducts research on herbal medicines (Rose & King, 1992). Also in England, the lady of the manor was known to look after her household staff with plant-based remedies. As printing and distribution of texts became more commonplace, so did medicinal knowledge and the herbs used in healing the sick. Caretakers frequently consulted books with botanical drawings and instructions on dosage for illness. Aside from Greek mythology and Biblical references, the ones mentioned here are some of the earliest accounts of combining plants with medicinal and educational value.

Horticultural Therapy

The phrase *horticultural therapy* was coined in 1948 by Ruth Mosher. This concept goes beyond using medicinal plants *on* people but rather it suggests the use of plants *with* people who have some type of illness. Cures for the body

seemed plentiful compared to cures for the soul. However, there were a few individuals who believed that digging in the soil had curative effects. Benjamin Rush ascribed to this philosophy in the late 1790s as did several European hospitals in the early 1800s who found that horticulture was soothing for mental patients (Olszowy, 1978).

There is some question about what therapy is and is not. Webster's dictionary (1986) defines therapy as "a remedial treatment of bodily disorder" (p. 1223). Present day definitions suggest that therapy includes the total personality and social adjustment, focusing first on the person, then on the disability. This holistic approach to healing is aimed at promoting mental and physical well-being. The term *rehabilitation* arrived after World War I when the concept of wellness inferred more than prescribing traditional medicines (Chubon, 1994). Rehabilitation went from a product to a process and its goals were to "improve the physical, mental, social, and vocational aptitudes to enable a person to live happily and productively" (Olszowy, 1978, p. 5).

Horticultural activities may be selected by a therapist in order to deliver specific rehabilitative outcomes such as occupational and physical therapy, recreational education, and vocational training. The tasks chosen must be in sync with an individual's current and future needs. Certain plant-related activities may remove the focus from the disability or illness itself while rehabilitating the total person. Diagnostic information also becomes available to therapists as observations during instructional settings are recorded (Dattilo, 1987). Therefore,

horticulture is a useful tool for planning and implementing a rehabilitative program with diverse outcomes.

According to a survey of agencies with horticultural therapy programs such as nursing homes, psychiatric facilities, children's hospitals, and mental health/mental retardation institutions, fewer than 20% indicated that a professional design service was used when developing their site (Kavanaugh & Musiak, 1992). Horticultural therapists themselves were often the ones who attempted to design and plan for outdoor facilities. Others surveyed said the agency site, building, and landscape were developed in progressive stages, therefore, a master plan which should ideally include designated healing/serenity areas lacked from the beginning.

As facilities expand and give way to complicated and contemporary configurations, therapeutic landscapes are affected by these changes. This type of growth was noted by Kavanaugh and Musiak (1991) in their examination of the Amarillo Garden Center in Texas whose expanding facility and special programs is proof of a growing demand for additional horticultural therapy services. Further, they reiterate the need for thorough design and space considerations when large institutions begin to look to the future. Many facilities with large installation jobs could save valuable time and money by using professional design services specializing in therapeutic landscapes (Kavanaugh & Musiak, 1993).

Karner (1989) lists a range of services offered by landscape specialists when they are enlisted to work for facilities practicing horticultural therapy. First, design consultation involves having a specialist peruse the list of plants already

selected by the horticultural therapist. Second, comprehensive project managing becomes available to the facility when it allows a designer to direct and supervise the landscape project. Master planning and site planning are additional services needed when existing or proposed activities for the space might be affected by any adjacent property, thereby influencing any and all therapeutic programming. A fifth service entails documenting, administering, and evaluating construction. Each of these features is critical to the success of developing a therapeutic landscape. During evaluation, both design and therapy professionals test the site plan for its therapeutic value and adequacy to meet the needs of the intended population.

The popularity in developing therapeutic landscapes for various societies must not be underestimated. Leavold Associates (1997) is a landscape design service for schools and community groups. The following statements taken from their web site (http://www. guilford.ac.uk/leavold) describe their mission of guiding clients:

> We are all influenced by and react to our environment. We believe that the characteristics and qualities of school grounds, hospital gardens, and other communal landscapes exerts an influence on people. An environment which is evidently not valued by the school can not be expected to be valued by its pupils. A bleak environment may convey the message that the children are not valued members of our society. Organizations caring for persons with disabilities and the elderly should consider the pleasure and therapeutic value to

be derived from the sensory and participatory experiences provided by gardens and gardening.

Leavold Associates is one of several landscape firms expanding their service areas to accommodate and assist any facility wishing to maximize the potential of their grounds as learning, play, or therapeutic resources while providing an asset to the local community.

Design and space issues do not end with the landscape. Additional literature is available on specific adaptations to create an accessible and therapeutic environment, including information on treating Alzheimer's patients with horticultural interventions (Ebel, 1991), installing gardens with senior citizens in nursing homes (Riordan & Williams, 1988), modifying heights of flower beds for individuals in wheelchairs (Yeoman, 1992), creating a gardening area for children with mobility impairments (Ross, 1997), restoring self-worth in elderly individuals through gardening (Tyson, 1987), forming rooftop gardens for AIDS patients (McCormick, 1993), accessing nature preserves for severely disabled children (Dannemaier, 1995), adding greenhouses to hospital grounds (Leccese, 1995), and developing task analyses for the orthopedically impaired to grow vegetables (Olszowy, 1978). Different populations have varying needs and it is critical to be aware of the strengths and weaknesses in each individual served in horticultural therapy settings (Mattson, 1993).

Research and Measurement in Horticulture Therapy

Quantitative and qualitative research projects have been conducted to measure the outcomes of horticultural experiences for persons with special

needs. Cimprich (1990) studied directed attention and the effects of making a commitment to engage in potentially restorative activities for patients healing from cancer. Half of the participants were told that this experience sometimes benefited people in recovery (intervention group). The other half did not receive such a suggestion (control group). Results indicated that nature-related activities were chosen most often by patients in the intervention group. Additionally, those patients involved in restorative activities had an increased directed-attention span, thus allowing for more time and energy to be spent engaging in activities beneficial to the recovery process.

According to Kaplan (1990), several other populations-in-need ought to be targeted for similar interventions. Research by Moore (1981) suggested that health care demands of prisoners could be reduced if their environment was made richer through live materials. Likewise, West (1986) discovered a significant inverse relationship between decreased stress responses of prisoners and increased landscape views. Ulrich (1984) and Verderber (1986) also illustrated the healing value of restorative views to nature in hospitals by demonstrating the positive effects of the natural environment on human health, especially after surgery. Results of all these examinations suggest that activities essential to maintaining or recapturing one's quality of life are dependent on directed attention, especially on or in natural settings.

Several case studies using behavioral and cognitive therapies in combination with horticultural activities improved the psychological health of participants (Schwebel, 1993). Patient conditions ranged from severe loneliness,

mental retardation, chronic depression, and substance abuse. In one case, a treatment team member was a horticultural therapist who used plants as a way to initiate healing. The experience with plants, garden activities, and structured dialogues between therapist and patient proved beneficial in helping to increase self-esteem, alter negative thoughts, and encourage leisure behavior. Another important aspect suggested by the case studies is the notion of optimism. Since so much of horticulture involves delayed gratification, i.e., waiting for a seed to sprout or a flower to open, a proficient horticultural therapist has to accept time and hope as integral parts of the recovery process. He or she must exercise patience while dealing with individuals whose problems are serious enough to warrant professional guidance.

The bereavement process typically involves assuaging painful moments in the present and honoring pleasant memories from the past. Fresh flower arrangements have long been associated with showing acts of sorrow and sympathy. Other living materials such as plants and trees have also been used to offer condolences. However, funeral traditions are changing since families are getting smaller and living farther apart (Indepth Research, as cited in Shoemaker, Relf, & Bryant, 1990). Still, positive correlations have been noted between adjustment scores on grief inventories and specific post-funeral rituals (Bolton & Camp, 1989). For example, child psychologist Sara Bonnett Stein (1974) says, “Living flowers that mark a human grave are also good markers for little animals, too” (p. 20). Further evidence supporting the use of flowers and plants in times of distress as having a significant impact during the loss of a loved one was derived

from interviews with funeral directors and grieving family members. They both confirmed the belief that the presence of flowers enhances memorial services while offering an alternative to conversations revolving around the deceased (Shoemaker et al., 1990).

In addition to providing positive support during the trauma of death and burials, the presence of living things has also favorably affected the enjoyment of life and work. An investigation into the role of corporate gardens in business settings revealed a higher productivity rate for some employees at the John Deere Company (Parker, 1990). The atrium located at the company's headquarters serves to enhance the work environment, increase morale among workers, and encourage a sense of pride in the workplace. Further, both active and passive enjoyment may result from an attractive worksite landscape, as well as the facilitation of recreational and social activities between co-workers (S. Low, as cited in Parker).

Horticultural therapy also influences other types of social interactions completely removed from the job site. Tristan and Nguyen-Hong-Nheim (1990) described adjustment difficulties and discomfort from international transitions experienced by immigrant populations. They studied Asian refugees who had relocated to the United States. Shifting from one culture to another includes tremendous challenges: second-language acquisition, climate differences, religious preferences, employment needs, and housing, to name a few. Exposure to greenhouse and gardening activities provided the refugees with vocational

training as well as socialization skills. A decrease in resettlement discomfort was observed and is attributed to horticultural opportunities.

Similarly, Vietnamese immigrants who moved to a major southeastern city experienced a tremendous sense of camaraderie when engaged in community gardening activities (Blake, 1996). One individual had been held captive in a labor camp prior to arriving in the United States. In an effort to thank the social service agency responsible for helping he and his wife settle in Atlanta, Dang Nguyen planted a garden behind the office property. He says working in the soil brings him great pleasure and allows him a yard in which to grow vegetables indigenous to his homeland. Several other Vietnamese immigrants visit this garden setting, enjoying the peaceful atmosphere and a chance to converse with friends in their native tongue. Nguyen also uses the garden as a classroom to teach Vietnamese children about different plants. These informal lessons are his way of explaining Vietnamese culture to children. In this case, horticulture acts as a bridge between generations, offers a venue for community farming, and provides a reason for local gatherings.

More reports of therapeutic and rehabilitative benefits of gardening are mentioned by Zhou and Relf (1991) as they assess case examples in China. Several individuals living in separate places from each other who experienced illness, trauma, depression, and disease were essentially healed by their involvement with horticulture. Those who were thin and emaciated found restorative properties in gardening activities while those who suffered physical impairments worked through depression with Bonsai projects. One man with

colon cancer installed a rock garden with ornamental plants and is now in complete remission. His doctor credits his natural hobby with curative effects. Another person had heart disease and tuberculosis but began gardening at the urging of friends. He is now recovered and has his strength back. The connection between wellness and recreation is promoted by many health organizations and medical institutions and is evidenced by doctors, nurses and therapists prescribing hobbies as part of a total treatment plan. As one physician of geriatrics put it “The three plagues of loneliness, helplessness, and boredom account for the bulk of suffering in a human community” (Thomas, 1999, p. 11).

There are many more examples of healing successes in China through horticultural activities but no one has conducted scientific research to understand the mechanisms by which this healing occurs. Using the individuals who were made well by some form of gardening as examples, there are three main characteristics of the recovery process: (a) the patients are usually worried and depressed and gardening takes their mind off the discomfort; (b) gardening means mild exercise and daily routines, both of which are essential for maintaining good health, (c) certain plants emit odors and fragrances inducing psychological responses. China has furthered the horticulture therapy movement by designing a Botanical Garden for the Blind and by creating specialty gardens on hospital grounds (Zhou & Relf, 1991).

Finally, it is important to include specific examples of measurement techniques used to document the success of any horticulture therapy program. Comparisons between baseline data and treatment data is helpful in determining

any changes in client progress (Airhart & Doutt, 1990). Questionnaires presented to trainers regarding the productivity rates of their subordinates may also provide information on skill acquisition. Self-completion surveys may be administered to clients to gain their personal performance evaluation. Still, inter-rater reliability is often needed to validate the results of certain psychometric tests and observational data.

Ten major ego functions affected by horticultural therapy experiences were outlined by Stamm and Barber (1978). Measuring changes in these specific areas offers a wealth of data concerning program operation and success. The following ego functions are connected to assorted gardening tasks: planning, preparing, measuring, regulating, creating, managing, relaxing, responding, tolerating, and reacting. Interestingly enough, possibilities for accurate measurement of these functions is most likely through field notes (anecdotal records), interviews (personal contact), observations (direct examinations), and other behavioral assessment techniques (Kazdin, 1994).

Slayton (1978, 1979) lists 15 ways that horticulture offers therapeutic benefits including daily living skills, attention to tasks, pleasure and enjoyment; frustration tolerance, socialization, behavioral control, leisure skills, reality orientation, self-esteem, self-expression, motor skills, independence, assertiveness, intellectual stimulation, and values clarification. Again, each of these components is most easily measured through in-depth behavioral analysis. To illustrate the point, semantics often confuse gardeners growing the same plant. One person calls the plant by its common name, the other uses scientific

nomenclature; same plant, different reference points. It is for this reason that many standardized tests, prewritten inventories, and published appraisal forms have little use when the goal is to gather details about specific philosophical orientations and behavioral changes. Each horticultural therapist has a vocabulary exclusive to his or her site, an agenda modified to meet various client needs. Both of these items are subject to seasonal changes.

Professional Trends in Horticulture Therapy

Professional horticultural therapists are frequently responsible for program evaluation to determine if the desired results are achieved with each person receiving services, be it for mental health reasons or physical rehabilitation (Zandstra, 1987). Whether the institution is private or public, much needed financial support is often procured or discontinued on the basis of these evaluations. Since long-range program planning often guides the horticultural therapy curricula, specific goals and daily objectives are typically tied into evaluation procedures. In order to truly assess client progress, identification of program goals and descriptions of instructor practices are imperative. One concern, presented by Olszowy (1978), is that occasionally there is too much emphasis on planned therapy and this narrow focus may destroy the spontaneity and joy in helping others. If this is the case, then one must be cautioned in the area of vocational training whose goals and objectives may be in conflict with client needs by being too rigid or structured.

In the late 1960s, Rhea McCandliss was the first horticultural therapist at the Mennigers Clinic in Topeka, Kansas. She conducted a survey of psychiatric

hospitals in the United States and concluded that professionally trained hort-therapists were needed. By 1971, she had assisted Kansas State University (KSU) faculty in developing the first curriculum in horticultural therapy in the U.S. (Odom, 1973). Since then, over 250 students have graduated from this program (Stober & Mattson, 1993).

In 1970, Spiegel-Roy, president of the International Horticultural Congress, announced in a public speech that “the aim of horticulture, a science with a human goal, must be to make human life healthier and more enjoyable, to provide us with beauty, color, and form” (p. 12, as cited in Relf, 1992). Wittwer (1972) reacted to the large and sudden enrollment increase in various horticulture departments nationwide by presenting an objective to all educators when he suggested that,

> “Restructuring of investments in research and training is called for at the undergraduate and graduate levels; and greater opportunities should be provided in urban and landscape horticulture, recreational, environmental, and therapeutic horticulture; and fruit, vegetable, and flower gardening, in addition to meeting traditional needs.” (p. 544)

Charles Lewis (1976) speculated about the entire future of the profession in his writings by claiming that,

> “society has found horticulture. With the people/plant concept, horticulture can discover new and vital dimensions in society. The questions concerning people/plant interaction will be answered because the pressures of human needs demand answers. To what

> degree will horticulture participate in the search? Can we enlarge the area of our horticultural concerns to include inherent human benefits?" (pp. 4-5)

Still another prominent figure in the field expressed a sense of urgency regarding the blending of areas related to horticulture. Harold Tukey (1983), Director of the Center for Urban Horticulture at the University of Washington wrote, "It is long past time when horticulturists should combine forces with the psychologist, the artist, the landscape architect to quantify in scientific terms the effects that plants have on humans in addition to providing food and substance" (p. 11).

In the early 1980s, KSU received a National Institutes of Mental Health grant to further investigate the professional issues facing horticultural therapists. Some of the major issues addressed in this research project were to discover similarities in occupational and personality traits of horticultural therapists (Czerkies, 1982), to provide a thorough report of current horticultural therapy job performance skills (Kuhnert, Shoemaker, & Mattson, 1982), and to identify mandatory competencies of horticultural therapists (Murphy, 1992). Demographic results indicated that horticulture therapists are largely white, educated females less than 40 years old, are typically married, and from agriculturally-based regions. A survey of job performance skills in the horticulture therapy field revealed that there was some difficulty in acquiring proper training for such positions due to the scarcity of college-level offerings. Further, when looking at specific job competencies in the field, most practicing hort-therapists felt strongly

about possessing some form of certification or registration through national testing.

National certification for horticultural therapists became available through the American Horticultural Therapy Association (AHTA) in 1985. This organization is dedicated to advancing the practice of horticultural therapy to improve human well-being. It purports to offer professional opportunities including annual meetings, research publications, job postings, and registration with national associations. The U.S. Department of Labor has listed the job of horticultural therapist as a medical position. In fact, it has been advertised as such in several places (AHTA Newsletter, 1990; Atlanta Journal, 1994). However, employment outside of hospitals is common, especially in juvenile delinquent centers, botanical gardens, educational institutions, and national parks.

Seven horticultural therapy standards of practice have been proposed by Mattson, Merkle, Hassan, and Waliczek (1994). These standards are intended to outline the profession's conditions and performances necessary for quality horticultural therapy services. Consolidated versions of the standards include offering sound services to clients by orienting them to the horticulture environment; maintain organized programs with financial and resource management; expose clients to a wide variety of specific tasks in integrated settings; assess client and develop individual treatment plans; provide proper and accurate documentation of procedures; scheduling of services must offer seasonal indoor/outdoor activities; and, maintain high ethical practices.

Fortunately, there are now textbooks and program guides available to assist the novice horticultural therapist as well as the experienced one. Bibby Moore's book Growing with Gardening (1989) and Kathleen Yeoman's book The Able Gardener (1992) have facilitated programmatic planning for all persons trying to cultivate a wide range of skills in special populations through horticultural practices. These versatile guides are a must-have for anyone working along side persons with disabilities due to the flexible nature of gardening activities.

Vocational Opportunities

Since 1928, agricultural education in the classroom has been supplemented with field-based activities offered through membership in one of the oldest vocational student organizations (VSO), the FFA or Future Farmers of America. Student clubs such as FFA are designed to promote careers and interest in agriculture by arranging occupational and hands-on experiences, by teaching leadership and cooperation skills, and by offering awards and recognition for strong participation. The U.S. Department of Education states that VSOs are an integral part of all vocational education and instructional programming. In addition, recruiting and involving students with special needs in VSOs allows for participation in activities that facilitate the acquisition of knowledge, skills, work habits, and positive attitude needed for employment and community success (Sarkees-Wircenski & Scott, 1995). More recently, FFA has expanded to include more careers adjacent to farming and agriculture such as horticulture and floriculture.

Veteran's Administration hospitals began offering rehabilitation to soldiers with disabilities in the form of gardening activities after both World Wars. This trend continued into the second half of the 20th century through the inception of vocational agriculture programs in public schools. Since work is often said to be therapeutic (Chubon, 1994), job training which involves therapeutic tasks such as flower arranging, landscape design, and vegetable gardening is construed as an extension of the entire horticultural-therapy movement.

Special Education and Horticulture

Prevocational opportunities for adolescents with developmental disabilities were explored by Airhart, Willis, and Westrick (1987). A horticultural training program was designed to improve behavioral and work-related skills of segregated high school students. Realistic expectations were assessed for each individual and a clear statement of training intentions was provided. A series of behavior modification steps was used to teach a simple sequence of horticulture skills within a structured work routine similar to that of a sheltered workshop. This instructional format reduced confusion, instilled confidence, improved self-image, and motivated clients to want to return to the program. Airhart et al. asserted that additional job skill development is warranted to raise the potential for employment.

A neglected group in the special populations category is that of youth in correctional facilities. Many people exiting the penal system are brought back as repeat offenders. In an effort to reduce this occurrence, the New Jersey Department of Corrections, along with two local universities, developed a

specialized training program for imprisoned youth (Flagler, 1993). The main objective was for the youth to gain horticultural skills to become employed as florists, in garden centers, nurseries, golf courses, parks, and interiorscape businesses. Structured work modules offered incarcerated youth an opportunity for gaining knowledge, responsibility, and achievement through participating in horticultural activities. Both students and teachers frequently measured program efficacy, academic progress, and socio-emotional status. Job placement attempts occurred after participants received career guidance and had experienced internships. Findings indicated “a growing sense of purpose as many individuals expressed satisfaction and pride in what they accomplished” (p. 52). In addition, proximity near large academic institutions afforded program graduates the opportunity to be continually mentored by extension agents. Also, liaisons created from the study resulted in productive networks with local green industries where apprenticeships and internships were encouraged.

Another study on vocational horticulture for special populations was conducted by Dobbs and Relf (1991) who examined the enclave model of employment in a grounds maintenance department. Beginning in 1986, an enclave of five adults with developmental disabilities and one supervisor were employed in the Virginia Polytechnical Institute grounds department. Duties included working in a crew to collect litter, weed landscapes, rake leaves, and shovel snow. According to follow-up reports, members of the enclave were enthusiastic, dedicated, had good attendance, and set examples for regular employees. Since many of the simple but required tasks were performed by the

enclave, salaried workers were able to concentrate on more complicated tasks. The maintenance contract stayed in effect at least five additional years, which proves that workers with developmental disabilities are able to function successfully as a small team as well as part of a larger, integrated horticulture staff.

Goodban and Goodban (1990) studied the possibility of using horticultural instruction with individuals in psychiatric settings. Horticultural therapy eventually became part of a work skills assessment unit. However, the original venue for evaluating client work-readiness was carpentry, which is somewhat limited in its therapeutic task offerings. An occupational therapist was placed in the carpentry unit designed to serve long stay patients and adjacent to the wood shop was a wilderness area. A 36 year-old man with significant behavioral and communication problems was the first to notice the nearby natural setting. He had been known for isolating himself and staring out windows. After no visible changes for weeks, the man suddenly began to point out the birds and mentioned the garden he once had to the occupational therapist. Eventually the adjacent lot became a place for individual gardening spaces, facilitating the practice of being responsible caretakers. This passage from carpentry into horticulture started new assessment and treatment areas which created much interest, provided rest and relaxation, and offered social interactions.

One last study worth mentioning combines horticulture and vocational training for adults with autism. Schleien et al. (1991) used systematic instruction of horticultural skills as a means to enhance the employment potential of persons

with autism. The rationale for the study was that the acquisition of horticulture skills to meet lifelong leisure needs has not been fully examined. Using A-B single subject designs, three adults with autism were taught three lifelong leisure skills in a greenhouse environment: planting seeds, transplanting seedlings, and repotting plants. Maintenance and generalizations of the first two tasks were achieved in a nearby farm setting. Significant increases in skill attainment occurred for all three participants with continuous social reinforcement procedures. The passage of scheduled time or frequency intervals was not required to receive verbal praise, just task completion. The potential of horticultural activities to meet lifelong leisure needs is represented well through this experiment since a variety of tasks were mastered as well as generalized to alternate settings.

Programmatic Issues for Special Populations

There is some concern about the general attitudes of staff responsible for delivering appropriate services at day treatment centers (Henry, Key, Balcazar, & Jopp, 1996). Some readily admit to lacking the proper background and training in special education or human behavior. These instructors and supervisors are still dedicated to caring for clients, yet many workers in institution-type settings do not see the value of offering a wider range of inclusive employment and recreational options (Wolfensberger, 1988).

A study by Gallivan-Fenlon (1994) revealed that service providers' opinions of the future potential of clients with disabilities are often based on personal expectations or unrelated encounters with the individuals, sometimes

leading to inaccurate ability profiles. When direct care staff or primary caregivers provided an evaluation of vocational skills, daily-life skills, and leisure participation ideas for adults with mental retardation, they frequently maintained lower aspirations than reflected in client self-reports or in family-desired goals.

Workers in institutional settings often hold low opinions of those clients or residents receiving treatment. This is a damaging perspective since it greatly influences the caliber of instructional activities and may limit the availability of appropriate services. Therefore, the recruitment of staff members whose beliefs are compatible with that of the agency is strongly encouraged (Rice & Rosen, 1991). In order to genuinely improve the quality of life for institutionalized individuals, it is critical for direct care staff to set high standards for client accomplishments since they are in direct contact with clients everyday (Henry et al., 1996).

The strength and impact of viewpoints held by direct-care staff and the community at large towards individuals with mental retardation should not be underestimated. Day treatment programs attempting to offer services that facilitate normalization must include activities suited to reach this goal. Horticulturally-based activities contain numerous intellectual, social, physical and emotional benefits (Hefley, 1973) that correspond with the attributes of a normalized lifestyle for persons with disabilities such as integration, vocational, and recreational opportunities (Hardman et al., 1993). The distinctive features of horticultural environments make them an excellent instructional setting for adults with disabilities including adaptability to behavior analysis, observable and

measurable tasks with discrete and continuous qualities, and outcomes with potential for primary (food, tokens) and secondary (e.g., privileges, free time) reinforcers.

Applied Behavior Analysis

Study of the individual has been the focus of many psychological and educational experiments. Freud and Piaget both used case studies to further their theories about human thought and behavior (Ary, Jacobs, & Razaveih, 1990). These researchers studied individuals in natural environments without much control over the setting. However, investigators using single-subject research will usually manipulate independent variables to ascertain their effects on dependent variables in the experimental design tradition. Since some researchers believe average or mean group scores offer little information about treating individual problems, single-case designs are often the preferred strategy for clinical applications of therapeutic interventions. This section will cover the following topics: single-subject design and definitions of associated terms, reliability and validity issues, various design types, and article reviews on studies using single-subject method with special populations.

Single-Subject Designs

Single-case experiments typically involve the intense analysis of behavior in one individual (Gall et al., 1996). There is no random assignment or use of control groups fin single subject research designs (Ary et al., 1990). While this might seem to encourage threats to validity and reliability, alternative measures are used to reduce the influence of these problems. In fact, most single-case

studies are rigorous and time-consuming since they include as much data collection as experiments that use two distinct groups for treatment and control purposes (Gall et al.).

Single-subject research design is still considered a quantitative method in that it uses procedures similar to experimental designs to exercise control over the research environment. Single-subject designs employ the following control measures: frequent observations of behaviors targeted for change, frequent checks on the reliability of experimenters' observations of participant behavior, indepth descriptions of experiment protocol to facilitate replication, and sometimes replication of the same treatment to another participant in the experiment (Gall et al., 1996).

Specific terms are associated with single-subject research designs (SSD). It is necessary to have an understanding of these terms before discussing specific design features and research studies using this method. Definitions of the following terms (in italics) are adapted from Ary et al. (1990), Barlow and Hersen (1984), Datillo (1987), Gall et al. (1996), and Kazdin (1994). *Behavior modification* is a specialization within psychology seeking to change behavior of individuals by applying experimentally-validated techniques such as social and token reinforcement, prompt and cue fading, and antecedent and consequence analysis. *Baseline data* is collected to assess participants natural behavior patterns in the absence of experimental treatment. *Escape or avoidant behavior* results in the cessation of an aversive event. *Extinction* is a procedure where a reinforcer that previously sustained a behavior is withheld for the purpose of

eliminating that behavior. *Generalization* refers to the likelihood that a behavior learned in response to a specific stimuli in a specific environment will occur in response to different stimuli in different environments. A *reinforcer* is any stimulus that strengthens a behavior, it may be positive (rewards/privileges), negative (removal of aversive/punishment), primary (extrinsic) or secondary (intrinsic).*Target behavior* is a behavior intended for change as a result of an intervention strategy. *Reversal designs* use the withdrawl and reapplication of an intervention to demonstrate stimulus control. *Multiple baseline designs* use the attainment of a target behavior after an intervention as justification for administration of a second intervention, and then a third; the target in these cases could be success across settings or success across participants where more than one baseline data set is collected.

Much success has resulted from the use of single-subject designs (SSD) in conjunction with training and teaching persons who have mental retardation. Foxx, Kyle, Faw, McMorrow and Bittle (1988) used a multiple baseline across-subjects design to advance the limited, often non-verbal communication skills, of students with MR. They successively taught each participant how to respond correctly to unfamiliar questions and identify new objects using signs or gestures when previous responses to the same requests were unintelligible. After training, the subjects successfully labeled items placed in front of them as well as answered questions about the items without viewing them.

In another study using multiple baselines (across tasks), peers with moderate MR were trained to teach persons with severe MR a variety of tasks

similar to workshop instruction (Wacker, Berg, Choisser, & Smith, 1989). Some participants were taught to sort and assemble packages, others learned how to match and file cards inside a mental box; still others were required to load a soft drink machine. Results indicated that each individual demonstrated steady improvement in acquiring a functional skill. Therefore, peer instruction from persons with moderate MR is an effective way to train persons with severe MR in vocational tasks.

Schloss, Schloss, Wood, and Kiehl (1986) cultivated appropriate speech and conversational skills among persons with MR using a self-monitoring strategy that generalized across behaviors. In their multiple-baseline study, the participants first received instruction via modeling and rehearsal on how to initiate and respond to directed and nondirected questions with others. They then were trained how to monitor their own successful usage of this skill with either a switch or a counter. Results revealed that teaching conversational skills in isolation (without self-monitoring) led to little or no change in appropriate speech. However, when the self-monitoring phase was implemented along with conversational instruction, substantial gains for all participants was noted.

Reinforcement Theory

There are two main categories of reinforcers, primary and secondary. Each type may have intrinsic and extrinsic value, depending on the delivery schedule and individual preferences. Primary reinforcers have a biological importance and are considered highly motivating (Alberto & Troutman, 1986). They include food, liquid, shelter, and sleep. These items are often more

appropriate for younger children with disabilities and are deemed temporary measures. Still, edibles provide a wide variety of reinforcer possibilities (Alberto, Jones, Sizemore, & Doran, 1980) and it is easy to monitor serving amounts, thereby reducing the negative effects of rewards (Balsom & Bondy, 1983).

In their single-subject study, Haring, Breen, Weiner, Kennedy, and Bedernesh (1995) used a variety of methods to teach purchasing skills to persons with severe MR including modeling, direct instruction, and videotaping. Although the participants received verbal praise for completing steps involved in shopping at a food store, they were allowed to consume the food item purchased shortly thereafter (during break time). It is possible that inadvertent primary reinforcers might alter the efficacy and reliability of teaching skills that are associated eating. However, this reinforcing effect is most appropriate and normal since food shopping for persons without disabilities is naturally reinforcing because these items could stave off hunger, feed a family, or satisfy guests. Still, It is especially important to try to pair primary reinforcers with secondary ones.

Secondary reinforcers include items or events that have social or symbolic value. These types of stimuli will eventually replace primary reinforcers if the individual responds to non-biological rewards. Previous studies indicated that individuals with severe mental retardation may be taught to respond to opportunities for social praise and special privileges (Gold, 1980; Premack, 1959).

Duker, Dortmans, and Lodder (1993) delivered verbal praise for correct responding as reinforcement throughout their study of non-verbal students with

severe MR. Multiple-baseline across individuals was used to determine if the participants could be taught how to request and reject specific items through manding (gesturing). Each time an individual asked for and and received an appropriate object through manding, he or she was given verbal praise by the trainer which validated their correct response. In addition, if the object presented was not what was asked for, and it was correctly rejected by the participant, verbal praise plus juice or cookies were provided.

Tokens are considered another form of secondary reinforcers and are frequently used with special populations (Alberto & Troutman, 1986). However, the tokens alone usually do not possess reinforcement power until they are paired with something else, such as five minutes of free time or a turn with a game (Kazdin, 1994). The process of exchanging tokens for goods and services allows for a wide variety of reinforcer schedules.

Tokens were issued to two young adults with severe developmental and sensory disabilities as reinforcers in a study by Van Hasselt, Hersen, Egan, McKelvey, and Sisson (1989). Each time participants remained on-task for a specified length of time (which gradually increased), they received monetary tokens placed in a bank. Once 10 tokens were earned, a back-up reinforcer could be *purchased*. This study first engaged a withdrawl design to demonstrate the positive reinforcing effect of a token economy for on-task behavior. Then, a multiple-baseline design across behaviors was used to teach and encourage pro-social behaviors. Both phases used the token system of reinforcement; results

indicated a reduction in the level of self-stimulatory behavior for both subjects as well as acquisition of functional leisure skills.

Scheduling of reinforcement is connected to the type of reinforcer planned. Typically, for a reinforcer to be effective, it must be administered immediately so that there is an association made between the behavior and consequence. Scheduling refers to patterns of timing for delivery of reinforcers. According to Kazdin (1994), responses reinforced every time (continuously) they occur are likely to fade quickly when reinforcers are removed. In addition, responses reinforced occasionally (intermittently) will be maintained longer, even after removal of the reinforcer. However, many maladaptive behaviors have a long history of intermittent reinforcement which means they are extremely difficult to extinguish due to the irregularity of reinforcers (Sprague & Horner, 1992). Stopwatches and kitchen timers make it easy for researchers to measure and alter reinforcement intervals (Sisson, VanHasselt, & Hersen, 1993).

When comparing instructional strategies, scheduling and delivery of reinforcers must be equivalent to truly discern which method results in reliable skills acquisition and superior generalization. Ferguson and McDonnell (1991) compared serial and concurrent sequencing while teaching generalized grocery item location to students with mental retardation using a multiple-baseline across subjects design. For some study participants, the training was administered in a single serial fashion with a specific hierarchy of steps to reach completion. They did not progress to another location until mastery was demonstrated in the first store. For others in the study, information was given in concurrent sequence

where training occurred at different sites whether or not the grocery item was located successfully. All participants were given direct verbal and gestural cues during the search and praise if they correctly located the desired item. Upon reliable performance, these cues were faded.

Results revealed both strategies led to improvements in community grocery skills. Those participants receiving concurrent sequence training located more items in non-trained stores and thus demonstrating generalization of shopping skills. However, participants in the serial sequence group were able to locate items in fewer steps than the concurrent trainees. This difference in generalization may be due to the fact that concurrent trainees received additional item presentations during training (Ferguson & McDonnell, 1991) and thereby received more opportunities for reinforcement.

According to Kazdin (1994), reinforcer sampling refers to a technique that provides a brief exposure to a reinforcing event or opportunity for the purpose of determining its promising value as a regular reinforcement strategy. The reinforcing potential of an item or activity corresponds with reinforcement history and deprivation (Alberto & Troutman, 1986). It is crucial to investigate what has motivated or hindered individual behavioral performance in the past as well as what is missing from, but desired by, the participants. These two issues (history/deprivation) are key factors in ascertaining which reinforcers work with certain people. If they are ignored, satiation may occur which means reinforcer sampling was overdone (Datillo & Murphy, 1987).

Kozloff (1994) suggests that when a participant does not demonstrate the desired behavior change, it is possible to administer a small amount of a new reinforcer to determine if this addition will encourage behavior change. Reinforcer sampling does have a possible drawback when undesirable or nonoccurring behaviors are inadvertently reinforced (Dattilo & Murphy, 1994). This problem may is resolved by allowing the participant a limited experience of the reinforcer in question.

An important aspect of a study by Sisson, VanHasselt, and Hersen (1993) was their adherence to *preferred stimuli* theory while choosing reinforcers. They examined behavioral interventions to reduce maladaptive responding in youth with severe disabilities. Positive consequences, such as delivery of preferred brands of candy and crackers, served as the reinforcement for a decrease in the display of aberrant behaviors. Participants exhibited several classes of maladaptive behaviors with self-injury and mouthing becoming the target behaviors after lengthy observations and input from teachers. Incidences of self-stimulation and disruptive behaviors were also recorded to determine concurrent effects of treatment. By using an assortment of reinforcement procedures (varied schedules and contingencies) with occasional overcorrection techniques, maladaptive behaviors were effectively reduced in one of two participants across all three settings (two vocational and one leisure). Application, withdrawl, and reapplication of brief physical restraint was implemented for the other participant, and thus added to the treatment package of other reinforcers. This addition reduced displays of mouthing to zero.

Differential reinforcement. (DR) Several authors have outlined the techniques associated with differential reinforcement strategies used in conjunction with reducing maladaptive behavior (Alberto & Troutman, 1986; Kazdin, 1994; Kozloff, 1994; Langone, 1995; Snell, 1993; Sternberg, 1994). These applied behavior analysis terms will be defined briefly and examples of usage will follow.

Differential Reinforcement of Other Behaviors. (DRO) is a procedure is used to reduce a behavior. All other behaviors except the one targeted for reduction are reinforced at specified points in time. Usually only one behavior is being manipulated. DRO involves the presentation of a consequent stimulus contingent upon the nonoccurrence of a behavior. Repp, Deitz, and Speir (1974) studied the use of DRO on stereotypic behaviors of three subjects. Embraces and verbal praises were issued to those individuals who did not exhibit the target behavior during brief timed intervals 40 seconds. As the maladaptive behaviors decreased, the interval lengths were increased.

Differential Reinforcement of Incompatible Behaviors. (DRI) involves reinforcing a response that is incompatible in its composition with the target behavior. The display of an appropriate response is not possible in conjunction with display of the target behavior. It is useful to identify specific behaviors that will be reinforced on occasions where the target behavior does not occur (Kazdin, 1994). Further, incompatible behaviors are chosen for reinforcement since they are essentially in conflict with the behavior targeted for reduction. Donnelly and Olczak (1990) employed the use of DRI techniques to decrease

pica (ingestion of nonfood items) in institutionalized adults with mental retardation. Chewing gum was considered a behavior incompatible with consuming inedible objects contained in the room. Reinforcement was at first delivered during short periods of engaging in the incompatible behavior, and later delivered after longer intervals without pica.

