SYSTEMATIC ANALYSIS OF GENERALIZATION PROGRAMMING OF VOCA-MEDIATED GREETING RESPONSES OF ADULTS WITH SEVERE DEVELOPMENTAL DISABILITIES

BY

JAMES M. EDIGER

A Thesis submitted to
the Faculty of Graduate Studies
In Partial Fulfillment of the Requirements for the Degree of

DOCTOR OF PHILOSOPHY

Department of Psychology
University of Manitoba
Winnipeg, Manitoba

The Faculty of Graduate Studies
500 University Centre, University of Manitoba
Winnipeg, Manitoba R3T 2N2

Phone: (204) 474 9377
Fax: (204) 474 7553
graduate_studies@umanitoba.ca

THE UNIVERSITY OF MANITOBA

FACULTY OF GRADUATE STUDIES

*****

COPYRIGHT PERMISSION

SYSTEMATIC ANALYSIS OF GENERALIZATION PROGRAMMING OF VOCA-MEDIATED GREETING RESPONSES OF ADULTS WITH SEVERE DEVELOPMENTAL DISABILITIES

BY

JAMES M. EDIGER

A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University of Manitoba in partial fulfillment of the requirement of the degree

Of

DOCTOR OF PHILOSOPHY

Acknowledgements

I would like to acknowledge and express my deepest gratitude to my advisor, Dr. Stephen Holborn, for his countless hours of consultation, support, guidance, encouragement, and friendship. You have instilled in me a standard of excellence that will undoubtedly influence all of my future behavior.

I would like to thank the members of my committee, Dr. Garry Martin, Dr. John Whiteley, and Dr. Dickie Yu, who all have contributed significantly both to this project and to my graduate training. I would also like to thank my external examiner, Dr. Rob Horner, for providing invaluable feedback on the manuscript.

I am grateful to Dr. Carl Stephens for his guidance, support, and the confidence he has shown in me throughout my graduate training.

I am also grateful to the four women who participated in my research and their families for their patience and their time. Thank you also to the incredibly dedicated staff of the St. Amant Centre, who accommodated my frequent, and often inconvenient, requests.

I would like to express my sincere appreciation to my trainers and probe partners for their generous gift of time and their commitment to the project. Thank you also to Kerri Walters and Michele Ediger their untiring efforts as research assistance.

A special thanks my friends and colleagues, Vicki Stubbings, Valdine Scott-Huyghebaert, and Angela Cornick, who provided much needed encouragement and much appreciated counsel.

Finally, I wish to acknowledge and express my appreciation for my wife, my friend, and my life partner, Michele, who provided unwavering support and encouragement throughout a very long, and often trying, process. Words are inadequate to express my gratitude or my love.

I wish to dedicate this thesis to Calvin James Ediger and William Mark Ediger. The time I spend on this project was time away from you. Please accept this dedication as a reminder of how very special and important you are to me.

Table of Contents

List of Tables

List of Figures

Abstract

The present research investigated the cumulative effects of three generalization programming strategies, on the generalized voice output communication aid (VOCA) mediated greeting responses of four adults with severe developmental disabilities. Individual programming components were introduced sequentially after which repeated assessments of generalization occurred. A combined research design, incorporating design features of multiple baseline across 2 participants, alternating conditions, and replication, evaluated the impact of massed trial training, spaced trial training, and multiple partner training on participants' greeting behaviors in the presence of unfamiliar, nondisabled peers in 4 distinct settings. All participants demonstrated incremental increases in generalized greeting behavior following massed trial training and multiple partner training but not following spaced trial training. Overall, the addition of multiple partner training to the training package resulted in the most pronounced increases in generalized responding, suggesting its primacy as a generalization programming component. These findings highlight the importance of training multiple stimulus exemplars as a generalization programming tactic, and point to stimulus control as the behavioral principle involved in producing generalization.

Systematic Analysis of Generalization Programming of VOCA-Mediated Greeting Responses of Adults with Severe Developmental Disabilities

For more than a century scholars, researchers, and practitioners have recognized the role of social competency in the clinical presentation of, and treatment for, mental retardation and other developmental disabilities (see AAMR, 2002; Siperstein, 1992 for historical reviews). Indeed, investigators have argued that limited social skills are a defining characteristic of mental retardation (e.g., Grossman, 1983) and that deficits in "social intelligence" should be central in any diagnosis of mental retardation (Greenspan & Granfield, 1992). The importance of social skills in the day-to-day functioning of persons with mental retardation has often been highlighted (e.g., McDevitt, Smith, Schmidt, & Rosen, 1978; Schalock & Harper, 1978). For example, lack of appropriate social skills has been identified as a significant contributor to the breakdown of community placements for persons with mental retardation (e.g., Stacy, Doleys, & Malcolm, 1979). Further, social skills deficits have been cited as a major reason for the failure of persons with mental retardation to obtain and maintain competitive employment (for a review see Greenspan & Schoultz, 1981). These perspectives led Schloss and Schloss (1985) to conclude that "interventions that promote social competence may be more likely to have an impact on the 'quality of life' of mentally retarded persons than traditional academic or vocational skill development efforts" (pp. 269-270).

Despite the recognized importance of social skills for persons with mental retardation and other developmental disabilities, empirical investigations of strategies to train and enhance social competency in this population have been relatively recent endeavors (for reviews, see Davies & Rogers, 1985; Robertson, Richardson, & Youngson, 1985). Initial efforts in this area were concerned primarily with the reduction of socially inappropriate, offensive, or disruptive behaviors (e.g., Bostow & Bailey, 1969; Weisen & Watson, 1967). More recently, investigators have become concerned with the teaching of pro-social behaviors to persons with developmental disabilities. In their review of the literature on social skills training for persons with mental retardation, Davies and Rogers (1985) found that many researchers have successfully enhanced the socially appropriate responses of persons with severe, moderate, and mild mental retardation. Positive outcomes have been reported over a broad range of target behaviors from simple motor responses such as hand waving (e.g., Stokes, Baer, & Jackson, 1974) and smiling (e.g., Hopkins, 1968) to more complex behavioral sequences and social rituals such as appropriate meal-time behaviors (e.g., Perry & Cerreto, 1977) and cooperative play (e.g., Lancioni, 1982) to social-cognitive skills such as interpersonal problem solving (e.g., Vaughen, Ridley, & Cox, 1983) and cognitive self-monitoring (Matson & Earnhart, 1981). According to Davies and Rogers, the most frequently used and successful behavioral procedures

consist of a combination of visual instruction, behavioral rehearsal, and contingent reinforcement.

One area of social skills training that has frequently been targeted by investigators is socially appropriate verbal behaviors (Robertson et al., 1985). Several investigators have pointed out the potential benefits that might accompany acquisition of a repertoire of social communication skills. For example, in many vocational settings, conversational skills are often the basis of initial evaluations for job placements (Craven, 1977; Schloss & Wood, 1990) and may affect long term employment status (Greenspan & Schoultz, 1981; Smith, 1981). Further, these skills may promote friendships and other social relationships with both disabled and non-disabled peers (Koegel, Koegel, Hurley & Frea, 1992). Indeed, many view the ability to communicate with others as a critical skill that contributes significantly to a disabled person's overall acceptance and participation in everyday life (Chadsey-Rusch, 1992; Sherman, Sheldon, Harchik, Edwards, & Quinn, 1992).

One of the difficulties faced by persons with severe developmental disabilities is a significant impairment in communication skills such that verbal communication is limited or absent altogether. Beukelman and Miranda (1998) described the profound impact that impaired verbal communication skills can have on the lives of persons with severe disabilities, such as limiting a person's opportunities to participate in meaningful social relationships. Fortunately,

interventions have been developed to enable those with severe communicative impairments to communicate with others. These interventions fall within the domain of Augmentative and Alternative Communication, a field of clinical practice devoted to assisting persons with severe communicative impairments.

Augmentative and Alternative Communication

When individuals are unable to use spoken language as a primary way of communicating, they must rely upon other methods and strategies to convey information to those around them. These other methods and strategies are collectively referred to as augmentative and alternative communication (AAC) and can range from simple gestures and facial expressions to the use of complex computerized devices that produce synthesized speech. According to the American Speech-Language-Hearing Association (ASHA), AAC refers to "an area of clinical practice that attempts to compensate . . . for the impairment and disability patterns of individuals with severe expressive communication disorders" (1989, p. 107). AAC practitioners assist individuals with impaired speech and communication skills to use aids and techniques to supplement existing verbal communication skills, or, in cases where speech impairment is severe, as a primary source of communication (Mustonen, Locke, Reichle, Solbrack, & Lindgren, 1991).

AAC systems fall into two general categories, gestural mode systems (e.g., American Sign Language) and graphic mode systems (e.g., Blissymbols).

Gestural mode systems involve the use of body movements (mainly the hands) and facial expressions to augment or to replace spoken communication. In contrast, graphic mode systems rely on stimuli (usually visual) presented through mediums other than the communicator's body to represent objects and concepts used in communication. Graphic mode systems may involve the use of line drawings, photographs, printed and other text based systems, and three-dimensional ("tangible") symbols.

Within the range of graphic mode AAC systems available, the use of electronic communication devices is increasing in popularity (Zangari, Lloyd, & Vicker, 1994). Electronic communication devices use technology to translate a non-vocal communicator's graphic-mode communicative responses (e.g., typing text into a computer) into auditory stimuli (e.g., a synthesized voice). Electronic communication devices can range in complexity from a simple system in which a communicator elicits attention from others by pressing a switch that sounds a buzzer (e.g., Gee, Graham, Goertz, Oshima, & Yoshioka, 1991) to the use of a laptop computer running software that produces a synthesized human voice to say words and phrases selected by the communicator. Devices that yield synthesized or digitized (recorded) speech are often referred to as Voice Output Communication Aids (VOCAs). Over the past decade, advances in computer technology have lead to a wide range of VOCAs being developed and utilized by non-vocal communicators (Beukelman & Miranda, 1998).

A number of authors have identified several advantages that VOCAs have over other AAC systems. First, because VOCAs produce speech output, they are easier for the lay person to understand, thereby reducing communication barriers often experienced by graphic and sign users when they attempt to communicate with others who are not familiar with AAC systems (Shepis, Reid, & Behrmann, 1996). These devices also enable the communicator to evoke attention and communicate information simultaneously, unlike other graphic and gestural mode systems, which require a user to initially gain the attention of a listener before information can be transmitted (Reichle & Karlan, 1985). As a result, potential communication partners may be more likely to respond to a communicator using a VOCA than to one using another AAC system (Durand, 1993; Calculator & Dollaghan, 1982). Finally, VOCAs allow a communicator to produce complex or sophisticated messages that would otherwise be impossible using other graphic based systems (Mustonen et al., 1991). Thus, the quality of communicative exchanges may be enhanced relative to that of other systems of communication.

Recognition of the advantages of VOCA use over other AAC systems has lead to growing interest in the use of these devices by people with developmental disabilities. Despite this interest, relatively little research has been published regarding the use of VOCAs as AAC systems with this population. The small body of literature that does exist suggests that persons with severe disabilities can learn to use VOCAs to request items (e.g., Shepis et al, 1996; Shepis, Reid,

Behrmann, & Sutton, 1998; Soto, Belfiore, Schlosser, & Haynes, 1995; Durand, 1993) and to initiate conversational exchanges (e.g., Dattillo & Camarata, 1991). A key issue that has yet to be addressed is that of generalization of VOCA use. Clearly, VOCA use would be limited if the communicator could only use the device in a circumscribed setting with a single communication partner. Although the Dattillo and Camarata (1991) and Shepis et al. (1996) investigations reported data suggesting that their participants used VOCAs outside of the training context, there are no analytical investigations that have specifically focused on generalized VOCA use as a primary outcome of interventions to teach VOCA use.

ACC Interventions and Generalization

Over the past 20 years, research in AAC has focused primarily on acquisition of communication skills, descriptive analysis of AAC system use, and the role of technology in AAC systems (Bedrosian, 1999; Zargari et al., 1994). Recently, there has been a growing awareness among AAC investigators of the importance of generalization in the overall efficacy of AAC interventions (Light, 1999; Schlosser & Braun, 1994). This has lead several investigators to evaluate various teaching methods with regards to their effectiveness at promoting generalized communicative behaviors. Among methods identified as "the best" are a set of training procedures referred to collectively as milieu teaching (Kaiser, Yoder, & Keets, 1992) or naturalistic teaching (Reichle & Sigafoos, 1991, Halle, 1982; 1987; Goertz & Sailor, 1994).

The essential feature of naturalistic teaching is that instruction occurs within the context of the learner's daily routines and experiences (i.e., in the natural environment) rather than in a highly controlled artificial setting, such as a special training room or the therapist's office. Learning trials are presented intermittently throughout the course of the day, rather than consecutively during training sessions, with the time of their occurrences largely under the control of the learner. Finally, communicative responses are functional only for those consequences that occur in the natural environment. That is, the use of contrived reinforcers to establish or maintain the communicative behavior is avoided. Proponents of naturalistic teaching suggest that these strategies are effective at producing generalized communication skills because they promote a heightened motivation to communicate. Goertz & Sailor (1994), for example, suggest that "training in the natural contexts enhances motivation above and beyond the specific situational contingencies of reinforcement that may be in effect" (p. 21).

Three procedural strategies have emerged within the natural teaching framework as being most conducive to producing generalized outcomes. These strategies include incidental teaching, mand-model technique, and time delay procedures (see Reichle & Sigafoos, 1991 for a more detailed description of these strategies). In the incidental teaching paradigm, the therapist waits for the learner to indicate some interest in an object or activity, then uses this "naturally occurring" situation as an opportunity to teach a requesting response. In the

mand-model approach, the therapist arranges the environment so that there are frequent situations in which the learner will require the assistance of the therapist (e.g., placing toys on a high shelf so that the learner must get the assistance of the therapist to obtain the toy). Once these contrived situations are encountered, the therapist will instruct the learner to request (i.e., mand) assistance utilizing a minimal prompting procedure (e.g., method of least prompts). Time delay also may involve the therapist arranging the environment so that the learner will require assistance of the therapist. However, instead of prompting the client to mand when these situations are contacted, the therapist will pause for a predetermined period of time before presenting the prompt. This delay in prompting allows the learner an opportunity to respond in the presence of a natural cue prior to the delivery of an instructional prompt.

Several studies have investigated the use of naturalistic teaching in the acquisition of communicative responses among persons with disabilties. Many of these studies suggest that naturalistic teaching can facilitate increases in the spontaneous emissions of target responses, maintenance of these responses over time, and generalization to new environments and partners (see Kaiser et al., 1992 for a review of this literature). Although this body of work suggests the possible utility of naturalistic training strategies in teaching generalized communicative responding in persons with severe developmental disabilities, several limitations are evident. First, the bulk of research demonstrating the effective use of

naturalistic teaching has not focused on persons with severe developmental disabilities, a group for whom AAC interventions are particularly relevant (Reichle & Sigafoos, 1991). Further, the extent to which naturalistic teaching strategies produce generalized communicative behaviors of individuals who are just learning to use AAC systems is not clear. Reichle (1997) reports that "the majority of investigations exploring the application of these procedures with beginning communicators, for the most part, have not carefully examined aspects of generalized use" (p. 122).

Finally, and of particular relevance to the present research, the critical components of naturalistic teaching strategies responsible for generalized responding have not been empirically demonstrated, despite calls for such an analysis by AAC investigators. In their discussion of evaluating the efficacy of AAC interventions, Schlosser & Braun (1994) state that, "once generalization is achieved in a study, an experimental analysis of the variables possibly associated with generalization success must be undertaken" (p. 211). This position has been voiced repeatedly in the behavioral literature by generalization researchers (Edelstein, 1989; Holborn & Ducharme, 1993, Johnson, 1979, Stokes, 1992; Stokes & Osnes, 1988; Ducharme & Holborn, 1997) who argue that investigations of the functional relationship between treatment variables and positive generalization outcomes are not just desirable, but essential if a complete

understanding of the processes and principles that underlie generalization is to be attained.

Purpose of Study

To date, the literature on naturalistic teaching has highlighted two characteristic features of the approach that are thought to be critical for generalization (Beukelman & Miranda, 1998; Goertz & Sailor, 1994). First, teaching trials are presented intermittently throughout the learner's day, during naturally occurring situations initiated by the learner, although the environment may be arranged by the teacher before hand to ensure that opportunities for learning present themselves. The goal is to ensure that the teaching trial occurs in a context that is similar to that which would be experienced in the natural environment (cf. Martin & Pear, 2002, p. 199). Second, the targeted communicative response is functional only for reinforcers that would likely be experienced, if the behavior occurred in the natural environment. Contrived reinforcers, that is, those that would not be experienced under non-training conditions, are avoided because their use is thought to detract from the learning experience (Goertz & Sailor, 1994).

A third feature inherent in the naturalistic teaching approach which likely contributes to generalization of communicative responses, is that the learner likely contacts multiple exemplars of salient stimuli (such as communication partners or specific settings) during communicative interactions, which ultimately become

discriminative for responding (Kaiser et al., 1992). During naturalistic training, the learner has access to an AAC system at all times in all situations. Inevitably, the learner will come in contact with several potential communication partners (e.g., a teacher, an instructional aid, a care provider, a peer, etc.) in a number of settings (e.g., in the classroom, hallway, kitchen, bedroom, etc). If naturalistic teaching strategies are employed by even a few of these partners, exposure to multiple exemplars of salient stimuli will have occurred, and the probability of a generalized response will have increased.

The behavioral literature has long recognized the importance of multiple exemplar training as a "tactic" in programming generalization. Indeed, in their seminal paper on generalization, Stokes and Baer (1977) describe the procedure of training sufficient exemplars as "perhaps one of the most valuable areas of [generalization] programming" (p. 355). Other investigators also have identified the training of multiple exemplars as being among the most critical generalization programming strategies across a broad range of target behaviors. For example, investigators have used this strategy in enhancing the generalization of communicative responses (e.g.,Chadsey-Rusch, Drasgow, Beinoehl, Halle, & Collet-Klingenberg, 1993; Hughes, Harmer, Killian, & Niarhos, 1995), pro-social behaviors (e.g., Ducharme & Holborn, 1997) and functional living skills (e.g., Horner, Albin & Ralph, 1986).

The purpose of the present study was to systematically investigate the effects of selected aspects of naturalistic teaching in producing generalization of a communicative response. Although previous research has indicated that naturalistic teaching strategies promote the generalization of newly learned communication responses, an analysis of the supposedly effective features of this approach has not been reported in the literature. The present research constituted a preliminary analysis and thus, was in accord with Schlosser & Braun's (1994) recommendation that, in assessing the efficacy of AAC interventions, "the effects of generalization strategies (independent variables) on generalized success (dependent variable) must be examined" (p. 211).

A secondary purpose was to document the effectiveness of naturalistic teaching strategies on the generalized use of VOCAs in persons with severe developmental disabilities (defined by the National Dissemination Centre for Children with Disabilities [2002] as individuals who "require ongoing, extensive support in more than one major life activity in order to participate in integrated community settings and enjoy the quality of life available to people with fewer or no disabilities."). Recently, Shepis et al. (1998) demonstrated that naturalistic teaching strategies were effective at increasing the communicative responses, including VOCA use, of four children with autism during two daily activities. Unfortunately, an assessment of the extent to which VOCA use generalized to new partners or new settings was not conducted. Indeed, very few studies have

investigated the generalized use of VOCAs in settings beyond the training environment. The present research attempted to expand on the existing literature on VOCA use among persons with severe developmental disabilities by specifically measuring generalization of VOCA use in non-training settings with communication partners not involved in skill acquisition training.

The specific communicative response targeted in this research was a simple social greeting response delivered via a VOCA. Several authors have noted the importance of greeting behavior, both in terms of its functional utility in gaining attention in a socially appropriate way and its role in determining a person's overall social attractiveness (Beukelman & Miranda, 1998). Further, an inability to initiate social contacts may lead to some clients being overlooked socially (Reichle, 1991). Although a number of studies have investigated the training and generalization of greeting responses in individuals with developmental disabilities (e.g., Stokes, Baer, & Jackson, 1974; Lowther & Martin, 1980; Matson & Francis, 1994), few have systematically analyzed factors responsible for generalized responding and none have investigated generalization of VOCA mediated greeting responses.

In the present study, three generalization programming procedures were introduced separately. During the initial phase of treatment, a "traditional" (Goertz & Sailor, 1994) behavioral training procedure, characterized by massed trial presentation and the use of contrived reinforcers, was introduced. In the next

phase, key features of a naturalistic teaching approach were introduced, including (a) presenting training trials intermittently throughout each participant's day, and (b) relying exclusively on naturally occurring consequences to maintain the target response. In the third treatment phase, training with multiple partners was added to the naturalistic teaching strategies introduced in the previous phase.

For the purposes of this study, generalization was defined as "the occurrence of relevant behavior under different, nontraining conditions without the scheduling of the same events in those conditions as had been scheduled in the training condition" (Stokes & Baer, 1977, p. 350). Generalization of greeting behavior to non-training partners and to non-training environments was assessed prior to the onset of each phase and again following the termination of each phase. This allowed for an analysis of the cumulative effects of the sequential introduction of the procedures on generalization.

A unique feature of the present research was the evaluation of generalization under two stimulus conditions (i.e., when participants were in the presence of a partner and when partners were alone). Many investigators have recognized the deleterious effects of overgeneralization, or the observation of a newly learned behavior in both appropriate and inappropriate nontraining situations. Indeed, Horner and Albin (1988) emphasize that "it is as important to teach people where not to perform newly learned skills as it is to teach them where they should use these skills" (p. 384). Despite this, few published studies have assessed whether

the generalization programming strategies employed resulted in overgeneralization. The goal of the present study was to teach participants to activate a VOCA *only when in the presence of a partner*. Generalized VOCA activation in the absence of a partner was considered inappropriate and undesired. In other words, the goal was to program "generalization with precision" (Horner et al., 1986).

Method

Participants

Participants were adult residents of the St. Amant Centre, a residential centre for persons with developmental disabilities in Winnipeg, Manitoba. Residents were selected for participation as follows: First, the Centre's Speech and Language Pathologists were provided with a brief description of the study and were asked to provide recommendations of residents who they thought would benefit from involvement in the study and who: (a) had no established socially appropriate method of greeting others or gaining attention from others, (b) were suspected of having a preference for social interaction with others, (c) were not currently using a VOCA independently to communicate with others, (d) had demonstrated no significant problem behaviors that would interfere with the study's procedures, and (e) had been assessed and judged to be physically capable of activating a VOCA known as a BIGmack (Ablenet Inc., see below for a description of this communication device).

In accord with Centre policy, parents and/or guardians of residents recommended by the Speech and Language Pathologists then were contacted and were informed about the purpose of the study and the procedures involved (see Appendix A for copy of the consent form). Residents whose parents/guardians did not provide consent were excluded from further consideration.

Next, the day program instructors of those residents whose parents/guardians provided consent were contacted and additional information to aid in participant selection was obtained. Specifically, instructors were asked to confirm that (a) the residents' daily schedule would allow for their participation in the study, (b) the residents enjoyed social interaction and were tolerant of social contact with people unfamiliar to them, (c) the residents attended day program regularly and were not frequently absent due to illness, and (d) the residents did not demonstrate significant visual or auditory impairments. Only those residents whose day program instructors were able to provide this confirmation were considered eligible for participation.

Among this group, four residents were identified by their living unit coordinators as being available for participation. All were women who lived with profound multiple disabilities including significant impairments in cognitive and physical functioning. Each utilized a wheelchair for ambulation and was dependent on others for all aspects of their personal care. Although all clients vocalized, these vocalizations were unintelligible. Further, none of the

participants utilized an augmentative or alternative communication system to communicate with others. Specific information about the participants' personal characteristics and skill level, as reported in their medical chart at the onset of the study, is presented in Table 1.

Prior to commencement of the study proper, the four selected residents were observed individually by the author for 10 minutes on three separate occasions to verify their tolerance/preference for social interaction. These sessions were conducted to (a) assess the participants' preference for social interaction relative to being alone, and (b) determine whether participants would be distressed by the presence of an unfamiliar person. During these sessions, participants were observed both under conditions of social isolation and while in the presence of the author. Further, the occurrences of behavioral indicators of happiness and unhappiness (Green & Reid, 1999) were recorded using a 30-second interval recording system (Kazdin, 1982, pp 30-32). Data recorded during these sessions indicated that none of the identified residents displayed behaviors indicative of unhappiness on more than 10% of intervals while in the presence of the observer, and none demonstrated indicators of happiness on more intervals when alone than when in the presence of the author.

Trainers and Probe Partners

Trainers were four Centre day program instructors, an undergraduate psychology student, a graduate psychology students, and the author. Trainers

Table 1

Personal Characteristics and Assessed Skill Levels of Participants

Participant	Age (years)	Diagnoses[a]	Assessed Age Equivalent Score[b]		
			Social Interaction	Language Comprehension	Language Expression
Rhonda	28	Moderate developmental delay; spastic athetoid cerebral palsy; musculoskeletal deformities	5 months	28 months	15 months
Carol	31	Microcephaly; profound developmental delay; spastic quadriparesis; seizure disorder	8 months	9 months	<6 months
Celine	37	Severe developmental delay; spastic quadriparesis; scoliosis	7 months	<6 months	<6 months
Kelly	27	Severe developmental delay; joint abnormalities; scoliosis	<4 months	<6 months	<6 months

[a]As reported in the participants' medical chart at the onset of the study

[b]Assessment of adaptive skills were conducted by the Centre's Psychology staff independent of this study using the Scales of Independent Behavior – Revised (Bruininks, Hill, Weatherman, & Woodcock, 1995)

were not involved in the direct care or support of the participants that they trained prior to or during the study. All trainers were required to attend a one-hour instructional inservice focused on training procedures and to score higher than 90% on a closed book test on the training protocol (see Appendix B) prior to working with participants. A total of seven individuals (four female and three male) served as trainers.

Generalization probe partners were undergraduate and graduate psychology students or Centre staff who volunteered to serve as probe partners. In total, 33 individuals served as probe partners. Prior to serving as a probe partner, these individuals were required to complete a brief training session which lasted approximately 15 minutes and to score 100% on a brief quiz presented orally at the end of the training session (see Appendix C). Probe partners were scheduled to conduct probes primarily based on their availability. However, no probe partner conducted more than one probe in any setting on any given day. None of the probe partners were involved in training sessions or had regular or frequent contact with any of the participants.

Voice Output Communication Aid

The Voice Output Communication Aid (VOCA) used was a BIGmack Communication Aid (AbleNet, Inc.) The BIGmack is a small battery powered device with a built-in microswitch that plays a brief pre-recorded message when activated. The unit measures about 12 cm in diameter and looks like a brightly

colored circle. It is lightweight and highly portable, making it an ideal introductory device for individuals who are learning to use a VOCA (Beukleman & Miranda 1998). The BIGmack was chosen because all participants were reported to have had experience in using the device, although none were currently using one independently as a communication device. Prior to involvement in the study, all participants were assessed by the Centre's Occupational Therapist, who verified that the participants were physically capable of independently activating a BIGmack.

The greeting message recorded on each participant's BIGmack was age appropriate and gender matched, and consisted of the statement "Hello, my name is _____ (participant's name)." This statement was chosen because it was believed to be a socially appropriate and effective stimulus to occasion a rejoinder from someone with whom the participant was not familiar (see Social Validation below).

Each participant had their BIGmack mounted on their wheelchair in a location that was easily accessible, but would minimally interfere with their ability to participate in their usual daily activities. Wanda and Shelly's BIGmacks were mounted with Velcro on their wheelchair trays, while Cheryl and Arlene's BIGmacks were attached to the arms of their wheelchairs via a bayonet mounting system. Each participant's day program instructor was asked to keep the BIGmacks mounted, but not turned on, throughout the day in between training

sessions. This was done to prevent the target response from inadvertently coming under the control of the presence of the device. At least five minutes prior to training sessions, the day program instructor or a research assistant unobtrusively activated the device, so that it was operational when training sessions began.

Settings

The research was conducted in four locations within the Centre. Training for Wanda and Cheryl was provided in their day program workrooms. This setting was selected because Wanda and Cheryl typically participated in skill training activities in their workrooms. Arlene and Shelly were trained in their bedrooms on their living units. Although these women also participated in training activities in their day program workrooms, their daily schedules involved working in different workrooms every day. Thus, it would have been impossible to ensure that training took place in the same workroom setting throughout the study. Fortunately, both women consistently spent a portion of their time in their bedrooms each day. By taking advantage of this aspect of the women's schedules, it was possible to provide training in a relatively consistent setting throughout the study. Because each woman shared her bedroom with another Centre resident who occasionally required exclusive use of the room for personal care, training trials occasionally (i.e., less than 10% of trials) took place in an adjacent bedroom with similar stimulus features.

Generalization probe trials for Wanda and Cheryl occurred in their workrooms, the Centre cafeteria, the living unit kitchen, and a common area on the living unit. Generalization probe trials for Arlene and Shelly were conducted in their bedrooms, a day program workroom, the centre Cafeteria, and the dining room on the living unit. These settings were selected for generalization probes because informal observations and reports from Centre staff indicated that residents were likely to have opportunities for social interactions with others in these settings. Each setting had stimulus properties that were very distinct from those of other settings utilized.

Design

A combined research design (Kazdin, 1982, p. 200), which integrated features of multiple baseline (across two participants), alternating conditions (involving two stimulus conditions), and replication (across a second pair of participants at a later time) designs, was used to evaluate the effects of three distinct training phases on generalized greeting responses. Training phases were presented in sequential fashion in which massed trial training was followed always by spaced trial training, which, in turn, was followed always by multiple partner training. A series of generalization probe trials was conducted following each training phase to evaluate the relationship between phase of training and generalized responding to nontraining partners and settings. An initial series of generalization probes, completed prior to the onset of the first training phase, served as baseline. Thus,

the independent variables were (a) phase of training, and (b) stimulus condition. The dependent variable was the percentage of probe trials and pre-trial observation periods with unprompted greeting responses.

Data collection and scoring

Target Response: The target response was operationally defined as activation of the BIGmack such that the prerecorded greeting message was played. During training trials, participant responses were classified as one of three types:

(a) Unprompted greeting: the target response was emitted within 15 s of the trainer sitting within 2 m of the participant and within the participant's field of view.

(b) Prompted greeting: the target response was emitted within 15 s of the trainer providing a verbal, gestural, or physical prompt to the participant.

(c) Refusal: the participant physically resisted or pulled hand away from the trainer when trainer provided a physical prompt to complete the target response.

During training sessions, trainers recorded participants' responses immediately at the end of each training trial.

During generalization probe trials, participant's responses were classified as one of three types:

(a) Unprompted greeting: the target response was emitted within 15 s of the probe partner sitting within 2 m of the participant and within the participant's field of view.

(b) Omission: the target response was not emitted within 15 s of the probe partner sitting within 2 m of the participant and within the participant's field of view.

