EVALUATION OF COMMUNICATION THERAPY AS AURAL REHABILITATION FOR ADULTS WITH ACQUIRED HEARING LOSS

by

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ABSTRACT

This research evaluated the effectiveness of an aural rehabilitation program based on a conversation-based approach espoused by Erber (1988) with working-aged adults with acquired mild-to-moderate hearing losses experiencing communication difficulties with unfamiliar communication partners in their occupational and/or educational environments. This approach is linguistically bases and attempts to improve the hearing-impaired subject's metalinguistic knowledge and knowledge of how language is used in conversation such that the amount of their conversations that they understand improves, thereby achieving more efficient and fluent communication. The current research adapted Erber's program by having an unfamiliar communication partner receive therapy, but not with the hearing-impaired subjects. Two hearing-impaired subjects participated in this research, as well as two unfamiliar communication partners, one who received therapy.

This research investigated two aspects of program evaluation. First, it investigated whether or not greater benefit would be derived by the hearing-impaired subjects in their interactions with an unfamiliar communication partner who received therapy compared to one who did not. Second, it appraised the validity of the selected evaluation methods and outcome measures.

The results indicated that although the hearing-impaired subjects only received limited benefit in terms of improvement on the proposed performance measures, they did report satisfaction with a change in their attitude or belief system. Both subjects reported increased confidence in terms of their ability to more fully participate in conversations and to manage and prevent communication breakdowns. Two

aspects of benefit gained by the hearing-impaired subjects were reductions in listening effort and feelings of miscomprehension. The results did not conclusively indicate that greater benefit was derived by the hearing-impaired subjects in their communication interactions with the unfamiliar communication partner who received treatment than in those with the one who did not receive treatment.

Examination of the selected evaluation methods and outcome measures indicated some areas of concern. The communication context of the tracking procedure may not be a valid one for examining changes in use of communication strategies or repair sequences due to the nature of tracking itself. The validity of measuring efficiency in conversations as the rate of information exchange was seriously questioned by this research. Measuring conversational fluency also proved to be problematic. Subjective and objective measures of fluency did not show consistent agreement.

Clinical implications generated by this research included: hearing-impaired subjects who experience communication difficulties with unfamiliar communication partners can benefit from such communication-based aural rehabilitation; the evaluation of communication success requires evaluation procedures which reflect a variety of communicative contexts and allow for a variety of outcome measures; consideration of successful therapy in terms of a change in a client's belief system; and, a need for the therapeutic process in aural rehabilitation to be driven by a more psychosocial perspective, rather than the medical model perspective of impairment, disability, and handicap.

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CHAPTER ONE

REVIEW OF LITERATURE

INTRODUCTION

Although hearing loss is a perceptual problem, its most significant impact is on the individual's communication ability in day-to-day conversational interactions (Erber, 1988). Often the effects of hearing loss and the associated communication disability result in a handicap in which the individual experiences a variety of psychosocial problems such as irritability, fatigue, a sense of isolation, and depression (Meadows-Orlans, 1985). In addition, hearing-impaired individuals may also experience social effects such as disruptions in social interactions within their family, social or work environments. Hearing handicap cannot be reliably predicted solely on measures of impairment; social and psychological factors must also be taken into consideration (Erber, 1988; Schow & Nerbonne, 1989). Acquired hearing loss in adults is generally associated with the elderly population. However, it is estimated that more than half a million Canadians of working and/or educational age, between 16 and 64 years of age, have a hearing loss (Canada Health Survey, 1981).

The vocational effects of mild-to-moderate hearing impairment in adults of working age are highly varied. Varying degrees of handicap are experienced depending on factors such as the nature of the job (e.g. public contact, telephone use, one-on-one or group interactions, etc.), the physical environment (e.g. lighting, noise, etc.), support of colleagues, and so on. Some of the occupational concerns of adults with acquired hearing loss are reported to include lack of promotion, feeling left out, loss of interaction with colleagues, loss of respect from colleagues, loss of job, altered job assignments, and loss of occupational

mobility (Meadows-Orlans, 1985). This population may also experience varying degrees of handicap in terms of educational achievement and career opportunities. However, in spite of the potential communication disability and handicap which working-aged hearing-impaired adults may experience in their home, work and/or educational environments, they are less likely to acquire hearing aids than older persons (Kyle, Jones, & Wood, 1985). Consequently, a need exists to examine alternative forms of aural rehabilitation and the potential benefits which might be derived by this population.

The purpose of this research is to evaluate the effectiveness of an aural rehabilitation program adapted from a program developed by Erber (1988), when it provided to working-aged hearing-impaired adults who have an acquired mild-to-moderate hearing loss. Erber's approach differs from traditional aural rehabilitation in two aspects. First, communication is viewed as an interactive process between at least two participants. Consequently, the effectiveness of communication is not only dependent on factors related to the listener, but also on speaker-based factors. Therefore, Erber's program incorporates a familiar communication partner in the treatment process. Second, the program focuses on linguistic and pragmatic aspects of effective communication, rather than having a strict reliance on perceptual enhancement techniques. The goal of treatment is to increase the hearing-impaired client's and the communication partner's awareness and application of metalinguistic knowledge to facilitate prevention and repair of communication breakdowns, thereby effecting more efficient, fluent conversations.

Erber's program is primarily intended to target hearing-impaired adults who experience communication difficulties with familiar communication parnters. However, the present study explores the aural rehabilitation needs of hearing-impaired adults in their work and/or educational environment where

conversational interactions are typically with unfamiliar communication partners (e.g. customers, workmates, classmates, teachers, etc.) and where the responsibility for managing effective conversational interactions is shifted back towards the hearing-impaired individual. Results from a recent study by Gibson and Caissie (1994), which evaluated the effectiveness of an aural rehabilitation program that provided training to a hearing-impaired adult on repair usage for the management of communication breakdowns, suggest that direct treatment with a hearing-impaired client may indirectly produce changes in the conversational partner's communicative behaviours thereby resulting in more fluent communication. Furthermore, Gibson and Cassie suggested that hearing-impaired individuals may benefit from an active role in conversational management, especially in the case of conversational interactions with unfamiliar communication partners. Therefore, in contrast to Erber's usual program, unfamiliar communication partners were selected for the present study.

Two goals were identified for the present study. With an ever increasing need to be accountable and cost-effective with intervention methods, it is necessary to examine whether the benefits derived by delivering such a program to only the hearing-impaired person differ from those derived if the program is delivered to both hearing-impaired individuals and unfamiliar communication partners (e.g. workmates). Therefore, the first goal was to evaluate whether this rehabilitative approach provided benefits to hearing-impaired subjects during communicative interactions with a communication partner typical of the kind of partner they might encounter in their work/educational setting (i.e. a partner who is unfamiliar and receiving no treatment), and if additional benefit was derived with unfamiliar communication partners who received treatment. Benefit was measured in terms of more efficient and fluent conversations.

The second goal of this study was to examine whether the evaluation methods chosen provided meaningful and valid information regarding derived benefits. Erber's approach is conversation-based: treatment focuses on pragmatic aspects of effective communication. Therefore, by definition, assessment of the effectiveness of such an approach requires conversation-based evaluation methods which can be subjected to pragmatic analyses. However, there are some potential pitfalls with pragmatic assessments. First, it is necessary to obtain a representative sample of the client's typical communication behaviours. Therefore, evaluation methods must be as ecologically valid as possible (e.g. different contexts, partners, environments, purposes, etc). Second, as communication is a complex process, it is not clear which communication behaviours are appropriate for analysis and assessment. Given that appropriate behaviours can be selected, do the chosen evaluation tools and methods yield valid outcome measures? Therefore, not only did this study examine the effectiveness of Erber's program, but it also examined the validity of the chosen evaluation methods and outcome measures.

LITERATURE REVIEW

Communication

Communication is an interactive process based on the notion of intentionality: all meaning expressions stem from the basic intention to participate and co-operate in a communicative interaction so as to convey certain meanings and not others (de Beaugrande and Dressler, 1981). The exchange of symbolic expressions in itself does not constitute communication; rather, communication is the successful interpretation or comprehension by a listener of a speaker's intent in performing a linguistic act (Green, 1989; Levinson, 1983). A listener's understanding of a speaker's linguistic message takes place in the context of the linguistic parts which constitute it and in the in the context of the participants general

knowledge about the events and objects being discussed (Brown & Yule, 1983; Garman, 1990). Consequently, the listener's understanding may incorporate elements not specifically encoded in the speaker's linguistic message. Therefore, different individuals understanding of the same discourse may not be exactly the same and, furthermore, a listener's interpretation of a speaker's linguistic message may not necessarily match a speaker's intended meaning. Considerable research has examined the communication process in terms of production and understanding of language. For the purposes of the present study, only language comprehension will be discussed.

A model of communication, according to Sanders (1993), attempts to represent the components of the communication process, their functions, and how they relate to each other. The value of such a model is that it provides a framework for understanding communication disabilities, as well as providing a rationale for the intervention process. Variations of a speaker-listener model of communication devised for the purposes of aural rehabilitation, including Erber's and Sander's, have typically included components representing: 1) the source or speaker; 2) the speaker's message expressed linguistically and carried as an acoustic signal, along with accompanying visual signals; 3) a self monitoring feedback loop for the speaker; 4) the physical environment (e.g. noise and lighting factors) through which the signal is transmitted; and, 5) a receiver or listener (typically the hearing-impaired person) who must receive and decode the speaker's message (Erber, 1988; Sanders, 1982, 1993; Schow & Nerbonne, 1989). With the exception of Erber, such speaker-listener communication models fail to explore communication within what Levinson (1983) states as "the most basic kind of language usage" (p. 285), a conversation, in which the roles of speaker and listener alternate between the participants.

Within a conversational model of conversation, the participants need to draw on not only their linguistic and conceptual knowledge, but also a range of "conversational or interactive" skills fundamental to effective communication. The dynamics of conversation have been investigated within the discipline of pragmatics, which examines the relationship between language behaviour and the contexts in which it is used. Some issues which fall under the domain of pragmatics include the intentionality underlying meaning expressions (speech acts), the organization and management of spoken exchanges, and the role of context and shared background knowledge in placing constraints upon meaning expression and interpretation. Such interactive and contextual factors need to be considered in any model that addresses communication within a conversational framework.

Because speaker-listener models fail to consider communication within a conversation framework, they inadequately depict the interactive and contextual factors which contribute to successful conversational interaction on a daily basis. However, the ultimate goal of the therapeutic process in aural rehabilitation is to enable successful communication for the client at the conversational level. By definition, this necessitates that the intervention process be driven by a conversational model of communication. Despite its limitations, Sanders (1993) model will provide a basis for the model of communication discussed in the following section.

