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Effects of conversational topic choice on outcomes of augmentative communication intervention for adults with aphasia

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Few variables have been found to predict successful use of augmentative and alternative communication devices (AAC) by persons with aphasia. The present study used a single case alternating treatment design to test whether choice of conversational topic improved the ability of three adults with aphasia to use symbol-based communication aids in clinical dialogues with familiar and unfamiliar partners, and in natural environment conversations with family members and friends. Results showed that the youngest participant with most recent onset of aphasia benefited clinically from choice in communication aid training. However, the benefit of topic choice did not extend to natural environments. At home and in other natural environments, use of communication aids was dependent on multiple social and contextual factors. Findings of this study were interpreted using a model of human motivation that considers both personal and environmental influences on achievement.

INTRODUCTION

Over the past four decades, the focus of aphasia treatment has expanded from addressing underlying impairment to enhancing an individual's communication abilities within the context of a complex social environment. Whereas early treatments (e.g., Myers, 1980; Rao & Horner, 1978; Skelly, 1979; Sparks & Holland, 1976) emphasised remediation of linguistic deficits, many of today's therapy approaches are also concerned with improving personal autonomy, quality of life, and the person's social support system (e.g., Fox, 1990; Fox & Fried-Oken, 1996a; Hoen, Thelander, & Worsley, 1997; Kagan, 1995; Kagan & Gailey, 1993; Lubinski, 1994; Lyon, 1992; Lyon et al. 1997; Marshall, 1993; Parr, 1996).

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The field of Augmentative and Alternative Communication (AAC) has a history of addressing many of the social communication issues now recognised as critical to comprehensive aphasia intervention (Light, 1988; Light & Binger; 1998). In particular, the participation model (Figure 1) offers a framework for assessing a person's communication needs, for identifying barriers to participation, and for developing skill-based and partner-focused treatments that address AAC system use, natural communication abilities, and natural environment adaptations (Beukelman & Mirenda, 1998). Efforts are now under way to draw from the field of AAC to develop specific assessment and intervention methods that will be of the greatest benefit to individuals suffering from participation restrictions imposed by aphasia (Beck & Fritz, 1998; Fox &

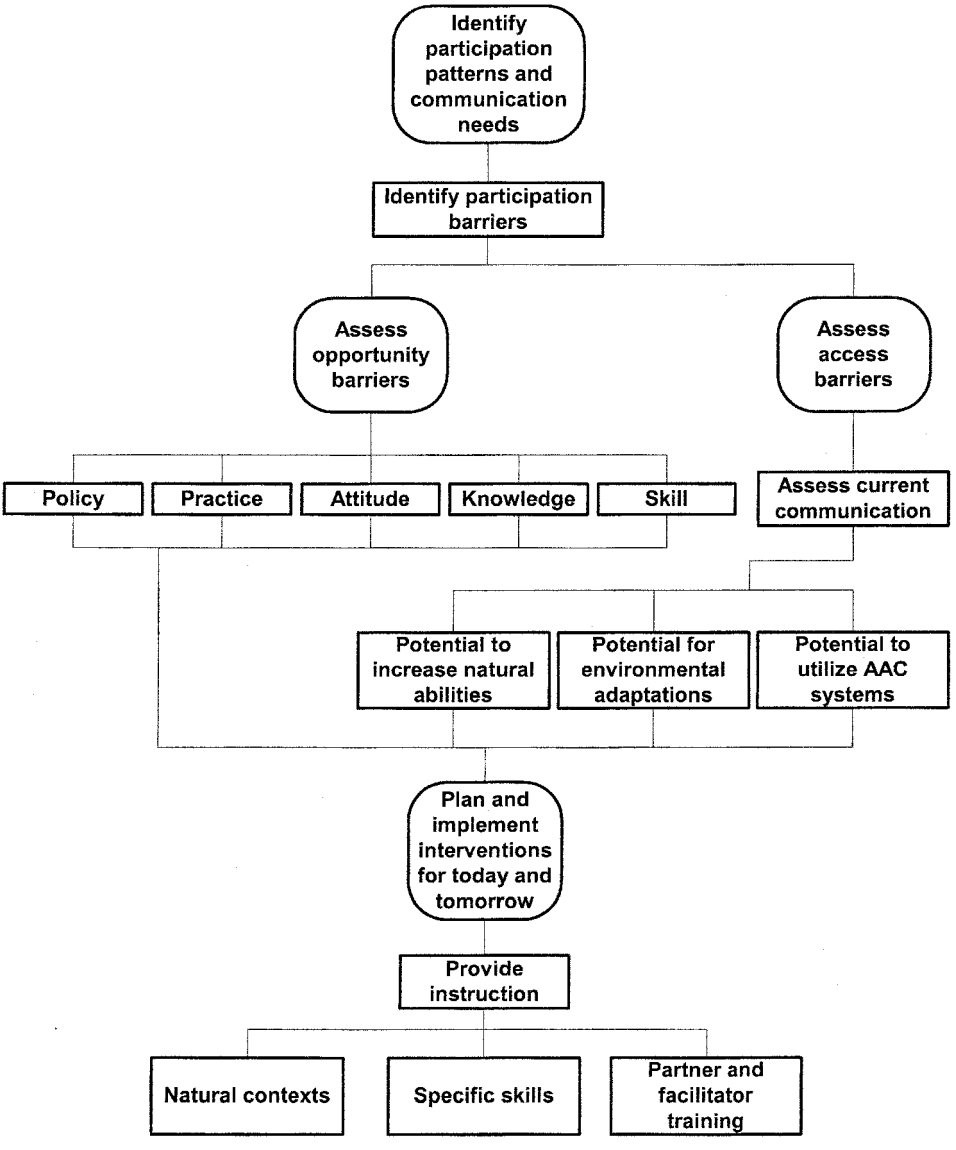

Figure 1. The participation model. Adapted from Beukelman and Mirenda (1998).

Fried-Oken, 1996b; Garrett & Beukelman, 1995; Kagan, 1998; Kratt, 1990; Lasker, Hax, Garrett, Moncrief, & Eischeid, 1997).

Research on AAC interventions in aphasia

Studies examining AAC interventions for persons with aphasia have only recently begun to identify treatment components that influence outcomes. These studies explore outcomes of AAC interventions employing aided (e.g., use of communication books and boards) and unaided (e.g., use of gesture) methods of communication. The most promising findings have come from case studies and single case experimental research that incorporated AAC assessment practices (Bailey, 1983; Beck & Fritz, 1998; Bellaire, Georges, & Thompson, 1991; Beukelman, Yorkston, & Dowden, 1985; Garrett & Beukelman, 1995; Garrett, Beukelman, & Low-Morrow, 1989; Lasker et al., 1997). These studies suggested that AAC interventions are most successful when they target the communication needs of the individual, and when they address linguistic, personal, and environmental barriers to successful system use.

Other studies have illustrated potential challenges that individuals with aphasia may experience in achieving independent use of gestures or symbols for communication. Purdy, Duffy, and Coelho (1994) showed that when persons with aphasia are taught to use multiple communication modalities, they most frequently choose to use speech in natural contexts. Subjects in a study conducted by Beck and Fritz (1998) had difficulty learning and retaining iconic codes for producing abstract messages if they scored below 5 on comprehension subtests of the Western Aphasia battery (Kertesz, 1982). Subjects in another study (Bellaire et al., 1991) used symbols to make requests and to communicate personal information in a natural environment only after they received training in that environment. One study used an alternating treatment design to explore the benefits of verbal versus nonverbal aphasia treatment on three subjects' ability to describe picture stimuli (Avent, Edwards, Franco, Lucero, & Pekowsky, 1995). The verbal treatment consisted of a programme to improve use of spoken language. The nonverbal treatment was a PACE-like programme that emphasised gesture, writing, and drawing. Three subjects showed unique response patterns to the two treatments, and the authors concluded that optimal treatment programmes may be idiosyncratic for individuals with chronic aphasia.

This review of AAC and aphasia research reveals a unique set of challenges associated with communication treatment outcomes. Although case studies suggest that people with aphasia can learn to use AAC methods in clinical and natural environments (Bailey, 1983; Beukelman et al., 1985; Garrett et al., 1989), empirical research has not yet identified specific variables that foster successful generalisation. Aphasia research has thus far only suggested one method for improving generalisation: training in the environment where specific communication skills will be used (Bellaire et al., 1991). The inefficiency of training individuals to use AAC systems in all natural environments inspires researchers to identify other variables that improve learning and generalisation.

Motivation and learning

Behavioural and social psychology are disciplines that have traditionally explored questions related to motivation and learning. An area that has received a great deal of attention is the influence of choice on learning and performance for disabled and nondisabled individuals. Motivational systems theory (Ford, 1992) stresses the importance of motivation for goal attainment, while also factoring in the impact of

skill, underlying biological or physiological capabilities, and the need for a responsive environment. According to Ford and other social psychologists (Bandura, 1986; Deci & Ryan, 1985; Rotter, 1954), participation in goal setting encourages learners to take responsibility for their goals, and promotes the persistence necessary for goal attainment. Other factors that contribute to successful goal attainment include the positive emotions that arise as a result of pursuing a meaningful goal and the belief in one's ability to achieve a goal called personal agency beliefs (Bandura, 1986; Ford, 1992). The application of choice in learning tasks and the potential for personal agency beliefs to enhance learning may also have relevance in training individuals with aphasia to use manual communication aids, such as communication boards or books.

A series of experiments involving word-association tasks supports Ford's (1992) contention that motivation for goal attainment is affected by the degree to which goals are self-selected (Bailey, Perlmuter, Karsh, & Monty, 1978; Monty, Geller, Savage, & Perlmuter, 1979; Monty & Perlmuter, 1975; Monty, Rosenberger, & Perlmuter, 1973; Perlmuter, Scharff, Karsh, & Monty, 1980). These experiments showed that nondisabled subjects learned significantly more in word association tasks when they chose stimulus or response words (Monty & Perlmuter, 1975). Moreover, the improved performance associated with choice generalised to aspects of a task that did not include choice. Even the choice of a few words early in a task (Monty et al., 1973), or choosing response words for another individual, resulted in an increase in the subjects' learning (Bailey et al., 1978). In a later experiment, Perlmuter et al. (1980) found additional evidence that choice promotes generalisation. When experimental subjects were allowed to choose stimulus words in a paired associate learning task, their performance improved on a concurrent unrelated motor task.

