Communication Breakdowns: Partner Contingencies and Partner Reactions

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Three experiments were conducted to assess how adult cochlear-implant users rectify breakdowns in communication with familiar-versus-unfamiliar conversational partners and how conversational partners might react to the breakdowns and subsequent repairs. Adult cochlear-implant users participated in structured communication interactions with familiar and unfamiliar conversational partners while being videotaped. The videotapes were rated by normal-hearing listeners to assess their reactions to communication breakdowns and the use of verbal repair strategies. Subjects were found to be most likely to use specific repair strategies regardless of whether the conversational partner was familiar. Reactions to the cochlear-implant users are influenced by their use of non-specific repair strategies (the higher the use, the less favorable the reaction) and their number of words (the fewer the words, the less favorable the reaction).

Although communication aids such as hearing aids and cochlear implants may significantly improve the speechreading abilities of persons with severe or profound hearing impairments, such aids alone may not meet all of clients' communication needs. Many users still experience communication breakdowns in real-world settings. Communication breakdowns might occur either because the user did not hear a conversational partner's utterance or because the user recognized the utterance incorrectly.

Persons with hearing impairment can use repair strategies to rectify breakdowns in communication. A repair strategy is a verbal instruction that a person provides to the conversational partner after the person does not recognize a spoken message. For example, the person might ask the conversational partner to repeat the misunderstood utterance, rephrase it, speak a topical keyword, or provide additional information. The person might ask the partner to write the mes-

sage, or to use hand gestures.

In recent years, much attention has been devoted to the questions of whether and how persons with hearing impairment use verbal repair strategies, and whether use of repair strategies enhances conversational fluency (Gagné, Stelmacovich, & Yovetich, 1991; Gagné & Wyllie, 1989; Knutson & Lansing, 1990; Schum, Tye-Murray, Sobaski, Schum, & Kelsay, 1992; Tye-Murray, 1991, 1992; Tye-Murray, Knutson, & Lemke, 1993; Tye-Murray, Purdy, & Woodworth, 1992). Experimental results suggest that repair strategies can effectively remedy breakdowns in communication (Gagné & Wyllie, 1989; Tye-Murray et al., 1992). Moreover, how willingly and how effectively a person uses repair strategies appears to vary with the conversational setting, the familiarity of the conversational partner(s) to the client, the client's personality and willingness to signal a communication breakdown, and the client's judgement concerning how well the partner might follow the repair strategy directive (Tye-Murray et al., 1992; Tye-Murray et al., 1993).

Many audiologic rehabilitation programs include repair strategies training (Abrahamson, 1991; Kaplan, Bally, & Garretson, 1985; Trychin, 1987a, 1987b; Tye-Murray, 1992) wherein the client learns to alert their conversational partners when communication breakdowns occur, and then provides explicit direction about what to do next. Research concerning repair strategy usage has influenced and will continue to influence audiologic rehabilitation programs. Two research issues have particular clinical relevance. The first issue is whether clients generally are able to signal and rectify breakdowns in communication, and hence, whether or not repair strategies training is necessary. The second issue is how clients might signal clarifications of unrecognized messages to ensure compliance on the part of their communication partners. For example, a client who is polite and directive in requesting clarification will likely be more successful in resolving a breakdown than a client who is defensive and vague.

In this investigation, three experiments were conducted to assess how adult cochlear-implant users rectify breakdowns in communication, and how conversational partners might react to the breakdowns and subsequent repairs. Highly structured interactions were used to minimize the effects of the following variables on the examination of repair strategy usage: the topic of conversation, the purpose of the communication interaction, the situation in which the interaction occurred, and (for Experiments 2 and 3) the personality and behavior characteristics of the conversational partner.

In Experiment 1, adult cochlear-implant users participated in a structured communication interaction with a familiar conversational partner and with an unfamiliar conversational partner who would not take the initiative to repair breakdowns in communication. The purpose was to identify the kinds of repair strategies that persons with hearing impairment use when they interact with familiar talkers, and also, whether repair strategy usage differs when they interact with an

unfamiliar talker who appears not to be practiced in repairing communication breakdowns. This latter type of person is representative of many people in the general population.

In Experiment 2, subjects again interacted with an unfamiliar talker in a structured communication interaction. However, in this experiment, the interactions lasted for a longer time than the interactions of Experiment 1, and more subjects were included. Also, a communication environment was created in which communication breakdowns were highly likely to occur. Thus, a larger inventory of repair strategies was obtained than in Experiment 1.

Finally, in Experiment 3, how conversational partners might react to communication breakdowns and subjects' use of verbal repair strategies was assessed. Some evidence suggests that persons find conversations less pleasant and rewarding when their conversational partners use repair strategies. For instance, Robinson and Reis (1989) found that conversants who interrupted their conversational partners (as when requesting a clarification) were perceived as not very sociable. Gagné et al. (1991) found that actors who portrayed persons with hearing impairments were perceived more favorably when they signalled fewer communication breakdowns than when they signalled many breakdowns. In this third experiment, we extended these findings by studying persons who actually have hearing losses and who experience communication breakdowns that are unstaged.

EXPERIMENT 1

Purpose of Study

In Experiment 1, conversational fluency between cochlear implant users and an unfamiliar partner, and between cochlear implant users and a family member or close friend, was assessed. Subjects were asked to recognize five sentences during a structured conversational interaction in order to assess their need for and use of repair strategies.

Subjects

Thirteen cochlear-implant users, 7 men and 6 women, served as subjects (see Table 1). Subject participation was a requirement of the Iowa Cochlear Implant Project. Subjects were assigned an identification number, preceded by the letters *CI.* Eleven subjects used the Cochlear Corporation Nucleus device, and 2 subjects (CI4 and CI12) used the Richards Ineraid device. The duration of device usage ranged from 7 to 68 months with a mean of 35 months ($SD = 18$). Subjects ranged in age from 34 to 74 years old, with a mean of 55 years ($SD = 14$). Only 1 subject lived alone. Thus, the majority of subjects had an opportunity to communicate with others on a daily basis. The spouse of each cochlear-implant subject or another frequent communication partner also participated in the exper-

iment. In only two instances was the communication partner someone other than a spouse. A mother served as the communication partner for CI5, and a neighbor served as the communication partner for CI4. These subjects were assigned the same identification number as their cochlear implant partner, preceded by the letters *FCP* (familiar conversational partner).

Materials

Test materials consisted of five sentences from the Communication Index (Schum et al., 1992) (see Appendix A). Each sentence was represented on a nine-split picture page with three-way confusions of context, situation, and/or similar sounding words (see Figure 1). One picture in the nine-split illustrated the sentence. A different picture page corresponded to each sentence. The picture pages were held together in a test booklet.