(c) Incorrect greeting: The target response was emitted during the 15 s pre-observation period that occurred just prior to the start of each probe trial.

Probe partners recorded participants' responses immediately following each probe trial.

Interobserver agreement: Interobserver agreement on the occurrence of the target responses during training trials was calculated using a point-by-point agreement ratio (Kazdin, 1982). A trained observer (an undergraduate psychology student) discretely observed at least 10% of all training trials across all training phases and recorded participants' responses as described above. These data were compared to data collected by the trainers. Interobserver agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. Specific interobserver agreement ratios for each participant's training data are presented in Table 2. Overall, interobserver agreement ratios for training trials were high, ranging from 99% to 100%, with a mean of 99.8%. Given the near perfect agreement agreement between data recorded by the trainer and the observer, more frequent interobserver agreement checks during training sessions were not deemed necessary.

Interobserver agreement on the occurrences of target behaviors during generalization probe trials was obtained in a similar fashion, although more frequent checks were made during generalization probes, as these data represented the primary outcome data for the study. Prior to and during each probe, a trained observer (an undergraduate psychology student or the author) discretely monitored at least 25% of probe trials and recorded the participant's target responses as described above. These data were compared to data recorded by the probe partners and a point-by-point agreement ratio was calculated as the number of agreements divided by the number of agreements and disagreements multiplied by 100. Interobserver agreement ratios ranged from 94% to 100%, with a mean of 98% for pre-trial observations, and from 96% to 98% with a mean of 97% for probe trials. Specific interobserver agreement ratios for each participant for generalization probe trials are presented in Table 2.

Treatment Integrity Checks: Treatment integrity checks (Billingsley, White, & Munson, 1980) were conducted on both the behaviors of trainers and the behaviors of probe partners. For reasons of efficiency and to minimize the likelihood that the observer would influence training and probe trials, a single observer simultaneously recorded treatment integrity and interobserver agreementdata. Critical procedural steps were identified for both the training protocol and the generalization probe trial protocol (see Appendix D for data sheets used to record treatment integrity data). During at least 10% of training

Table 2

Interobserver agreement ratios (IOAs) for training trials and generalization probe trial by participant

	Training Trials		Generalization Probe Trials		
Participant	% Trials observed	IOAs	% Trials observed	IOAs (Pre-trial)	IOAs (Probe trials)
Rhonda	14	99%	30	94%	98%
Carol	13	100%	27	100%	96%
Celine	12	100%	42	99%	96%
Kelly	13	100%	42	99%	98%

trials conducted by each trainer and during at least 25% of all generalization probe trials, a trained observer (an undergraduate psychology student) discretely observed trainers and probe partners as they conducted trials and recorded the number of procedural steps followed correctly.

For both training and generalization trials, calculation of treatment integrity checks consisted of dividing the number of procedural steps completed following the established protocol by the total number of procedural steps multiplied by 100%. An omission or deviation from the specified procedure or additional prompting or praising was scored as an error. Overall, across all trainers, treatment integrity for training was 100%. Treatment integrity for generalization probe trials ranged from 98.6% to 99.2%, with a mean of 98.9%. On the few occasions when a probe partner did not follow procedural steps correctly, corrective feedback regarding the procedural error was provided immediately following the probe trial.

Training procedure

Participants were trained individually to use their BIGmack VOCAs over the course of the three training phases outlined below. Training phases were introduced sequentially with generalization probes occurring before the introduction of each phase and following its termination. Shifts in training phase occurred only after a participant attained a predetermined mastery criterion for the target behavior and a series of generalization probes were conducted.

Generalization was assessed after participants met a predetermined mastery criterion during training, rather than continuously during training, to enhance the robustness of the generalization effects (Chandler et al., 1992).

Training phase 1 - Massed trial training: In the first phase of training, participants were involved in 1 to 4 training sessions per day during which 10 training trials were presented consecutively. Each training session began with the trainer approaching the participant and stating that it was time to practice using the VOCA. The trainer and participant then moved to a designated area of the room and training trials commenced.

A trial began with the trainer observing the participant from outside of the participant's field of view. Once 15 s had passed in which the participant did not activate the BIGmack, the trainer approached the participant and sat within 2 m of the participant and within her field of view. The trainer then made direct eye contact with the participant and waited for the participant to activate the BIGmack. If the participant activated the BIGmack within 15 s such that the pre-recorded greeting was played, the trainer responded by smiling, offering the rejoinder "Hello," and talking to the participant for 15-30 s. During early trials, some participants also received edible or sensory reinforcement (see Training Results below).

If the participant did not respond within 15 s, a System of Least Prompts protocol(cf. Martin & Pear, 2002, p. 121) was implemented. Specifically, the

trainer offered the verbal prompt "Say 'Hello' to me," and waited for an additional 15 s for a response. If the participant activated the BIGmack, the response was consequated as described above. If the participant did not activate the BIGmack within 15 s, the trainer repeated the verbal prompt while providing a gestural prompt (i.e., pointed to the BIGmack) and again waited 15 s for a response. Activation of the BIGmack during this time was consequated as described above. If the participant did not activate the BIGmack within 15 s, the trainer repeated the verbal prompt while physically guiding the participant (i.e., by lightly grasping her hand moving it) to activate the BIGmack, and then consequated the response as described above. If the participant resisted the physical prompt, for example by pulling hand away from the trainer, the trial was immediately terminated and the trainer left the area. Once a trial was completed or terminated, the trainer would leave the participant, record the data, and then immediately start the next trial. This process continued until a total of 10 training trials was completed.

The training protocol was modified slightly for Arlene and Shelly. Specifically, these participants were trained under the System of Least Prompts protocol until they demonstrated unprompted greeting on 50% of trials during one session. At that point, the System of Least Prompts was discontinued so that no additional prompting was provided. During these trials, if the participant failed to emit an unprompted greeting response within 15 s of the trainer's approach, the

trainer terminated the trial and left the area. This modification was introduced to ensure that the participants' responding did not inadvertently come under the control of prompts from the trainer.

Further modifications to the training protocol were introduced for Cheryl, Arlene, and Shelly when they failed to reach the mastery criterion following several training sessions (see Training Results below). These modifications included increasing the response time window from 15 to 30 s (for Arlene and Shelly) and having the trainer provide a brief physical prompt (i.e., lightly grasping participants' hands and redirecting them away from a grasped object) to stop an interfering behavior immediately upon sitting in front of the participant (for Cheryl and Arlene). These modifications were faded completely before the end of this training phase.

Massed trial training sessions were provided 1 to 4 times per day each weekday until the participants' performances met a pre specified training criterion of 80% independent responding across 3 consecutive blocks of 10 trials. This level of performance has been used as a mastery criterion in previous studies in which communicative responses were taught to persons with developmental disabilities (e.g., Lowther & Martin, 1983; Shepis, Reid, & Behrman, 1996). Once this criterion was met, a series of generalization probes was conducted, followed by commencement of spaced trial training.

Training phase 2 - Spaced trial training: Spaced trial training incorporated many of the aspects of the naturalistic training strategies described by Halle (1982; 1987). Specifically, spaced trial training involved (a) arranging the environment so that naturally occurring opportunities for the participants to communicate occurred throughout each training day, and (b) providing natural (i.e., social) consequences contingent on the target behavior.

This training phase differed from the previous phase in two critical ways. First, training trials were not conducted one immediately after the other, but rather, occurred intermittently throughout each participants' day (Mean intertrial interval = 40 mins, range 5 to 280 mins). This was done as an attempt to have training trials approximate naturally occurring situations in which the participants might use their BIGmacks to greet someone (i.e., the approach of a potential conversational partner following a period in which that partner had not been seen).

Second, participants were neither informed of the onset of training trials nor moved to a specified area within the training setting prior to the onset of the training trials (although all training trials were scheduled to occur when the participant was scheduled to be in the training environment). Thus, from the perspective of a participant, training trials occurred "spontaneously" and unexpectedly. In order to maximize the degree to which the training situation approximated the naturally occurring conditions in which a participant might

greet someone, training trials were initiated only when (a) the participant was not engaged in social interaction with another person, (b) the participant was not engaged in an educational activity, actively working on a task, or participating in a group activity, and (c) the participant was not asleep.

Otherwise, training trials were presented as in the previous training phase. That is, a trial started with the trainer observing a participant covertly and waiting for 15 s in which no BIGmack activation occurred. The trainer then approached the participant and sat within 2 m of the participant and within her field of view. The trainer waited 15 s for an Unprompted greeting response. If the participant emitted an Unprompted greeting, the trainer responded by smiling, offering the rejoinder "Hello," and talking to the participant for 15-30 s. If no response was given, the System of Least Prompts protocol was followed as outlined previously.

Spaced trial training was provided until participants reached the mastery criterion of responding with an unprompted greeting on 80% of trials over 3 consecutive blocks of 10 trials. Unlike the previous training phase, it was often impossible to conduct 10 trials over the course of one day because of the intermittent nature of trial scheduling. On average, 5 trials were conducted with each participant per day (range 2 to 10).

Training Phase 3 – Multiple partner training: Procedures in this training phase were identical to those in the previous phase, except that training was provided by four trainers rather than by a single trainer. The decision to use four trainers in

this phase was based on previous research investigating generalization programming of greeting skills which suggested that four exemplars would be sufficient to produce generalization of the target behavior (Lowther & Martin, 1983; Stokes, Baer, & Jackson, 1974). As in the previous phase, the intermittent nature of the schedule of training trials allowed for a limited number of trials to be conducted each day. On average, each participant received 4 trials each day (range 1 to 8). The mean intertrial interval during this phase was 51 min (range 5 to 330 min). Participants remained in this training phase until they reached the mastery criterion of responding with an unprompted greeting on 80% of trials over 10 consecutive trials with each trainer.

Probe trials

Once a participant met the mastery criterion for a training phase, a series of generalization probe trials was scheduled. The purpose of these probe trials was to evaluate the extent to which training affected the participant's Unprompted greeting behaviors towards partners not involved in training. Each series of generalization probes involved 40 trials, conducted over 5 consecutive days (usually Monday to Friday) in 4 distinctly different settings (10 trials in each of the training setting and 3 settings in which training was not received). During each of these days, 2 probe trials were conducted in each setting by 2 different probe partners, for a total of 8 probes per day. Consecutive probe trials were separated by at least 5 minutes.

To the greatest extent possible, probe trials were conducted at time periods when the participants' daily schedules would naturally place them in the probe settings. However, due to logistics involved in conducting multiple trials in multiple settings, participants were brought to some probe settings especially so that trials could be conducted. This was frequently the case for probes that took place in the cafeteria.

All probe trials followed the same procedure. Prior to the onset of a probe trial, a research assistant ensured that the participant was in the appropriate setting and that her BIGmack was operational. The participant then was left alone until all probes scheduled for that setting were completed. Probe trials were only initiated when participants (a) were not engaged in social interaction with another person, (b) were not engaged in a meaningful activity, and (c) were awake.

A probe trial began with the probe partner first covertly observing the participant for 15 s from outside of the participant's field of view. This pre-trial observation was conducted to (a) assess whether or not the participant activated the BIGmack in the absence of a partner to greet, (b) ensure that the participant was awake and available for a probe. Regardless of whether or not the BIGmack was activated during the pre-trial observation period, the probe partner then approached the participant and sat within 2 m of the participant and within her field of view. The probe partner made direct eye contact with the participant and waited for 15 s for the participant to emit an unprompted greeting response. If the

participant activated the BIGmack, the probe partner offered the rejoinder "Hello" and spoke to the participant for 15 to 30 s, then left the area. If the participant did not activate the BIGmack within 15 s, the probe partner left the area without saying anything to the participant. Immediately after leaving the participant, the probe partner recorded the participants' responses during the pre-trial observation period and during the trial on a data sheet.

Social Validity

Social validity was evaluated in two ways. First, in order to evaluate the perceived effectiveness of the training procedures and to assess whether target skills generalized beyond experimental situations, direct care staff who provided support to the participants were asked to complete the same questionnaire prior to baseline data collection and then again approximately one month after the last training session. During this month, staff supporting the participants were instructed to allow the participants access to their VOCA's as much as possible throughout the day. Unfortunately, no formal monitoring of the extent to which participants were able to access their VOCA during this time period was possible.

The questionnaire included 8 items which asked respondents to rate on a 5-point Likert-like scale the extent to which they agreed with statements related to (a) the participants' social attractiveness, and (b) the participants' tendencies to spontaneously greet others (see Appendix E for a description of the questionnaire). Four direct care staff who provided support for the participant

being rated were asked to complete questionnaires anonymously. Although every effort was made to have the pre- and post-training questionnaires completed by the same respondents, changes in staffing made this impossible in all cases. However, for all participants, at least two of the four respondents provided pre- and post-training ratings.

Second, to assess the perceived importance of the selected target behaviors, a questionnaire of mixed format (i.e., yes-no, Likert-type scale ratings, forced-choice) was distributed to 28 employees of the Centre who were not involved in the study in any other capacity. Efforts were made to obtain a sample from a wide range of individuals including staff members whose positions required them to have daily contact with Centre residents (e.g., direct care staff, day program staff) and those whose positions did not require regular contact with Centre residents (e.g., maintenance staff, kitchen staff). Questionnaire items inquired about respondents' opinions regarding (a) the relationship between greeting behaviors and overall perception of friendliness, (b) importance of various specific greeting behaviors of unfamiliar partners, and (c) the proportion of people with a disability and without a disability encountered each day who initiate a greeting (see Appendix E for a description of the questionnaire). Respondents to this questionnaire were naïve as to the purpose of the study or the procedures involved.

Results

Training in VOCA use

Training sessions provided opportunities for participants to develop proficient VOCA use for emitting the target behavior while being exposed to generalization programming tactics. Proficiency/mastery was operationally defined as emitting unprompted greeting responses on 80% of trials over 3 blocks of 10 trials for massed trial and spaced trial training. To ensure that participants displayed mastery of the response across several trainers in multiple partner training, the operational definition of proficiency/mastery for this phase was changed to emitting unprompted greeting responses on 8 of 10 consecutive trials for each trainer. The number of training trials required by each participant to reach mastery during each training phase is presented in Table 3. Session by session training data for each participant are summarized in Appendix F.

Among the participants, Wanda progressed through training most rapidly. She attained the mastery criterion during massed trial training within 160 trials. During the spaced trial training, Wanda required an additional 70 trials to reach the mastery criterion. During spaced trials with multi trainers, Wanda reachedcriterion in 40 trials, the fewest number of trials possible given the criterion. In total, Wanda participated in 270 training trials.

Relative to Wanda, the other participants required substantially more training to reach criterion during massed trial training. In addition, the training protocol

Table 3

Number of training trials to mastery criterion for each participant

	Training Phase						
			Multiple Trainer Training				
Participant	Massed trial training[a]	Spaced trial training[b]	Trainer 1	Trainer 2	Trainer 3	Trainer 4	Total[c]
Rhonda	160	70	10	10	10	10	40
Carol	660	30	10	10	10	10	40
Celine	450	30	10	10	13	14	47
Kelly	410	40	10	15	16	114[d]	155

[a]Minimum number of trials to reach criterion is 30

[b]Minimum number of trials to reach criterion is 30

[c]Minimum number of trials to reach criterion is 40

[d]Included in this total are 94 "massed trials" needed to establish consistent unprompted responding with this trainer

had to be modified and supplemented with additional reinforcement before Cheryl, Arlene, and Shelly were able to reach the mastery criterion.

After failing to reach the mastery criterion after 210 massed training trials, the training protocol used with Cheryl was modified in two ways. First, contingent reinforcement in the form of a preferred edible was provided following each instance of an unprompted greeting response. Second, the trainer began to physically prompt Cheryl to separate her hands immediately at the beginning of each trial. This was introduced because it was noted that Cheryl consistently failed to respond during trials in which her hands were folded when the trainer approached her. Evidently, Cheryl had been taught to sit with her hands folded for prolonged periods by a previous care provider to prevent her from inappropriately grabbing at objects in her environment. These modifications lead to a steady increase in unprompted responding with attainment of the mastery criterion after 240 trials. At this point, both the delivery of edibles and the physical prompting were faded out over the next 210 trials. In total, Cheryl required 660 trials during massed trial training to reach the mastery criterion. Despite this fact, she was able to reach the mastery criterion within the minimum number of trials possible in both spaced trial training (30 trials) and multiple partner training (40 trials). Across all training phases, Cheryl received 730 training trials.

Similar to Cheryl, Arlene failed to reach the mastery criterion during massed trial training after 220 trials using the system of least prompts protocol. The

training protocol was subsequently modified by (a) increasing the duration of the response window from 15 to 30 s to allow Arlene more time to execute a response, (b) providing a preferred edible contingent on emitting an unprompted greeting, and (c) physically prompting Arlene to stop manipulating her shirt with her hands, if she was engaged in this behavior when the trainer approached her. Arlene reached the mastery criterion within the 30 trials following the introduction of these modifications. At this point, the modifications were gradually faded out over the next 200 trials. In total, Arlene received 450 trials during massed trial training. In contrast, she reached criterion level of performance quite quickly during both spaced trial training and multiple partner training, requiring 30 (the minimum possible) and 47 trials in each phase, respectively. Across all training phases, Arlene received a total of 527 training trials.

Shelly also required substantial training before reaching criterion during the massed trial training phase. The system of least prompts protocol was insufficient in producing the necessary level of responding after 180 trials. The protocol was modified by (a) increasing the duration of the response window from 15 to 30 s, to allow Shelly more time to execute a response and (b) providing access to a massager (a Conair Body System Wand Massager, #CONWM30R, set at "HIGH" setting and handed to the participant) for 15 s contingent upon unprompted greeting (Shelly's day program instructor reported that, in her experience, Shelly

consistently demonstrated a preference for access to a massager over any other stimulus available in the day program). Criterion level responding was attained over the next 30 trials. The modifications then were faded over the next 190 trials. Overall, Shelly received 410 training trials during massed trial training. In contrast, Shelly required only 40 trials during spaced trial training to reach the mastery criterion of performance. During multiple partner training, Shelly attained criterion level performance (i.e., 80% of trials with unprompted greeting over 10 consecutive trials) with three of the four trainers with 42 trials, but failed to demonstrate this level of performance with a fourth trainer. As a result, training with the fourth trainer reverted to massed trial training for 94 trials until Shelly reached the 80% across three blocks of 10 trials criterion. At that point, spaced trial training with the fourth trainer was reinstated and Shelly reached criterion within 10 trials. In total, across all training phases, Shelly received 605 training trials.

Generalization Probes

The present research utilized a combined experimental design (Kazdin, 1982, p. 200) to investigate the effects of training on participants' generalized greeting behaviors. One element of the design involved a multiple baseline arrangement, which allowed for an examination of the extent to which shifts in training phase corresponded to changes in the target behavior. A second design element involved an alternating conditions arrangement, in which the target

behavior was concurrently measured under two different stimulus conditions (i.e., in the presence of a partner [presumed to be an S^D, since responding under these conditions resulted in social interaction] and during pre-trial observation periods [presumed to be an S^Δ, since responding under these conditions did not result in social interaction]). This design element allowed for an examination of the extent to which each stimulus condition was discriminative for the target behavior. A third design element involved a direct replication of the experimental procedures across pairs of participants. This element allowed for an evaluation of the extent to which the results obtained from the one pair of participants extended to the second pair. Thus, the combination of these three elements allowed for the simultaneous examination of the effects of successive training phases on generalized responding under both S^D and S^Δ conditions and for the testing of the generality of these effects across participants.

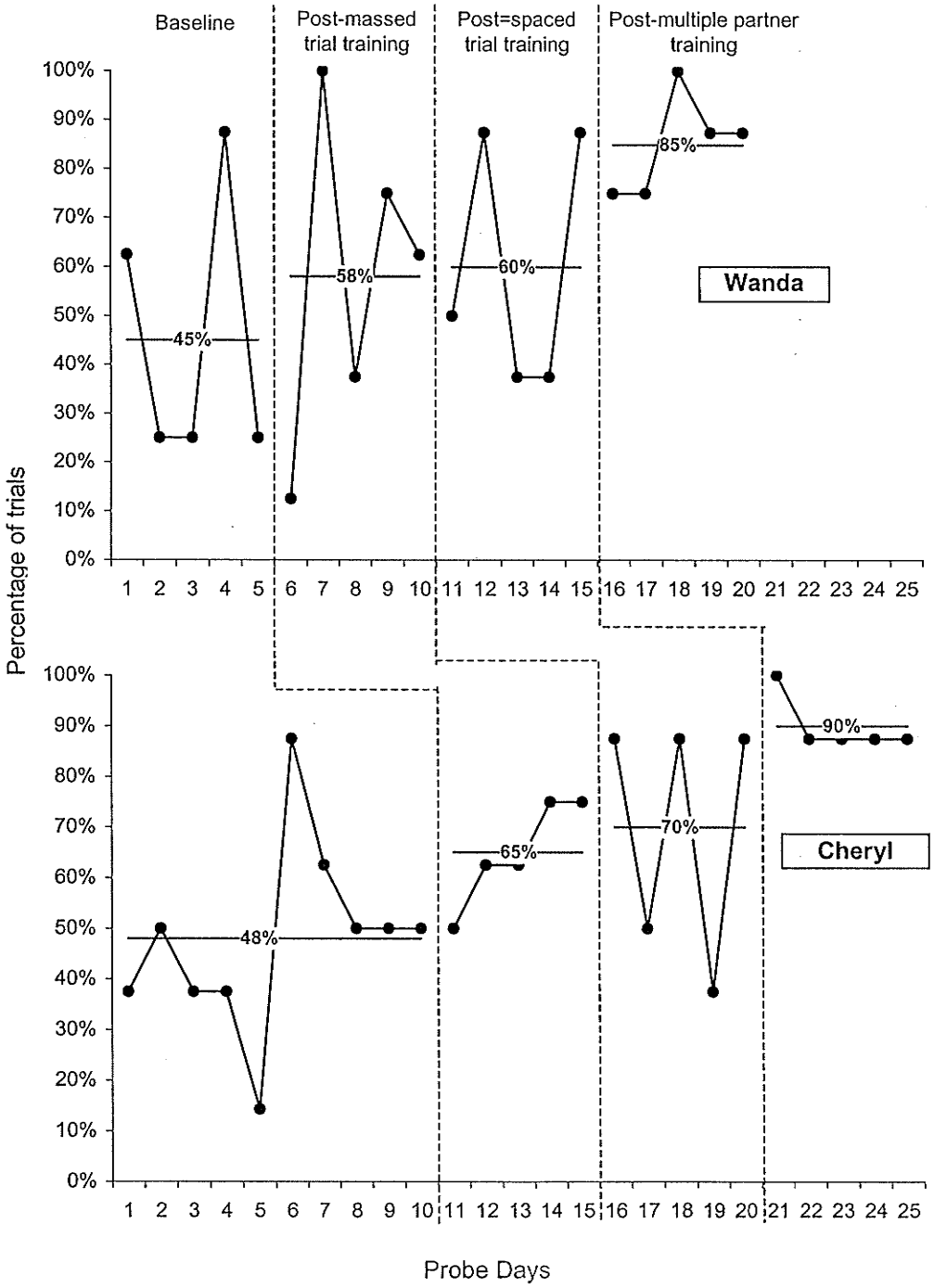
Given the complexity of the combined design, the generalization data are presented in two ways to aid in interpretation of the results. First, only data obtained when participants were with partners is examined to illustrate the effects of shifts in training phase on generalized responding. This has generally been the convention for data presentation in the applied generalization programming literature. Then, a finer grain analysis of the impact of training on generalized greeting behavior is presented by comparing data obtained under S^D conditions with data obtained under S^Δ conditions. This comparison illustrates the

differential effects of training on generalized responding when participants were in the presence of partners and when alone in the generalization settings. Although this type of comparison has not typically been presented in the applied research investigating generalization, it enables more precise analysis of the discriminated nature of generalized responding in relation to sequential changes in training.

Figure 1 presents data collected during generalization probe days for Wanda and Cheryl during baseline, and following massed trial, spaced trial, and multiple partner training. These data are expressed as the percentage of the eight probe trials conducted each day with unprompted VOCA activations. As can be seen in the top panel of Figure 1, Wanda's daily performance during baseline was quite variable, ranging from 25% to 88% ($\underline{M}$ = 45%). Daily performance remained highly variable following massed trial training, ranging from 13% to 100%, with a slight elevation in mean percentage of trials with unprompted VOCA activations ($\underline{M}$ = 58%). Daily performances became slightly less variable following spaced trial training (range: 38% to 88%), while mean performance ($\underline{M}$ = 60%) showed little change from the previous phase. Finally, increased stability was observed in Wanda's daily performance following multiple partner training, which ranged from 75% to 100% over probe days. This stability occurred alongside a

Figure Caption

Figure 1. Percentage of daily generalization probes in the presence of partners with unprompted VOCA activations (Wanda and Cheryl).


Baseline
Post-massed trial training
Post=spaced trial training
Post-multiple partner training
Wanda
Cheryl
45%
58%
60%
85%
48%
65%
70%
90%
Percentage of trials
Probe Days

substantial elevation in the mean percentage of trials with unprompted VOCA activations (M = 85%).

Cheryl's generalization probe data are presented in the bottom panel of Figure 1. During the baseline series of generalization probes, Cheryl's daily performance was initially variable, ranging from 14% to 88%, but stabilized just above the mean (M = 48%) during the final three probe days. Following massed trial training, an increasing trend was noted in the data, with daily performances increasing from 50% to 75% (M = 65%) over the course of five probe days. However, daily performance once again became variable following spaced trial training (range = 38% to 88%, M = 70%), with no directional trend evident in the data. Finally, a stable and very high level of performance was observed following multiple partner training. During this phase, daily performance ranged from 88% to 100% (M = 90%) with stable performance at 88% on the final four probe days.

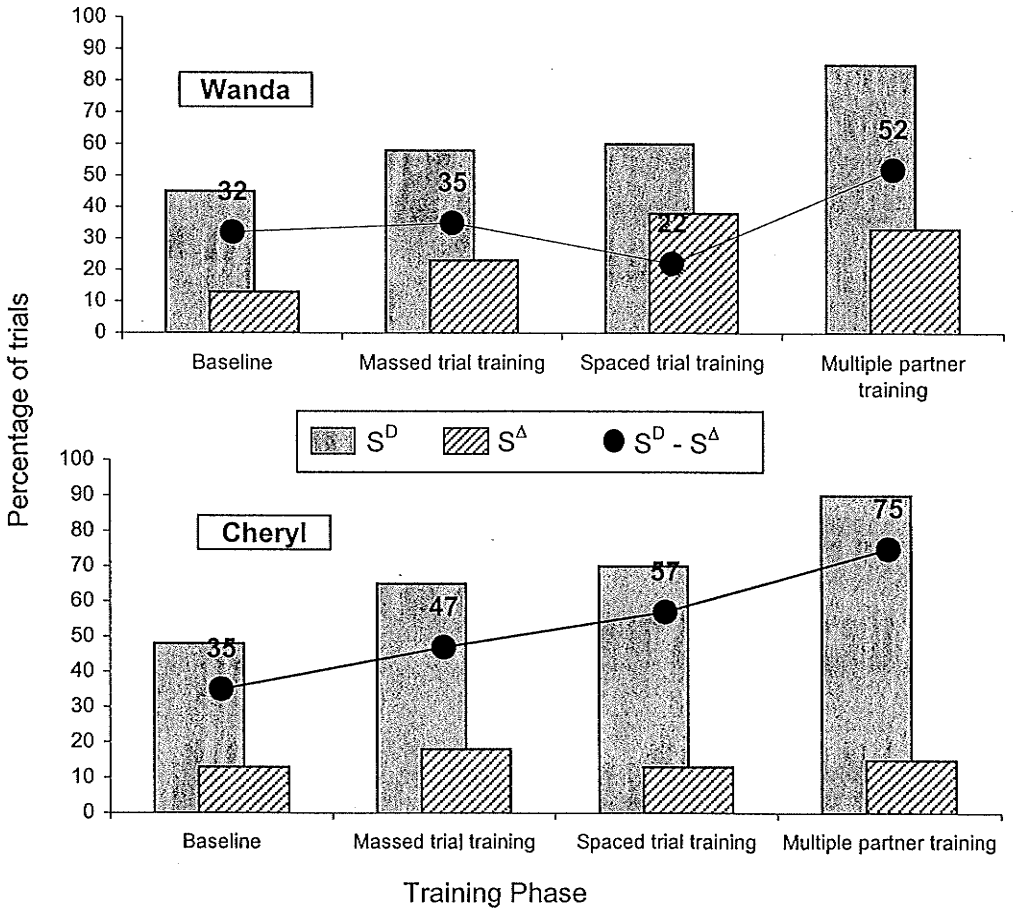
In summary, Wanda and Cheryl demonstrated similar patterns of responding when in the presence of partners across the experimental phases. Specifically, both participants displayed a general increase in mean percentage of probe trials with unprompted VOCA activations over successive training phases, with the most substantial increase occurring after multiple partner training. Further, daily performances varied throughout most experimental phases for both participants, but attained greatest stability following multiple partner training.

Although these results suggest that training phase did effect participants' generalized responding, they do not necessarily demonstrate that training specifically produced changes in participants' generalized greeting behavior. Such a demonstration requires a comparison between the participants' performance under S^D and S^Δ conditions. In the present study, VOCA activation was considered greeting behavior only when emitted in the presence of a partner. If training truly led to changes in participants' generalized greeting behavior, increased VOCA activation should be observed only when participants where in the presence of partners, and not when they were alone. In other words, VOCA activation should increasingly come under control of the discriminative stimulus "partner" over successive experimental phases. To determine if this indeed occurred, comparisons were made between the participants' mean performance during each experimental phase when in the presence of partners (i.e., the S^D condition) and during pre-trial observation periods (the S^Δ condition). Mean data were used to simplify the presentation of these comparisons, and the interested reader is referred to Appendix F for presentation of daily data for each participant under S^D and S^Δ conditions.

Figure 2 depicts the mean percentage of trials with VOCA activations under S^D and S^Δ conditions for each training phase for Wanda and Cheryl. As can be seen in the top panel of the figure, the difference between Wanda's mean performance under S^D and S^Δ conditions during baseline was 32%. This

Figure Caption

Figure 2. Mean percentage of trials with unprompted VOCA activations under S^D and S^Δ conditions, and S^D - S^Δ differences, for training phases for Wanda and Cheryl.


Wanda
Cheryl
Percentage of trials
100
90
80
70
60
50
40
30
20
10
0
32
35
22
52
35
47
57
75
Baseline
Massed trial training
Spaced trial training
Multiple partner training
S^D
S^Δ
$S^D - S^\Delta$
Training Phase

difference increased slightly to 35% following massed trial training, but decreased to 22% after spaced trial training. Finally, following multiple partner training, Wanda displayed a much larger difference between responding under S^D and S^Δ conditions (52%).