The researchers hypothesised that the perception of control increased motivation, which enhanced learning. Further, they found that the greatest benefit was seen when choices were made between alternatives of equal or comparable value. For example, when choices were made between highly familiar words, experimental subjects learned significantly more than when choices were made between words with different levels of familiarity. Monty and colleagues (1979, p. 177) suggested that

> If alternatives offered are perceived as constituting a real or meaningful choice (i.e., a choice of a gold versus a silver mechanical pencil) then the feeling of control may develop. By contrast if the available alternatives are dissimilar in attractiveness (i.e., a gold mechanical pencil versus a wooden pencil), they are not likely to provide a meaningful choice, and hence perceived control may not develop.

A study by Bandura and Cervone (1983) supports a second tenet of Ford's (1992) motivational systems theory, that learning is enhanced when self-selected goals are combined with personal agency beliefs. When compared with conditions offering only one motivational variable, the subjects in this study performed twice as well on a mechanical task when they set their own goals and were given frequent feedback regarding goal attainment. Bandura and Cervone's findings suggest that research investigating the influence of choice may produce results with greater significance if feedback regarding goal attainment is incorporated into the design.

Many of the aforementioned experiments have been replicated with aged and disabled adults. Learning was significantly greater in choice than nonchoice conditions for elderly community-dwelling adults (Fleming & Lopez, 1981), for elderly adults who had sought clinical help for memory problems (Perlmuter & Smith, 1979), and for chronically ill adults (Perlmuter, Goldfinger, Sizer, & Monty, 1989). However, increases in accurate

responses were attenuated for elderly and chronically ill adults when compared with young, nondisabled subjects.

Two recent investigations examined aspects of choice among persons with aphasia. Freed, Marshall, and Nippold (1995) found that aphasic subjects who developed personalised cues in a labelling task scored higher, albeit not significantly higher than when cues were assigned. A second study examined the effect of conversational topic choice on the quality of interaction between aphasic persons and their partners. The results of this research showed that conversational partners used more facilitory behaviours when the topic was chosen by a person with severe aphasia, and fewer facilitory behaviours when partners interacted with moderately aphasic persons about their chosen topics (Rogers, Schlegel, Alarcon, Olswang, & Klingenberg, 1999). This preliminary research suggests that choice may play a role in learning for persons with aphasia, and that it also may influence partner's behaviour in conversational exchanges.

Subjects in most choice studies demonstrated communicative abilities that allowed them to choose verbally or graphically presented options. Only one previous study addressed the effect of mode of choice on choice-making reliability for individuals with severe communicative disabilities. Vaughn and Horner (1995) examined whether food choices made by a man with severe autism were more reliable when presented verbally or using picture symbols. Results showed that the subject accepted a significantly higher percentage of meals when he made choices using symbols than when choices were presented verbally. Their findings supported the notion that the reduced linguistic and cognitive demands of picture-based choice making may be advantageous for some severely communicatively impaired individuals.

This body of research supports the potential benefit of choice across numerous operational interpretations of the term ''choice''. Choice has been defined in these studies as choice of stimulus materials, choice of response mode, choice of topic, choice of targets or thresholds for learning, and choice of activity in natural environments. Findings of these investigations support the notion that choice in a variety of contexts may improve performance in disabled and nondisabled individuals across tasks and that generality to natural environments may occur.

Choice and psychosocial change in aphasia

Research investigating psychosocial change suggests that adults with aphasia experience reduced control over many aspects of their lives (Artes & Hoops, 1978; Brumfitt, 1993; Chwat, 1980; Code & Muller, 1992; Herrmann & Wallesch, 1989; Kinsella & Duffy, 1978; Le Dorze & Brassard, 1995; Malone, 1969; Parr, 1994; Shewan & Cameron, 1984; Williams & Freer, 1986). In particular, following the onset of aphasia, many family members take control of choice making in important areas of daily life. Spouses and adult children report assuming increased responsibility for personal, economic, and social decisions (Artes & Hoops, 1978; Chwat, 1980; Malone, 1969). Ultimately, family members often report dissatisfaction with the increased burden that they assume, and individuals with aphasia report feelings of powerlessness (Le Dorze & Brassard, 1995).

The research also suggests that autonomy is lacking in the lives of many aphasic persons (Artes & Hoops, 1978; Brumfitt, 1993; Chwat, 1980; Code & Muller, 1992; Herrmann & Wallesch, 1989; Kinsella & Duffy, 1978; Le Dorze & Brassard, 1995; Malone, 1969; Parr, 1994; Shewan & Cameron, 1984; Williams & Freer, 1986). Nonetheless, few therapy approaches incorporate increased choice in their treatment objectives (Fox, 1990; Fox & Fried-Oken, 1996a; Lubinski, 1994; Lyon, 1992; Lyon et

al., 1997; Parr, 1996). No empirical research has yet examined how incorporating choice in treatment objectives might influence therapy outcomes for individuals with severe aphasia.

PURPOSE OF THE RESEARCH

The purpose of this research was to test whether choice of conversational topic improved the ability of adults with severe aphasia to learn to use communication aids to respond to questions and to comment in dialogues within a clinical environment. In this research, choice of conversational topic was made from topics judged to be of equal value to each research participant. In addition, the researchers examined whether conversational topic choice influenced communication aid use by communicators with aphasia and their conversational partners in diverse settings. The specific experimental questions were:

1. Does choice of conversational topic influence learning and generalisation of communication aid use for individuals with aphasia?
2. Do individuals with aphasia rate their satisfaction with conversations about topics they have chosen more highly than conversations about topics that are assigned?
3. Do conversational partners rate their satisfaction with conversations about topics chosen by their aphasic partners more highly than conversations about topics that are assigned?

METHOD

Research design

This investigation addressed each of these questions by examining outcomes of two experimental conditions in an alternating treatment single subject design. Quantitative data on selected variables were obtained during experimental sessions. In addition, generalisation to natural environments was assessed using quantitative and qualitative data reported by each participant's primary conversational partner. This design was selected because of its ability to control for threats to internal validity, and because it offered a method for comparing choice and nonchoice topic communication aid training in experimental and maintenance phases without baseline data collection (Barlow & Hersen, 1984).

Participants

Three participants were selected from potential candidates referred by speech-language pathologists in a large metropolitan area. Participants met the following pre-established criteria. They were: (a) between ages 40 and 85 years, (b) at least six months post onset of a focal left hemisphere CVA, (c) diagnosed with severe aphasia by a certified speech-language pathologist, (d) primary English speakers, (e) without reports of dramatic fluctuations in alertness, (f) without reports of diffuse neurological damage, (g) without reports of learning or psychiatric disorders, (h) reported to have normal corrected vision without evidence of a visual field cut, and (i) reported by referring clinicians to fit Garrett's (1992, p. 341) description of a comprehensive communicator:

> The comprehensive communicator has retained a variety of communication skills following the stroke, but these skills are often too fragmented or inconsistent for effective communication without support. Due to their typically independent lifestyles, these

individuals usually wish to participate in various types of conversational exchanges that occur in many environments.

In addition, each participant had a primary partner (friend, family member, or caregiver) who was willing to converse with the participant using a communication aid. Primary partners were also willing to complete weekly quantitative data sheets on communication aid use and to report qualitatively on their satisfaction with conversational exchanges on choice and nonchoice topics. Unfamiliar partners who interacted with the participants during experimental sessions were graduate students in speech-language pathology and occupational therapy. They had no reported hearing or vision deficits.

Participants were three adult men, DD, JV, and JB, who scored less than 4 out of 10 points possible on Western Aphasia Battery (Kertesz, 1982) subtests measuring spontaneous speech, repetition, and naming; and more than 4 out of 10 points possible on comprehension subtests. As summarised in Table 1, all participants identified 12 line drawings with written labels with a minimum of 80% accuracy, and sorted 30 drawings with written labels into three semantic categories with a minimum of 57% accuracy. Primary partners reported that the participants had opportunities to engage in conversation on a daily basis.

Procedure

Participants were taught to use two communication aids in conversations about their high-interest topics. The participant selected a ''choice'' topic, and a ''nonchoice'' topic was selected by the investigator from the participant's high-interest topics. Communication aids were constructed in a comparable manner across topics. Additional procedures

TABLE 1
Summary of participant characteristics

Participant	*DD*	*JV*	*JB*
Age	49	77	83
Gender	Male	Male	Male
Etiology	Left CVA	Left CVA	Left CVA
Time post CVA	10 months	3 years	5 years, 8 months
WAB Aphasia Classification	Broca's Aphasia	Broca's Aphasia	Broca's Aphasia
WAB Aphasia Quotient	33	12.6	48.8
ID line drawings	83% accuracy	80% accuracy	100% accuracy
ID drawings by semantic class	57% accuracy	66% accuracy	66% accuracy
Conversational partners	Multiple child and young adult partners	Multiple child and young and old adult partners	Multiple old adult partners. Brief contacts with young adult partners
Conversational environments frequented	Home, restaurants, ball games, friend's homes	Home, adult day care, restaurants, church	Home, senior centre

were designed to promote comparability in partner and participant training. Probes were conducted to measure differences between the two experimental conditions.