Procedures

The Communication Index was first administered by the cochlear-implant subject's familiar communication partner. On another test date, it was administered by an adult female who was unknown to the subjects (an unfamiliar partner).

Administration by unfamiliar partner. The unfamiliar partner is a receptionist and secretary in a hospital speech and hearing clinic, and is accustomed to speak-

Table 1

Biographical Information About the Cochlear-Implant Subjects (CI)

Subject	Gender	Age (years)	Duration of use (months)	Education level	No. of people living with CI user at time of test
CI1	F	69	25	8th grade	1
CI2	M	42	7	Bachelors	3
CI3	M	72	25	High school	1
CI4[a]	M	74	18	8th grade	0
CI5	F	34	58	Bachelors	2
CI6	F	54	41	Masters	1
CI7	F	36	68	High school	3
CI8	F	47	26	1 year college	1
CI9	M	46	45	3 years college	4
CI10	M	58	44	8th grade	1
CI11	F	64	18	High school	1
CI12[a]	M	70	52	Bachelors	1
CI13	M	43	33	4 years.college	2

[a]Ineraid cochlear-implant users. All of the other subjects are Nucleus cochlear-implant users.

ing with clients who have hearing impairment. The unfamiliar partner memorized a list of rules prior to the study (see Appendix B). These rules were used to limit the unfamiliar partner's speaking behavior and to ensure her behavior remained consistent across subjects. She was instructed not to initiate conversational repairs, so she appeared unpracticed in rectifying communication breakdowns.

Subjects were tested individually, and did not receive instruction about verbal repair strategies. Prior to testing, the cochlear-implant subjects were instructed to listen to the unfamiliar partner read a sentence (see Appendix C). After hearing it, the subjects were either to repeat the sentence verbatim or to point to the picture that best represented each sentence. Subjects were told that they could ask for any information to help them recognize the sentence. They were to act as if they were involved in a typical conversational interaction.

The subject and the unfamiliar partner sat next to each other in front of a table,

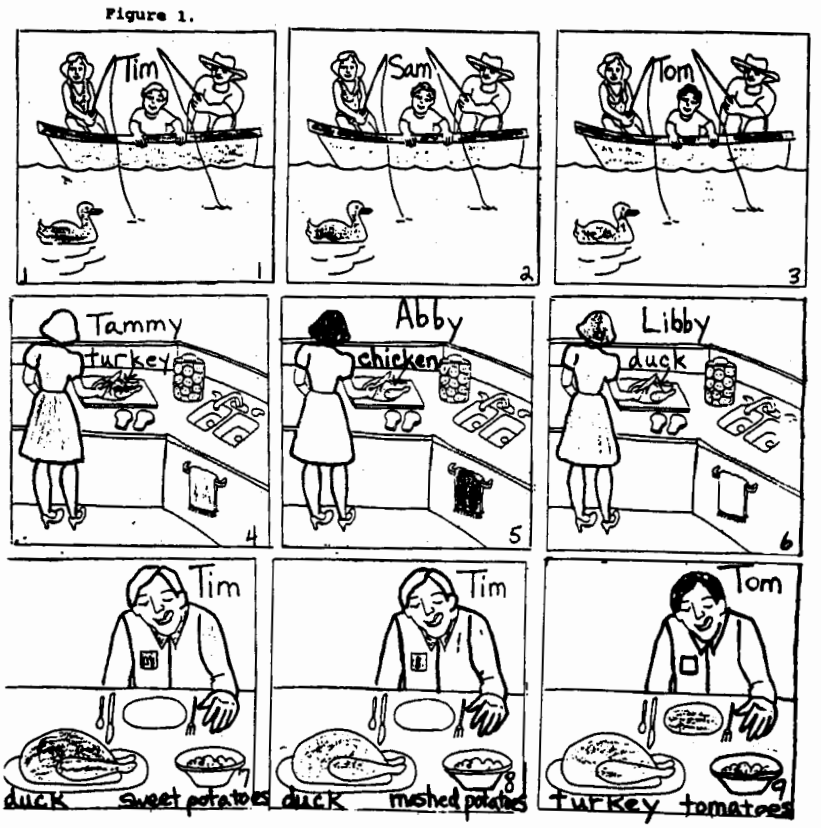

Figure 1. Response page from the Communication Index. The sentence item for this response page is, *Tim likes mashed potatoes and duck.*

with the subject's implanted ear toward the unfamiliar partner. The Communication Index picture booklet was placed on the table. The unfamiliar partner's conversational voice level was measured and recorded at the subject's ear. The recorded value averaged over all test sessions was 66.6 dBA SPL ($SD = 2.0$). To create a difficult listening environment, a 6-talker babble was presented in soundfield and calibrated at the level of the subject's environmental microphone to 68 dBA SPL. An Ag-180 Pro-line Panasonic model videorecorder was set up to record the interaction.

Administration by familiar communication partner. The familiar communication partners were not specifically asked to act as passive conversants while they administered the Communication Index. Prior to testing, the communication partner was simply instructed to read each sentence, speaking in a typical conversational voice level and manner without providing signs, gestures, and/or pointing while maintaining eye contact (see Appendix D). Due to the change in communication partner, the instruction sheets given to the cochlear-implant subjects were slightly different (see Appendix E).

Scoring

Conversational fluency was indexed in three ways. First, we determined whether the subject recognized the sentence item after the first presentation. If this occurred, the sentence item was recorded as sentence correct. Sentence correct was only recorded when the subject pointed to the correct picture or repeated the sentence verbatim immediately after the first presentation of the sentence. Next, we timed how long each sentence item lasted until recognition occurred. Timing began when the unfamiliar partner presented the sentence item and ended when the cochlear-implant subject repeated the sentence verbatim or pointed to the correct picture. Each test session was also timed. Timing for the entire session began when the first sentence was presented by the unfamiliar partner and ended when the cochlear-implant subject correctly responded to the last sentence. All utterances that occurred between test items were included in the session time. For example, a subject might have apologized for his or her slowness to recognize an item, or may have made a humorous remark between two different test items. Finally, we tallied how many words and interchanges (a verbal or non-verbal turn taken by either the unfamiliar partner or the subject) occurred during the entire test. Words coded included any off-task remarks that may have been made during a test item or in between test items.