Differential Reinforcement of Alternate Behaviors. (DRA) refers to reinforcing any alternative responses that reduce the probability of the occurrence of undesirable behaviors. Several types of behavior may represent alternatives to the maladaptive target behavior. For example, Deitz, Repp, and Deitz (1976) studied the effects of DRA on an individual with mental retardation who talked constantly in class. Reinforcement was issued when the student attended to academic tasks. It would be possible to talk and study at the same time. However, the development of functional behaviors was an important concern to the researchers, not just the reduction of excessive speech. Therefore, the cessation of the target behavior (talking) was accomplished by reinforcing an alternative behavior (studying).

Differential Reinforcement of High Frequency Behaviors. (DRH) is a procedure is used to increase behaviors. The goal is to have desirable behaviors performed faster or more often. Behaviors must be performed rapidly in order to receive reinforcement (Baldwin & Baldwin, 1981). Response rates are then shifted to higher levels when on a DRH schedule.

Differential Reinforcement of Low Frequency Behaviors. (DRL) is a procedure is used to reduce behaviors. The idea is to allow certain behaviors if

they occur at low rates. Target behaviors for DRL are usually those displayed too often or too rapidly.

Behaviors must be performed slowly for reinforcement to occur (Baldwin & Baldwin, 1981). Slower rates of desired behavior are reinforced during DRL schedules.

Assessment. In order for individuals with disabilities to fully access community resources, they ought to be able to perform a number of skills related to employment, leisure, and personal care across a range of settings and untrained conditions (Ferguson & McDonnell, 1991). However, individuals with mental retardation who engage in self-injurious (SIB) and self-stimulating (SSB) behavior often lack proper or minimal communication skills, which greatly limits their ability to express positive and negative opinions of community experiences.

Many factors from biological to environmental have been purported as reasons for the existence of aberrant behavior such as self-injury. Behavior theorists believe that SIB might be caused by social needs or a desire for attention as well as a desire to escape a given situation (Bosch, Van Dyke, Smith, & Poulton, 1997). Medical professionals agree that genetic syndromes often have associated pain and discomfort which may encourage persons with severe disabilities to alter their body/voice in some way to attain physical relief (Loschen & Osman, 1992).

Whatever the cause, effective assessment of aberrant behavior is imperative prior to the application of any intervention. Determining the function of a behavior in question through functional analysis often leads to a more

successful intervention than if behavioral functions remain unknown (Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993). Brief assessments may suffice when locating a stimulus control for maladaptive behavior since thorough analyses of target behaviors are often not possible due to time constraints (Broussard & Northrup, 1995).

Four products of functional assessments have been identified by Horner et al. (1993) as necessary outcomes. The first one is an operational definition of the target behavior. These definitions should be written so that anyone might be able to interpret and recognize the same behavior. Further, frequency or rates of occurrence, duration or length of display, and intensity or severity of target behaviors must all be reported. Sprague and Horner (1993) indicate a need to assess all behaviors occurring together since they may serve a common function (i.e., screaming and head-bobbing for food).

The second element of functional assessment is to acknowledge predictor variables. These antecedents are usually noted as the events occurring right before the problem behavior is exhibited. Recording what people, words, furniture, time, lighting, requests, and emotional states are present is important, too. Being hungry, angry, sad, or tired greatly influences behavior. Therefore, the impact of psychological and environmental influences, as well as immediate and distant events, must not be ignored when assessing predictor variables (Horner et al., 1993).

An important third element of functional assessment is to discover the many possible consequences of engaging in maladaptive behaviors. The

response or reaction elicited by certain acts has been shown to either increase or decrease the likelihood of the behavior reoccurring (Kazdin, 1995). For individuals with mental retardation, it is highly common for aberrant behavior to serve a communicative function, including requests or refusal of certain items or to receive attention from others (Cirrin & Rowland, 1985). In addition, aberrant behavior has also been known to serve an escape function where individuals avoid activities perceived to be aversive, such as working, cleaning, reading, writing, eating, sleeping, or bathing (Carr, Newsome, & Binkhoff, 1980).

The fourth and final element of functional assessment outlined by Horner et al. (1993) is verification of controlling hypotheses through direct observation. These behavioral consequences serve to document the contributing or predictor variables that maintain conduct disorders. Successful manipulation of target behaviors is accomplished through carefully planned interventions which will ultimately assure the researcher that any behavior changes are a function of the treatment variables (Masters & Mori, 1986).

Pace, Iwata, Cowdery, Andree, and McIntyre (1993) exposed subjects in their study to four different conditions when conducting a functional analysis of self-injurious escape behavior. The demand condition involved presenting an academic task every 30 seconds and delivering praise contingent on correct answers. An occasional time-out from the task was allowed if SIB was displayed. In the attention condition, the experimenter instructed the subject to play with toys while paperwork was completed. If the subject exhibited SIB, the experimenter issued a reprimand, with concern, to interrupt the SIB. The alone

condition was comprised of observations of the subject alone, in a room with a chair. Play was the last condition and served as a control for the other three situations. The experimenter allowed access to toys and praised the subject every 30 seconds if no SIB occurred during that interval; instances of SIB were ignored.

Behavioral analyses in a variety of setting/conditions offers a wealth of data regarding behavioral functions. Demand conditions yielded high occurrences of SIB while little or no SIB was observed in the other three situations. Extinction plus eventual demand-fading reduced SIB in large amounts for two of the three participants. SIB became highly variable but in a decreasing direction for the last participant when extinction alone was employed. As demands faded, SIB was reduced dramatically. All subjects became more compliant during instructional phases as their SIB was reduced. By sampling or assessing the conditions under which SIB occurred most often, treatment packages were developed more efficiently.

Wacker, Berg, Choisser, and Smith (1989) reported that behavior problems occurred in their study of peer training due to the trainer (participant with MR) teasing other participants (also with MR). Staff interventions were required for a few sessions until the teasing stopped. Apparently the trainer was also hurrying the trainees in their task completion rates by administering unecessary prompts. As the situation became more demanding, some previously compliant participants became disruptive until the teasing and over-prompting was terminated by staff. Thus, a quick antecedent analysis revealed the trainer's

temporary interference and functions of subsequent behavioral problems of others.

Maladaptive behaviors may have communicative functions, too, especially if speech is limited. Functional communication training was shown to reduce escape-maintained aberrant behavior and increase task completion (Lalli, Casey, & Kates, 1995). Two steps are involved in this procedure: 1) identification of the target behaviors's operant function, and 2) reinforcement of alternative responses with the same consequence. A positive aspect of teaching subjects to use verbal or gestural responses during instruction is that reinforcement may come at any time since it is contingent upon appropriate language rather than passage of time or absence of aberrant behavior. However, the reinforcer selected is sometimes unavailable at the moment. So, when an individual exhibited the trained verbal or signed response (instead of previous maladaptive behaviors) to avoid (escape) the instructional or demand situation, he/she did not always receive immediate reinforcement. Even though escape behavior was reduced from functional communication training, task-completion was frequently interrupted (Lalli et al., 1995).

Bird, Dores, Moniz, and Robinson (1989) successfully applied communication training to persons exhibiting self-injury without compromising activity participation. They slowly increased response requirements of their subjects in order for them to avoid demands even after they emitted the prescribed verbal response. This was accomplished through requiring completion of additional steps in a series of tasks before instruction was terminated. For

example, the subjects had to perform more steps in order to receive a token worth a one-minute break. This study demonstrated achieving low rates of aberrant behavior in their subjects while task performance increased. Thus, once the function of maladaptive behavior is identified through proper assessment, it becomes possible to replace the target behavior with appropriate responses as well as promoting gains in new skill acquistion.

Generalization and Maintenance

Generalization refers to the process of seeing behavioral gains from a treatment setting be expressed in a different setting, or *generalized* to a another situation (Barlow & Hersen, 1984). Many individuals with mental retardation have difficulty transferring skills to new situations (Beirne-Smith, Patton, & Ittenbach, 2001). Therefore, generalization is frequently built into most studies involving applied research. *Maintenance* applies to the tendency of a learned behavior to occur after programmed reinforcers have been removed (Kazdin, 1977). Generalization and maintenance of new behaviors is often used to evaluate treatment effectiveness (Alberto & Troutman, 1986).

There are three basic types of generalization in behavior change: across subjects, across trainers, and across settings. (Barlow & Hersen, 1984). Researchers must ask if the behavioral treatment indicated is successful with one client, will it work on the next? If an older female trainer has success in reducing aberrant behavior, will a younger male produce the same results? Finally, if prosocial behaviors appear at work following an intervention, will these

social skills be seen at home? All of these variables may facilitate or inhibit generality of newly acquired behaviors.

Stokes and Baer (1977) have outlined nine techniques for assessing and programming for generalization. Each technique is described next and examples are provided. The first one is called *train and hope*, indicating that generalization may occur by chance when the new behavior in itself is reinforcing - not just the programmed reinforcement. Teaching students with severe or profound MR to smile when greeted at school might be transferred to community settings because of the positive feedback from others, even without provision of the original primary reinforcers. If a training setting has enough similarities to a real setting, generalization may occur spontaneously (Haring et al., 1995).

The second technique is sequential *modification* meaning the application of similar strategies to a variety of settings where change is also desired. For example, teachers could employ a specific worksheet-completion contingency requirement before recess as could parents require homework-completion prior to TV time. It is difficult though, to accurately establish the same strict contingencies in different settings, especially if the trainers are not the same, either. Videotaped modeling of specific and sequential steps involved in a grocery shopping task facilitated the generalization of skills to different stores (Haring et al., 1995).

A third item in generalization procedures is the *introduction to natural maintaining contingencies.* Ideally, positive behavior changes will be reinforced outside the training environment by the existence of naturally occurring

reinforcers. Persons with severe disabilities may be taught self-feeding skills at home at breakfast. These skills may then generalize to other settings, or times of day at fast-food restaurants or public vending machines, since they allow the person some control over when he or she eats (Alberto & Troutman, 1986).

Training sufficient exemplars is the forth technique from Stokes and Baer (1977). Individuals are exposed to environmental conditions that possess a range of similar and dissimilar stimuli that could elicit a regular pattern of responses. Bus riding skills of a person with severe MR did not generalize over time from a simulated setting to a natural setting because the two environments had too many differences and not enough similarities (Coon, Vogelsberg, & Williams, 1981).

Training loosely is the fifth item in generalization techniques. Typically, exercising tight control over single-subject research is done for validity and reliability reasons. However, varying the conditions of the training could lead to increased opportunities for response generalization to occur (Alberto & Troutman, 1986). Unless one skill is a prerequisite for another, efficiency is not always added when mastery of the first task is required before teaching the next task. Therefore, flexibility in instruction may improve chances for transfer of skills.

A sixth technique is the use of *indiscriminable contingencies.* Manipulation of training materials and varying the schedule of reinforcers tends to have a more lasting effect on behavior change than does the use of pre-set interval scheduling and systematic instruction (Beirne-Smith et al., 1994). Peterson, Peterson, West, & Richard, (1999) found that delaying the delivery of

reinforcers led to generalization and maintenance of new behaviors across settings since it was difficult for the subjects to determine when contingencies were in effect.

Programming common stimuli in more than one setting is the seventh technique. A possible method of training for generalization or maintenance is the purposeful application/utilization of same stimuli in both training and natural settings.The same desk and blackboard might be brought to a job site as exists in the classroom; thus, contrived similarities in two the settings increases the likelihood of stimulus generalization. Jackson and Wallace (1974) used a token system during training sessions of an adolescent with MR to attain improvements in vocal volume. Generalization to the non-training setting (classroom) occurred using the same token economy as reinforcement.

The eighth and ninth components of Stokes and Baer's generalization procedures are somewhat related so they are combined here: *mediate generalization* and train *for generalization.* Research in self-monitoring and self-training is hugely common when persons with MR are the participants (Ferretti, MacArthur, & Okolo, 2001; Jackson & Altman, 1996; Warren & Bambura, 1989). To *mediate* generalization would be to observe and to monitor the maintenance of skills in different settings with different materials. To train for generalization would be to include several of the steps previously described in applied research.

Often the ultimate goal for the behavior analyst is to allow control of the contingencies to be handled by the subjects themselves (Alberto & Troutman, 1986). This objective is less plausible with individuals who have severe and

profound disabilities since their cognitive skills may preclude accurate self-assessment. A widely recognized barrier to the normalization for persons with MR is their heavy reliance on external cues and structured settings (Ferretti, et al., 1993). However, the use of videos, pictorial guides, recorded instructions, and familiar materials allows for some self-scheduling and self-direction to occur during leisure activities (Bambura & Ager, 1992). Multifaceted interventions are recommended to effectively manage and maintain reduced levels of maladaptive behavior in persons with MR (Jackson & Altman, 1996) and therefore encourage community participation in socially accepted ways (Schlaock, 1990).

The nature of instruction and the diversity of interventions greatly influences generalization and maintenance of behaviors (Horner, Dunlap, & Koegel, 1988). In order for the teaching of specific skills to be beneficial, it should be done within the natural environment or living arrangement. Further, naturalistic learning is empowering to the individual with disabilities and is associated with self-advocacy in procuring long-term needs and interests. One of the problems with transition stages in a person's life, be it from an institution to a group home or from school to work, has been the inability of persons with MR to become an actual part of the community and to be viewed as valuable, contributing members (Szymanski, 1994).

A person with MR must be able to recognize and perform familiar tasks over time such as obtaining lunch in a variety of fast-food places, repotting several different kinds of flowers and plants, or undergoing employment training (Bierne-Smith et al., 1994). Further, a successful high school graduate with

disabilities is defined by Sitlington, Frank, and Carson (1992) as having not only some level of work status but normalized residential and social components as well, including involvement in three or more leisure activities. Gardening and other forms of horticulture serve as excellent community-based settings mediums for teaching a variety of normalizing skills to persons with disabilities in hopes that they achieve a valued role in society (Wolfensberger, 1972).

CHAPTER 3

METHOD

This chapter describes the method and procedures used in this study, including (a) participants, (b) materials/settings, (c) data collection, (d) target behaviours, (e) experimental design, (f) reliability/validity, (g) experimental procedures, (h) interobserver agreement, and (j) data analysis.

Single-subject research design originates from the field of applied behavior analysis involving experiments where a particular behavior, setting, or condition of an individual is measured at periodic intervals (Gall, Borg, & Gall, 1996). Following the establishment of a baseline in the targeted behavior, experimental treatment is administered to determine if a causal connection can be made between treatment variables and results. Single-subject design allows progress to be documented while the effectiveness of therapeutic interventions are assessed (Campbell & Stewart, 1986). It is crucial to maintain consistency in both baseline and intervention data collection since the entire premise of *replication* rests on this issue. There are different types of replication although there is little agreement and much discussion on the definitions of each kind (Barlow & Hersen, 1984; Sidman, 1960; Tawney & Gast, 1984). For this study, *replication* refers to *systematic* repetition of similar experiments previously performed by others. It includes both *intrasubject* (various treatments or settings for each individual) and *intersubject* (same treatment applied to multiple participants) types of replication.

Participants

Four adults with severe/profound mental retardation (1992 definition of the American Association on Mental Retardation) participated in the study. Three males and one female between the ages 20 and 50 were chosen through information gleaned from staff interviews, direct observations, and a review of their individual habilitation plan (IHP). Examination of current psychological and adaptive skills was used to determine potential participant's ability to meet experimental requirements.

Participation was on a volunteer basis although additional selection criteria included a history of regular attendance at the day center (attending 18 out of 20 days or a rate of 90%) as well as no previous exposure to gardening or plant-related activities. Written and verbal explanations regarding research procedures were provided to potential candidates prior to selection. Results of the study have been kept confidential in terms of participant identification. No real names have been be used on any published material stemming from this project.

To be eligible, participating adults had to be receiving day services at a selected sheltered workshop (ICF-MR) for at least six consecutive months prior to the study to ensure that behavior patterns and medication effects were stabilized. This particular sheltered workshop was a private, nonprofit corporation located in a town with a population of approximately 150,000. It was chosen for its proximity to the research settings and the large number of persons served. The workshop provided services for individuals with developmental disabilities, specifically mental retardation. It accommodated approximately 90 adults each

month and delivers several services including *day habilitation* offering intensive instruction in daily living skills; *specialized employment* providing in-house contract work and off-site enclave arrangements; and *supported employment* available for job training and supervision at various worksites.

Participants' caseworkers and supervisors described them as being fully ambulatory yet exhibiting aberrant behaviors with a fairly high, bothersome frequency (i.e. throws objects once every five minutes in a 2-hour period) or lengthy duration (i.e. scratches arms for 10 consecutive minutes). Once selected, written permission to participate was granted by parents or guardians, and specific background information on each participant was collected including name, age, race/ethnicity, living situation, educational history, medical history, IQ and adaptive behavior scores, habilitation goals, community experiences, vocational training, and staff input regarding daily routines.

Materials/Settings

Materials used in the study consisted of typical horticultural supplies: potting soil, trowel/scoop, watering can, hose, 4-7 inch square and round plastic pots, long trays/flats, and 6-packs of seasonal annual plants and 4-inch tropical plants. These materials were located in both of the experimental settings. Each participant received instruction during treatment phases in two nature-based settings (a commercial greenhouse and an environmental education classroom) chosen for their rich stimuli and availability. One participant attended for half days so he received all treatment/instruction soley in the greenhouse. Additional

materials used in this research included a video camera, VCR, and a small audio tape recorder.

Permission to access both the greenhouse and classroom at the State Botanical Garden (SBG) located in Athens, GA was granted by the executive director of the facility. The first setting was a 15 feet by 30 feet propagation, quonset-style greenhouse located at the SBG. This structure has a central aisle 4 feet by 30 feet and wire benches on both sides measuring 3 feet high and 3 feet deep. The floor was covered with large gravel for drainage. Entry to the greenhouse required walking next to other greenhouses, flats of plants, container-grown trees, loose supplies, buckets, pots and other garden items. It was a stimulus-rich setting. The likelihood of encountering passing garden volunteers or regular employees was highly probable in this area.

The second setting for instruction was an indoor classroom with several natural accents, logs, branches, plants, pictures, windows, shelves, sinks, light systems, benches, tables and chairs. Classes offered to the public by the education staff at the SBG are frequently taught here as it mimics a science education school classroom. Regular volunteers received training in this room, and children attending summer camp also use the space. The room had a glass wall facing the outdoors and opened up to a large patio with several colorful planters. To the right was the conservatory and to the left a bridge leading to a gazebo overlooking the International Garden where a quaint stream was in view.

History and background	*Alvin's profile	*Marsha's profile	*Colin's profile	*Mitchell's profile
D. o B. (age)	4/15/51	1/20/56	10/2/68	7/21/74
Race/Gender	African Am. male	White female	African Am. male	White male
Primary diagnosis	Profound mental retardation	Schizophrenia (in remission) Epilepsy	Severe mental retardation	Severe mental retardation
Secondary diagnosis	Obesity, external otitus	Seizure disorder, GI & urinary problems	Numerous Autistic Tendencies	Sturge-Weber Hydrocephaly
Mental age	2 years, 6 mos	1 year	2 years	Uncalculatable
Additional disabilities	Diabetes, gout, hearing loss	Positive PPD, medical issues	High blood pressure	Seizure disorder, left facial palsy
Strengths	- toilets self - dresses self - cleans up - peaceful - follows directions	- friendly - peaceful - approachable - strong fine motor - gross motor OK	- cooperative - compliant - not aggressive - community OK -toilets/feeds self	- fine motor - expressive language -toilets self -feeds self
Needs	- community integration - communication skills (nonverbal) - increase attention span - sugar monitoring - increased mobility, exercise & fine motor	- community integration - communication skills (nonverbal) - decrease self-stim - constant monitoring - toileting guidance - picks up objects & puts in mouth	- increase social interactions -increase self-expression - increase mobility - increase attention span - Increase on-task behaviour - reduce self-stim	- increase daily living skills - increase community integration - social skills - increase mobility - increase independence - constant rountine for complaince
Meds	Takes 3 meds for diabetes & weight	Takes 7 meds for medical problems	2 meds for hypertension	Takes 7 meds for various problems
Residence	Lives in home w/female sibling	Non-stable, has 3 other roomates	Lives at home w/Mom/step dad	Resides in apt. with direct care worker
Misc. info.	No behavior plan on file, has higher adaptive skills	History of displaying maladaptive & abberant behavior	No behavior plan on file, public masterbation	General spasticity, impulse problems, falls easily

* Pseudonyms used to protect identity of participants.

Figure 3.1 Medical and educational history of study participants.

The third setting intended for treatment (located outside and adjacent to the classroom) was eventually determined unfeasible for use. During the time planned for data collection at this third site, many auditory and visual distractions

were present due to the installation of another large garden 50 yards away. The constant presence of dump trucks, earth movers, brick cutting machines, and other land excavation equipment yielded an atmosphere far too noisy for teaching, learning and data collection.

Only two of the four participants were eligible for the maintenance portion of the study, having achieved a correct task completion rate of 80% or more. Therefore, following the original treatment phases, a third setting was located at the work center to assess retention levels of newly acquired gardening skills. A conference room was the only space available to set up the exact same horticultural assembly line of steps to repot plants. Since art and recreational activities are occasionally organized and taught in this area, the setting was considered a viable site for generalization and maintenance studies. Access to continuing education or hobby classes at local craft stores is exceedingly limited for clients with severe/profound disabilities, especially those with aversive behaviors. Therefore, while these individuals might be offered similar activities, they are typically conducted *in-house* as public outings sometimes exacerbate outbursts.

Data Collection

This study required several days of data collection in each experimental setting. It was necessary to first identify and document the presence of a specific behavior out of an entire behavioral repertoire, targeted for reduction. Initial behavioral observations of each participant were performed prior to transporting them to locations where baseline and intervention data would eventually be

collected. This informal, evaluative stage allowed for estimations of certain behavioral patterns, habits and reinforcers for use during the actual study. Records of these observations and notes from conversations with direct-care staff about problem behaviours were maintained by the researcher throughout the study.

Derby et al. (1992) indicated that participating in early observations of participant behaviors enhances the level of recording accuracy later. Detailed discussions with direct-care staff and work center supervisors revealed behaviors that regularly interfered with day programming, work opportunities, and leisure activities for each participant. Brief interview-style conversations using a simple questionnaire were initiated with work center personnel. Verbal responses were then recorded in written form. Results helped indicate which behaviors to watch for during pretreatment assessment (which occurred later at the work center.) The following questions were asked verbally and directed at personnel most closely associated with potential study participants:

1. Who has good (regular) attendance?
2. How long has he/she been coming here?
3. Is the family involved or do they ever visit?
4. Does he/she get to go on field trips?
5. Does he/she cause you any problems?
6. How often does that behavior occur?
7. Is this a regular thing or out of the ordinary?
8. Do you think other employees feel this way?
9. What happens if he/she goes off campus?

10. Do you think he/she can learn new things?

11. Any idea how to stop the problems?

12. If you could change something, what would it be?

Replies to these general questions are listed below in table form. Answers were shortened into brief statements about each participant.

Table 3.1

Summary of Day Center Responses to Questions of Behavior and Demeanor

Mitchell	Alvin	Marsha	Colin
"He be violent and wild sometimes, but if he have that calculator with him, he be fine!"	"Everybody love him! He smiles a lot but that tongue is out a lot, too. It can look real funny."	"She's out of it! Her home life wasn't too good, so she takes lots of medication now."	"He is the best dressed here…but he can't even zip or button his own pants by himself."
"He need a real regular schedule…if something be different or changes, he have a bad day!"	"His clothes don't fit well, and he messes with that belt all the time…pants, too."	"She put EVERYTHING in her mouth! We have to watch her constantly or she will choke."	"Sometimes he just checks out of reality or whatever we're doing at the center."
"Sometimes it takes two of us to hold him and calm him down."	"He's real loving and gentle, but sorta lazy. He does some chores."	She doesn't understand much when asked to follow directions."	"You have to ask him many times to do something for you."
"He gets too close to folks and rambles a lot."	"He eats too much and is slow at doing things."	"It's sad she can't do much for herself at all."	"He moves his head and looks at his hands alot."

During the first pretreatment assessment, initial data collection usually reveals existing individual stimulus-control patterns (Horner et al., 1989). Approximately 40 observations (4 per day) were conducted for each participant (2 in the morning, 2 in the afternoon) lasting at least 10 minutes per session, for two consecutive weeks (Monday through Friday). The goal was to record preliminary details such as general occurrence or nonoccurrence and approximate frequency or duration of possible target behaviors as they occurred/existed naturally during workday hours. These observations did not

serve as baseline data since the behaviors occurred outside of designated treatment environments (see Appendix C for sample schedule).

A second pre-treatment assessment was performed to confirm that target behaviors were properly identified and to avoid contaminating treatment effects. By briefly exposing participants to each treatment setting before collecting baseline data (yet after initial behavioral observations at the work center), possible interactions from novelty or setting effects would have become apparent well in advance of administering the intervention. Without precise measurement features, research results could contain threatening fluctuations. The researcher must be assured that any reduction in aberrant behavior occurred only in the presence of treatment and not during pre-exposure or baseline sessions. Conclusions of this pre-treatment phase dictated which specific behaviours would be targeted for change. A quick visit to both experimental settings decreased chances of behavior change being attributed to the intervention if it was, in actuality, a change in setting or environmental conditions which caused behavior to improve or worsen (Alberto & Troutman, 1986).

Both preassessment observations combined with verbal input from work center staff furnished enough information to select target behaviors and begin collecting baseline data in the first setting (greenhouse). With the presence of a thorough description of target behaviors, functional analyses were not required. Actual baseline data was collected via videotape where only the researcher, participant, and colleague of the participant were present. Observations were

conducted separately but on the same day for all participants exactly as if treatment was administered except no instruction was offered.

Study participants were brought into the greenhouse individually and exposed to assorted stimuli (surroundings/supplies) for three-10 minute periods by rotating each person for a total of 30 minutes. This schedule allowed for any radical or unforseen behavior changes in participants to occur, suggesting the possibility of novelty or saturaturation effects. Simple conversation was encouraged between the participant and someone familiar (e.g., work center staff) so as to recreate a setting where typical levels of self-stimulation or self-injury occurred.

Once target behaviors were established, the recording procedure was repeated with all 4 participants until baseline data was collected for each person, noting any ascending or descending trends. Three to five stable data points were needed before concluding baseline data collection (Tawney & Gast, 1984). Results of all baseline data was recorded by hand immediately afterward using video taped sessions. Baseline results were both descriptive and predictive so that any subsequent changes in behavior can be compared to this naturally-occurring level (Kazdin, 1982).

Behavior occurring during the treatment phase was videotaped and then examined by trained observers who viewed a random selection of taped sessions from greenhouse and classroom settings. Individual written checklists were created specifically for each participants' target behaviors using an appropriate measuring technique for each behavior. That is, recording methods were dictated

by the type of behavior displayed be it continuous, discreet, intermittent, or periodic (Table 3.2 contains this information). Trained observers (one per participant) recorded individual behaviors by a variety of methods justified by Alberto and Troutman (1986).

Target behaviors related to temporal dimensions with characteristics such as latency (length of time *prior* to responses) or duration (length of time *bewteen* responses), were recorded on data sheets prepared to reflect these styles of presentation. A start/stop time column was preprinted on a page for the observer to indicate when each cue was issued and when the corresponding response followed or how long behaviors lasted.

For target behaviors with a numerical value and discrete (distinct beginning and ending) or continuous (ongoing) characteristics, an interval recording method was utilized. High frequency behaviors (occurring every 5-10 seconds) as well as low frequency behaviors (occurring once every 2 or 5 minutes) were best recorded using interval methods on a log sheet. Occurrence and nonoccurrence of target behaviors were reported by using either +/- (plus/minus symbols) or x/o (letters X and O) codes during each 10-minute period on a cycle of 1-minute intervals (indicating presence or absence at each minute). For continuous behaviors, start and stop times were recorded during 5 or 10-minute intervals with a stop watch.

Target Behaviors (Dependent Measures)

Results from numerous activities were the driving force behind selection of participants. Comments and concerns from direct care staff and supervisors at the day center offered a wealth of information towards narrowing the choices.

When they mentioned who engaged in antagonistic behaviors (hitting, bumping, scratching others) and attention-getting behaviors (screaming, dropping on floor, refusing requests), those persons were observed more astutely for potential inclusion in the study. When it was discovered that some clients are often not allowed to participate in field trips due to behavior problems, they received more focus than compliant clients. Using verbal statements from staff, personal observation both at the center, and examination during community outings, selection of the participants was concluded when consistent yet problematic behaviors were recorded. The other criteria for selection had been met prior to these intense observations (regular attendance, no gardening experience, and at the center for at least 6 months.)

For Alvin, the first chosen, both administrators and staff commented on his odd habits of “fiddling” and snorting. They indicated these behaviors made people stare at him in public. The second client was Marsha. Her inability to care for herself on a basic level precluded her being exposed to many activities. The employees remarked that Marsha needed constant watching because she rubs her fingers constantly and puts anything in her mouth. Colin was chosen third. He received evaluations claiming that he doesn’t speak, needs lots of prompting, and doesn’t always follow directions. Mitchell was chosen fourth. According to

Table 3.2

Summary of Target Behaviors, Function, and Recording Methods for Study Participants

Participant	Behavior#1	Behavior#2	Behavior#3
Alvin	**Belt fixation**: fiddling & constant contact with buckle and waist area	**Rubs head & face**: constant touch of face, jaw, strokes cheeks and head	**Tongue protrusion** & grunts: sticks out tongue past lip, deep throat noises
Purpose or Function of Behavior	**Self-stimulation**: sensory gratification or boredom	**Self stimulation**: sensory gratification or self-affirmation	**Self stimulation**: sensory gratification or physiology
Recording Methods	**Interval:** divide session into 5-5min. intervals & record time spent w/belt	**Duration:** record length of time tongue out during 5 5-minute intervals.	**Interval:** divide session into 10-15 2-min. intervals & record frequency
Participant	**Behavior#1**	**Behavior#2**	**Behavior#3**
Marsha	**Handmouthing**: gradually placing most of fingers & hand into mouth	**Pillrolling**: constant rubbing together of thumb and pointer fingers, both hands	**Nonresponsive**: completely ignores cues, flat affect, no expression at all
Purpose or Function of Behavior	**Self-stimulation:** sensory gratification or attention	**Self-stimulation**: sensory gratification or escape	**Escape** or sensory deficit issues related to meds
Recording Methods	**Event recording**: logging occurrences over time/session	**Duration:** length of behavior over time in min. or seconds	**Duration**: presence of behavior over time in min. or sec.
Participant	**Behavior#1**	**Behavior#2**	**Behavior#3**
Colin	**Facial tics**: head & neck sways, jerks, bobs head often	**Overfocus on item**: stares constantly at object or area for extended time	**Nonresponsive**: completely ignores cues, flat affect, no expression at all
Purpose or Function of Behavior	**Self-stimulation**, boredom, may be medical condition	**Self stimulation**, or escape, focuses on patterns or colors	**Escape** mostly, to avoid task or show boredom in activity
Recording Methods	**Duration**: length of behavior displayed over time	**Duration**: length of behavior displayed over time	**Event recording**: log occurrences over time in session
Participant	**Behavior#1**	**Behavior#2**	**Behavior#3**
Mitchell	**Holding calculator**: constantly using or touching buttons	**Touches teacher**: gets too close, near head of others with head & hands	**Babbles**: uses habit statements over & over, repeats same 5 sentences again
Purpose or Function of Behavior	**Escape**: self stimulation and avoidance of tasks	**Attention**: waits to be told “no” and has nothing to say	**Attention**: escapes commands & gets a reprimand for noise
Recording Methods	Duration: record behavior over time	Event Recording: occurrences over time	Event Recording: occurrences over time

staff, he had a history of violence and many health complications. His mood swings made socialization difficult. The researcher confirmed and validated many of these staff concerns regarding client behavior through direct observations over a two to three month period. By triangulating the information received, precise selection of three target behaviors per participant was possible.

Pilot visits to greenhouse (before treatment session began) revealed no change in target behaviors. Therefore, after learning that exposure to treatment settings did not change any behaviors, it was determined that target behaviors could be finalized and recording methods chosen. One final exposure to the greenhouse was conducted to collect baseline data. This was considered the first phase of the actual study to observe the natural speed, frequency, occurrence, display, etc. of target behaviors. It yields critical information as it is the value to which all subsequent data will be compared.

Experimental Design and Procedures

The design method used was called *alternating treatments* which investigates the influences of assorted treatments executed at the same time. In this case, assorted treatments meant administering an intervention in two different settings of greenhouse and classroom. These interventions are conducted simultaneously, yet the conditions and timing varied. Many features were purposefully change such as pot and plant size, plant type, pot and flower color and time of day. This variety of supplies helps broaden the potential for training in other settings and sequences. In alternating design, there is no return

to baseline. The pattern is A-B-C where A=baseline, B=treatment 1 and C=treatment 2. A rapid alternation of two or more treatments or conditions within a single subject occurs (Barlow & Hernsen, 1984). Alternating treatment designs are used when a researcher desires to know which of several interventions work best, both therapeutically and experimentally. Results of this design are graphed in a line format. Typically a simple visual inspection of the data points may reveal a specific causal agent for a designated behavior change.

Demonstration that one treatment is more effective than another occurs when no data points cross on a graphic display of results, suggesting the absence of carryover or cumulative effects (Alberto & Troutman, 1986).Those two occurrences can contaminate data if controls for validity and reliability are not addressed. In alternating designs, responses from treatment must occur rapidly and frequently in order to assign a preferred status to a particular intervention (Barlow & Hersen, 1984). Otherwise behavior change may be attributed to delayed or unrelated occurrences and haphazard conclusions may be drawn.

Data Collection

Prior to any data collection, permission to conduct this study was received from the Institutional Review Board (IRB) at the University of Georgia (see Appendix A-D for consent form examples) as well as from the local social service agency from which participants were selected. The experimental conditions for this study involved administering verbal horticultural instructions using an alternating treatments design with both intrasubject replication (within each participant) and intersubject replication (between multiple participants) in two

settings. Four adults with severe mental retardation served as participants to determine if decreases in aberrant behavior occurred and if these reductions could be attributed to the presence of a horticultural treatment.

After baseline data was collected for each participant, individual horticultural instruction from a specially designed script began in the greenhouse setting. These treatment sessions lasted at least twice as long as baseline phases which 20 minutes per session. Time studies were done *a priori* to determine an average length of time required for completion of the horticultural activity using employees of the local botanical garden. Each individual received the same instruction for the same task at least twice daily, once or twice in the morning and once or twice in the afternoon, depending on timely arrivals and transportation issues. Detailed task analyses were performed on instructional sequences. This protocol was transcribed so that all steps in the intervention sequence were clearly defined, replicable, and possessed obvious start and end times demonstrating completion and or noncompletion for behavioral raters (see Appendix J for a list of specific steps employed in the task analysis).

Depending on fine and gross motor ability, participants were asked to unstackthen partially fill with potting soil from a nearby bin, approximately 6 plastic pots ranging in size from 4 inches to 7 inches. Soil scooping and pot-filling steps were said to be mastered when pots were properly separated, lined up on the work bench and adequately filled as judged by the teacher. The lesson continued by instructing participants to remove starter plants from cell-packs and place one-per-pot into the soil-filled pots. Once this was done 6 times, directions

were given to fill each pot with additional soil to cover plant roots which were visible. Packing down of soil around the root ball and tapping sides of pots was also required for each pot. Next, participants had to place all pots into a watering tray and water each pot with a pre-filled watering can until it drained. The final step was for a tag/label indicating the date and plant name to be inserted point down into each pot in the tray. Completion of all steps of the task required between 25 and 40 minutes on the first day. Less time was required as the teaching week progressed. It was anticipated that all participants would master this sequence by the end of the week-long session (5 Monday through Friday week days) with approximately four lessons per day (two in the morning and two in the afternoon).

Reinforcement

Several specialized types of reinforcement were used to address abberant behavior displays. In order to continue attaining desired responses while promoting decreases in disruptive responses, differential reinforcement schedules were created for each individual. Differential reinforcement of other behavior (DRO), differential reinforcement of incompatible behavior (DRI) and differential reinforcement of alternate behavior (DRA) were all possibilities for reducing negative behaviors. Depending on what target behaviors (self-injury or self-stimulation) were identified, certain types of reinforcement were more effective than others.

For instance, in the case of DRI, if no body-rocking occurred when a demand was made for Colin, a verbal comment such as “I like the way you’re

being careful and standing still with that plant” is made during step completion. This reinforces a behavior that is incompatible (being still) with self-stimming (body-rocking). Reinforcers were delivered noncontingently at first, whereby any approximation of the desired response was reinforced through verbal or gestural praise, and then faded as a function of horticulture skill performance, focusing on the new skill more than on the behavior problem.

Behavioral outcomes were deemed successful if a reduction in aberrant displays occurred during the application of horticultural instruction that included variable reinforcers (e.g., verbal praise, positive feedback, break time with snack). Reinforcement was administered first in a continuous fashion, given freely upon initiation and partial completion of requests (steps in task). Continuous thinning of reinforcers (slowly increasing time between reinforcement) was then be used to lengthen on-task-behavior as well as reduce participant need for constant external validation. Finally, intermittent schedules of reinforcement were adopted which required the participant to perform more steps successfully before receiving any reinforcment.