A Model of Communication

Sanders' (1993) model views communication in terms of an interactive process between a speaker, a listener, and the physical environment. Within this model, the communication process begins with the speaker formulating an idea or thought, linguistically encoding it as a meaningful message using the

conventional rules of one's language (i.e. phonology, syntax, and semantics) and then articulating it. Although Sanders' model presents a detailed account of the production process, the focus of the present discussion will be on describing the processes involved in language comprehension. Even though Sanders' model is strongly based on the perceptual and information processes involved in language comprehension, much like the traditional speaker-listener models, Sanders has attempted to incorporate interactive and contextual factors in his model. Further aspects with respect to cognitive processes and pragmatic aspects of language comprehension, based on the extensive research on communication, will be integrated into Sanders' model.

Generally, cognitive-based models of language comprehension include the following primary processes and components: perceptual analysis of the incoming sensory information, lexical access/processing, parsing, and interpretative processes (Garman, 1990; Smith & Leinonen, 1992). Sanders' model proposes three stages in language processing stages: 1) peripheral reception/pattern; 2) pattern analysis and linguistic reconstruction; and, 3) conceptual reconstruction. The first processing stage encompasses a perceptual analysis of the speech signal in terms of the detection and pattern analysis of the acoustic components resulting in a phonetic representation of the speech input. Garman (1990) proposes that language comprehension within discourse involves not only the perceptual analysis of the acoustic input constituting the linguistic signal, but also of various other sensory inputs. Some include: 1) visual input independent of the conversational participants in a given situation which might contain information about objects and events in terms of being potential referents; 2) visual input from the speaker independent of the linguistic message such as gestures and facial expressions which might carry information relevant to the speaker's intended meaning; and, 3) auditory information not dependent on the articulation of the

specific linguistic signal such as voice quality and rate. Parallel interactions exist between the perceptual processing of various sensory input (e.g. between visual and auditory input) (Garman, 1990).

The second processing stage in Sanders' model involves the lexical and structural (syntactic) linguistic reconstruction of the speech input. Lexical reconstruction involves accessing the mental lexicon. Accessing the mental lexicon language processing entails the listener mapping the phonological form onto stored neurosensory traces in his or her mental lexicon, which once activated will stimulate the associated meaning representations (Garman, 1990). The mental lexicon is typically represented as being comprised of two components, stored word meanings and stored word forms, as well as information about how the word relates to other words (Garman, 1990). Although the structure of the mental lexicon has received considerable attention and research, as well as the access method, it is beyond the scope of the present discussion to review such conceptual theories. Syntactic reconstruction involves the parsing of the interrelationships of the temporally sequenced identifiable lexical items (i.e. a formal structural representation of the speech input is created). The third processing aspect Sanders' proposes is the conceptual reconstruction or semantic interpretation of the linguistic reconstruction of the speaker's speech input using cognitive structures and processes (e.g. world knowledge, inferences, schemata, coherence) and pragmatic knowledge (e.g. speech acts, turn-taking and contingent sequences, etc.). It is through these interpretative processes that a meaningful, coherent, representation of incoming discourse is possible (Garman, 1990). Some of these interpretive processes will be discussed later.

It is generally agreed that the processes of language comprehension proceed in parallel at all levels, as opposed to serially (Garman, 1990). Marslen-Wilson and Tyler (1975) presented evidence that speech

input is processed continuously by the listener, rather than in discrete units. Analysis at one level (i.e. structural reconstruction) does not have to wait until processing has been completed at another level (i.e. lexical reconstruction); rather, the results from processing at one level are available at all other levels to guide processing decisions. Consequently, the analysis is highly predictive. While lexical and structural processing is proceeding, the interpretative processes could be developing expectancies based on world knowledge recruited from the portion of the linguistic input recently processed. Such expectancies play a role in the conceptual representation of the speaker's message because they allow the listener to make predictions about the information being processed. Further to being described as a continuous process, language comprehension is generally viewed as being an interaction between bottom-up and top-down processing.

Bottom-up processing in spoken language comprehension is assumed to include the initial analytical processing of the auditory signal at the phonetic level until the morphologic and syntactic units are reconstructed. In contrast, top-down processes generate predictions about the evolving meaning of the message on the basis of expectancies derived from world knowledge, language knowledge, metalinguistic knowledge, and contextual factors. Although the exact relationship of the time-course between bottom-up and top-down processing has not been specifically determined, Sanders' model proposes a parallel interaction such that once the bottom-up analysis begins, the higher-order constraints of top-down cognitive processes set up certain expectations and predictions about the probable evolution of the structure, content and meaning of the message which are further influenced by the ongoing bottom-up analysis.

Top-down effects may have a much stronger influence on language comprehension when bottom-up processing at the perceptual level is less than ideal (Flores D'Arcais & Jarvella, 1983; Garman, 1990; Sanders, 1993). For example, if the analysis of the acoustic signal yields a distorted or impoverished percept (e.g. as in hearing impairment), top-down processes may be recruited to facilitate the conceptual reconstruction of the message. Using top-down processing, the listener may be able to achieve closure by making predictions about the structure, content or meaning of misperceptions within a given context, thereby clarifying them without having to engage in disruptive repair sequences.

Redundancy

Sanders' (1993) discusses language comprehension in his model of communication in terms of redundancy factors in the transmission and processing of information. The idea that messages carry information derives from a mathematical theory of communication developed by Shannon and Weaver (1967), who examined the efficiency of signal transmission in telecommunications. Within this theory, the information was described as the informativeness of the symbols in a message relative to one's expectations of those symbols. Informativeness is based on the statistical probability of occurrence of a signal: the greater the probability of occurrence of a signal, the less information it contains. Thus, the greater the probability of occurrences of a signal, the greater the predictability based on one's expectations, and the greater the redundancy of the information in the signal. As such, information processing is closely linked to the notions of predicability and redundancy, and consequently to what the listener is required to hear to be able to process a message.

Redundancy may be defined as "the part of a message that can be eliminated without a significant loss

of information" (Sanders, 1993, p.100). It is well known that language expressions carry a certain amount of redundancy. Redundancy is the result of structural, contextual, and situational constraints (Sanders, 1993). The information in a speaker's message is conveyed according to the formalized rules of one's language (i.e. phonology, morphology, and syntax). These rules act as structural constraints because they create predictable structural patterns which govern the combination of sounds into words, words into utterances, and utterances into connected discourse. Contextual constraints are present in the discourse itself (e.g. the conversational topic) and act to limit the speaker's choice of words and phrases used to convey a particular meaning. Situational constraints further limit the speaker's choice of expression and are a function of factors of the situation in which the message is communicated.

These same constraints which create redundancy in the speaker's message also act to constrain the listener's interpretation of that message. Redundancy acts to combat "noise" factors which might adversely affect the listener's ability to comprehend the message (Sanders, 1993). The higher the redundancy of the message (hence predictability), the more resistant it will be to noise factors. According to Sanders (1993), noise factors might originate with the speaker (e.g. compliance to formalized language rules, syntactic complexity, etc.), the environment (e.g. acoustic noise and reverberation, etc.) or the listener (e.g. familiarity with language rules, familiarity with the topic, fidelity of the auditory system, etc.). Redundancy not only lessens the pressure on the listener to attend to and process each bit of information, but it also contributes to a listener's ability to achieve closure in the face of reduced auditory information on the basis of expectation driven constraints, thereby facilitating comprehension (Schow & Nerbonne, 1989).

Context

Comprehension of spoken language involves the transformation of speech into a mental representation of what the listener thinks the speaker intended. Various contextual parameters, external and internal, operate to affect the construction of the speaker's intended meaning in the listener's mind (Brown & Yule, 1983; Davis and Wilcox, 1985; Sanders, 1993; Singer, 1990). Contextual parameters act to constrain the interpretation the listener constructs by providing a frame of reference for integrating the propositional content of a message with relevant knowledge and providing the listener with linguistic and contextually-based expectations, which facilitate comprehension (Singer, 1990). If the listener is processing what may be a degraded signal (e.g. sensorineural hearing impairment) contextual factors may play an even greater role in the interpretive process (Erber, 1988; Garman, 1990; Sanders, 1993). The hearing-impaired individual may be able to use contextual expectations to make inferences about misperceptions to arrive at the intended meaning without interrupting the flow of communication. Context is generally viewed as being either "external" to the discourse or "internal" to the discourse (i.e. the participant,s characteristics such as world knowledge and belief system or the evolving co-text) (Brown & Yule, 1983; Davis & Wilcox, 1985). Each will be discussed in turn.

External context, referred to as extralinguistic context by Davis and Wilcox (1985), consists of elements within the physical environment or situation in which a conversation occurs. It includes the physical setting or place (e.g. grocery store, work setting), the time (e.g. morning), the physical surroundings (i.e. objects), and the social relationship between the participants (e.g. social status, age, gender, cultural and educational background, etc.) (Davis & Wilcox, 1985; Sanders, 1993; Smith & Leinonen, 1992). Such contextual factors not only affect the relevance and meaning of a speaker's message, but also bias the

listener's expectations.

The other aspect of external context which greatly influences the listener's interpretation and comprehension of the speaker's message is the listener's acquired background or world knowledge. Consequently, successful communication is based on the mutual or shared background knowledge of the conversational participants (Levinson, 1983). Various contextual parameters within a conversation (e.g. the situation, the topic, etc.) activate the listener's background knowledge which is relevant to the interpretation of what the message might state and set up expectations for what might follow. Activation of relevant mutual knowledge is facilitated by knowledge structures stored in semantic memory referred to as schemas, scripts, frames or mental models (Brown & Yule, 1983; Singer, 1990). The function of such schematic knowledge is that it allows world experiences and knowledge to be organized into referential frames, which the language user can then use to predict the probable content, form and meaning of a message and of the discourse. As such, schematic knowledge aids in integrating new information, events, and experiences. For example, scripts, which are knowledge representations of a standard sequence of events (e.g. props, actors' roles, event chain, goal) associated with a stereotypical event (e.g. visiting a doctor, going to a restaurant, etc.) (Brown & Yule, 1983; Singer, 1990) set up expectations about what each participant might say (both the content and form of the utterances), when they might say it as the discourse evolves, and the communicative function of the utterance.