Choice and nonchoice topic assessment. Each participant's high-interest topics were identified in a sorting procedure. As a first step in the procedure, the first author interviewed each participant and his primary conversational partner in order to compile a list of general interest topics. For example, one participant indicated that he was interested in talking about his work as a construction supervisor and another participant enjoyed talking about his activities at a local senior centre. Additional topics of interest to cohorts of similar age and the same gender were added to the general interest list (Stuart, Vanderhoof, & Beukelman, 1993; Stuart, Vanderhoof-Bilyeu, & Beukelman, 1994). Examples of these topics include family, friends, finance, pets, sports, foods, politics, news, travel, church, and cars. All topics were depicted using single-word labels combined with commercially available photographs. During a session with only the first author present, each participant sorted 24 topic pictures into three piles: (a) topics of high interest, represented by an 8-inch diameter happy face icon with the word ''Like'' written above, (b) topics of moderate interest, represented by an ambivalent-faced icon with ''So-So'' written above, and (c) topics of low interest, represented by a sad-faced icon with ''Don't Like'' written above (see Figure 2). Following the sort, participants assigned ranks to pictures in the high-interest group. Participants confirmed that the topic rated #1 was their choice for communication aid training. The lowest-ranked high-interest topic was identified as the nonchoice topic for each participant.

One Tri-folder® communication aid was developed for each participant's choice and nonchoice topics, for a total of two communication aids per participant (see appendices A, B, and C). Communication aids were designed in a comparable manner across topics. Communication aid vocabulary was derived from transcripts of conversations involving participants, the first author, and their primary conversational partners. Each aid contained personal photographs, colour photographs scanned from magazines, and/or line drawings obtained from the Boardmaker® computer program with key word labels. Twelve symbols were placed on each of three pages classified into the following categories found to be useful in conversational exchanges during a pilot study (Fox & Fried-Oken, 1996a): (a) people, things, or places; (b) descriptors such as opinions, feelings, temporal concepts, or locations; and (c) events or actions. Using Adobe Photoshop® software, photographs or Boardmaker® symbols were copied onto three 8.5 $\times$ 11-inch pages of Kodak electronic imaging paper and were placed in a Tri-folder® binder. The Tri-folder® was selected as it allowed the user to see three panels of 12 symbols each when the folder was open. The left panel of each Tri-folder® contained events or actions, the middle panel contained descriptors, and the right panel contained symbols for people, things and places. This order was chosen so that difficult concepts for aphasic persons to access, such as verbs and descriptors, were placed centrally or in the participant's left visual field (Smith, 1996). It was assumed that any undetected visual neglect or field cut would most likely be in the right visual field (Brookshire, 1997).

Communication aid training. Participants and conversational partners received training designed to promote communication aid learning and generalisation. Participants attended two 1-hour training sessions per week for 6 weeks to learn to use communication aids in conversations. Choice and nonchoice conversational topic training was counterbalanced, with training of only one conversational topic occurring during each training session. Each session included two components: symbol

Figure 2. Topic sort procedure.

identification training and conversational symbol use training. Participants began each session by identifying six symbols (two symbols from each of the three communication aid pages). Symbol identification was taught using a prompt-fade training strategy (Hunt, Alwell, & Goetz, 1991). During each session participants learned to use the six trained symbols to respond to questions and to comment in dialogues as described in the conversational training protocol outlined in Figure 3. The first author acted as conversational partner in all training sessions.

Participant training was supplemented with conversational partner training designed to promote generalisation. Partners watched a 10-minute instructional video that encouraged

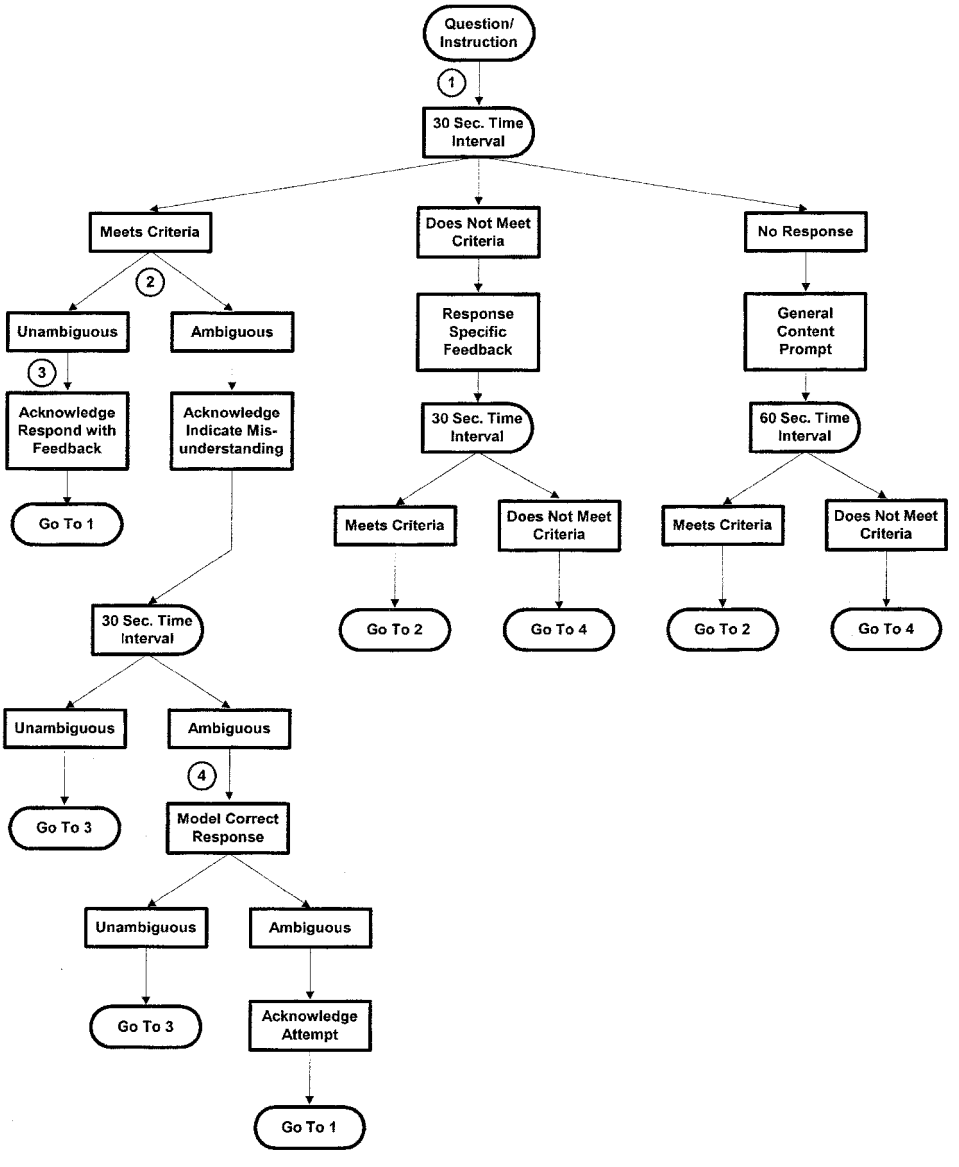

Figure 3. Conversational training protocol. Adapted from Doyle et al. (1991).

them to point to pictures on the communication aid when conversing with the participant, to give the participant adequate time to respond and comment, and to confirm their understanding of the participant's message. In natural environments, partners were encouraged to take the communication aid with them when visiting friends, to model communication aid use for others, and to interpret the participant's responses for less familiar partners. This video was viewed by partners in participants' natural environments and by unfamiliar partners who conversed with the participants during generalisation probes.

Personal agency belief enhancement procedures. Following each training session, the first author and each participant collaboratively reviewed all questions that were asked. The total number of responses requested was discussed, and the number of symbols used was recorded on a 40-level Likert scale. For purposes of comparison, scales from prior sessions were available for participants to review if they chose to do so. Scales were used for participant feedback only.

Measurement. The participants' ability to respond to questions and to comment using communication aid symbols was assessed during videotaped counterbalanced probes with the investigator and with unfamiliar partners. In each condition (choice topic and nonchoice topic), participants were video recorded while responding to 10 questions selected randomly from a set of 36 questions per topic. Questions were organised to approximate a natural flow of conversation, and were rephrased if the participant appeared not to understand. If the participant responded to a question in a manner that the partner understood (e.g., a communication aid symbol, speech, or a gesture), the partner acknowledged understanding and prompted the participant to comment. For example, if DD responded to the question ''What do you plan to do in the back yard?'' by pointing to the symbols for ''remove'' and ''fir tree'' the partner first made a statement of general understanding, such as ''Great, you think that the fir tree needs to be removed'', followed by a brief conversational comment (e.g., ''Those big trees sometimes make a back yard too shady''). If the participant did not comment spontaneously at this point, the partner provided a general comment prompt, such as ''Tell me something else''. This procedure continued until all 10 questions had been addressed.

Symbols identified by participants were considered to be nonambiguous if conversational partners acknowledged understanding by repeating the participant's message while pointing to the symbols used by the participant. Dependent variables measured during probes included the number of nonambiguous symbols used to respond to questions, and the number of nonambiguous symbols used to comment. A third dependent variable measured participant satisfaction. Participants were asked to rate their satisfaction with choice and nonchoice conversations each week using a 7-level Likert scale.

Additional quantitative and qualitative dependent variables were measured in the participant's natural environments. Primary conversational partners recorded total minutes of communication aid use for the choice and nonchoice communication aids each day and rated their satisfaction with conversations using a 7-level Likert scale. Additionally, they were encouraged to provide written comments regarding each day's conversations.

Maintenance data were collected for a minimum of 2 weeks following termination of training. Weekly generalisation probes and natural environment data collection continued during this period for two of the participants. Natural environment generalisation data for

one participant were collected for only 1 week following the end of training, as training was extended by 1 week due to illness.

Data were summarised by calculating mean weekly scores for each quantitative dependent variable (mean number of symbols used to respond and comment in clinical and generalisation probes, and mean number of minutes communication aids were used in natural environment conversations). Mean scores were plotted on graphs and analysed visually to determine if observable trends or differences existed between conditions.