Altering reinforcement schedules was arranged after assessing skill aquisition levels in participants. If an individual completed the entire sequence of repotting plants three times with only 3-5 errors, regardless of prompting needs, thinning of reinforcers began. It was possible for success (task completion with no errors) to occur in only one setting (greenhouse) but not in the other (classroom). A reduced reinforcement schedule was used only in settings when 100% of the horticulture steps were accurately completed.

An important goal was to lengthen time between reinforcers so as to create more independence while instruction was continuously administered. In addition, it was critical to consider the reinforcement history of each participant to avoid saturation or deficiencies. For example, it was possible to inadvertently reinforce a participant's attention-getting behavior with the application of too many compliments. Like wise, reducing reinforcement when mastery was achieved could complicate the goal of reinforcing a response to any cue for the participant with non-response problems.

Prompts

A hierarchy of prompts and cues was devised for each participant based on data recorded during initial observations regarding response attending, on-task behavior, as well as aberrant behavior occurrences. Reinforcer sampling (food, drink, breaks, escape) and time lapses between each prompt (5,10, or 15 second delays) were also established for each person by using preliminary information that examined and explained behavioral function. Participants with self-stimulation or self injurious issues were given cues on a more rapid basis than those whose goals included a reduction of constant distracting or acting out behaviors. A history of reinforcers previously used with each participant somewhat influenced the design of the reinforcement schedule. However, physical observations, personal interactions, and day center visits dictated what techniques and patterns were eventually employed. The nature of single-case research requires that the interventions as well as reinforcement s be adapted throughout the study, as needed, depending on daily outcomes.

Several levels of prompts were also employed during instruction beginning with the least intrusive types (verbal request or modeling) up to more intrusive prompting methods (partial physical guidance or full hand-over-hand) pausing for 10-15 seconds between each cue. For example, if the stimulus was the verbal cue “Put soil in the pot,” as soon as the participant reaches for the spade or scoop and began the motion, this behavior received positive acknowledgement in the form of specific feedback, e.g., nodding while saying “I’m glad you found the scoop beside you.” Upon successful completion of request, provided no aberrant behavior was displayed, additional praise e.g., “Nice work” with positive facial expressions (grins and smiles) was delievered so as to provide feedback regarding client success and instructor approval. Likewise, if the task was recorded as incomplete, comments such as, “The pot isn’t full yet so I’ll add the rest of the soil, then you can pack it down,” were issued and the participant was instructed to pick up where the teacher stopped.

Once each participant successfully demonstrated the ability to perform specific gardening tasks in a variety of locations using various materials, step-by-step horticulture instruction was no longer necessary. The generalization and maintenance portion of the study was scheduled once it was decided that certain participants, having mastered the task sequence, could advance to this phase. It was designed to determine if the newly acquired skills had transferred from a treatment setting to a non-treatment setting. By this time, the instructor employed a gradual withdrawal of reinforcers and fading of prompts in both instructional settings so that no true intervention (e.g., direct instruction) was applied in

generalization and maintenance settings. Not only is it critical that observed changes in behavior are replicated in the nontreatment setting (i.e., maladaptive behavior decreases), but proof of replacement behaviors (i.e., gardening skills) are also desired to declare this phase of the experiment effective. (2005, *Clinical Practice Guideline,* Report of the Guideline Recommendations for Autism/Pervasive Developmental Disorders.)

Data Analysis

Data analysis in single-subject designs is done in stages (see Appendices P and Q for sample recording sheets). Videotape recordings were used to document the contents of the written checklists initially indicated. Tapes were available daily to raters for viewing or listening. Raters were asked to watch at least 5 randomly assigned videotaped instructional sessions of each participant and complete the accompanying data recording sheet. Thus, at least 30% of the data was evaluated by outside raters and the minimum criteria of a 90% interrater agreement was established. This entailed comparing results of one rater's assessment with another rater's assessment on the same session many times over. This arrangement is typical for multiple baseline studies (Tawney & Gast, 1984.)

Social Validity

Wolf (1978) suggested that social validation be observed and recorded via study participants opinions of research outcomes. As three individuals in this study were completely non-verbal and one had only a few sentences to his vocabulary, follow up on day center staff opinions after treatment was deemed

more appropriate than surveying actual participants. Direct-care workers as well as administrators had positive comments regarding the apparent effects on the 4 individuals when asked about any noticeable differences. Broad claims such as, “he is a lot happier and calmer when he returns here” to very specific feedback including, “he seems better able to use his hands now” were among the opinions shared.

Geller (1991) purports that solving societal ills is insufficient if the applications employed are not widely accepted and implemented with target audiences. Social validity within applied research focuses on enhancing the reputation or perceived appearance of persons considered marginal or less valued in society. As gardening is appealing to a wide variety of people with different abilities and backgrounds, the social validity component could be said to be an inherent part of this study. Also, because horticultural skills are considered highly desirable by many groups (Southeast Master Gardener Conference, 2000), inclusive activities involving plants were encouraged at the day center due to the prestige created by this experience.

Observer Agreement

Interrater observers were recruited from several undergraduate students in the College of Education at UGA. They were required to have at least two or more years experience or classroom instruction in the field of special education, abnormal psychology, or related fields. Accuracy of behavioral observations was critical to the study so it was extremely important to choose volunteers with the following qualities: general familiarity of persons with severe disabilities, concern

for treatment of persons with disabilities, and an understanding of the value in replacing maladaptive behaviors with functional skills. Selected observers also professed a belief in client rights, a willingness to employ objective observational techniques, and were available during specified times. Fliers advertising volunteer opportunities were developed and distributed to several pertinent university departments (e.g., Special Education, Psychology, Therapeutic Recreation, Child and Family Development and Social Work) and also via e-mail to student list-servs.

Informal phone interviews with interested individuals who responded to said announcements were conducted to further describe goals of the study. Prospective observers were then asked to fill out a brief questionnaire (either on paper or on-line) about educational and employment history. Responses helped the researcher locate similarities between applicants regarding attitudes toward individuals from special populations. A confidentiality waiver was presented at that time to ensure agreement with rules of participation and commitment to the study.

Training of volunteer interraters was performed by the researcher and occurred after live treatment sessions had concluded. For 5 days, two hours per day, each volunteer was given data sheets and shown how to record specific incidents of particular acts displayed by persons with disabilities. Some of these target behaviours were modeled directly, demonstrating authentic target behaviors. No monetary incentives or rewards were offered to participant volunteers. However, many majors in the College of Education now require

community service or volunteer hours so it was suggested this experience might serve in that capacity.

Reliability

This study included the use of accountability measures by videotaping the trainer and participants during all baseline, treatment, and follow-up data collection phases. Volunteer observers who were trained intensively recorded target behaviors and task progress (in relation to completion) by accessing taped audio/visual records of what transpired. Thus, not only were observers able to record and confirm behavior change, they could investigate specific discrepancies, if any materialized, on individual data sheets created from visual inspection of the tapes.

Calculating interobserver agreement has been performed the same way by numerous researchers (e.g., Alberto & Troutman, 1986; Barlow & Hersen, 1984; Davis et al., 1992 ; Derby et al.,1992; Horner et al., 1989; Sisson et al., 1993; Vollmer et al., 1993) by taking the number of agreements divided by the number of agreements plus disagreements, multiplied by 100. This procedure was selected when using timed interval (yes/no) recording methods for presence or absence of behaviour. The calculation amount yields a percent agreement coefficient; values between .80 or 1.00 higher are considered acceptable (Alberto & Troutman, 1996). Reliability checks between raters were performed for each participant using data from treatment and, when applicable, generalization sessions.

Accuracy of observations for event-recording or total duration scores was ensured by using the gross method of agreement. According to Tawny and Gast (1984), this requires dividing the larger number into the smaller one. The criterion for interobserver agreement was set at a value of 90%. Retraining of volunteers on data collection procedures was an option if interrater scores did not meet the proposed level. Results of these calculations are in Chapter 4.

Validity

Behaviors were operationally defined and highly measurable. Observers for the entire study included the primary researcher and a number of well-trained volunteers. All received the same instruction (piloted on professional horticulturists) and participated in numerous practice sessions to ensure consistently accurate data collection and analyses methods. All four participants received the same verbal or physical cues and prompts to complete each step in the task sequence. Times, days, and sites for instructional sessions were the same each day for each participant except one week apart. Project supplies remained familiar during the study unless an adaptive tool was warranted.

Since the participants had never gardened before, the experience was free of contamination from history or saturation effects. Moreover, they had all been on field trips before, ridden a bus, visited new places, brought meals to assorted sites, and represented the general population at many day centers who serve individuals with severe disabilities - whether private or public. Thus, the possibility of novelty effects was removed since this format of leisure outings is typical at most DD/MR facilities. In addition, it is hoped that external validity

would eventually be established as gardening skills transfer readily to similar settings. Therefore, light modifications were made during treatment sessions to build in potential for a generalization and maintenance phase. Size, type, color, and quantity of plants and pots were varied repeatedly, usually after near skill mastery, without changing the general goal or set sequence of tasks required.

CHAPTER 4

RESULTS

This chapter presents the results of a study which examined the effects of horticultural instruction on persons with severe mental retardation in three main areas: aberrant behavior, leisure skills acquisition, and employment potential. Most of the results are displayed graphically in the following categories: treatment intervention schedules, treatment data for separate settings, treatment data for combined settings, including generalization and maintenance phases where applicable, gardening skills completion ratios, directional trend lines of graphs (accelerating/decelerating), and interrater reliability coefficients.

Schedule of Treatments across Settings

Participants received horticultural instruction separately for one week (5 consecutive days) in two training settings during morning and afternoon timeslots. Since there were 4 participants, the treatment phase required four consecutive weeks (i.e., one week per participant). Since coordination of transportation is often a major barrier for community based instruction, transporting one client per week, twice a day, was more plausible than accommodating 4 adults in multiple settings at the same time for 5 consecutive days.

While week-long instruction does not always lead to generalization to nontrained settings nor maintenance of skills over time, intensity of treatment (minimum of 4 interventions daily) was similar to traditional gardening workshops designed to teach critical skills in a short period of time (National Garden Clubs,

2003). Still, a variety of environments along with diversity in materials enhanced opportunities for transfer of horticulture knowledge. Further, use of multiple exemplars and repeated measures during instruction increased the chance for generalization and maintenance.

Treatment Scheduling

Table 4.1 represents Alvin's treatment schedule, whose ability to complete the task sequence improved rapidly i. e., the number of sessions increased throughout the week doubling by the last day of treatment. Alvin was also able to handle greater demands for the number of plants repotted. His task mastery levels allowed the addition of two generalization and maintenance phases 4 and 6 weeks later.

Marsha's schedule is shown in Table 4.2 and is similar to Alvin's except that she did not achieve the same proficiency. Steps were consolidated or removed as necessary since she was substantially slower at task completion although she attended for the same length of time and number of sessions as the others. For example, if locating, filling and using the watering can required too much prompting and guidance (more than 6 verbal cues in a minute and still incorrect), that step was replaced with a shorter version of simply picking up the already-filled watering can placed nearby.

The treatment for Colin is presented in Table 4.3. His week contained one absence. Although he missed a day of treatment, little or no skill loss was observed. Additional sessions were added on the last day to compensate for the

48-hour gap in instruction. Colin received a series of 6 separate treatments on Friday instead of 4. He repotted 36 plants on his last day.

Mitchell's days of treatment lasted through morning hours only. His medical conditions and behavioral history precluded him from participating during afternoon hours. Table 4.4 shows that he attended sessions for half days and was then transported back to the center at noon each day. His level of achievement improved throughout the week such that generalization and maintenance phases were warranted at 4 and then 6 weeks later.

Target Behaviors for Alvin

The graphics in Figure 4.1 depict Alvin's treatment data for reducing tongue protrusions and grunts. Sessions were held in both the greenhouse and classroom. His target behaviors were drastically reduced from baseline scores which are represented in the first segment before the dotted line in each graph. Subsequent graphs illustrate an entire week of treatment where values are averaged by collapsing the data from each treatment session from a single day. While it is important to view how target behaviors change during 5 consecutive days of treatment, it is equally critical to examine results from a single day of treatment by observing changes occurring in just 5 hours, especially with persons whose behaviors and moods are known to change rapidly (Ludins-Katz & Katz, 1990).

For Alvin, there was no need to conduct the split-middle test identifying the direction of the trend. These graphs show obvious trends decelerating on both the first and last day of treatment. In fact, Friday represents an even more stable

change than Monday for tongue protrusions although both days include a rapid drop of displaying the undesirable behaviors (constantly protruding tongue coupled with a deep throat grunt or gurgle during instruction.)

During baseline, tongue protrusions and throat noises were exhibited 317 times within the 25- minute session. Once treatment began, they were immediately reduced to less than half that amount at their highest point but more often they were exhibited less than 100 times per session. Each session lasted 25 minutes so that means a tongue protrusion or grunt sound typically occurred between 10-20 times per 5-minute interval during instruction.

In Figure 4.2, Alvin's second target behavior, belt fixation, is represented for Monday and Friday sessions. These also were drastically reduced upon implementation of treatment. During baseline, Alvin fiddled, touched, grabbed, or held his belt for a total of 9 minutes and 33 seconds out of the 25-minute session. However, during treatment sessions 1 though 4 on Monday, his belt fixation totals in seconds were only, 42, 42, 44, and 36 respectively – less than one minute for each session. On Friday, Alvin's last day, totals for belt fixation were never higher than 27 seconds for each of the 4 treatment sessions.

Next, Figure 4.3 represents Alvin's last target behavior of touching, rubbing or making contact with his head and or face. Each episode had to last at least 1 to 3 seconds to be counted. This behavior occurred 24 times during baseline but was reduced to 14 times for Monday's first session. By Friday's last session, this self-stimulation behavior occurred only 2 times in a 25-minute period. That total indicates a decline of 92% from baseline to conclusion.

Target Behaviors for Marsha

The first target behavior for Marsha's communication is represented in Figure 4.4. A baseline total of 79 attempts at communication with only 25 responses to those attempts meant a response rate of 32%. During the first treatment session on Monday, Marsha responded to 60 out of 112 communication attempts (54%). On her last day of treatment, Friday afternoon, she had a response rate of 58%, responding 53 times to 92 attempts. Although that rate seems low, it still represents an increase of almost twice the baseline response rate of 32%.

The second behavior targeted for reduction in Marsha was pillrolling. This form of self-stimulation is common among persons with severe mental retardation, especially those under heavy medication (Heistad, Zimmerman, & Doebler, 1982). The baseline shown in Figure 4.5 was not as stable as other behaviors. She engaged in pillrolling for a total of 5 minutes and 8 seconds during the initial observation lasting 25 minutes. Once treatment began, pillrolling lasted 3 minutes and 25 seconds, then only 1 minute and 40 seconds for two of the Monday morning sessions lasting a total of 65 minutes. Eventually pillrolling was substantially reduced by Friday's last session with the total time of 37 seconds spent pillrolling. However, the session prior to this resulted in 7 minutes and 41 seconds of pillrolling. So, although the occurrence of this target behavior decreased from baseline to the end of treatment, some spikes in presentation were noted during certain five-minute intervals.

Figure 4.6 represents results from Marsha's final target behavior of handmouthing. During baseline, she spent 9 minutes, 58 seconds performing this behavior. After treatment began, her handmouthing was reduced to 25 for the entire 50-minutes session. On the last day of treatment, handmouthing rates remained at zero for Marsha's last two sessions. These sessions were shorter than the morning ones (25 minutes versus 50 minutes) as Marsha tended to fatigue in the afternoons. Additionally, she was asked to repot fewer plants during the shorter sessions and completed half as many units (3 instead of 6). However, Marsha achieved rates of completion at 80% or above despite her the varied times of her sessions and quantity of tasks (see Figure 4.23).

Target Behaviors for Colin

Colin's graphs illustrate his responses to attempts at communications (see Figure 4.7). During baseline, he responded 12 times to 28 attempts at communication indicating a rate of 43%. Once treatment began on Monday, Colin's response rate jumped to 92% by responding 60 times to 65 attempts at communication. This positive trend was maintained throughout the week, but by Friday he had established an 85% response rate responding 41 times to 48 attempts, an increase of almost double the baseline.

Figure 4.8 shows Colin's staring and *checking out* behavior. He engaged in this behavior for 2 minutes during the 25 minute baseline session. He then decreased exhibiting the behavior in the first 3 Monday sessions by over 75%, meaning he *checked out* for only 27 seconds of 65 minutes of morning treatments. By Friday, the behavior occurred slightly more often during the last 3

sessions. Colin *checked out* for a total of nearly 3 minutes during 55 minutes of afternoon treatments.

Colin also exhibited behaviors including facial tics, head bobs and neck sways reminiscent of those with Tourettes Syndrome or mild autism/cerebral palsy. The baseline total for these behaviors was 3 minutes and 45 seconds (see Figure 4.9) On the first day of treatment, session 1 resulted in a decrease of target behaviors to 1 minute, 7 seconds. This decelerating trend continued to only 50 seconds during the second Monday session, and down to 5 seconds for the third session. During the last session Monday revealed that Colin exhibited these sporadic movements for 17 seconds total during the 20-minute session, a decrease of over 95% from baseline. Friday's results represent the continued decline of this behavior throughout the last 3 sessions. The total time spent exhibiting this target behavior was 26 seconds during 60 minutes, a drop of almost 90% from the baseline score.

Target Behaviors for Mitchell

Figure 4.10 illustrates data for Mitchell's target behavior of getting too close to or touching the teacher. All his treatments were conducted in the greenhouse during morning hours. The baseline total for touching the teacher was 9 times in a 25-minute session. When treatment started on Monday, his behavior actually increased to 17 times per 30 minute session, or a total of 34 times in an hour. On Friday, however, the incidence of this close contact dropped to only 7 times, then 4 times, respectively for the last 2 sessions totaling 60 minutes.

Mitchell also produced repetitive sounds and habit statements similar to babbling the same words over and over again. Figure 4.11 shows baseline data for the target behavior of making noise 56 times in a 35-minute period. When treatment began, he reduced these sounds by 75% making habit statements only 14 times in the first session. Although Friday's last two sessions show an increase in habit statements compared to Monday's sessions, habit statements for Friday had still decreased by half of baseline (23 and 34 times, respectively).

Mitchell's last target behavior was calculator use. Attachment to this object occupied nearly 20 minutes during the baseline session of 25 minutes (see Figure 4.12). After treatment began, the constant touching/holding of the calculator dropped to just over 6 minutes for Monday's first session. By the last treatment session Friday afternoon, Mitchell's calculator use decreased to slightly over 5 minutes during the 25-minute instructional session.

Treatment for Greenhouse Setting

Figures 4.13 through 4.16 represent data for all 4 participants with morning treatment occurring only in the greenhouse. Each figure illustrates results from the 3 target behaviors assigned to each participant. The daily scores used to create the graphs have been averaged such that each day is represented by only one data point although 2-4 sessions might have occurred on that day. This layout shows how each participant progressed throughout the week of their treatment in terms of change over time with target behaviors. One can see if an increase or decrease was stable from Monday to Friday.

Alvin's target behaviors remained well below baseline levels. In fact, belt fixation, head contact, and tongue protrusions were substantially reduced soon after treatment began on Monday and stayed reduced throughout the week until Friday. The trends are all decelerating ones, even during generalization and maintenance phases held 4 and 6 weeks later (see Figure 4.13).

Figure 4.14 shows changes in Colin's 3 target behaviors while receiving treatment in the greenhouse. Scores indicate an average of each day's results. His responses to communication attempts increased throughout the week from a baseline response rate of 39% to 76% by Friday. His *checking out* behavior decreased sharply from almost 2 whole minutes of staring off into space during baseline and to just 3 seconds on Monday. However, this started to rise again slowly by Friday's conclusion with an average score of over a minute and a half of *checking out*. Facial tics and neck sways dropped from a baseline of 3 minutes, 45 seconds to a total of 13 seconds by Friday's treatment.

Figure 4.15 illustrates Marsha's target behaviors. She reduced her handmouthing from 10 minutes during baseline to a rate of zero by Friday. Likewise the pillrolling behavior decreased but only slightly from 5 minutes at baseline to 4 minutes in the last greenhouse session (greater reduction of this behavior occurred in the middle of the week). Marsha's communication responses increased to 43% by Friday from 31% during baseline. Her effort expended to respond to communication may explain the slow increase in pillrolling which has self-stimulation associations.

Figure 4.16 represents Mitchell's greenhouse data for all three target behaviors. His scores for touching the teacher or getting too close were ultimately reduced but fluctuated throughout the week. Baseline yielded 9 incidents in 25 minutes and Friday's average was reduced to 5 times, although during the generalization and maintenance phase the touching behavior rose back up to 8 times per session. The habit statements were reduced by half from 54 times during baseline to 28 times by Friday, and just 14 times during generalization and maintenance phase a month later. Calculator use was also reduced from a baseline of nearly 20 minutes to just over 8 minutes by Friday morning treatments, and reduced further in the generalization and maintenance session to 49 seconds. Graphs in Figure 4.16 constitute all of Mitchell's data since he attended treatment for half days and his instruction was administered in the greenhouse during morning hours only.

Treatment for Classroom Setting

Figures 4.17 through 4.19 illustrate behavior change that occurred for each participant in the classroom setting alone. Mitchell is not represented here as he only received treatment in greenhouse. Alvin's classroom data is represented in Figure 4.17. He maintained a reduction in all 3 target behaviors throughout classroom sessions as well as during generalization and maintenance phases. Each behavior was decreased at the end of treatment by at least 87% from baseline totals compared to the start of treatment.

Colin's classroom data is represented in Figure 4.19. He continued to increase his response to communication attempts from 39% to 80%. Facial tics

were reduced from 3 minutes, 45 seconds at baseline to just 7 seconds by Friday's end. However, Colin checked out with irregularity and any decreases were followed by sharp increases throughout the week of treatment.

Figure 4.19 shows Marsha's classroom results, which are similar to her greenhouse totals. Handmouthing incidents remained low from 10 minutes at baseline to 13 seconds on Friday afternoon. Duration of pillrolling also stayed lowered by nearly half (5 minutes to 3 minutes) while communication responses to attempts improved from 31% at baseline to 49% by the study's conclusion.

Figures 4.20 through 4.22 illustrate combined setting results using averages calculated from morning greenhouse sessions and afternoon classroom sessions. These data are critical for interpretation of treatment effectiveness. Although daily and even hourly progress is important, observing behavior change over time, within and between settings, is imperative here.

Treatment for Combined Settings

Figure 4.20 illustrates Alvin's results for combined settings. His averages across the week of treatment demonstrate stable and substantial reductions in all 3 target behaviors. Additionally, since he reached a level of mastery in completion rates of horticultural tasks, Alvin was included in the generalization and maintenance phases.

Colin's combined setting results are shown in Figure 4.21. All 3 of his target behaviors recorded a reduction, some greater than others. Colin's facial tics and head sways dropped by nearly 95% from almost 4 minutes at baseline to 10 seconds by the last treatment. Likewise the staring and *checking out*

behaviors decreased from close to 2 minutes at baseline to less than a minute and a half. This behavior was exhibited sporadically, especially on the last day of treatment in which extra instructional sessions were required due to an absence on the previous day. However, communication responses to attempts nearly doubled when it jumped from less than 40% at baseline to almost 80% on Friday.

Figure 4.22 represents Marsha's data from combined settings. Handmouthing behavior decreased the most from a duration of 10 minutes at baseline down to barely 10 seconds at the study's conclusion. Pillrolling was reduced by almost half when the baseline score of over 6 minutes was reduced to slightly over 3 minutes by Friday afternoon. When communication responses were averaged throughout the week, they revealed a 31% increase from baseline scores line to 46% by the last day of treatment. However, the 46% was actually a drop from single session scores on other weekdays.

Task completion rates for all 4 participants are represented in Figure 4.23. This chart refers to the level at which all the tasks in the repotting sequence were performed correctly and completed with an average number of prompts. The individual sections on the chart include the days used to derive the data which were selected randomly and double checked by another rater. Mitchell's totals for the week included completion rates over 95% and a generalization and maintenance phase rate of 98%. Marsha's completion rates hovered between 82% and 97% but remained erratic and actually began to drop toward the end of the study. Colin's rates tended to show improvement with an 88% completion rate on the first day to 90% on the last day. However, he had some scores that

did not increase each day but remained high. Alvin's scores were the strongest of all 4 participants. His completion rates yielded values between 96% and 100% with a generalization and maintenance phase a month later of 98% completion rate. The number of tasks requiring completion for all participants ranged from 40 to 60 steps, depending on an individual's ability to perform each demand with an appropriate number of verbal or physical cues.

Interobserver Rates

Table 4.5 shows interobserver agreement rates for Alvin's target behaviors. Comparisons of two rater's scores are listed in the formula used. Belt fixation had an agreement rate of 92% meaning there was little disagreement between raters while viewing the same videotaped session. The agreement rate for head/face touching behavior was lower at 75%. Although this behavior was measurable, it may have been viewed and evaluated differently by the raters on that specific day. Tongue protrusions were easier to record and calculate so it is not surprising that the agreement rate was 98% for this behavior.

Table 4.6 illustrates interobserver rates for Colin's 3 target behaviors. His head bobs and neck swaying resulted in an agreement rate of 94%. While recording incidents of Colin staring into space or *checking out* during the session used to evaluate agreement, an 87% rate resulted between raters. This behavior may not have been as easy to observe as Colin's other target behavior of responding to communication which yielded a 97% agreement rate. Still, any score above 80% is considered a strong agreement between raters.

Table 4.7 represents Marsha's target behaviors and the interobserver agreement scores. Results show a strong agreement between raters for all behaviors. The handmouthing rate was 92% while pillrolling scored a 91% agreement rate. The most difficult behavior to observe accurately due to the participant's totally flat affect was the communication responses to attempts. However, this category ranked high also with an agreement rate of 92%.

Mitchell's data for agreement rates is indicated in Table 4.8. His behaviors were complex yet resulted in very high agreement rates. His use of the calculator scored a 94% agreement rate as did the number of time he touched or moved too close to the teacher. Mitchell's habit statements and repetitive sounds received a 90% agreement rate which is still high for this broad class of behaviors. Adequate descriptions of target behaviors have led to these high interobserver agreement rates. The next chapter will focus on interpretation of the data generated from the study while addressing limitations and implications through supporting literature relevant to the field of horticulture therapy.

Table 4.1

Summary of Treatment Schedule for Alvin

Day of Week	Time of Day	Location	Sessions	Plants/Session	Daily Total
Monday	Morning Afternoon	Greenhouse Classroom	2 2	6 6	24 plants 4 sessions
Tuesday	Morning Afternoon	Greenhouse Classroom	3 2	9 6	30 plants 5 sessions
Wednesday	Morning Afternoon	Greenhouse Classroom	3 3	9 9	36 plants 6 sessions
Thursday	Morning Afternoon	Greenhouse Classroom	3 1	9 8	26 plants 4 sessions
Friday	Morning Afternoon	Greenhouse Classroom	2 2	8 8	32 plants 4 sessions
Generalization & maintenance	Morning Only 4 weeks later	Hope Haven Activity Room	3	5	15 plants 3 sessions
Generalization & maintenance	Morning Only 6 weeks later	Hope Haven Activity Room	2	6	12 plants 2 sessions

Table 4.2

Summary of Treatment Schedule for Marsha

Day of Week	Time of Day	Location	Sessions	Plants/Session	Daily Total
Monday	Morning Afternoon	Greenhouse Classroom	2 1	6 6	18 plants 3 sessions
Tuesday	Morning Afternoon	Greenhouse Classroom	2 1	6 6	18 plants 3 sessions
Wednesday	Morning Afternoon	Greenhouse Classroom	2 1	8 3	19 plants 3 sessions
Thursday	Morning Afternoon	Greenhouse Classroom	1 2	6 6	18 plants 3 sessions
Friday	Morning Afternoon	Greenhouse Classroom	2 1	4 3	11 plants 3 sessions

Table 4.3

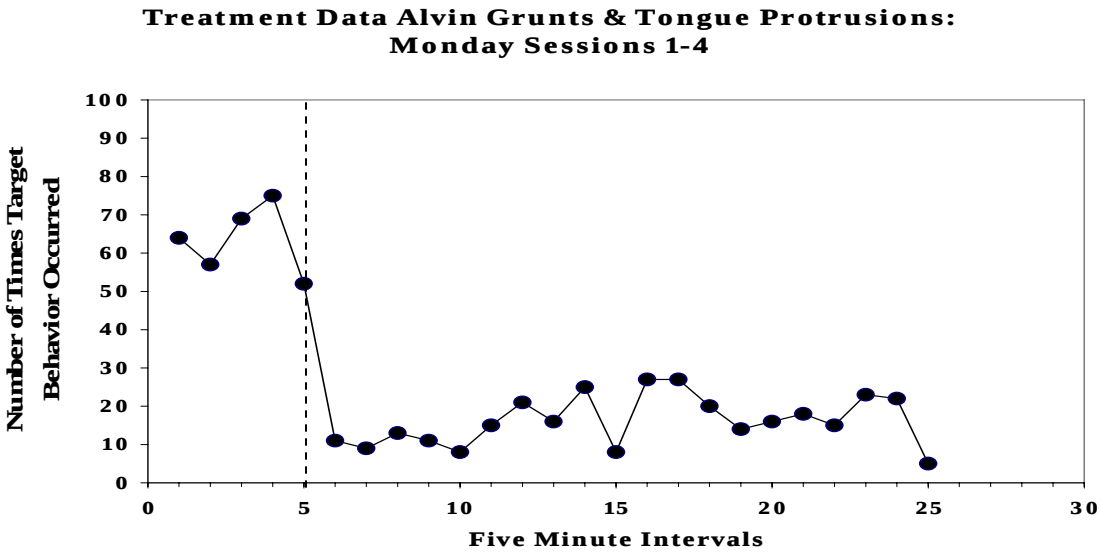
Summary of Treatment Schedule for Colin

Day of Week	Time of Day	Location	Sessions	Plants/Session	Daily Total
Monday	Morning Afternoon	Greenhouse Classroom	2 2	6 6	24 plants 4 sessions
Tuesday	Morning Afternoon	Greenhouse Classroom	2 2	6 6	24 plants 4 sessions
Wednesday	Morning Afternoon	Greenhouse Classroom	2 2	6 6	24 plants 4 sessions
Thursday	Morning Afternoon	Absent Absent	--- ---	--- ---	--- ---
Friday	Morning Afternoon	Greenhouse Classroom	4 2	6 6	36 plants 6 sessions

Table 4.4

Summary of Treatment Schedule for Mitchell

Day of Week	Time of Day	Location	Sessions	Plants/Session	Daily Total
Monday	Morning Afternoon	Greenhouse Absent	2 ---	6 ---	12 plants 2 sessions
Tuesday	Morning Afternoon	Greenhouse Absent	3 ---	6 ---	18 plants 3 sessions
Wednesday	Morning Afternoon	Greenhouse Absent	2 ---	6 ---	12 plants 2 sessions
Thursday	Morning Afternoon	Greenhouse Absent	2 ---	6 ---	12 plants 2 sessions
Friday	Morning Afternoon	Greenhouse Absent	2 ---	8 ---	16 plants 2 sessions
Generalization & maintenance	Morning only 4 weeks later	Hope Haven Activity Room	2	12	24 plants 2 sessions
Generalization & maintenance	Morning only 6 weeks later	Hope Haven Activity Room	2	12	24 plants 2 sessions



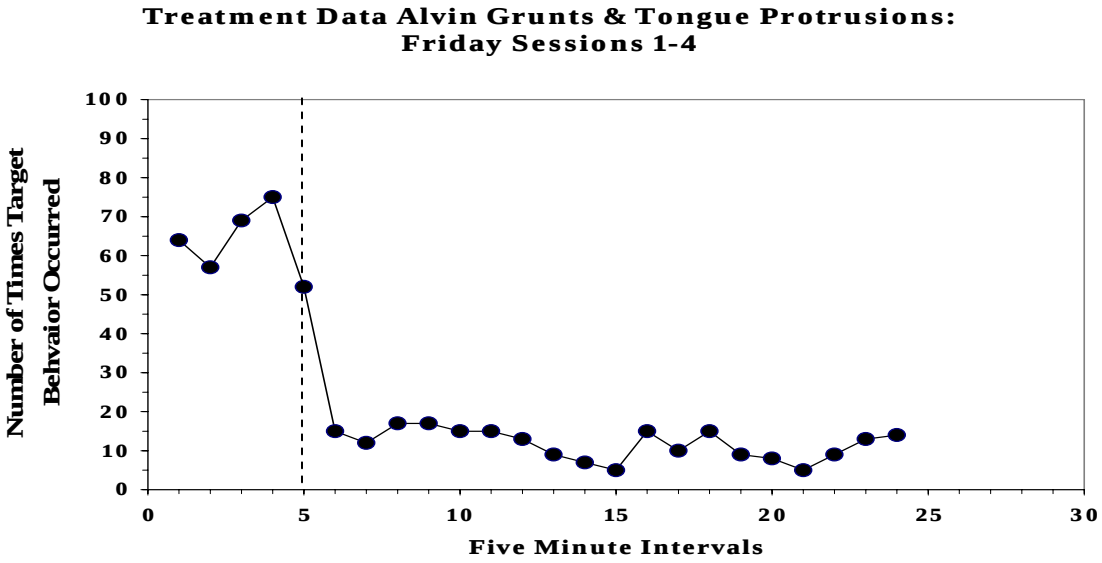


Figure 4.1. Treatment data for Alvin on Monday and Friday (grunts and tongue).

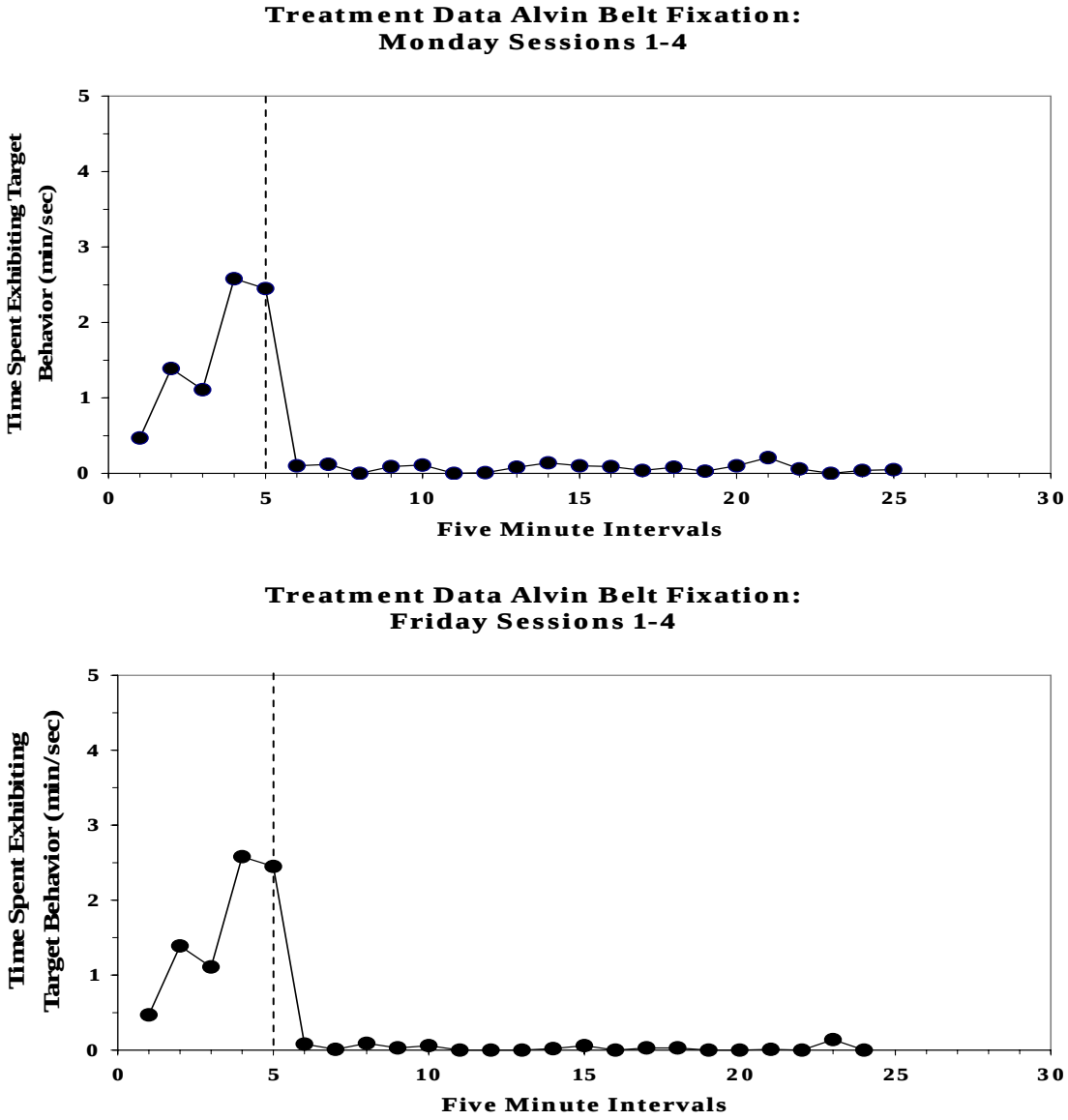


Figure 4.2. Treatment data for Alvin on Monday and Friday (belt fixation).