In contrast to external context, internal context includes elements found within the discourse or dialogue. As discourse is a dynamic interaction, it consists of more than just a sequence of utterances. It consists of interactions within utterances, sequential interactions among individual utterances, and a linkage of

individual utterance meanings to create a more global coherence (Sinclair, 1985; Kintsch & van Dijk, 1978; van Dijk & Kintsch, 1983). Each utterance sets the scene for the next, with the interpretations of subsequent utterances being dependent on the interpretations of previous ones (Sinclair, 1985). According to models of discourse comprehension presented by Kintsch and van Dijk (1978) and van Dijk and Kintsch (1983), discourse processing requires the construction and interpretation of a multi-level mental representation conceptualized as consisting of a macrostructure and microstructure. Together they form a coherent representation of the discourse, called a text base.

The macrostructure of a discourse consists of a schematic representation of the main ideas of a message (Kintsch & van Dijk, 1978). The macrointerpretation reflects the meanings of individual utterances and the relationships among them, whether explicitly stated or tacitly implied. The context it provides is one of global meaning (i.e. topic), which contributes to the listener forming a coherent representation of the discourse, thereby facilitating comprehension (Kintsch and van Dijk, 1978; van Dijk & Kintsch, 1983). The topic of a conversation plays two important roles in language comprehension: it places constraints on the relevant vocabulary and world knowledge the listener needs to activate and it serves as an anchor for the integration of the ideas conveyed by the message into a coherent representation (Singer, 1990). Familiarity with a topic can influence a listener's ability to interpret misperceptions. The greater the listener's familiarity with the conversational topic, the more likely it is that she has the relevant vocabulary and knowledge to make inferences and predictions regarding misperceptions.

The microstructure consists of the organized underlying network of ideas or propositions and their relations, which is mapped onto a sequence of utterances. A critical function of the microstructure is the

achievement of referential coherence, or connection between propositions (Brown & Yule, 1983). The speaker's surface structure expression signals referential coherence through the employment of appropriate word and sentence ordering and by effective use of linguistic cohesive devices. Discourse comprehension requires that the listener attend to these linguistic signals within and between utterances. Other context effects found at the microstructure level consist of the highly predictable phonological, syntactic and lexical patterns created by formalized language rules (Garman, 1990; Sanders, 1993). Such linguistic constraints can facilitate language comprehension, especially in the event of misperceptions. For example, parts of speech (nouns, verbs, adjectives, adverbs) guide the interpretation process by generating expectations about the syntactic structure of the utterance (Singer, 1990). If a listener fails to perceive the word "cat" in the following utterance "The cat chased my dog", the listener might predict that the missing word is most likely a noun on the basis of her knowledge of syntactic rules.

Another type of internal context, referred to as paralinguistic context by Davis & Wilcox (1985), consists of suprasegmental features such as intonation and prosody. Paralinguistic conventions serve a variety of purposes in communication. They can be used to convey affective information, to identify new information, to signal meaning of a word (e.g. through syllabic stress) and to identify the syntactic function of a statement.

Speech Act Theory

Communication does not simply entail saying something, but using language to elicit one's intended actions on the listener (i.e. using language to get things done). Using language to such social and psychological ends constitutes speech act theory. Speech act theory was originally formulated by Austin

(1962) to describe how people use language to accomplish social goals. It has been further developed by Searle (1969, 1979), and others, to distinguish between the literal content of a proposition and its intended or conveyed meaning (i.e. direct versus indirect speech acts).

Within this theory, speech acts are considered to be the basic units of communication. A speech act is understood to be the social action (e.g. asserting, questioning, promising) performed by a speaker within the context of the utterance (van Dijk & Kintsch, 1983). When producing the utterance, a person is performing three acts simultaneously: a locutionary act, an illocutionary act, and a perlocutionary act (Austin, 1962). The locutionary act refers to the actual production of an utterance, separate from its underlying meaning and intent. The illocutionary act is the intended communicative function or action (e.g. promising, warning, questioning, etc.) which is realized in the syntactic construction and can be classified as either: assertive, directive, declarative, commissive, or expressive (Searle & Vanderveken, 1985). Assertives are used to comment about the world; directives attempt to get the listener to do something; declaratives bring about a change in state of affairs; commissives oblige a speaker to a future course of action (e.g. promise); and expressives identify a speaker's personal attitudes or emotional feelings. The perlocutionary act refers to the particular effect the illocutionary act has on the mental state or behaviour of the listener on a particular occasion.

Within a speech act, the illocutionary act is independent from the propositional content, the predicate and arguments (Brown & Yule, 1983). For example, you and a friend might be discussing your entertainment plans for the evening and your friend comments "It's been a long time since I've been to a movie." The force of the utterance is that of a directive - you are being asked indirectly to go to a movie, yet on the

surface the utterance appears to be a statement of fact (assertive). Therefore, comprehension of spoken language requires the listener to go beyond simply restructuring the linguistic pattern and propositional content of a speaker's message, but to also identify the speech act underlying a speaker's utterance. A listener's identification of a speaker's intended speech act is guided by the grammatical form of the utterance, the mutual knowledge of the speaker and listener, and the context which it occurred (Singer, 1990). Misinterpretations of a speaker's intent can occur if a listener performs only a literal interpretation on the basis of the propositional content and does not consider the intent of its use in a particular situation.

Turn-taking and Contingent Sequences

Conversational interactions have not only been analyzed in terms of the social functions of utterances, but also in terms of how those utterances function in organizing the discourse itself. Conversational interactions are organized by initiating, responding, and terminating interactional sequences. Two organizing aspects of interactive conversation which have been extensively analyzed are the phenomena of turn-taking and contingent sequences (i.e. adjacency pairing).

An essential characteristic of conversation is turn-taking, the smooth and apparently effortless switching in roles from the hearer to speaker, and vice versa (Green, 1989). Turn-taking dynamics were first described by the sociologists Sacks, Schegloff, and Jefferson (1974). Turn-taking conventions allow for smooth interchanges between speaker and listener with less than five per cent of the speech stream being delivered in overlap, and gaps between turns being fractions of a second (Levinson, 1983; Prutting and Kirchner, 1983). Turn-taking conventions also allow for the coordination of the participants'

contributions so each achieves her respective goals (Clark and Clark, 1977). Effective turn taking requires the listener to look or listen for particular speaker signals which may indicate that the speaker's turn is coming to an end. Speaker signals may be subtle or direct and include falling intonation, drop in pitch or loudness, an extended final syllable, a prolonged pause, the use of stereotypical utterances (e.g. "you know"), and nonverbal indices such as prolonged eye contact and stopping hand gestures (Duncan, 1972).

Within this framework of turn-taking, Schegloff and Sacks (1973) noted a further structural feature of conversational organization known as adjacency pairing (contingent sequences). An adjacency pair consists of two utterances produced by two different speakers and positioned adjacent to each other. The relationship between the two utterances is that one constitutes a first pair part and the other a second pair part, and together they form a pair type (e.g. question-answer, offer-acceptance, greeting-greeting, etc.). The rule governing their operation is that given the first pair part (e.g a question), the second pair part is expected (e.g. an answer). The first part (initiation) acts to constrain or influence the form of the second part (response) (Coulthard, 1985). A question usually begs an answer, a greeting a counter-greeting and so on.

The descriptive power of the notion of adjacency pairing is that it captures the recurrent patterns of conversation and sets up sequencing rules which govern expectancies of what can occur for discourse to be coherent. However, as conversation is an interactive process, there is no way to place absolute constraints on what the other will say. Therefore, Levinson (1983) suggests replacing the notion of adjacency with that of conditional relevance (the setting up of specific expectations of what the speaker

expects as a response which have to be attended to). A preference ranking operates over the possible alternatives for second parts (e.g. an answer is a preferred second part to a question, but other dispreferred second parts may actually occur). The discourse will be deemed coherent, regardless of whether a preferred or dispreferred second part occurred, as long as the second part is related to either the illocutionary force or the pragmatic presuppositions (background beliefs or assumptions of the speaker) of the preceding utterance (the first part) (Tsui, 1991).

The idea that initiations may constrain or influence subsequent responses, thereby facilitating comprehension, has clinical implications for aural rehabilitation. A hearing-impaired individual can use his or her knowledge about these sequential tendencies of conversation to avoid potential communication breakdowns by anticipating or predicting the form and content of the other person's utterance (i.e. the second part) in response to his or her utterance (i.e. the first part). In addition, one type of contingent sequence of particular importance for the purposes of aural rehabilitation is the repair sequence. Compared to normally hearing adults, adults with hearing impairment are more likely to experience a greater proportion of conversational dysfluencies as a result of the misperception of their conversational partner's spoken messages (Erber, 1988). Consequently, the success of conversational interaction is in part dependent on a person's ability to use communication repair strategies to resolve such conversational dysfluencies.

Listeners and speakers can apply a variety of communication strategies to resolve communication breakdowns. Listeners can use either nonspecific or specific requests for clarification, questions that seek to clarify a misperceived prior utterance (Erber, 1988; Gagné et al., 1991). Nonspecific requests

for clarification generally provide no information to which portion of the message was misperceived, while specific requests for clarification do. Research indicates that specific requests for clarification are more effective than non-specific requests for clarification in resolving conversational dysfluencies (Erber, 1988; Gagné & Wyllie, 1989; Owens & Telleen, 1981). Speakers use a variety of repair strategies to resolve communication breakdowns such a repeating, rephrasing, explaining (see Caissie & Rockwell, 1993; Erber 1988; Owens & Telleen, 1981). The type of repair strategy used by the speaker may also influence the ease with which communication breakdowns are resolved. For example, Gagné and Wyllie (1989) found that paraphrasing a misperceived word was a more effective repair strategy than simply repeating the word. Furthermore, a study by Gibson and Caissie (1994) suggests that the clarification requesting behaviours of a listener may yield changes in the partner's repair usage in conversational context.

The Effects of Hearing Loss on Verbal Communication

Aural rehabilitation is a comprehensive process designed to assist hearing-impaired persons to actualize their optimal potential in communication (Alpiner & McCarthy, 1987; Schow & Nerbonne, 1989). This requires that any aural rehabilitation approach be guided by an understanding and appreciation of the effects of sensorineural hearing loss on verbal communication in adults with acquired hearing loss. Hearing loss and its consequences can be described on three levels: impairment, disability, and handicap (Stephens & Hétu, 1991; World Health Organization (WHO), 1980). As these classifications provide a useful framework for understanding the processes of aural rehabilitation, each will be discussed in turn.

Hearing impairment refers to the defective auditory function resulting from anatomical and physiological changes to the auditory system. In sensorineural hearing loss the defective function originates at the

cochlear level (e.g. damaged hair cells or auditory nerve fibers) and results in impaired auditory functions such as reduced sensitivity, impaired intensity processing, and reduced frequency, spatial and temporal resolution/discrimination (Stephens & Hétu, 1991). Thus, hearing impairment compromises the accuracy of the neural coding of the frequency and intensity characteristics of speech sounds resulting in the listener receiving distorted neural patterns. Because comprehension of spoken language is very much dependent on the integrity of the auditory neural coding, hearing impairment can adversely affect the hearing-impaired listener's comprehension, hence communication success, and result in a communication disability.