Independent variable reliability. Participant's high-interest topic selections were verified in a second sort that took place after a 5-minute delay during the initial assessment session, and in a final sort at the end of the research study. Raw agreement of topics identified as high interest ranged from 80% to 100% between the first and second sort in the initial assessment and from 33% to 75% when the first assessment was compared with the post-study sort. The highest-ranked topic remained the same in all sorts for DD and JB, however JV's interest in talking about family declined to fourth place in his final sort.

Dependent variable reliability. Upon completion of the experiment, 30% of all probe video recordings were randomly selected, analysed by an independent scorer, and then compared with the first set of frequency data for each probe session. A ratio of the smaller frequency to the larger frequency of nonambiguous communication aid symbols, multiplied by 100, was used to assess interrater reliability (Barlow & Hersen, 1984). Session-by-session reliability of response scores ranged from 76% to 100%, with an overall mean of 89%. Session-by-session reliability of comment scores ranged from 24% to 100% with an overall mean of 82%. The lower range of interrater reliability in comment scores is primarily accounted for by a proportionally lower frequency of commenting for all participants.

RESULTS

Numbers of nonambiguous communication aid symbols used by each participant are presented in Figures 4–7. As shown, differences in symbol use between choice and nonchoice conditions were seen for DD and JV when responding to questions during early training probe sessions. Effects were maintained over the course of training and generalisation probes, and throughout maintenance for only one participant, DD.

Communication aid use in clinical probes

As noted, only DD used a greater number of symbols to respond to questions about his choice versus his nonchoice topic throughout training and generalisation probes (Figures 4 and 5). JV used a slightly higher number of symbols to respond to choice topic training probe questions in the early weeks of the study. However, this effect reversed or diminished before the training period was completed (Figure 4). There was no effect of choice for JV or JB in responding to questions during generalisation probes (Figure 5).

Figures 6 and 7 show that symbol use for DD and JV was variable for commenting in training and generalisation probes. JB shows a similar pattern of variability during the first 3 weeks of training probes and throughout generalisation probes. However, Figure 6 shows that JBs commenting accelerated for his choice topic during week 4 and remained higher throughout the remaining period of data collection.

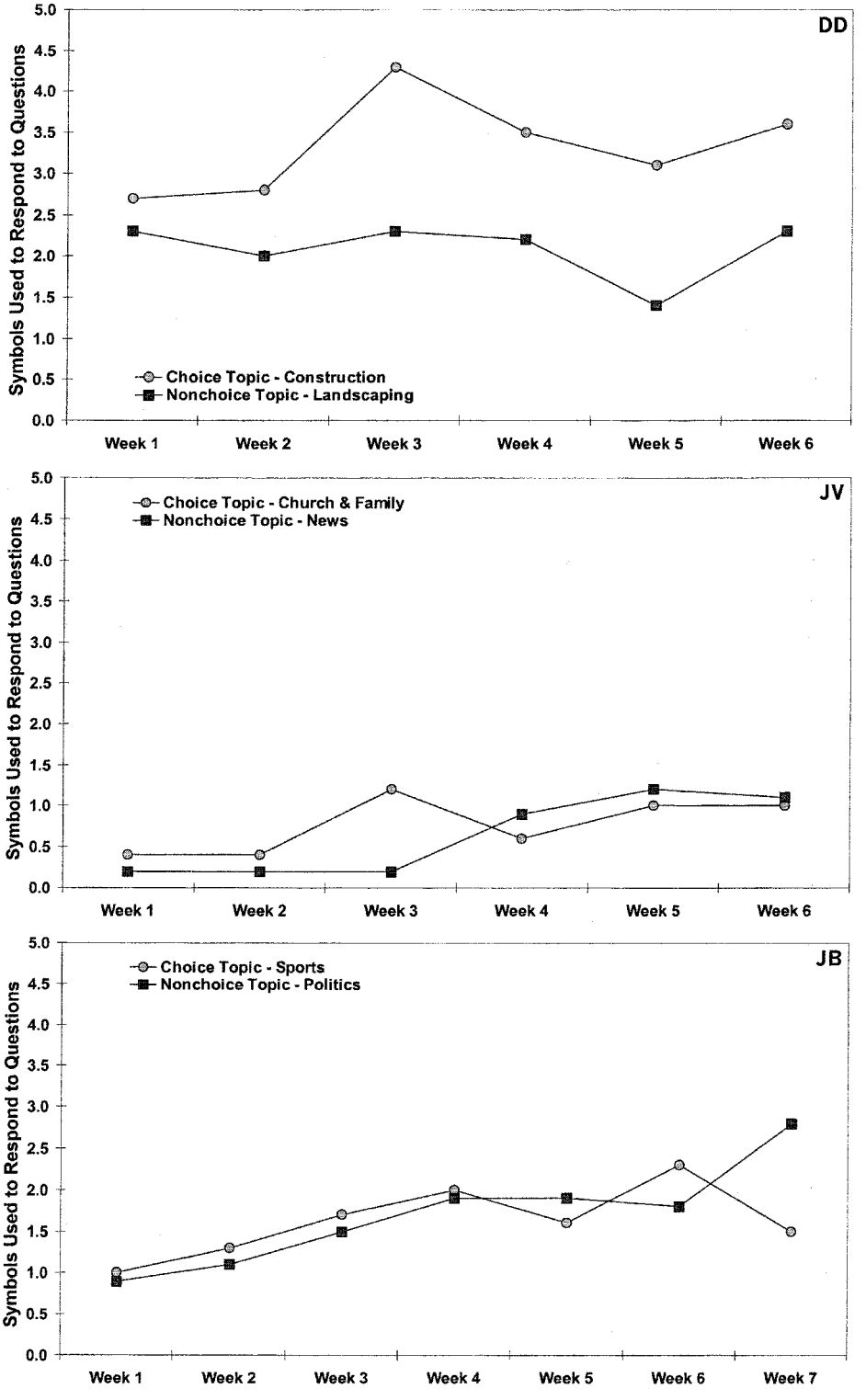

Figure 4. Mean number of symbols used to respond to questions in clinical probes with the experimenter.

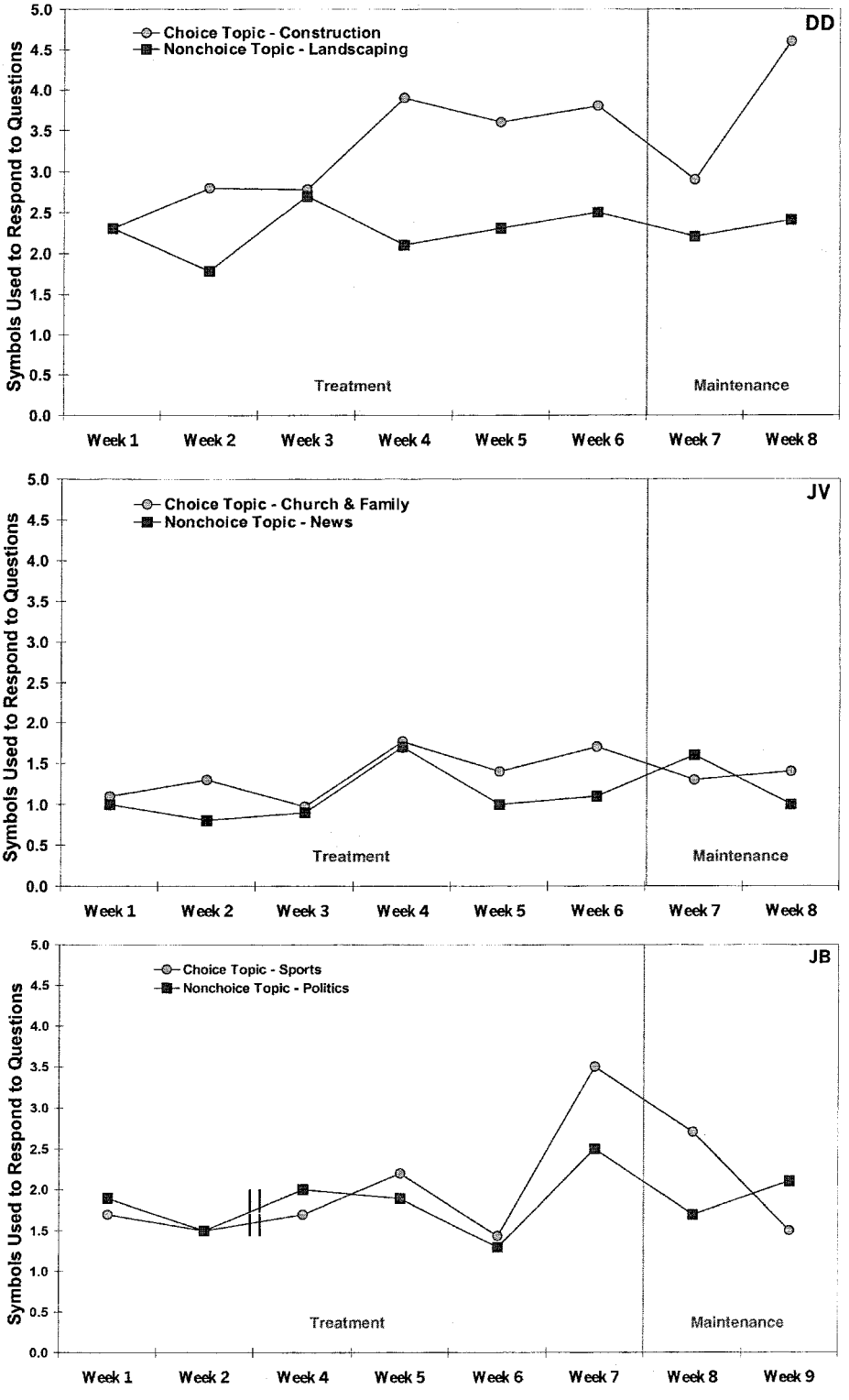

Figure 5. Mean number of symbols used to respond to questions in generalisation probes with unfamiliar partners.