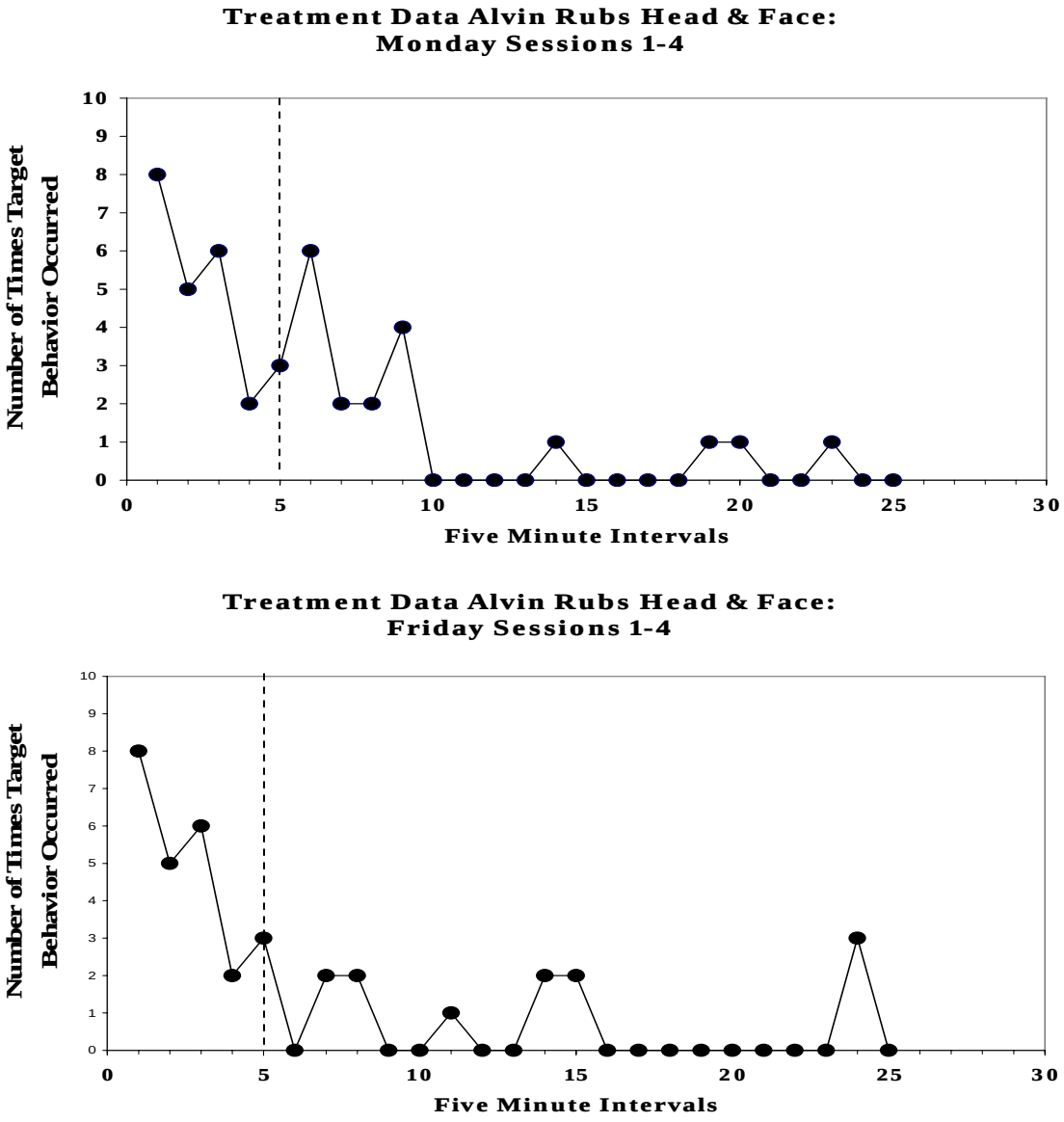


Figure 4.3. Treatment data for Alvin on Monday and Friday (head and face).

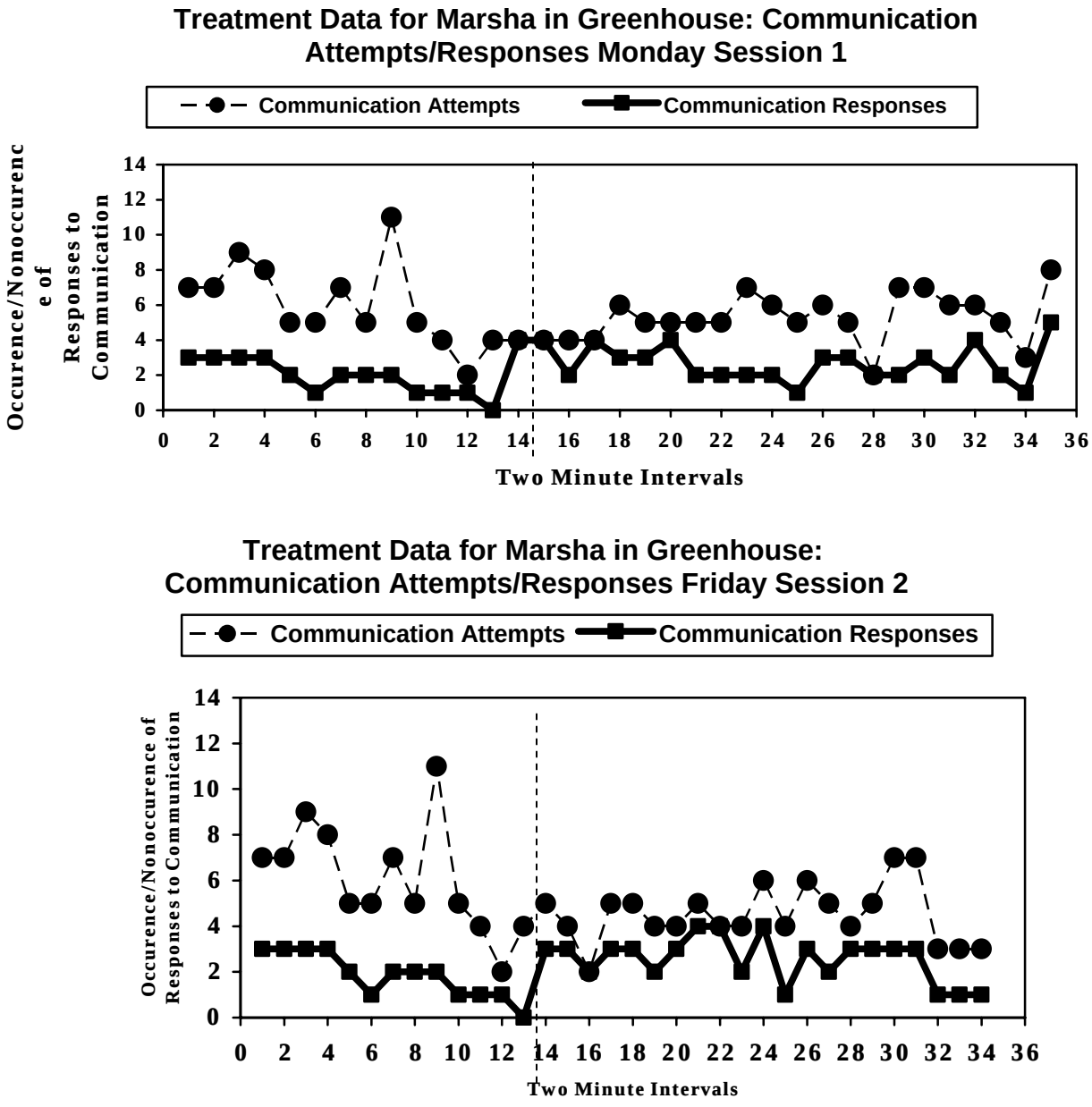
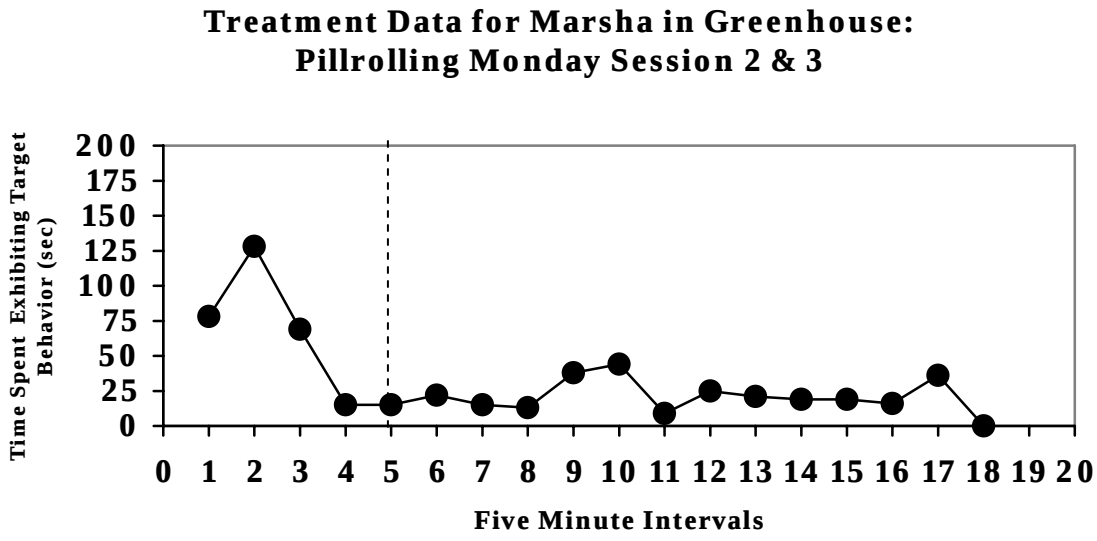


Figure 4.4. Treatment data for Marsha on Monday and Friday (communication).



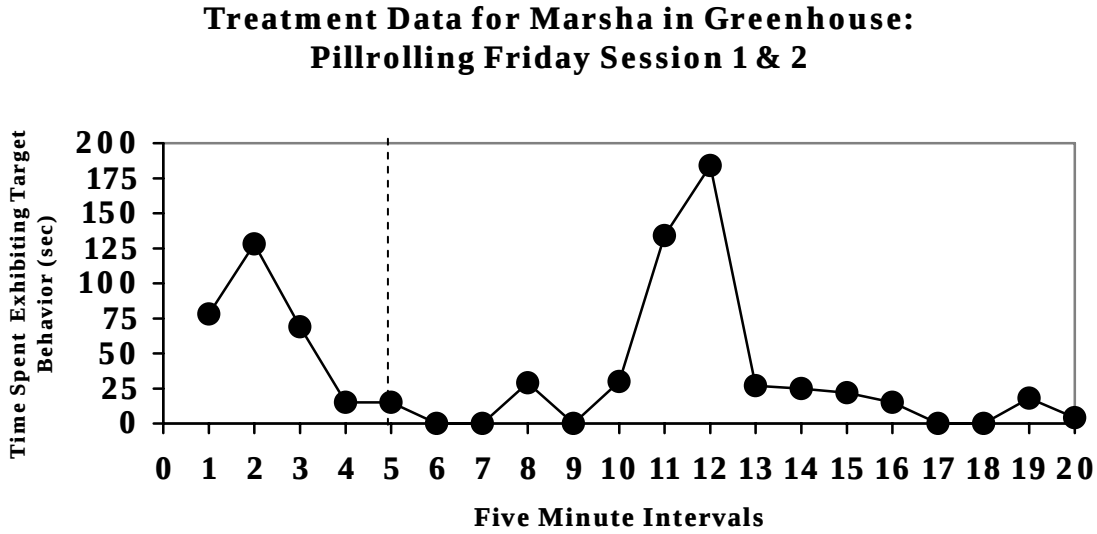
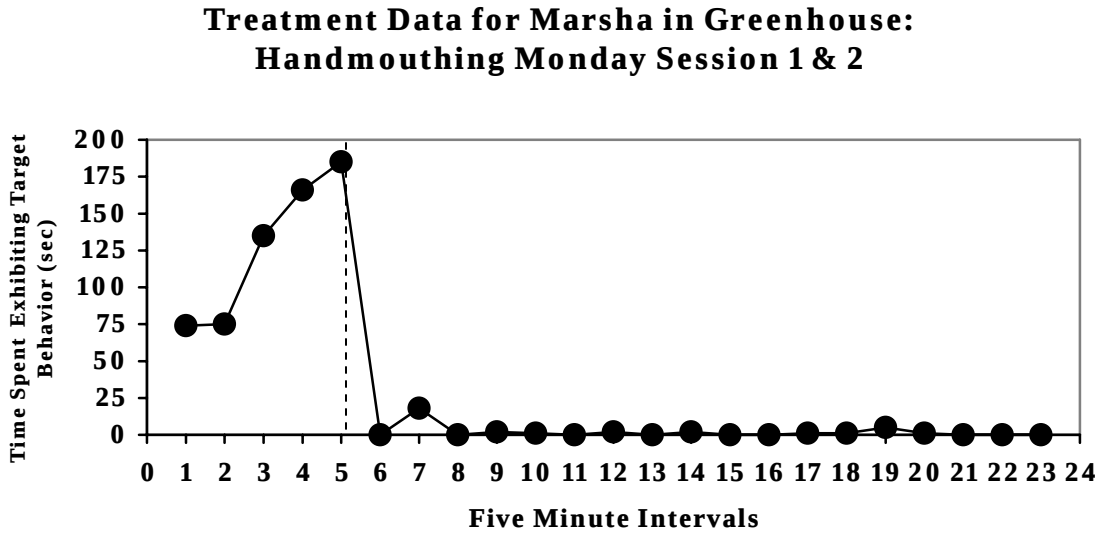


Figure 4.5. Treatment data for Marsha on Monday and Friday (pillrolling).



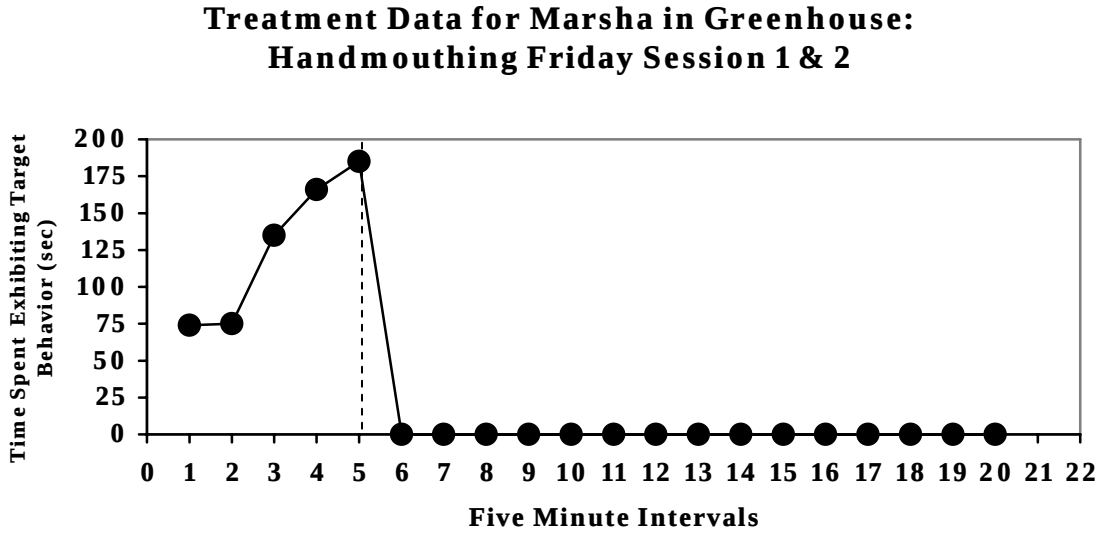
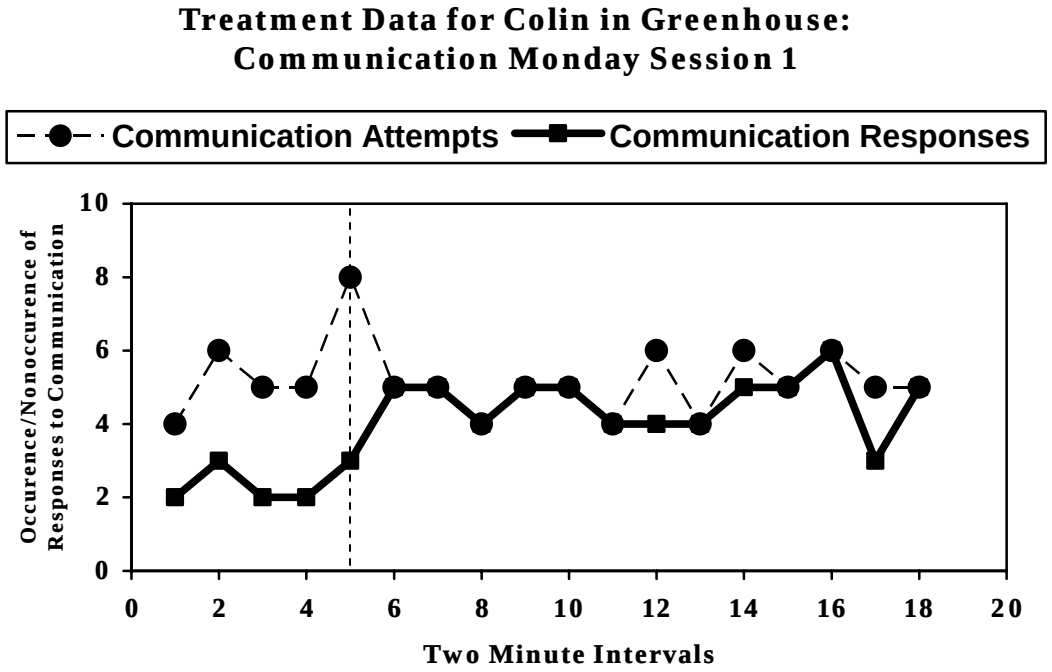


Figure 4.6. Treatment data for Marsha on Monday and Friday (handmouthing)



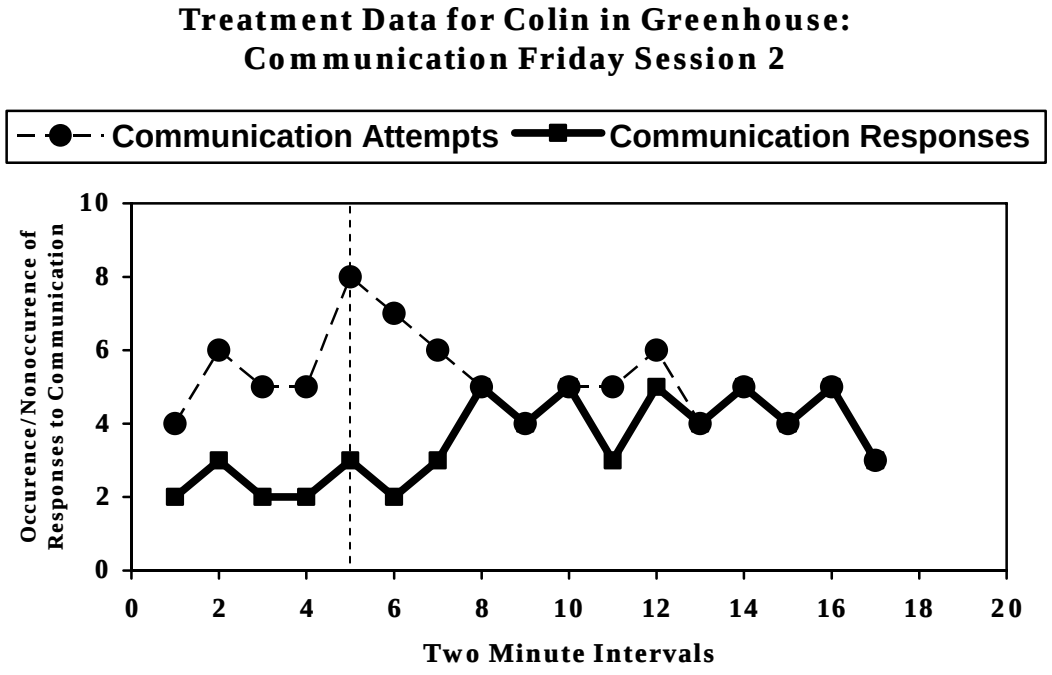


Figure 4.7. Treatment data for Colin on Monday and Friday (communication).

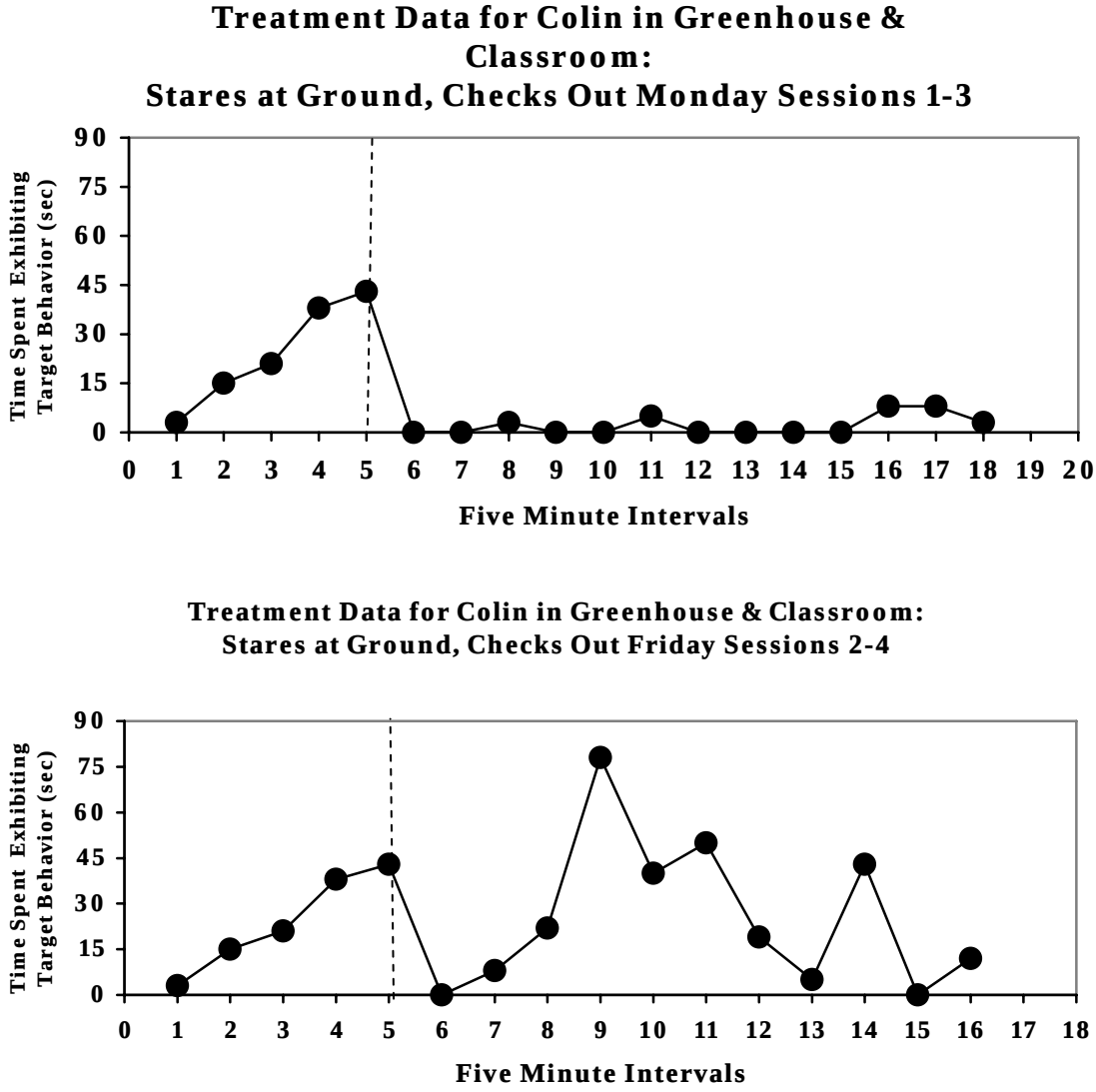
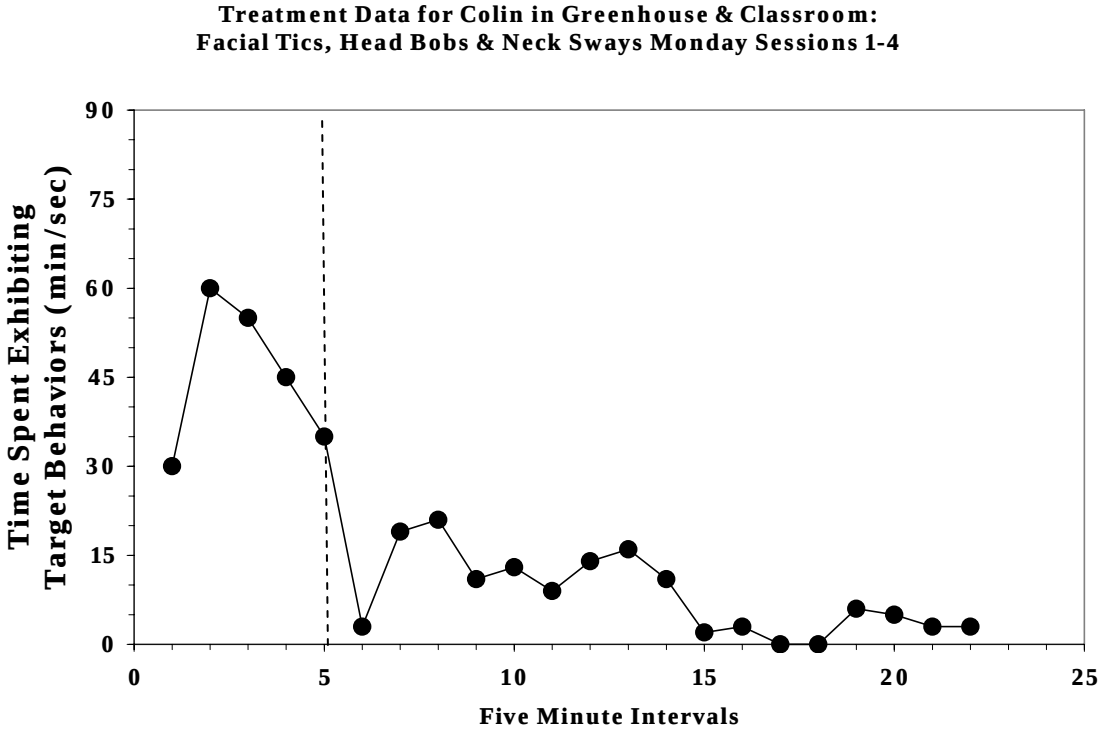


Figure 4.8. Treatment data for Colin on Monday and Friday (stares/checks out).



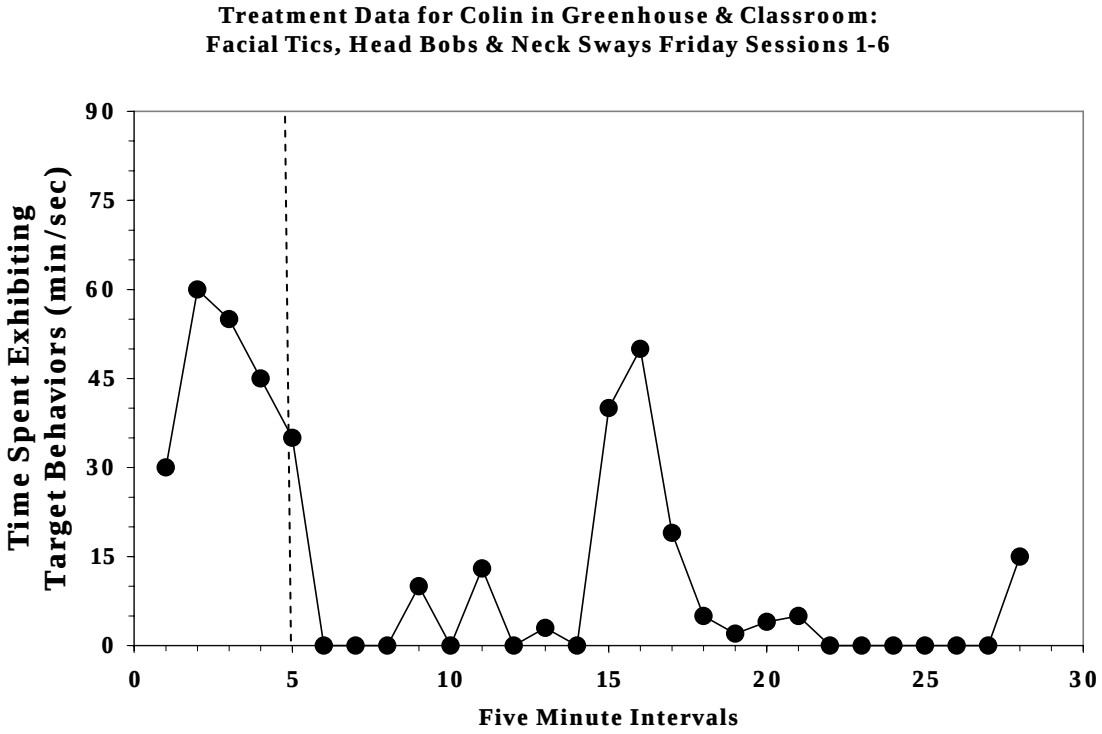
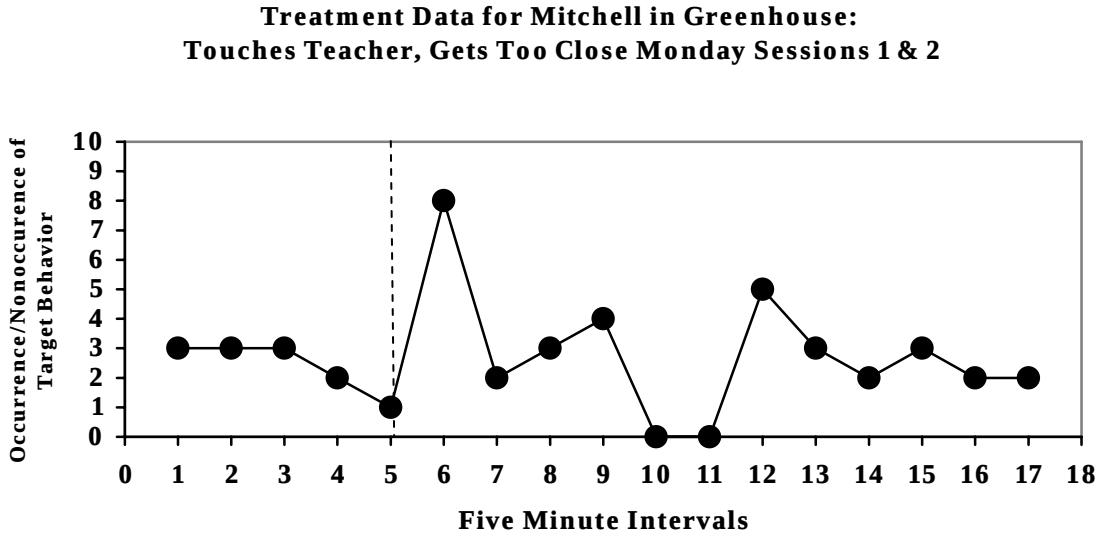


Figure 4.9. Treatment data for Colin on Monday and Friday (facial tics, head bobs & neck sways).



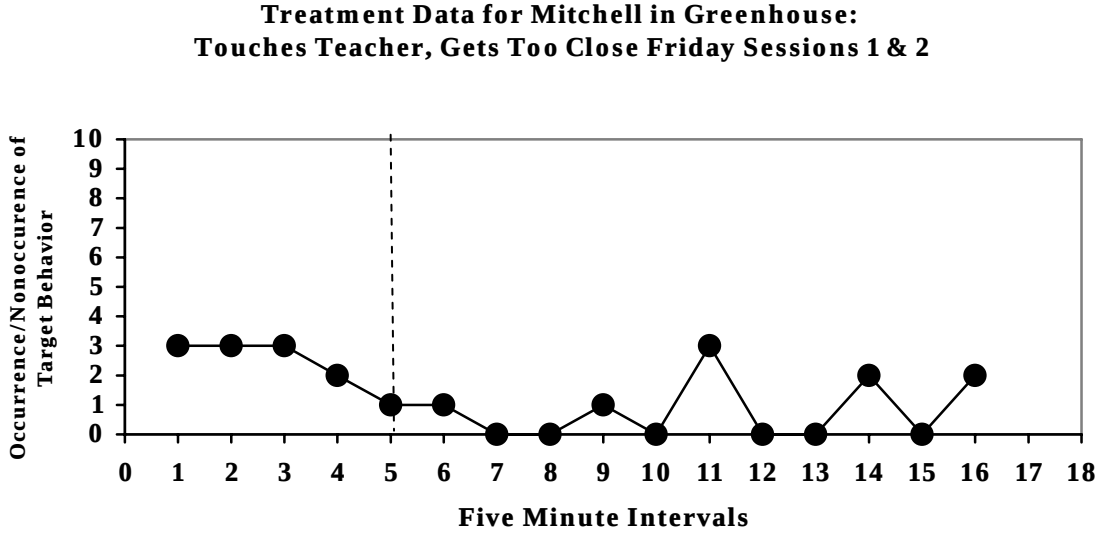


Figure 4.10. Treatment data for Mitchell on Monday through Friday (touches teacher, gets too close).

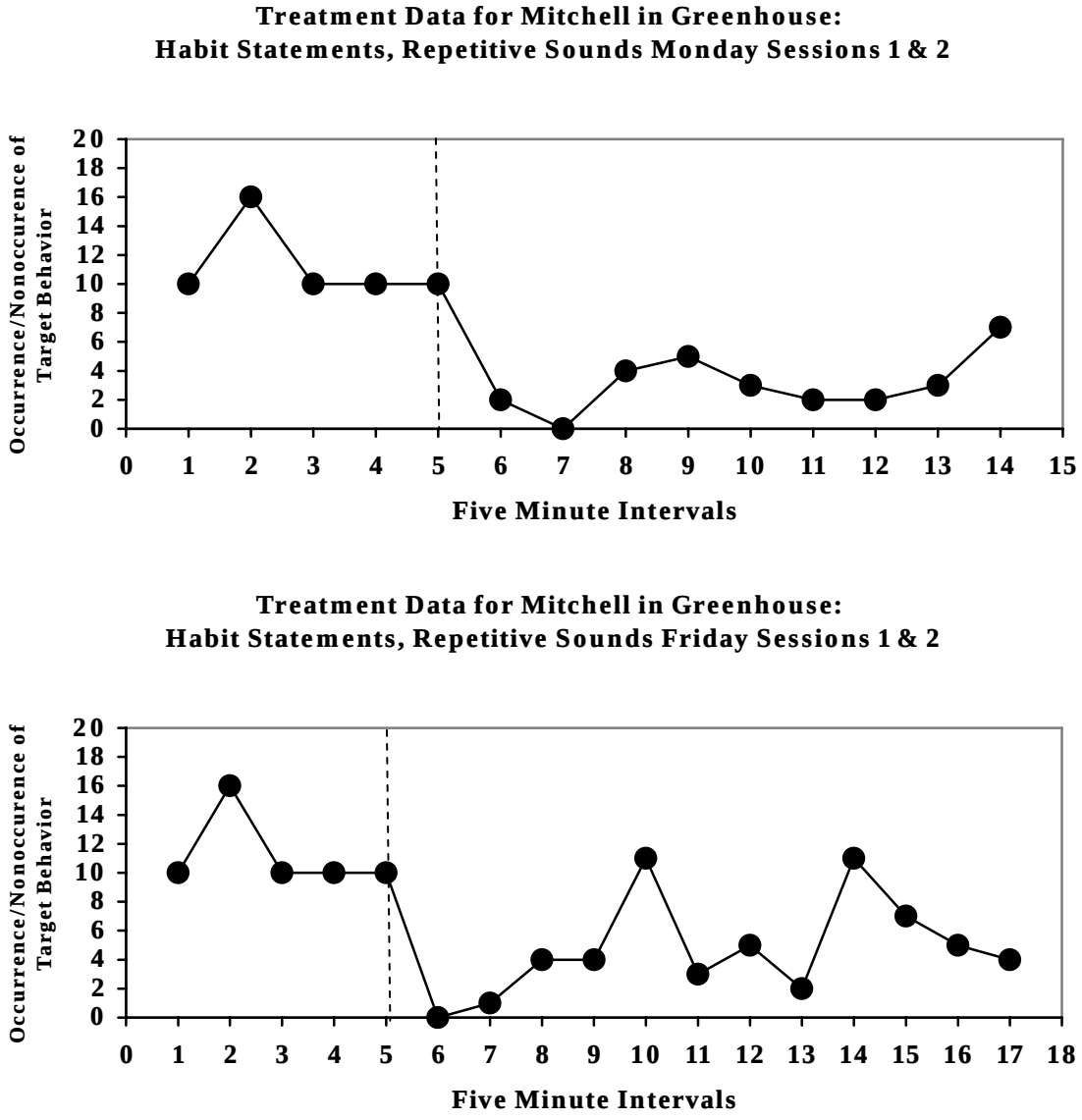


Figure 4.11. Treatment data for Mitchell on Monday through Friday (habit statements, babbling, and repetitive sounds).