The verbal exchanges that occurred during the Communication Index were orthographically transcribed by a graduate student in speech-language pathology. The verbal and non-verbal behaviors exhibited by the subject and the unfamiliar partner were coded and tallied. Appendix F presents three examples of interchanges between a subject and the unfamiliar partner during a test item presentation. Codings of the utterances are included. Following Gagné et al. (1991),

responses (excluding responses when the subject pointed to the correct picture or repeated the test item verbatim) fell under two main categories, *non-specific* and *specific.*

Non-specific responses by the subjects provided no direct guidance to the conversational partners about what to do next. They included *non-specific verbal prompts,* as when a subject said, "What?", "Huh?", "Pardon?", or "Please repeat that." They also included *non-specific non-verbal prompts.* A subject might have shook his or her head, or shrugged the shoulders.

Specific responses provided specific direction. They were coded as one of three types of repair strategy. When a subject used the *repetition* repair strategy, the subject asked the conversational partner to repeat a part of an utterance, such as "Could you repeat that last word?" The *keyword* repair strategy occurred when the subject asked the partner to speak one word, or the topic of the sentence. When a subject indicated what segment of an utterance was recognized by either repeating or rephrasing it, the response was coded as a *confirmation* repair strategy.

Responses that could not be adequately described by either of the two main categories, specific and non-specific, occurred infrequently. There were only six

Table 2

Communication Index with Unfamiliar Conversational Partner

Subject	% correct	Average time per item (seconds)	Total test item time[a] (seconds)	Total test session time[b] (seconds)
CI1	40	26	130	180
CI2	0	17	87	158
CI3	40	31	156	188
CI4	0	39	196	239
CI5	80	10	52	79
CI6	40	8	39	87
CI7	20	14	72	101
CI8	80	18	89	157
CI9	60	16	78	109
CI10	20	26	128	178
CI11	20	48	238	289
CI12	20	31	155	213
CI13	40	18	92	133
M	35.4	23.2	116.3	162.4
(SD)	(26.0)	(11.7)	(57.9)	(61.8)

[a]Sum of each sentence item.

[b]Time taken to complete the whole task, including the time in between items.

occasions in which subjects responded with a remark such as, "I don't get it." This remark is a non-specific verbal prompt if the subject recognized some words but did not confirm what was recognized. It is a confirmation repair strategy if the subject recognized no words. For the purpose of this investigation, this infrequently used remark was recorded as an *other* repair strategy category.

The unfamiliar partner responses were coded to verify that the rules, listed in Appendix C, were not broken. The unfamiliar partner admirably followed the rules, breaking them only on one occasion. Because the broken rule in this situation did not aid the subject in repeating the sentence verbatim, the sentence responses were coded.

Intra- and inter-judge agreement checks were completed for both the verbal and non-verbal codings. Intra-judge reliability was computed approximately 6 months after all of the data for the Communication Index were collected and transcribed. Three communication interactions, randomly chosen by a naive clinician, were re-transcribed and coded by the same speech-language pathology student who transcribed the other interactions. A comparison of the transcripts with their original counterparts revealed that intra-judge agreement was 92%.

Inter-judge agreement was computed by a clinician who was not familiar with

Table 3

Communication Index with Familiar Conversational Partner

Subject	% correct	Average time per item (seconds)	Total test item time[a] (seconds)	Total test session time[b] (seconds)
CI1	60	25	127	246
CI2	20	56	280	325
CI3	60	19	96	144
CI4	0	28	138	217
CI5	80	14	72	130
CI6	60	27	135	289
CI7	60	26	130	189
CI8	60	18	90	137
CI9	100	12	62	282
CI10	60	17	87	103
CI11	20	87	437	576
CI12	60	18	89	198
CI13	60	19	95	157
M	53.8	28.2	141.4	203.2
(SD)	(26.3)	(20.8)	(104.3)	(124.4)

[a]Sum of each sentence item.

[b]Time taken to complete the whole task, including the time in between items.

the Communication Index, but was knowledgeable in transcribing and trained in using the coding system. The same three communication interactions coded by the speech-language pathology student were also transcribed and coded by the clinician. Inter-judge agreement was 86%.

Results

Table 2 shows that the subjects usually did not recognize a sentence after the unfamiliar partner presented it the first time. The percentage of times a subject either immediately identified the correct picture for a sentence item or repeated the sentence correctly ranged from 0 to 80%, with an average of 35% items correct. Not surprisingly, because the subjects speechread their partners on a daily basis, subjects performed better when the familiar communication partners presented the test items (see Table 3). Scores ranged from 0 to 100%, with an average of 54%. These findings indicate subjects had ample opportunity to attempt to repair communication breakdowns, and that all subjects experience some difficulty in speechreading with background noise. In addition, subjects had more opportunity in this experiment to use repair strategies with the unfamiliar partner than with their familiar communication partner.

Even though fewer communication breakdowns occurred when they interacted with their familiar communication partners, on average, the total time needed to

Table 4

Number and Type of Repair Strategies Used with Unfamiliar Conversational Partner

Subject	Specific	Non-specific	Other	Total
CI1	3	1	0	4
CI2	10	1	1	12
CI3	10	0	0	10
CI4	4	6	3	13
CI5	1	0	0	1
CI6	5	0	0	5
CI7	6	0	0	6
CI8	7	1	1	9
CI9	0	2	0	2
CI10	10	4	0	14
CI11	14	6	0	20
CI12	13	1	0	14
CI13	10	1	0	11
Total	93	23	5	121
M	7.2	1.8	0.4	9.3
(SD)	(4.4)	(2.2)	(0.9)	(5.5)

Table 5

Number and Type of Repair Strategies Used with Familiar Conversational Partner

Subject	Specific	Non-specific	Other	Total
CI1	8	0	0	8
CI2	22	1	0	23
CI3	6	0	0	6
CI4	14	1	0	15
CI5	1	0	0	1
CI6	6	0	0	6
CI7	4	0	0	4
CI8	5	0	0	5
CI9	0	0	0	0
CI10	8	1	0	9
CI11	15	7	1	23
CI12	6	0	1	7
CI13	3	0	0	3
Total	98	10	2	110
M	7.5	0.8	0.2	8.5
(SD)	(6.1)	(1.9)	(0.4)	(7.5)

Table 6

Number of Words and Conversational Turns Between Subjects and Familiar Conversational Partners (FCP)

Subject	Total no. of words (per subject)	Total no. of words (per FCP)	Total no. of turns taken (per subject)	Total no. of turns taken (per FCP)
CI1	65	137	17	23
CI2	160	148	27	30
CI3	55	86	11	11
CI4	83	150	19	22
CI5	0	68	6	8
CI6	140	113	17	13
CI7	49	95	10	14
CI8	164	100	13	13
CI9	62	66	6	7
CI10	56	71	7	12
CI11	207	238	37	34
CI12	207	104	19	20
CI13	93	97	9	10
Total	1341	1473	198	217
M	103.2	113.3	15.2	16.7
(SD)	(65.6)	(46.9)	(9.0)	(8.5)

recognize a test item and total test session time were longer than when subjects interacted with the familiar partner (see Tables 2 and 3). These findings suggest simple measures such as length of a conversational turn or length of an interaction may not adequately capture conversational fluency between two talkers (see also Caissie & Rockwell, 1993).