Cheryl's data are presented in the bottom panel of Figure 2. During baseline, Cheryl's mean performance in the S^D condition differed from her performance in the S^Δ condition by 35%. This difference increased to 47% following massed trial training, and then to 57% following spaced trial training. Finally, the difference in performance under S^D and S^Δ conditions jumped substantially to 75% following multiple partner training

Overall, these data indicate that Wanda's and Cheryl's generalized VOCA activating behaviors differed when in the presence of a partner than when alone, and that this difference increased most following multiple partner training. Visual inspection of the data presented in Figure 2 suggests that both participants generally demonstrated increasing trends in their mean performance across successive training phases under S^D conditions. However, under S^Δ conditions, the participants' mean performance across training phases differed only slightly. Whereas Wanda demonstrated a general increasing trend in her mean performance across training phases (with a slight reduction in mean responding following multiple partner training), Cheryl's performance remained stable. Nonetheless, both participants showed substantial separation in their mean

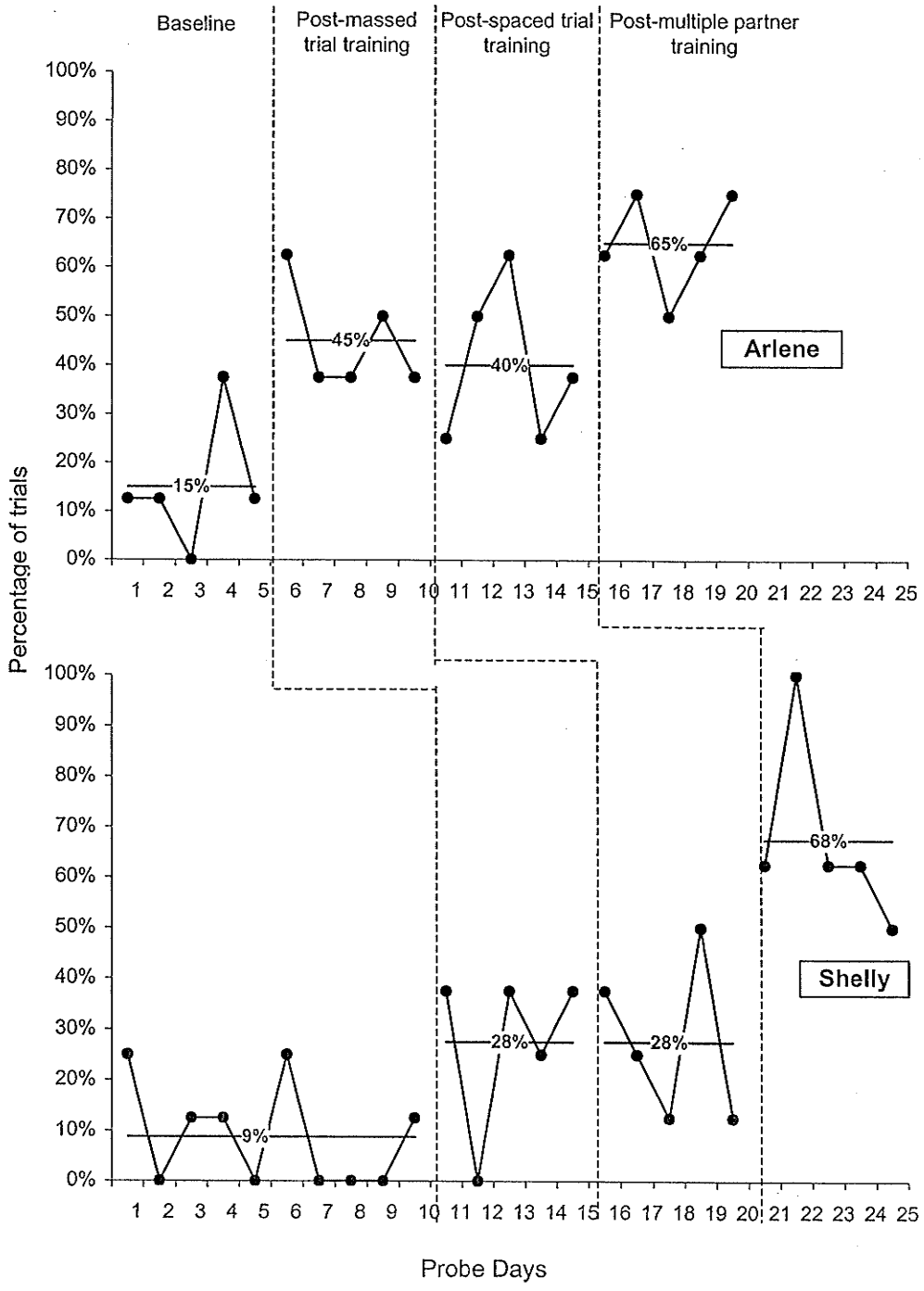
performance under S^D and S^Δ conditions following multiple partner training, indicating that VOCA activating behavior was almost exclusively under the discriminative control of the presence of a partner following this training phase.

The generality (Kazdin , 1982, p. 282) of these results was tested through a direct replication of the experimental procedures with a second pair of participants. As with the presentation of results from Wanda and Cheryl, data obtained from Arlene and Shelly when with partners are first presented in isolation, and then are compared to data obtained when the participants were alone.

Data reflective of the VOCA activating behaviors of Arlene and Shelly when in the presence of partners are presented in Figure 3. As can be seen in the top panel of the figure, Arlene's performance during baseline was variable, ranging from 0% to 40% of trials with unprompted VOCA activations over probe days ($\underline{M}$ = 15%). This variability was reduced following massed trial training, with daily performances ranging from 40% to 65%, while mean performance increased markedly ($\underline{M}$ = 45%). Variability in daily performance increased again after spaced trial training (range = 25% to 65%), while a slight reduction in the mean percentage of probes with unprompted VOCA activations was observed ($\underline{M}$ = 40%). Finally, variability in daily performance decreased following multiple partner training (daily performances ranged from 50% to 75%), while mean performance increased substantially ($\underline{M}$ = 65%).

Figure Caption

Figure 3. Percentage of daily generalization probes in the presence of partners with unprompted VOCA activations (Arlene and Shelly).


Baseline
Post-massed trial training
Post-spaced trial training
Post-multiple partner training
Arlene
15%
45%
40%
65%
Shelly
9%
28%
28%
68%
Percentage of trials
Probe Days

The bottom panel of Figure 3 shows generalization data collected from Shelly when in the presence of partners. During baseline, Shelly's daily performance was generally variable, ranging from 0% to 25% (M = 9%) across probe days, although more stability (three data points at 0%) was seen towards the end of this phase. Increased variability in daily performance returned following massed trial training (range = 0% to 38%), along with an increase in mean performance (M = 28%). Shelly's performance changed relatively little following spaced trial training in terms of variability in daily performance (range: 13% to 50%) and mean performance during this phase remained unchanged (M = 28%). Finally, following multiple partner training, an immediate large increase was seen in daily performance, which, although variable over probe days (range: 50% to 100%), resulted in a substantially elevated mean performance (M = 68%).

Results from this pair of participants suggest that the impact of training may have been slightly different for Shelly than for Arlene. Shelly's data indicated that she demonstrated a substantially larger increase in responding after multiple partner training than after massed trial training. In contrast, Arlene's data suggests that multiple partner training produced an increase in responding of similar magnitude to that produced by massed trial training. In other words, massed trial training may have had a greater effect on Arlene's generalized greeting behavior than it did for Shelly's. To determine if this indeed is the case,

a comparison of VOCA activating behaviors under S^D and S^Δ conditions is necessary.

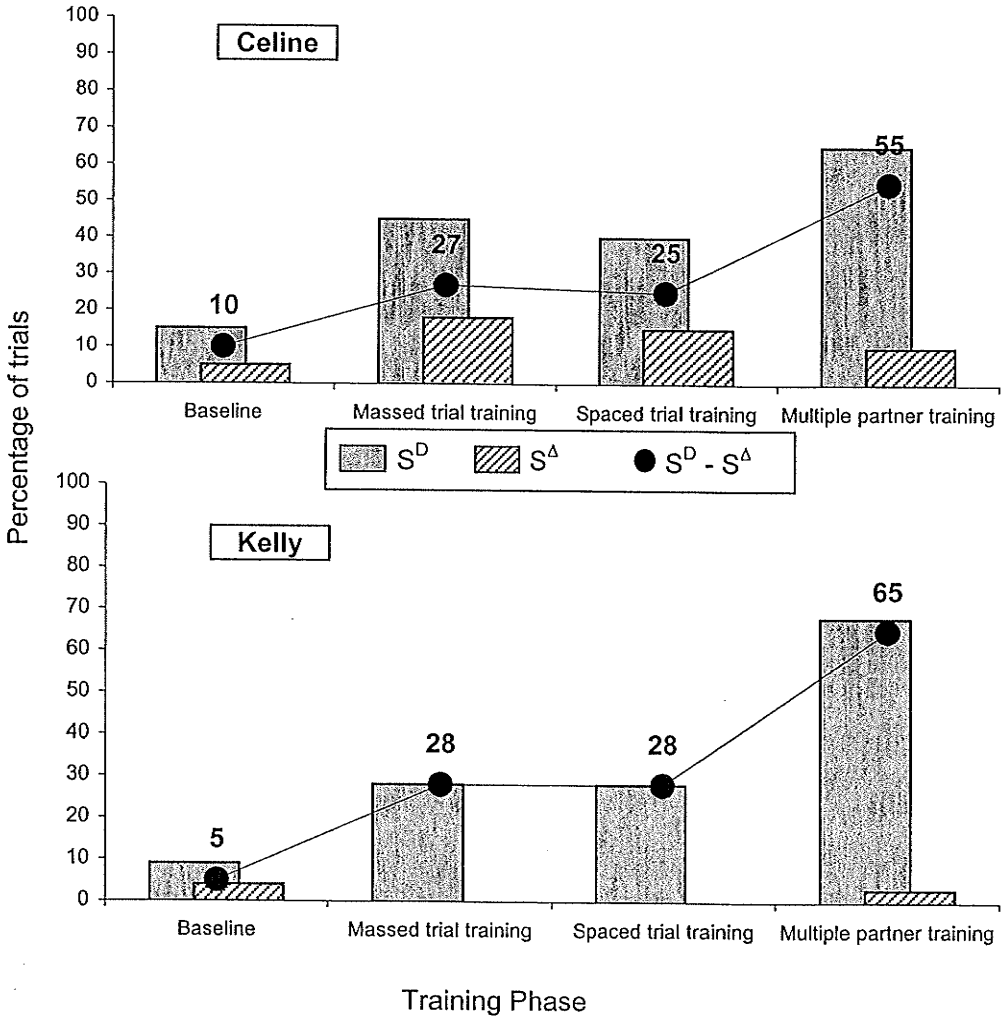
Figure 4 depicts the mean percentage of trials under S^D and S^Δ conditions during which Arlene and Shelly emitted unprompted VOCA activations for each experimental phase. As seen in the top panel of this figure, the difference between Arlene's mean performance during baseline under S^D and S^Δ conditions was 10%. This increased to 27% following massed trial training and remained virtually unchanged following spaced trial training (difference = 25%). Finally, following multiple partner training, Arlene demonstrated a substantial difference of 55% between her mean performance under S^D and S^Δ conditions.

Shelly's data are presented in the bottom panel of Figure 4. During baseline, the difference between her mean performance under S^D and S^Δ conditions was 5%. This difference increased to 28% following massed trial training, and remained there after spaced trial training. Finally, like Arlene, Shelly displayed a substantial difference in responding under S^D and S^Δ conditions following multiple partner training (difference = 65%).

Visual inspection of the data presented in Figure 4 helps to clarify the discrepancy noted between Arlene's and Shelly's patterns of responding when in the presence of partners. As described earlier, both Arlene and Shelly generally demonstrated an increasing trend in their mean performance across training phases when in the

Figure Caption

Figure 4. Mean percentage of trials with unprompted VOCA activations under S^D and S^Δ conditions, and S^D - S^Δ differences, for training phases for Arlene and Shelly.


Celine
Kelly
Percentage of trials
Training Phase
Baseline
Massed trial training
Spaced trial training
Multiple partner training
10
27
25
55
5
28
28
65
S^D
S^Δ
$S^D - S^\Delta$

presence of partners, with Shelly showing the greatest between-phase increase following multiple partner training, while Arlene showed between-phase increases of similar magnitude following massed trial training and multiple partner training. Examination of the participants' performances in the S^D and S^Δ conditions suggests that, despite this difference, training had a similar effect on the generalized greeting behaviors of both participants. The data in the top panel of Figure 4 indicates that, although Arlene demonstrated a relatively large increase in responding following massed trial training under S^D conditions, this occurred along with an increase in responding under S^Δ conditions, resulting in a relatively small difference between the two. However, following multiple partner training, both Arlene and Shelly demonstrated relatively high levels of responding in the S^D condition and relatively low levels of responding in the S^Δ condition. This suggests that for both participants, VOCA activating behavior came more exclusively under the control of the stimulus "partner" following multiple partner training than during any other phase. In other words, although Arlene may have displayed a substantial increase in generalized VOCA activating behaviors following massed trial training, she, like Shelly, showed the greatest increase in generalized greeting behavior following multiple partner training.

Social Validity

Social validity assessment data were collected from direct care staff, who rated participants' social greeting skills prior to and following their involvement

in the research, and from a sample of Centre employees, who provided ratings of the importance of greeting behavior as a target for intervention. Briefly, direct care staff rated participants as being more likely to offer unprompted greetings to others following their involvement in the research. In addition, greeting in general, and introducing oneself and saying "Hello" when greeting in particular, were identified by the sample of Centre employees as an important social skill which affects the perceived friendliness of a person. These results suggest that the training produced noticeable changes in the participants' greeting behavior, and that greeting is an important social skill to target in behavioral interventions. The reader is referred to Appendix E for a detailed description of social validity assessment data.

Discussion

The primary finding of my research was that individuals with severe developmental disabilities demonstrated generalized VOCA-mediated greeting responses to greet unfamiliar nondisabled peers. The participants demonstrated generalized responding across four settings and across many different peers. The results suggested that maximum generalization was realized only after participants completed all three training phases, with the greatest increase in generalized greeting occurring after multiple partner training. Indeed, by the end of training, all participants displayed close to a 100% increase in the percentage of

generalization trials with unprompted greeting over baseline, and, on average, offered unprompted greetings on 77% of available opportunities to do so.

The specific greeting behaviors targeted in the research were identified through a social validation questionnaire as being among the most important to demonstrate when meeting an unfamiliar peer. Further, Centre staff who provide direct support for the participants reported noticing improvements in the participants' unprompted greeting behaviors in situations not monitored as part of the research.

Because the behavior of interest in the present study was greeting, it was essential to demonstrate that the effects of training were specific to participants' VOCA activating behaviors when they were in the presence of partners. This was accomplished by recording participants' behaviors under both S^D (with partners) and S^Δ (alone) conditions. A comparison of the resulting data revealed that training had a differential effect on participant's VOCA activating behavior, with substantial increases in responding occurring only when participants were in the presence of partners. These data strengthen the conclusion that training did indeed enhance participants' generalized greeting behaviors.

A common feature of studies demonstrating successful generalization outcomes has been the simultaneous introduction of multiple generalization programming tactics (Chandler et al., 1992). While this may enhance the likelihood of positive outcomes (Azrin, 1977), it also precludes an analysis of the

individual contributions made by each generalization programming tactic to the overall effect. In the present study, training was purposely delivered across multiple phases (cf. Ducharme & Holborn, 1997), each followed by a series of generalization probes, so that the impact of each phase on generalization could be observed. Because of the sequential nature in which training was provided, it was not possible to isolate the contributions of generalization tactics introduced during later training phases from those introduced during earlier phases. However, the design of the study does allow for an examination of the additive effects of several generalization programming tactics in producing a generalization outcome. Towards this end, an analysis of the likely generalization programming tactics (Stokes & Baer, 1977) introduced during each training phase and a review of the impact of each training phase on participants' performances during subsequent generalization probes will now be presented.

In the present study, massed trial training introduced at least two of Stokes and Baer's (1977) generalization programming tactics: *Introduce to natural maintaining contingencies* and *Programming common stimuli. Introduce to natural maintaining contingencies* involves selecting target behaviors for training that "normally will meet maintaining reinforcement [in the natural environment] after the teaching." (p. 353). Unprompted greeting appears to be this type of target behavior, because unprompted greeting was always (at least within the context of the present study) consequated by social interaction with a partner in

all generalization settings. In cases where participant's unprompted greeting behaviors during training were not immediately maintained by social interaction, the behavior was first established using "contrived" reinforcers which were then faded out, so that, ultimately, greeting always was followed only by its "natural" consequences.

Programming common stimuli involves ensuring that salient stimuli will be present in both the training setting and the generalization settings. During massed trial training sessions, participants were exposed to several salient stimuli that also were present in all generalization settings, including the participants' VOCA, certain arrangements of furniture (i.e., the presence of chair close to the participant for a partner to sit in), and the absence of other people in the immediate area (i.e., trainers and probe partners were instructed to not begin a trial if the participant was interacting with someone at the time of initiation of a trial).

For all participants, mass trial training resulted in increased unprompted greeting during the subsequent series of generalization probes. The magnitude of this increase was small to moderate for Wanda, Cheryl, and Shelly, but substantial for Arlene. However, unlike the other participants, Arlene also experienced a sizable increase in the percentage of trials with VOCA activation when no partners were present following massed trial training. This suggests that the

observed improved performance following massed trial training may have been inflated by an increase in Arlene's indiscriminant VOCA activating behavior.

Spaced trial training differed from massed trial training in the temporal presentation of the trials. That is, training trials were conducted exactly as in massed trial training, except that instead of being presented one right after the other, trials were presented intermittently throughout the participants' day. One consequence of this was that participants were not "prepared" in any particular way for training trials, as they had been in the previous training phase. As a result, there was a greater degree of variability in the stimulus conditions within the training environment from trial to trial, depending on what was happening in the environment at the time the trial started. For example, participants were often in different areas of the room during subsequent trials, resulting in variations in the sounds, sights and number of others within visual range from trial to trial. With regards to Stokes and Baer's (1977) generalization programming tactics, spaced trial training most closely approximates the tactic of *Train loosely*. According to Kirby and Bickel (1988), the essential feature of this tactic is that "all stimulus dimensions of the [training] setting that are practically manipulatable are varied during training" (p. 120).

In the present study, spaced trial training had negligible effects on the unprompted greeting behaviors of all participants. Apparently, restructuring training environments so that the presentation of training trials more closely

resembles naturally occurring opportunities to communicate contributed little to the overall effectiveness of the training package in producing generalized responding. In addition, Wanda displayed an increase in incorrect responding following spaced trial training, suggesting that, at least for this participant, restructuring the training environment in this way may not have been completely benign.

Multiple partner training introduced a single new element into the training package, namely, receiving training from several trainers rather than from a single trainer. Much has been written in the generalization literature about the effectiveness of training with multiple stimulus exemplars in producing generalized outcomes (Brown & Odom, 1994; Stokes & Osnes, 1989), and it is considered by many investigators to be one of the most important strategies for promoting generalized responding (e.g., Baer, 1983; Ducharme & Holborn, 1997; Horner Sprague, & Wilcox, 1982; Lowther & Martin, 1983; Stokes & Baer, 1977).

For participants in the present study, the impact of introducing multiple trainers into the training package was marked and consistent. Substantial increases in the percentages of generalization probe trials with unprompted greeting were uniformly observed across participants following multiple partner training. Indeed, Wanda, Cheryl, and Shelly, clearly demonstrated their greatest gains in generalized responding following this training phase. Arlene's increase,

although slightly less than that observed following massed trial training, was comparable in magnitude to that of Wanda and Cheryl. Further, when performance under S^D conditions was compared to performance under S^Δ conditions, multiple partner training produced the greatest difference between responding in the presence of a partner and when alone for all participants. This suggests that training by multiple partners had a greater impact on increasing generalized greeting behavior than the other training phases.

The preceding analysis suggests that training led to generalized responding because it exposed participants to procedures known to promote generalization. However, it does not explain (a) how the training produced generalized responding or (b) why participants' generalized responding increased incrementally over successive training phases. To answer these questions, a brief discussion of the principles thought to underlie generalization is required.

Perhaps the most explicit analysis of the principles underlying generalization is that offered by Kirby and Bickel (1988). Briefly, these authors argue that generalization is the behavioral outcome of the strategic implementation of procedures that establish or prevent the development of controlling relationships between stimuli present in the training environment and the target behavior. For Kirby and Bickel, successful generalization outcomes only will occur when training adequately results in the fulfillment of two conditions: (a) the target behavior is brought under the control of stimuli in the training environment that

are also likely to be present in nontraining settings, and (b) the target behavior is not inadvertently brought under the control of stimuli in the training environment that are likely to be absent from nontraining environments.

From the perspective offered by Kirby and Bickel (1988) massed trial training may have been effective in satisfying the first condition. By programming common stimuli and introducing natural maintaining contingencies, massed trial training ensured a great degree of similarity in the stimulus features of the training and generalization settings, including both antecedent and consequent events. However, massed trial training also may have inadvertently violated the second condition by bringing greeting behavior under the conditional control of stimuli associated with a specific trainer (e.g., the trainer's eye or hair color, physical stature, or idiosyncratic mannerisms). As a result, generalization was less than complete.

Although spaced trial training may have functioned to address the second of Kirby and Bickel's (1988) conditions, it was likely inadequate. Because training during this phase occurred against a background of changing extraneous stimuli (i.e., those that are not intended to become discriminative for responding in nontraining settings), the probability of establishing undesired stimulus control was reduced. The effectiveness of this strategy was probably limited, however, because spaced trial training did not result in a variation of presumably the most salient stimuli in the training environment, namely, the unique features of the

single trainer. As a result, spaced trial training had little (or no) impact on generalized responding.

Fulfillment of both conditions was probably not adequately met until after the introduction of multiple partner training. During this phase, the repeated presentation of new partner exemplars resulted in variations of extraneous features of the most salient discriminative stimulus class (i.e., those associated with the trainer) while holding constant stimulus features common to all trainers (e.g., basic form of head and face, arms, legs, and torso), so that responding came under the control of these features. Because these features also were those likely to be associated with all partners, multiple partner training contributed to both (a) bringing the behavior under the control of stimuli likely to be present in the generalization environments and (b) avoiding inadvertent stimulus control by stimuli not present in nontraining environments.

Introducing multiple trainers into the training situation may have functioned to bring participants' greeting behavior under discriminative control of the stimulus class, that is, a set of stimuli that all share a common and specific set of characteristics (Martin & Pear, 2002) of "partner." One of the outcomes of establishing a behavior under the discriminative control of a stimulus class is that virtually all members of the same class can occasion the behavior, even if those members have not been explicitly trained (Horner et al., 1982). Thus, through multiple partner training, probe partners, by virtue of their membership in the

stimulus class of "partner", became S^D's for greeting behavior. Consequently, responding in their presence increased, resulting in levels of performance that were substantially higher than in baseline.

My research adds to the body of research that has amassed over the past five decades documenting the efficacy of behavioral interventions in producing generalization of target responses. However, unlike the vast majority of such empirical investigations, it is one of only a handful that goes beyond simply demonstrating generalization to examining the variables responsible for its occurrence (e.g., Chadsey-Rusch et al., 1993; Ducharme & Holborn, 1997; Walters, Ediger, & Holborn, 2002). Such analytic investigations of the functional relationships between treatment variables and generalized outcomes are critical to enhancing the scientific understanding of generalization (Chandler et al., 1992; Edelstein, 1989; Stokes, 1992).

The present research employed an experimental design that allowed for an examination of the relationship between various features of a training protocol and generalized responding. Ducharme and Holborn (1997) used a similar design in their investigation of social skills training with hard of hearing children. In that study, training was provided over two phases, the first focusing primarily on skill acquisition and the second on skill generalization. As in the present study, these authors reported that maximum generalization was not realized until after the introduction of all training phases. Interestingly, the key element in their final

training phase was the systematic use of multiple stimulus exemplars. Thus, the results of the present study are consistent with, and add support to, the conclusions drawn by Ducharme and Holborn (1997) that "the systematic use of multiple stimulus exemplars of salient environmental stimuli was the key to promoting generalization" (p. 649).

Training with multiple stimulus exemplars is the keystone of the generalization-programming methodology known as General-case programming (GCP). Briefly, GCP is an instructional strategy that fosters generalization of newly acquired behavior by structuring training around a systematic analysis of the stimulus conditions that set the occasion for the behavior in the natural environment (Horner, et al., 1982). GCP has been successfully used to teach generalized behaviors across a range of community living and personal care skills (e.g., Day & Horner, 1986; Horner, Jones, & Williams, 1985; Horner, Williams, & Stevely, 1987; Sprague & Horner, 1984). Recently, several investigators have applied GCP to teaching generalized communicative responses to people with disabilities (e.g., Chadsey –Rusch, et al., 1993; McDonnell, 1996; O'Neill, Faulkner, & Horner 2002; Romer, Cullinan, & Schoenberg, 1994). Although the communicative behaviors targeted in these studies have been of limited scope (all have focused on manding behavior), the results have demonstrated the viability and effectiveness of this methodology for communicative behaviors.

Although the present study did not specifically utilize GCP methodology, it is likely that behavioral mechanisms responsible for the observed results are the same as those activated through GCP. Within GCP, procedures are conducted to ensure that exemplars from stimulus classes that should occasion the behavior in the natural environment are incorporated into training, so that they enter in to controlling relationships with the target behavior. Also, GCP procedures attempt to ensure that the behaviors do not come under the control of stimuli that are not members of the identified stimulus classes. As described above, multiple partner training in the present study may have accomplished both of these outcomes. The fact that generalization was less than complete for two of the participants (i.e., Arlene and Shelly) may reflect the fact that multiple partner training did not adequately expose these participants to the full range of "general cases" present in the generalization environments to establish complete generalization.

The present study makes a unique contribution to the generalization programming literature in its use of data reflective of participant responding both in the presence (i.e., S^D conditions) and absence (i.e., S^Δ conditions) of the intended controlling stimulus condition in the generalization settings. By recording participants' behavior just prior to the onset of each trial and then during the trial, a finer grained analysis of the impact of training on generalized responding was achieved. Specifically, a comparison of responding under S^D and S^Δ conditions revealed that training produced substantial changes in VOCA

activating behaviors only when participants were in the presence of partners. Thus, it can be asserted with certainty that training did indeed enhance generalized greeting behavior.

Beyond this, $S^D - S^\Delta$ comparisons revealed a source of inter-participant variability, and in doing so, strengthened the generality of the results (Sidman, 1969, pp. 154-157). When the S^D data obtained from Arlene and Shelly were examined in isolation, it appeared as though the participants differed in the extent to which they benefited from massed trial training relative to multiple partner training. Specifically, whereas Shelly clearly showed a greater gain in generalized responding following multiple partner training than massed trial training, Arlene's gains were more equivalent. However, by taking into account the effects of training on Arlene's VOCA activating behaviors when she was with partners and when she was alone, the "true" impact of massed trial training on her greeting behavior was shown to be similar to that displayed by Shelly. Indeed, $S^D - S^\Delta$ comparisons revealed that the greatest separation between data obtained when in the presence of partners and when alone came following multiple partner training for all participants.

The present research also extends the AAC literature in several important ways. First, it directly addresses the concern voiced by Schlosser and Braun (1994) of a lack of AAC studies that "unequivocally demonstrate that generalization is due to treatment" (p. 221). As these authors point out, empirical

demonstrations of causal behavior change and generalization are important because they validate the efficacy of AAC interventions. The present study not only demonstrated successful outcome of a treatment for teaching persons with severe developmental disabilities to use an AAC system, its primary dependent measure was generalized responding. Further, the research design conformed to Schlosser and Braun's recommended design principles that permit the "unequivocal demonstration of generalization" (p. 218).

Second, the present research adds to the small but growing number of studies investigating the use of voice output technology for persons with severe developmental disabilities. Despite the obvious need for VOCA mediated communication systems among this population, there have been surprisingly few studies investigating teaching strategies that promote skill acquisition or generalized use with participants who are severely developmentally disabled. Studies that have involved such individuals have primarily focused on basic communicative responses such as requesting objects (Shepis et al., 1998) or assistance (Durand, 1993; Gee et al., 1991; McGregor, Young, Gerak, Thomas, & Vogelsberg, 1992). An exception was reported by Dattilo and Camarata (1991), who successfully taught an adult living with cerebral palsy (but not an intellectual disability) to use a VOCA to initiate conversations with his familiar nondisabled peers. The present study follows in the spirit of Dattilo and Camarata's research

(1991) in demonstrating the successful use of VOCA technology by persons with severe developmental disabilities for social-communicative purposes.

Finally, the results of the present study have implications for AAC interventionists who utilize naturalistic teaching strategies to promote generalization of communicative responses. In the second training phase of the present experiment, efforts were made to incorporate training of the greeting response into the natural course of the participants' daily routine by presenting training trials unpredictably (from the perspective of the participants) and intermittently. Despite these efforts, negligible changes in generalized responding were observed. Thus, altering training protocols so that they approximate naturally occurring communicative opportunities may not be sufficient to promote generalization. In the present study, training with multiple trainers (which may have made the training an even closer approximation to the natural environment) had a greater impact on generalized greeting behavior. Unfortunately, the design of the present study does not allow for definitive conclusions to be drawn about the effectiveness of multiple partner training when provided in a less naturalistic training environment, and this question is certainly worthy of future study. In the meantime, the results of the present study suggest that AAC interventionists should include multiple stimulus exemplars as a prominent feature in their communication training programs.

My research offers an example of how investigators might examine the functional relationships between treatment elements and their effects on generalized responding. Hopefully, it will serve to spark further interest in, and research on, the variables and behavioral principles that underlie generalization. Johnson (1979) cogently articulated the need for such research more than two decades ago: "While there is no question that we need to develop procedures for obtaining desired responding in settings of secondary interest with a minimum expenditure of resources, it is important to understand that progress towards this goal will be facilitated by the proper description and an empirical understanding of the variables and processes that are at work in such efforts" (pp.3).

Future research also should be directed towards the development of a training technology that would facilitate skill acquisition and generalized use of more sophisticated VOCAs than the one used here. In the present study, the BIGmack was selected as the VOCA for training partially because all participants were novice VOCA users. Although this device allowed participants to initiate social contact, they were relegated to a passive role in the subsequent interaction because their devices were limited to a single message. More sophisticated devices would allow for a greater diversity of communicative responses and consequently, more meaningful and reinforcing social interactions (Beukleman & Miranda, 1998).