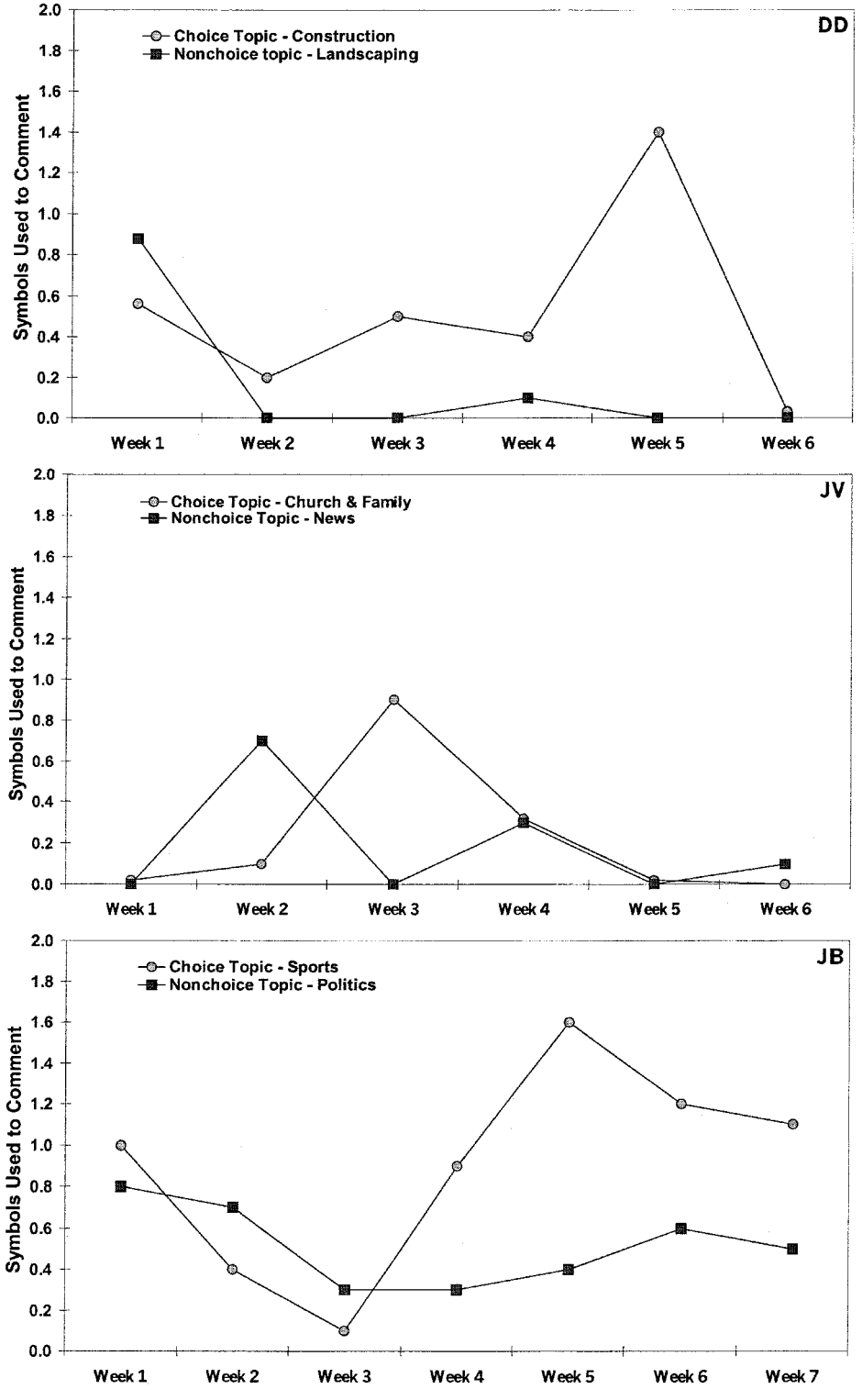

Figure 6. Mean number of symbols used to comment in clinical probes with the experimenter.

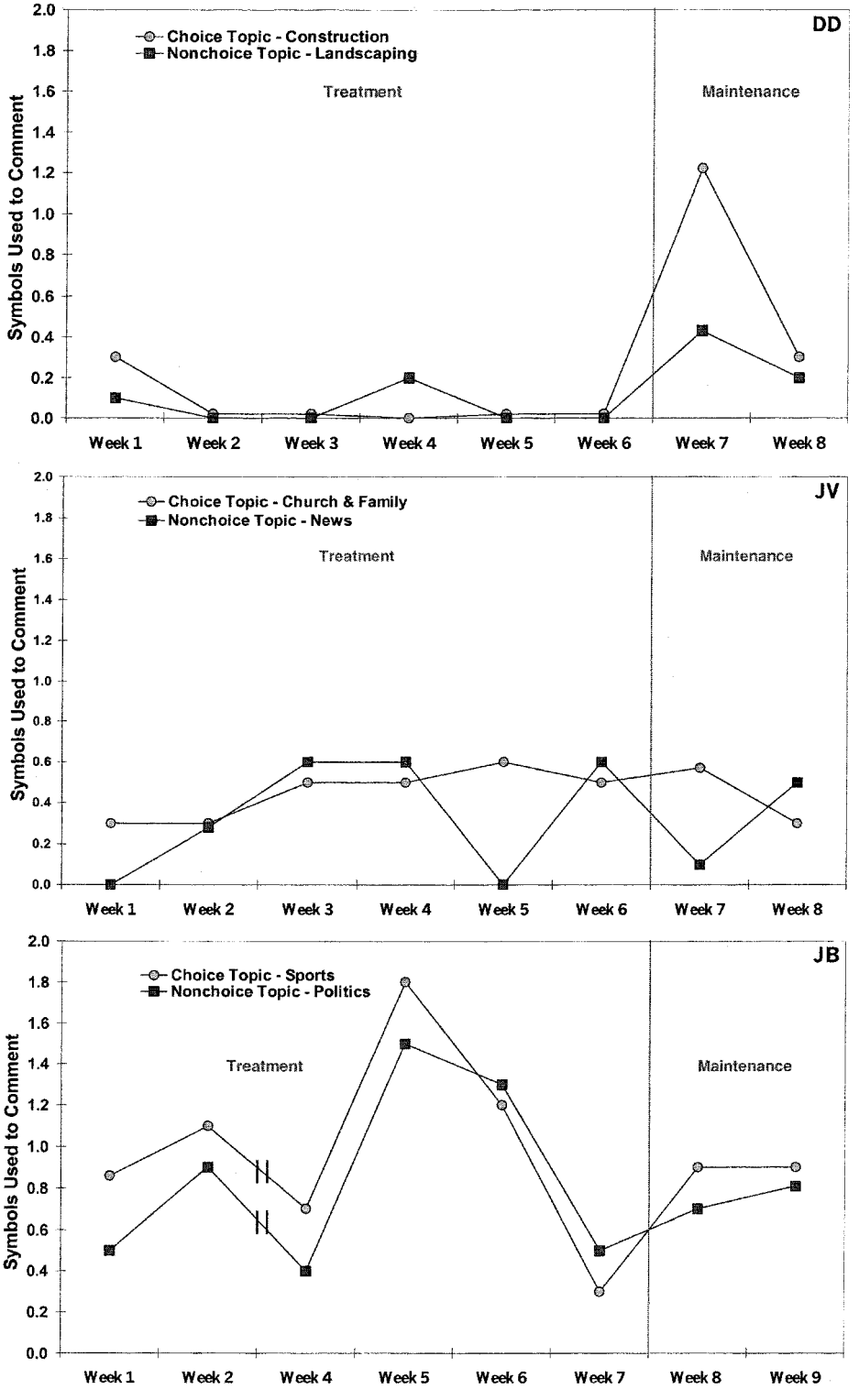

Figure 7. Mean number of symbols used to comment in generalisation probes with unfamiliar partners.

Communication aid use in natural environments

Figure 8 shows that of the three study participants DD used his communication aids most frequently in natural environments. Although DD responded and commented more using his choice communication aid during the clinical probes, he used his nonchoice communication aid more in natural environments. He engaged in conversations using his choice topic aid for an average of 22 minutes per week and with his nonchoice communication aid for 52 minutes per week. The pattern of choice and nonchoice communication aid use was opposite for JV, who used his choice topic aid for an average of 16 minutes per week and his nonchoice communication aid for 10 minutes per week. JB used his communication aids least in natural environments. He used his choice topic aid for an average of 8 minutes per week. His nonchoice communication aid was used only during the first week for a period of 4 minutes. There was no evidence of an effect of choice in the natural environment for any of the participants.

Participant and partner satisfaction

Figure 9 shows that the participants reported a high level of enjoyment in both choice and nonchoice topic conversations. DD and JB rated all choice topic conversations more highly than nonchoice topic conversations. Overall, JV rated enjoyment of his nonchoice topic conversations more highly than his choice topic conversations. However, JV's ratings were highly variable across conversations.

Figure 10 shows that partners also reported high levels of satisfaction with natural environment conversations. Factors that may have influenced satisfaction were noted in the partner's weekly comments. JV's wife indicated that she especially enjoyed lengthy conversations that she and JV had about news programme they watched together on television. DD's wife reported high levels of enjoyment when DD was able to convey new information using his communication aid and when he paired spoken words with symbols. JB's grandson assigned higher satisfaction scores to conversations when the sequence of symbols JB used and the content of those symbols immediately made sense to him.

DISCUSSION

Webster's dictionary defines preference as a state of being preferred or liking better. Choice is defined as choosing or making a selection. Although topic preference may be a relatively static entity for some individuals, topic choice is by its nature highly dynamic. Lyon (personal communication, January, 2000) suggests that, ''if we wish to sample choice one is left to operationally define a process and investigate it at a set point in time, preferably through a process that accounts for as much variability as possible.'' In this research, preferred conversational topics were operationally defined as those topics that participants sorted from a finite set into a ''highly preferred'' category in a 3-category sorting procedure. The choice conversational topic was defined as the top-ranked preferred topic, and was confirmed as each participant's selection for communication aid training. Results of this research illustrate some of the difficulties inherent in capturing the effects of a dynamic concept such as choice in a complex and lengthy procedure such as communication aid training. The variability across subjects and conditions evident in the results of this research may be explained in part by this difficulty. A close examination of the findings suggests the possibility that other variables played a role as well, and that those variables were unique to the participants and their partners.