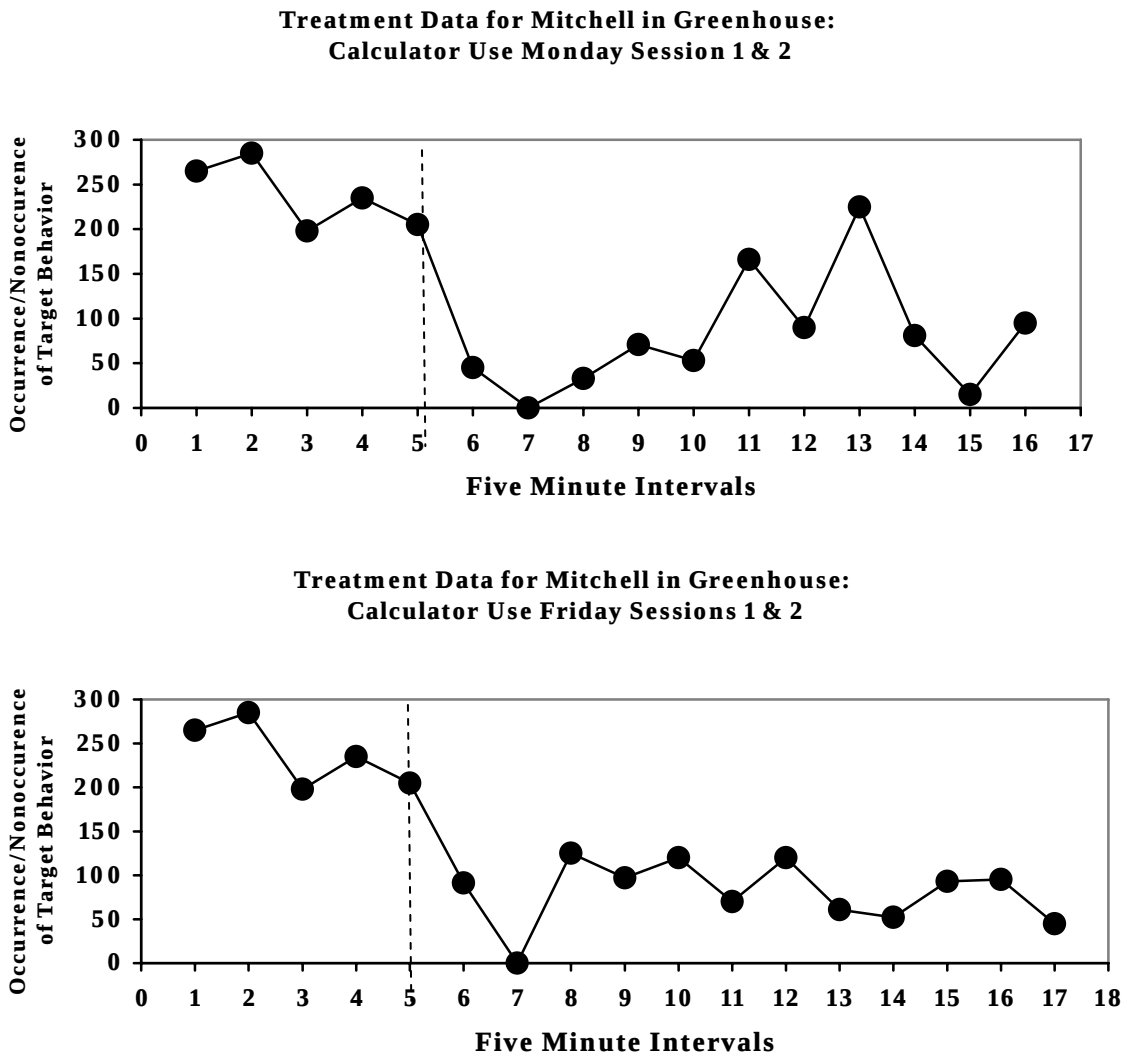


Figure 4.12. Treatment data for Mitchell on Monday & Friday (calculator use).

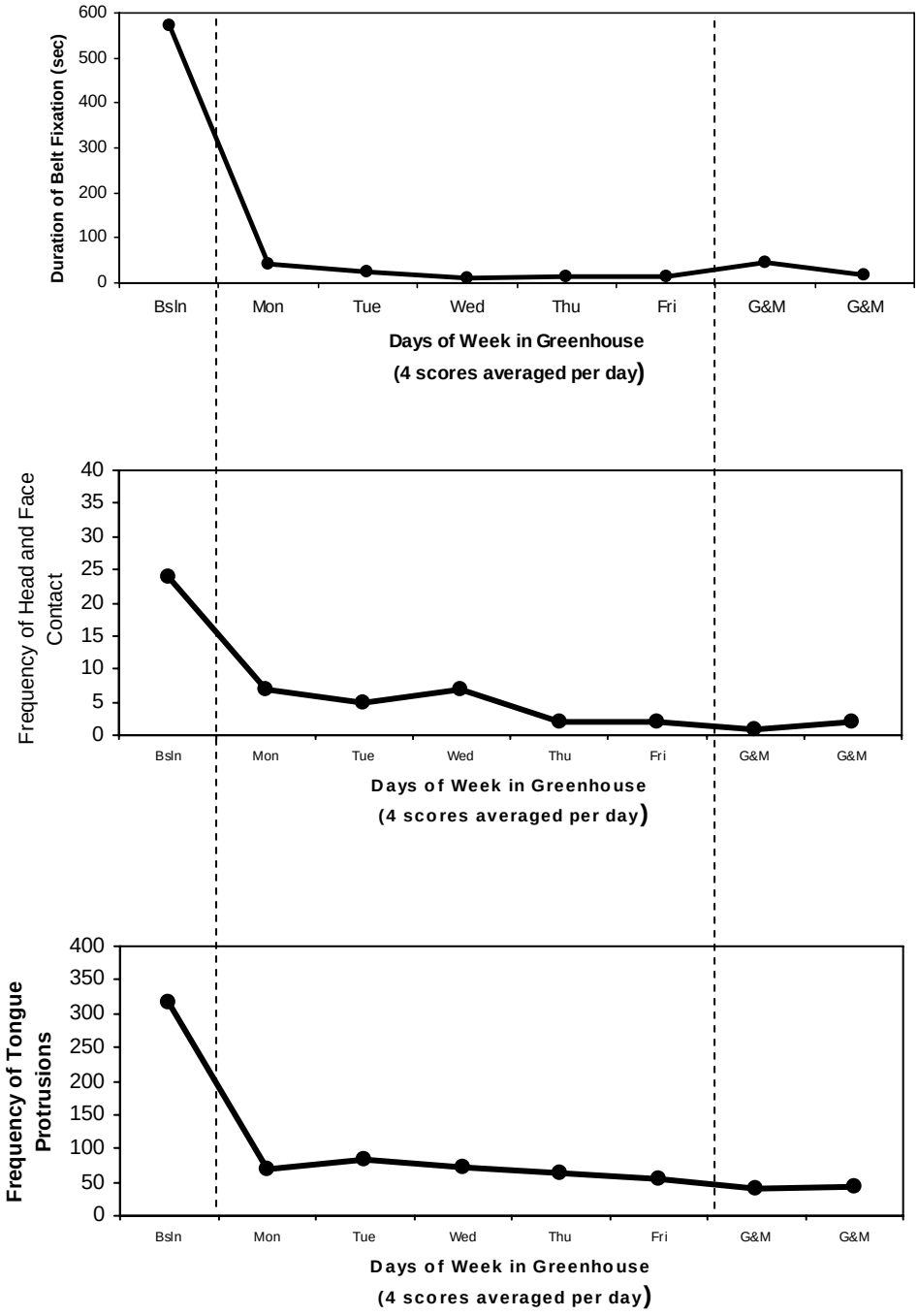


Figure 4.13. Treatment data for Alvin in greenhouse.

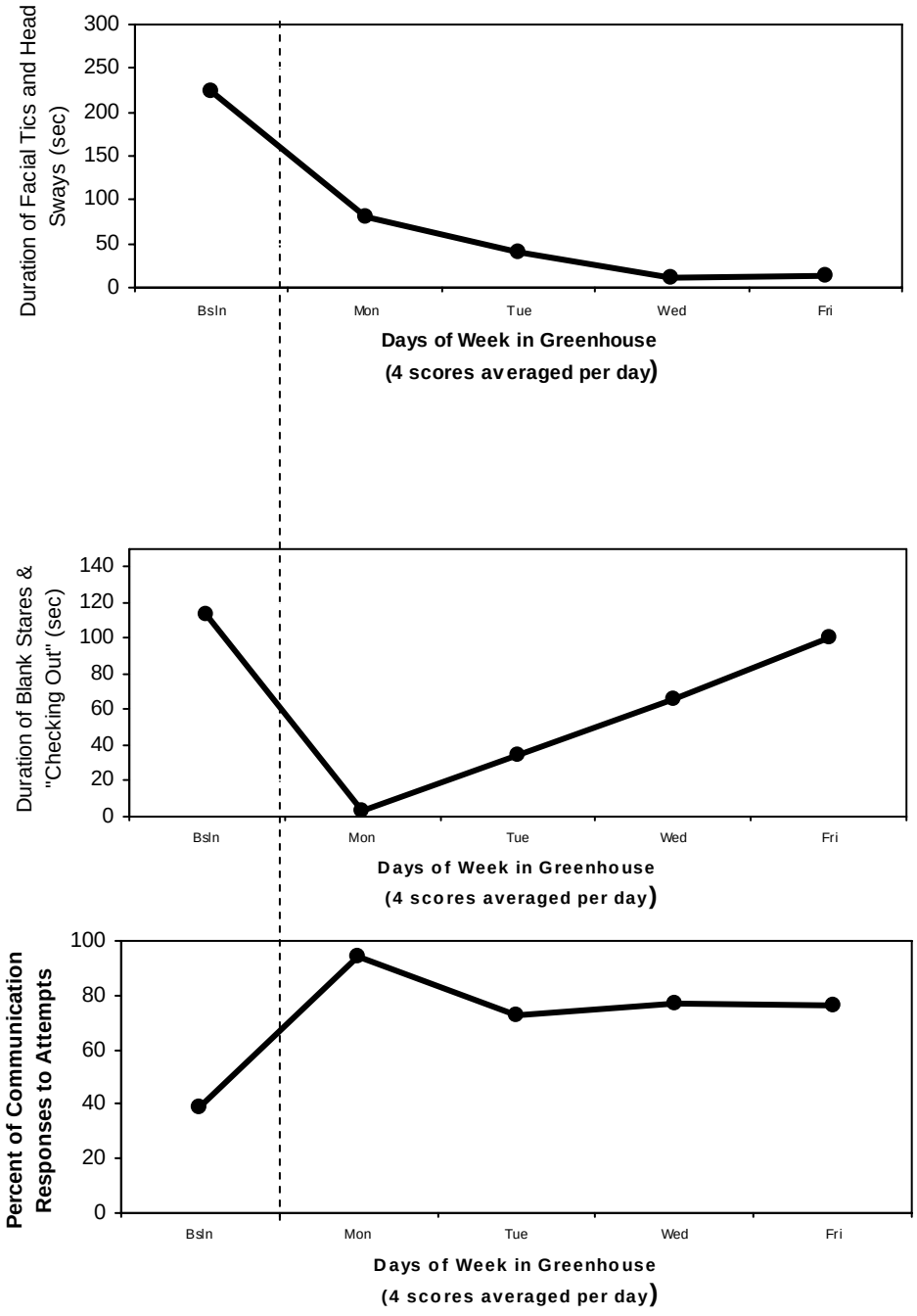


Figure 4.14. Treatment data for Colin in greenhouse.

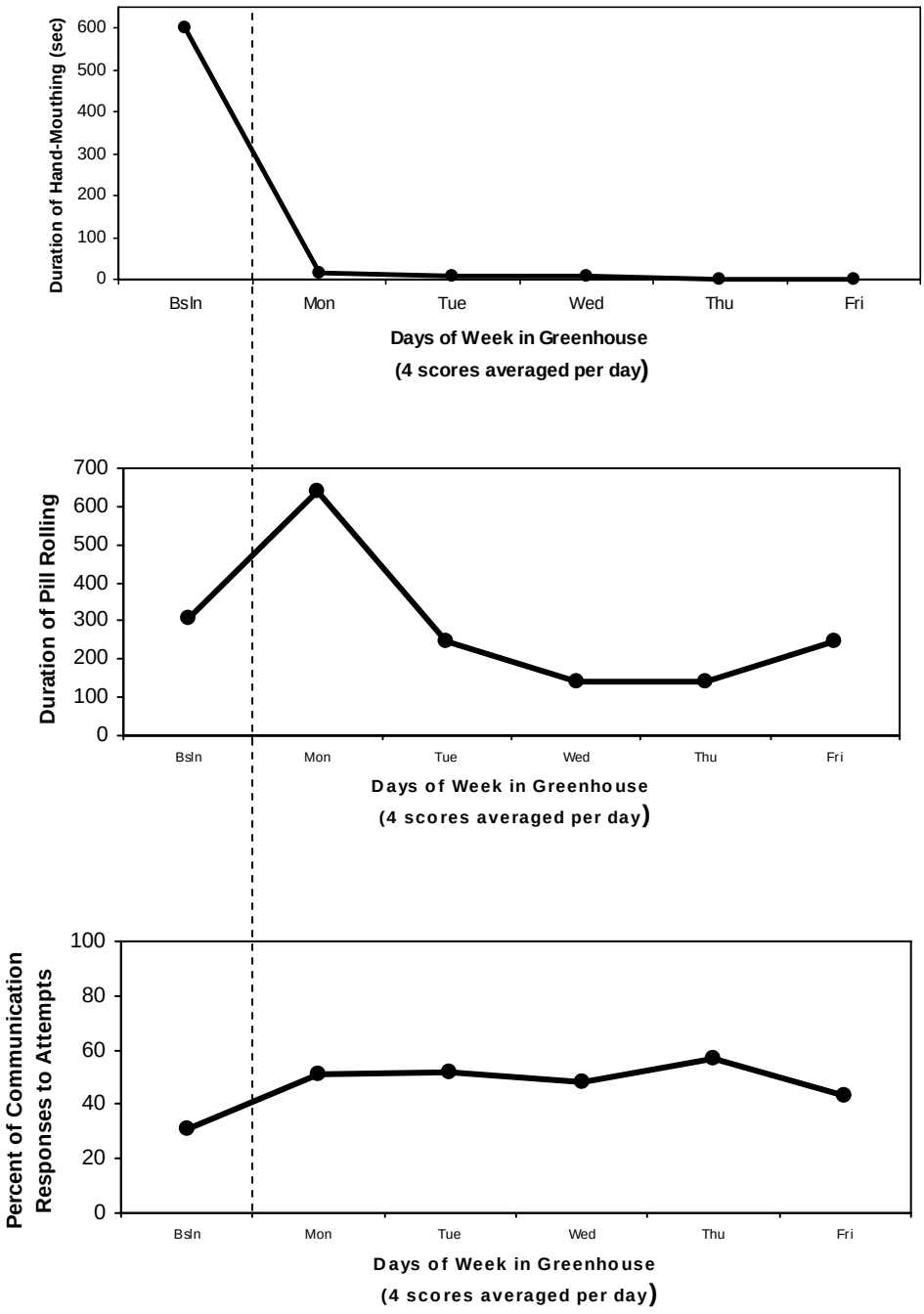


Figure 4.15. Treatment data for Marsha in greenhouse.

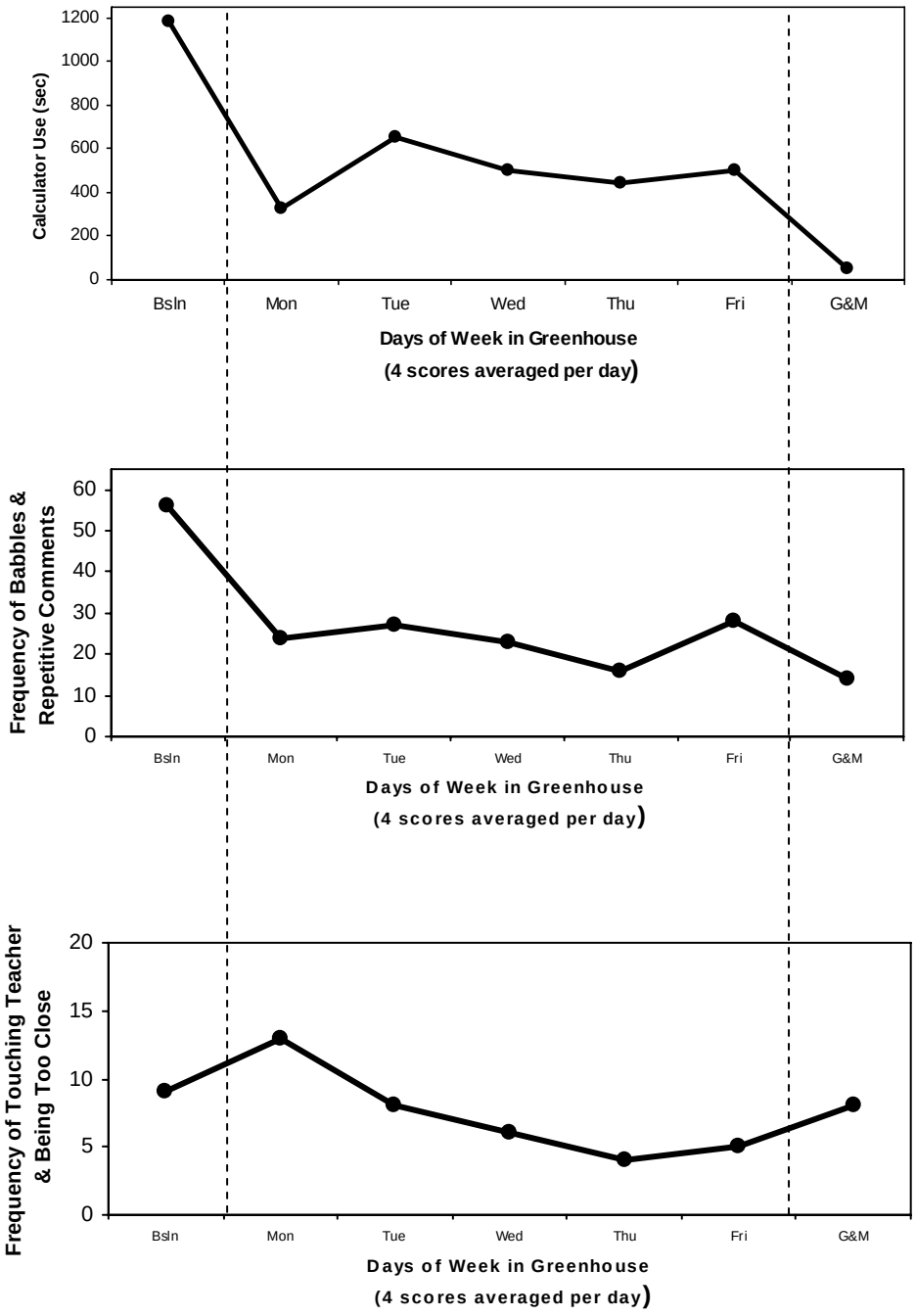


Figure 4.16. Treatment data for Mitchell in greenhouse.

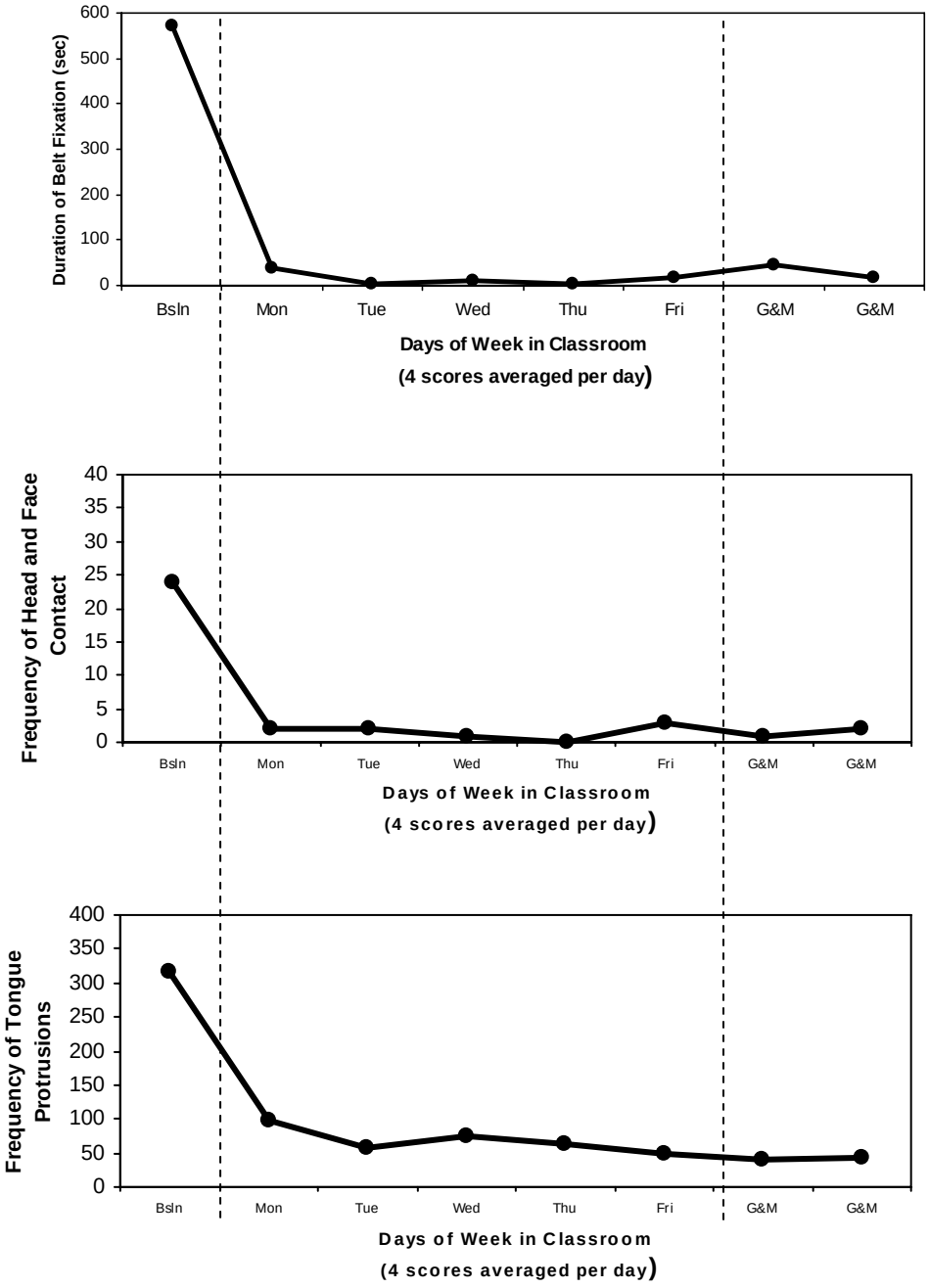


Figure 4.17. Treatment data for Alvin in classroom.

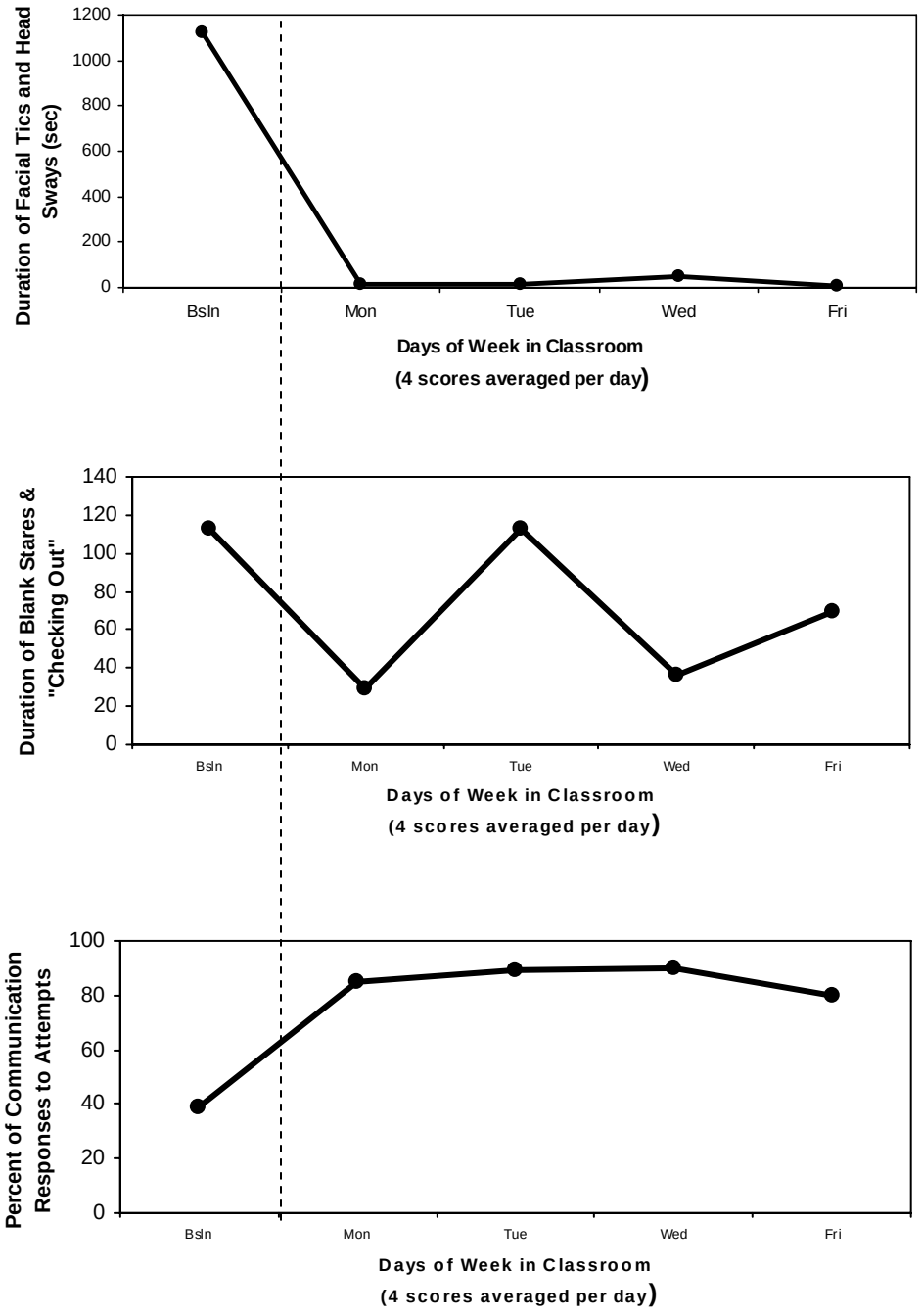


Figure 4.18. Treatment data for Colin in classroom.

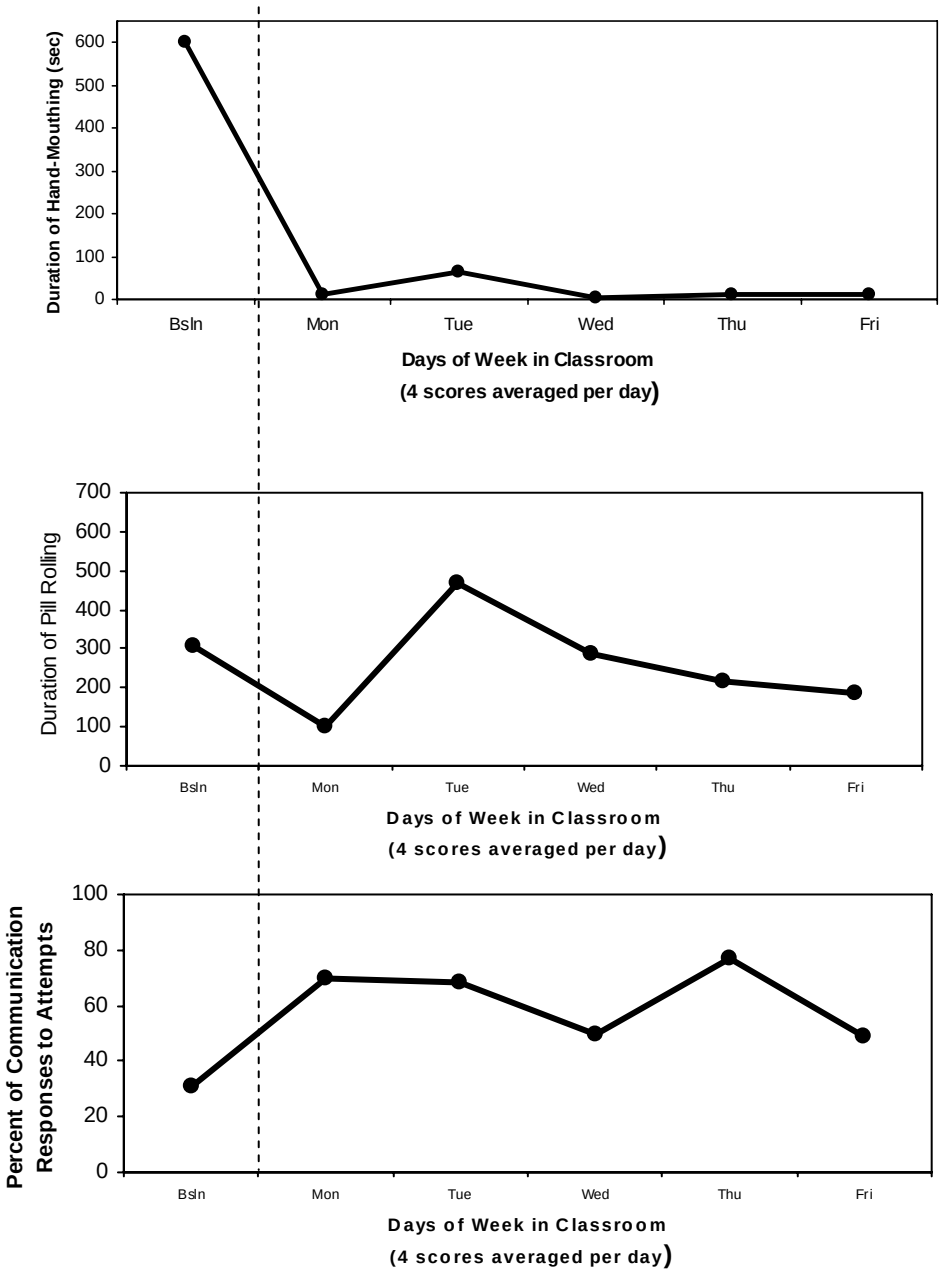


Figure 4.19. Treatment data for Marsha in classroom.

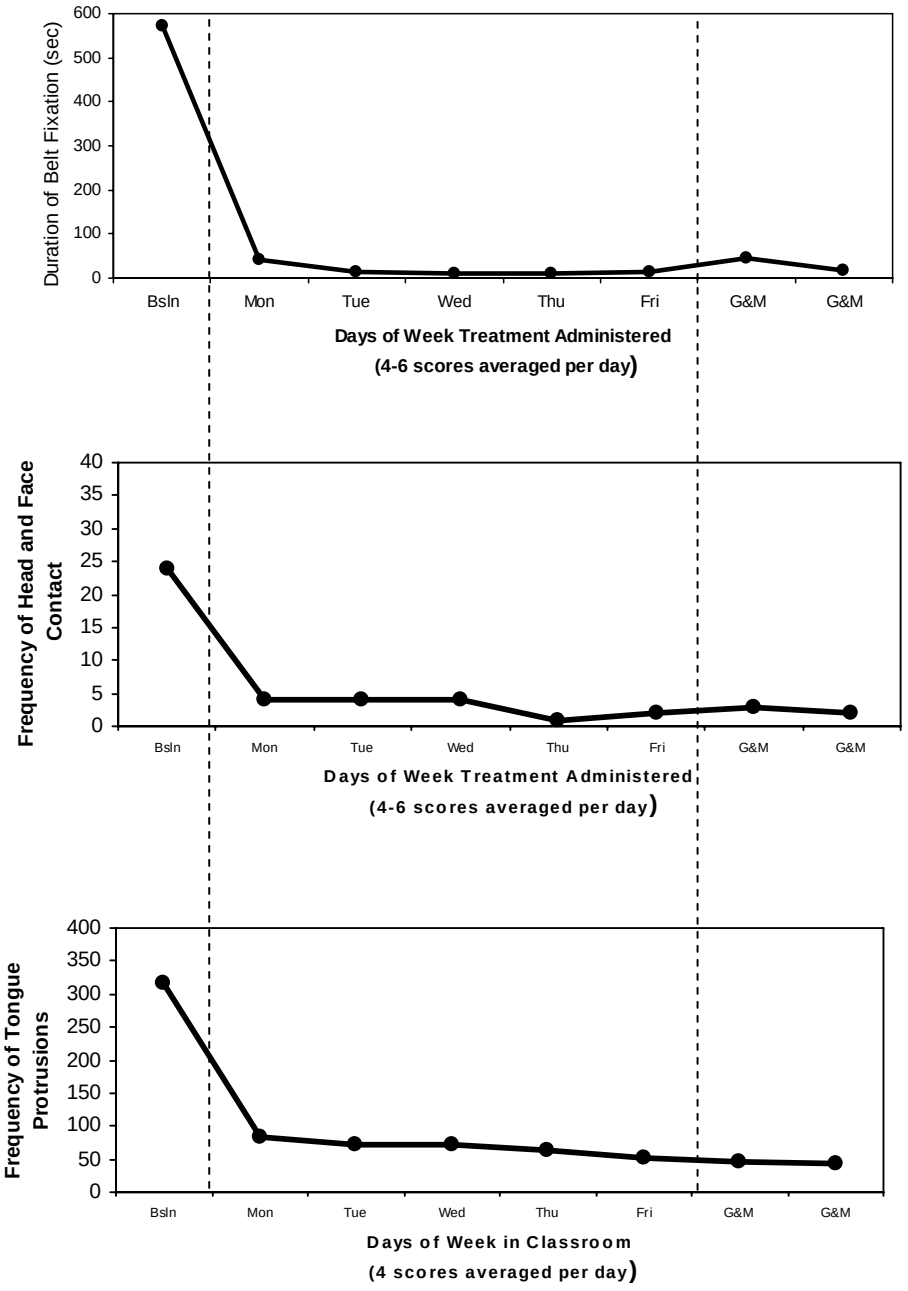


Figure 4.20. Combined treatment data for Alvin (greenhouse and classroom).

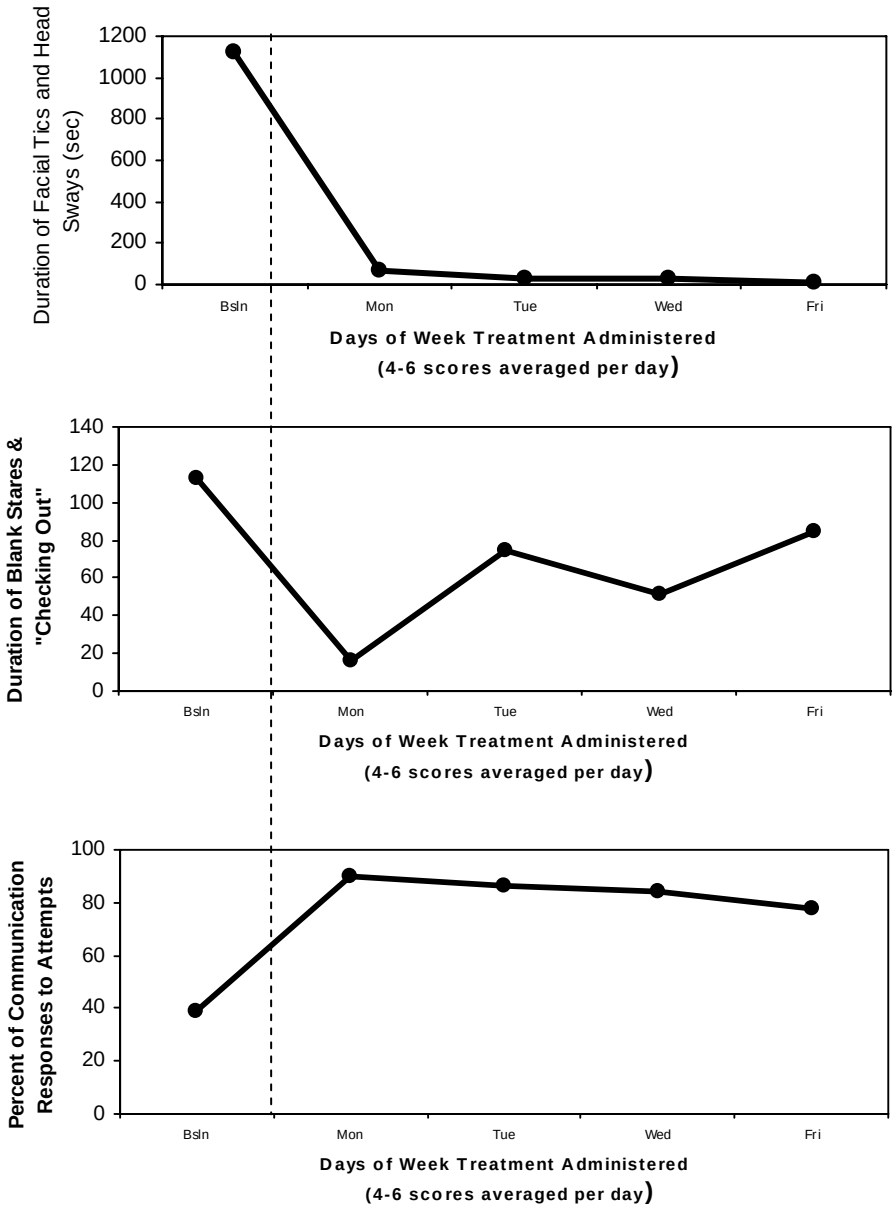


Figure 4.21. Combined treatment data for Colin (greenhouse and classroom).