Disability refers to the inability to perform an activity within the range considered normal for a human being (WHO, 1980). Hearing disability refers to the actual "auditory" consequences of the hearing impairment within the individual's life (Stephens & Hétu, 1991). If the hearing impairment is of a degree that results in impaired detection, discrimination, and/or identification of the acoustic correlates in the signal, then a perceptual disability may be evidenced (Erber, 1988). As adults with acquired hearing loss have learned the language rules and pragmatic aspects of conversational interactions, compensation for the reduction in auditory information may be accomplished to some degree through top-down speech comprehension processes. However, if the combination of contextual constraints and auditory information is insufficient, the hearing-impaired person may experience what Erber (1988) refers to as an "interactive" communication disability; the hearing-impaired person experiences difficulties understanding conversational speech which often results in dysfluent conversation. Some typical characteristics of dysfluent conversations between a hearing-impaired person and a normal hearing person might include extended gaps or silences, re-starts, topic shifts, turn-taking disruptions, incomplete understanding, and

repair sequences (Erber, 1988). However, there is no perfect correlation between measures of hearing disability and impairment because hearing disability is a complex function of the nature and severity of the hearing impairment interacting with social, vocational, and situational factors (Stepens & Hétu, 1991). For example, a mildly hearing-impaired person who only experiences a mild disability in her social environment, may experience a greater disability in her work environment because of increased pressures to comprehend complex and unfamiliar information.

The last level to describe the effects of hearing loss is handicap. Handicap refers to the disadvantage resulting from impairment or disability that limits the fulfilment of a role considered normal for a given individual (WHO, 1980). Hearing handicap refers to the non-auditory problems experienced by either the hearing impaired person or communication partner (Stephens & Hétu, 1991). For example, the hearing-impaired person may experience anxiety, irritability, negative self-image, reduced quality of social interactions, or reduced occupational satisfaction (Erber, 1988; Stephens & Hétu, 1991). In addition, secondary handicaps such as increased effort, stress, and fatigue may be experienced due to increased processing demands (Sanders, 1993; Stephens & Hétu, 1991). A communication partner may also experience stress, anxiety, reduced satisfaction with social interactions or increased effort due to the restrictions and burdens of defective communication with the hearing-impaired individual.

Overview of Aural Rehabilitation

Two terms commonly used to refer to the professional efforts designed to help persons with hearing loss are aural rehabilitation and aural habilitation. Although some authors use the two terms interchangeably, others choose to distinguish between them. Aural habilitation is typically used to refer to treatment efforts

involving language acquisition with prelingually hearing-impaired children, while aural rehabilitation refers to those efforts used to restore a lost state or function. As this study deals with adults with acquired hearing loss (i.e. postlingual), the latter term is the appropriate choice. Aural rehabilitation is not something we do to a person, but rather a comprehensive process designed to assist hearing-impaired persons to realize their optimal potential in communication by maximizing their own resources (Alpiner & McCarthy, 1987,1993; Schow & Nerbonne, 1989). It attempts to lessen the hearing disability, thereby preventing or reducing the hearing handicap associated with hearing loss (Coyte, 1992; Stephens & Hétu, 1991).

Historically, aural rehabilitation has directed its efforts at reducing the perceptual disability associated with hearing loss by enhancing or restoring the hearing-impaired person's perceptual abilities (Erber, 1988; Schow & Nerbonne, 1989). This typically involves improving detection, discrimination and identification abilities, the bottom-up processes of speech comprehension. This approach is known as traditional aural rehabilitation and generally consists of three basic components: 1) selection of hearing aids and assistive listening devices for the amplification of sound; 2) speechreading training in the use of articulation patterns to compensate for missing auditory information; and, 3) auditory training for improving the recognition and discrimination of speech sounds (Alpiner & McCarthy, 1993). With the advent of improved hearing aid technology and questions regarding the long-term effectiveness of speechreading and auditory training in dealing with communication difficulties, the emphasis of the traditional approach has gradually narrowed to hearing aid selection and adjustment.

Although no one would dispute that many hearing-impaired adults have benefited from the amplification

centered traditional approach, there has been a growing recognition within the field of audiology of the shortcomings of this approach (Erber, 1988). The traditional approach recognizes that postlingual hearing impairment results in a communication disorder of sensory/perceptual origin, but fails to give due consideration to the ensuing "interactive" communication disability often experienced by hearing-impaired people. Because limitations exist in the degree to which the hearing-impaired person's perceptual abilities can be improved through speechreading and auditory training and the degree to which perceptual difficulties can be resolved (especially in adverse listening conditions) by amplification, a need exists for therapies specific to the interactive or conversational disability associated with hearing impairment to be included in the aural rehabilitation process (Erber, 1988). Rather than only addressing bottom-up processes of speech comprehension, such therapies would also incorporate top-down contextual processes and conversational/pragmatic aspects of communication. Furthermore, for aural rehabilitation to be ecologically valid, promoting the transferance of acquired skills to the client's everyday world, treatment methods should be interactively based as in typical conversation, rather than the clinician-dominated teaching paradigm typically used aural rehabilitation.

Another shortcoming of the traditional approach is that it has typically failed to consider the interactive nature of conversational interaction. As defined earlier in the discussion of a communication model, communication takes place when a message is sent and received. However, aural rehabilitation has typically focused on the communication disorder of the hearing-impaired client and her responsibility to manage her communication difficulties. The role of the communication partner(s) has been neglected. Consequently, traditional approaches have not routinely incorporated the hearing-impaired client's communication partner(s) in the aural rehabilitation process. Due to such shortcomings with the

traditional approach many hearing-impaired persons continue to express dissatisfaction with the results obtained in their everyday communications (Erber, 1988; Schow & Nerbonne, 1989).

In response to the shortcomings of the traditional approach, progressive aural rehabilitation approaches have been developed. These new approaches are not meant to replace traditional aural rehabilitation, but rather to complement it. Audiologists have recognized the importance of the interaction between analytical bottom-up and expectation driven top-down processes in discourse comprehension and have attempted, in differing degrees, to incorporate both processing aspects into rehabilitation programs. Consequently, alternative approaches typically still consist of a perceptual enhancement component, but also now commonly include some form of communication training, methods for minimizing conversational dysfluency (e.g. communication strategies, problem-solving techniques, coping strategies, etc.) and counselling on psycho-social effects of hearing loss. Furthermore, unlike traditional approaches, alternative approaches are based on the concept that successful communication is a shared responsibility between the hearing-impaired person and his or her conversational partners. Therefore, the participation of both the hearing-impaired person and conversational partners in the rehabilitation process is considered important for a successful outcome.

Some examples of present progressive approaches are: 1) the adjustment approach (Alpiner & McCarthy, 1987,1993), which counsels the hearing-impaired person and spouse on the nature of hearing impairment and its consequences, as well as on problem-solving techniques, communication strategies, and coping strategies to enhance communication success; 2) the "Living with Hearing Loss" program (Abrahamson, 1991), which counsels hearing-impaired persons and their spouses on environmental management, stress

management, assistive devices, cognitive strategies to cope with negative attitudes, and communication strategies; and, 3) Erber's (1988) communication therapy program, a communication training program which educates the hearing-impaired person and communication partner on the use of interactive, contextual and linguistic cues so that they learn to become more effective communicators and achieve successful conversational interaction. As Erber's communication-based therapy approach is used in this study, it will be discussed in further detail.

Erber's Communication Therapy Approach

This section provides an overview of Erber's communication-based aural rehabilitation program as described in "Communication Therapy for Hearing-impaired Adults" (1988). The primary goal of the program is to improve conversational fluency, the ease and efficient, of hearing-impaired persons' daily conversational interactions. Erber contends that to achieve this goal we need to recognize that even though hearing impairment is primarily a communication disorder of sensory/perceptual origin, the perceptual enhancement techniques of traditional aural rehabilitation have limited effectiveness in many daily communication situations. Therefore, Erber suggests that ecologically valid aural rehabilitation can not continue to be entrenched in perceptual methods, but requires a shift in theory and practice towards a more "conversation-based" approach which incorporates many of the interactional and contextual aspects of communication previously discussed. Erber's program addresses this need.

Erber's (1988) communication therapy program targets the communication disability associated with hearing loss primarily at the conversational level. As such, he describes his therapy approach as being conversation-based with respect to both its theoretical basis and its therapy delivery. The primary goal

is to improve conversational fluency and the primary means of doing so is through the development of the hearing-impaired client's meta-communication or meta-linguistic awareness. The program strives to educate and increase the hearing-impaired clients' awareness, that in spite of their perceptual limitations, they possess knowledge of language structure and use and knowledge of how conversations work which can be used to their advantage to improve comprehension and achieve more fluent conversational interactions. Because the program aims to improve metalinguistic awareness (how to use one's knowledge of language and conversational structure), as opposed to increasing linguistic knowledge (i.e. increasing specific knowledge of syntactic rules, etc.), participation in the program requires that potential clients possess adequate language knowledge and skills. The clinical population the program is intended to target is, therefore, postlingually hearing-impaired adults.

Based on his clinical experience, Erber suggests four "contextual aids" which contribute to the hearing-impaired client's comprehension of a conversation: 1) environmental and situational factors; 2) word-order and word-associations (semantic and syntactic patterns); 3) inter-personal and inter-relational factors; and, 4) sequential contingencies. In relation to the communication model presented earlier, the first three aids were discussed under contextual aspects of discourse comprehension, while the fourth aid constitutes a pragmatic aspect of comprehension of conversation. Therapy activities are directed at improving the client's awareness of these aids to not only improve comprehension and avoid potential communication breakdowns, but also to develop efficient clarification strategies to more effectively handle communication breakdowns when they do occur. For example, Erber reports that many hearing-impaired people first resort to top-down contextual and pragmatic strategies to reconstruct or clarify misperceptions, many of which were discussed in our communication model. Only when these are

insufficient does the person resort to bottom-up perceptual analysis. Therefore, increasing the client's awareness of contextual and pragmatic aspects of speech comprehension should be of benefit to the client.