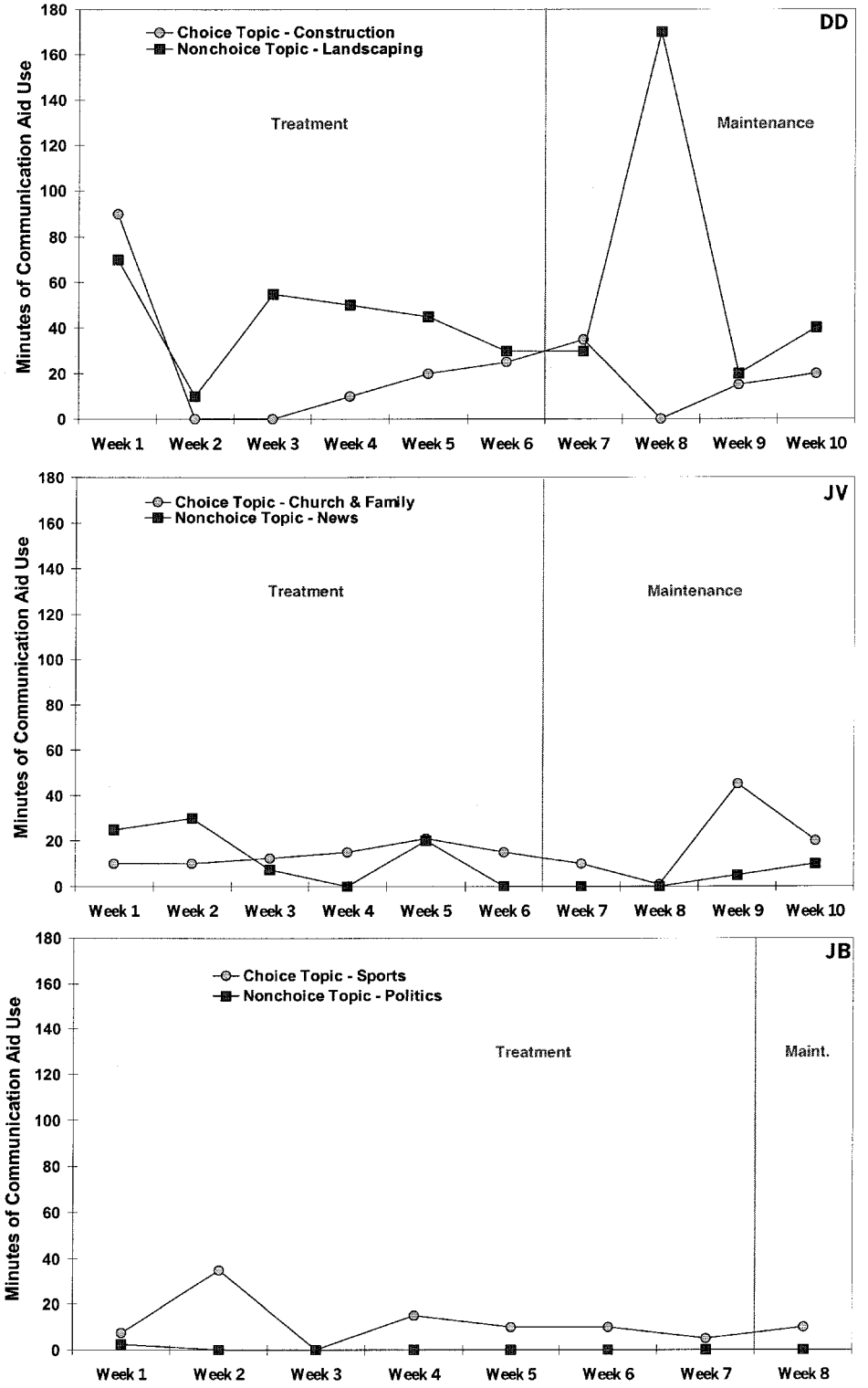

Figure 8. Mean number of minutes of communication aid use in natural environment conversations as reported by partners.

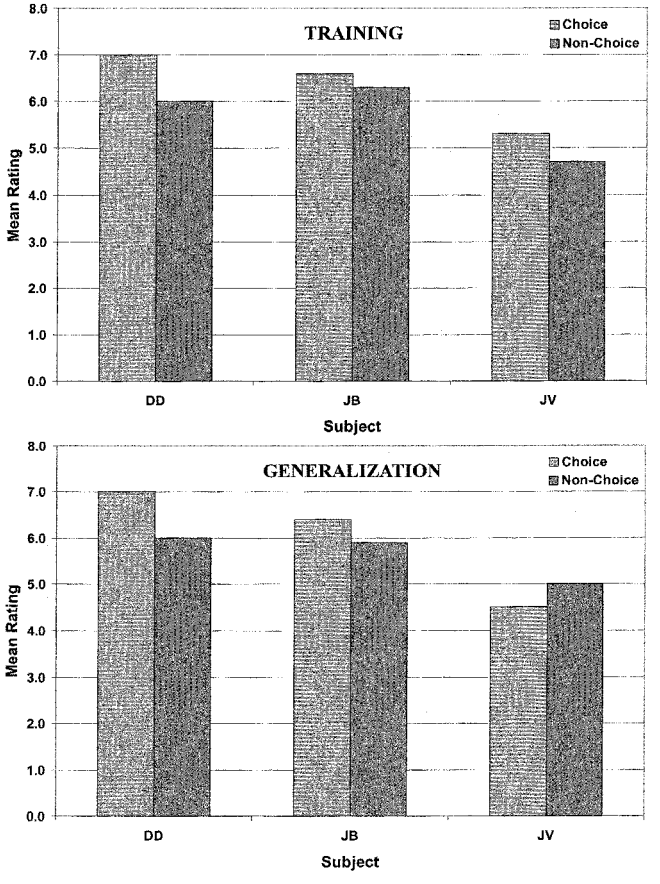

Figure 9. Mean participant satisfaction ratings.

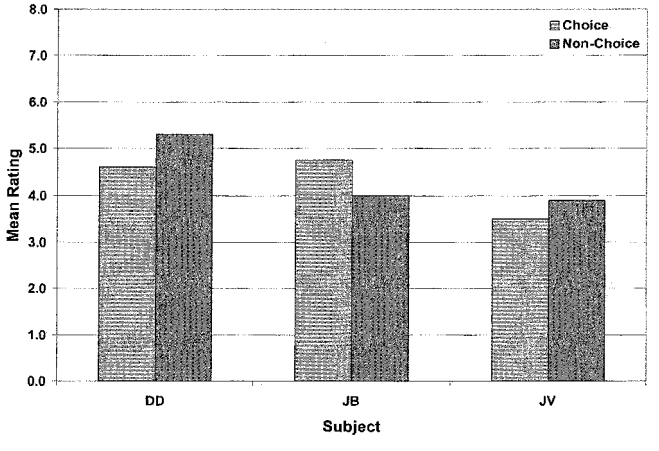

Figure 10. Mean satisfaction ratings for natural environment partners.

Clinical findings

DD's performance was superior using his choice topic communication aid to respond to training and generalisation probe questions (Figures 4 & 5). The effect of topic choice was not apparent in DD's symbol use for commenting (Figures 6 & 7). In contrast, JV's training probe data in Figure 4 show a weak and temporary effect of choice on communication aid learning. Topic choice did not produce an effect on JV's symbol use in any of the other experimental conditions. The effect of topic choice on JB's performance is most evident when responses and comments during training probes are examined concurrently (Figures 4 & 6). JB's responses measured during the early weeks of training suggest no effect for topic choice. Evidence for an effect is seen in the second half of the training probes when JB's use of symbols to comment increased significantly in the choice topic condition. This increase offset a slight decrease in JB's choice topic training probe responses during the same period.

Possible explanations for differences just described emerge when each participant's performance is examined in relation to prior research. In their summary of research on motivation and ageing, Perlmuter et al. (1989) concluded that the benefit of choice was reduced for elderly and chronically ill persons when compared with young, nondisabled individuals. It is possible that JV's age (77) and the severe and chronic nature of his disability (WAB aphasia quotient of 12.6 and 3 years post-onset) reduced his ability to benefit from conversational topic choice as it was operationally defined in this study. Conversely, a younger individual such as DD (age 49), with a more recent and less severe aphasia (10 months post onset, and WAB aphasia quotient of 33), experienced a greater and more sustained clinical benefit of topic choice when responding to questions.

A second factor that may have influenced clinical findings for DD and JV was partner-related. DD's performance may have been influenced by his willingness to share information with different partners. For example, DD's highest levels of commenting were evident in training probes with the investigator acting as his partner (Figure 6), and he used few symbols to comment during interactions with unfamiliar partners in generalisation probes (Figure 7). Partners' communicative style or eagerness also may have contributed to JB's pattern of symbol use. Examination of JB's data in Figures 5 and 7 shows choice and nonchoice symbol use rising and falling in relative concert across generalisation probes with different partners. This pattern suggests that unique partner characteristics may have had an impact on the number of symbols that JB used to respond to questions and to comment across all generalisation probe sessions.