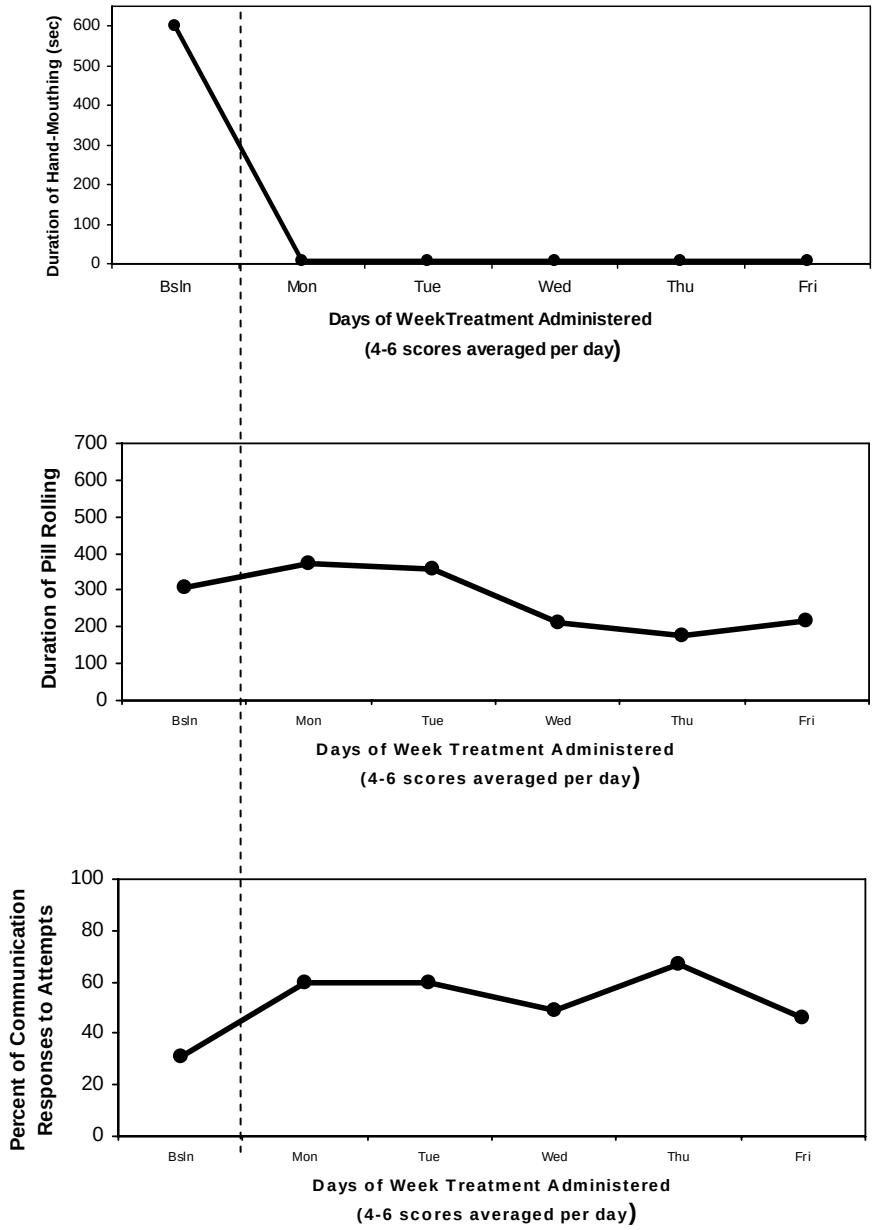


Figure 4.22. Combined treatment data for Marsha (greenhouse and classroom).

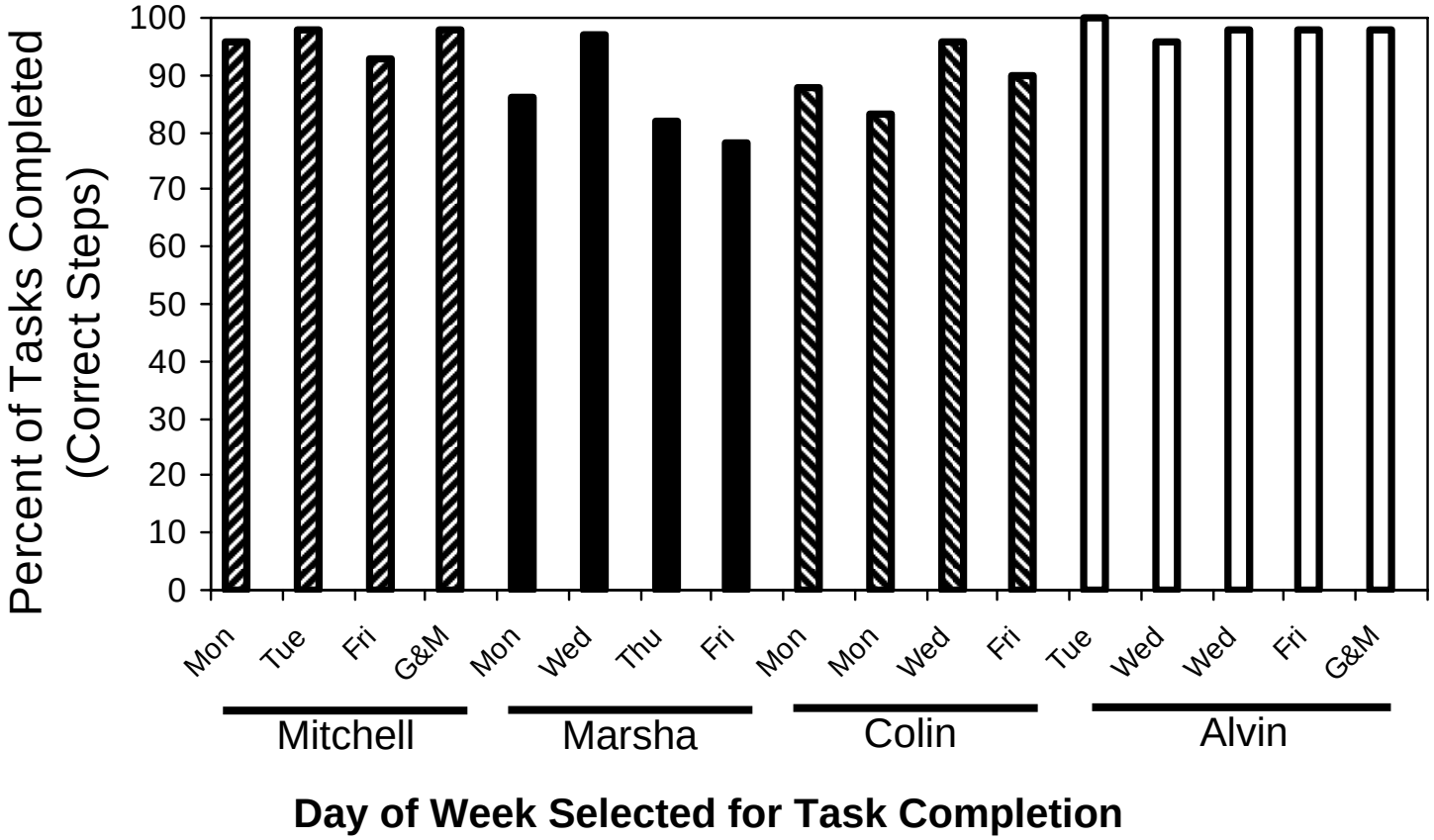


Figure 4.23. Task Completion Rates for all 4 participants.

Table 4.5 Inter Observer Agreements Rates For Alvin's 3 Behaviors.

Participant Name	Target Behavior	Observer 1 Results	Observer 2 Results	Agree/Disagree Formula	Agreement Coefficient
Alvin	Belt Fixation	12 seconds per session	13 seconds per session	12/13 =.923x100=	92%
Alvin	Head , Face Rub	3x per session	4x per session	3/4 =.75x100	75%
Alvin	Tongue Protrusions	83x per session	85x per session	83/85= .976x100=	98%

Table 4.6 Inter Observer Agreements Rates For Colin's 3 Behaviors.

Participant Name	Target Behavior	Observer 1 Results	Observer 2 Results	Agree/Disagree Formula	Agreement Coefficient
Colin	Head, Neck Sway & Bob	15x per session	16x per session	15/16= .937x100=	94%
Colin	Checks Out, Stares	111 sec. per session	128 sec. per session	111/128= .867x100=	87%
Colin	Communicate Repsonses	91% per session	94% per session	91/94= .968x100=	97%

Table 4.7 Inter Observer Agreements Rates For Marsha's 3 Behaviors.

Participant Name	Target Behavior	Observer 1 Results	Observer 2 Results	Agree/Disagree Formula	Agreement Coefficient
Marsha	Handmouth, Fingers	11x per session	12xper session	11/12= .916x100=	92%
Marsha	Pillrolling	115x per session	126x per session	115/126= .912x100=	91%
Marsha	Communicate Responses	46% per session	50% per session	46/50= .920x100=	92%

Table 4.8 Inter Observer Agreements Rates For Mitchell's 3 Behaviors.

Participant Name	Target Behavior	Observer 1 Results	Observer 2 Results	Agree/Disagree Formula	Agreement Coefficient
Mitchell	Calculator Touching	261 seconds per session	277 seconds per session	261/277= .942x100=	94%
Mitchell	Babbles & Sounds	19x per session	21x per session	19/21= .904x100=	90%
Mitchell	Touches Teacher	16x per session	17x per session	16/17= .941x100=	94%

CHAPTER 5

DISCUSSION

This chapter discusses the study's results described in the previous chapter. The following research questions will be answered here: Will adults with severe mental retardation learn basic horticulture skills?

1. Will adults with severe mental retardation learn basic horticulture skills?
2. Will horticulture instruction in a greenhouse setting reduce aberrant behavior?
3. Will horticulture instruction in an outdoor garden setting reduce aberrant behavior?
4. Does a greenhouse setting reduce the frequency and intensity of aberrant behavior more often or more effectively than an outdoor garden setting?
5. Will horticulture skills learned in a greenhouse setting be generalized and maintained to an outdoor garden setting?

Sections covering internal and external reliability, content and social validity, study limitations, current implications and future applications of research results are also provided as well as support from recent literature throughout.

Completion Rates of Participants

According to Kormann and Petronko (2004), individuals with developmental disabilities who have behavioral challenges are frequently served

in community-based programs rather than in institutions. Both rural and urban communities offer vocational and recreational programs. Therefore, it is not surprising that good examples of these programs demonstrate the ability for participants to learn a new skill while reducing unwanted behaviors. Still, treatment plans are often so complex that attempts to implement them face many barriers such as community misconceptions and biased attitudes (Hieneman & Dunlap, 2000.)

Data from this study illustrates that learning is indeed possible in the right setting with systematic instruction. Alvin's completion rates did not dip below 96% and his average was 98% for all 5 days. He kept demonstrating skills typically absent from persons labeled "severe and profound" including self-monitoring, sound body balance, spatial acuity, resourcefulness, astute vision, long-term memory, accurate recall, and fine and gross motor skills – he essentially employed his own measures of quality control which remained present during all instructional sessions.

Alvin learned faster than the others and remembered more steps in the entire sequence from day to day such that the need for cueing and prompting were minimized early on in his instructional sessions. Further, his generalization and maintenance sessions occurred 4 weeks and 6 weeks after treatment, yet very little skill was lost in this time span. Although Alvin required minimal prompting during follow-up sessions which were held in a third and new setting, he continued to complete the same tasks with the same proficiency. In fact, his

own adaptations to enhance speed and accuracy were still incorporated into the task sequences despite drastic changes in materials and setting.

The other 3 participants also learned horticultural skills, but not to the extent and consistency of Alvin's performance. Marsha only had one day where she was under the 80% criterion and on that day her completion rate was 78%. Colin scored no less than 83% even on his low day. Mitchell, while only attending for 5-half days, still scored well on completion rates ranging from 93% to 98% for treatment and for generalization and maintenance sessions. If the score was not 100% it means corrections were needed and that the specific task was given an incomplete label. Only one participant, Alvin, achieved this score on one day from both raters.

Many factors such as time of day, lighting, and materials contribute to completion rates of task sequences. However, the range here between participants was quite narrow and completion scores well beyond acceptance criterion for all participants. Thus, this particular horticulturally-based treatment and instruction plan successfully ruled out confounding variables affecting skills acquisition such as daily mood, general health, and fine/gross motor ability (Wichrowski, Whiteson, Haas, Mola, & Rey, 2005), interest level and setting selection (Ottoson & Grahn, 2005), student-teacher rapport (Borg & Gall, 1886), and task stress (Goodrich, 2005).

Instruction and Aberrant Behavior

The ability to find, train, and retain direct-support staff is a huge barrier to sustaining and expanding community-based services for persons with disabilities

(Hewitt & Lakin, 2001). In a survey by Test, Flowers, Hewitt, and Solow (2004), behavior problems and communication of persons with mental retardation were rated highest as concerns identified by administrators. Plus, the growing gap between high expectations and limited preparation of direct support staff contributes enormously to staff burnout and turnover rates (Hewitt & O'Nell, 1998.)

Greenhouse Results

Since each participant in this study had 3 separate target behaviors toward which intervention was directed, these will be addressed individually for each person. Behaviors targeted for change were identified through a variety of sources and criteria such as day center administration and staff commentary, direct-caregiver concerns, potential health hazards, inappropriateness for public outings, and extreme frequency or duration.

All participants experienced treatment in the greenhouse. Generally speaking, behaviors intended for reduction were decreased in all participants in this setting. Likewise, the 2 participants with behaviors targeted for increase were improved on both. Although visual inspection of graphed data was the primary technique in determining when criteria for success was met (stable baselines and obvious trends), certain results required additional calculations to verify stability within conditions. Those are explained later where applicable.

Alvin's target behaviors included belt fixation, tongue protrusions, and face/head contacts. He demonstrated substantial and consistent decreases in behavior. These reductions in aberrant behaviors are highly related to his high

rate of task completion for all sessions. As Alvin was more engaged with the horticultural sequences, he performed the target behaviors less. His individual data sheets from each daily session, as well as his averages from the entire week, demonstrate little variation except from baseline to the start of treatment. Alvin maintained this downward trend for each behavior suggesting that the treatment was exceedingly effective at, and responsible for, reducing all 3 of his target behaviors in just one day and during generalization and maintenance sessions.

Marsha's results in the greenhouse showed some desirable behavior changes. She maintained a serious reduction in handmouthing while receiving treatment throughout the week. However, pillrolling reductions could not be considered stable due to daily fluctuations which skewed the week's average. Her ratio of communication responses to attempts increased, which means she paid better attention to her surroundings than during baseline and was more involved in the process for which instructions were being given. Although the drop in occurrence (of responding to attempts) was not as severe here as for handmouthing, Marsha's results for communication responses were still considered improved and stable. When comparing her baseline score of 25 responses to 79 attempts with her scores from a session three days later of 59 responses out of 103 attempts, this increase is a definite improvement in skill.

Colin's sessions in the greenhouse showed a reduction in all 3 target behaviors. Facial tics and head sways decreased steadily over the week of treatment, although Colin's *checking out* behavior tended to elevate at the same

time and was, therefore, categorized as unstable. While the aberrant behavior (facial tics) was reduced, the trade-off appeared to be that his escape behavior (checking out) increased. There are many reasons why this could occur but it was most likely because a multitude of new stimuli were introduced as the sessions progressed, which can be distracting for persons with even mild attention deficits (Lemer, 1996). Thus, these autistic-like behaviors (stares at fingers within one inch of his face or at highly patterned objects/clothing in room) that occurred while Colin *checked out* were accelerated from the subtle changes in materials and settings (i.e. writing/labels on plant containers, variegated/textured leaves).

Communication was another target area for Colin as he was described as having attention deficits by staff and administrators. His responses to attempts increased after the first day and remained stable. Despite an absence on the fourth day, he managed to maintain an improved response rate on the fifth and final day with 138 responses to 179 attempts throughout four morning sessions.

Mitchell's target behaviors were the easiest to identify as staff knew him well. Although he had a history of violence and some acts were witnessed during initial observations, he seemed fairly well adjusted when placed in smaller groups or quieter settings and was informed ahead of time of the day's events. He clearly had an obsession with a large battery-operated calculator. It seemed as much a security blanket as it did an escape tool for him. Mitchell's use and contact with this item dropped dramatically when treatment began, yet he actually mastered many of the repotting tasks with one hand while also touching

the calculator. Still, after performing the stability level test within conditions where data points fluctuate, Mitchell's decrease in calculator use was positive and decelerating but not considered stable.

Mitchell's other two behaviors requiring reduction involved social skills. He tended to babble or ramble senselessly which concerned staff. During treatment, when Mitchell was completely involved in an activity, these noises decreased somewhat but the meaning of them became clearer than during baseline. It seemed when concentrating on a specific tedious horticultural task, Mitchell liked to repeat certain statements the way another person might hum or whistle a tune– somewhat aimlessly, but not with malicious intent to annoy. Likewise, his proximity to the teacher during sessions decreased slightly from baseline but was not eradicated. As the week progressed, a positive rapport was built between the teacher and student so it stands to reason that a closer physical presence (less space between the dyad) evolved where smiles and grins were exchanged as well as instruction. According to the formula for stability levels, Mitchell's "getting too close to teacher" behavior was unstable.

Classroom Results

An outdoor setting was originally scheduled as the third setting for data collection. However, due to unplanned construction and limited time at the botanical garden, four participants received treatment in the greenhouse and three in the classroom. Still, there were very few differences between the two venues. Alvin's data revealed almost identical changes from high incidence target behaviors being reduced to near zero occurrence across all days and all

behaviors. His scores remained the most stable even during generalization and maintenance sessions up to 6 weeks later.

Marsha had similar fluctuations in her target behaviors for the classroom as for the greenhouse. Handmouthing was again reduced substantially, from 10 minutes in baseline to only 13 seconds on the last day. Averages for pillrolling frequency were scattered between 1 and 7 minutes during the week. Because baseline was around 5 minutes, those other treatment data points are too irregular to declare behavior change stable. Although Marsha's communication responses increased from 25 out of 79 attempts at baseline to much higher rates (29 out of 58 on one day and 101 out of 126 on another day), these advances were not consistent enough to be considered stable.

Colin's facial tics and head sways remained low to practically none by the end of treatment. The change in setting did not affect this particular target behavior. He did, however, display a more irregular pattern of *checking out* in the classroom than in the greenhouse. There was more with which to stimulate himself, more clutter, and more to stare at during the afternoons in the classroom than the plant life found in the greenhouse. Also, busy prints on clothing proved to be a distraction for him.

Fortunately, communication rates continued to increase for Colin and a stable pattern of responding to communication attempts was observed. A sharp increase on the first day was maintained throughout the week despite his checking out occasionally. Although his attending to stimuli delayed his completion of instructional sequences, Colin seemed to enjoy the new sights,

sounds, and scents afforded him during this week-long experience. His affect stayed pleasant and cooperative, while no self-injury or aggression surfaced as a result of unfamiliar surroundings. He did successfully complete the demands issued him even though he required more prompting. Colin remained “in the present” for a majority of the sessions but remained true to his reputation for being a follower requiring directions.

Indoor versus Outdoor Instruction

It is clear from the data that no major differences occurred between the two settings for any participant. The results may be totally different if data collection in an outdoor setting had been possible. However, inconsistencies found in the location alone, using a generic description like outdoor, could contain major differences compared to a designated indoor setting including noise, heat, rain, exhaust, insects, wind, fragrances, colors, and sounds. All of these features become uncontrolled variables that could drastically influence outcomes depending on their association to each participant.

Research Design Characteristics

Three important features of reliability for single-subject designs are assessment consistency, bias removal, and behavioral definitions. Consistent assessment measures facilitate reliability among multiple observers. If frequency and duration counts of behavior are highly varied from one rater to the next, it is possible that the raters themselves are highly varied, too, in their observation techniques. In order to properly implement a behavioral change program, consistency between raters is imperative (Kazdin, 1994). In this study,

consistency was established by documenting similar results in agreement tallies (comparing scores from data sheets).

Internal Reliability

Removing bias from observational recordings may be tricky but is very necessary. When agreement ratings are assessed and proven to be accurate, individual observer biases are minimized. Using two or more raters also helps reduce the effects of individual observer traits. One rater's opinion of target behavior may vary daily by recording leniently one day or more stringently the next. Agreement between multiple raters provides a check on the consistency of anyone recording behaviors (Kazdin, 1994). A total of six observers were recruited and trained for data collection of target behaviors and completion rates.

Achieving interobserver agreement was also important to ensure that the target behavior was well-defined. Reliability checks of recorded behaviors were made before collecting authentic baseline data. Multiple observations conducted prior to beginning increased the likelihood that the target behavior viewed by all raters was, in fact, the same event. Observers had the potential for becoming less reliable in their ratings over time and, therefore, less agreement between raters might be expected. However, since reliability checks were conducted periodically throughout the experiment, observer drift and favoritism were reduced.

Reliability of assessment and observational procedures are enhanced when there is strong interobserver agreement, but achieving adequate agreement levels may be difficult (Mudford, Hogg, & Roberts, 1997). In this

study, all four participants received exactly the same treatment, for the same length of time, at the same time of day, in the same settings, with the same supplies. Furthermore, raters had similar backgrounds, a familiarity with special populations, and received identical training and clear behavior descriptions. Due to these methods being consistently applied from start to finish, internal reliability measures were established early on and stayed constant throughout the study.

External Reliability

According to Black (1999), when used in a research context, the term reliability is an indication of two measures of the same thing. Single-subject designs usually compare three or more persons, behaviors, settings, or strategies. Study participants serve as the control for themselves and for one another (Gresham, 1998). This was possible because persons with severe mental retardation, even those with differing backgrounds, have multiple similarities just from the nature of their disability and how society has responded to their condition. Although there may be variability in response to interventions within certain groups of disabilities (Dattilo, 2000) a treatment that is successful with one participant may work well with another if they both have a similar developmental disability.

This study had the benefit of employing systematic instruction to 4 individuals, thereby establishing inter-subject reliability. Examination of three individuals in two different settings provided intra-subject reliability. The fact that 3 separate and distinct behaviors were examined for each participant during each session ensured a sound study with important features such as repetition

(same intervention administered 4 times daily) and replication (same decreases and increases were sustained).

Generalization and Maintenance

Kerlinger (1986) says that generalizing means the results of a study may be applied to other subjects, groups, or conditions. Results from this study's generalization and maintenance phases were a significant boost to reliability. Two of the participants (Alvin and Mitchell) were offered an opportunity to perform the same sequence in a third setting, responding with high task completion rates up to six weeks later (98% for each.) Certain strategies were employed throughout the study to make this transition from treatment settings to natural settings positive. In single-subject research, consistent instruction with fading prompts allows individuals to become less dependent on the teacher. Time between cues or reinforcement should increase (Dattilo, 2000). This was the case for all participants. The instructor allowed more time to lapse before issuing praise or re-asking a question as the week progressed.

Finally, regarding generalization and maintenance, changing materials or supplies, enough to be slightly unfamiliar (different pot size, color, shape) while still serving the same purpose (e.g., a container to hold soil), can facilitate transference of skills to alternate settings. Too many major differences or no differences at all may make for a less triumphant shift to alternate settings in terms of maintaining skill level. There is usually a tradeoff between generalizability and external validity. One feature tends to suffer as the other improves because the more the experiment is controlled, the more artificial the

situation is and the less generalizable it becomes (Rubin & Babbie, 2001.) The environment utilized for the generalization and maintenance phase was actually not completely new but was, unfortunately, filled with more noise and distractions than either of the two treatment settings. In actuality, it was somewhat surprising that task completion rates remained so high in this third setting while target behaviors also remained desirably low. Maintenance of gains for Alvin and Mitchell was tremendous compared to Marsha and Colin who continued to need rapid prompting and frequent reinforcement.

Validity

The most familiar definition of validity in single-subject designs refers to "the extent to which a score or data point measures what it is intended to measure" (Barlow & Hersen, 1984, p. 129). Validity in single-subject research designs is largely connected to the reliability of data collection procedures as well as the generality of findings. Behavioral observations are often considered a valid and accurate means of evaluation because interpretation is not required (Sarason & Sarason, 1987).

Further, there are numerous ways to record the presence of a selected behavior, in frequency and duration, strength and intensity, variation and constancy, or onset and latency (Alberto & Troutman, 1986). The nature of participant target behaviors largely influenced the choice of recording procedures. Threats to internal and external validity are controlled for in unique ways. As with true experimental research designs, single-case methods have

many validity checks built into the procedures. Three types of external validity listed by Barlow and Hersen (1984) were controlled for and are discussed next.

Content validity refers to the extent to which inferences from scores or tallies adequately represent the content or conceptual domain that they claim to measure (Gray 2004). This type of validity is analyzed by determining if an observation instrument is adequately sampling the behavioral domain of interest. Multiple forms of behavioral assessments were used to increase content validity. Recommendations from Barlow and Hersen (1984) of anecdotal records for preliminary observations, recording duration of continuous behaviors, frequency counts for discrete behaviors, and interval recording for time-lapse studies were all utilized to ensure each domain of interest was accurately measured.

Construct validity is the second type of validity mentioned by Barlow and Hersen (1984) and involves the extent to which inferences from scores or data points accurately reflect the construct that the score claims to measure. In single-case studies constructs refer to the degree to which observations accurately measure a psychological or abstract construct (Gray, 2004) and in this study it refers to communication. Two participants increased their communication responses substantially by the end of treatment. This construct was defined by these qualities: turning head in direction of speaker, making eye contact, and performing some action following a request – in short, not ignoring the instructor. Results from observational and anecdotal data were used to identify behavioral constructs and determined criteria against which the raters evaluated the participants.

Criterion validity is the last category mentioned by Barlow and Hersen (1984). It includes other types of validity by which claims about a score or calculation may be judged. In single-subject designs, criterion-related validity of assessment scores or intervention results refers to the degree to which one source of behavioral-type data may be substituted for another. It is said that observational data obtained in structured settings corresponds poorly with data collected in naturalistic settings. That is precisely why this study incorporated at least 3 settings in which to collect data that were considered normal, inclusive, and uncontrived. Thus, decisions about treatment applications in natural (non-treatment) settings may indeed be based upon data collected during this experiment since similar and innate environmental conditions existed in all 3 settings.

Social Validity

Replacing maladapative behavior with functional, healthier behaviors suggests that an intervention is truly successful. One concept in studies involving persons with disabilities which measures social value of a skill or societal views of verifiably important activities is known as *social validity* (Schwartz & Baer, 1991). This component is typically evaluated by determining if the presence of a new behavior (or absence of a previous behavior) has societal worth or is valued by the public at large outside experimental settings. Thus, the importance of establishing similarities between treatment and non-treatment settings to facilitate transferability of newly acquired skills in persons with mental retardation (Barlow & Hersen, 1984) cannot be overstated. The intention of this study was

not only to teach basic horticulture skills to persons with mental retardation, but to enhance the probability that these skills would transfer to other settings in the natural environment. Therefore, sites chosen for training were integrated, naturally existing, and had characteristics in common with generalization and maintenance sites.

In addition, behaviors generalizing more readily to alternate settings are those which serve a functional purpose because they possess a high probability of obtaining reciprocal feedback and reinforcement from others (Stainback et al., 1983). Once treatment began for all participants, staff comments and opinions adopted a more positive tone. Weekly verbal exchanges between the researcher and direct-care workers confirmed this attitude shift during regular visits to the center. Unsolicited remarks such as, “He loves it there! He come back in a good mood!” and, “I wish all of ‘em could plant flowers – makes ‘em smile more!” may be interpreted as verification of the study’s social validity.

Regarding the employment potential for persons in this study, there is considerable knowledge about how to teach work tasks to individuals with special disabilities. Research indicates that many persons with disabilities can work competitively with performance levels approximating those of nondisabled workers (Hill & Wehman, 1981). Nonetheless, a high percentage of workers with disabilities fail in competitive employment placements and even in volunteer assignments.

Work placement reports from job coaches are often laden with accounts of aberrant social behavior for persons with disabilities and these reports describe

social deficiencies that concern employers. Sadly, many persons with disabilities lose their jobs for social reasons, not because of their inability to perform work tasks (Wehman, 1981). Since this study effectively reduced maladaptive behaviors over time in all participants while concurrently teaching skills considered a talent to larger audiences (gardening), the value of this combination has positive ramifications for both employment and leisure settings. Horticulturally-based sites remain an effective and suitable place to conduct inclusive activities for persons with severe disabilities (Soderback, Soderstrom, & Schlanderer, 2004). Furthermore, the nature of gardening tasks allow for completely age appropriate prompting and cueing similar to instructional formats used for persons without disabilities. Although differential reinforcement of incompatible and alternate behaviors (DRI and DRA, respectively) is common for persons from special populations, those techniques have merit within numerous learning situations (Rubin & Babbie, 2001). These techniques were employed often with each study participant especially during behaviors such as Marsha grabbing gravel or perlite or Mitchell's touching the teacher or calculator. Requesting that Marsha pick up an empty pot as she reached for the soil bin or asking Mitchell to get the watering can as he went for the calculator are examples of these reinforcement methods.

Marc Gold explored and perfected this teaching strategy using specialty reinforcers in the 1960s and 1970s while training persons with severe disabilities to assemble bicycle brake components without ever saying the word "no" during instruction. Marc Gold's educational philosophy is rooted in providing a deep

respect for all people, particularly those that have been treated and labeled negatively by society (Durgin, 2004). It was his original teaching model that incorporated social validity long before it was chic; it was his desire for humane instruction of marginal populations when not yet en vogue; and it is his enlightened philosophy that permeates special education literature today.

Measurement Strategies

High internal validity is established when the intervention is identified as the behavioral change agent rather than extraneous variables (Tawney & Gast, 1984). Ruling out factors other than the treatment variable as possible causes of change in the dependent variable is a key component to any group design, as well as for single-subject designs. Experimental designs control for threats to internal validity by random sampling and random assignment (Gall, Borg, & Gall, 1996). Single-subject designs use other methods to achieve internal and external validity.

The following techniques were incorporated into the procedures used for this study. *Reliable observations* of behaviors thwarted possible contamination of data. Enlisting multiple observers allowed for inter-rater agreement checks and the focus on observing only one behavior at a time further reduced these threats (Barlow & Hersen, 1984). *Repeated measures,* common in experimental designs for observing change, revealed information on participants from different points in time (Gall et al., 1996). An observer might miss something if behaviors are measured one time a day or in one setting. Or, results might be tainted when

observers are switched, instructions unclear, and settings altered (Barlow & Hersen, 1984.)

Since different behaviors required different observation methods, both frequency and duration counts of aberrant behavior were warranted, in addition to occurrence-nonoccurrence scores so that an accurate picture of behavior patterns was obtained (Matson, 1990). Even with proper recording forms, comfortable chairs, and fresh batteries in timers, raters may view the same behavior differently. Still, there is benefit as well as concern in having multiple observers. More variation in behavior interpretation could occur during data collection.

In this study, agreement through triangulation and crosschecks validated findings of raters. Clear operational definitions of target behaviors and data collection methods resulted only after pilot observations outlined target behaviours with a record of how, what, when, and where it occurs as recommended by Hawkins (1982). Providing this detailed information to raters ensured more accurate observations and a yielded high interrater agreement rates. Fortunately, treatment validity and reliability are closely liked with accuracy and consistency in administering effective interventions (Barlow & Hersen, 1984) so the more precise data collection, the more truthful results remain.

Establishing b*aseline and treatment stability* were necessary for determining critical information about target behaviors. Since behavior variations are expected in persons with severe disabilities, it was sometimes difficult to divide treatment influences from regular behavior. This might have been due to

already decreased target behaviors becoming susceptible to sudden shifts or reversions as with non-target behaviors of persons with disabilities. However, baselines were predominantly nonfluctuating so it was not necessary to withhold treatment.

A margin of variation during baseline was allowed but not if the range was so wide that treatment effects went unnoticed. Maintenance of baselines or treatments are often influenced by institutional and moral factors because sometimes data collection sites limit access to the setting or limit participant availability (Barlow & Hersen, 1984). Pilot tests in the form of pre-assessment observations help researchers plan ahead by offering preliminary information regarding length of time required to collect data (Gall, et al., 1996). All methods to ensure access to settings for the duration of the study (approximately 3 months) were procured in advance.

Exact methods of data collection were determined after study participants were chosen and respective target behaviors identified. Participants had to fit the criteria in age range, disability level, attendance record, and display behaviors that interfered with work or leisure scheduling referred to as *target* behaviors. These target behaviors resembled anything from inappropriate or repetitive gross motor movements during break time or meals as well as a series of distracting fine motor gestures resulting in constant off task behavior. According to Tawney and Gast (1984), if change is rapid and dramatic following the intervention, it is assumed that the treatment led to the change. However, the design used here

was alternating treatments, which lacks a reversal phase (treatment is withdrawn), so proof of causal agents can be somewhat evasive.

Study Limitations

The use of rigorous designs such as single-subject, even though internal validity is typically maximized, can still have certain problems (Borg & Gall, 1986). Topics addressed here include limitations with design methods, instructional strategies, and participant logistics while conducting applied behavioral research.

Design

Limitations from c*arry-over effects* occur when results from the previous phase carry-over into the next phase (Barlow & Hersen, 1985). This concept presented a possible contamination for this study since participants were exposed to 2 different settings in fairly rapid succession. However, the results from each treatment condition did not represent any ricocheted or sudden changes when participants shifted from one setting to another. Had this been the case, graphed data from individual or daily sessions would have revealed a spiked line consistent with each setting change.

O*rder effects* can present a different type of concern if the ordering or timing of an intervention is thought to affect the results (Rubin & Babbie, 2001). Since greenhouse sessions were always conducted in the morning and classroom sessions always in the afternoon, the chance of ordering complications were definitely present. It was hoped these settings could be alternated moreso than simple AM/PM regimes but the pitfalls of applied

research required data collection to occur only when those two designated areas were available. Still, no conflicts surfaced from this arrangement in that skills were not lost or gained as a result of the settings being alternated only by time of day.

Irreversibility of effects is yet another way data collection and interpretation may be compromised (Rubin & Babbie, 2001). This enigma suggests that once a change is effected it can not be undone. Since successful generalization and maintenance phases are not easily achieved, yet are so important for severe/profound learners, one hopes that new skills are, in fact, a result of treatment and are irreversible. Unlike withdrawal designs, when using alternating treatments, irreversibility does not threaten stability of results. In addition, all participants reported having no previous gardening experience such that each started with zero knowledge of this recreational field. Further, no habits, preferences, or even familiarity with horticultural activities from earlier exposure were suspected so there was no need to investigate irreversibility effects.

Instructional Strategies

A limitation here was that only two participants achieved a level of mastery to warrant the generalization and maintenance phase. While it is customary to offer this follow-up opportunity only to those who appear to need little cueing and less reinforcement when treatment is complete (Tawney & Gast, 1984), all four participants could benefit from exposure to, or instruction in, a third setting. Still,

the setting used for generalization and maintenance was not as naturalized as hoped.

A home setting would have been ideal for generalization and maintenance since that is where most gardening naturally occurs. Skills for home landscaping or container gardening have more practical value than greenhouse skills which generalized to the work setting. Although, when seeking escape from home or work conflicts, studies show healthy stress reduction at work may include sitting outside, nearness to nature, enjoying a garden, touching grass or plants, smelling flowers, and walking park trails (Clare & Barnes, 1999; Edlin, Golanty, & Brown 2000; Kaplan, 1990; Ulrich, 1981.) Therefore, to maintain positive behavior change, or to remove the stimulus causing aberrant displays, partaking in outdoor excursions, focuses the mind on more positive things.

The fact that secondary reinforcers were used generously at first then faded increased the chances of skill retention for all participants since rewards such as praise and affirmations tend to last longer than food or drink (Alberto & Troutman, 2003.) Furthermore, using primary reinforcers for adults is less age-appropriate and might even become a contaminating variable to treatment given the particular preferences to flavor and taste.

Short-term gains were very evident from day to day as each participant recalled critical information from the previous session while maladaptive behaviors decreased. Long-term benefits were demonstrated in at least two participants in that skill transference occurred up to 6 weeks after treatment began. Such gains need reinvestigation at subsequent dates to test their

endurance over time for becoming lifelong leisure skills. In addition, the length of time that skills remain functional in different settings is an area worth studying.

Participant Logistics

Certain limitations when working with special populations in applied settings occur no matter how many variables are controlled. For Marsha, her week in treatment was also her week to recover from severe bronchitis requiring prescription cough syrup. The effects of codein seemed to make a flat affect more flat and disconnected. Furthermore, after her treatment concluded, inquiries were made about her typical non-medicated state when illness was not an issue. Staff commentary and clinical files revealed that Marsha was regularly on Haldol, an exceedingly strong barbiturate intended to dull the senses.

This news explained her tired appearance, lumbering pace, sunken eyes, intermittent comprehension, and all around motionless demeanor. Apparently, her behavior patterns had been so disturbing (smearing fecal matter, hitting others) that the best solution was heavy medication. Working with Marsha remained a challenge throughout the week and the day she smiled in session became an isolated event. If possible, repeating treatment with an undrugged Marsha is still desired.