Despite the fact that subjects had more chances to use repair strategies with the unfamiliar partner, they used only slightly more repair strategies when interacting with the unfamiliar partner than with their familiar communication partners (see Tables 4 and 5). On average, subjects used 9.3 repair strategies with the unfamiliar partner and 8.5 repair strategies with their familiar communication partner, which was not a significantly different performance. Regardless of who administered the test, subjects were significantly more likely to use specific repair strategies than non-specific repair strategies (see Tables 4 and 5). Subjects were somewhat more likely to use non-specific repair strategies when interacting with the unfamiliar partner than with the familiar communication partner, although this trend was not significant. An analysis of variance revealed a significant difference in the types of repair strategies [$F(1,12) = 480.1$, $p < .0001$]

Table 7

Number of Words and Conversational Turns Between Subjects and Unfamiliar Conversational Partners (UCP)

Subject	Total no. of words (per subject)	Total no. of words (per UCP)	Total no. of turns taken (per subject)	Total no. of turns taken (per UCP)
CI1	47	78	11	11
CI2	78	103	17	17
CI3	90	108	14	18
CI4	75	143	18	23
CI5	6	47	6	11
CI6	101	75	15	15
CI7	40	67	10	15
CI8	215	96	17	19
CI9	29	79	10	14
CI10	75	120	20	25
CI11	121	141	26	30
CI12	139	138	17	20
CI13	83	88	15	17
Total	1099	1283	196	235
M	84.5	98.7	15.1	18.1
(SD)	(53.6)	(30.3)	(5.1)	(5.5)

but no interaction effects between type of repair strategies and communication partner. Subjects spoke more words when speaking with the familiar versus unfamiliar conversational partner, and the familiar communication partners spoke more words than the unfamiliar partner (see Tables 6 and 7).

EXPERIMENT 2

Purpose of Study

The purpose of Experiment 2 was to examine more fully the use of repair strategies when subjects interacted with an unfamiliar conversational partner.

Subjects

The same subjects who participated in Experiment 1, except CI2, participated in Experiment 2. An additional 8 cochlear-implant subjects who did not participate in Experiment 1 due to lack of familiar partners participated in this experiment. A total of 20 subjects were included.

Materials

Test materials consisted of two lists of 10 short sentences adapted from the Communication Index (Schum et al., 1992) (see Appendix G). One half of the subjects received test items 1 - 10 and the other half received test items 11 - 20. The same booklets with the nine-split picture pages were used to hold the test items. Prior to testing, cochlear-implant subjects were given the same instruction sheet used during the unfamiliar partner interaction in Experiment 1 (see Appendix C).

Procedures

With only one exception, the procedures were identical to the interaction with the unfamiliar partner in Experiment 1. In Experiment 1, subjects received the sentence items in an audition-plus-vision condition. Some cochlear-implant users achieve excellent word recognition in an audition-plus-vision condition, even in the presence of background noise. In order to induce communication breakdowns, it was necessary in Experiment 2 to eliminate visual speech cues for some subjects. Subjects who scored 40% or more sentences correct during the interaction in Experiment 1 received the stimuli in an audition-only condition. In this condition the unfamiliar partner obscured her mouth with a dark mesh screen. Subjects who did not participate in Experiment 1 completed the same five sentence items used in Experiment 1 to determine their test condition. Eleven cochlear-implant subjects were tested in an audition-only condition (CI1, CI17, CI18, CI3, CI5, CI6, CI8, CI20, CI21, CI9, and CI10). There were two cases in which subjects actually scored less than 40%, but were still tested in an audition-only condition (CI10 and CI21, who each scored 20%) and three cases

in which the subjects scored 40% and were put in an audition-plus-vision condition (CI13, CI15, and CI16). These placements resulted from miscounts made by the clinician at the time of testing.

The verbal exchanges that occurred during the Communication Index were orthographically transcribed by the same speech-language pathology student as in Experiment 1. Each sentence item interaction was timed for length. Orthographic data transcribed after a 1-min time cutoff were not coded. There were two instances in which we allowed early termination due to a broken rule by the unfamiliar partner. In both cases coding of the interchange terminated at 45 s instead of 60 s. All of the verbal and non-verbal behaviors exhibited by the subject and the unfamiliar partner within the 1-min time limit were tallied and coded.

The unfamiliar partner responses were coded to verify that the rules, listed in

Table 8

Number of Items Correct and Average Time Per Item with Unfamiliar Conversational Partner (10 Test Items)

Subject	Condition[a]	% correct after 1st presentation	% correct within 1-min time limit	Average time per item (seconds)
CI1	A	11%	89%	26
CI3	A	0%	50%	42
CI4	AV	20%	100%	20
CI5	A	0%	89%	27
CI6	A	0%	56%	31
CI7	AV	40%	100%	8
CI8	A	20%	90%	20
CI9	A	11%	44%	46
CI10	A	0%	30%	31
CI11	AV	40%	90%	23
CI12	AV	40%	100%	16
CI13	AV	40%	100%	9
CI14	AV	0%	100%	21
CI15	AV	20%	100%	15
CI16	AV	80%	100%	12
CI17	A	20%	80%	24
CI18	A	0%	40%	46
CI19	AV	11%	80%	22
CI20	A	0%	20%	52
CI21	A	0%	0%	60
M		17.6	71.5	27.6
(SD)		(21.2)	(31.8)	(14.6)

[a]A = audition only; AV = audition-plus-vision

Appendix B, were not broken. If a rule was broken, the dialogue for that test item was eliminated from the data corpus. The unfamiliar partner typically followed the rules, breaking them on only eight occasions.

Sentence correct was recorded when the subject either repeated the sentence verbatim or pointed to the correct picture immediately after the first presentation. We also determined when subjects repeated a sentence verbatim or pointed to the correct picture within the first minute of the item presentation.