Analysis of JB's data suggests that a third variable may have played a role in his ability to benefit from topic choice. JB's relatively less severe language disability (WAB aphasia quotient of 48.8) appears to have influenced his performance. Unlike the other two participants, JB learned to use commenting in training probes in order to achieve a more natural pattern of conversational turn-taking when communicating about his choice topic (Figure 6). In JB's training probes, the effects of age and chronic disability appear to have been mitigated by preserved linguistic skills. This result supports a finding of Doyle, Oleyar, and Goldstein (1991) wherein a conversational training protocol produced a more balanced pattern of spoken language turn-taking in an aphasic individual with a similar aphasia quotient

In contrast to the variability of communication aid symbol use across participants and conditions in the clinical probes, participants made consistent discriminatory judgements when rating their satisfaction with choice and nonchoice topic conversations (Figure 9). In most cases, they concluded that conversing about topics that they had chosen for

communication aid training was more satisfying than communicating about a preferred topic they had not chosen. Higher levels of satisfaction with choice topic conversations suggest topic choice may be one of the variables that increase enjoyment and perceived control in interactions with persons with aphasia. This finding extends the results of other studies demonstrating increased levels of motivation and enjoyment produced by choice in individuals with cognitive and linguistic disability (Bambara, Ager, & Koger, 1994; Bambara, Koger, Katzer, & Davenport, 1995; Parsons, Reid, Reynolds, & Bumgarner, 1990).

Natural environment findings

In contrast to the high satisfaction ratings that aphasic participants gave their choice topic conversations, data shown in Figure 10 provide no evidence that a conversational partner's satisfaction ratings have a relationship to the aphasic participant's choice of conversational topic. These data suggest that partners considered multiple factors when assigning a satisfaction rating. Comments provided by the wives of DD and JV show that they considered the amount of information conveyed, whether the communication aid was used, and the aphasic person's mood at the time of the conversation. Notes submitted by JB's grandson primarily addressed the difficulty that he had understanding the ''gist'' of some of his grandfather's messages. These notes appeared frequently during the early weeks of data collection, but were infrequent as the study progressed, suggesting that the grandson became a better interpreter of JB's symbol use over time.

This study confirms some of the same challenges with natural environment generalisation demonstrated in prior empirical research (Bellaire et al., 1991; Coelho & Duffy, 1985, 1990; Purdy et al., 1994). In fact, although each of the participants showed improved use of nonambiguous symbols in communication aid training over time, this improvement did not translate to more time spent using the aids at home (Figure 8). Moreover, DD's superior use of his choice topic communication aid in clinical probes did not result in greater use of his choice communication aid in natural environments. This suggests that other variables were more critical to natural environment communication aid use than the ability to access and use nonambiguous symbols and topic choice *per se*.

Findings of this research suggest that perhaps topic preference is one of those variables. As all of the participants used one or more of their communication aids frequently with their natural environment partners, topic preference may be a more potent indicator of natural environment relevance than topic choice. The importance of topic relevance and other social and interactive variables is supported by the qualitative data reported by partners in this study. Partners reported that communication aids were used under the following conditions: (a) when conversational partners shared an interest in the topic, (b) when vocabulary was useful with multiple partners in conversations addressing various temporal orientations, (c) when partners compensated for the aphasic participant's difficulty initiating use of the communication aid, and (d) when partners understood how to facilitate conversations by modelling symbol use themselves, and by teaching others to communicate with their aphasic partners. These results support AAC and aphasia research that recognises the importance of context and partners for achieving generalisation of therapy outcomes (Alarcon, Hickey, Rogers, & Olswang, 1996; Garrett & Beukelman, 1995; Light and Binger, 1998; Lyon et al., 1997; McNaughton & Light 1989; Simmons-Mackie & Damico, 1997), and that demonstrates the importance of appropriate vocabulary for successful natural environment communication aid use (Stuart et al., 1994, 1997).

IMPLICATIONS

Results of this study suggest that some individuals with aphasia are able to learn to use communication aids to have conversations about their preferred topics. Of the three participants, the youngest with the most recent onset of aphasia benefited most from topic choice and showed the greatest potential to use his choice and nonchoice topic communication aids with partners in multiple natural environments. This finding suggests that the optimal clinical benefit of conversational communication aid training may be experienced by younger persons or by persons with less chronic aphasia. It is possible that the relatively intact social support network of younger, less chronically ill persons (Kinsella & Duffy, 1978) provides greater opportunities for communication. Moreover, early intervention designed to promote conversation with multiple partners may actually favour preservation of the social network critical to psychosocial well being for aphasic individuals and their families (Le Dorze & Brassard, 1995; Parr, 1994). This is not to say that only younger individuals will benefit from communication aid training. JV's relatively frequent use of both communication aids suggests that age, severity, and chronicity of aphasia may not preclude older individuals from using preferred topic communication aids in natural settings with multiple partners.

Although topic choice may promote improved communication aid learning for some individuals, other issues related to environmental opportunities must be considered for successful natural environment generalisation to occur. The complex interplay of context, participant's initiation, partner interest, and partner facilitation that appears to influence communication aid use points to a need for collaborative goal setting. Optimally, topic choice assessment should be conducted in the environment of interest, and should involve the person with aphasia as well as potential conversational partners. Partners should be asked to report changes in life situation that are likely to affect opportunities for communication, including their own level of interest in the topics. The goal of such an interaction would be to help the person with aphasia make an informed choice when selecting topics for communication aid training.

Finally, although a minimal level of partner training appeared to be adequate for many of the partners involved in this study, there is evidence that other conversational partners may need greater support (Kagan, 1995; Kagan & Gailey, 1993; Lyon et al., 1997). Light and Binger (1998) propose that partners may need to use multiple strategies to promote use of communication aids. Among these are structuring the environment to promote communication, confirming the individual's intended message, and modelling appropriate use of the communication aid. Successful communication aid training will depend on adequate assessment of these and other partner skills for facilitating communication aid use.

The personal and environmental factors just mentioned indicate a need for a comprehensive theoretical framework for AAC intervention with persons with aphasia. Specifically, this study's results lend support to Ford's (1992) Motivational Systems Theory (MST). Ford's theory creates an integrative framework for motivation. According to MST, four prerequisites are necessary for effective functioning. They are: (a) the motivation necessary to initiate and maintain goal-directed activity, (b) the skill necessary to produce the desired consequences, (c) biological functioning necessary to support the activity, and (d) the cooperation of a responsive environment.

The relationship of these prerequisites is expressed in the following formula:

$$\text{Achievement/Competence} = \frac{\text{Motivation} \times \text{Skill}}{\text{Biology}} \times \text{Responsive Environment}$$

where Motivation = Goals × Emotions × Personal Agency Beliefs.

Guided by MST, one might view DD's ability to use his communication aids from the perspective of an interplay of multiple factors (Fox & Sohlberg, 2000). By choosing to talk about construction, DD selected a meaningful or relevant goal. Collaborative feedback following each session allowed DD to view his goal as attainable, and supported his personal agency beliefs. Support provided by DD's wife compensated for biological limits that damage to DD's language centres imposed on his communicative abilities. The success that he experienced in communicating information about construction jobs to his wife and others lent emotional salience to the experience, and further supported his personal agency beliefs. However, the importance of DD's goal varied with the environment where he attempted to use his construction communication aid. This resulted in greater overall use of his landscaping (nonchoice topic) communication aid. MST assigns a greater relative value to the environment, allowing it to overshadow the combined effect of motivation, skill, and biology. Such a theoretical framework provides an explanation for why DD used his construction communication aid less in natural environments, while his use of the aid was clearly superior in clinical interactions.

MST provides a theoretical framework for future research examining AAC treatment outcomes for persons with aphasia. It suggests a role for choice as a variable that can influence learning, and it provides a schema for evaluating the relative importance of other social and environmental variables. However, MST does not reveal the range of interpretations of choice that may benefit learners with aphasia.

This research examined the benefit of conversational topic choice for promoting use of communication aids designed to communicate opinions or to describe events. It may be that choice will be more powerful when a person with aphasia chooses an overall purpose for communication aid training. For example, one person may choose to use a communication aid to reminisce, another to tease or joke, and another to share ideas or opinions. Or it may be that choice will be most beneficial when vocabulary is selected or when photographs and symbols are chosen for inclusion on a communication aid. It has been suggested (J. Lyon, personal communication, 2000), that we have only begun to ''scratch the surface in attempting to define, control and assess the complexity of investigating choice.'' Lyon proposes that there is reason to suspect that ''if we can better capture choice, addressing and complementing the idiosyncratic thoughts, needs, feelings, and desires of communicators ... we may indeed find that this variable is influential in everyday use of communication and participation in life.''