Recently, there has been increased interest in the AAC literature in strategies for promoting unprompted communication in persons with severe disabilities (Carter, Hotchkis, & Cassar, 1996; Reichle & Sigafoos, 1991; Sigafoos & Reichle, 1993). Interestingly, the conceptualization of unprompted communication in this body of work parallels the stimulus control approach to generalization. For example, several authors have suggested that spontaneity can be established by first identifying the "naturally occurring" stimuli that ought to control the communication, then introducing interventions to bring the communicative behavior under their control (Halle, 1989; Kaczmarek, 1990). Future research might investigate the connection between spontaneity and generalization and evaluate the extent to which research findings from one area are applicable to the other. For example, a likely finding might be that individuals who are taught to communicate spontaneously will also demonstrate "automatic" generalization of their spontaneous communicative responses.

Several limitations of the present research should be considered both in interpreting the present results and in planning future investigations. First, since only four participants were involved, replication across a larger number of participants would further establish generality of the results. A related concern is that a multiple baseline design across only two participants was used. Traditionally, multiple baseline designs employ three or more baselines to demonstrate experimental control over behavior (Kazdin, 1982, p. 135). Indeed,

the original plan was to utilize a multiple baseline design across four participants. However, this plan had to be abandoned when difficulties in identifying a sufficient number of participants who met the inclusion criteria were encountered. Although Wanda and Cheryl were identified relatively early on during the project, identifying two additional participants proved more challenging. Thus, instead of delaying training for Wanda and Cheryl until two more appropriate participants were found, the research design was altered from a multiple baseline across 4 to a multiple baseline across 2, with replication across a second pair of participants. Although a multiple baseline design across two participants may not be quite as compelling as a design with more baselines, the inclusion of other the two other research design elements (i.e., alternating conditions and replication) proved persuasive in demonstrating experimental control over the dependent variable.

A second limitation was that the additive design employed in the study did not permit complete analysis of the independent contributions of each training phase to the overall generalization effects. Although the results suggest that multiple partner training likely contributed most to generalization, such a conclusion is only tentative. Future research may address this issue by varying the order in which training phases are introduced across several participants. However, it may not be possible to completely disentangle the effects of multiple partner training on generalized responding from those of either massed trial training or spaced trial training, since multiple partner training necessarily requires presentation of

training trials in either massed or in spaced fashion. Perhaps the most prudent approach would be to evaluate the effects of massed trial training with multiple partners, since this arrangement might be logistically easier to arrange than would spaced trial training with multiple partners.

Third, assessment of the extent to which training resulted in changes in the participants' day-to-day social-communicative behaviors was limited to pre-and post-training questionnaires responses from direct care staff. Although these data indicated that, on average, direct care staff rated participants as demonstrating enhanced greeting skills following training, the data provide no information about whether training ultimately led to (a) participants having more extensive social interactions with others outside of experimental situations, and (b) noticeable improvements in the participants' quality of life. It will be important for future research to evaluate more fully the impact of social-communication skills training on maintenance of the same skills in the natural environment and, ultimately, on the quality of life of individuals with severe disabilities.

Finally, two of the participants (i.e., Arlene and Shelly) failed to show complete generalization following multiple partner training. Although both demonstrated increases in generalized greeting that were well above baseline levels, more robust effects were desirable. Towards this end, multiple partner training could have been extended to occur with more partners and/or in more training settings (Lowther & Martin, 1980). Doing so may have broadened the

range of stimulus classes that could occasion the participants greeting behaviors and hence, may have produced greater generalization. This suggestion is consistent with the recommendation of Chadsey-Rusch and Halle (1992) that, when programming for generalized communicative behaviors (in their case, utilizing GCP methodology), trainers should incorporate stimulus variation across several dimensions, including people and settings.

In summary, the present study demonstrated the sequential effects of three generalization programming tactics on the generalized unprompted greeting behavior of four adults with profound multiple disabilities using a simple VOCA. The results indicated that both massed trial training and training with multiple trainers contributed to the overall generalization effects, with the latter resulting in the greatest increase in generalized responding. My research contributes to and expands both the behavioral literature on generalization programming and the AAC literature on VOCA use, and represents an initial step in clarifying questions pertaining to the effective features inherent in naturalistic teaching strategies that promote generalized communicative responding. Future research efforts should analytically determine the key principles and tactics of programming generalization and, in doing so, may lead to a training technology that simultaneously optimizes both skill acquisition and generalized responding.

References

American Association on Mental Retardation. (2002). Mental Retardation: Definitions, Classification, and Systems of Supports. Washington, DC; AAMR.

American Speech-Language-Hearing Association. (1989). Competencies for speech-language pathologists providing services in augmentative communication, ASHA, 31, 107-110.

Azrin, N. H. (1977). A strategy for applied research. Learning based but outcome oriented. American Psychologist, 32, 140-149.

Baer, D.M. (1983). The role of current pragmatics in the future analysis of generalization technology. In R.B. Stuart (Ed.), Adherence, compliance, and generalization in behavioral medicine, (pp. 192-212). New York: Brunner/Mazel.

Bedrosian, J.L. (1999). AAC efficacy research: Challenges for the new century. Augmentative and Alternative Communication, 15, 2 – 3.

Bergen, A.E. (2002). Blocking of stimulus control over human operant behavior. Unpublished master's thesis, University of Manitoba, Winnipeg, Manitoba.

Beukelman, D.R., & Miranda, P. (1998). Augmentative and alternative communication: Management of severe communication disorders in children and adults (2nd Edition). Baltimore: Paul H. Brookes.

Billingsley, F., White, O. R., & Munson, R. (1982). Procedural reliability: A rationale and an example. Behavioral Assessment, 2, 229-241.

Bostow, D. E., & Bailey, J. B. (1969). Modification of severe disruptive and aggressive behavior using brief time out and reinforcement procedures. Journal of Applied Behavior Analysis, 2, 31-37.

Brown, W. H., & Odom, S. L. (1994). Strategies and tactics for promoting generalization and maintenance of young children's social behavior. Research in Developmental Disabilities, 15, 99-118.

Bruininks,R. H., Hill, B. K., Weatherman, R. E., & Woodcock, R. W. (1995). Scales of Independent Behavior – Revised. Riverside Publishing.

Calculator, S., & Dollaghan, C. (1982). The use of communication boards in residential settings. Journal of Speech and Hearing Disorders, 14, 281-287.

Carter, M., Hotchkis, G., & Cassar, M. (1996). Spontaneity of augmentative and alternative communication in persons with intellectual disabilities: Critical review. Augmentative and Alternative Communication, 12, 97-109.

Chadsey-Rusch, J. (1992). Toward defining and measuring social skills in employment settings. American Journal on Mental Retardation, 4, 405-418.

Chadsey-Rusch, J., & Halle, J. (1992). The application of general-case instruction to the requesting repertoires of learners with severe disabilities. Journal of the Association for Persons with Severe Handicaps, 17, 121-132.

Chadsey-Rusch, J., Drasgow, E., Reinoehl, B., Halle, J., & Collet-Klingenberg, L. (1993). Using general-case instruction to teach spontaneous and generalized requests for assistance to learners with severe disabilities. Journal of the Association for Persons with Severe Handicaps, 18, 177-187.

Chandler, L. K., Lubeck, R. C., & Fowler, S. A. (1992). Generalization and maintenance of preschool children's social skills: A critical review and analysis. Journal of Applied Behavior Analysis, 25, 415-428.

Craven, L. (1977). Job skills are not enough. Industrial Education, 66, 32-33.

Dattilo, J., & Camarata, S. (1991). Facilitating conversation through self-initiated augmentative communication treatment. Journal of Applied Behavior Analysis, 24, 369-378.

Davies, R. R., & Rogers, E. S. (1985). Social skills training with persons who are mentally retarded. Mental Retardation, 23, 186-196.

Day, H.M., & Horner, R. H. (1986). Response variation and the generalization of a dressing skill: Compariosn of a single instace and general-case instruction. Applied Research in Mental Retardation, 7, 189-202.

Ducharme, D. E., & Holborn, S. W. (1997). Programming generalization of social skills in preschool children with hearing impairments. Journal of Applied Behavior Analysis, 30, 639-651.

Durand, M. (1993). Functional communication training using assistive devises: Effects on challenging behaviors and affect. Augmentative and Alternative Communication, 9, 168-176.

Edelstein, B. (1989). Generalization: Terminological, methodological, and conceptual issues. Behavior Therapy, 20, 311-324.

Gee, K., Graham, N., Goertz, L., Oshima, G., & Yoshioka, K. (1991). Teaching students to request continuation of routine activities by using time delay and decreasing physical assistance in the context of chain interruption. Journal of the Association for Persons with Severe Handicaps, 16, 154-167.

Goertz, L., & Sailor, W. (1994). New directions: Communication development in persons with severe disabilities. In G. Butler (Ed.), Severe Communication Disorders, Intervention Strategies (pp. 19-32). Gaithersberg, Maryland: Aspen Publishers, Inc.

Green, C.W., & Reid, D.H. (1999). A behavioral approach to identifying sources of happiness and unhappiness among individuals with profound multiple disabilities. Behavior Modification, 23, 280-293.

Greenspan, S., & Granfield, J. M. (1992). Reconsidering the construct of mental retardation: Implications of a model of social competence. American Journal on Mental Retardation, 96, 442-453.

Greenspan S., & Schoultz, B. (1981). Why mentally retarded adults lose their jobs: Social competence as a factor in work adjustments. Applied Research in Mental Retardation, 2, 23-38.

Grossman, H. J. (Ed.). (1983). Classification in mental retardation. Washington, DC: American Association on Mental Retardation.

Halle, J.W. (1982). Teaching functional language to the handicapped: Using the natural environment as the context for teaching. Journal of the Association for the Severely Handicapped, 7, 29-37.

Halle, J.W. (1987). Teaching language in the natural environment. An analysis of spontaneity. Journal of the Association for the Severely Handicapped, 12, 28-37.

Halle, J.W. (1989). Identifying stimuli in the natural environment that control verbal responses. Journal of Speech and Hearing Disorders, 54, 500-504.

Holborn, S. W., & Ducharme, D. E. (1993). The ABC's of programming generalization: Back to the basics of behavior analysis. Unpublished manuscript, University of Manitoba.

Hopkins, B. L. (1968). Effects of candy and social reinforcement, instructions and reinforcement schedule learning on the modification and maintenance of smiling. Journal of Applied Behavior Analysis, 2, 121-129.

Horner, R.H., Albin, R., & Ralph, G. (1986). Generalization with precision: The role of negative teaching examples in the instruction of generalized grocery

item selection. Journal of the Association of Persons with Severe Handicaps, 11, 300-308.

Horner, R.H., Jones, D., & Williams, J.A. (1985). A functional approach to teaching generalized streetcrossing. The Journal of The Association for Persons with Severe Handicaps, 10, 71-78.

Horner, R.H., Sprague, J., & Wilcox, B. (1982). General case programming for community activities. In B. Wilcox & G. T. Bellamy (Eds.), Design of High School Programs for Severely Handicapped Students (pp. 61-98). Baltimore: Paul H. Brookes.

Horner, R.H., Willimans, J.A., & Stevely, J.D. (1987). Acquistion of generalized telephone use by students with moderate and severe disabilities. Research in Developmental Disabilities, 8, 229-247.

Hughes, C., Harmer, M. L., Killian, D. J., and Niarhos F. (1995). The effects of multiple-exemplar self-instructional training on high school students' generalized conversational interactions. Journal of Applied Behavior Analysis, 28, 201-218.

Johnson, J. M. (1979). On the relation between generalization and generality. The Behavior Analyst, 2, 1-6.

Kaczmarek, L. (1990). Teaching spontaneous language to individuals with severe handicaps: A matrix model. Journal of the Association for Persons with Severe Handicaps, 15, 160-169.

Kaiser, A.P., Yoder, P.J., & Keets, A. (1992). Evaluating milieu teaching. In S. Warren & J. Reichle (Eds), Communication and language intervention: Causes and effects in communication and language intervention (pp. 9-47). Baltimore: Paul H. Brookes.

Kazdin, A. (1982). Single-case research designs: Methods for clinical and applied settings. New York: Oxford University Press.

Kirby, K. C., & Bickle, W. K. (1988). Toward an explicit analysis of generalization: A stimulus control interpretation. The Behavior Analyst, 11, 115-129.

Koegel, L., Koegel, R., Hurley C., & Frea, W. D. (1992). Improving social skills and disruptive behavior in children with autism through self-management. Journal of Applied Behavior Analysis, 25, 341-354.

Lancioni, G. E. (1982). Normal children as tutors to teach social responses to withdrawn mentally retarded schoolmates: Training, maintenance, and generalization. Journal of Applied Behavior Analysis, 15, 17-40.

Lowther, R.M., & Martin, G.L. (1980). Multiple settings and trainers for programming generalization of a social response of severely retarded persons. Behavior Research of Severe Developmental Disabilities, 1, 131-145.

Martin, G.L., & Pear, J.J. (2002). Behavior modification: What it is and how to do it (7th ed.). Englewood Cliffs, NJ: Prentice-Hall.

Matson, J. L., & Earnhart, T. (1981). Programming treatment effects to the natural environment. Behavior Modification, 5, 27-37.

Matson, J.L., & Francis, K.L. (1994). Generalizing spontaneous language in developmentally delayed children via a visual cue procedure using caregivers as therapists. Behavior Modification, 18, 186-197.

McDevitt, S. C., Smith, P. M., Schmidt, D. W., & Rosen, M. (1978). The deinstitiutionalized citizen: Adjustment and quality of life. Mental Retardation, 16, 22-24.

McGregor, G., Young, J., Gerak, J., Thomas, B., & Vogelsberg, T. (1992). Increasing functional use of an assistive communication device by a student with severe disabilities, Augmentative and Alternative Communication, 8, 243-250.

Mustonen, T., Locke, P., Reichle, J., Solbrack, M., & Lindgren, A. (1991). An overview of augmentative and alternative communication systems. In Reichle, J., York, J., & Sigafoos, J. (Eds.), Implementing Augmentative and Alternative Communication: Strategies for Learners with Severe Disabilities (pp. 1-37). Baltimore: Paul H. Brookes.

National Dissemination Centre for Children with Disabilities (2002). Severe and/or Multiple Disabilities [On-line], Fact Sheet Number 10. Available: www.nichcy.org/pubs/factshe/fs10txt.htm

Perry, M. A., & Cerreto, M. C. (1977). Structured learning training of social skills for the retarded. Mental Retardation, 15, 59-525.

Reichle, J., & Karlan, G. (1985). The selection of an augmentative system in communication intervention: A critique of decision rules. Journal of the Association for Persons with Severe Handicaps, 10, 146-156.

Reichle, J., & Sigafoos, J. (1991). Establishing spontaneity and generalization. In Reichle, J., York, J., & Sigafoos, J. (Eds.), Implementing Augmentative and Alternative Communication: Strategies for Learners with Severe Disabilities (pp. 157-171). Baltimore: Paul H. Brookes.

Reichle, J. (1997). Communication intervention with persons who have severe disabilities. The Journal of Special Education, 31, 110-134.

Robertson, I., Richardson, A. M., & Youngson, S. C. (1985). Social skills training with mentally handicapped people: A review. British Journal on Clinical Psychology, 23, 241-264.

Schalock, R. L. & Harper, R. S. (1978). Placement from community-based mental retardation programs. How well do clients do? American Journal of Mental Retardation, 17, 289-293.

Schloss, P. J., & Schloss, C. N. (1985). Contemporary issues in social skills research with mentally retarded persons. Journal of Special Education, 19, 269-282.

Schloss, P. J., & Wood, C. E. (1990). Effect of self-monitoring on maintenance and generalization of conversational skills of persons with mental retardation. Mental Retardation, 28, 105-113.

Schlosser, R.W., & Braun, U. (1994). Efficacy of AAC interventions: Methodologic issues in evaluating behavior change, generalization, and effects. Augmentative and Alternative Communication, 10, 207-223.

Shepis, M.M., Reid, D.H., & Behrman, M.M. (1996). Acquisition and functional use of voice output communication by persons with profound multiple disabilities. Behavior Modification, 20, 451-468.

Shepis, M.M, Reid, D.H., Behrmann, M.M., & Sutton, K.A. (1998). Increasing communicative interactions of young children with autism using a voice output communication aid and naturalistic teaching, Journal of Applied Behavior Analysis, 31, 561-578.;

Sherman, J. A., Sheldon, J. B., Harchik, A. E., Edwards, K., & Quinn, J. M. (1992). Social evaluation of behaviors comprising three social skills and a comparison of the performance of people with and without mental retardation. American Journal on Mental Retardation, 96, 419-431.

Sidman, M. (1969). Tactics of scientific research: Evaluating experimental data in psychology. Boston: Authors Cooperative .

Sigafoos, J., & Reichle, J. (1993). Establishing spontaneous verbal behavior. In R.A. Gable & S.F. Warren (Eds.), Strategies for teaching students with mild to severe mental retardation (pp. 191-230). London: Jessica Kingsley.

Siperstein, G. N. (1992). Social competence: An important construct in mental retardation. Mental Retardation, 96, iii-vi.

Smith, T. (1981). Employer concerns in hiring mentally retarded persons. Rehabilitation Counseling Bulletin, 24, 316-318.

Soto, G., Belfiore, P.J., Schlosser, R.W., & Haynes, C. (1995). Teaching specific requests: A comparative analysis on skill acquisition and preference using two augmentative and alternative communication aids, Education and Training in Mental Retardation, 2, 169-178.

Sprague, J. R., & Horner, R. H. (1984). The effects of single instance, multiple instance, and general-case training on generalized vending machine use by moderately and severely handicapped students. Journal of Applied Behavior Analysis, 17, 273-278.

Stacy, D., Doleys, D. M., & Malcolm, R. (1979). Effects of social skills training in a community-based program. American Journal of Mental Deficiency, 84, 152-158.

Stokes, T. F. (1992). Discrimination and generalization, Journal of Applied Behavior Analysis, 25, 229-432.

Stokes, T. F., & Baer, D. M. (1977). An implicit technology of generalization. Journal of Applied Behavior Analysis, 10, 349-367.

Stokes, T. F., Baer, D. M., & Jackson, R. L. (1974). Programming the generalization of a greeting response in four retarded children. Journal of Applied Behavior Analysis, 7, 599-610.

Stokes, T. F., & Osnes, P. G. (1989). An operant pursuit of generalization. Behavior Therapy, 20, 337-355.

Vaughen, S. R., Ridley, C. A., & Cox, J. (1983). Evaluating the efficacy of an interpersonal skills training program with children who are mentally retarded. Education and Training of the Mentally Retarded, 18, 191-196.

Walters, K., Holborn, S.W., & Ediger, J.M. (2002). General case programming of instruction following for individuals with developmental delays. Poster session presented at the 28th annual meeting of the Association for Behavior Analysis, Toronto, ON.

Wiesen, A., & Watson, E. (1967). Elimination of attention seeking behaviors in a retarded child. American Journal of Mental Deficiency, 72, 18-23.

Williams, B. A. (1996). Evidence that blocking is due to associative deficit: Blocking history affects the degree of subsequent associative competition. Psychonomic Bulletin & Review, 3, 71-74.

Zangari, C., Lloyd, L.L., & Vicker, B. (1994). Augmentative and alternative communication: An historic perspective. Augmentative and Alternative Communication, 10, 27-59.

Author Note

This research was supported in part by a The Sister Bertha Bauman Research Research Award, St. Amant Centre and by a J. G. Fletcher Research Award, University of Manitoba, Faculty of Arts.

Appendix A
Project Description and Consent Form

Systematic Analysis of Generalization Programming of VOCA-Mediated Greeting Responses of Adults with Severe Developmental Disabilities

This project will be conducted by James Ediger, Behavior Analyst at St. Amant Centre and Ph. D. Candidate in the Department of Psychology at the University of Manitoba, and will be supervised by Dr. Stephen Holborn, Department of Psychology, University of Manitoba. The project has been approved by the St. Amant Centre and the University of Manitoba Department of Psychology Human Ethical Review Committee.

What is the study about?
Being able to greet others is an important skill for persons with developmental disabilities. Teaching someone to greet is only useful, however, if the newly learned skills are used by the person in "real-life" situations. In this project, we would like to investigate whether the way in which greeting skills are taught has an effect on how well the person uses these skills in their every day life. To do this, participants will be involved in daily teaching sessions during which they will learn how to greet someone using a voice output communication aid (VOCA), an electronic device that allows a person who does not speak to communicate verbally by pressing a switch that plays a recorded message. To determine if the newly learned skills are transferring to daily life, participants will be observed at various times throughout the day to see if they greet people who they come in contact with.

What will the project include, and how long will it last?
The study is expected to last for about four months and will involve the following:

1. An initial assessment in which participants are observed in their work room, the cafeteria, or their living units to find out how well they greet others before receiving any teaching. This will take about a week of daily observations to complete.

2. Daily teaching sessions during which an instructor (a Centre staff or volunteer) works individually with participants, teaching them how to use a voice output communication aid to greet others. Teaching will involve instruction (telling participants what to do), modeling (showing participants what to do), practicing, and praising participants.

3. At various points in the project, observations will be conducted to see how well the newly learned greeting skills have transferred to "real life" situations. These observations will involve having research assistants locating themselves within 3 metres of the participants and waiting for the participants to greet them. These probes will occur in the participants workroom, the cafeteria, and on the living unit.

Is participation voluntary?
Yes. Your decision regarding consent will in no way affect any services that the participant may be receiving now or in the future from the St. Amant Centre or from the University of Manitoba.

Can participation be stopped at any time?
Yes. Participation can be stopped at any time, and for any reason. It will not affect services that the participant is receiving now or in the future.

Will personal information be kept confidential?
Yes. The identity of all participants will be kept strictly confidential. All data collected will be kept in a secured office, and will be accessible only to researchers. Any presentations, reports, or publications as the result of this project will not contain any information identifying the participants.

Are there any risks to taking part in the study?
No. The teaching procedures will include modeling, instructing, and praise. These are common procedures, and present no risk to participants. Observations of participants will not interfere with regularly occurring activities.

Are there benefits to taking part in the study?
There are several potential **direct benefits** for participants. First, participants will learn an important social skill of greeting others. This may assist them in the future to develop new friendships and may enhance the relationships they currently have. Second, participants will have the opportunity to meet and develop relationships with several staff and volunteers, thereby possibly increasing their circle of friends and advocates. Finally, participants will learn to use a voice output communication aid (VOCA) to communicate with others.

Is there any compensation for participating?
No, there is no financial compensation for participating.

Who should I contact if I have any questions or concerns about the project?
If you have any questions or concerns about the project please call James Ediger at 256-4301, ext. 307 (St. Amant Centre), or Dr. Stephen Holborn at 474-8245 (University of Manitoba).

What should I do if I am interested?
If you are a family member or advocate, but are not the legal guardian, we would like your support for the participant to take part in this project. Please sign the section, *Support of Family/Advocate*, to indicate your support. The person(s) with legal authority to give consent should sign the section, *Signature of Person Legally Authorized to Give Consent*, at the bottom of this page.

CONSENT FORM

Please sign the appropriate section(s) of this form and return it if you wish your child to be considered for involvement in the following project:

Systematic Analysis of Generalization Programming of VOCA-Mediated Greeting Responses of Adults with Severe Developmental Disabilities

---

Support of Family/Advocate

I support the participation of _____ in this project.

Print Name of Parent/Advocate	Signature of Parent/Advocate	Date

---

Signature of Person Legally Authorized to Give Consent

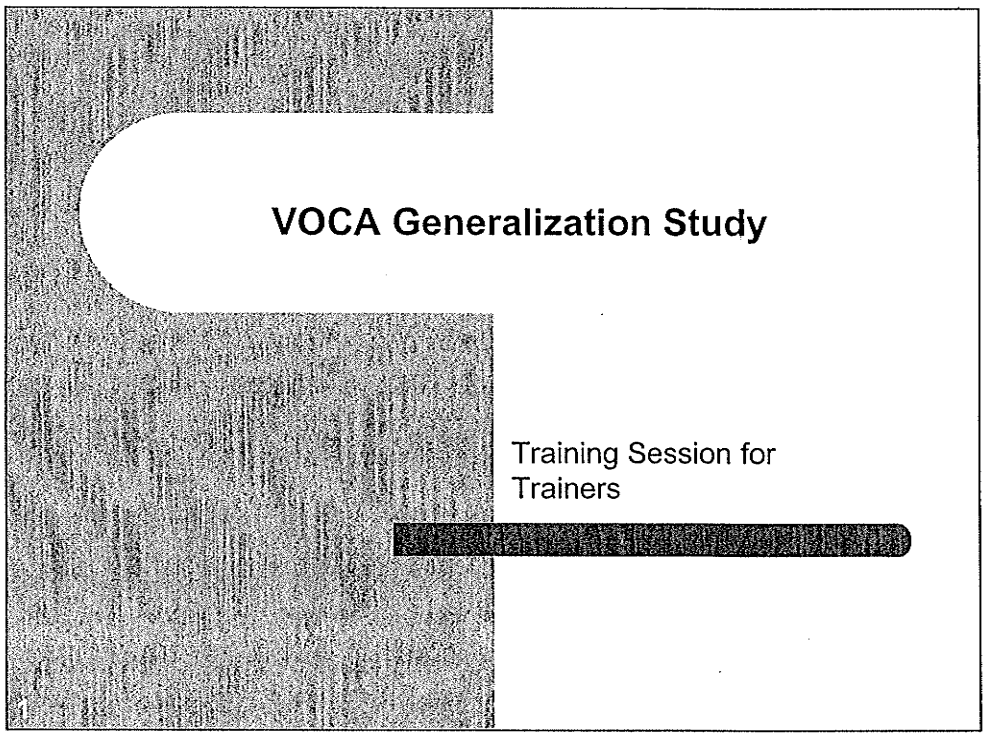
By signing this form, I give consent for _____ to participate in the above named research project. I am aware that I may withdraw my consent at any time with no impact on the services that the participant is receiving or may receive in the future. I consent to:

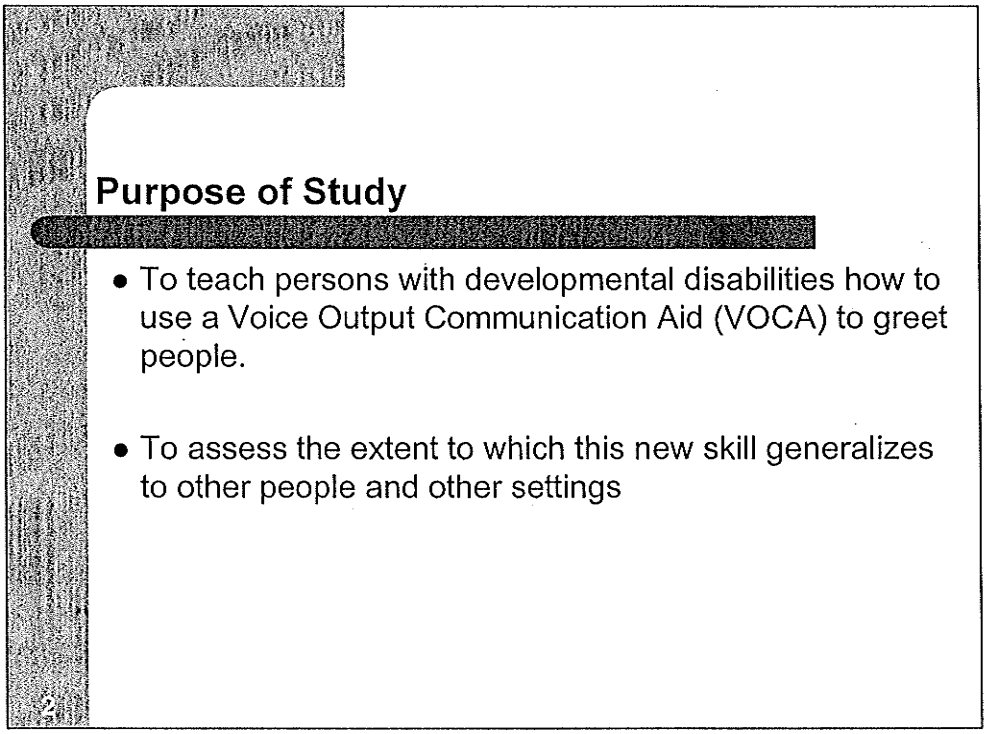
- **Allow project staff to gather demographic and diagnostic information about the participant from clinical/agency records;**
- **Allow project staff to assess the participant's social skills through direct observation during naturally occurring social situations and/or by interviewing Centre staff familiar with the participant;**
- **Allow project staff to work with the participant to teach him or her how to use a VOCA to greet others;**
- **Allow project staff to observe the participant and a partner (a Centre staff or Volunteer) in the workroom, cafeteria, and on the living unit to see how well greeting skills are used in "real life" situations;**
- **Allow the participants results to be included in publications, reports, talks, so that others may learn for this project (the identity of the participant will not be disclosed).**

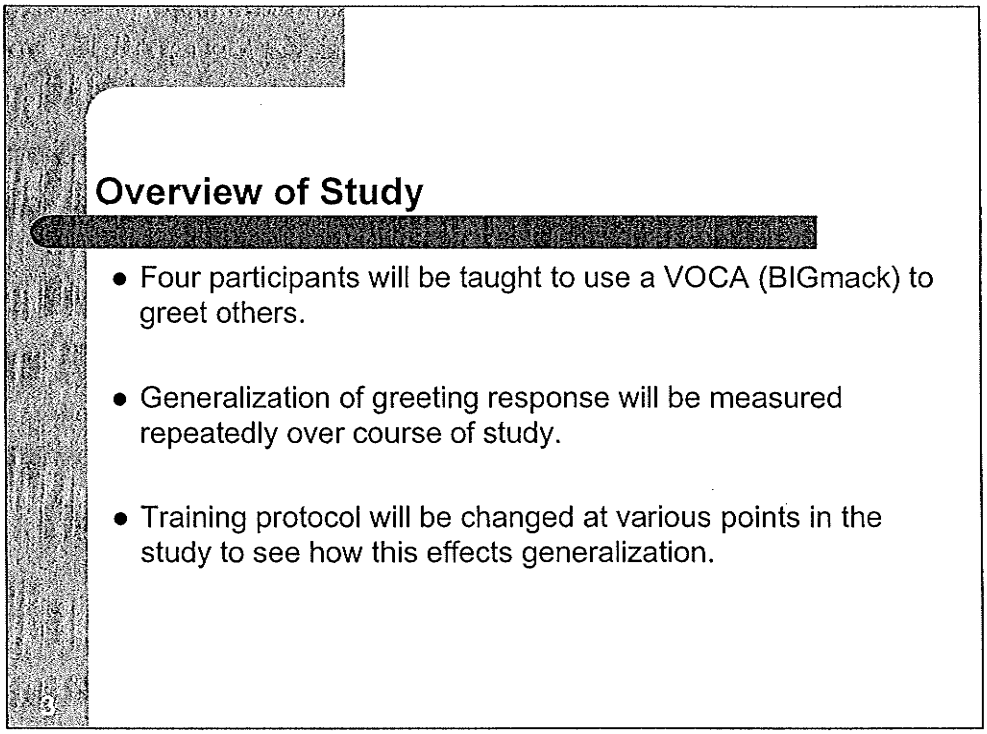
Print Name of Person Legally Authorized to give Consent	Signature of Person Legally Authorized to give consent	Date