Results

Table 8 suggests that the cochlear-implant subjects usually did not recognize a sentence after the unfamiliar partner presented it once. The percentage of times a subject either immediately identified the correct picture for a sentence item (chance performance = 11%) or repeated the sentence correctly ranged from 0 to 80%, with an average of 18% correct. Thus, subjects had ample opportunity to attempt communication repairs.

The subjects typically recognized the test items within the allotted 1-min time

Table 9

Number and Type of Repair Strategies Used with Unfamiliar Conversational Partner

Subject	Specific	Non-specific	Other	Total
CI1	23	3	0	26
CI3	26	6	0	32
CI4	5	9	0	14
CI5	9	5	0	14
CI6	34	12	1	47
CI7	9	0	0	9
CI8	16	5	0	21
CI9	22	13	0	35
CI10	7	20	4	31
CI11	14	4	0	18
CI12	17	0	1	18
CI13	10	1	0	11
CI14	16	3	2	21
CI15	14	1	0	15
CI16	1	1	0	2
CI17	20	5	0	25
CI18	2	17	2	21
CI19	26	3	0	29
CI20	26	14	2	42
CI21	2	23	7	32
M	15.0	7.3	.95	23.2
(SD)	(9.4)	(6.9)	(1.8)	(11.3)

period. Table 8 shows that an average of 72% test items were recognized. Thus, even though subjects rarely recognized the sentences after the first presentation, they eventually did so after interacting with the unfamiliar partner for a maximum of 1 min. On average, they recognized items after an interchange that lasted 27.6 s.

The number and type of repair strategies used by each subject during the test sessions are presented in Table 9. On average, subjects used 23.2 repair strategies during their test sessions. Subjects most often used specific repair strategies when they were unable to recognize a sentence. On average, they used 15.0 specific repair strategies. They used non-specific repair strategies relatively infrequently (7.3 on average). The exceptions to this trend were CI4, CI10, CI18, and CI21 who used more non-specific repair strategies than specific repair strategies. A paired comparison *t*-test showed the difference between use of specific and

Table 10

Average Number of Words Spoken and Turns Taken Per Item with Unfamiliar Conversational Partner (UCP)

Subject	Average no. of words per item (subject)	Average no. of words per item (UCP)	Average no. of turns taken per item (subject)	Average no. of turns taken per item (UCP)
CI1	16	19	4	4
CI3	19	30	4	5
CI4	8	17	3	3
CI5	7	19	3	4
CI6	20	31	6	7
CI7	7	11	6	3
CI8	22	16	3	3
CI9	19	28	4	5
CI10	6	25	4	4
CI11	16	20	4	5
CI12	15	14	3	4
CI13	11	12	2	3
CI14	19	16	3	4
CI15	18	14	3	4
CI16	1	8	1	2
CI17	19	15	3	4
CI18	11	31	5	5
CI19	22	15	5	5
CI20	22	28	5	5
CI21	6	21	3	3
M	14.2	19.5	3.7	4.1
(SD)	(6.5)	(7.1)	(1.3)	(1.1)

non-specific strategies was significant ($t = 3.51$, $p < .004$). Table 10 indicates that the unfamiliar conversational partner usually spoke more words per item than the subjects, although she took only marginally more turns.

EXPERIMENT 3

Purpose of Study

In Experiment 3, the social implications of using repair strategies were considered. We looked at how judges who have normal hearing perceived the cochlear-implant subjects who participated in Experiment 2, and how they perceived the interactions.

Subjects

Sixteen adults with normal hearing, 9 men and 7 women, served as judges (see Table 11). Judges were recruited from the University of Iowa Hospitals and Clinics on a volunteer basis with compensation. Selection criteria included having no immediate family member with a hearing loss nor having had contact more than once a month with an individual who has a hearing loss. Judges ranged in age from 21 to 39 years old, with a mean of 28 years ($SD = 6.4$).

Table 11

Biographical Data for the Judges in Experiment 3

Subject	Gender	Age (years)	Education (years after high school)	Occupation
VR1	M	21	3.0	Student
VR2	M	23	4.0	Bartender
VR3	F	31	4.0	Therapeutic recreation specialist
VR4	M	23	5.0	Research assistant
VR5	M	30	7.0	Unemployed
VR6	F	23	2.5	Secretary
VR7	F	39	4.0	Medical technician
VR8	M	29	4.0	Senior imaging technician
VR9	F	21	3.0	Pharmacy technician
VR10	F	39	4.0	Clinical technician
VR11	M	26	2.0	Waiter
VR12	M	23	4.5	Typist
VR13	F	21	3.0	Student
VR14	M	24	4.0	Clerk
VR15	F	34	4.0	Clerk
VR16	M	35	4.0	Clerk
M		28	4.0	
(SD)		(6.4)	(1.1)	

Materials

A 15-item scale adapted from Gagné et al. (1991) was used to assess judges' reactions to the videotaped communication interactions. Scale items were chosen according to which attributes might be considered desirable or undesirable in a conversational partner. Each test item consisted of a 6-point differential scale. The rating scale was separated into two parts. The first half (items 1 - 7) measured the judges' reaction toward the personalities of the cochlear-implant subjects (see Table 12). For example, judges were asked to indicate whether a cochlear-implant subject seemed pleasant or unpleasant on a rating scale where *1* indicated unequivocally pleasant and a *6* indicated unequivocally unpleasant. The second half (items 8 - 15) measured how the judges felt emotionally toward the cochlear-implant subject. For example, judges indicated whether the cochlear-implant subject in the video segment made them feel composed or irritated, using a 6-point scale.

In selecting personality test items from the original list compiled by Gagné et al. (1991), an attempt was made to choose items that would be minimally influenced by a cochlear-implant subject's appearance and demeanor. For example,

Table 12

Personality Test Items

Items measuring the personality of the CI[a] subject
1. Pleasant - Unpleasant
2. Sociable - Unsociable
3. Interesting - Boring
4. Friendly - Unfriendly
5. Cooperative - Uncooperative
6. Assertive - Passive
7. Courteous - Discourteous
Items measuring how the CI subject made the rater feel
8. Composed - Irritated
9. Successful - Frustrated
10. Content - Discontent
11. Comfortable - Uneasy
12. Refreshed - Fatigued
13. Satisfied - Dissatisfied
14. Pleased - Annoyed
15. Relaxed - Anxious

Note. From "Reactions to requests for clarification used by hearing-impaired individuals" by J.-P. Gagné, P. Stelmacovich, and W. Yovetich, 1991, *Volta Review, 93,* p. 129. Copyright 1991 by Alexander Graham Bell Association for the Deaf. Adapted by permission.