Delivery of therapy activities is based on a clinical model of communication which Erber (1988, p. 27) developed. Erber's clinical model is not meant to replace the communication model discussed earlier, but rather to provide a rationale for therapy delivery techniques. The aspects of communication discussed earlier in the discourse communication model operate within this model as well. Typically, models of communication employed in aural rehabilitation cast the normal hearing person as the initiator of conversation and the hearing-impaired person as the receiver (Sanders, 1982; Erber, 1988). However, based on clinical observations that suggest hearing-impaired people tend to communicate most successfully when they are directing the conversation, Erber (1988) proposes a more clinically relevant model of communication which views the hearing-impaired person as an active participant in the communication process, rather than a passive listener. Consequently, for therapy purposes, the model depicts the hearing-impaired client as an initiator and director of the conversation, while the normal hearing person is primarily a responsive listener. In addition to the two conversational participants, the model includes two additional people: 1) an observer who is not directly involved in the conversations, but rather observes the conversation for its overall effectiveness and fluency; and, 2) a planner, typically the clinician responsible for organizing and implementing the treatment, who guides both communicators in achieving more fluent conversations.

A clinical implication of Erber's clinical model is that it allows the hearing-impaired client to be the initiator

during therapy activities so that the client can practice using his or her metacommunication skills to influence the evolving conversation to achieve optimal fluency. The program has three principal focuses for the hearing-impaired client. First, it concentrates on improving the client's confidence in applying contextual (both internal and external) and pragmatic strategies (i.e. contingent sequences, speech act theory) to make reliable predictions about the possible content and form of misperceptions. Second, the client learns to guide a conversation in ways that increase the predictability of a speaker's responses, hence increasing the intelligibility of the speaker's utterance and improving comprehension. This might include asking response-limiting questions, selecting familiar topics, and requesting specific clarification when necessary. Both of these actions have the predictive power of narrowing the range of possible content, forms, and directions of a conversation; thereby, increasing the likelihood of correct perception and interpretation of a message's meaning (Erber, 1988). Third, the client learns a problem-solving approach to the resolution of communication breakdowns.

A second aspect of Erber's program is the therapy component with a communication partner of the hearing-impaired client. Because communication is a shared interactive process, conversational fluency is maximized by contributions of both participants. Therapy with the communication partner focuses on increasing the intelligibility of her messages, increasing her awareness and use of pragmatic aspects which influence successful communication (e.g. turn-taking, introducing topics, and contingent sequences), employing effective repair strategies to resolve communication breakdowns, and instilling an appreciation of the communication difficulties experienced by the hearing-impaired person through use of an electronic instrument which simulates hearing loss, HELOS (see Chapter 2 for a more detailed description).

Evaluation of Aural Rehabilitation Effectiveness

Program evaluation serves the purpose of providing information for decision making (Coyote, 1992; Schery & Lipsey, 1983). It assists clinicians in making informed choices about appropriate management of individuals with communication disorders, as well as consumers in making informed decisions regarding alternate treatment approaches. Furthermore, it assists government agencies, with their ever increasing need to be fiscally responsible, in making informed decisions regarding cost effective treatment services. However, while clinicians and government agencies both acknowledge the limits on health care expenditures, decisions regarding treatment services should not only consider economic efficient, but also the long-term benefits provided to clients and society as a whole. (Coyote, 1992). Clinicians within the field of communication disorders, both speech-language pathologists and audiologists, have never been more aware of the need for treatment efficacy research.

The term "treatment efficacy" has a broad meaning which encompasses research focusing on treatment effectiveness, treatment efficiency, and treatment effects (Kendall & Norton-Ford, 1982). Efficacy studies whose focus is on treatment effectiveness ask whether or not treatment works. Treatment efficiency research asks whether one treatment works better than another. Studies focusing on treatment effects examines which aspects of treatment differentially alter which behaviours. Treatment efficacy studies within the field of communication disorders typically explore treatment effectiveness and efficiency (Olswang, 1990). Classifying efficacy studies in communication related services also depends on the program evaluation issue(s) being examined: 1) outcome measures; 2) implementation or service delivery process; and/or, 3) the process (Schery & Lipsey, 1983; Coyote, 1992). Program evaluations which focus on outcome measures ask if benefit was derived from treatment, and if so why and how.

Service delivery evaluations examine the cost effectiveness of the service delivery system (e.g. organizational and staff support). Program evaluations which focus on process issues regarding the procedures and activities that constitute the treatment or delivery system (e.g. admissions, schedule of treatment).

While examination of the service delivery framework and processes provides clinicians and third-party agencies with valuable information, outcome research is the ultimate indicator of benefits derived by the clients and society (Coyote, 1992). Within the area of communication disorders, the classification scheme of impairment, disability, and handicap previously discussed not only provides an useful interpretive framework for intervention decisions, but also for outcome measures decisions. Selection of appropriate outcome measures requires consideration of the targeted aspect of the rehabilitation process: a reduction in impairment, disability, and/or handicap (Coyote, 1992). Program evaluation in the area of communication disorders is a multifaceted process which requires considerations about the type of efficacy study (i.e. treatment effectiveness, efficiency, or effects), the program aspect(s) being evaluated (i.e. outcome measures, service delivery, and/or process), and which aspect of the rehabilitation process is being explored (i.e. impairment, disability, or handicap).

In aural rehabilitation, the primary goal of intervention is to reduce hearing disability and handicap associated with hearing impairment. Because of the complex nature of hearing disability and handicap, no one evaluation instrument or outcome measure is seen as being the "ultimate" choice. Instead, program evaluations tend to use a variety of evaluation instruments and outcome measures. The most common evaluation instruments in aural rehabilitation are receptive tasks, self-report questionnaires, and

the tracking procedure (Alpiner & McCarthy 1987; Erber, 1988; Schow & Nerbonne, 1989). Receptive tests involve repetition of a spoken stimulus which is typically a monosyllabic word or a sentence. As the primary function of these tests is to assess an individual's auditory perceptual abilities, outcome measures are typically related to speech discrimination scores or use of communication strategies (e.g. Gagné & Wyllie, 1989). Receptive tests in recent studies that have examined use of communication strategies have also employed interactive computer software programs (e.g. Tye-Murray, 1991; Tye-Murray, Purdy, Woodworth, & Tyler, 1990). A variety of self-report instruments exist which provide subjective measures of disability and handicap (see Schow & Gatehouse for an overview, 1990). These instruments have typically been used in program evaluations of hearing aid fitting and follow-up (e.g. Garstecki, Hutton, Nerbonne, Newman, & Smoski, 1990; Oja & Schow, 1984). However, they have also been used in evaluations of more communication-based aural rehabilitation programs (e.g. Feldbruegge, 1994). The tracking procedure (DeFilippo & Scott, 1978) is also primarily a receptive task, but it uses discourse materials (i.e. ongoing speech in a variety of text genres) and involves interaction between a sender and receiver. The receiver is required to repeat the sender's message verbatim (please see Chapter 2 for a complete description). It provides measures of disability in terms of efficient of information exchange and use of communication strategies.

However, the traditional evaluation methods used in aural rehabilitation have been criticized for their lack of ecological validity. The contrived evaluation tasks and resultant outcome measures do not adequately reflect the hearing-impaired individual's functional communication abilities in typical everyday conversational interaction and are therefore not generalizable outside of the clinical setting (Coyote, 1992; Pichora-Fuller & Gallagher, 1992). Receptive tests at the word and sentence level provide narrow

outcome measures which do not reflect the role of top-down processing and pragmatic factors in discourse comprehension. The tracking procedure, although it has greater potential for capturing these aspects of discourse comprehension, it is still not truly representative of normal conversational interaction because of the verbatim repetition involved in the task.

If aural rehabilitation efficacy studies are to have any ecological validity, they must begin to incorporate evaluation tasks more representative of daily interactive conversation. Furthermore, with the trend towards more pragmatic conversation based therapies (e.g. Erber's program, 1988), there exists a need for more pragmatically based program evaluations which examine various aspects of clients' conversational performance. In recognition of this need for greater ecological validity in aural rehabilitation program evaluation, Erber (1988) has incorporated an evaluation task he refers to as "TOPICON", a dyadic conversation based on a preselected topic. Qualitative outcome measures are derived from doing a conversational analysis of the dyadic conversation using a pragmatic observational checklist which he has adapted from pragmatic protocols employed in other areas in communication disorders such as aphasia and head injury (e.g. Prutting & Kirchner, 1987). However, as only a few efficacy studies in aural rehabilitation have employed such pragmatic based evaluation instruments and analyses (e.g. Feldbruegge, 1994; Gibson & Caissie, 1994), further research into the use and validity of pragmatic evaluation tools in aural rehabilitation is required.

GENERAL HYPOTHESES

Aural rehabilitation is a process designed to help hearing-impaired persons optimize their effectiveness as communicators and to improve the quality of their conversational interactions. The focus of aural

rehabilitation has traditionally been to improve speech recognition by reducing the perceptual disability associated with hearing loss, with amplification being the main component. However, as previously discussed in the proposed communication model, speech comprehension within conversation is interactive involving not only "bottom-up" perceptual processes but also "top-down" processes including linguistic, pragmatic, cognitive, and social factors. Focusing only on the perceptual aspect of hearing loss overlooks the other factors contributing to the ability of hearing-impaired persons to be effective communicators and engage in successful conversational interactions.

Erber (1988) proposes that traditional aural rehabilitation models need to incorporate the linguistic and pragmatic aspects of speech comprehension which contribute to successful communication. Furthermore, unlike traditional aural rehabilitation approaches, Erber (1988) proposes that involving a familiar communication partner in treatment with the hearing-impaired client will assist in achieving more efficient and fluent conversations between the two in everyday conversational interactions.

The present study examined the effectiveness of a communication-based aural rehabilitation program adapted from Erber (1988) with working-aged mild-to-moderately hearing-impaired subjects who experienced difficulties with conversational interaction in their work/educational environments. Generally, this target population of working-aged hearing-impaired persons is resistant to using amplification, most probably because of perceived effects on their self-image (e.g. intellectual and social competence). They are more likely to engage in the other components of traditional aural rehabilitation such as speechreading and auditory training. This training has been found to be of limited benefit in reducing the perceptual disability and improving communication (Erber, 1988). However, a study of Gibson and

Caissie (1994) suggests that hearing-impaired individuals may benefit from treatment directed at increasing their active role in conversational management, especially in conversational interactions with people who are not familiar with their communication difficulties. Therefore, it would seem that the introduction of and research into the effectiveness of alternative aural rehabilitation approaches which incorporate linguistic and pragmatic aspects of conversational interactions into the role of conversational management is a necessary step in the evolution of aural rehabilitation.

As the conversational interactions of concern (i.e. at work and at school) with this study's intended target population typically involve unfamiliar communication partners, Erber's approach has been adapted for the purposes of the present study so that conversational interactions are more representative of those typically occurring in such settings. Therefore, an unfamiliar communication partner participated in the therapy component, but separate from that of the hearing-impaired subjects. Another unfamiliar communication partner received no treatment.