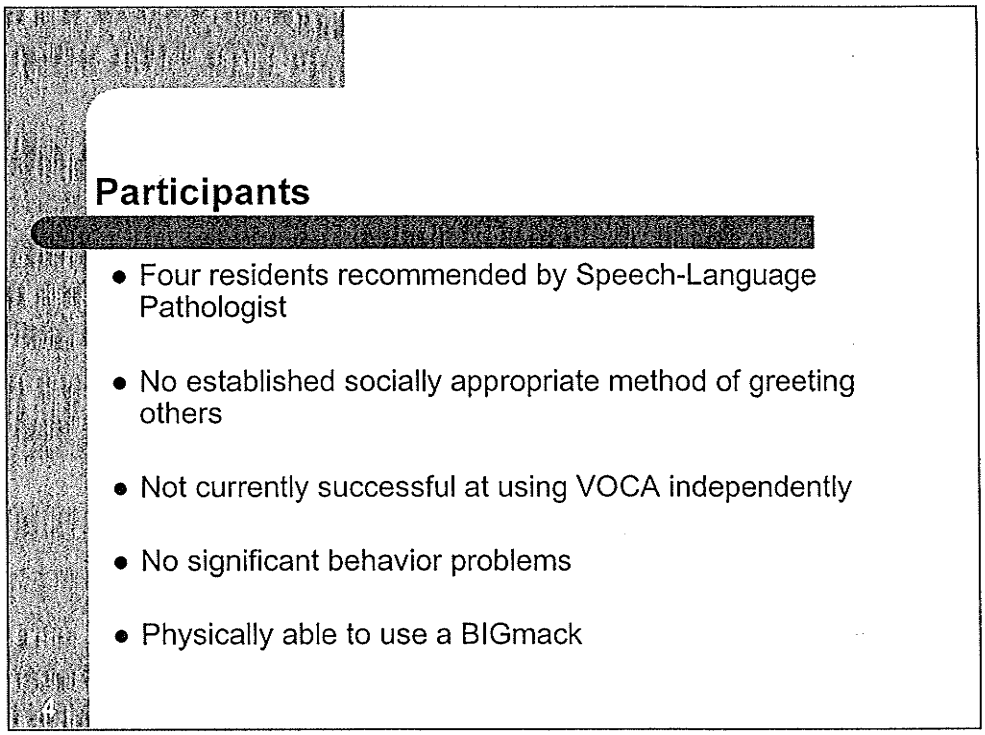
---

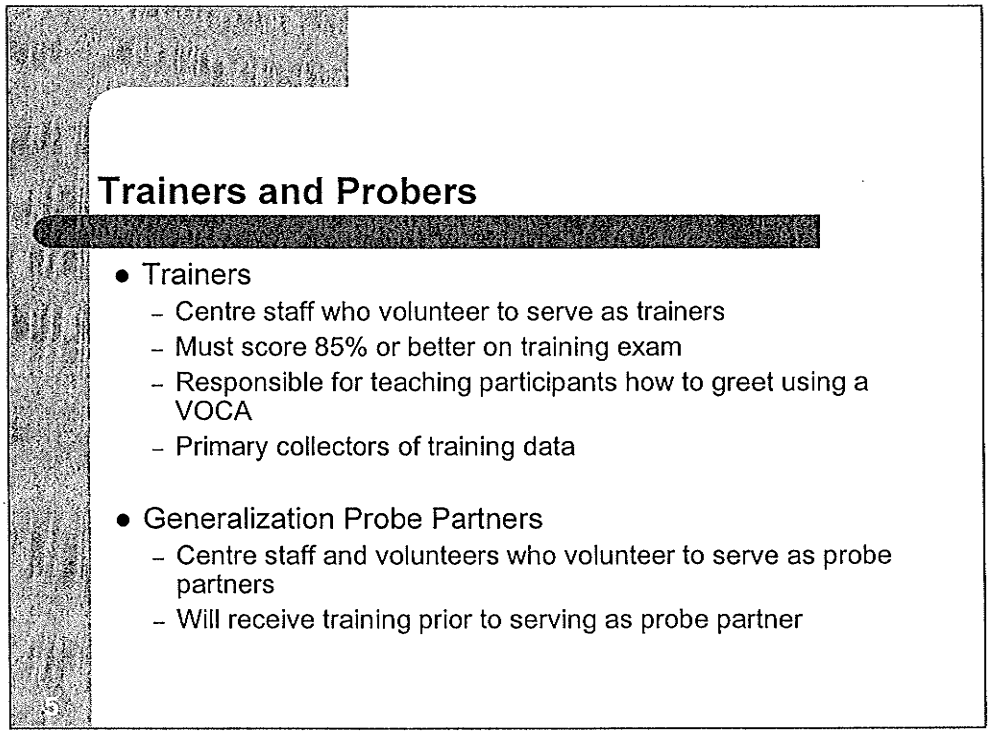
Appendix B
Training Package and Examination for Trainers

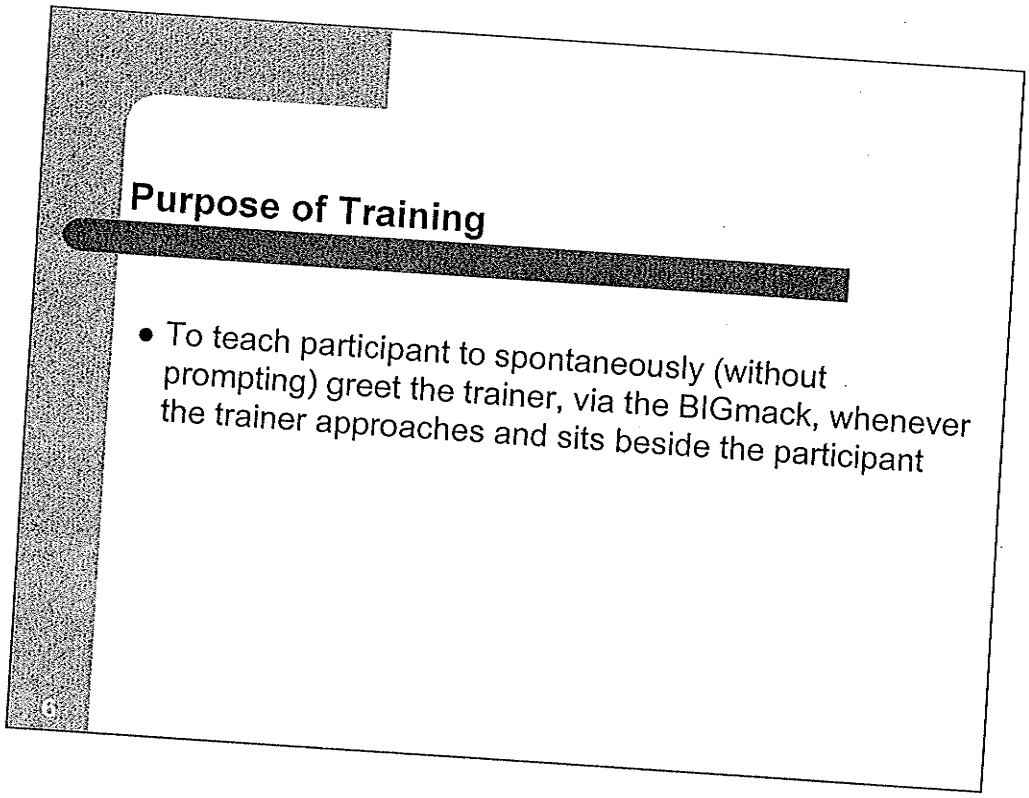


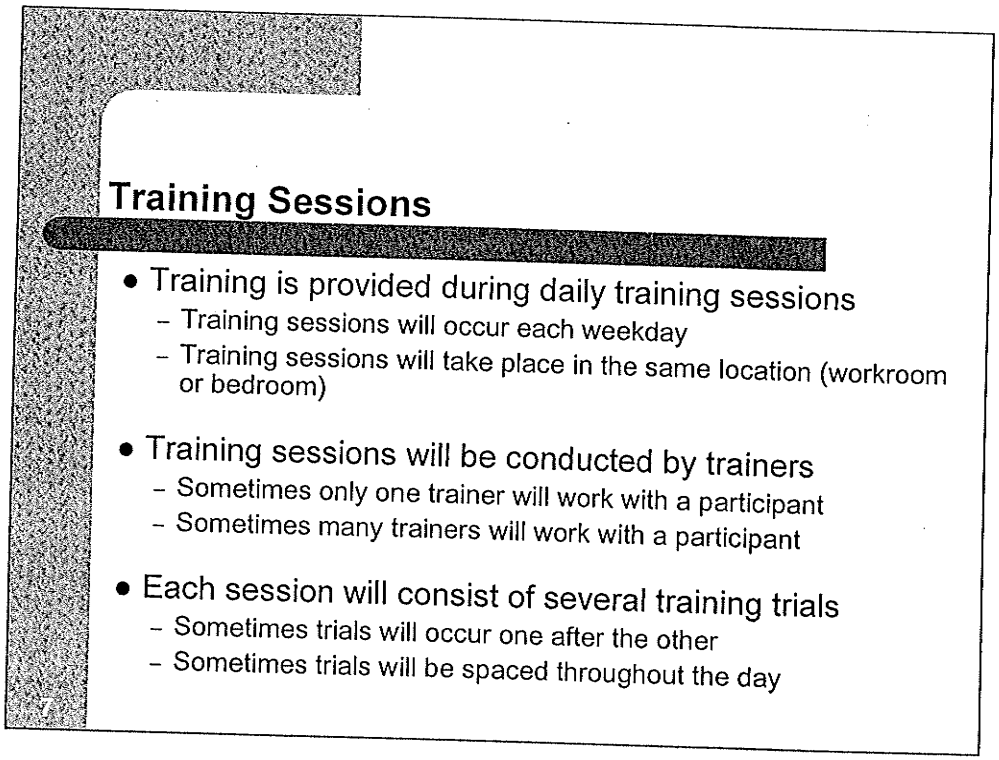

Purpose of Study
• To teach persons with developmental disabilities how to use a Voice Output Communication Aid (VOCA) to greet people.
• To assess the extent to which this new skill generalizes to other people and other settings
2

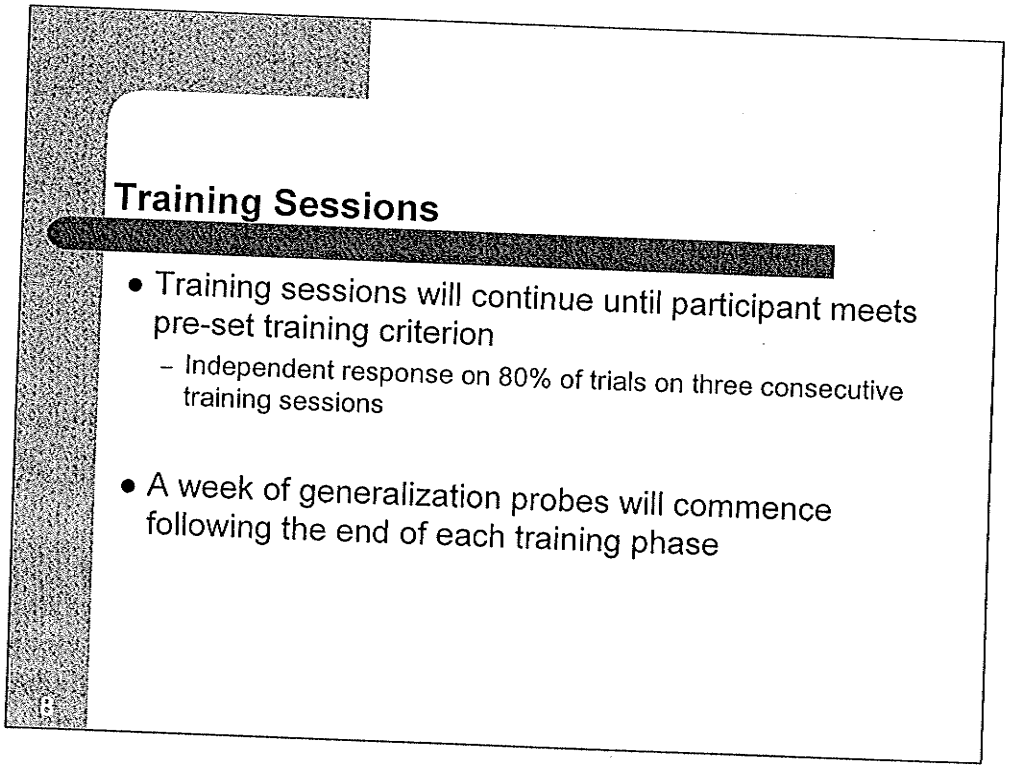

Overview of Study
• Four participants will be taught to use a VOCA (BIGmack) to greet others.
• Generalization of greeting response will be measured repeatedly over course of study.
• Training protocol will be changed at various points in the study to see how this effects generalization.

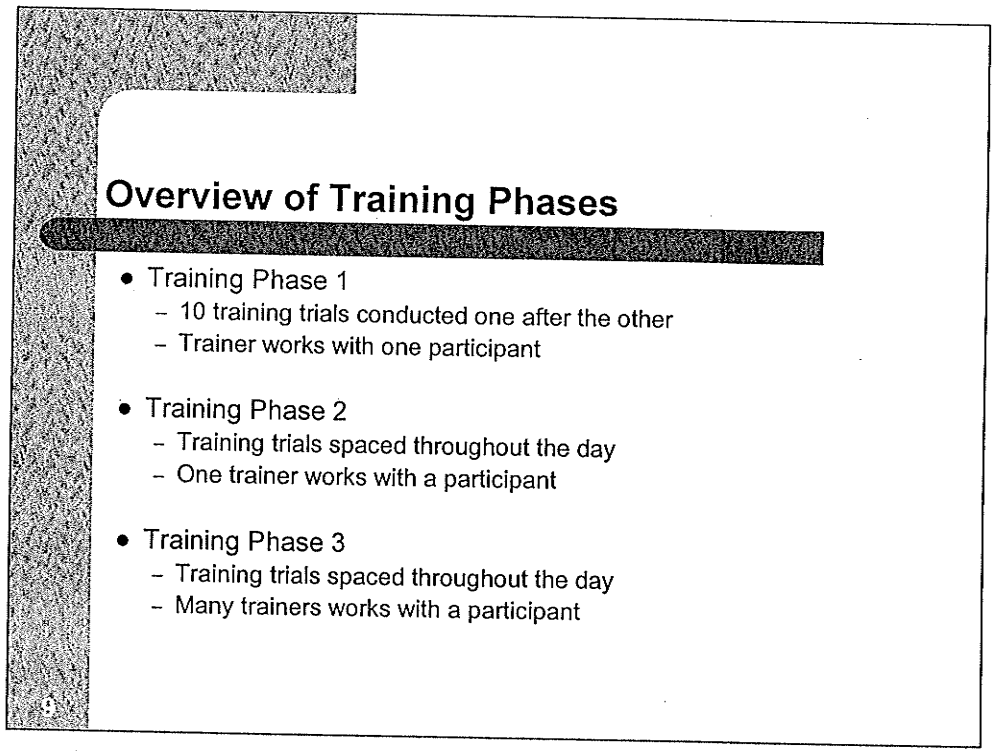

Participants
• Four residents recommended by Speech-Language Pathologist
• No established socially appropriate method of greeting others
• Not currently successful at using VOCA independently
• No significant behavior problems
• Physically able to use a BIGmack
4

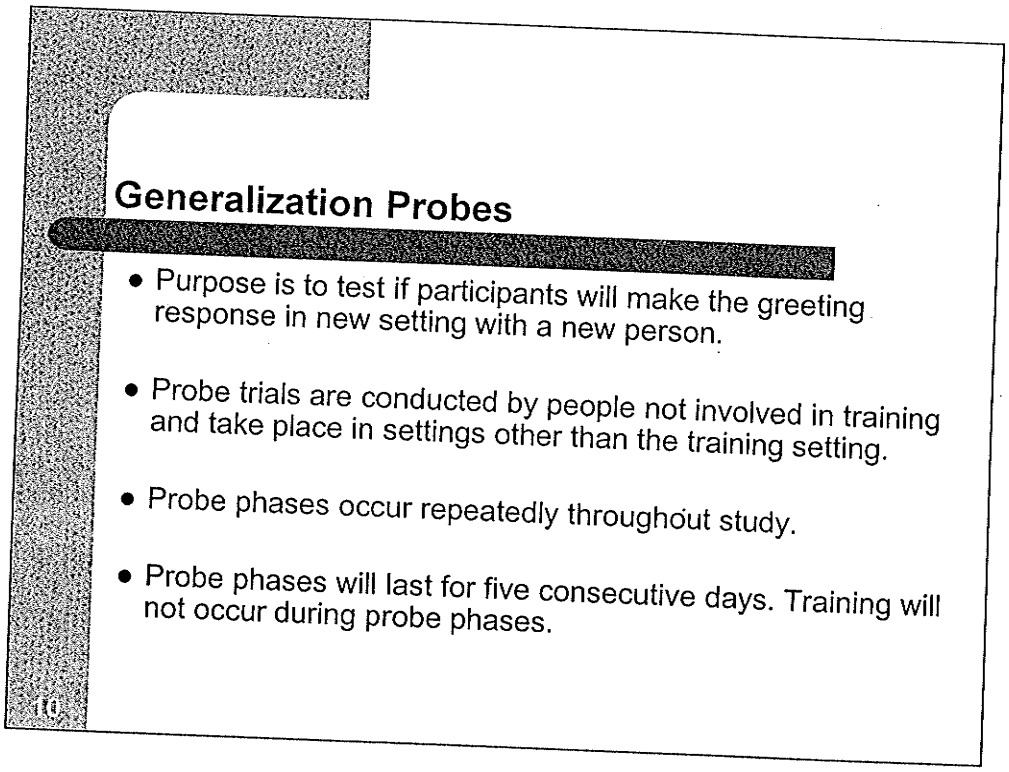

Trainers and Probers
• Trainers
– Centre staff who volunteer to serve as trainers
– Must score 85% or better on training exam
– Responsible for teaching participants how to greet using a VOCA
– Primary collectors of training data
• Generalization Probe Partners
– Centre staff and volunteers who volunteer to serve as probe partners
– Will receive training prior to serving as probe partner
5

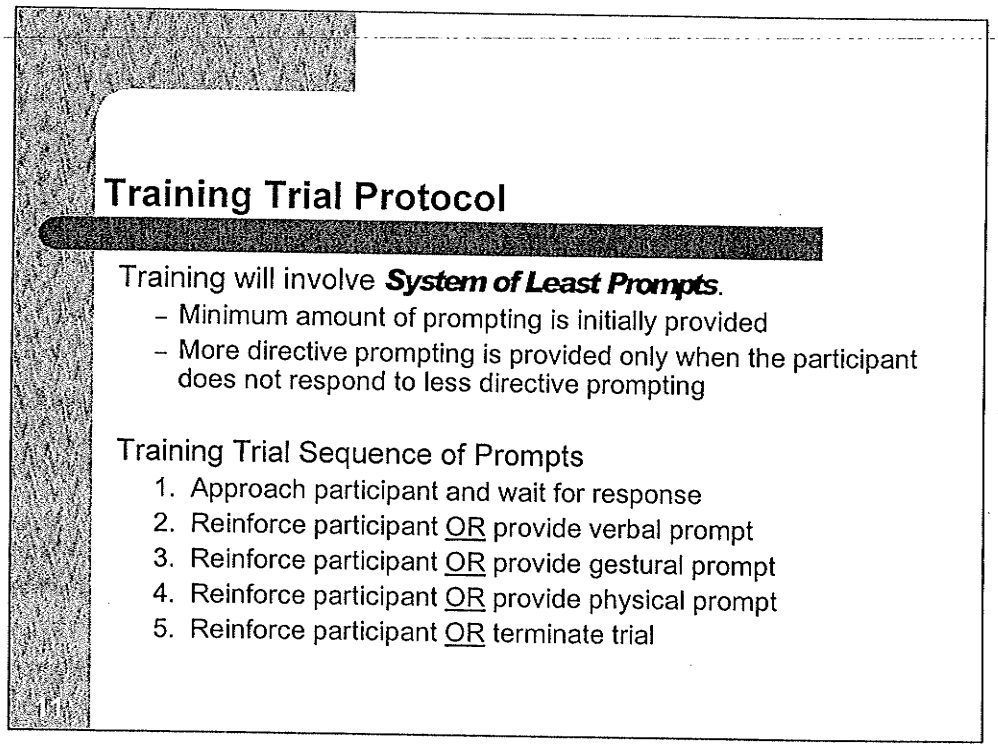

Purpose of Training
• To teach participant to spontaneously (without prompting) greet the trainer, via the BIGmack, whenever the trainer approaches and sits beside the participant
6

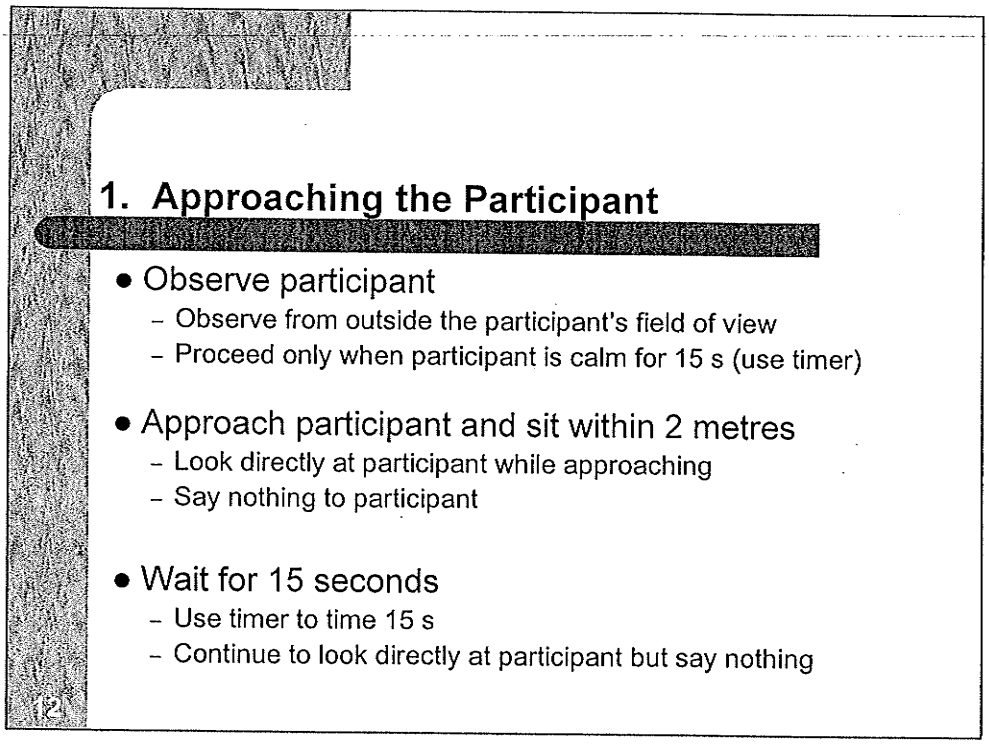

Training Sessions
• Training is provided during daily training sessions
– Training sessions will occur each weekday
– Training sessions will take place in the same location (workroom or bedroom)
• Training sessions will be conducted by trainers
– Sometimes only one trainer will work with a participant
– Sometimes many trainers will work with a participant
• Each session will consist of several training trials
– Sometimes trials will occur one after the other
– Sometimes trials will be spaced throughout the day

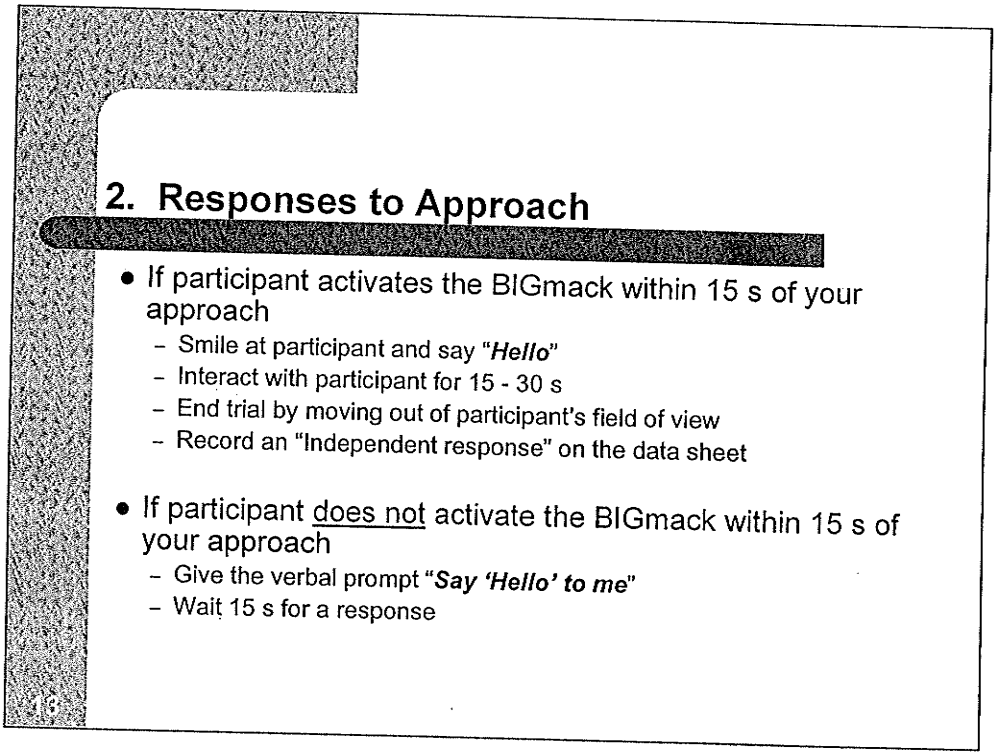

Training Sessions
• Training sessions will continue until participant meets pre-set training criterion
– Independent response on 80% of trials on three consecutive training sessions
• A week of generalization probes will commence following the end of each training phase
8

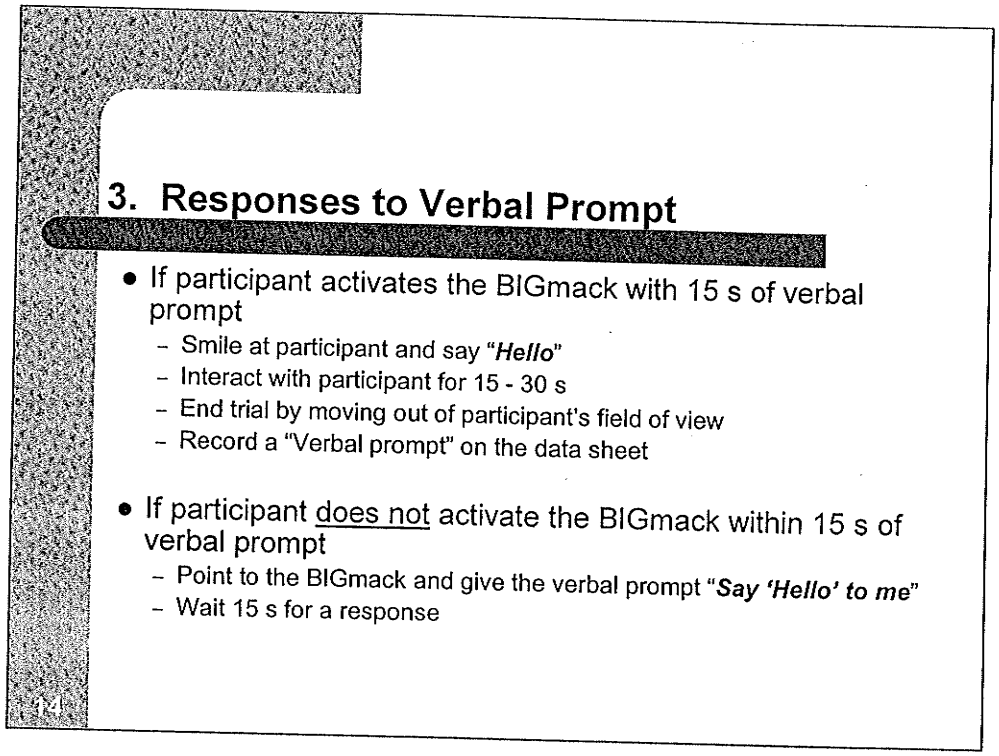

Overview of Training Phases
• Training Phase 1
– 10 training trials conducted one after the other
– Trainer works with one participant
• Training Phase 2
– Training trials spaced throughout the day
– One trainer works with a participant
• Training Phase 3
– Training trials spaced throughout the day
– Many trainers works with a participant

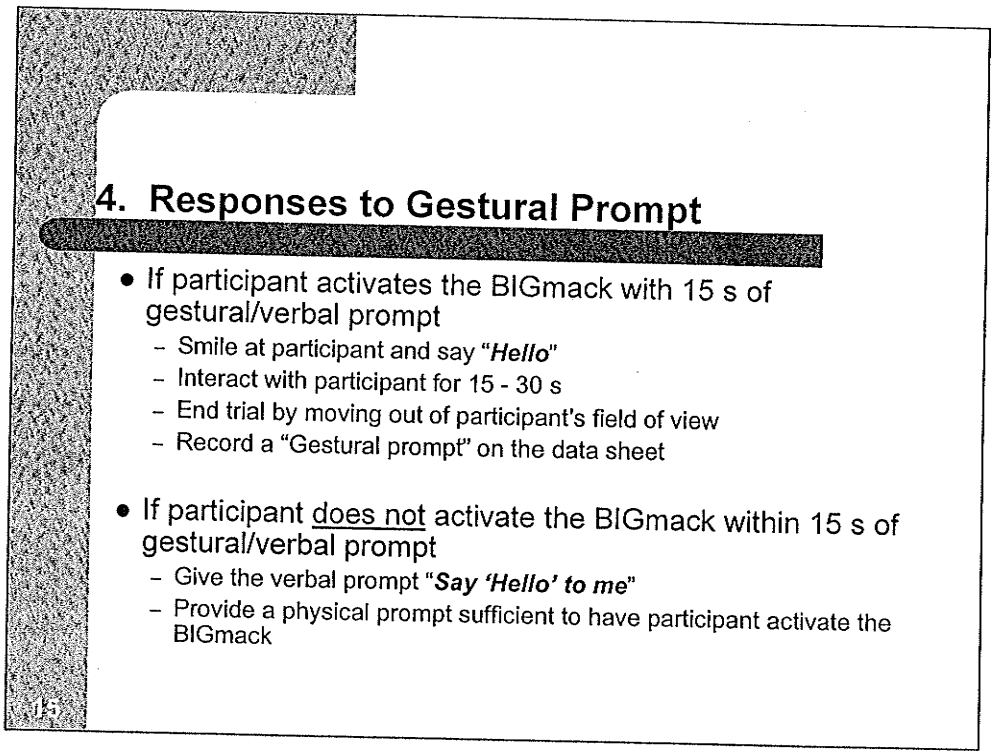

Generalization Probes
• Purpose is to test if participants will make the greeting response in new setting with a new person.
• Probe trials are conducted by people not involved in training and take place in settings other than the training setting.
• Probe phases occur repeatedly throughout study.
• Probe phases will last for five consecutive days. Training will not occur during probe phases.
10