[a]CI = cochlear implant

the scale of Gagné et al. (1991) includes the personality trait continua *high achiever - low achiever* and *employable - unemployable.* Judgements of these traits might be contingent, in part, upon factors other than communication style, such as the age of the subject or the clothes the individual is wearing. Therefore, we omitted these items.

Procedure

Twenty videotaped segments from Experiment 2 were used as stimuli. Judges viewed the videotapes either alone or in pairs on a 19-in color Sony Trinitron television with a Sony SLV-575UC model VCR. Due to the length of the task, two 2-hr sessions were required; each session consisted of watching 10 or 11 of the 21 videotapes with two 10-min breaks interspersed. Videotapes were shown

Table 13

Number of Words Spoken and Number of Turns Taken
by Both the Subject and the Unfamiliar Conversational Partner (UCP)
During the 5-min Video Clip

Subject	Total no. of words spoken (subject)	Total no. of words spoken (UCP)	Total no. of turns taken (subject)	Total no. of turns taken (UCP)
CI1	125	158	28	32
CI3	120	189	27	31
CI4	84	166	27	37
CI5	29	167	20	25
CI6	197	213	43	44
CI7	65	101	18	22
CI8	215	174	27	33
CI9	144	212	31	31
CI10	74	221	31	35
CI11	144	175	34	41
CI12	161	157	35	44
CI13	110	136	24	29
CI14	159	135	26	30
CI15	175	139	29	35
CI16	7	76	12	20
CI17	220	177	38	42
CI18	98	220	28	32
CI19	193	134	42	43
CI20	148	145	26	26
CI21	99	215	57	39
M	128.4	165.5	29.2	33.6
(SD)	(58.8)	(39.7)	(7.7)	(7.2)

in random order. Each videotape presented a different cochlear-implant subject completing the Communication Index test with the unfamiliar partner. All videotaped segments began at the same point (at the beginning of task) and were shown until the Communication Index was completed or until 5 min had elapsed. The 5-min cutoff was arbitrarily chosen for time factor and judge fatigue reasons. Eight video segments (CI7, CI8, CI12, CI13, CI14, CI15, CI16, and CI17) included the entire 10 test items.

The judges were told to watch each video while imagining they were a person with normal hearing interacting with the person who has a hearing loss. The unfamiliar partner and cochlear-implant subject in each video were clearly pointed out by the experimenter before each video segment started. After viewing each segment, the judge filled out the personality response questionnaire (see Table 12) for that interaction. Ratings were correlated with variables indexing the cochlear-implant subjects' performances.

Table 14
Number of Items Completed and the Number and Type of Repair Strategies Used During the 5-min Video Clip

Subject	No. of Items completed	No. and type of repair strategies used			
		Specific	Non-specific	Other	Total
CI1	4.50	17	4	0	21
CI3	3.50	12	6	3	21
CI4	10.00	5	9	0	14
CI5	3.50	10	3	0	13
CI6	4.00	21	13	1	35
CI7	10.00	9	0	0	9
CI8	10.00	18	5	0	23
CI9	2.00	14	8	3	25
CI10	5.75	7	12	4	23
CI11	9.00	17	4	0	21
CI12	10.00	17	1	1	19
CI13	10.00	12	2	0	14
CI14	6.50	11	3	2	16
CI15	10.00	14	1	0	15
CI16	10.00	1	1	0	2
CI17	10.00	23	5	0	28
CI18	4.00	1	7	2	10
CI19	8.00	23	3	0	26
CI20	3.25	16	2	3	21
CI21	5.75	15	9	7	31
M	7.0	13.2	4.9	1.3	19.4
SD	(3.0)	(6.4)	(3.7)	(1.9)	(7.7)

Table 15

Personality Ratings of the Cochlear-Implant Subjects

	Mean ratings and standard deviations for test items (1-7)								
Subject	**Pleasant - unpleasant**	**Sociable - unsociable**	**Interesting - boring**	**Friendly - unfriendly**	**Cooperative - uncooperative**	**Assertive - passive**	**Courteous - discourteous**	***M***	***(SD)***
CI1	1.9	2.1	2.9	1.8	1.8	3.5	2.0	2.3	(.7)
CI3	2.4	2.7	3.3	2.8	2.2	3.8	2.3	2.8	(.6)
CI4	3.0	3.5	3.4	3.1	2.6	3.7	3.1	3.2	(.4)
CI5	2.8	3.3	3.7	2.8	2.8	4.0	2.6	3.1	(.5)
CI6	2.9	2.4	2.5	2.6	2.6	1.6	2.9	2.5	(.4)
CI7	2.6	2.9	3.2	2.8	2.1	3.1	2.4	2.7	(.4)
CI8	2.1	1.7	2.1	1.9	1.8	1.8	2.0	1.9	(.2)
CI9	2.6	2.9	3.3	2.4	2.4	3.6	2.4	2.8	(.5)
CI10	2.5	3.4	3.0	2.3	2.5	3.3	2.4	2.8	(.5)
CI11	2.4	2.7	3.1	2.3	2.0	3.4	2.3	2.6	(.5)
CI12	2.6	2.6	2.9	2.4	2.5	3.1	2.5	2.7	(.3)
CI13	2.0	1.9	2.5	1.9	1.8	2.6	2.2	2.1	(.3)
CI14	2.7	2.7	3.3	2.5	2.3	3.4	2.3	2.7	(.4)
CI15	2.0	2.1	2.6	1.9	1.6	2.6	1.8	2.1	(.4)
CI16	3.3	3.3	3.7	3.5	2.2	3.2	3.0	3.2	(.5)
CI17	1.5	1.6	1.8	1.6	1.4	1.8	1.4	1.6	(.2)
CI18	2.7	3.0	3.4	2.3	2.4	3.8	2.6	2.9	(.5)
CI19	1.7	1.5	2.1	1.4	1.6	1.6	1.8	1.7	(.2)
CI20	2.7	2.5	2.9	2.4	2.6	2.7	2.4	2.6	(.2)
CI21	2.9	3.2	3.3	2.9	3.1	3.6	2.9	3.1	(.3)
M	2.5	2.5	3.0	2.4	2.2	3.0	2.4		
(SD)	(.5)	(.6)	(.5)	(.5)	(.4)	(.8)	(.4)		

Note. The lower the score the more favorable the rating.