The evaluation of this program's effectiveness is based on a protocol adapted from Oja and Schow (1984) that examines use, benefit and satisfaction on the part of the hearing-impaired subjects (to be discussed in Chapter 2). The evaluation methods and outcome measures chosen for the present study recognize that benefit may be experienced in the areas of impairment, disability, and/or handicap as discussed earlier in Chapter 1. The adaptation to Erber's program generated two research questions with respect to the effectiveness of the treatment program used in the present study. First, would the hearing-impaired subjects derive benefit (i.e. be more efficient and fluent communicators with an unfamiliar communication partner who also received treatment) from participating in this communication-based aural

rehabilitation approach? Second, was it necessary that an unfamiliar communication partner participate in the treatment program in order for the hearing-impaired subjects to derive benefit from such a program? In other words, is it sufficient that only the hearing-impaired subject participate in treatment? Will additional benefit be derived by the hearing-impaired subject when unfamiliar communication partners also participate in treatment? Because it would be impossible to target all of the unfamiliar communication partners within a hearing-impaired person's work/school environment, this question has implications for cost-effectiveness and mode of service delivery.

Another research question involves the validity of the evaluation methods and outcome measures selected for the present study, which will be specifically outlined in Chapter 2. As the present study employed a communication-based therapy approach, the evaluation of its effectiveness was largely based on pragmatic assessment methods which identify and quantify communication performance or "behaviours". However, because of the complexity of communication, choosing valid outcome measures to identify benefit and reliable evaluation methods to measure change in benefit can be problematic. In addition, the ecological validity of the evaluation methods must also be considered. Therefore, the present study also examined the validity of the chosen outcome measures and evaluation methods.

Based on the research questions discussed above, the general hypotheses posed for the present study are:

1. The hearing-impaired subjects will benefit from this treatment approach by improving their ability to understand conversation, such that more efficient and fluent communication is achieved. A basic

assumption underlying this hypothesis is that hearing-impaired persons can use their knowledge of the metalinguistic and metaconversation techniques presented in Erber's program to achieve more fluent conversations.

2. Greater benefit will be derived by the hearing-impaired subjects in conversational interactions with the unfamiliar communication partner who received treatment than in those with the unfamiliar communication partner who did not receive treatment. The assumption is that this therapy approach provides the unfamiliar communication partner with an appreciation of hearing loss and trains the partner to employ techniques which he or she can use to make conversations more easily understood and fluent.

3. The outcome measures and evaluation methods will be sufficiently selective and sensitive to indicate if benefit occurs.

CHAPTER 2

METHODS AND PROCEDURES

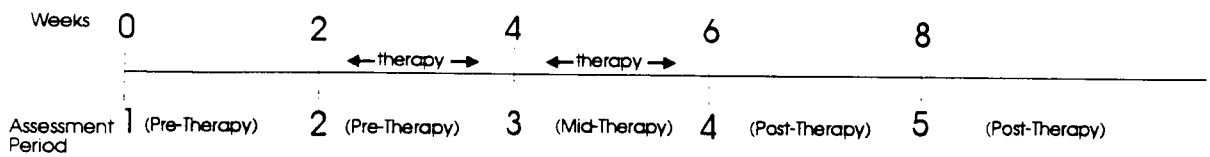
In the present study the effectiveness of a communication-based aural rehabilitation program (adapted from Erber, 1988) for working-aged mild-to-moderately hearing impaired adults who experienced communication difficulties within their occupational and/or educational environments was examined. Specifically, the following questions were examined: 1) whether or not the communication performance of mild-to-moderately hearing impaired adult subjects would improve as a result of this type of therapy; 2) if so, whether or not the therapy would be equally effective in improving the communication performance of hearing-impaired adult subjects during communication interactions with a unfamiliar communication partner who received therapy compared to an unfamiliar communication partner who did not receive therapy; and, 3) whether or not the evaluation methods used to assess change in communication behaviours were valid. In Chapter 2, the general methods and procedures of therapy and evaluation are described, as well as the analysis procedures employed in quantifying outcome.

RESEARCH DESIGN

This study employed a within-subjects repeated measures design using a number of evaluation tools. The participants were two hearing-impaired adult subjects who received intervention and two normally hearing adult subjects who served as unfamiliar communication partners, one of whom received intervention (i.e. the intervention communication partner, ICP) and one of whom did not (i.e. the control communication partner, CCP). The study consisted of a therapy component which was administered over a four week period and an evaluation component which was administered over an eight week period.

The therapy and evaluation components of this study are displayed in Figure 2.1.

Figure 2.1. Time-frame for evaluation and therapy schedule.



The intervention component entailed each hearing-impaired subject receiving eight hours of individual intervention and the ICP receiving seven hours of individual intervention over a four week period. Intervention was an adaptation of the communication-based aural rehabilitation program developed by Erber (1988). The CCP did not receive any intervention. Neither the ICP nor the CCP interacted with either of the hearing-impaired subjects during the intervention sessions, nor did they receive any information pertaining to the nature of the intervention sessions conducted with the hard-of-hearing subjects.

To evaluate the effects of therapy each hearing-impaired subject's communication performance was evaluated with both the ICP and the CCP. Each hearing-impaired subject was required to attend five separate one-hour evaluation sessions with the CCP at regular intervals of two weeks. The evaluation sessions were scheduled as follows (see Figure 2.1): 1) two weeks pre therapy; 2) at the start of

therapy; 3) two weeks after the start of therapy (i.e. mid therapy); 4) on completion of therapy; and, 5) two weeks post therapy. Each hearing-impaired subject was also required to attend three separate one-hour evaluation sessions with the ICP at evaluation sessions 1 (2 weeks pre-therapy), 3 (mid-therapy), and 5 (2 weeks post-therapy). All evaluation sessions were kept within an one-hour time limit. At the evaluation periods in which the hearing-impaired subjects had to complete an evaluation with both of the communication partners (i.e. 1,3, and 5), the one-hour session with the CCP was completed first with a rest period of at least one hour before the evaluation session with the ICP was initiated.

The evaluation schedule was initially to be set up so that there would be two baseline measurements, evaluation periods 1 and 2, with evaluation 2 providing a control for possible task practice effects. However, it was not possible for each hearing-impaired subject to be evaluated at each of the five sessions with both the ICP and CCP due to the subjects' time-constraints. Consequently, the evaluation schedules of the hearing-impaired subjects with the ICP (evaluation sessions 1, 3, and 5) and the CCP (all five evaluation sessions) were not the same. Examination of the data in evaluation sessions 1 and 2 with the CCP did not indicate practice effects. Therefore, due to the discrepancy between the evaluation schedules of the ICP and CCP, evaluation 1 was chosen to be the baseline measurement.

SUBJECTS

Hearing-impaired Subjects

Two hearing-impaired adult subjects participated in this study. In addition, one pilot subject served to determine appropriate evaluation and intervention procedures. Data collected on the pilot subject were not subjected to analysis nor presented in this paper. All of the subjects were recruited through an

audiologist involved in a project on Post-Secondary Hearing Accessibility being conducted at the School of Audiology and Speech Sciences at the University of British Columbia. The selection criteria for the hearing-impaired subjects were as follows: 1) at least a mild bilateral sensorineural hearing loss; 2) no prior communication therapy; 3) residual communication difficulties in his/her occupational and/or educational environment; 4) fluent speaker of English; and, 5) desire to participate in the study. In the presence of the referring audiologist, the investigator screened each subject to determine eligibility for inclusion in the study and to explain the general philosophy of the aural rehabilitation therapy (i.e. using recurring conversational patterns and rules in the management of their hearing difficulties in conversational situations). Each subject signed and received a copy of a consent form.

Subject 1, a 45-year-old woman, presented with a flat mild bilateral sensorineural hearing loss. She reported experiencing communication difficulties within her work environment as a research lab assistant and with unfamiliar communication partners, but did not yet wish to consider amplification. Subject 2, a 26-year-old female undergraduate student majoring in English Literature, presented with a sloping mild-to-moderate bilateral sensorineural hearing loss. She reported communication difficulties within her educational setting and with unfamiliar communication partners. A trial period of hearing aid usage during her classes was being considered, but was not initiated until after the completion of this study. The audiological profile of the two hearing-impaired subjects may be found in Appendix A.

Communication Partners

Two normally hearing post secondary-educated females participated as unfamiliar communication partners for the hearing-impaired subjects in the study. One served as the ICP and received intervention

regarding effective communication skills with hearing-impaired individuals. She was recruited through the "Community Outreach for Hard of Hearing Seniors" project being jointly conducted by the School of Audiology and Speech Sciences and the Western Institute for the Deaf and Hard of Hearing. Her participation in the present study constituted part of her training for employment in that project. She was not known by either of the hearing-impaired subjects prior to this study.

The second normally hearing subject served as the control communication partner (CCP). She did not participate in any therapy sessions, nor was she aware of the particulars of the therapy program. She was a graduate-student research assistant employed by the School of Audiology and Speech Sciences. As with the ICP she was not known by either of the hearing-impaired subjects prior to this study.

THERAPY PROCEDURES

Therapy, which was adapted from a communication based aural rehabilitation approach developed by Erber (1988), consisted of two aspects: 1) information components which involved introducing the conversational principles employed by Erber, and 2) providing practice activities for the application of the new knowledge and skills. Therapy was structured such that each hearing-impaired subject and the ICP received all of the information components, accompanied by appropriate practice activities, by the end of week two of therapy (i.e. before the mid evaluation). The two weeks of therapy following the mid-evaluation provided further intensive practice in the implementation of the skills in less structured activities (i.e. more naturalistic conversational situations), especially in listening situations reported by the subjects to be particularly difficult. Following is a general description of the therapy program administered to the hearing-impaired subjects and the ICP. For more detailed therapy logs for the hearing-impaired subjects

and the ICP, please refer to Appendices B and C, respectively.

Hearing-impaired Subjects

Each hearing-impaired subject received eight hours of individual communication-therapy. Subject 1 received two one-hour sessions per week in the first two weeks of therapy, one one-hour session in week three of therapy, and two one-and-a-half hour sessions in week four of therapy. Subject 2 received two one-hour sessions per week. Both subjects received the same total therapy time. Therapy sessions were conducted in an audiology laboratory room located in the School of Audiology and Speech Sciences at the University of British Columbia and were scheduled at the convenience of the subjects. All sessions were conducted by the investigator in the presence of a supervising clinician who participated in exercises and/or discussions as required.

For the purpose of this study, therapy was presented in terms of four information components: 1) problem solving and clarification requests; 2) semantic and syntactic factors; 3) situational and contextual factors; and, 4) sequential contingencies. Each will be discussed below.