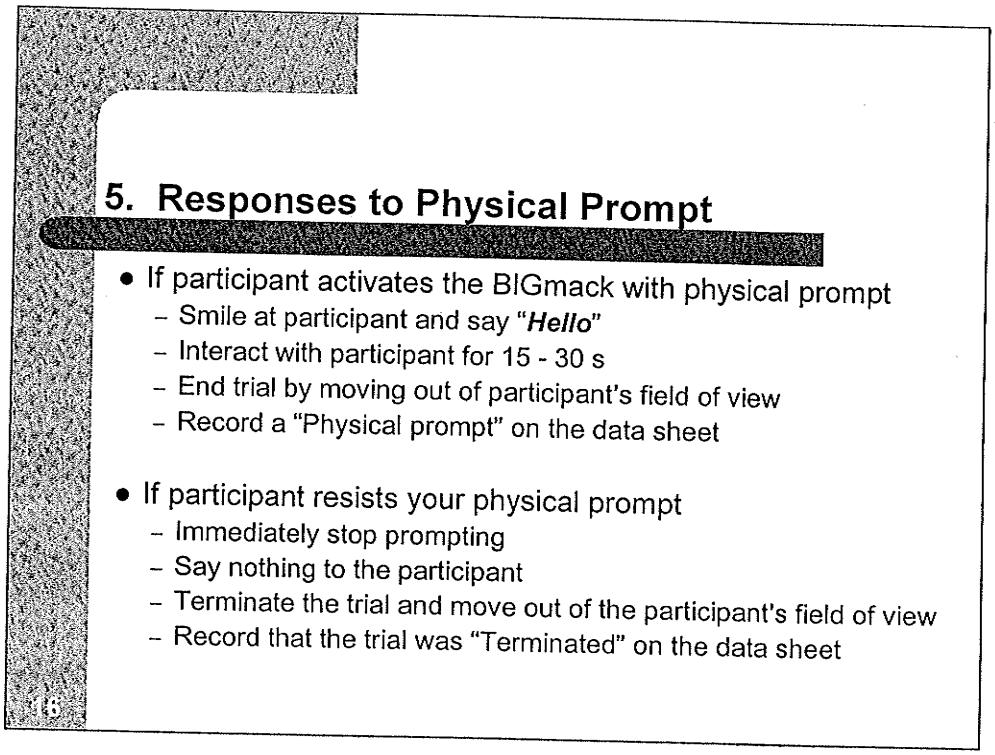

Training Trial Protocol
Training will involve System of Least Prompts.
- Minimum amount of prompting is initially provided
- More directive prompting is provided only when the participant does not respond to less directive prompting
Training Trial Sequence of Prompts
1. Approach participant and wait for response
2. Reinforce participant OR provide verbal prompt
3. Reinforce participant OR provide gestural prompt
4. Reinforce participant OR provide physical prompt
5. Reinforce participant OR terminate trial

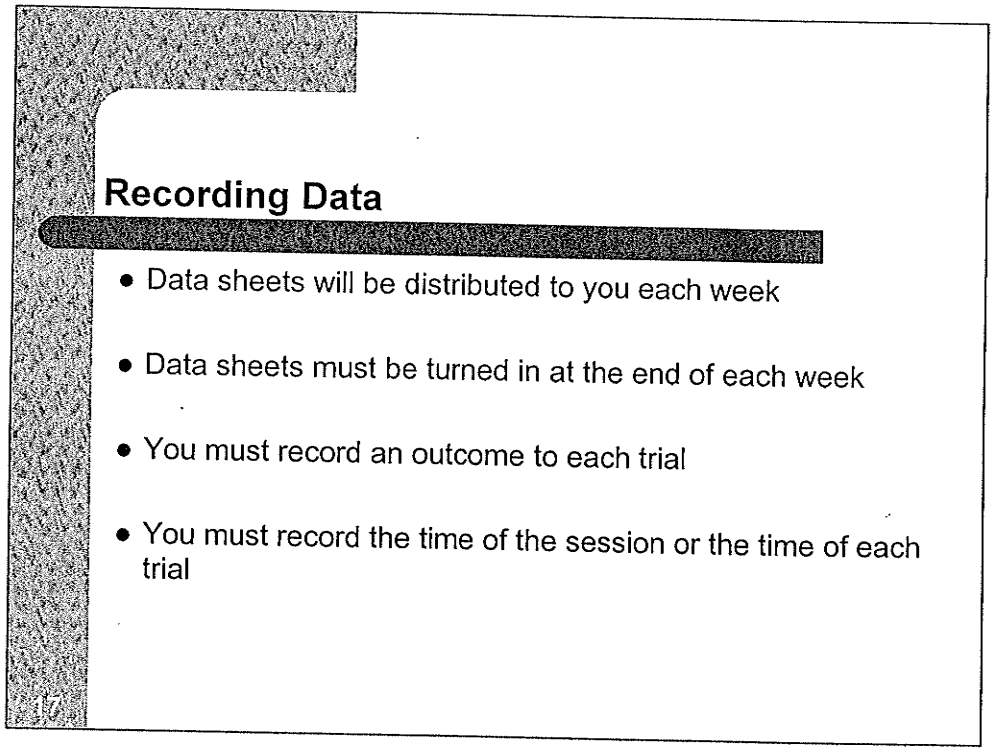

1. Approaching the Participant
• Observe participant
– Observe from outside the participant's field of view
– Proceed only when participant is calm for 15 s (use timer)
• Approach participant and sit within 2 metres
– Look directly at participant while approaching
– Say nothing to participant
• Wait for 15 seconds
– Use timer to time 15 s
– Continue to look directly at participant but say nothing
12

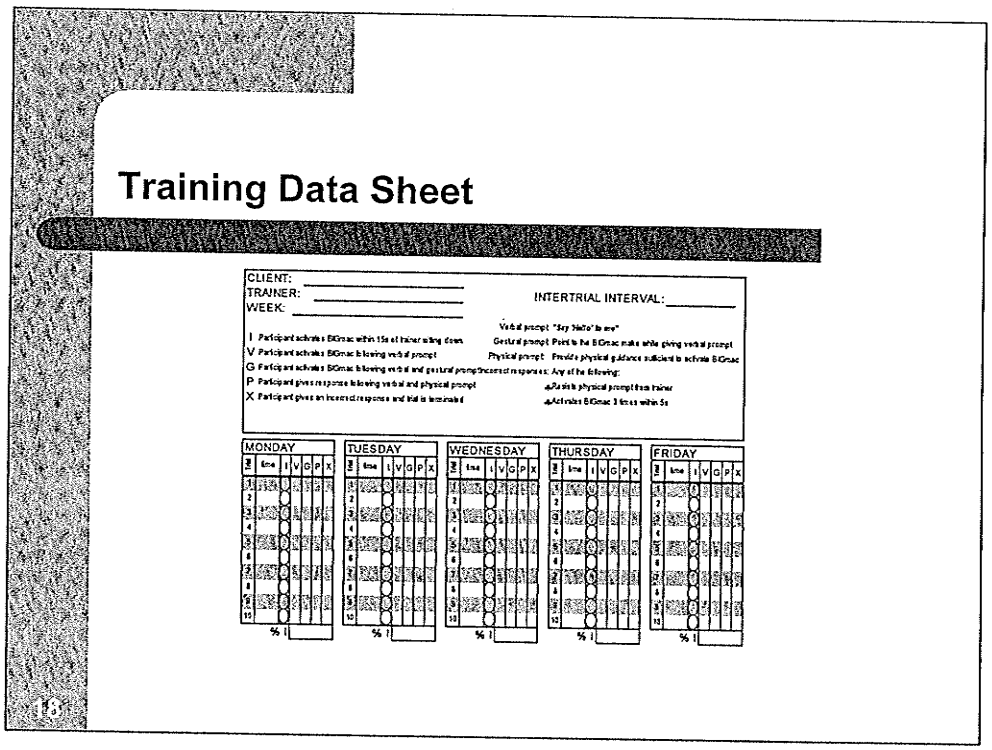

2. Responses to Approach
• If participant activates the BIGmack within 15 s of your approach
– Smile at participant and say "Hello"
– Interact with participant for 15 - 30 s
– End trial by moving out of participant's field of view
– Record an "Independent response" on the data sheet
• If participant does not activate the BIGmack within 15 s of your approach
– Give the verbal prompt "Say 'Hello' to me"
– Wait 15 s for a response

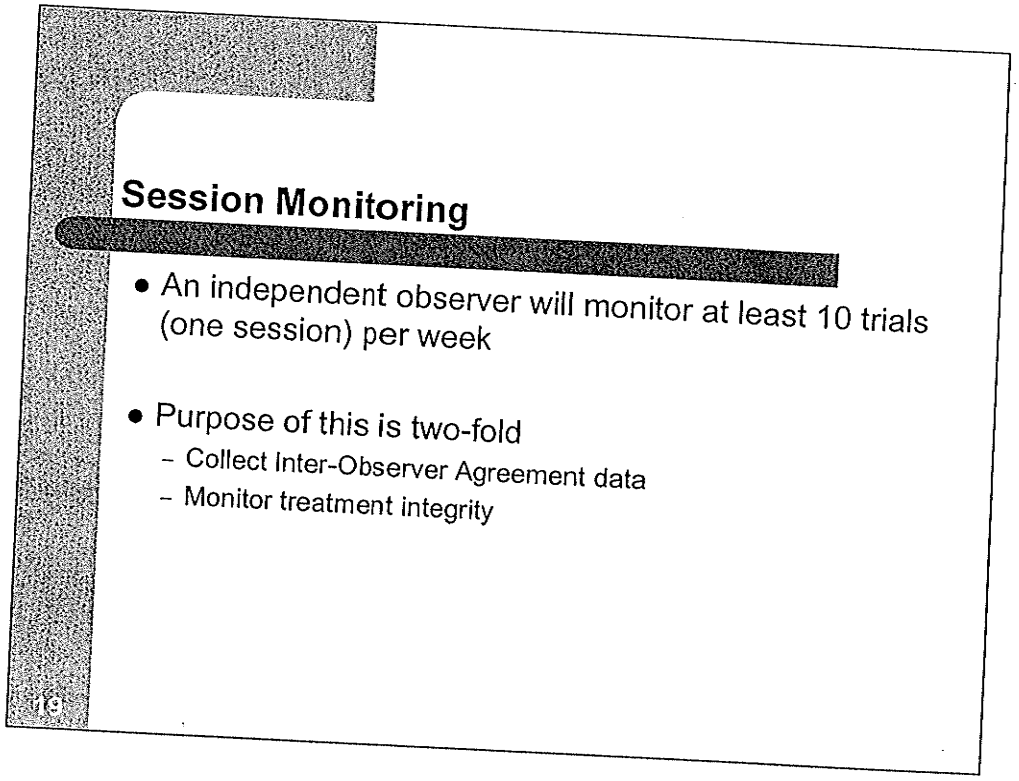

3. Responses to Verbal Prompt
• If participant activates the BIGmack with 15 s of verbal prompt
– Smile at participant and say "Hello"
– Interact with participant for 15 - 30 s
– End trial by moving out of participant's field of view
– Record a "Verbal prompt" on the data sheet
• If participant does not activate the BIGmack within 15 s of verbal prompt
– Point to the BIGmack and give the verbal prompt "Say 'Hello' to me"
– Wait 15 s for a response

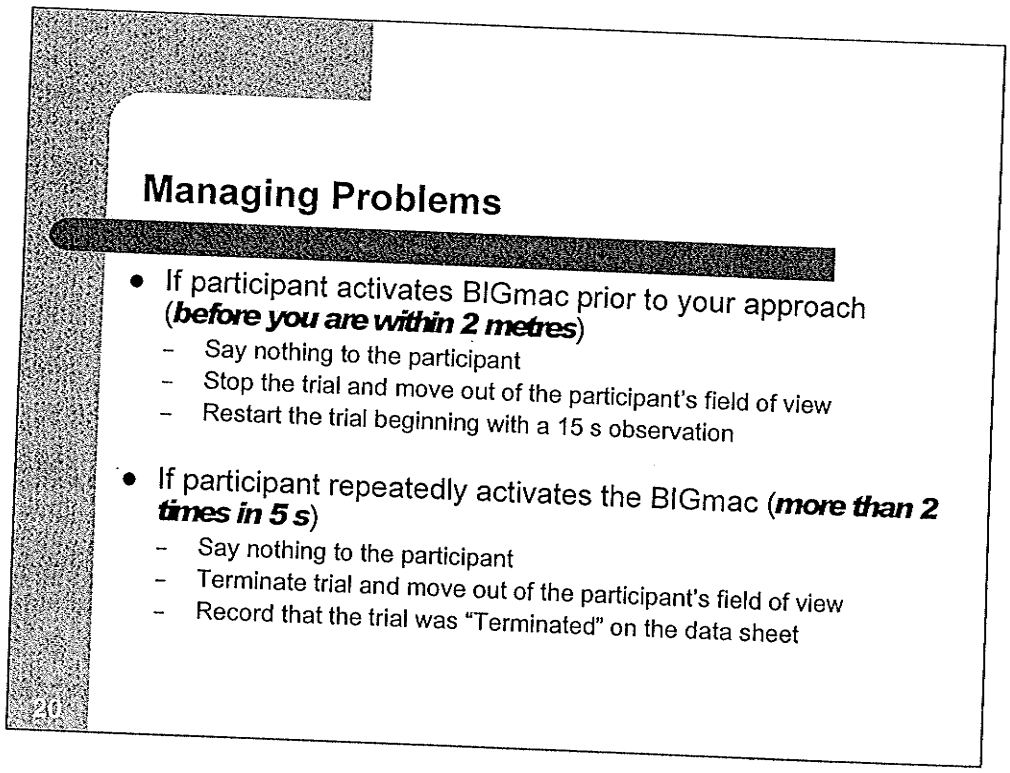

4. Responses to Gestural Prompt
• If participant activates the BIGmack with 15 s of gestural/verbal prompt
– Smile at participant and say "Hello"
– Interact with participant for 15 - 30 s
– End trial by moving out of participant's field of view
– Record a "Gestural prompt" on the data sheet
• If participant does not activate the BIGmack within 15 s of gestural/verbal prompt
– Give the verbal prompt "Say 'Hello' to me"
– Provide a physical prompt sufficient to have participant activate the BIGmack
15


5. Responses to Physical Prompt
• If participant activates the BIGmack with physical prompt
– Smile at participant and say "Hello"
– Interact with participant for 15 - 30 s
– End trial by moving out of participant's field of view
– Record a "Physical prompt" on the data sheet
• If participant resists your physical prompt
– Immediately stop prompting
– Say nothing to the participant
– Terminate the trial and move out of the participant's field of view
– Record that the trial was "Terminated" on the data sheet
16


Recording Data
• Data sheets will be distributed to you each week
• Data sheets must be turned in at the end of each week
• You must record an outcome to each trial
• You must record the time of the session or the time of each trial
17


Training Data Sheet
CLIENT:
TRAINER:
WEEK:
INTERTRIAL INTERVAL:
I Participant activates BiGmac within 15s of trainer sitting down
V Participant activates BiGmac following verbal prompt
G Participant activates BiGmac following verbal and gestural prompt
P Participant gives response following verbal and physical prompt
X Participant gives an incorrect response and trial is terminated
Verbal prompt: "Say 'Hello' to me"
Gestural prompt: Point to the BiGmac make while giving verbal prompt
Physical prompt: Provide physical guidance sufficient to activate BiGmac
Correct responses: Any of the following:
Activate BiGmac 3 times within 5s
MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
% I


Session Monitoring
• An independent observer will monitor at least 10 trials (one session) per week
• Purpose of this is two-fold
– Collect Inter-Observer Agreement data
– Monitor treatment integrity
19


Managing Problems
• If participant activates BIGmac prior to your approach (before you are within 2 metres)
– Say nothing to the participant
– Stop the trial and move out of the participant's field of view
– Restart the trial beginning with a 15 s observation
• If participant repeatedly activates the BIGmac (more than 2 times in 5 s)
– Say nothing to the participant
– Terminate trial and move out of the participant's field of view
– Record that the trial was "Terminated" on the data sheet
20

VOCA Generalization Study – Examiniation for Potential Trainers

Name: Date:

INSTRUCTIONS: Read each question and all four response options carefully then circle the letter beside the response that is most correct.

1. In this study, participants will be taught to use a VOCA to do what?

   (a) Greet others
   (b) Request something
   (c) Indicate a preference
   (d) Introduce themselves

2. What type of VOCA will participants be taught to use in this study?

   (a) Bigmack
   (b) Cheap Talk
   (c) Touch Talker
   (d) Speak Easy

3. Training sessions will always occur where?

   (a) Cafeteria
   (b) Workroom / Bedroom
   (c) Kitchen
   (d) Common area on living unit

4. When approaching a participant, which of the following is <u>not</u> required?

   (a) Observe participant for 15 seconds before approaching
   (b) Approach participant and sit within two metres
   (c) Say nothing and wait for 15 seconds
   (d) Carry a clipboard

5. If the participant activates the BIGmack within 15 seconds of your approach, which of the following is the correct response of the trainer?

   (a) Say "Hello," talk with participant, end trial, and record data
   (b) Smile, talk with participant, end trial, and record data
   (c) Smile, say "Hello," talk with participant, end trial
   (d) Smile, say "Hello," talk with participant, end trial, and record data

6. To end a training trial, you must do which to following?

   (a) Tell the participant that it is time for you to go
   (b) Move out of the participant's field of view
   (c) Wait for the participant to be calm for 15 seconds
   (d) Wait until the participant activates the BIGmack

7. If the participant does not activate the BIGmack within 15 seconds of your approach, what should you do?

   (a) Give the verbal prompt, "Press the switch," and provide physical assistance as needed
   (b) Give the verbal prompt, "Say 'Hello' to me," and then wait 15 seconds for a response
   (c) Give the verbal prompt, "Say 'Hello' to me" while pointing to the BIGmack then wait 15 seconds for a response
   (d) Give the verbal prompt, "Press your switch," and then wait 15 seconds for a response

8. If the participant does not activate the BIGmack within 15 seconds of a verbal prompt, what should you do?

   (a) Terminate the trial
   (b) Point to the BIGmack and wait for an additional 15 seconds
   (c) Repeat the verbal prompt while pointing to the BIGmack and wait for 15 seconds
   (d) Repeat the verbal prompt and provide a physical prompt sufficient for the participant to respond

9. In this study, a gestural prompt involves what?

   (a) The trainer pointing to the BIGmack
   (b) The trainer pretending to activate the BIGmack
   (c) The trainer waving to the participant
   (d) The trainer looking at the BIGmack

10. If the participant does not activate the BIGmack within 15 seconds of a verbal/gestural prompt, what should you do?

    (a) Repeat the verbal/gestural prompt and wait an additional 15 seconds
    (b) Repeat the verbal prompt and provide physical assistance sufficient to have the participant activate the BIGmack
    (c) Terminate the trial
    (d) Repeat the verbal prompt and model the appropriate response

11. What should you do if the participant resists your physical prompt to activate the BIGmack?

    (a) Reassure the participant that you are trying to help her
    (b) Instruct the participant that she must not activate the BIGmack
    (c) Discontinue the prompt and wait until the participant is not resistant the re-prompt
    (d) Terminate the trial and move out of the participant's field of view

12. What should you do if a client activates the BIGmack before you are within two metres?

    (a) Continue with the trial as if the participant hadn't activated the BIGmack
    (b) Respond as you would if the participant activated the BIGmack after you sat down
    (c) Terminate the trial and tell the participant to wait until you are closer before activating the BIGmack
    (d) Immediate restart the trial

13. In which of the following situations would you terminate a trial?

    (a) The participant activates the BIGmack more than 2 times within 5 seconds
    (b) The participant activates the BIGmack 2 times within 5 seconds
    (c) The participant fails to activate the BIGmack within 15 seconds of your sitting down
    (d) The participant looks away from you as you approach

14. Which of the following would preclude you from conducting a training trial?

    (a) During the pre-approach observation, you see that the participant is interacting with someone
    (b) During the pre-approach observation, you see that the participant is sleeping
    (c) During the pre-approach observation, you see that the participant does not have access to the BIGmack
    (d) All of the above

15. During your initial approach, which of the following should you not do?

    (a) Look directly at the participant
    (b) Say nothing to the participant
    (c) Wave to the participant
    (d) Sit within 2 metres of the participant

16. What type of data are trainers responsible for?

    (a) Data reflective of participants' performance during training sessions
    (b) Data reflective of participants' performance during generalization probes
    (c) Treatment integrity data
    (d) Inter-observer agreement data

17. When recording data, which of the following are you required to do?

    (a) Record a response for every trial
    (b) Submit data sheets at the end of the week
    (c) Record the time of each session or each trial
    (d) All of the above

18. In this study, a verbal prompt involves saying what to the participant?

    (a) "Say 'Hello' to me"
    (b) "Greet me"
    (c) "Press your switch to say 'Hello' to me"
    (d) "Press your switch"

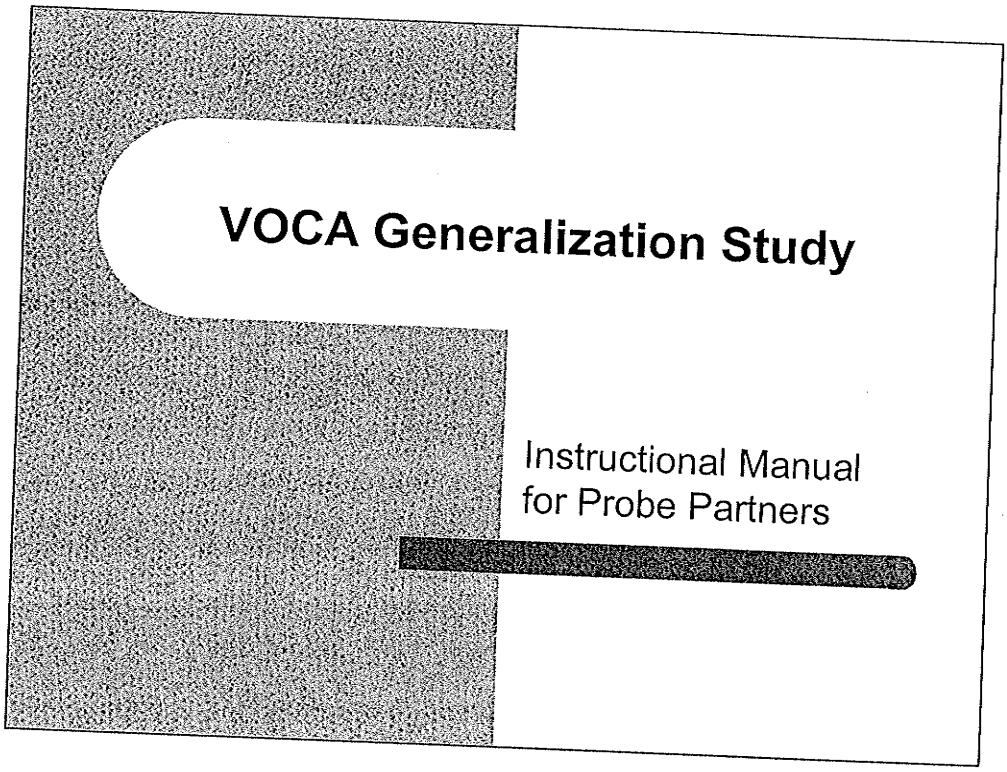
19. Which of the following is not true about generalization probes?

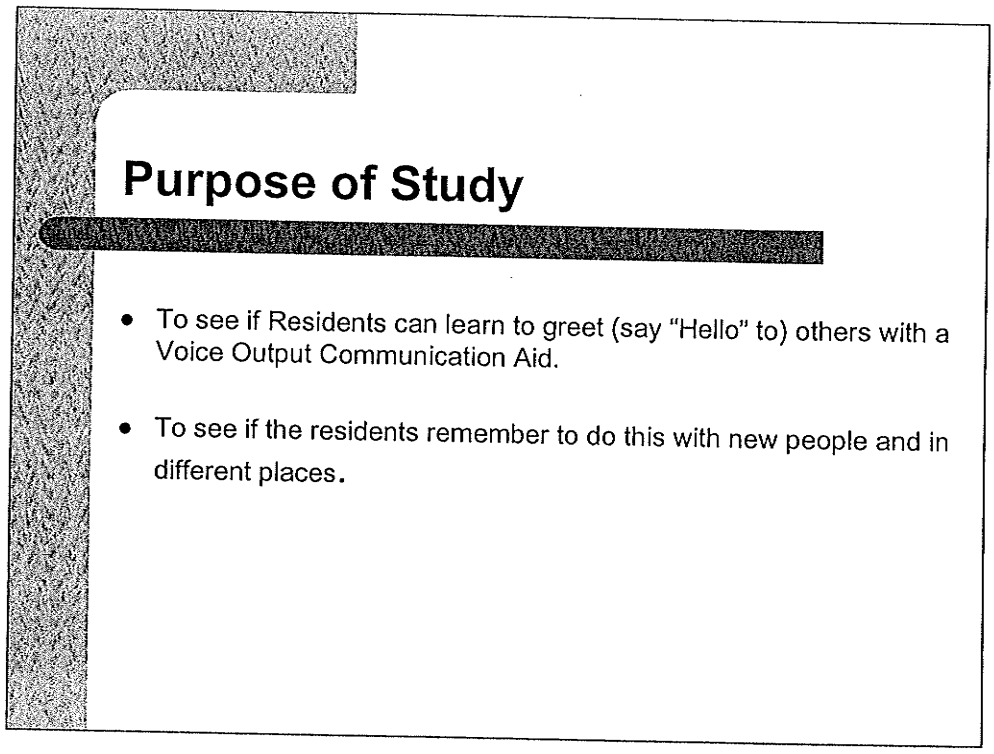
(a) Probe phases are scheduled for the same week for all participants
(b) Training continues during probe phases
(c) Probe phases are repeated throughout the study
(d) Each probe phase lasts for 5 days

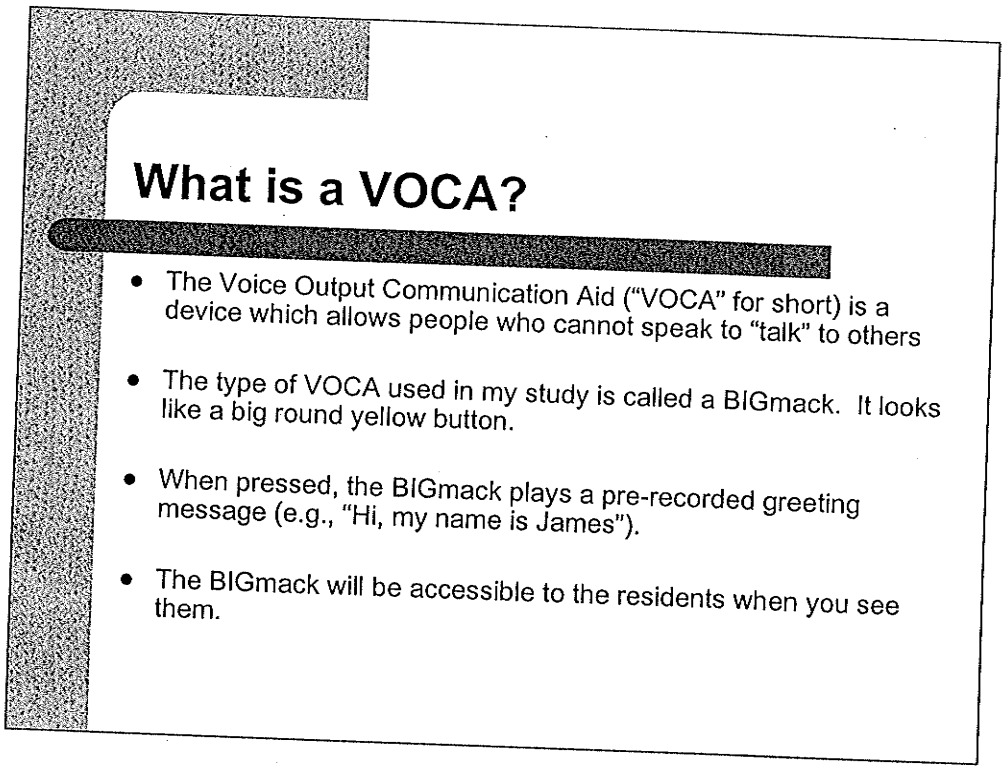
20. During a training phase, training continues until when?