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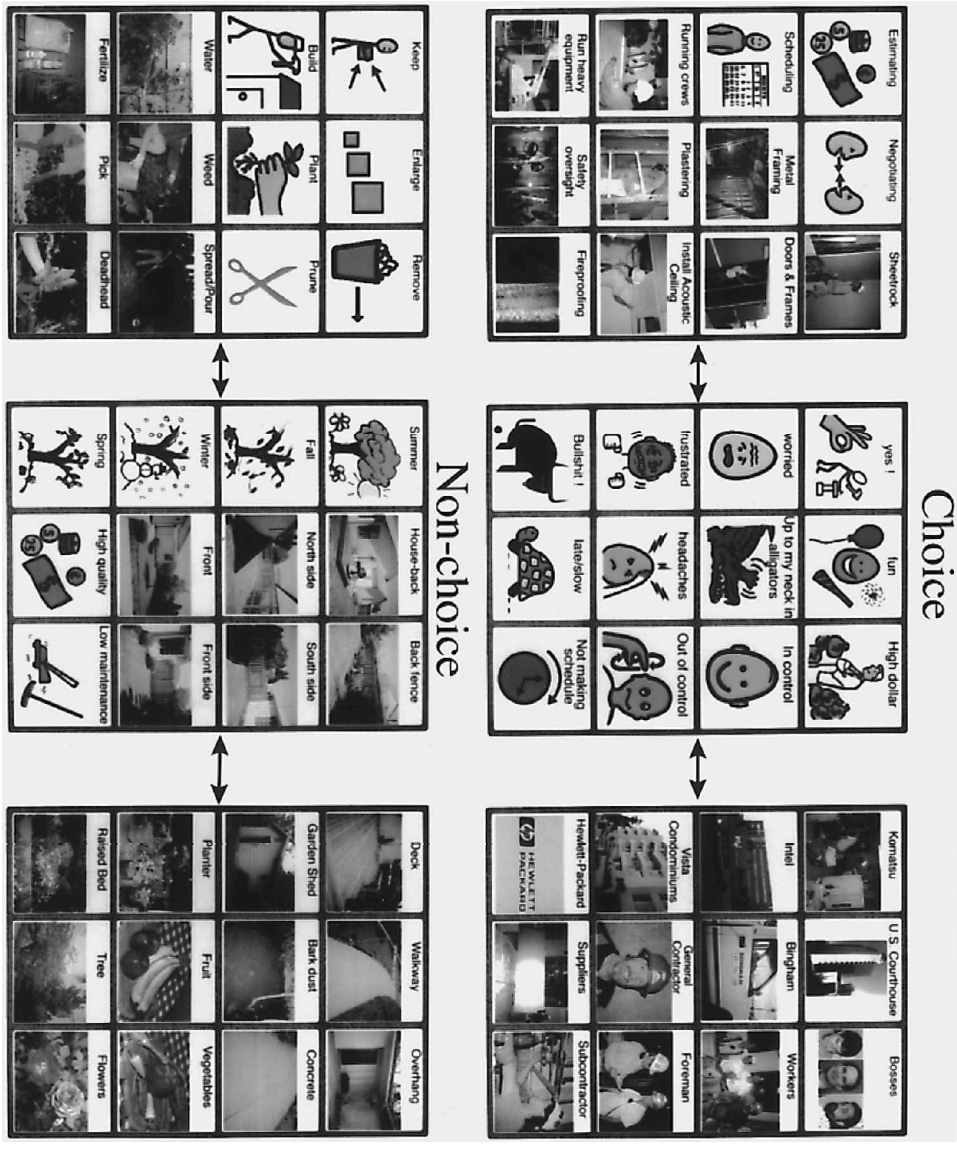
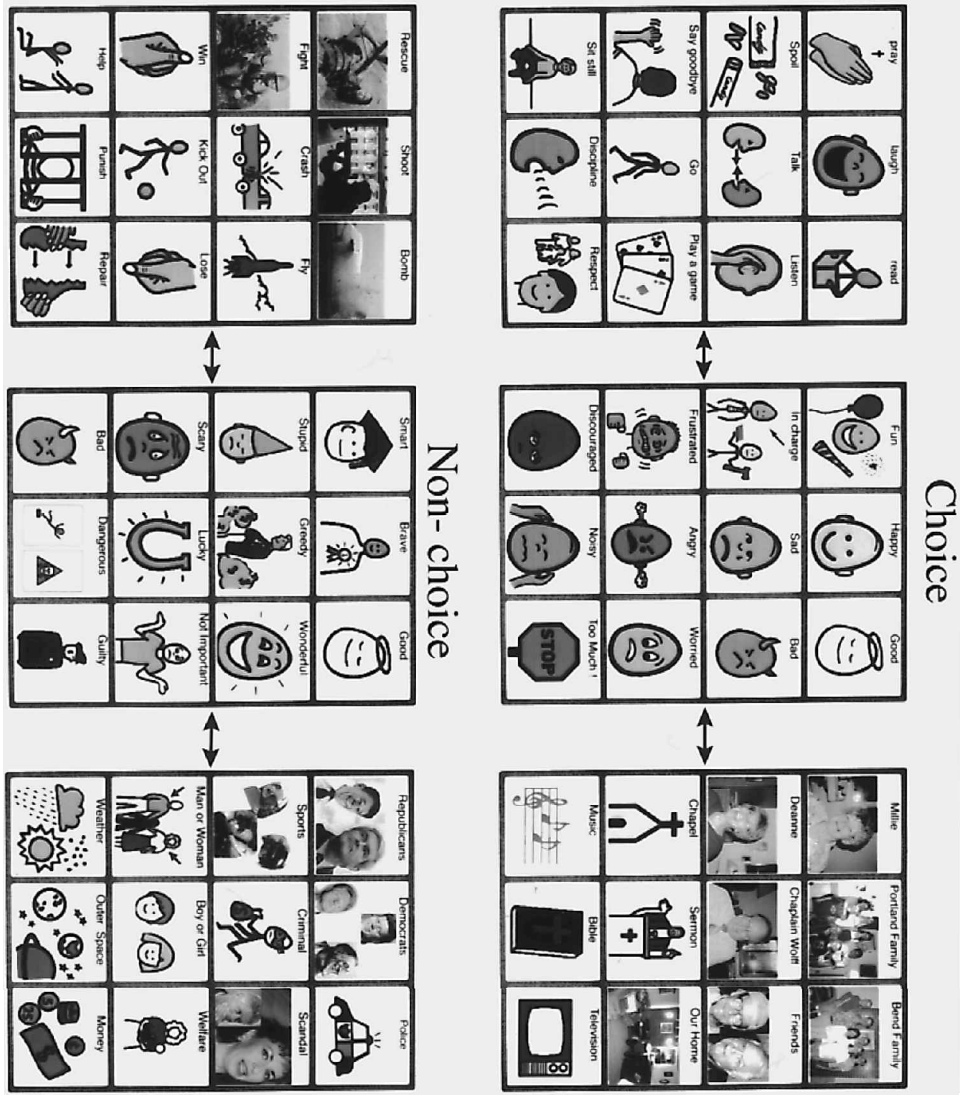
APPENDIX A

Black and white reproduction of DD's colour Trifolder® communication aids



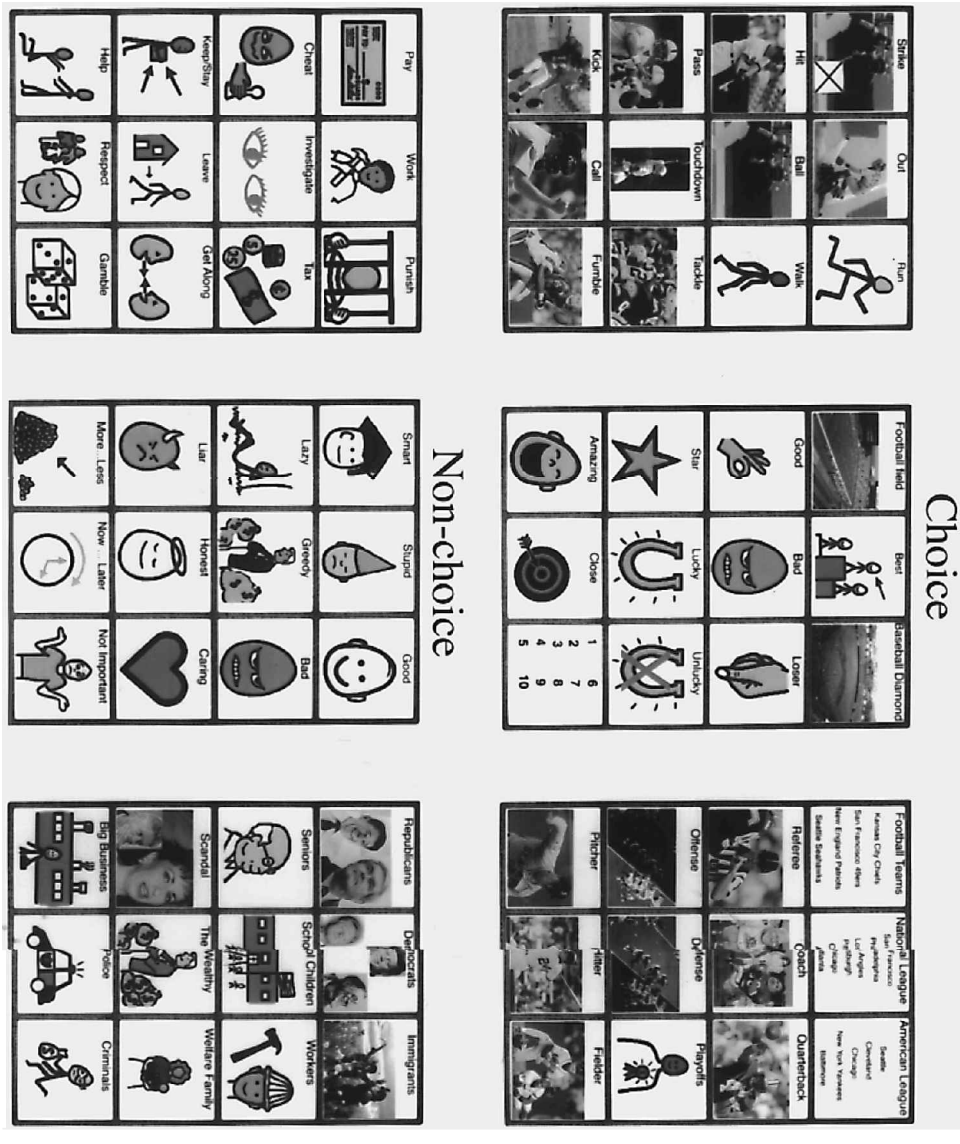
APPENDIX B

Black and white reproduction of JV's colour Trifolder® communication aids



APPENDIX C

Black and white reproduction of JB's colour Trifolder® communication aids



APPENDIX D

Definition of terms used in conversational training protocol (Figure 3)

Meets Criteria: A response or comment that includes at least one communication board symbol.

Does Not Meet Criteria: A response or comment that does not contain any of the trained communication board symbols, but uses other communication modalities (e.g., gesture, speech attempts, etc.) in an attempt to convey the desired message.

Ambiguous: Responses or comments that contain symbols that the conversational partner does not understand.

Response-specific Feedback: The conversational partner provides positive feedback regarding the attempt to communicate, and suggests that the participant try again using the communication board.

No Response: The participant either does not respond to the question or instruction, or indicates a lack of understanding of the task.

General Content Prompt: The conversational partner explains the task, instructs the participant to respond using the communication board, and demonstrates two possible alternative responses. The question/prompt is then repeated.