Component one involved explaining a problem-solving approach to resolve communication breakdowns (e.g. identification of the source of difficulty, selection of a corrective strategy, and evaluation of the effectiveness of the strategy) and discussing different sources of communication breakdown (e.g. message structure or content, environment, speaker's manner of presentation) and appropriate solutions. It also included an explanation of the different types of clarification requests and their advantages and disadvantages (e.g. specific versus nonspecific clarification requests). The types of clarification requests

discussed included requesting: repetition of a specific constituent, rephrasing, modification of syntax, confirmation, explanation, spelling, and a change of speaker's manner of presentation. In addition, the use of effective clarification requests was discussed in relation to a communication breakdown continuum (Kaplan, Bally & Garrestson, 1985). Written materials listing the problem solving steps, sources and solutions to communication breakdowns, and contrasting specific versus nonspecific clarification requests with examples were provided to each subject.

The second component involved an explanation of how the subjects could use their already existing knowledge about word associations and the grammatical rules and patterns of English to make "informed guesses" when misperceptions occurred. Appropriate handouts with examples were provided.

Component three involved an explanation and discussion of how contextual cues (e.g. the environment, shared knowledge of the participants, etc.) create expectations which could be used by the hearing-impaired subject to increase the understanding of a conversation and to help to clarify misperceptions. A handout providing examples of contextual cues and the degree to which they might limit the predictability of the content of a conversation was given to each subject.

The last information component provided an explanation about the sequential tendencies of a conversation and a discussion on how one's knowledge about them might be used to "direct" or guide a conversation so as to enhance the predictability, hence the intelligibility, of a communication partner's response and to help clarify misperceptions based on these sequential expectations. A handout detailing the hierarchy of sequential contingencies in relation to the predictability of the communication partner's

response (e.g. yes/no questions, choice questions, specific questions, general questions, and statements) with appropriate examples was provided.

Each of the four information components was accompanied by appropriate practice activities, both structured and unstructured (e.g. TOPICON, QUESTAR), in order to allow the subjects opportunities to apply the new knowledge and skills. For a more detailed description of these therapy activities please refer to Erber (1988).

Instrumentation

A GSI 16 audiometer, model 1716, was used in the presentation of live voice in therapy activities done in an IAC sound-attenuating booth. Recorded eight speaker babble noise at varying S/N ratios was used in some of the therapy activities (see Appendix B) and was presented using a Yamaha KX-500 U cassette deck routed through the audiometer. Therapy sessions were audiotaped with a Marantz 420 taperecorder and a PZM microphone (33-1090B). One therapy session was videotaped using a Sony videocamera mounted on a tripod.

Intervention Communication Partner

The ICP received seven hours of individual therapy. Over the four week therapy period, she received three two-hour sessions once per week in the first three weeks of therapy and one one-hour session in week four. The ICP did not interact with the hearing-impaired subjects during their therapy sessions. Therapy sessions were conducted in an audiology laboratory room located in the School of Audiology and Speech Sciences and were scheduled at the subject's convenience. All sessions were conducted

by the investigator in the presence of a supervising clinician who participated in exercises and/or discussions as required.

Therapy for the ICP consisted of four areas of focus. First, the problem-solving approach to resolving communication breakdowns (as noted above) was explained. Potential sources of communication breakdowns and appropriate solutions were discussed, especially those relevant to the communication partner (e.g. manner of presentation, message content and form). Second, an explanation of the different types of repair strategies was provided and discussed in relation to Kaplan et al.'s (1985) Expressive Communication Breakdown Continuum. The repair strategies that were discussed included partial repetition, paraphrasing, elaborating/explaining, simplifying syntax, confirming, spelling and the use of gestures (definitions and examples of each category may be found in the Analysis section below). Third, the concept of sequential contingencies was explained and discussed in relation to how the communication partner's responses might vary in their intelligibility for a hearing-impaired individual. Fourth, the communication partner was provided with opportunities to experience a simulated hearing loss using a device which simulates a range of hearing losses, HELOS (Erber, 1988), in order to foster a greater understanding and appreciation of communication difficulties experienced by hearing-impaired individuals. Ramifications of hearing loss with respect to the communication problems that were experienced when HELOS was used were discussed, along with possible solutions. Appropriate handouts were provided for all areas of focus.

A variety of therapy activities, both structured and more naturalistic, provided opportunities for the ICP to practice and apply the new knowledge and skills. Therapy activities were often conducted in a sound

booth using the HELOS equipment, with the ICP acting sometimes as the person experiencing a simulated hearing loss and sometimes as the communication partner with the investigator or clinician experiencing the hearing loss.

Instrumentation for HELOS

HELOS is an electronic hearing-loss simulator which modifies the incoming speech signal to simulate a range of hearing losses. The use of this equipment allows the normally hearing communication partner to experience speech as it might be perceived by a hearing-impaired individual and provides training opportunities for the use of communication techniques.

The device alters the incoming speech signal in that it creates effects similar to abnormally elevated auditory thresholds by passing the electrical speech signal through a circuit which filters out high frequency components of sound input. In addition, it creates the perception of auditory distortion by introducing random time delays between input and output signals which become progressively greater as the input frequencies increase (Gagné and Erber, 1987; Erber 1988).

During the therapy sessions with the ICP the HELOS was set up in a sound booth with the participants being able to see each other through a window. The input to the HELOS came from a microphone on the client-side of the booth. The HELOS output was presented through the audiometer over the loudspeaker. The HELOS settings were adjusted so that the listener (either the ICP, investigator, or clinician) experienced difficulty in understanding the speaker's speech.

EVALUATION PROCEDURES

The objective of this rehabilitation program was to improve the hearing-impaired subject's ability to engage in more efficient and fluent conversations. Erber (1988) defines a fluent conversation as "one in which information, ideas, feelings, and attitudes are exchanged in an efficient and coherent manner" (p. 187). Although various rating scales have been used to qualitatively describe the nature of conversations (Davis and Wilcox, 1985; Prutting and Kirchner, 1987), no standard method for quantifying the fluency of a conversation presently exists.

Erber (1988) attempts to quantify conversational fluency through the use of a subjective fluency assessment scale based on a similar one developed by Prutting and Kirchner (1987) for assessing communication behaviours of traumatic head injured clients. However, Erber (1988) outlines the need for more quantifiable measures of conversational fluency to be developed and tested for reliability and validity. He contends that a basic component of conversational fluency which may be quantifiable is efficiency. Erber defines efficiency as the rate at which ideas and feelings are conveyed by the communicators (i.e. the rate of information exchange). According to him, three correlates of efficiency contribute to conversational fluency and are easily quantifiable: 1) the turn-per-minute rate; 2) the proportion of time each communicator talks during the conversation; and, 3) the proportion of total conversation devoted to information exchange versus clarification. However, conversational fluency, as defined by Erber (i.e. efficiency), is only a theoretical notion which has yet to be substantiated by research. For the purposes of this study it will be accepted that efficiency is one of the necessary conditions of a fluent conversation. The present study employed a battery of four evaluation tools as a means for gathering data to quantify the degree of efficiency and fluency in conversations.

Evaluation Battery and Materials

A battery of four evaluation activities was employed in this study to evaluate the subjects' ability to engage in more fluent and efficient conversations: the Hearing Performance Inventory (Giolas, Owens, Lamb, and Schubert, 1979), a tracking procedure (DeFilippo and Scott, 1978), a conversational TOPICON activity (i.e. dyadic conversation) (Erber, 1988), and a post therapy interview. The arrangement of the four evaluation activities across the evaluation sessions with the ICP and CCP is displayed in Table 2.1. Each evaluation tool and its testing procedures will now be discussed.

TABLE 2.1 Evaluation battery and schedule

Evaluation Activity		Evaluation Session				
		1	2	3	4	5
HPI Questionnaire		*			*	
Tracking	CCP	*	*	*	*	*
	ICP	*		*		*
TOPICON	CCP	*	*	*	*	*
	ICP	*		*		*
Post Therapy Interview with each HI subject and ICP						*

Notes:

HI = hearing-impaired
CCP = control communication partner
ICP = intervention communication partner

The Hearing-Performance Inventory

The Hearing-Performance Inventory (HPI) is a self-report evaluation tool developed to assess "hearing

performance in those problem communication areas experienced in everyday listening" (Giolas, Owens, Lamb, and Schubert, 1979). This study employed the 131-question version of the HPI because it provides sufficient information needed to assess progress and can be completed within a reasonable time-frame by the subjects. The basic format of the HPI consists of having listeners judge their listening performance in a variety of everyday listening situations according to the following six response choices: practically always, frequently, about half the time, occasionally, almost never, and does not apply. The HPI also served as a potential diagnostic aid in considering individual rehabilitation goals.

The HPI questionnaire was completed both pre and post-intervention (evaluation period 1 and 4, respectively) by the hearing-impaired subjects. The subjects were allowed to complete the HPI questionnaire at home, but were required to return it at the following evaluation period (2 and 5, respectively). Prior to handing out the questionnaire, the investigator discussed the nature of the questionnaire with each subject and provided instructions on the use of the response categories. Written instructions were also provided with each questionnaire.

In addition to serving as part of the evaluation battery, the HPI also served as a potential diagnostic aid in considering individual rehabilitation goals.

Tracking Evaluation Task

Tracking Procedure

Tracking is a an method designed by De Filippo and Scott (1978) to train and evaluate the reception of ongoing speech by hearing-impaired individuals. It requires one participant to repeat verbatim written

text that is presented orally by a second participant. If the first participant fails to repeat the presented passage of the text verbatim, then the two participants must engage in a repair sequence until the passage of text is repeated verbatim. This procedure is repeated until the whole text is completed. The time required to complete the text is measured and words per minute is calculated. In order to make the tracking task sufficiently difficult for the hearing-impaired subjects in the present study (i.e. avoid floor and ceiling effects), competing noise was introduced into the tracking task. Thus, the hearing-impaired subjects in the present study listened to and repeated verbatim prepared text material that was presented orally by either the CCP or ICP in eight speaker babble noise.

Each hearing-impaired subject was required to track text at all five evaluation sessions with the CCP and at evaluation sessions 1, 3, and 5 with the ICP. At each evaluation session each hearing-impaired subject and communication partner pair tracked two text types: a narrative and a restaurant review. Following the completion of each text, each hearing-impaired subject was required to complete ten written multiple-choice questions about the content of the passage. Please refer to Appendices D and E for an example of a narrative text and the corresponding questions and to Appendices F and G for an example of a restaurant review text and corresponding questions. Following completion of each text the hearing-impaired subject was required to answer questions 1 to 4 of a Verbal Protocol Questionnaire (see Appendix H) developed by Pichora-Fuller and Johnson (1993) regarding communicative aspects of the interaction. All tasks in the tracking evaluation activity, except for the multiple-choice questions, were audiorecorded and transcribed later for analysis.