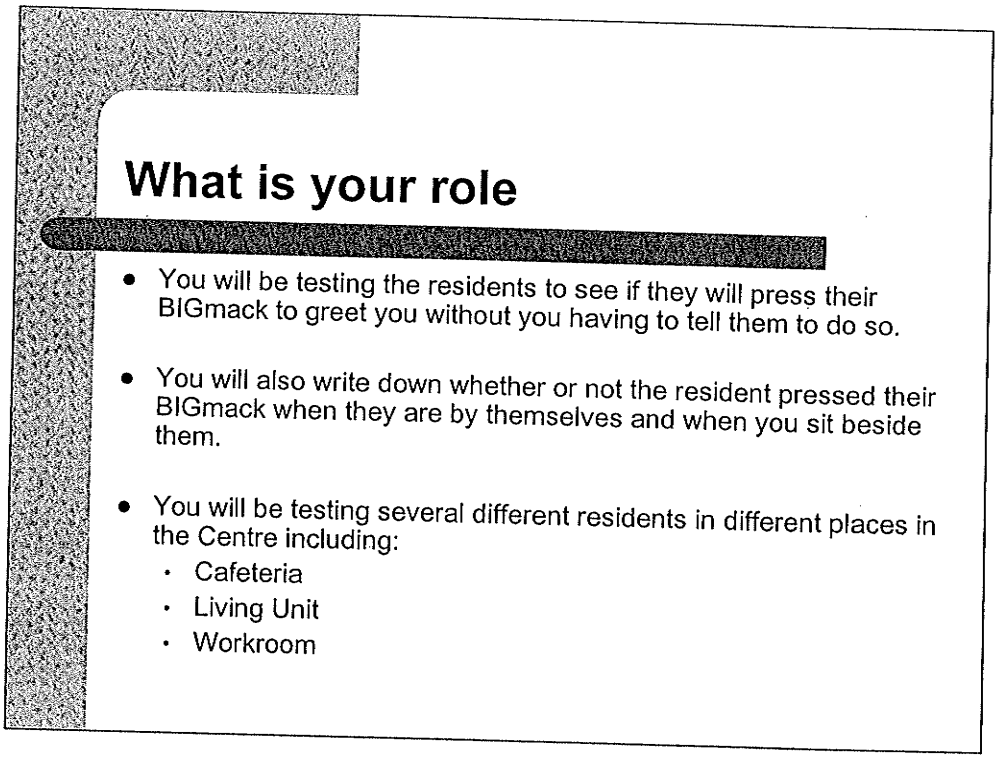
(a) The participant activates the BIGmack during the trainer's approach
(b) The participant is able to activate the BIGmack without assistance from the trainer
(c) The participant has reached criterion of 80% independent responding over three consecutive sessions
(d) The participant has reached the criterion of 90% independent responding over three consecutive sessions

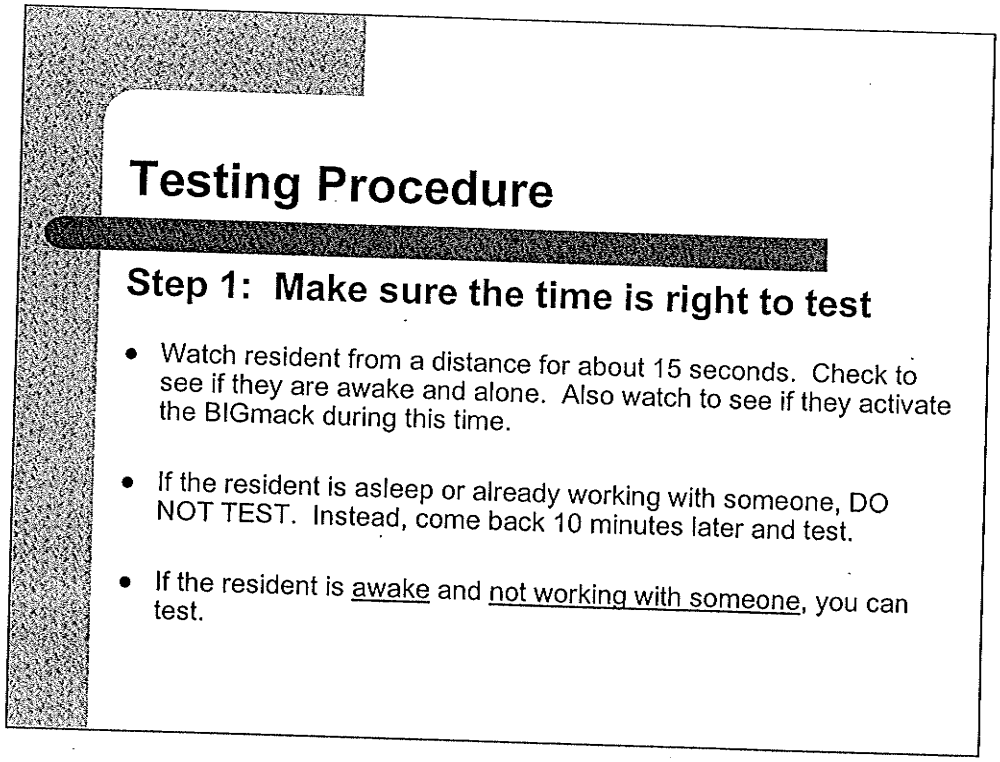
Appendix C
Training Package for Probe Partners

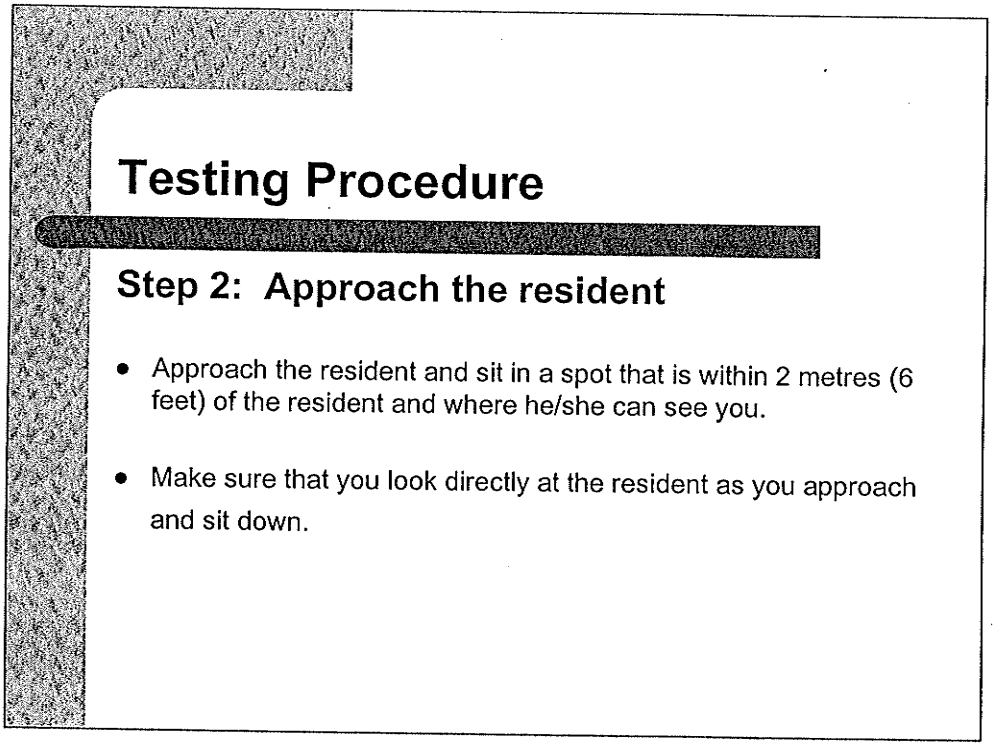


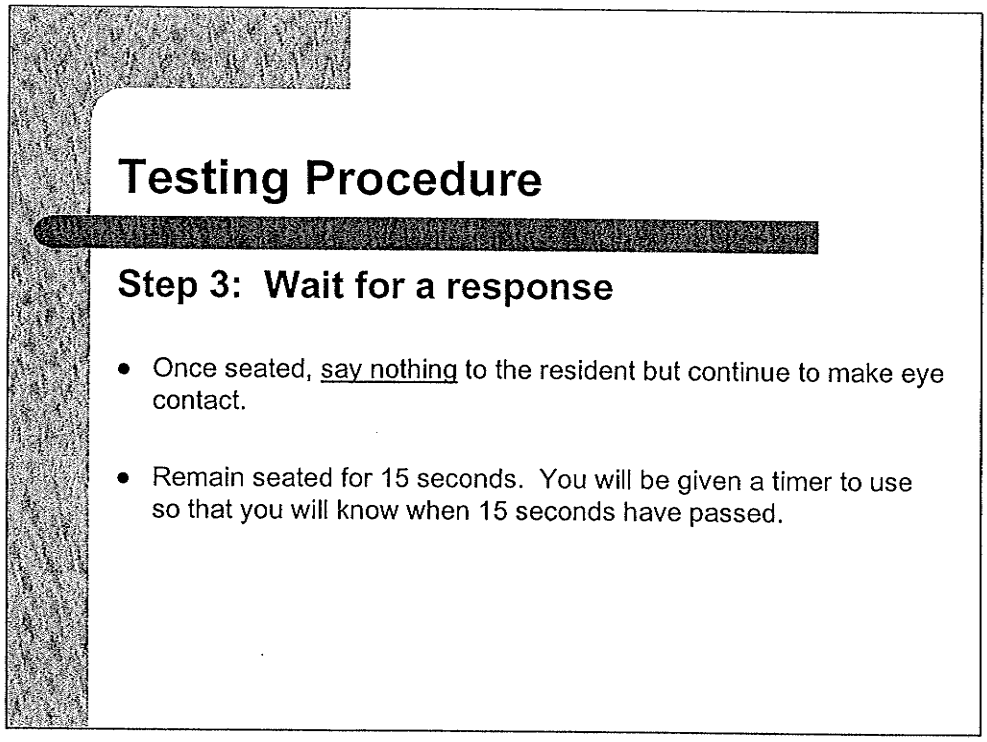

Purpose of Study
• To see if Residents can learn to greet (say "Hello" to) others with a Voice Output Communication Aid.
• To see if the residents remember to do this with new people and in different places.

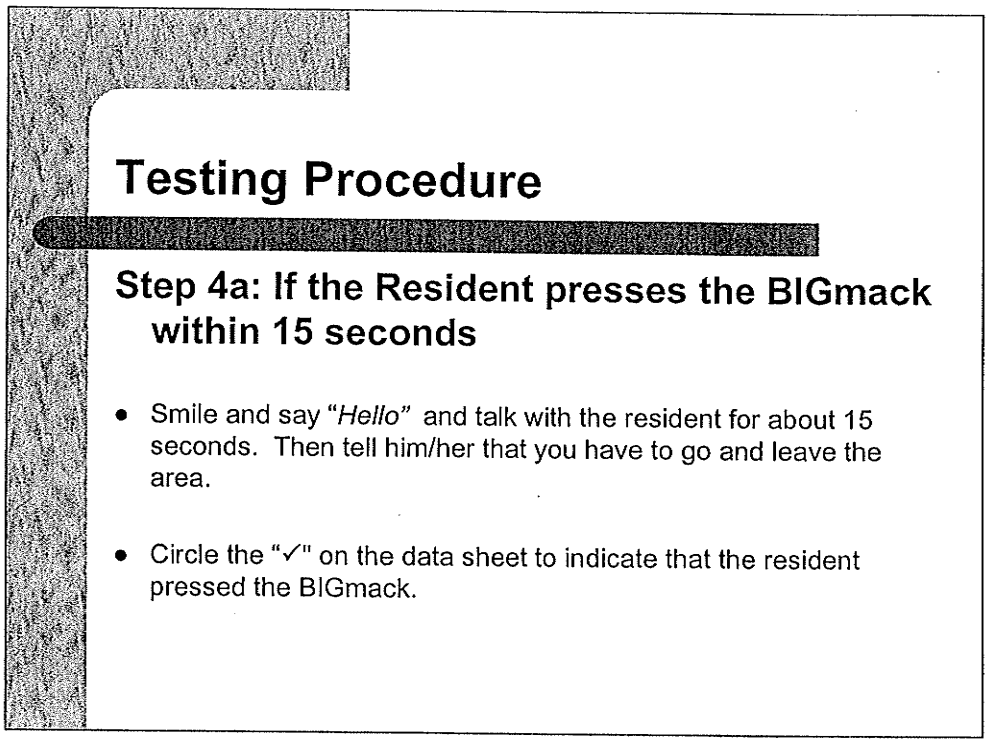

What is a VOCA?
• The Voice Output Communication Aid ("VOCA" for short) is a device which allows people who cannot speak to "talk" to others
• The type of VOCA used in my study is called a BIGmack. It looks like a big round yellow button.
• When pressed, the BIGmack plays a pre-recorded greeting message (e.g., "Hi, my name is James").
• The BIGmack will be accessible to the residents when you see them.

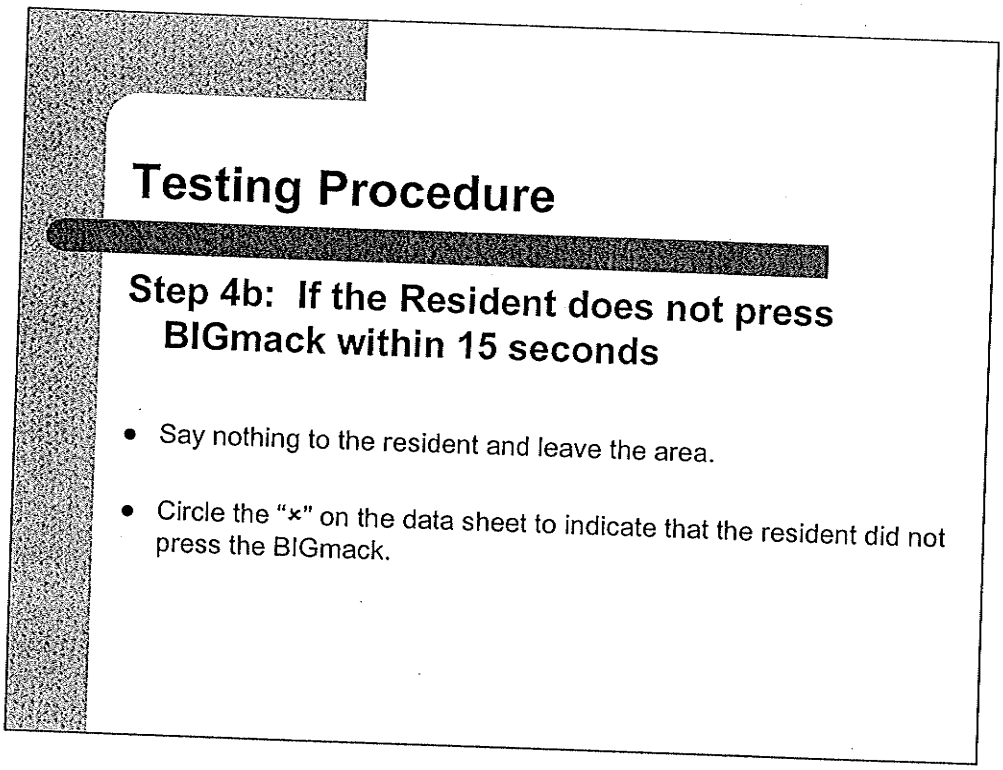

What is your role
You will be testing the residents to see if they will press their BIGmack to greet you without you having to tell them to do so.
You will also write down whether or not the resident pressed their BIGmack when they are by themselves and when you sit beside them.
You will be testing several different residents in different places in the Centre including:
Cafeteria
Living Unit
Workroom

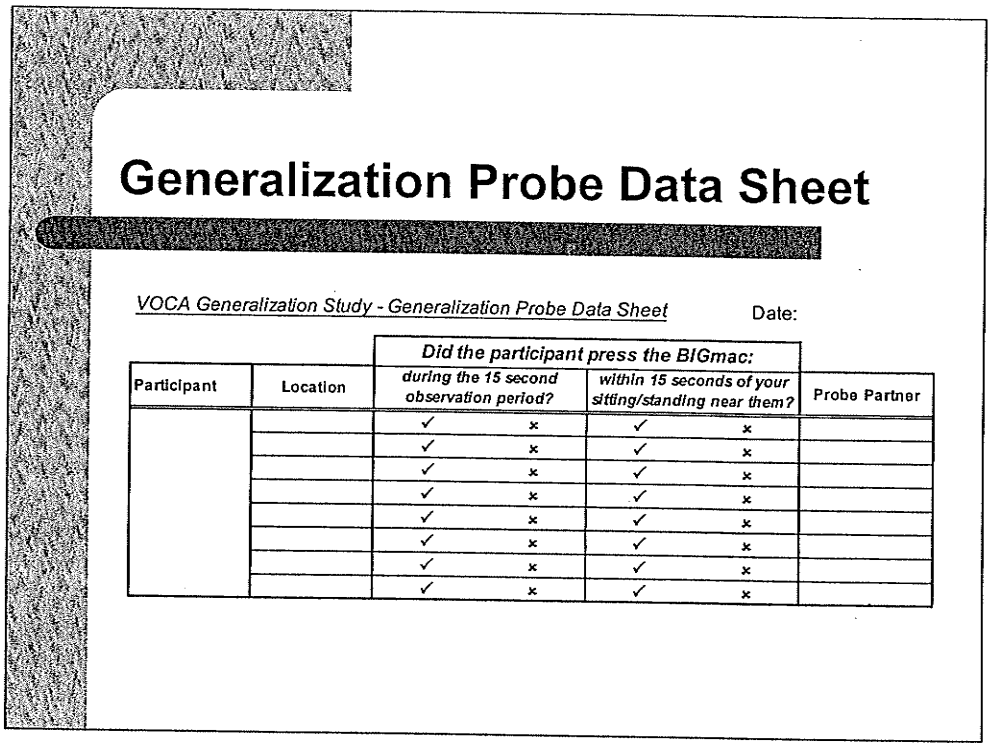

Testing Procedure
Step 1: Make sure the time is right to test
• Watch resident from a distance for about 15 seconds. Check to see if they are awake and alone. Also watch to see if they activate the BIGmack during this time.
• If the resident is asleep or already working with someone, DO NOT TEST. Instead, come back 10 minutes later and test.
• If the resident is awake and not working with someone, you can test.


Testing Procedure
Step 2: Approach the resident
• Approach the resident and sit in a spot that is within 2 metres (6 feet) of the resident and where he/she can see you.
• Make sure that you look directly at the resident as you approach and sit down.


Testing Procedure
Step 3: Wait for a response
• Once seated, say nothing to the resident but continue to make eye contact.
• Remain seated for 15 seconds. You will be given a timer to use so that you will know when 15 seconds have passed.


Testing Procedure
Step 4a: If the Resident presses the BIGmack within 15 seconds
• Smile and say "Hello" and talk with the resident for about 15 seconds. Then tell him/her that you have to go and leave the area.
• Circle the "✓" on the data sheet to indicate that the resident pressed the BIGmack.

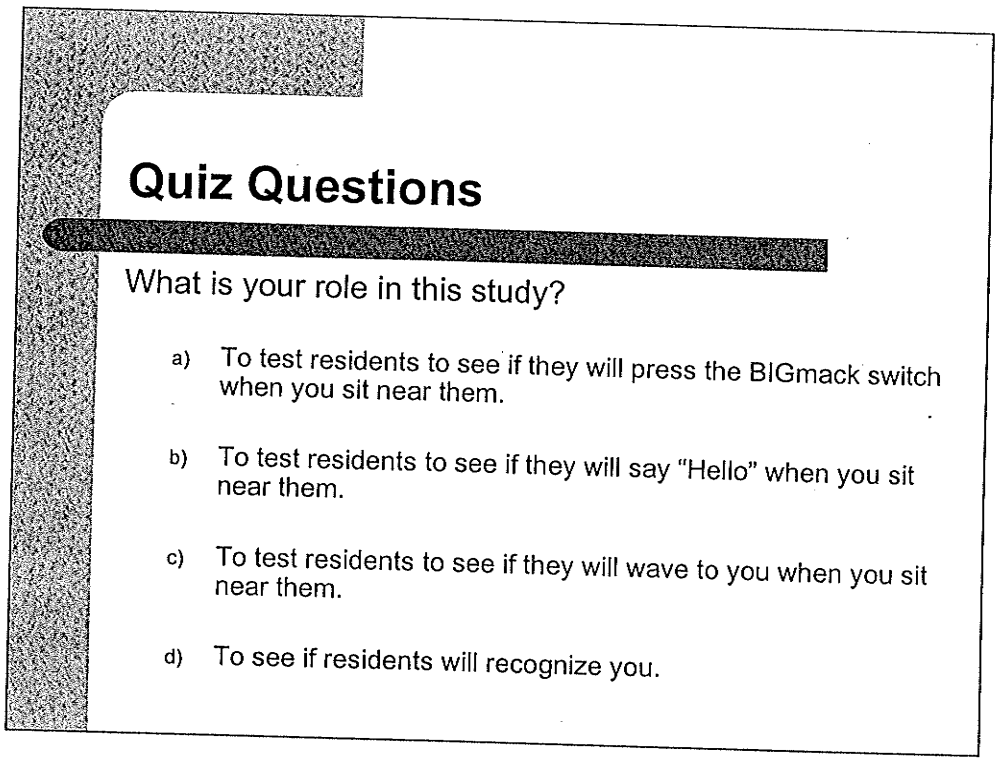

Testing Procedure
Step 4b: If the Resident does not press BIGmack within 15 seconds
• Say nothing to the resident and leave the area.
• Circle the "×" on the data sheet to indicate that the resident did not press the BIGmack.

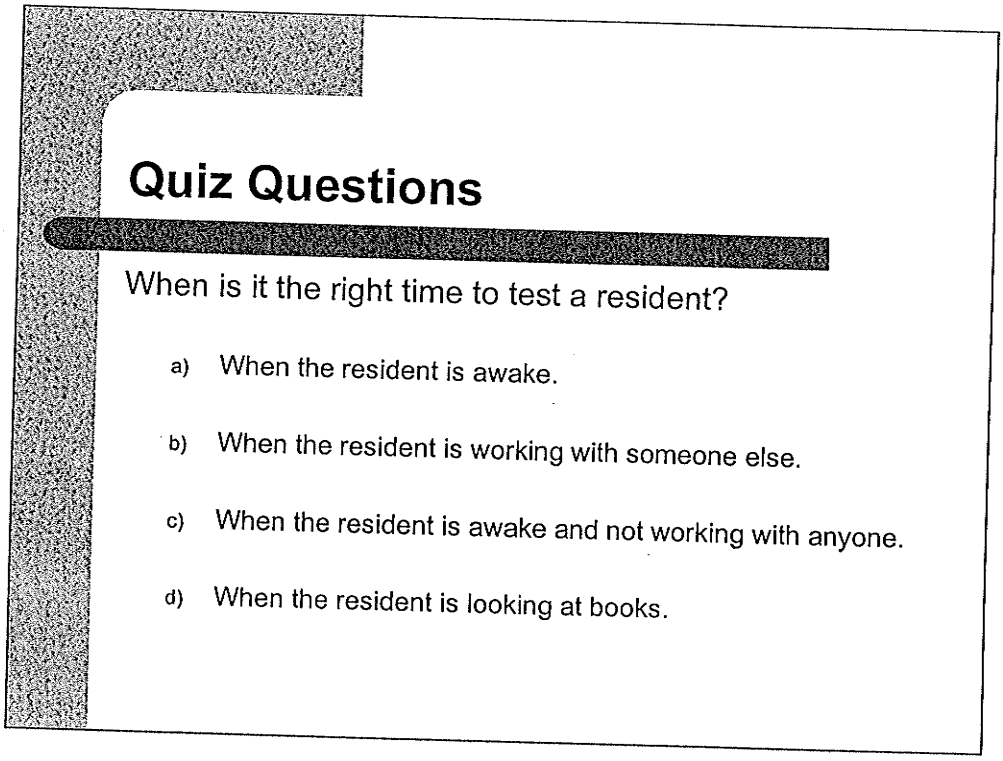


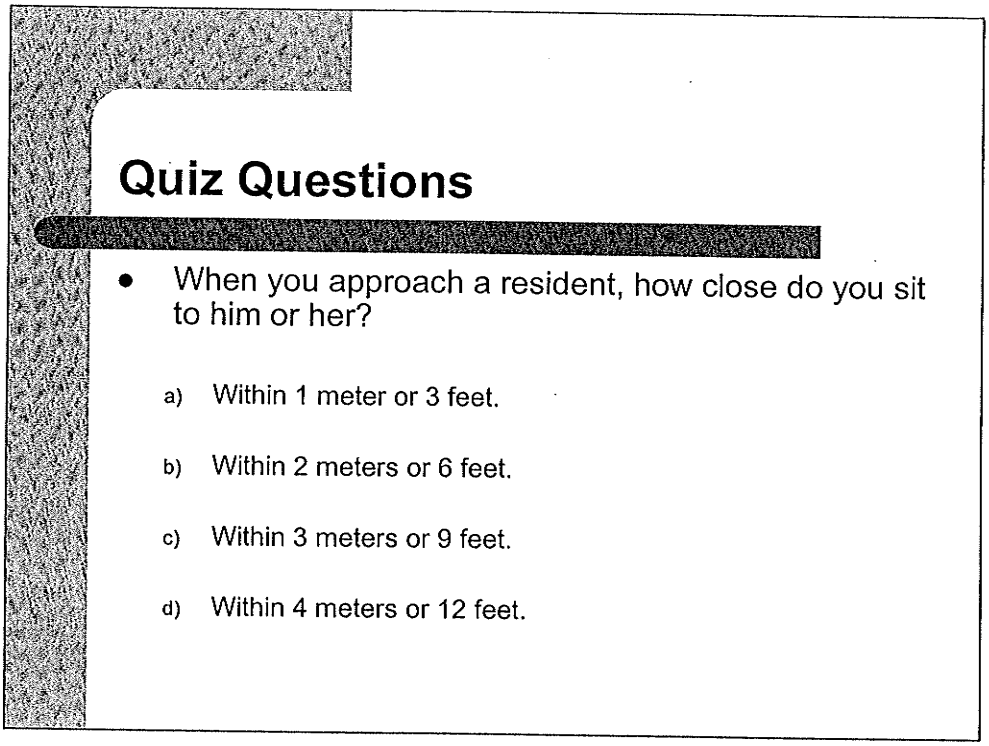
Generalization Probe Data Sheet

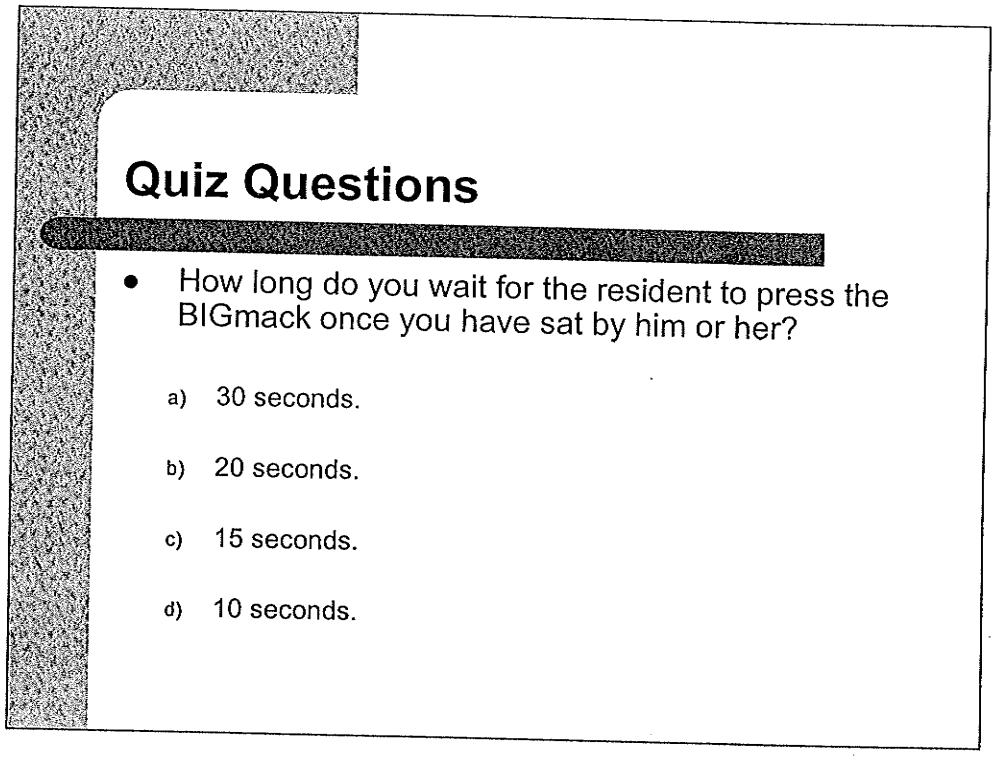
VOCA Generalization Study - Generalization Probe Data Sheet Date:

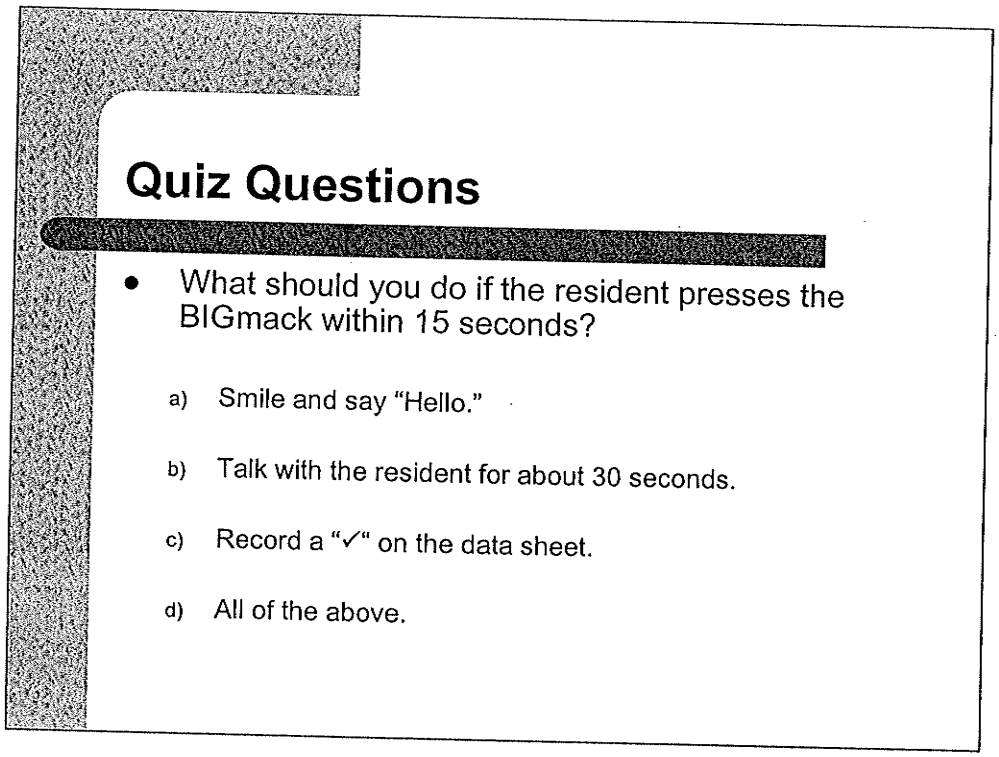
Participant	Location	Did the participant press the BIGmac: during the 15 second observation period?		Did the participant press the BIGmac: within 15 seconds of your sitting/standing near them?		Probe Partner
		✓	×	✓	×	
		✓	×	✓	×	
		✓	×	✓	×	
		✓	×	✓	×	
		✓	×	✓	×	
		✓	×	✓	×	
		✓	×	✓	×	
		✓	×	✓	×	

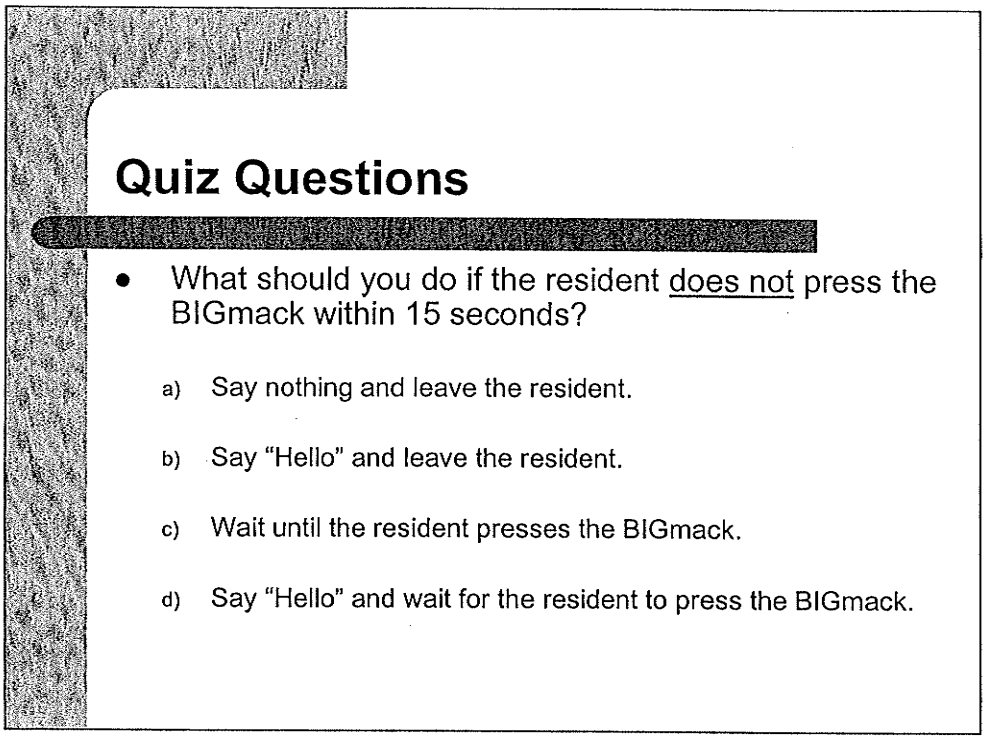

Quiz Questions
What is your role in this study?
a) To test residents to see if they will press the BIGmack switch when you sit near them.
b) To test residents to see if they will say "Hello" when you sit near them.
c) To test residents to see if they will wave to you when you sit near them.
d) To see if residents will recognize you.