Half days for Mitchell may have skewed some data since the other three participants received treatment in two settings. However, his normal days at the center ended at noon so it was a naturally-occurring schedule for him. The State still required community-based exposure while he was in their service. Since data was divided by settings and the week's average, his graphed scores represent

what they claim. Mitchell was included in the study despite his irregular schedule because he met all the criteria for selection and care-giver consent was provided. Had that not be available from everyone, they could not have participated.

Another possible limitation stems from Colin's absence on the 4th day. All the other participants received instruction for 5 consecutive days. Since no one can predict illness or absences in advance, it must be absorbed into the realm of applied research hazards. Colin was required to perform additional sessions on the last day to have the same number of data points as the others. Thus, his contributions were equal although he might have *checked out* more on Friday being asked to do extra task sequences. Still, his communication responses rose by the study's conclusion.

There is the distinct possibility that Alvin has been misdiagnosed as having severe/profound mental retardation. He clearly mastered the horticultural tasks and performed well during the generalization and maintenance sessions, too. Both of which are possible for persons with severe developmental disabilities so that is not the reason for skepticism. It is the accuracy and the consistency of his day-to-day sessions that were more in sync with someone who has a much higher IQ score. Furthermore, since legislation in the last 40 years has afforded a better special education for persons who have mental retardation, it is possible that Alvin has benefited from this and shows great improvement than someone twice his age not exposed to early interventions.

The adaptive component within the definition of mental retardation suggests that it is not enough to possess academic (translated as cognitive)

skills, but rather aspects of safety knowledge, personal self-care, and everyday living skills. Alvin clearly mastered some skills with ease and comprehended more than the others, but, there is much doubt that he could successfully take the bus, drive a car, or use kitchen appliances on his own. Despite advances in cognitive testing materials, since he is nonverbal, assessing his true intellectual ability remains problematic.

Other limitations connected to vunerable populations were time allowed for actual instruction, transportation to and from treatment sites, consent from all parties, funding for materials, and technology use in natural settings. These struggles are common when conducting research with participants with special needs. It is likely that logistics will continue to cause delays for future projects in public settings. However, since some level of inclusion is found in all school systems, and outdoor classrooms are becoming more popular, it should be expected that the two entities will merge more frequently and eventually surpass these barriers.

Study Implications

This study attempted to contribute to many different fields of literature by addressing design issues, special education shifts, recreation/leisure studies, and horticultural therapy advances. Conducting applied research is wrought with many barriers since field work is always more complex than studies in controlled, clinical settings (Alberto & Troutman, 2000). Effective treatments have been provided by therapists using single-subject designs for many years, especially for individuals with mental retardation or other complicating factors where speech

and communication may be limited (Campbell, 1988). Future research should expand knowledge and applicability of horticultural as a treatment modality.

In terms of these specific research outcomes, successful behavioral interventions using horticultural activities were demonstrated here using a largely underserved population who may now be viewed in a positive light. Results indicated that target behaviors were decreased throughout treatment for all four participants and remained decreased for two participants after treatment ended. In addition, staff perspectives of participants were enhanced as a function of this experience. Marc Gold believed staff opinions make a huge difference in the lives of persons with disabilities. He claimed that during training, the choice of words used could elevate the stature people with severe disabilities, while at the same time respect their rights (Durgin, 2004).

Although training and education of ICF-MR (Intermediate Care Facility-Mental Retardation) staff has never been easy for many reasons, professional effectiveness requires staff serving people with disabilities to possess and maintain values that keep them open and flexible to learning and desirous of fresh treatment perspectives (Kaiser & McWhorter, 1990). The services that a person requires today may change tomorrow, in a month, or a year from now.

Part of offering quality special education services in school systems or with provider agencies involves a willingness to shift instructional paradigms. This means making a commitment to the self-determination philosophy which is a continual process adhering to developmental changes and interest areas over a lifetime (Sands & Weymeyer, 1996). During both Alvin and Mitchell's treatment,

their own adaptations to the learning process were celebrated, not corrected, without ever compromising reliability or validity.

This is the beauty of applied research: the unexpected ways in which the procedures of administering an intervention demonstrate far more in human capital than the actual variables being examined. It was at these times of illumination the nagging question regarding appropriateness of selecting target behaviors became a daily visitor. Who is to say that just because staff finds some abnormal client action annoying it goes to the chopping block soon to be a behavior targeted for reduction? And who can be sure the same behavior leading to self-injury in one will have the same result in another to warrant prohibiting any facsimiles of it? Sadly, an implicit characteristic of many psychiatric diagnoses locate sources of aberration soley within the individual without considering the complex environmental stimuli surrounding the labeled individual (Marelich & Erger, 2004). More study is needed in the area of ethical choices behind selection of behavior interventions that do not directly relate to safety or health issues.

General wellness and promotion of leisure opportunities for persons with disabilities remains a focus for therapeutic recreation (Howard & Young, 2002). Gardening and plant-related activities continue to have enormous potential as a leisure activity with a wide range of engagement. One can derive benefits from passive enjoyment by simply hiking in the woods collecting leaves (Kaplan, 1986) or competing in a flower show with the best Camelia (Relf, 1991).

Even community gardens have been evaluated as leisure sites for interracial interaction in urban settings (Glover, Parry, & Shinew, 2006.) Another form of garden-related leisure is found in autographical books where authors use metaphors between horticultural settings and human emotion. Famous gardening columnist Lee May authored a text in 1995 called “In My Father’s Garden” where a reunion with his estranged father after a 20 year absence was made possible only through discussions about their gardens. While it is doubtful persons with severe disabilities will write a book and publish it, they can certainly be given cameras to photograph gardens they visit or be taught how to collect seeds from the roadside. Basically, horticultural activities are flexible by design and offer recreational activities for aging populations (Relf, 1997), can be adapted for persons in wheelchairs (Adil, 1994), offers hope to disabled children (Greenstein, 1995) and provides benefits to the visually impaired (Goodrich, 2005). It is still the number one hobby in the U.S. and is considered a need by many, not a luxury. It does not waiver in popularity as a function of the weather, economy, or income and is represented in all cultures, faiths, ethnicity, and geographic regions (Reader’s Digest, 1986).

Future research should expand knowledge and applicability of horticulture as a treatment modality in assorted settings. Persons with paralysis in all four limbs can access computer programs with a mouthstick and design their own vegetable garden (Shepherd Center, 2000). Horticultural therapy is frequently employed at assisted living centers because of its effectiveness with dementia patients (Gogloitti, Jarrott, & Yorgason, 2004). More and more, non-gardening

settings such as schools, nursing homes, family shelters, and mental institutions are developing horticulture programs to broaden their offerings for leisure activities, enhance building appearance, and encourage community involvement.

Nowadays, many hospital settings have a resident hort-therapist who assists clients with recovery and healing in elaborately landscaped grounds specially designed for wellness and improved medical care (Ulrich, 2000). In a study examining the effects of horticulture on hospital patient mood and heart rate, results revealed that this intervention improved mood state and may help reduce stress during cardiac rehabilitation (Wichrowski, Whiteson, Haas, Mola, & Rey, 2005).

Bridges are being made between the utility of horticulture and marginal populations such that both entities have increased value. This particular study added new information specific to the use of single subject methodology with persons who have severe disabilities in a greenhouse setting at a public garden. Fields that may benefit from the results are special education, horticultural therapy, social work, recreation and leisure, and applied behavior analysis.

Conclusions

A study by Cole, Waldron, and Majd (2004) indicates that inclusive school settings for students with mental disabilities produced an increase in certain academic scores as compared to instruction delivered in a traditional classroom employing the pull out method for students with special needs. While horticulture is not always considered an academic subject, the setting in which any teaching occurs affects students with and without disabilities. According to Cole et al., a

change in mindset is needed from merely debating whether or not to provide inclusive settings to determining how best to create and administer inclusive education to ensure success for all students. It is no longer a case of *when* to include everyone but *how*.

As is the case with adults with disabilities who exit public school systems, it is especially inappropriate to separate them from mainstream society. In fact, a continuation of this study could address how well students with and without disabilities who received an inclusive education perform, adapt, and exist in non-academic settings such as ones with a focus on recreation. Offering a well-rounded education (academics and leisure) to persons of all ability levels increases the chance of society outside school settings being more receptive to including everyone rather than acquiescing to mandated rules about it. Bogdan and Taylor (2001) purport that in order for persons with developmental disabilities to become full community members, caring relationships must be present and nurtured as they are within groups of non-disabled persons.

The values of therapeutic versus scientific gains must be distinguished. It is simply not enough to reduce target behaviors; they must be decreased to safer levels and yield an improvement in individual behavioral repertoires. If new skills are transferred to new settings, particularly naturalistic environments, generalization and maintenance segments of the study will have contributed substantially to recreation and leisure research. Moreover, due to the potential for expanding treatment variables to include specific occupationally-based

instruction, advances in job placement procedures and supported employment options within the larger horticulture industry are imminent.

It is important to remember that social validity is defined as the value placed on a treatment, intervention, or experience in terms of its worth to study participants (Wolfensberger, 1988). Research results with certain characteristics enhance a study's social validity. There are many ways to measure this construct including assessment of the following features: value to participants' quality of life, response of peers and significant others, potential for improved role and opportunities in society, and effects of treatment.

By developing research initiatives that lead to liaisons with public gardens and arboreta, avenues for volunteer training, data collection, and therapeutic interventions will be opened. Hopefully researchers will have less difficulty accessing appropriate sites for studying the effects of a multitude of gardening tasks and activities on persons with differing abilities. Future studies can continue to investigate naturally-inclusive settings without compromising research integrity or forgoing reliability.

Issues of validity remain a concern for novice horticultural therapists who may need guidance in identifying actual goals and objectives to target during treatment. It is not sufficient to simply teach new skills without addressing long term change that affects quality of life. Surveying agency staff or direct care workers for ideas on implementing recreation and leisure activities affords them ground level involvement which may lead to longer-lasting behavior changes.

Finally, tolerance of alternate forms of communication and instructional advances will facilitate the creation of guides and scripts for progressive and effective community-based training. As with any educational or social service trend, identifying key players with vested interests and by keeping them connected through feelings of usefulness, both researcher and participant alike can make great strides establishing goals, achieving milestones, and adding to the growing body of horticultural therapy research.

REFERENCES

Adil, J.R. (1994). Accessible Gardening for People with Physical Disabilities: A Guide to Methods, Tools, and Plants. Woodbine House, Inc. Bethesda, MD 20817.

Airhart, D. L. (1987). Horticulture training for adolescent special education students. Journal of Therapeutic Horticulture, 2 , 17-22.

Airhart, D. L. (1988). Horticulture therapy activities for exceptional students. NACTA Journal, 42-44.

Airhart, D. L., & Doutt, K. M. (1990). Measuring client improvement in vocational horticultural training. In D. Relf (Ed.). The role of horticulture in human well-being and social development: A national symposium (pp. 181-184). Portland, OR: Timber.

Airhart, D.L., T. Willis, & P. Westrick. (1987). Horticultural training for adolescent special education students. Journal of Therapeutic Horticulture 2,17-22.

Alberto, P. A., & Troutman, A. C. (1986). Applied behavior analysis for teacher (2nd ed.). Columbus, OH: Merrill.

Alberto, P., Jones, N., Sizemore, A., & Doran, D. (1980). A comparison of individual and group instruction across response tasks. Journal of the Association for Persons with Severe Handicaps, 5, 285-293.

Alexander, J., North, M. W., & Hendren, D. K. (1995). Master gardener classroom garden project: An evaluation of the benefits to children. Children's Environments, 12(2), 256-263.

American Horticultural Therapy Association. (1995). Professional certification guidelines. Gaithersburg, MD.

Ary, D., Jacobs, L. C., & Razaveih, A. (1990). Introduction to research in education (4th ed.). Ft. Worth, TX: Harcourt Brace Jovanivich.

Balsom, P. D., & Bondy, A.S. (1983). The negative side effects of reward. Journal of Applied Behavior Analysis, 16, 283-296.

Baldwin, J. D., & Baldwin, J. I. (1981). Behavior principles in everyday life. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1977). Social Learning Theory. Englewood Cliffs,NJ: Prentice Hall.

Barlow, D. H., & Hersen, M. (1988). Single case experimental design: Strategies for studying behavior change (2nd ed.). New York: Pergamon.

Barloff, J. G., & Olley, J. S. (1999). Mental Retardation. UK: Psychology Press.

Barton, E. J., & LaGrow, S. J. (1983). Reducing self-injurious and aggressive behavior in deaf-blind persons through overcorrection. Journal of Visual Impairment and blindness, 77, 421-424.

Baumeister, A. A. Runcie, D., & Gardepe, J. (1984). Processing of information in iconic memory: Differences between nonretarded and retarded subjects. Journal of Abnormal Psychology, 93, 433-477.

Baumgart, D., Brown, L., Pumpian, I., Nisbet, J., Ford, A., Sweet, M., Messina, R., & Schroeder, J. (1982). Principle of partial participation and individualized adaptations in educational programs for severely handicapped students. Journal of The Association for Persons with Severe Handicaps, 3, 71-77.

Becker, W., Englemann, S. & Thomas, D. (1971). Teaching: A course on applied psychology. Chicago: Science Research Associates.

Belfiore, Browder, & Mace. (1994). Assessing choice-making and preference in adults with profound mental retardation across community and center-based settings. Journal of Behavioral Education, 4, 217-226.

Beirne-Smith, M., Patton, J. R.,Ittenbach, R. (2001). Mental Retardation (6th Ed.). NJ: Prentice Hall.

Bender, R. E. (1970). The conquest of deafness. Cleveland: The Press of Case Western Reserve University.

Berkell, D., & Brown, J. (1989). Transition from school to work for persons with disabilities. New York: Longman.

Bird, F., Dores, P. A., Moniz, D., & Robinson J. (1989). Reducing severe aggressive and self-injurious behaviors with functional communication training. American Journal on Mental Retardation,1, 37-48.

Blake, J. (1996, September 8). A taste of home. The Atlanta Journal-Constitution, p. A1.

Bloom, B. (Ed.). (1956). Taxonomy of educational objectives. New York: McKay.

Bogdan, R., & Taylor, S. J. (2001). The social construction of humanness: Relationships with people with severe retardation. In S. J. Taylor & R. Bogdan, Introduction to qualitative research methods: A guidebook and resource (3rd ed.). New York: John Wiley & Sons.

Bolton, C., & Camp, D. J. (1989). The post-funeral ritual in bereavement counseling and grief work. Journal of Geriatric Social Work, 13 (3/4), 49-59.

Borg, W. R., & Gall, M.D. (1989). Educational research: An introduction (5th ed.). New York: Longman.

Bosch, J., Van Dyke, D. C., Smith, S. M., & Poulton, S.(1997). Role of medical conditions in the exacerbation of self-injurious behavior: An exploratory study. Mental Retardation,35, 124–130.

Borthwick-Duffy, S. A., & Eyman, R. K. (1990). Who are the dually diagnosed? American Journal on Mental Retardation, 94, 586-595.

Bradley, L. (1993, March). Including students with disabilities in the mainstream. Lincletter, 15 (3).

Brawner-Jones, N. (1994). Support needs and strategies for adults with profound disabilities. In L. Sternberg (Ed.), Individuals with profound disabilities: Instructional and assistive strategies. (3rd ed. pp 510-540). Austin, TX: Pro-Ed.

Bristow, A. (1992). Gardening in retirement (2nd ed.). London: The Royal Horticulture Society.

Brodwin, Tellez, and Sandra K. Brodwin (1995). Medical, Psychological and Vocational Aspects of Disability. New York: Elliot & Fitzpatrick.

Broussard, C., & Northrup, J. (1995). An approach to functional assessment and analysis of disruptive behavior in regular education classrooms. School Psychology Quarterly, 10, 151-164.

Browder, D. M. (1991). Assessment if individuals with severe disabilities: An applied behavior approach to life skills assessment (2nd ed.). Baltimore: Brokes.

Brown, F., & Snell, M.E. (1993). Meaningful assessment. In M. E. Snell (Ed.), Instruction of students with severe disabilities. (4th ed.). (pp. 61-98). New York: Macmillam.

Bruner, J. (1986). Actual minds, possible worlds. Cambridge, MA: Harvard.

Bunney, S. (Ed.). (1996). The illustrated encyclopedia of herbs: Their medicinal and culinary uses. New York: Barnes & Noble.

Burgess, C. W. Horticulture and its application to the institutionalized elderly. Activities, Adaptive, & Aging, 14(3), 51-61.

Campbell, D. T., & Stanley, J. C. (1963). Experimental and quasi-experimental designs for research. Chicago: Rand McNally.

Calvert, D. R., Redell, R. C. Jacobs, U., & Baltzer, S. (1972). Experiences with preschool deaf-blind children. Exceptional Children, 38, 415-421.

Cano, J., & Metzger, S. (1995). The relationship between learning style and levels of cognition of instruction of horticulture teachers. Journal of Agricultural Education, 36(2), 36-43.

Carney, C. G. & Wells, C. F. (1987). Career planning: Skills to build your future (2nd ed.). Monterey, CA: Brooks/Cole.

Carr, E. G., Newsome, C. D., & Binkoff, J. A. (1980). Escape as a factor in the aggressive behavior of two retarded children. Journal of Applied Behavior Analysis, 13, 101-117.

Chaplin, M. (1980). Gardening for the physically handicapped & elderly. London: The Royal Horticulture Society.

Chubon, R. A. (1994). Social and psychological foundations of rehabilitation. Springfield, IL: Charles. C. Thomas.

Cimprich, B. (1990). Attentional fatigue and restoration in individuals with cancer. Doctoral dissertation, University of Michigan.

Cirrin, F. M., & Rowland, C. M. (1985). Communicative assessment of youths with severe/profound mental retardation. Mental Retardation, 23(2), 53-62.

Clippings (1995). Class schedule for spring/summer. The Atlanta Botanical Garden Newsletter, vol. 2.

Cloet, A., & Underhill, C. (1982). Gardening is for everyone. London: Souvenir.

Crawford, M. E. & Mendell, R. (1987). Therapeutic Recreation and Adapted Physical Activities for Mentally Retarded. New Jersey: Prentice Hall.

Coon, M.E., Vogelsberg R.T. & Williams, W. (1981). Effects of classroom public transportation instruction on generalization to the natural environment. Journal of the Association for the Severely Handicapped 6, 46- 53.

Czerkies, V. (1982). The horticultural therapy vocational interest inventory. In R. Mattson & J. Shoemaker, (Eds.) Part 1: Defining horticulture as a therapeutic modality (pp. 9-16). Department of Horticulture, Kansas State University.

Dannenmaier, M. (1995). Healing gardens. Landscape Architecture, 85(1), 56-58.

Dattilo, J., & Murphy, W. D. (1987). Behavior modification in therapeutic recreation. State College, PA: Venture.

Dattilo, J., & Murphy, W. D. (1991). Leisure education program planning: A systematic approach. State College, PA: Venture.

Dattilo, J., & St. Peter, S. (1991). A model for including leisure education in transition services for young adults with mental retardation. Education and Training in Mental Retardation, 26, 420-432.

Dattilo, J., & Schleien, S. J. (1994). Understanding leisure services for individuals with mental retardation. Mental Retardation, 32(1), 53-59.

Deitz, S. M., Repp, A. C., & Deitz, D. E. D. (1976). Reducing inappropriate classroom behavior of retarded students through three procedures of differential reinforcement. Journal of Mental Deficiency Research, 20, 155-170.

Derby, K. M., Wacker, D. P., Sasso, G. Steege, M., Sigrand, C. & Asmus, J. (1992). The use of brief functional analysis within an outpatient clinic: A summary of 79 cases. Journal of Applied Behavior Analysis, 25, 713-721.

Donatelle, R. J. (2002). Access to health (7th ed.) San Francisco, CA: pearson Education, Inc.

Dunlap, G. , Kern-Dunlap, L. Clarke, S., & Robbins, F. (1991). Functional assessment, curriculum revision, and severe behavior problems. Journal of Applied Behavior Analysis, 24, 387-397.

Doxon, L. E., Mattson, R. H., & Jurich, A. P. (1987). Human stress reduction through horticultural vocational training. HortScience, 22, 655-656.

Dobbs, G. S., & Relf, D. (1991). Enclave employment of individuals with disabilities in a university grounds maintenance department: A case report. Journal of Therapeutic Horticulture, 7, 38-48.

Donnelly, D. R., & Olczak, P. V. (1990). The effect of differential reinforcement of incompatible behaviors (DRI) on pica for cigarettes in persons with intellectual disability. Behavior Modification,14, 81-96.

Durgin, C. J. (2004). Paradign Shift: A reflection on the contributions of Marc Gold and implications for improving services today (Marc Gold Associates.) Article retrived July 7th, 2006 from http://www.marcgold.com/durginarticle.html

Duker, P. C., Dortmans, A., and Lodder, E. (1993). Establishing the manding function of communicative gestures with individuals with severe/profound mental retardation. Research in Developmental Disabilities, 14, 39–49.

Dunlap, G., Kern-Dunlap, L. Clarke, S., & Robbins, F. (1991). Functional assessment, curriculum revision, and severe behavior problems. Journal of Applied Behavior Analysis, 24, 387-397.

Duscharme, E. (1993). The lives of teacher educators. New York: Teachers College.

Dyer, K., Dunlap G., & Wenterling V. (1990). The effects of choice-making on the serious problem behaviors of students with developmental disabilities. Journal of Applied Behavior Analysis, 23, 515-524.

Ebel, S. (1991). Designing stage-specific horticultural therapy interventions for patient's with Alzheimer's disease. Journal of Therapeutic Horticulture 6(1), 3-9.

Eberbach, C. (1990). Children's gardens: The meaning of place. In D. Relf (Ed.), The role of horticulture in human well-being and social development: A national symposium (pp. 80-83). Portland, OR: Timber.

Edlin, G., Golanty, E., & McCormack, K. (2000). Essentials for health and wellness. (2nd ed.) Sadbury, MA: Jones and Bartlet.

Emshoff, J. G., Redd, W. H., & Davidson, W. S. (1976). Generalization training and the transfer of treatment effects with delinquent adolescents. Journal of Experimental Psychiatry and Behavior Therapy, 7, 141-144.

Engelmann, S., Becker, W.C., Carmine, D., & Gersten, R (1988). The direct instruction Follow-Through model: Design and outcomes. Education & Treatment of Children, 4, 303-317.

Evans, V., & Fredericks, B. (1991). Functional curriculum. Journal of Developmental and Physical Disabilities, 3(4), 409-447.

Evans, I. M. & Scotti, J. R. (1989). Defining meaningful outcomes for persons with profound disabilities. In F. Brown & D. Lehr (Eds.), Persons with profound disabilities: Issues and practices (pp. 83-107). Baltimore: Brookes

Erickson, R. C. & Wentling, T. L. (1988). Measuring student growth: Techniques and procedures for occupational education (rev. ed.). Urbana, IL: Griffon.

Falvey, M. A., Bishop, K. D., & Gage, S. T. (1995). Mental retardation. In M. G. Brodwin, F. A. Tellez, & S. K. Brodwin (Eds.), Medical, psychosocial, and vocational aspects of disability (pp.165-178). Athens, GA: Elliot & Fitzpatrick.

Felton, J. S. (1995). The physical examination. In In M. G. Brodwin, F. A. Tellez, & S. K. Brodwin (Eds.), Medical, psychosocial, and vocational aspects of disability (pp.35-49). Athens, GA: Elliot & Fitzpatrick.

Ferguson, D. L., & Baumgart, D. (1991). Partial participation revisited. Journal of the Association for Persons with Severe Handicaps, 16, 218-227.

Ferguson, B., & McDonnell, J. (1991) A comparison of serial and concurrent sequencing strategies in teaching generalized grocery item location to students with moderate handicaps. Education and Training in Mental Retardation, 26, 292-304.

Ferretti, R. P., MacArthur, C. A., & Okolo, C. M. (2001). Teaching for historical understanding in inclusive classrooms. Learning Disability Quarterly,24, 59-71.

Ferro, J., Foster-Johnson, F., & Dunlap, G. (1994). Relation between curricular activities and problem behaviors of students with mental retardation. American Journal on Mental Retardation,101,184-194.

Flagler, J. (1993). Correctional youth and the green industry. Journal of Therapeutic Horticulture, 7, 49-55.

Forness, S. R., Thornton, R. L., & Horton, A. A. (1981). Assessment of applied academic and social skills. Education and Training of the Mentally Retarded, 4.

Foxx, R. M., Faw, G. D., McMorrow, J. M., Kyle, M. S., & Bittle, R. G. (1988) Replacing maladaptive speech with verbal labeling responses: an analysis of generalized responding. Journal of Applied Behavior Analysis,4, 411–417.

Frick, M. (1993). Theme: Serving individuals with disabilities. Agricultural Education Magazine, 65 (9), 44-20.

Gallivan-Fenlon, A. (1994). Their senior year: Family and service provider perspectives on the transition from school to adult life for young adults with disabilities. Journal of the Association for Persons with Severe Handicaps, 19, 11-23.

Gall, M. D., & Borg, W. R. & Gall, J. P.(1996). Educational research: An introduction (6th ed.). White Plaines: NY: Longman.

Gearheart, B. R. , & Weishahn, M. W. (1984). The exceptional student in the regular classroom (3rd ed.). St. Louis: Times Mirror/Mosby.

Gee, K., Graham, N., Sailor, W., & Goetz, L. (1993). Acquisition of basic sensory, motor, and social skills within regular class, school, and community settings. Behavior Modification, 17 (3), 210-222.

Gigliotti, C. M., Jarrott, S. E., & Yorgason, J. (2004). Effects of horticultural therapy activities for persons with dementia. Dementia, 3(2), 161-180.

Gigliotti, C. M., & Jarrott, S. E. (2005). Effects of horticultural therapy on engagement and affect. Canadian Journal on Aging. 2494) 367-377.

Gold, M. (1980). Try another way: Training manual. Champaign,IL: Research.

Goodban, A,, & Goodban, D. (1990). Horticultural therapy: A growing concern. British Journal of Occupational Therapy, 53, 425-429.

Goodrich, D. (2005, summer/fall). Gardening for young visually impaired or multi-impaired children. VIP Newsletter. 17, (1). Retrieved July 7th, 2006, from http://www.nfb.org/fr/fr18/fr05sf12.htm

Glausier, S. R., Whorton, J. E., & Knight, H. V. (1995). Recreation and leisure likes/dislikes of senior citizens with mental retardation. Activities, Adaptive, & Aging, 19(3), 43-54.

Glover, T. D., Parry, D. C., & Shinew, K. J. (2006). Leisure spaces as potential sites for interracial interaction: Community gardens in urban places. Journal of Leisure Research, 36(3).

Gresham, F. M. (1998). Designs for evaluating behavior change: Principals of single case methodology, In T. S. Watson & F. M. Gresham (Eds.).

Griffin, D. K., Rosenberg, H., Cheyney, W., & Greenberg, B. (1996). A comparison of self-esteem and job-satisfaction of adults with mild mental retardation in sheltered workshops and supported employment. Education and Training in Mental Retardation & Developmental Disabilities, 31, 142-150.

Griswold, M. (1996). A history of the sanctuary garden. Design Quarterly, 169, 1-9.

Gray, D. E. (2004). Doing research in the real world. London: Sage.

Greenstein, R. (1995) Education policy discourse and the new South Africa. Perspectives in Education, 16, 193 - 204.

Guess, D., & Siegel-Casey, E. (1985). Behavioral control and education of severely handicapped students: Who's doing what to whom? and why? In D. Bricker & J. Filler (Eds.), Serving students with severe mental retardation: From theory to practice. (pp. 230-244). Reston, VA: Council for Exceptional Children.

Hahn, A., Danzberger, J., & Lefkowitz, B. (1987). Dropouts in America: Enough is known for action. Washington, D C : Institute for Educational Leadership.

Hardman, M., Drew, C., Egan, M, & Wolf, B. (1993). Human exceptionality (4th ed.). Boston, MA: Allyn & Bacon.

Haring, K. A. & Lovett, D. L. (1990). A follow-up study of special education graduates. The Journal of Special Education, 23, 463-477.

Haring, T. G,. Breen, C., Weiner, J., Bednersh, F., & Kennedy, C. H. (1995). Using videotape modeling to promote generalized purchasing skills. Journal of Behavioral Education, 5, 29-54.

Hart, B., & Risely, T. (1975). Incidental teaching of language in preschool. Journal Applied Behavior Analysis, 8, 411-420.

Hazasi, S. B., Johnson, R. E., Hazasi, J. E., Gordon, L. R., & Hull, M. (1990). Employment of youth with and without handicaps following high school: Outcomes and correlates. Journal of Special Education, 23(4), 243-255.

Hasazi, S. B., Gordon, L. R., & Roe, C. A. (1985). Factors associate with the employment status of handicapped youth exiting high school form 1975-1983. Exceptional Children, 51, 455-469.

Hefley, P. D. (1973). Horticulture: A therapeutic tool. Journal of Rehabilitation, 39, 27-29.

Henderson, A. S. (1994). Does aging protect against depression? Social Psychiatry & Psychiatric Epidemiology, 29, 107-109.

Henry, D., Keys, C., Balcazar, F., & Jopp, D. (1996). Attitudes of community-living staff members toward persons with mental retardation, mental illness, and dual diagnosis. Mental Retardation, 34, 367-379.

Heward, W. L., & Orlansky, M. D. (1984). Exceptional children (2nd ed.). Columbus, OH: Merrill.

Hewitt, A. & Lakin, K. C. (2001). Issues in the direct support workforce and their connections to the growth, sustainability and quality of community supports. Durham, NH: National Program Office of Self-Determination.

Hewitt, A. & O'Nell, S. (1998). People need people: The direct service workforce. Impact, 10, 3-4.

Hieneman, M., & Dunlap, G. (2001). Factors affecting the outcomes of community based behavioral support: II. Assessing the relative importance of factor categories. Journal of Positive Behavior Interventions, 3, 67-74.

Hile M, G., & Desrochers, M. N. (1993). The relationship between functional assessment and treatment selection for aggressive behaviors. Research in Developmental Disabilities, 4, 265-274.

Hill, W. F. (1977). Learning: A survey of psychological interpretations (3rd ed.). New York: Harper & Row.

Hill, C. O.,& Relf, P. D. (1982). Gardening as an outdoor activity in geriatric institutions. Activities, Adaptive, & Aging, 3(1), 47-54.

Hill, J. W., & P. Wehman. (1979). Employer and nonhandicapped co-worker perceptions of moderately and severely retarded workers. Journal of Contemporary Business 8, 107-111.

Hoge, G., & Dattilo, J. (1995). Recreation participation patterns of adults with and without mental retardation. Education and Training in Mental Retardation and Developmental Disabilities, 30, 283-298.

Hope Haven Quarterly Report. (2004, Spring). Empowering Individuals with developmental disabilities. mPrint Design Studio: Author.

Horner, R. H., & Billingsley, F. F. (1988). The effect of competing behavior on the generalization and maintenance of adaptive behavior in applied settings. In R. H. Horner, C. Dunlap, & R. L. Koegel (Eds.). Generalization and maintenance: Lifestyle changes in applied settings (pp. 197-220). Baltimore: Brookes.

Horner, R. H., Albin, R. W., & Mank, D. M. (1989). Effects of undesirable behaviors on the generalization of adaptive skills: A case study. *Behavior Modification, 13*, 74-90.

Horner, R. H., Sprague, E. G., & Flannery, K. B. (1993). Building functional curricula for students with severe intellectual disabilities and severe behavior problems. In R. Van Houten & S. Axelrod (Eds.), Behaviorial Analysis and Treatment (p. 47-71). New York: Plenum.

Howard, D. K., & Young, M. E. (2002). Leisure: A pathway to love and intimacy. Disability Studies Quarterly,22, 101-120.

Howell, K. W., & Nolet, V. (2000). Curriculum based evaluation for special and remedial education (3rd ed.). Atlanta: Wadsworth.

Insel, P. M. & Roth, W. T. (2006). Core concepts in health (10th ed.) Boston: McGraw-Hill.

Jackson, D. A., & Wallace, R. F. (1974). The modification and generalization of voice loudness in a fifteen-year-old retarded girl. Journal of Applied Behavior Analysis, 7, 461–471.

Jackson, T. L., & Altman, R. (1996). Self-Management of aggression in an adult male with mental retardation and severe behavior disorders. Education and Training in Mental Retardation and Developmental Disabilities, 31, 55-65.

Janick, J. (1990). Horticulture and human culture. In D. Relf (Ed.), The role of horticulture in human well-being and social development: A national symposium (pp. 19-27). Portland, OR: Timber.

Johnson, A. B. (1990). Out of bedlam: The truth about deinstitutionalization. New York: Basic Books.Kaiser, A. R., & McWhorter, C. M. (Eds.). (1990).

Preparing personnel to work with persons with severe disabilities. Baltimore: Brookes.

Kanner, L. (1964). A history of the care and study of the mentally retarded. Springfield, IL: Charles C. Thomas.

Kaplan, R. (1973). Some psychological benefits of gardening. Environment & Behavior, 5(2), 145-162.

Kaplan, R. (1990). The psychological benefits of nearby nature. In D. Relf (Ed.), The role of horticulture in human well-being and social development: A national symposium (pp. 125-133). Portland, Oregon: Timber Press, Inc.

Kaplan, R. (1990). The restorative environment: Nature and human experience. In D. Relf (Ed.), The role of horticulture in human well-being and social development: A national symposium (pp. 134-142). Portland, Oregon: Timber.

Kamphaus, R. (1987). Conceptual and psychometric issues in the assessment of adaptive behavior. The Journal of Special Education, 21, 27-35.

Karner, G. (1989) Contracting design services. American Society of Landscape Architects, Washington, DC.

Kay, B. R. (1990). Bittersweet farms. Journal of Autism and Developmental Disorders, 20, 309-321.

Kavanaugh, J., & Musiak, T. (1991). Design and planning of horticultural therapy landscapes. American Horticulture Therapy Association Abstracts, Philadelphia.

Kavanaugh, J. & Musiak, T. (1992). Surveying the therapeutic landscape. Lubbock, Texas: Texas Tech University. Department of Landscape Architecture.

Kavanaugh, J., & Musiak, T. (1993). Selecting design services for therapeutic landscapes. Journal of Therapeutic Horticulture, 7, 19-22.

Kazdin, A. E. (1994). Behavior modification in applied settings. (5th ed.). Pacific Grove, CA: Brooks/Cole.

Kerlinger, F.N. (1986). Foundations of behavioral research (3rd. ed.). Fort Worth, TX: Holt, Rinehart, and Winston.

Kochhar, C., & Deschamps, A. (1992). Public crossroads in preserving the right of passage to independence for learners with special needs. The Journal for Vocational Special Needs, 14(2/3), 9-19.

Koller, H., Richardson, S. A., & Katz, M. (1988). Peer relationships of mildly retarded young adults living in the community. Journal of Mental Deficiency Research, 32, 321-331.

Kormann, R. J., & Petronko, M. R.(2004). Community inclusion of individuals with behavioral challenges: Who supports the careproviders? Mental Retardation, 42,223–228.

Kozloff, M. A. (1994). Improving educational outcomes for children with disabilities: Principles for assessment, program planning, and evaluation. Baltimore: Brookes.

Krefting, L. (1991). Rigor in qualitative research: The assessment of trustworthiness. American Journal of Occupational Therapy, 45, 214-222.

Krell, S. L. (1983). Acquisition of horticulture work skills by mentally retarded adults using social reinforcement. Unpublished master's thesis, Kansas State University, Manhattan, KS.

Kuhnert, K., Shoemaker, J., & Mattson, R. (1982). Job analysis of the horticultural therapy job profession. In R. Mattson & J. Shoemaker, (Eds.) Part 1: Defining horticulture as a therapeutic modality (pp. 17-27). Manhattan, KS, Department of Horticulture, Kansas State University.

Lalli, J. S., Casey, S. &, Kates, K. (1995). Reducing escape behavior and increasing task completion with functional communication, extinction,and response training. *Journal of Applied Behavior Analysis, 21*, 261-268.

Landesman-Dwyer, S., & Sackett, G. (1978). Behavioral changes in non-ambulatory profoundly mentally retarded individuals. In C. E. Meyers (Ed.), Quality of life in severely and profoundly mentally retarded people: Research foundations for improvement (pp.55-144). Washington, DC: American Association on Mental Deficiency.

Langone, J. (1990). Teaching students with mild and moderate learning disabilities. Boston: Allyn and Bacon.

Leavold Associates. (1997). Landscape design in the community [On-line]. (pp.1-3) Available: http//www.guilford.ac.uk/leavold/

Leccese, M. (1995). Nature meets nurture. Landscape Architecture, 85(1), 68-70.

Lee, J. S. (1994). Program planning guide for agri-science and technology education. Danville, IL: Interstate.

Lehr, J., & Harris, H. (1988). At-risk low achieving students in the classroom. Washington, DC: National Education Association.

Lemer, A.C. (1996).Infrastructure obsolescence and design service life. Journal Infrastructure Systems, 2, 153–161.

Lenske, B. J., Rotatori, A. F., & Kapperman, G. (1980). The use of behavior modification with deaf-blind persons. Journal for Special Educators, 17, 86-91.

Lenox, D. B., & Miltenberger, R. G. (1989). Conducting a functional assessment of problem behaviors in applied settings. Journal of the Association for Persons with Severe Handicaps, 14, 304-311.

Lewis, C. (1976). Society and horticulture. HortScience, 11(1), 4-5.

Lewis, M. V. (1991). The conceptual framework for inquiry: Facilitator or impediment to understanding? Journal of Vocational Education Research,16(4), 13-24.