Table 16

Ratings that Reflect how Each Cochlear-Implant Subject Made the Judges Feel

	Mean ratings and standard deviations for test items (8-15)									
Subject	**Composed - irritated**	**Successful - frustrated**	**Content - discontent**	**Comfortable - uneasy**	**Refreshed - fatigued**	**Satisfied - dissatisfied**	**Pleased - annoyed**	**Relaxed - anxious**	***M***	***(SD)***
CI1	2.6	2.9	2.9	2.4	3.1	2.9	2.8	2.6	2.8	(.2)
CI3	3.1	3.6	3.3	2.9	3.8	3.4	3.4	3.1	3.3	(.3)
CI4	3.1	3.3	3.0	3.0	3.6	3.1	3.1	3.0	3.2	(.2)
CI5	3.5	3.9	3.8	3.4	4.1	3.8	3.6	3.4	3.7	(.3)
CI6	3.2	3.3	3.2	3.2	3.4	3.2	3.4	3.3	3.3	(.1)
CI7	2.3	2.1	2.5	2.4	2.5	2.3	2.3	2.3	2.3	(.1)
CI8	2.1	2.1	2.3	2.3	2.4	2.1	2.0	2.4	2.2	(.2)
CI9	3.4	3.4	3.4	3.3	4.0	3.6	3.3	3.4	3.5	(.2)
CI10	3.0	3.4	3.1	2.7	3.5	3.4	3.2	3.2	3.2	(.3)
CI11	2.7	3.2	2.9	2.4	3.3	3.1	2.9	3.1	3.0	(.3)
CI12	2.5	2.6	2.6	2.6	2.9	2.4	2.6	2.6	2.6	(.1)
CI13	2.0	2.3	2.3	2.3	2.5	2.3	2.4	2.3	2.3	(.1)
CI14	3.0	3.3	3.3	2.9	3.6	3.1	3.1	3.1	3.2	(.2)
CI15	2.1	2.1	2.3	2.1	2.5	2.1	2.1	2.3	2.2	(.2)
CI16	2.8	2.6	2.9	2.8	3.3	2.7	2.9	3.1	2.9	(.2)
CI17	2.1	1.9	2.1	2.0	2.2	1.8	1.9	2.1	2.0	(.1)
CI18	3.8	4.1	3.9	3.8	3.9	3.8	3.8	4.1	3.9	(.1)
CI19	2.1	2.1	2.3	2.1	2.5	2.3	2.3	2.3	2.3	(.1)
CI20	3.3	3.6	3.4	3.1	3.6	3.3	3.0	3.5	3.4	(.2)
CI21	3.4	3.9	3.7	3.4	3.9	4.1	3.8	3.6	3.7	(.2)
M	2.8	3.0	3.0	2.8	3.2	2.9	2.9	2.9		
(SD)	(.6)	(.7)	(.5)	(.5)	(.6)	(.7)	(.6)	(.5)		

Note. The lower the score the more favorable the rating.

Results

Tables 13 and 14 characterize the interactions between the cochlear-implant subjects and the unfamiliar conversational partner during the 5-min interval. Table 13 shows that, on average, the unfamiliar partner spoke more words and took more turns during the interaction than the subjects. Subjects used more specific than non-specific repair strategies (see Table 14). On average, they recognized 7.0 of the 10 test items during the 5-min interaction, and used 19.4 repair strategies.

Table 15 presents the personality ratings assigned by the judges. The rating scores from each judge were averaged for each cochlear-implant subject. In general, subjects were rated favorably on every personality dimension, as indicted by the relatively low average scores for each column in Table 15. Scores ranged from 1.6 (the most favorable rating) to 3.2 (the least favorable).

Pearson correlation coefficients were computed to examine the relationship between the judges' impressions of the cochlear-implant subjects' personalities and the subjects' use of specific and non-specific repair strategies, their number of words, and their number of conversational turns during the 5-min interactions. Subjects who were most likely to use specific repair strategies were also most likely to be rated favorably ($r = -.71$, $p < .0001$). This was also true for subjects who used more words ($r = -.77$, $p < .001$) and who took more turns ($r = -.45$, $p < .05$). There was not a significant relationship between the use of non-specific repair strategies and personality ratings.

Ratings that reflect how the cochlear-implant subject made the judges feel are presented in Table 16. The rating scores for each judge were again averaged for each subject. The scores were generally favorable, ranging from the most favorable score of 2.0 to a least favorable score of 3.9.

Pearson correlation coefficients revealed that cochlear-implant subjects who used specific repair strategies ($r = -.45$, $p < .05$) and who spoke more words ($r = -.46$, $p < .05$) were more likely to elicit positive feelings from the judges. Subjects who used more non-specific repair strategies were likely to elicit more negative feelings ($r = -.48$, $p < .03$). There was no significant relationship between subjects' number of turns and ratings pertaining to feelings.

DISCUSSION

This investigation involved highly structured communication interactions between persons who use cochlear implants and familiar and unfamiliar conversational partners. Experiment 1 showed that subjects were likely to use specific repair strategies when performing the experimental task, regardless of familiarity with the conversational partner. When speaking with an unfamiliar partner, they were more likely to speak fewer words. Experiment 2, in which subjects interacted with the unfamiliar conversational partner, also indicated that specific

repair strategies were used more often than non-specific repair strategies. Experiment 3 demonstrated that judges' reactions to persons with hearing impairments may be influenced by cochlear-implant subjects' use of non-specific repair strategies: the higher the use, the less favorable the reaction. Thus, these results obtained with subjects who have hearing impairments correspond with those obtained with actors, and a different communication task (Gagné et al., 1991). Experiment 3 also demonstrated that reactions vary with the number of words used by the person who has hearing impairment: the fewer the words, the less favorable the reaction. One interpretation of this finding is that conversational partners might respond more favorably to persons who verbally try to repair communication breakdowns, and who also participate actively in the interchanges.

These findings present important considerations for audiologic rehabilitation programs. First, they suggest that clients' conversational interactions may vary with the familiarity of the conversational partner (see also Tye-Murray et al., 1992). As such, assessment and training activities might include activities with both familiar and unfamiliar partners.

Secondly, the results of Experiments 1 and 3 suggest that individuals with hearing impairment are more likely to use behaviors that elicit unfavorable responses with persons who do not know them. That is, they are somewhat more likely to use non-specific repair strategies and to speak fewer words with strangers, and these behaviors may be related to less favorable judgements. Ironically, unfamiliar persons are the very ones who are most likely to base their judgements of the person on the quality of the conversational interchange, because they have no other information by which to form an opinion. These results imply that audiologic rehabilitation programs should include practice in using specific repair strategies with unfamiliar partners, and practice in verbally expressing communication breakdowns.