Quiz Questions
When is it the right time to test a resident?
a) When the resident is awake.
b) When the resident is working with someone else.
c) When the resident is awake and not working with anyone.
d) When the resident is looking at books.


Quiz Questions
When you approach a resident, how close do you sit to him or her?
a) Within 1 meter or 3 feet.
b) Within 2 meters or 6 feet.
c) Within 3 meters or 9 feet.
d) Within 4 meters or 12 feet.


Quiz Questions
How long do you wait for the resident to press the BIGmack once you have sat by him or her?
a) 30 seconds.
b) 20 seconds.
c) 15 seconds.
d) 10 seconds.


Quiz Questions
• What should you do if the resident presses the BIGmack within 15 seconds?
a) Smile and say "Hello."
b) Talk with the resident for about 30 seconds.
c) Record a "✓" on the data sheet.
d) All of the above.


Quiz Questions
What should you do if the resident does not press the BIGmack within 15 seconds?
a) Say nothing and leave the resident.
b) Say "Hello" and leave the resident.
c) Wait until the resident presses the BIGmack.
d) Say "Hello" and wait for the resident to press the BIGmack.

Appendix D
Treatment Integrity Data sheets for Training Sessions and Probe Trials

Treatment Integrity Data Sheet for Training Sessions

CLIENT:
TRAINER:
OBSERVER:
DATE:

KEY
✓ Response Observed
× Response Not Observed

	1	2	3	4	5	6	7	8	9	10
1. Initiation of trial.										
Waited until designated intertrial interval elapsed										
Waited until participant was calm and sitting for 15 s.										
Approached client and sat within his/her field of view and within 2m of the participant.										
Looked directly at the participant during approach.										
Once seated, said nothing to the participant but continued to make eye contact.										
Maintained this for 15s or until client responded.										
2a. If the participant activated the BIGmac within 15 s of sitting down:										
Responded by smiling and returning the greeting.										
Spoke to client for approximately 30 s.										
Ended trial after 30 s by moving out of participant's field of vision.										
Recorded an INDEPENDENT (I) response on the data sheet.										
2b. If the participant did not activate the BIGmac within 15 s of sitting down:										
Provided the verbal prompt *"Say 'Hi' to me by pressing the switch."*										
Allowed 15 s for a response.										
3a. If the participant activated the BIGmac within 15 s of the verbal prompt:										
Responded by smiling and returning the greeting.										
Spoke to client for approximately 30 s.										
Ended trial after 30 s by moving out of participant's field of vision.										
Recorded a VERBAL PROMPT (V) response on the data sheet.										
3b. If the participant did not press the switch within 15 s of the verbal prompt:										
Repeated the verbal prompt while pointing to the BIGmac.										
Allowed 15 s for a response.										
4a. If the participant activated the BIGmac within 15 s of the verbal/gestural prompt:										
Responded by smiling and returning the greeting.										
Spoke to client for approximately 30 s.										
Ended trial after 30 s by moving out of participant's field of vision.										
Recorded a GESTURAL PROMPT (G) on the data sheet.										
4b. If the participant did not activate the BIGmac within 15 s of the verbal/gestural prompt:										
Repeated the verbal prompt and provided a physical prompt										
5a. If the participant activated the BIGmac with a physical prompt										
Responded by smiling and returning the greeting.										
Spoke to client for approximately 30 s.										
Ended trial after 30 s by moving out of participant's field of vision.										
Recorded a PHYSICAL PROMPT (P) on the data sheet.										
5b. If the participant resisted the physical prompt:										
Immediately stopped prompting										
Said nothing to participant										
Terminated the trial by moving away and out of the participant's field of vision.										
Recorded that the trial was TERMINATED (X) on the data sheet.										
6. If the participant activated the BIGmac prior to trainer being within 2m of the										
Terminated the trial by moving away and out of the participant's field of vision.										
Recorded that the trial was TERMINATED (X) on the data sheet.										
7. If the participant activated the BIGmac more than 3 times within 5 s:										
Terminated the trial by moving away and out of the participant's field of vision.										
Recorded that the trial was TERMINATED (X) on the data sheet.										
8. Inter-trial interval										
Remained out of visual range of the participant for the designated inter-trial interval										
TOTAL ✓'s										

Treatment Integrity Data Sheet for Generalization Probe Trials

DATE: _____

RESEARCHER: _____

✓ if observed
× if not observed

	CLIENT:							
	PROBER:							
	TIME:							
1. Pre-approach *Did the probe partner:*								
Discretely observe the participant for about 15 s.								
Start the probe only if the participant was awake and not working with someone								
2. Approach participant *Did the probe partner:*								
Sit within 2m of participant and within the participant's field of view								
Look directly at participant during approach								
Say nothing to the participant but continued to make eye contact								
3. If the participant DID activate the BIGmack within 15s of the prober sitting down, complete this section: *Did the probe partner:*								
Respond by smiling and saying "*Hello*"								
Spend about 30 s talking to the client								
Recorded a correct (✓) response on the data sheet								
4. If the participant DID NOT activate the BIGmack within 15s of the prober sitting down, complete this section: *Did the probe partner:*								
Say nothing to the participant during 15 s								
Leave participant after 15 s by moving out of his/her field of view.								
Record an incorrect (×) response on the data sheet.								
TOTAL ✓'s								

Appendix E

Assessments of Social Validity

The social validity of the present study was evaluated in two ways. First, direct care staff who supported the participants were asked to complete a questionnaire prior to the onset of the research and one month following a participant's completion of training. The questionnaire consisted of the following eight statements:

1. This resident usually greets others when she sees them.
2. Most people consider this resident to be friendly.
3. This resident independently initiates social interactions with others.
4. People seem drawn to this resident.
5. People like to spend time socializing with this resident.
6. This resident spontaneously greets others.
7. This resident would rather be with others than alone.
8. This resident would greet you if she saw you in the hallway.

Respondents were provided with a 5-point Likart scale, with 1 representing "Strongly Disagree" and 5 representing "Strongly Agree," on which they indicated how strongly they agreed with each statement as applied to the participant being rated. Individual item ratings obtained during each administration were averaged across respondents to produce a pre-training mean rating and a post-training mean rating score for each item. Pre-training mean

ratings were then subtracted from post-training mean ratings to produce a change score for each item. Observed change scores for each item for each participant are presented in Table 4.

Four of the items on the questionnaire (i.e., items 1, 3, 6, and 8) were related to the participants' tendencies to greet others. As can be seen in Table 4, positive change scores were observed for all participants for each of these items. Change scores for greeting items ranged from 0.25 to 1.25 ($\underline{M} = 0.81$), from 0.75 to 1.25 ($\underline{M} = 0.94$), from 0.75 to 1.00 ($\underline{M} = 0.88$), and from 0.75 to 1.00 ($\underline{M} = 0.94$), for Wanda, Cheryl, Arlene, and Shelly, respectively.

The four remaining items (i.e., items 2, 4, 5, and 7) were related to the participants perceived friendliness and social attractiveness. Table 4 shows that positive change scores were observed for each of these items for Wanda and Shelly. Pre-post training change scores on "friendliness" items ranged from 0.50 to 1.00 ($\underline{M} = 0.69$) and from 0.50 to 1.50 ($\underline{M} = 0.94$) for Wanda and Shelly, respectively. In contrast, negative change scores were observed for three of the four "friendliness" items for Cheryl and Arlene. Pre-post training change scores ranged from –0.50 to 0.00 ($\underline{M} = -0.25$) and from –0.50 to 0.25 ($\underline{M} = -0.25$) for Cheryl and Arlene, respectively.

Overall, these data indicated that direct care staff perceived a positive change in the greeting behaviors of all participants following the participants involvement in training, with pre-post changes in ratings on "greeting" items

Table 4

Pre- and post-training change scores for questionnaire responses from direct care staff

Questionnaire item	Wanda	Cheryl	Arlene	Shelly
1. This resident usually greets others when she sees them.	0.75	1.00	1.00	0.75
2. Most people consider this resident to be friendly.	0.50	-0.50	-0.25	0.50
3. This resident independently initiates social interactions with others.	1.25	0.75	1.00	1.00
4. People seem drawn to this resident.	0.50	0.00	0.25	0.75
5. People like to spend time socializing with this resident.	0.75	-0.25	-0.50	1.00
6. This resident spontaneously greets others.	1.00	0.75	0.75	1.00
7. This resident would rather be with others than alone.	1.00	-0.25	-0.50	1.50
8. This resident would greet you if she saw you in the hallway.	0.25	1.25	0.75	1.00
Mean change in greeting items	0.81	0.94	0.88	0.94
Mean change in friendliness items	0.69	-0.25	-0.25	0.94

increasing, on average, by almost one rating point for each participant. In contrast, direct care staff perceived the impact of training on participants friendliness and social attractiveness was less consistent. Direct care staff's ratings on "friendliness" items for Wanda and Shelly showed positive changes, while their ratings on most of these same items for Cheryl and Arlene showed negative changes. The magnitude of these negative changes were small (i.e., about ¼ of a rating point, on average, and not greater than ½ of a rating point for any specific item), however, suggesting that the impact of training on perceived friendliness was minimal.

The second way in which the social validity of the research was assessed was by soliciting opinions from Centre employees regarding the importance of greeting behaviors. Specifically, Centre employees not otherwise involved in the research were asked to complete a questionnaire that contained the following items:

1. Do you perceive people who initiate a greeting as being friendlier than people who do not?
2. Are you more likely to talk with someone if they greet you than if they do not?
3. When you are greeted by someone who you do not know well, how important is it to you that he or she greet you by:
    a) Shaking hands with you

b) Asking how you are feeling

c) Making eye contact with you

d) Waving to you

e) Saying "Hello"

f) Telling you about themselves

g) Smiling at you

h) Introducing themselves

4. How many people with disabilities do you encounter each day? How many people without disabilities do you encounter each day?

5. What proportion of people with disabilities that you encounter each day initiate a greeting? What proportion of people without disabilities that you encounter each day initiate a greeting?

For the first two items, respondents were required to endorse either a "Yes" or a "No" response option. For the third item, respondents were required to rate their perceived importance of the listed greeting behavior topographies on a 5-point Likart scale, with 1 representing "Very much" and 5 representing "Not at all." For the fourth item, respondents were required to endorse one of the following response options: "0," "1 - 3," "4 - 6," "7 – 10", "More than 10," both for people with and people without disabilities. For the fifth item, respondents were required to endorse one of the following response options: "None," "about

¼," "about ½," "about ¾," "All,." Both for people with and people without disabilities.

Data from Centre employees responses to the questionnaire are summarized in Table 5. These data indicate that 93% of respondents perceived people who initiate a greeting as being more friendly than those that do not and that 89% of respondents reported that they would be more likely to talk with someone who initiated a greeting than if they did not. Respondents also identified making eye contact, saying "Hello," and introducing oneself as among the most important greeting behaviors when initiating a social contact with a person one does not know well (mean ratings of 1.5, 1.8, and 1.5, respectively). Finally, most respondents indicated that in their daily experiences, people without disabilities were more likely to initiate a greeting than were people with disabilities. Among people encountered on a daily basis, respondents estimated that at least one-half of those without disabilities initiated a greeting, compared to no more than one-half of those with disabilities.

Overall, these data suggest that Centre employees perceive greeting as a socially valid skill to teach people with disabilities, both because those who greet are seen as more friendly and because people with disabilities may be deficient in this skill relative to people without disabilities. Among the various types of greeting behaviors that can be taught, Centre employees identified those targeted in the present research as among the most important.

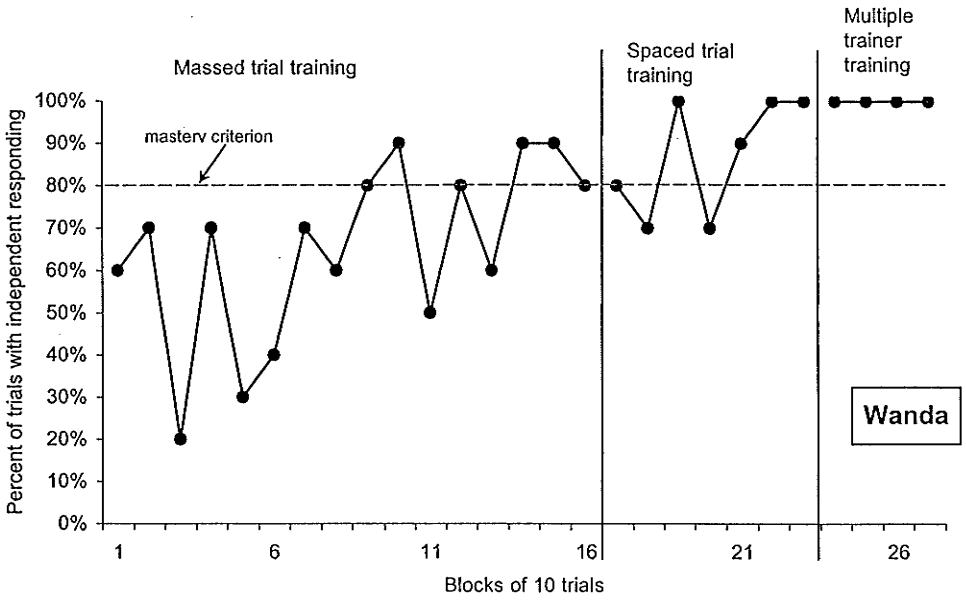
Table 5

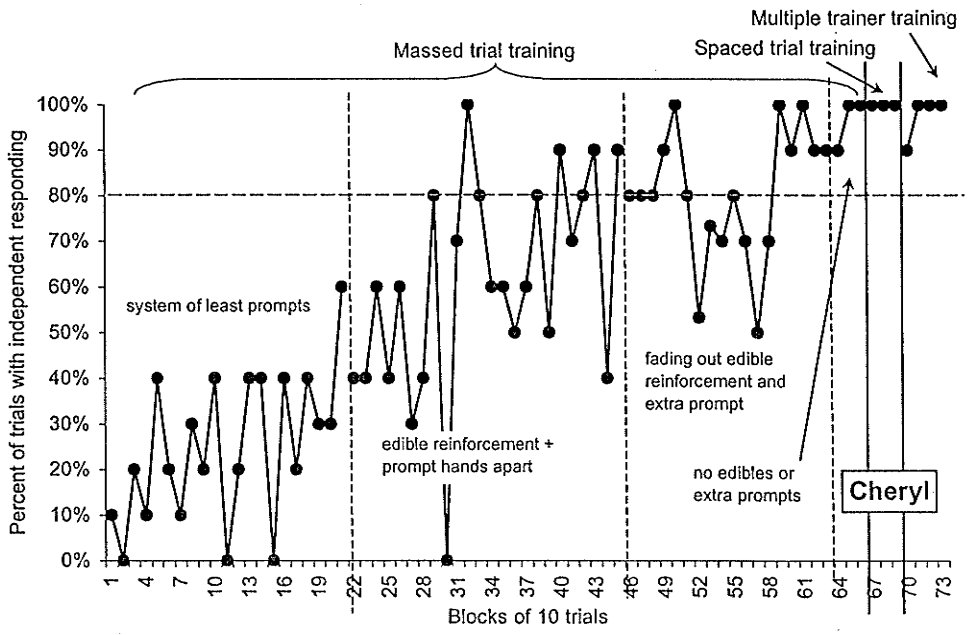
Responses to items on social validity questionnaire from Centre employees

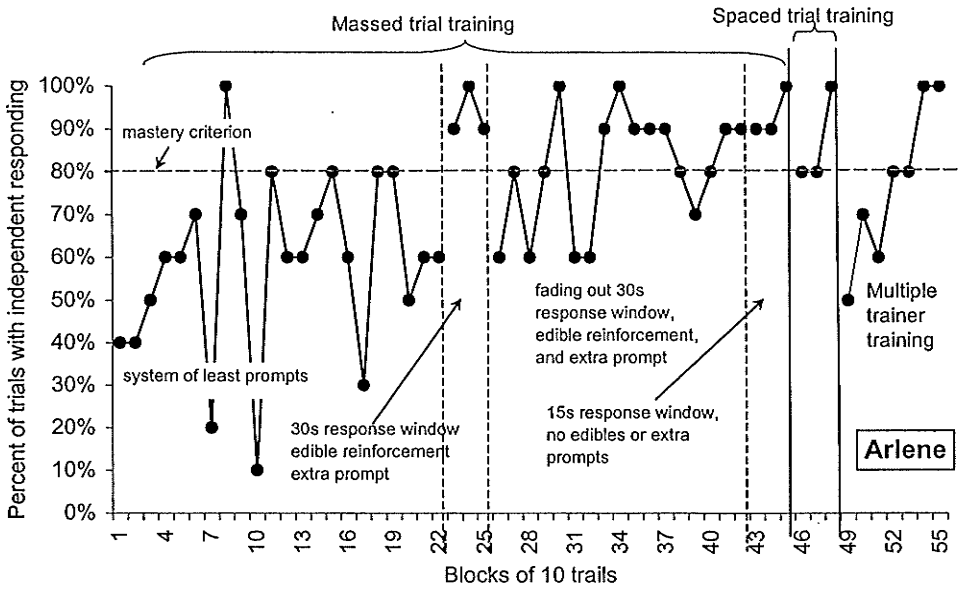
	YES	NO
1. Do you perceive people who initiate a greeting as being friendlier than people who do not?	93%	7%
2. Are you more likely to talk with someone if they greet you than if they do not?	89%	11%
3. When you are greeted by someone who you do not know well, how important is it to you that he or she greet you by:		
	Mean	SD
Making eye contact	1.5	1.07
Introducing themselves	1.5	1.10
Smiling at you	1.6	1.03
Saying "Hello"	1.8	1.14
Waving to you	3.5	1.20
Telling you about themselves	3.8	1.12
Shaking hands with you	3.9	1.35
Asking how you are feeling	4.1	1.05
4. How many people with disabilities/without disabilities do you encounter each day?		
	With disabilities	Without disabilities
0	0%	0%
1 to 3	14%	0%
4 to 6	11%	4%
7 to 10	18%	18%
More than 10	54%	79%
5. How many of these people initiate a greeting?		
None	50	0
About ¼	42	0
About ½	7	18
About ¾	0	25
All	0	57

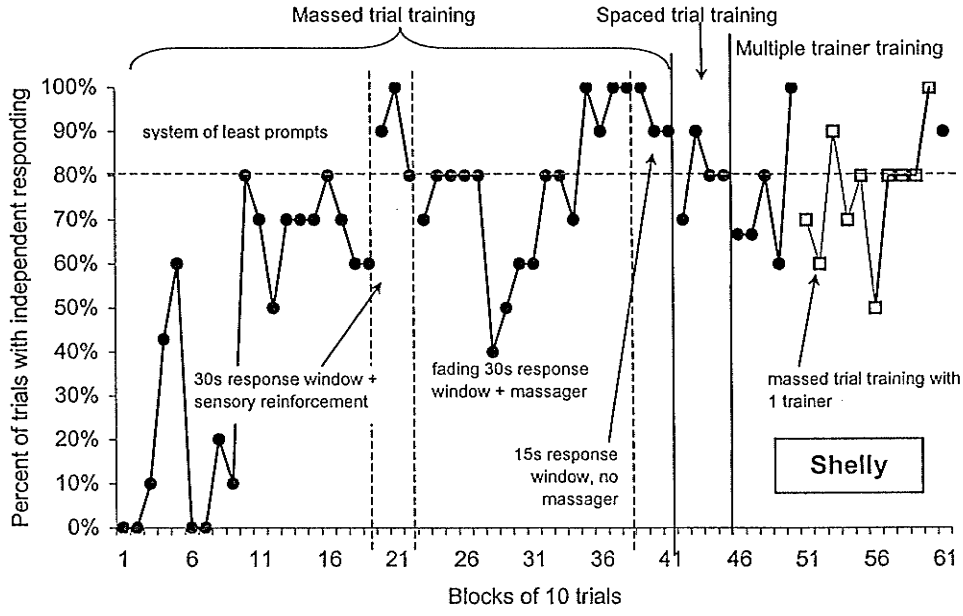
Appendix F

Training data (in graph form) for Wanda, Cheryl, Arlene, and Shelly



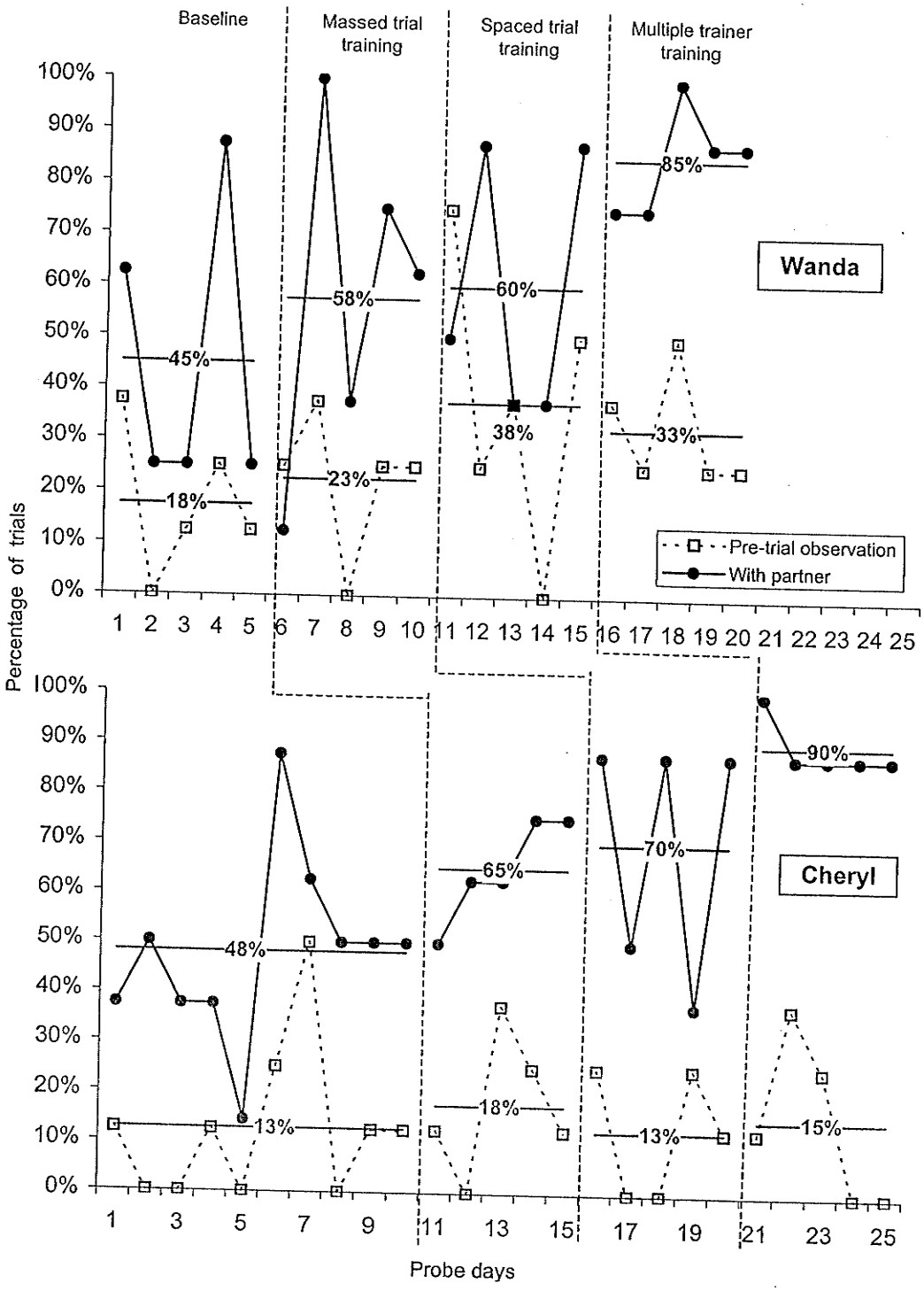


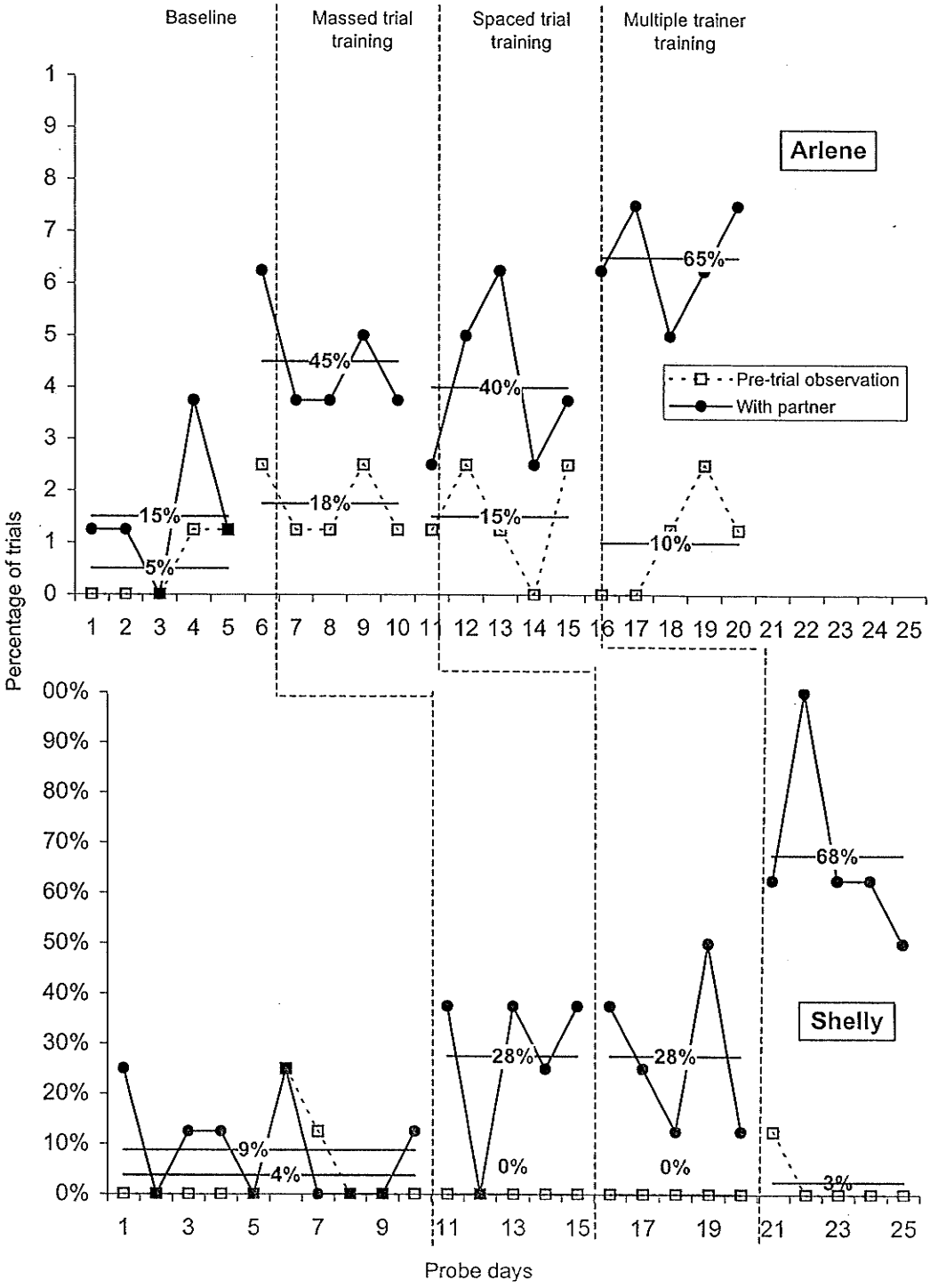

Massed trial training
Spaced trial training
Percent of trials with independent responding
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
mastery criterion
system of least prompts
30s response window
edible reinforcement
extra prompt
fading out 30s
response window,
edible reinforcement,
and extra prompt
15s response window,
no edibles or extra
prompts
Multiple
trainer
training
Arlene
1
4
7
10
13
16
19
22
25
28
31
34
37
40
43
46
49
52
55
Blocks of 10 trails


Massed trial training
Spaced trial training
Multiple trainer training
Percent of trials with independent responding
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
system of least prompts
30s response window +
sensory reinforcement
fading 30s response
window + massager
15s response
window, no
massager
massed trial training with
1 trainer
Shelly
1
6
11
16
21
26
31
36
41
46
51
56
61
Blocks of 10 trials

Appendix G

Percent of trials per probe day with unprompted responding under S^D and S^Δ conditions for Wanda, Cheryl, Arlene, and Shelly




Baseline
Massed trial training
Spaced trial training
Multiple trainer training
Arlene
Pre-trial observation
With partner
15%
5%
45%
18%
40%
15%
65%
10%
Shelly
9%
4%
28%
0%
28%
0%
68%
3%
Percentage of trials
Probe days