Liben, L. S. & Polansky, C. J. (1977). Inferences on inferences: The effects of age, transitive ability, memory load, and lexical factor. Child Development, 48, 1490-1497.

Lincoln, Y. S., & Guba, E. G. (1985). Naturalistic inquiry. Beverly Hills, CA: Sage.

Lombana, J. H. (1992). Guidance for students with disabilities. (2nd ed.). Springfield, IL: Thomas.

Lombard, D., Neubauer, T. E., Canfield, D., & Winett, R. A. (1991). Behavioral community intervention to reduce the risk of skin cancer. Journal of Applied Behavior Analysis,24, 677-686.

Londa, S. (2004) Plants and Empire: Colonial Bioprospecting in the Atlantic World. Boston: Harvard University.

Loschen, E. L., & Osman, O. T. (1992). Self-injurious behavior in the developmentally disabled: assessment techniques. Psychopharmacology Bulletin, 28, 433-438.

Lowenfield, B. (1975). The changing status of the blind. Springfield, IL: Thomas.

Luselli, J. K., Evans, T. P., & Boyce, D. A. (1985). Reinforcement control of severe dysfunctional behavior of blind, multihandicapped students. American Journal of Mental Deficiency, 90, 328-334.

Luselli, J. K., Myles, E., & Littman-Quinn, J. (1983). Analysis of a reinforcement-timeout treatment package to control severe aggressive and destructive behaviors in a multihandicapped Rubella child. Applied Research in Mental Retardation, 4, 65-78.

Maag, J. W. (1989). Assessment in social skills training: Methodological and conceptual issues for research and practice. Remedial and Special Education,10, 6-17.

Marelich, W. D. & Erger, J. S. (Eds.). (2004) The Social psychology of health: Essays and readings. Thousand Oaks, CA: Sage.

MacMillan, D. L., Semmel, M.I., & Gerber, M. M. (1995). The social context: Then and now. In J. M. Kauffman & D. P. Hallahan (Eds.), The illusion of full inclusion (pp. 19-38). Austin, TX: Pro-Ed.

McCormick, K. (1995) Realm of the senses. Landscape Architecture, 85(1), 60-62.

McDonnell, J., Hardman, M. L., Hightower, J., Keifer-O'Donnell, R., & Drew, C. (1993). Impact of community-based instruction on the development of adaptive behavior of secondary-level students with mental retardation. American Journal on Mental Retardation, 97, 575-584.

McWilliams, R., Nietupski, J., & Hamre-Nietupski, S. (1990). Teaching complex activities to students with moderate handicaps through forward chaining of shorter total cycle response sequences. Education & Training in Mental Retardation, 25, 293-298.

Masters, L. F., & Mori, A. A. (1986). Teaching secondary students with mild learning and behavior problems. Rockville, MD: Aspen.

Mattson, R., Merkle, J., Hassan, B., & Waliczek, T. (1994). The benefits of community gardening. Community Greening Review, American Community Gardening Association.

Merriam, S. B. (1988). Case study research in education: A qualitative approach. San Francisco: Jossey-Bass.

Miller, P. H. (1989). Theories of developmental psychology. (2nd ed.). New York: Freeman.

Mira, M., & Hoffman, S. (1974). Educational programming for multihandicapped deaf-blind children. Exceptional Children, 40, 513-514.

Mish, F. C. (Ed.). (1986). Webster's ninth new collegiate dictionary. Springfield, MA: Merriam-Webster.

Moore, B. (1989). Growing with gardening: A twelve month guide for therapy, recreation, and education. Chapel Hill: University of North Carolina.

Moyer, J. R., & Dardig, J. C. (1978). Practical task analysis for educators. Teaching Exceptional Children, 11, 16-18.

Mudford, O. C., Hogg, J., & Roberts, J. (1997). Interobserver agreement and disagreement in continuous recording exemplified by measurement of behavior state. American Journal on Mental Retardation,102, 54-66.

Munk D. D. & Repp, A. C. (1994). The relationship between instructional variables and problem behavior: A review. Exceptional Children, 60, 390-401.

Murphy, J. F. (1975). Recreation and leisure service: A humanistic perspective. Dubuque, IA: Brown.

Murphy, P. (1982) Testing objective knowledge of professional horticultural therapists. In R. Mattson & J. Shoemaker (Eds.), Part 1: Defining horticulture as a therapeutic modality. (pp.37-66). Manhattan, KA, Department of Horticulture, Kansas State University.

Neff, W. F. (1985). Work and human behavior (3rd ed.). New York: Aldine.

Neumayer, R., Smith, R. W., & Lundgren, H. M. (1993). Leisure-related peer preference choices of individuals with Down syndrome. Mental Retardation, 31, 396-402.

O'Brien, S., & Repp, A. C. (1990). Reinforcement-based reductive procedures: A review of 20 years of their use with persons with severe or profound retardation. Journal of the Association for Persons with Severe Handicaps, 15,148-159.

Oberman, C. E. (1965). A history of vocational education in America. Minneapolis: Denison.

Odom, R. (1973) Horticultural therapy: A new education program. HortScience, 8, 458-460.

Olszowy, D. R. (1978). Horticulture for the disabled and disadvantaged. Springfield, IL: Thomas.

O'Reilly, M. F., Green, G., & Braunling-McMorrow, D. (1990). Self-administered written prompts to teach home accident prevention skills to adults with brain injuries. Journal of Applied Behavior Analysis, 24, 431-446.

Pace G.M, Iwata B.A, Cowdery G.E, Andree P.J, McIntyre T. Stimulus (instructional) fading during extinction of self-injurious escape behavior. Journal of Applied Behavior Analysis, 26,205–212.

Parker, D. C. (1990). The corporate garden. In D. Relf (ed.), The role of horticulture in human well-being and social development: A national symposium (pp. 28-33). Portland, OR: Timber.

Parrish, J. M., Iwata, B. A., Dorsey, M. F., Bunck, T. J., & Slifer, K. J. (1985). Behavioral analysis, program development, and transfer of control in the treatment of self-injury. Journal of Behavior Therapy and Experimental Psychiatry, 16, 159-168.

Patel, I. C. (1990). Socio-economic impact of community gardening in an urban setting In D. Relf (Ed.), The role of horticulture in human well-being and social development: A national symposium (pp. 84-87). Portland, OR: Timber.

Peterson, L. D., Peterson, M. H., West, R. P., & Richard, K. (1999). Young effects of student self-management on generalization of student performance to regular classrooms. Education & Treatment of Children, 22, 357-382.

Pike Family Nursery. (1993). Unpublished employee handbook.

Premack, D. (1959). Toward empirical behavior laws: I. Positive reinforcement. Psychological Review, 66, 219-233.

Priest, M. J. (1984). Assessing adult developmentally disabled client ability to discern horticultural crop quality. Unpublished master's thesis, Manhattan, KA, Kansas State University.

Kelly, R. L, & Matson, J. L. (1989). Social skills in the hearing impaired. Journal of Clinical Child Psychology, 3, 247-258.

Reader's Digest (1990). Magic and medicine of plants. Pleasantville, New York: The Reader's Digest Association.

Reid, D. H., Phillips, J. F., Green, C. W. (1991). Teaching persons with profound multiple handicaps: A review of the effects of behavioral research. Journal of Applied Behavior Analysis, 24, 319-336.

Reiss, S. (1990). Prevalence of dual diagnosis in community-based day programs in the Chicago metropolitan area. American Journal on Mental Retardation, 94, 578-585.

Repp, A. C., Deitz, S. M., & Speir, N. C. (1974). Reducing stereotypic responding of retarded persons by the differential reinforcement of other behavior. Journal of Mental Deficiency, 79, 279-284.

Rice, D. M., & Rosen, M. (1991). Direct-care staff: A neglected priority. Mental Retardation, 29(4), iii-iv.

Richardson, S. A., Katz, M., & Koller, H. (1993). Patterns of leisure activities of young adults with mild mental retardation. American Journal on Mental Retardation, 97, 431-442.

Riggen, K. ,& Ulrich, D. (1993). The effects of sport participation on individuals with mental retardation. Adapted Physical Activity Quarterly, 10(1), 42-51.

Riordan, R. J., & Williams, C. S. (1988). Gardening therapeutics for the elderly. Activities, Adaptation, and Aging 12,103-111.

Rogers, C. R. (1959). A theory of therapy, personality, and interpersonal relationships as developed in the client-centered framework. In S. Koch (Ed.), Psychology: A study of science. New York: McGraw-Hill.

Rose, G., & King, P. (Eds.). (1992). Good gardens guide: 1992. London: Vermilion.

Ross, R. (1997). Gardening with wheels. New Mobility, March.

Rotegard, L. L., Bruininiks, G. H., Holman, J. G., & Lakin, K. C. (1985). Environmental aspects of deinstitutionalization. In R. H. Bruininiks & K. C. Lakin (Eds.), Living and learning in the least restrictive environment (pp. 155-184). Baltimore: Brookes.

Rubin, A. & Babbie, E. (2001). Research methods in social work. (4th ed.). Pacific Grove, CA: Brookes/Cole.

Sailor, W. , Gee, K., & Karasoff, P. (1993). Full inclusion and school restructuring. In M. E. Snell (Ed.), Instruction of students with severe disabilities (4th ed, pp. 1-30). New York: McMillan.

Salvia, J., & Ysseldyke, J. E. (1984). Assessment in remedial and special education (3rd ed.). Boston: Houghton Mifflin.

Sands, D. K., & Wehmeyer, M. L. (Eds.). (1996). Self-determination across the life span: Independence and choice for people with disabilities. Baltimore: Brookes

Sarason, I. G., & Sarason, B. R. (1987). Abnormal psychology: The problem of maladaptive behavior. Englewood Cliffs, NJ: Prentice-Hall.

Sarkees-Wircenski, M. & Scott, J. L. (1995). Vocational special needs (2nd ed.). Homewood, IL: American Technical.

Schalock, R.L. (1990). Quality of life: Perspectives and issues. Washington, DC: American Association on Mental Retardation.

Schleien, S. J., Kiernan, J., & Wehman, P. (1981).Evaluation of an age-appropriate leisure skills program for moderately retarded adults. Education and Training of the Mentally Retarded, February.

Schleien, S. J., & Ray, M. T. (1988). *Community recreation and persons with disabilities*. Baltimore: Brookes.

Schleien, S. J., Rynders, J. E., Mustonen, T., Heyne, L. A., & Kaase, S. J. (1991). Teaching horticulture skills to adults with autism: A replicated case study. Journal of Therapeutic Horticulture, 7, 21-35.

Schloss, P. J., Schloss, C. N., Wood, C. E.,& Kiehl,W. S. (1986). A critical review of social skills research with behaviorally disordered students. Behavioral Disorders, 12, 1–14.

Schwartz, S., & Baer, D. M. (1991) Social validity assessments: is current practice state of the art? Journal of Applied Behavior Analysis, 24, 189–204.

Schwebel, A. I. (1993). Psychological principals applied in horticultural therapy. Journal of Therapeutic Horticulture, 8, 3-12.

Sharpton, W. R., & West, M. (1992). Severe and profound mental retardation. In P. J. McLaughlin & P. Wehman (Eds.), Developmental disabilities: A handbook for best practices (pp.16-29). Stoneham, MA: Andover Medical.

Shoemaker, C. A. (1982). Modeling as prevocational horticultural training method with trainable mentally retarded adults. Unpublished master's thesis, Manhattan, KA, Kansas State University.

Shoemaker, C. A., Relf, D., & Bryant, C. (1990). The role of flowers in the bereavement process. In D. Relf (Ed.), The role of horticulture in human well-being and social development: A national symposium (pp. 43-46). Portland, OR: Timber.

Sidman, M. (1960). Tactics of scientific research. New York: Basic Books.

Sigafoos, Tucker, Bushnell, (1997). A practical strategy to increase participation and reduce challenging behavior during leisure skills programming. *Mental Retardation, 35,* 198-208.

Sitlington, P.L., Frank, A.R., & Carson, R. (1992). Adult adjustment among high school graduates with mild disabilities. Exceptional Children, 59, 221-233.

Sisson, L. A., VanHasselt, V. B., & Hersen, (1993). Behavioral interventions to reduce maladaptive responding in youth with dual sensory impairment. Behavior Modification, 17(2), 164-188.

Slayton, D. (1978-79). Meeting individual needs through horticultural therapy. National Council for Therapy and Rehabilitation through Horticulture Newsletter, 5 (12), 3-6.

Slifer, K. J., Iwata, B. A., & Dorsey, M. J. (1984). Reduction of eye-gourging using a response interruption procedure. Journal of Behavior Therapy and Experimental Psychiatry, 15, 369-375.

Smith, J. K., & Heshusius, L. (1986). Closing down the conversation: The end of the quantitative -qualitative debate among educational inquirers. Educational Researcher, 15(1), 4-12.

Snell, M. E. (Ed.). (1993). Instruction of students with severe disabilities (4th ed.). New York: Macmillan.

Soderback, I., Soderstrom, M., & Schlander, E. (2004). Horticultural therapy: The healing garden and gardening in rehabilitation measures at Danderyd Hospital Rehabilitaion Clinic, Sweden. Pediatric Rehabilitation, 7(4), 245-260.

Sprague, J. R., & Horner, R. H. (1993). Determining the acceptability of behavior support plans. In M. Wang, H. Walberg, & M. Reynolds (Eds.), Handbook of special education. Oxford, London: Pergamon.

Sprague, J. R., & Horner, R. H. (1992). Covariation with functional response classes: Implications for treatment of severe problem behavior. Journal of Applied Behavior Analysis, 25, 735-745.

Stainback, W., Stainback, S., & Strathe, M. (1983). Generalization of positive social behavior by severely handicapped students: A review and analysis of research. Education and Training of the Mentally Retarded, 18, (pp. 294-299).

Stamm, I. & Barber, A. L. (1978). The Nature and Change in Horticultural Therapy. Paper presented at the 6th Annual Conference, National Council of Therapy & Rehabilitation through Horticulture, Topeka, KA.

Stein, S. B. (1974). About dying: An open family book for parents and children together. New York: Walker.

Sternberg, L. (Ed.). (1994). Individuals with profound disabilities: Instructional and assistive strategies (3rd ed.). Austin, TX: Pro-Ed.

Stober, P. L., & Mattson, R. H. (1993). A survey of horticultural therapy professional issues. Journal of Therapeutic Horticulture, 7, 23-41.

Stokes, T. F., & Baer, D. M. (1977). An implicit technology of generalization. Journal of Applied Behavior Analysis, 14, 131-140.

Stoneham, J. (1997). Why is horticulture a good medium for work with people with special needs? [On-line]. Horticultural therapy goals. (pp.1-4). Available: http//ourworld.compuserve.com/homepages/ Jane_Stoneham/jmcd.htm

Storey, K., Sandow, D., & Rhodes, L. (1990). Service delivery issues in supported employment. Education and Training in Mental Retardation, 25, 325–332.

Thomas, W. & Stermer, M. (1999). Eden Alternative Principles hold promise for the future of long-term care. Balance, 3, 14-17.

Tawney, J. W., & Gast, D. L. (1984). Single subject research in special education. Columbus: Merrill.

Taylor, R. L. (1993). Assessment of exceptional students: Educational and psychological procedures (3rd ed.). Needham Heights, MA: Allyn & Bacon.

The Education of All Handicapped Act Amendments of 1983. Pub.L.No. 98-199.

The Education of All Handicapped Children Act of 1975. Pub. L. # 94-142.

The Vocational Education Amendments of 1976. Pub. L. # 94-482.

Tristan, J., & Nguyen-Hong-Nheim, L. (1990). Horticultural therapy and Asian refugee resettlement. In D. Relf (Ed.), The role of horticulture in human well-being and social development: A national symposium (pp. 189). Portland, OR: Timber.

Tukey, H. (1983). Horticulture and other professionals. HortScience, 18(1), 11-13.

Tyson, M. M. (1987). Memories of Grandma's backyard. Journal of Therapeutic Horticulture 2, 29-35.

Ulrich, R. S. (1990). The role of trees in human well-being and health. In P. D. Rodbell (Ed.) , Proceedings from the fourth urban forestry conference: American forestry association (pp.25-30). Washington, DC: National Forestry Department

Ulrich, R. S. (1990). View through a window may influence recovery from surgery. Science, 224, 420-421.

Ulrich, R. S., & Parsons, R. (1990). Influences of passive experiences with plants on individual well-being and health. In D. Relf (Ed.), The role of horticulture in human well-being and social development: A ational symposium (pp. 93-105). Portland, OR: Timber.

Valenstein, E. S. (1986). Great and desperate cures. New York: Basic Books.

Van Hasselt, V.B., Hersen, M. Egan, B.S., McKelvey, J. L., & Sisson, L.A. (1989). Increasing social interactions in deaf-blind severely handicapped young adults. Behavior Modification, 2, 257-72.

Van Houten, R., Axelrod, S., Bailey, J. S., Favell, J. E., Foxx, R. M., & Iwata, B. A., et al. (1988). The right to effective behavioral treatment. *Journal of Applied Behavior Analysis, 21*, 381-384.

Verderber, S.F. (1986). Dimensions of person-window transactions in the hospital environment. Environment and Behavior 18, 450-466.

Voeltz, L. M., & Evans, I. M. (1982). The assessment of behavioral interrelationships in child behavior therapy. Behavioral Assessment, 4, 131-165.

Vollmer, T. R., Iwata, B. A., Zarcone, J.R., Smith, R. G., & Mazaleiski, J. L. (1993). The role of attention in treatment of attention-maintained self-injurious behavior: Noncontingent reinforcement and differential reinforcement of other behavior. *Journal of Applied Behavior Analysis, 26*, 9-21.

Vollmer T.R, Marcus B.A, Ringdahl J.E, Roane H.S. Progressing from brief assessments to extended experimental analyses in the evaluation of aberrant behavior. Journal of Applied Behavior Analysis, 28, 561–576.

Wacker, D. P., Steege, M. W., Northop, J., Sasso, G., Berg, W., Reimers, T., Cooper, L., Cigrand, K., & Donn, L. (1990). A component analysis of functional communication training across three topographies of severe behaviors problems. Journal of Applied Behavior Analysis, 23, 417-429.

Wacker, D. P., Berg, W. K., Choisser, L., & Smith, J. (1989). Evaluation of the generalized effects of a peer-training procedure with moderately retarded adolescents. Journal of Applied Behavior Analysis, 22, 261–273.

Walker, H. M., Colvin, G., & Ramsey, E. (1995). Antisocial behavior in school: Strategies and best practices. Pacific Grove, CA: Brooks/Cole.

Warren, S., & Bambura, L. (1989). An experimental analysis of milieu language intervention: Teaching the action-object form. Journal of Speech and Hearing Disorders, 54, 448-461.

Wehman, P. (1981). Competitive employment: New horizons for the severely disabled individuals. Baltimore: Brookes.

Wehman, P., Moon, M. S., Everson, J. M., Wood, W., & Barcus, J. M. (1988). Transition from school to work: New challenges for youth with severe disabilities. Baltimore: Brookes.

Wehman, P., Kregel, J., & Seyfarth, J. (1985). Community integration of young adults with mental retardation: Transition from school to adulthood. In P. Wehman & J. W. Hill (Eds.). Competitive employment for persons with moderate and severe mental retardation: From research to practice (pp. 197-215). Richmond Rehabilitation and Training Center, VA Commonwealth University.

Wichrowski, M., Whiteson, J. Haas, F. Mola, A. & Rey, M. (2005). Effects of horticultural therapy on mood and heart rate in patients participating in an inpatient rehabilitation program. Journal of Cardiopulmonary Rehabilitation, 25(5), 270- 274.

Winnett, R. A., Moore, J. F., & Anderson, E.S. (1991). Extending the concept of social validity: Behavior analysis for disease prevention and health promotion. Journal of Applied Behavior Analysis, 24(2), 231-234.

Wittwer, S. H. (1972). Restructuring horticulture. HortScience, 7(6), 544.

Wolcott, H. F. (1990). On seeking - and rejecting - validity in qualitative research. In E. W. Eisher, & A. Peshkin, (Eds.). A qualitative inquiry in education (pp. 121-152). New York: Teacher's College.

Wolfensberger, W. (1972). Normalization: The principle of normalization in human services. Toronto: National Institute on Mental Retardation.

Wolfensberger, W. (1988). Common assests of mentally retarded people that are not commonly acknowledged. Mental Retardation, 26, 75-76.

Yeomans, K. (1992). The able gardener: Overcoming barriers of age & physical limitations. Pownal, VT: Storey.

Zandstra, P. J. (1987). Evaluating the effectiveness of your horticultural therapy program. Journal of Therapeutic Horticulture, 2, 23-27.

Zarcone, J. R., Iwata, B. A., Hughes, C. E. & Vollmer, T. R. (1993). Momentum versus extinction effects in the treatment of self-injurious escape behavior. Journal of Applied Behavior Analysis, 26, 135-136.

Zhou, W., & Relf, D. (1991). Horticulture for special populations in China. Journal of Therapeutic Horticulture, 6,10–15.

APPENDIX A

GUARDIAN CONSENT FORM

GUARDIAN CONSENT FORM

, , agree to allow my child participate in the research project entitled: “Effects of Gardening Activities on Persons with Disabilities”: A project providing inclusive opportunities for adults with mental retardation”. This research is being conducted by Martha DeHart, who is a doctoral student in the Department of Occupational Studies, under the direction of Dr. Jay Rojewski [706/542-1682] at The University of Georgia. I understand that this participation is entirely voluntary; I can withdraw my consent at any time without penalty. I also have the option to receive a copy of the results of the study if I so desire.

The following points have been explained to me: I

1) The reason for the research is to examine the effects of teaching horticultural skills on aberrant behaviours of adults with mental retardation and to investigate ways in which study participants might be included in leisure activities by volunteering within the community.

2) The procedures are as follows: Ms. DeHart will recruit 2-4 adults with cognitive disabilities with whom she personally met and observed at their day treatment center. The researcher will accompany each participant to each participant to each setting at the local botanical garden and remain present throughout the week during instruction. Simple repotting of pansies from 6-packs into 6’ pots is the primary task.

These options and activities will be described in detail prior to any sessions so to plan according to center staff scheduling. Transportation will be provided by center staff and the primar researcher. Photographs and videotaping of the surroundings and participants will be taken only if consent is granted by the parents/guardians.

Permission for such pictures will be acquired in advance of actual photographing. Additional data collection will include conducting a brief informal interview with the participants at the greenhouse where instruction will occur to observe their The entire project will last approximately 10-12 weeks from start to finish but each individual will only be taught for one week.

3) No discomforts or stresses are foreseen.
4) No risks are foreseen.
5) The results of this project will be kept entirely confidential. No real names or identifying information about people or places are used.

6) The investigator will answer any further questions about the research, now or during the course of the project at my request. Ms. DeHart may be reached at (706) 769-3391 regarding any aspect of the study.

_____

Signature of Investigator Date Signature of Participant Date

PLEASE SIGN BOTH COPIES OF THIS FORM.
KEEP ONE AND RETURN ONE THE OTHER TO THE INVESTIGATOR.

Research at The University of Georgia which involves human participants is overseen by the Institutional Review Board. Questions or problems regarding your rights as a participant should be addressed to Ms. Julia Alexander; Institutional Review Board; Office for V.P. for Research; The University of Georgia; 606A Graduate Studies Research Center; Athens GA, 30602-7411; Telephone: (706) 542-6514.

APPENDIX B

PARTICIPANT CONSENT FORM

PARTICIPANT AGREEMENT FORM

I, _____, agree to participate in the volunteer project with Martha DeHart. I understand that she will be teaching me gardening lessons at the botanical gardens and I will visit the greenhouse and a classroom there. I can decide if I want to participate and she will be there the whole time. If I stay with the project I know Martha will be videotaping me while we garden to show what I did there. I will be repotting and watering plants. If I do not want to do any of these things, I do not have to. If I change my mind and do not want to participate, I can leave the project just by asking Martha.

Signed: _____

Date:_____

Witness:_____

Date: _____

APPENDIX C

DIRECTOR OF FACILITY CONSENT FORM

DIRECTOR OF FACILITY CONSENT FORM

I, , agree to allow select clients served here to participate in the research project entitled: ""Effects of Gardening Activities on Persons with Disabilities": A project providing inclusive opportunities for adults with mental retardation".". This research is being conducted by Martha DeHart, who is a doctoral student in the Department of Occupational Studies, under the direction of Dr. Jay Rojewski [(706) 542-1682] at The University of Georgia. I understand that this participation is entirely voluntary; I can withdraw my consent at any time without penalty. I also have the option to receive a copy of the results of the study if I so desire.

The following points have been explained to me:

1) The reason for the research is to determine the effects of simple instructional activities using plant-related material for adults with mental retardation since leisure involvement for this group can be limited and challenging.

2) The procedures are as follows: Ms. DeHart will visit my worksite several weeks to make observations about who might participate in this project. The visits will not last more than two hours at a time and will be discreet so as not to disrupt the regular schedule of the participants served at the facility. The time and place of the Ms. DeHart's visits will be mutually agreeable to us both.

Members of direct-care staff will also be interviewed about behavior problems of certain clients that might benefit from an intervention using plants. After four clients are chosen, Ms. DeHart will teach them individually for one week at a time at the local botanical garden in two settings – a greenhouse and classroom. Transportation will be provided by the center bus driver. Supplies will be provided by Ms. DeHart.

3) No discomforts or stresses are foreseen. Participation is completely voluntary.

4) No risks are foreseen. No one will be forced to participate in the study.

5) The results of this participation will be kept confidential. No real names or identifying information about people or places will be used. Videotaping of the clients will be performed by Ms. DeHart and destroyed at the study's conclusion.
6) The investigator will answer any further questions about the research, now or during the course of the project at my request.

_____

Signature of Investigator Date Signature of Participant Date

(Sign both copies of form; keep one and return one to the investigator.)

Research at The University of Georgia which involves human participants is overseen by the Institutional Review Board. Questions or problems regarding your rights as a participant should be addressed to Ms. Julia Alexander; Institutional Review Board; Office for V.P. for Research; The University of Georgia; 606A Graduate Studies Research Center; Athens GA, 30602-7411; Telephone: (706) 542-6514.

APPENDIX D

VOLUNTEER CONSENT FORM

VOLUNTEER CONSENT FORM

I, , agree to participate as a volunteer for dissertation data analysis activities by serving as a trained observer of video-taped instructions. By signing this paper, I am agreeing to all the rules of confidentiality listed below as explained to me by the primary researcher, **Martha DeHart** on .

I agree to the following steps required for this study:

1) I will be shown video tapes of persons with disabilities who have been taught simple gardening skills in a greenhouse & classroom.

2) I will be shown and trained on how to evaluate the target behaviors for each participant and given a written description of each one.

3) I will then watch the videos of Ms. DeHart instructing the participants and record the incidence of these target behaviors.

4) I will use the special data recording forms provided by Ms. DeHart and complete it as accurately as possible, to the best of my ability.

5) I acknowledge that there is no payment or favors bestowed upon me as a result of my volunteering to assist with this research.

6) I realize I am not to discuss what I see on the tapes with anyone except other volunteers and Ms. DeHart so as not to reveal any identifying information such as race, gender, name, age, or disability of any participant.

7) I have been invited to ask questions at any time and will follow the guidelines set forth in training activities administered by Ms. DeHart.

8) I am aware that this study has been approved by the IRB at UGA and Ms. DeHart is adhering to Federal guidelines for research involving human subjects. She is a graduate student in the COE.

Signature of Volunteer date

APPENDIX E

STUDENT VOLUNTEER RECRUITMENT FLIER & LETTER

VOLUNTEERS NEEDED!

Please consider assisting a doctoral student at UGA analyze dissertation data involving adults with severe disabilities…Great opportunity to add research experience on your resume!

WHAT: Observe videotaped instructional sessions of adults with disabilities in a greenhouse and record frequency of target behaviors (sounds/actions) on log sheet.

WHEN: Participation requested during Spring & Summer semesters of 2004…Approx. 5 hours a week to view tapes in Aderhold; flexible scheduling allowed throughout the day.

WHY: KDE offers awards for community volunteer hours (and itÕs also a good way to learn about single-subject research designs!)

CONTACT: Call (706/338-9311) or e-mail Martha DeHart <mdehart@coe.uga.edu> for more information. All training will be provided. Volunteers must sign a confidentiality agreement prior to participation.

==========

Dear Students,

Thanks for e-mailing me or signing up at the KDE meeting to learn more about this research opportunity. I hope the paper flier or e-announcement explained what I am in need of regarding help with my data analysis. Most of you have asked about the time commitment connected to this project and I only have an estimate of that right now. However, there are some "guidelines" I can at least share with you at this point:

1) There are four clients who received instruction & who were videotaped.

2) Each client had two behaviors identified as needing "reduction" (for example, constantly touching his waist or belt buckle and grunting).

3) Each client had 2-4 sessions per day, for five days straight; two in the morning and two in the afternoon - each lasting about 20 minutes.

4) Some of the client sessions must be viewed twice to separate the two "target" behaviors and the frequency recorded; I need data for EACH behavior, not just each session.

5) Only selected sessions need to be viewed as long as some agreement between viewers is reached…I am required to evaluate 30% of the sessions - which is about 6 sessions per client.

6) I will provide the special checklist forms & recording sheets for each client so all you need to do is watch the video and listen for a timer to mark five minute

segments...Each five minute segment for each behavior has a box or blank where you'll fill in hash marks like this: ///// = 5. These forms will vary & I'll total them all up later.

7) There will be a practice session for each of you to learn to what exactly to watch for with each client...then I'll put the video on again from the beginning and actually begin scoring/recording what you see/observe.

8) The training might take an hour at the very most...I expect some of you will catch on quickly if I can explain the "behaviors" you need to record. The more specific I can be, the better recorders/observers you all will be and my research will be that much more accurate if I train you well - please ask any questions before, during or after the training.

9) All of this will hopefully take place in the same room (the Dean's conference room in Aderhold) with a video projector & TV for viewing.

10) Once trained, most sessions will only last an hour or so...If I ask you to sit there longer, something called "observer drift" begins and people tend to not observe as accurately after an hour of the same tape. So I will break it up depending on your schedules.

11) If you can spare a few hours a week (2?) that would be great! I really hope to complete this in two months, preferably by the end of this semester...

Please let me know how this sounds to each of you. If you can still participate, that is good news! If you feel it just isn't your thing, that's OK, too. I need really interested & dedicated people since unfortunately there is no funding to pay my volunteers. We could go out to lunch sometime afterwards and celebrate the end of this project!!

Not everyone has to come at the same time - I will be there whenever you all are free to be trained and view tapes...I am not grading you at all; just trying to teach you specific things about this type of research method. Many, many thanks. And please do not hesitate to call or write back with additional questions if you are still unsure and need more information in order to make up your mind.

For those still willing to participate, please send me your class & work schedules so I can organize a few different times for us to meet and see some practice tapes (on campus in G-10 Aderhold I think it is...)

Sincerely,

Martha DeHart, M.S.
706/338-9311 cell

APPENDIX F

SAMPLE DATA COLLECTION SHEET (ALVIN)

NAME: Alvin TARGET BEH: belt fixations FUNCTION: self-stim

RECORDING METHOD: 15 sec interval recording across 15 min. 2-4xday (demonstrates amount of on/off task behavior & frequency of banging)

KEY: TB= touch belt, circle when touching belt during each 15sec.

DAY/TIME: Thursday 9-9:15am DAY/TIME: Thursday 2-2:15 pm

15" 15" 15" 15"	15" 15" 15" 15"
1) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
1) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
2) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
2)TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
3) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
3)TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
4) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
4) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
5) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
5) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
6) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
6) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
7) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
7) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
8) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
8) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
9) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
9) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
10) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
10) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
11) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
11) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
12) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
12) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
13) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
13) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
14) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
14) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
15) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB
15) TB TB TB TB TB TB TB TB	TB TB TB TB TB TB TB TB

APPENDIX G

SAMPLE DATA COLLECTION SHEET (MARSHA)

NAME: Marsha TARGET BEH: hand-mouthing FUNCTION: sensory

RECORDING METHOD: 10 second intervals for 25 minutes 4Xday

(tells approximate number, duration, & distribution of target occurrences)

KEY: x = occurrence (hand in mouth) o = nonoccurrence

DAY/TIME: Monday 9-9:25am

10-second interval/per minute

1 2 3 4 5 6

1_____
2_____
3_____
4_____
5_____
6_____
7_____
8_____
9_____
10_____
11_____
12_____
13_____
14_____
15_____
16_____
17_____
18_____
19_____
20_____
21_____
22_____
23_____
24_____
25_____

DAY/TIME: Monday 9:30-10am

10-second interval/per minute

1 2 3 4 5 6

1_____
2_____
3_____
4_____
5_____
6_____
7_____
8_____
9_____
10_____
11_____
12_____
13_____
14_____
15_____
16_____
17_____
18_____
19_____
20_____
21_____
22_____
23_____
24_____
25_____

APPENDIX H

SAMPLE DATA COLLECTION SHEET (COLIN)

NAME: Colin TARGET BEH: Communication Response FUNCTION: Escape

RECORDING METHOD: 1 minute intervals for 25 minutes 4Xday
(provides coding for occurrences of specific communication behaviors during interval)

KEY: COM ATT = Communication Attempt COM RESP = Communication Response
(slash thru with colored marker = occurrence for each attempt & response)

DAY/TIME: Tuesday 9-9:30am

1 Minute Intervals		
1	COM ATT	COM RESP
2	COM ATT	COM RESP
3	COM ATT	COM RESP
4	COM ATT	COM RESP
5	COM ATT	COM RESP
6	COM ATT	COM RESP
7	COM ATT	COM RESP
8	COM ATT	COM RESP
9	COM ATT	COM RESP
10	COM ATT	COM RESP
11	COM ATT	COM RESP
12	COM ATT	COM RESP
13	COM ATT	COM RESP
14	COM ATT	COM RESP
15	COM ATT	COM RESP
16	COM ATT	COM RESP
17	COM ATT	COM RESP
18	COM ATT	COM RESP
19	COM ATT	COM RESP
20	COM ATT	COM RESP
21	COM ATT	COM RESP
22	COM ATT	COM RESP
23	COM ATT	COM RESP
24	COM ATT	COM RESP
25	COM ATT	COM RESP

DAY/TIME: Tuesday 1-1:30pm

1 Minute Intervals		
1	COM ATT	COM RESP
2	COM ATT	COM RESP
3	COM ATT	COM RESP
4	COM ATT	COM RESP
5	COM ATT	COM RESP
6	COM ATT	COM RESP
7	COM ATT	COM RESP
8	COM ATT	COM RESP
9	COM ATT	COM RESP
10	COM ATT	COM RESP
11	COM ATT	COM RESP
12	COM ATT	COM RESP
13	COM ATT	COM RESP
14	COM ATT	COM RESP
15	COM ATT	COM RESP
16	COM ATT	COM RESP
17	COM ATT	COM RESP
18	COM ATT	COM RESP
19	COM ATT	COM RESP
20	COM ATT	COM RESP
21	COM ATT	COM RESP
22	COM ATT	COM RESP
23	COM ATT	COM RESP
24	COM ATT	COM RESP
25	COM ATT	COM RESP

APPENDIX I

SAMPLE DATA COLLECTION SHEET (MITCHELL)

NAME: Mitchell TARGET BEH: touches calculator FUNCTION: escape

RECORDING METHOD: total duration across interval of 25 minutes 2-3xday (determines time spent engaging in behavior during set interval)

KEY: enter time at start/end of interval, tallying sec/min. per interval

DAY/TIME: Wed. 9-9:15am DAY/TIME: Wed. 2-2:15 pm

	start	stop		start	stop
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		
15			15		
16			16		
17			17		
18			18		
19			19		
20			20		
21			21		
22			22		
23			23		
24			24		
25			25		

APPENDIX J

DATA COLLECTION SHEET FOR

TASK COMPLETION

Task Analysis for Completion Rates

NAME: SESSION: RESULTS:

1) Go to/stay in designated area for repotting. comp incomp

2) Get 6” pots ready for repotting (stack/touch). comp incomp

3) Fill pot with soil using scoop/trowel (no spill). comp incomp
comp incomp
comp incomp
comp incomp
comp incomp
comp incomp

4) Using hand, pick up six pack with pansies. comp incomp

5) Remove plants from container gently. comp incomp
comp incomp
comp incomp
comp incomp
comp incomp
comp incomp

6) Correctly put 1 pansy plant per 6” pot. comp incomp
comp incomp
comp incomp
comp incomp
comp incomp
comp incomp

7) Add more soil to each pot to cover roots. comp incomp
comp incomp
comp incomp
comp incomp
comp incomp
comp incomp

8) Carefully pack soil down around plant. comp incomp
comp incomp
comp incomp
comp incomp
comp incomp
comp incomp

9) Tap sides of each pots to level soil. comp incomp
comp incomp
comp incomp
comp incomp
comp incomp
comp incomp

10) Fill watering can with water. comp incomp

11) Water each plant thoroughly (water drains.)	comp	incomp
	comp	incomp
	comp	incomp
	comp	incomp
	comp	incomp
	comp	incomp
12) Place one tag label per pot (right-side up).	comp	incomp
	comp	incomp
	comp	incomp
	comp	incomp
	comp	incomp
	comp	incomp
13) Place pots in tray (level & steady).	comp	incomp
	comp	incomp
	comp	incomp
	comp	incomp
	comp	incomp
	comp	incomp