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APPENDIX A

SENTENCES PRESENTED TO CI SUBJECTS IN EXPERIMENT 1

1. The player named Gil wears a hat and green pants.
2. The color of his shirt matches the fruit in his hand.
3. There are six marbles on the floor.
4. The woman with blond hair wears a red dress.
5. Carrie has a cherry pie.

Note. From "Repair strategies used by partners of adult cochlear-implant users" by L. Schum, N. Tye-Murray, C.M. Sobaski, D.J. Schum, and D.M.R. Kelsay, 1992, San Antonio, TX: American Speech-Hearing-Language Association Conference. Adapted by permission.

APPENDIX B

RULES FOR THE UNFAMILIAR CONVERSATIONAL PARTNER

1. Read the typed sentence on the card.
2. Read the sentence to the subject with a normal clear voice.
3. Provide eye contact.
4. If the subject does not say anything for 5 s repeat the sentence.
5. If the subject repeats or rephrases a part of the sentence, repeat the remaining parts.
6. If the subject incorrectly responds, correct what was said.
7. If the subject asks for specific information, provide what was asked.

8. Do not gesture, sign, or point to the pictures.
9. If after 1 min the subject does not understand the sentence, then provide gestures, signing, and/or pointing.

APPENDIX C

INSTRUCTIONS FOR THE COCHLEAR-IMPLANT USERS WHEN THEY INTERACTED WITH THE UNFAMILIAR CONVERSATIONAL PARTNER

Pretend that you are speaking to an unfamiliar person in your community setting. The person will say some sentences to you in the presence of background noise. For each sentence, you will be given a page with nine pictures on it. Your task is to point to the picture that best describes the sentence or repeat the exact sentence.

If you do not understand what the person says or if you pick the wrong pictures, you can ask the person for any information that will help you understand the sentence. Feel comfortable to act as you would in a typical conversational setting.

APPENDIX D

INSTRUCTIONS FOR THE FREQUENT CONVERSATIONAL PARTNERS

You and your spouse are going to do an exercise to determine how well he/she can understand sentences that are spoken when background noise is present.

I have a group of cards with simple sentences typed on them. You will be given one card at a time. For each sentence, first read it silently to yourself and *memorize* it. Then, say the sentence to your spouse. Speak in your *typical conversational voice level and manner;* do not try to talk above the background music or exaggerate your speech. *Do not* provide any gestures, signs, or pointing. The first time you say the sentence, say it *exactly* as it is written.

If your spouse has not understood the statement after 1 min, then you may help him/her with gestures, signs, and/or pointing.

Your spouse will be given pages with nine pictures each. Each page corresponds to one of your sentences. You will be familiarized with the pictures and sentences prior to beginning the exercise.

Your spouse's job will be to determine exactly what was said by pointing to the picture that *best* describes the sentence. If he/she chooses an incorrect picture or a picture that is similar to the sentence but not exact, then you must help him/her to better understand. Your sentence card has the correct picture number on it.

Be sure not to point or make reference to any of the pictures unless it has taken 1 min or longer for him/her to understand. The clinician will keep time for you.

APPENDIX E

INSTRUCTIONS FOR THE COCHLEAR-IMPLANT USERS WHEN THEY INTERACTED WITH THEIR FREQUENT CONVERSATIONAL PARTNERS

You and your spouse are going to do an exercise to determine how well you can understand sentences when background noise, such as music, is present.

Your spouse is going to say some sentences to you. For each sentence, you will be given a page with nine pictures. Examine the pictures before your spouse states the sentence. You may either point to the picture that *best describes* the sentence or you may repeat the sentence.

Do not begin to look for the picture until your spouse has said the entire sentence.

APPENDIX F

EXAMPLES (EX) OF SENTENCE - ITEM INTERCHANGES WITH CODES

UCP = Unfamiliar conversational partner
CI = Cochlear-implant subject

EX. 1: The player named Gil wears a hat and green pants.

UCP: "The player named Gil wears a hat and green pants.
CI: (shakes head) (NON-SPECIFIC, NON-VERBAL PROMPT)
UCP: "The player named Gil wears a hat and green pants."
CI: "That was Phil?" (SPECIFIC/CONFIRMATION)
UCP: "No, it is Gil."
"The player named Gil, wears a hat and green pants."
CI: "What was Gil doing?" (SPECIFIC/REQUEST REPETITION OF AN UTTERANCE)
UCP: "He wears a hat and green pants."
CI: "He is playing football?" (SPECIFIC/CONFIRMATION)
UCP: "He is wearing green pants."
CI: (points to correct picture) (RESPONSE)

EX. 2: The color of his shirt matches the fruit in his hand.

UCP: "The color of his shirt matches the fruit in his hand."
CI: "The color of his shirt matches what?" (SPECIFIC/REQUEST REPETITION OF AN UTTERANCE)
UCP: "The fruit in his hand."
CI: "The fruit in . . . " (SPECIFIC/CONFIRMATION)
UCP: "In his hand."
CI: "In his hand?" (SPECIFIC/CONFIRMATION)
UCP: "Yes."
CI: "The color of his shirt matches the fruit in his hand." (RESPONSE)

EX. 3: The woman with blond hair wears a red dress.

UCP: "The woman with blond hear wears a red dress."
CI: "Uh, it's about a woman I thought in a restaurant." (SPECIFIC/CONFIRMATION)
UCP: "The woman with blond hair wears a red dress."
CI: "Red dress, wears a red dress . . . " (SPECIFIC/CONFIRMATION)
UCP: "The woman with blond hair."
CI: (points to correct picture) (RESPONSE)

APPENDIX G

SENTENCES PRESENTED TO CI SUBJECTS IN EXPERIMENT 2 (ONE HALF OF THE SUBJECTS RECEIVED TEST ITEMS 1 - 10 AND THE OTHER HALF RECEIVED TEST ITEMS 11 - 20)

Test Items:

1. They play with only trucks and a shovel.
2. He only drinks cola.
3. The bird sits in the tree with the light green leaves.
4. Only red candy hangs on the tree.
5. They have only a bowl of chips to eat.
6. He will eat a turkey sandwich.
7. Holly dropped her cereal.
8. Granny wears a purple dress.
9. Tim likes mashed potatoes and duck.
10. She holds a pie for dinner.
11. Ron holds nothing in his hand.
12. His mother holds a red apple.
13. The woman set her purse on the gray counter.
14. Carrie has an apron on.
15. Jed and Ted have the most toys.
16. Red presents sit under the tree.
17. They're eating popcorn and pretzels on the floor.
18. The chicken is on the table.
19. She has a purple towel.
20. The chocolate dessert is in the oven.