Materials for Tracking

Materials for the tracking activity included 22 passages (6 of which were used with the pilot subject) consisting of equal numbers of two text structures: narratives and restaurant reviews. Of the 22 passages and their corresponding multiple-choice questions six were borrowed from Howarth (1992), eight were developed by Feldbruegge (1994), and eight were developed by the investigator.

In order for the texts to be appropriate for individuals with a range of educational backgrounds, they were equated for readability. Each of the passages was run through the Grammatik IV software program, which analyzes sentence grammar and syllable length to derive a readability score based on Flesch's formula (as cited in Howarth, 1992). However, the software program does not equate the texts for vocabulary. Each passage was judged to have a readability score of 60 to 75, which equates to a grade 7 to 9 reading level. The passages were also equated for overall number of syllables. Across the 22 passages, the number of syllables ranged from 487 to 624 and from 482 to 592 for the narratives and restaurant reviews respectively. Details regarding the readability scores, reading levels, and syllable numbers of each text may be found in Appendix I. Passages were divided into lines followed the criteria used by Howarth (1992, pp 41-42).

The 22 passages used were randomly selected (without replacement) across the evaluation sessions. At each evaluation period the CCP tracked the same texts with both hearing-impaired subjects. This arrangement lends itself to possible practice effects on the part of the CCP which should have been controlled for by alternately reversing the order in which the hearing-impaired subjects were evaluated with the CCP over the evaluation schedule. For example, in evaluation session one S2 could have been

evaluated with the CCP first and in evaluation session two S1 could have been evaluated first. However, this was not feasible, as it proved to be inconvenient for the subjects. Consequently, S2 was always evaluated first, before S1, in all evaluation sessions with the CCP. The ICP was never assigned the same text material with both hearing-impaired subjects during the same evaluation session and never the same text material assigned to the CCP.

Presentation conditions for Tracking

Testing was done with the communication partner presenting the text material to the hearing-impaired subject seated equidistant from two loudspeakers in an IAC sound-attenuating booth. The communication partner could view the hearing-impaired subject through a double-pane glass window, but speechreading cues were prevented by having the communication partner hold the text material so as to cover her mouth. Eye contact was allowed. Prior to testing, the input control was adjusted so that the communication partner's voice intensity approximated 0dB on the VU meter. The passage of text in eight speaker babble noise was presented diotically through a loudspeaker system at a -20dB S:N (45/65 dBHL) for each hearing-impaired subject. A description of the process used to determine the S/N ratio employed with the hearing-impaired subjects may be found below in section "D". It was necessary to employ background noise and eliminate speechreading cues to make the task sufficiently difficult to avoid ceiling effects.

The investigator was seated next to the communication partner, where she timed each text with a stopwatch in full view of both participants. A 15 minute time limit was imposed on the tracking of each text in order to keep the evaluation sessions within the hour timeframe allotted for each evaluation

session. In the event that a text was not completed within the allotted 15 minutes, only the first five multiple-choice questions were completed by the hearing-impaired subject. Each hearing-impaired subject completed the multiple-choice questions and the verbal protocol while still seated in the sound booth, with the investigator administering the Verbal Protocol Questionnaire through the loudspeaker system.

Determination of Signal-to-Noise Ratio

To ensure that any changes in communication behaviour as a result of intervention would be observable (i.e. to avoid floor and ceiling effects) during both the tracking and TOPICON evaluation activities, competing noise was introduced. Therefore, it was necessary to determine the S/N ratio to be used with each hearing-impaired subject during the evaluation activities. This was done at the beginning of evaluation session one for each hearing-impaired subject using a procedure suggested by Pichora-Fuller (personal communication, 1993).

The procedure was carried out by the investigator with the hearing-impaired subject seated in the sound booth equidistant from the loudspeakers. All the audiometric tests were administered through the loudspeaker system with the instrumentation described below and used eight speaker babble noise.

First, the hearing-impaired subject's babble threshold was determined using the descending/ascending method (Bilger, Nuetzel, Rabinowitz, & Rzeczkowski, 1984). Steps of 2dB HL were used. Second, the Speech Perception in Noise (SPIN) test (Bilger et al., 1984; Kalikow, Stevens, & Elliott, 1977) was administered. A +8 dB S:N was used with the taped sentences being presented 50 dB above and the

babble noise 42 dB above the subject's babble threshold. The goal here was to find the lowest S/N ratio at which the subject could still achieve 100% recognition of conversational speech (i.e. where ceiling effects would be expected). If the subject did not achieve 100% at the +8 dBHL S:N, then the lowest S/N had to be searched for using different SPIN lists. However, this was not necessary with either subject. Third, the Speech Recognition Threshold (SRT) in noise (Cheesman, 1992) was administered. Taped presentation of a small closed set of spondees was used. The presentation level for the babble noise was set at 65 dBHL, while that of the tape was initiated at 65 dBHL followed by 5 dBHL descending steps. The goal here was to find the S/N ratio at which the subject could no longer detect conversational speech (i.e. where floor effects would be expected).

The S/N selected was to be one that was half way between the S/N at which the subject attained 100% recognition of the sentence-final words of the SPIN test and the S/N at which the subject could not identify spondees chosen from a small closed set. Then, using the selected S/N, the live speech was to be presented 50 dB above the subject's babble threshold (if possible) and the babble noise at a level necessary to achieve the desired S/N. However, some difficulties in this S/N selection procedure arose. After determining each hearing-impaired subject's desired S/N, a trial tracking run with a practice narrative passage was attempted. It was found that with both subjects the selected S/N was not sufficiently difficult, even without speechreading cues. The subjects were still able to track at least 90% of the text. This is most likely a factor of the increased contextual cues provided by the narrative text in comparison to the materials used in the SPIN and SRT tests.

To determine a more appropriate S/N for the evaluation, the investigator had each subject track various

practice narrative passages at a variety of decreasing S/N (with respect to the S/N determined using the above procedure) until a S/N was reached at which the subject could track the material with approximately 75% accuracy. A lower level of accuracy was not chosen as it was felt this would make the restaurant reviews too difficult. As both hearing-impaired subjects reported the babble noise to be uncomfortable to listen to above 65 dBHL, the babble noise was held constant at 65 dBHL while the voice level was adjusted until an appropriate S/N was found.

Instructions for Tracking

Prior to the tracking of each text, the hearing-impaired subjects were instructed to listen to and immediately repeat verbatim the passage as presented by the communication partner. The communication partners were simply instructed to verbally present the written text. No strict instructions were given for them to present the text line by line as printed. Both the hearing-impaired subjects and the communication partners were instructed to use any strategies they knew of to resolve communication breakdowns. They were also informed that this was a timed activity, so they were to proceed as quickly as possible. In addition, the hearing-impaired subjects were made aware in the initial instructions that they would be required to answer multiple-choice questions about the content of the text and to answer questions regarding aspects of the interaction (i.e. the verbal protocol) following each text.

"TOPICON" Evaluation Task

Procedure for TOPICON

TOPICON (Erber, 1988) is a dyadic conversation about an identified topic. A conversation-evaluation tool such as this one provides a more functional evaluation of communication skills and behaviour than

the tracking evaluation tool does because it exemplifies more typical everyday conversations (e.g. natural turn-taking, no requirement to repeat the partner's input verbatim, spontaneous input of one's own idea versus reading a prepared text, etc.). As with the tracking activity, the conversation was carried out with competing noise to avoid ceiling effects (i.e. so that it would not be too easy for the hearing-impaired subjects). The procedure for determining the S/N ratio was outlined in the "Tracking" section.

Specifically, the procedure for the TOPICON evaluation activity required each hearing-impaired subject to engage in a 10 to 20 minute dyadic conversation with either the ICP or CCP at the appropriate evaluation sessions (See Table 2.1). The communication partner's voice and the competing noise were presented diotically through the loudspeaker system. Prior to the introduction of the competing noise, the topic was announced with both the CCP and ICP. In conversations involving the CCP, the CCP introduced ten predetermined personal information items. The ICP did not introduce predetermined personal information items into her conversations with the hearing-impaired subjects. Following a conversation with the CCP, the hearing-impaired subject was required to complete ten written multiple-choice questions about the content of the conversation (see Appendix J) and to answer the Verbal Protocol. In the case of the conversations involving the ICP, the hearing-impaired subject was required to complete the Verbal Protocol only. As the ICP did not introduce predetermined personal information items, a multiple-choice quiz was not administered. Each conversation was audiorecorded and transcribed later for discourse analysis. Each corresponding verbal protocol was also audiorecorded and transcribed later for analysis.

Materials for TOPICON

The topics for the conversations with the CCP were preselected by the CCP before the start of the study. A total of five topics, one for each evaluation period, were chosen. Thus, each hearing-impaired subject completed the same topic with the CCP at each evaluation period. The only criterion imposed on the topic selection process was that they should be "common" topics. The CCP was also required to compile a list of ten personal information items for each topic which were to be embedded into each conversation as naturally as possible. This provided an opportunity to objectively assess the hearing-impaired subjects' comprehension of the conversations.

To determine the topic of each conversation with the ICP, both the hearing-impaired subjects and the ICP rated a written list of 16 familiar topics (see Appendix K) in terms of how familiar each topic was to them and their ability to engage in at least a 10 minute conversation on each one. Prior to each conversation the investigator used these lists to choose a topic which was mutually rated as highly-familiar by both the hearing-impaired subject and the ICP.

Presentation conditions for TOPICON

The testing set-up for the TOPICON evaluation activity was the same as that outlined for the tracking activity. As in the tracking activity, an eight speaker babble noise at a -20dB S/N was used for each hearing-impaired subject and speechreading cues were not allowed.

Instructions for TOPICON

The two participants were instructed prior to each conversation to simply talk as they would normally in

a conversation. Each hearing-impaired subject was made aware that she would be required to complete the Verbal Protocol and, in the case of conversations with the CCP, the multiple- choice questions.

Post Therapy Interview

The 15 to 20 minute post therapy interview required each hearing-impaired subject to rate and discuss her satisfaction with her ability to use the information and communication techniques introduced in therapy to gain benefit in her everyday communications and with the communication-based therapy approach to aural rehabilitation in general (see Appendix L). A 10 point satisfaction rating scale was employed, with a rating of 1 being highly dissatisfied and 10 being highly satisfied. The post therapy interview with the intervention communication partner required her to discuss her general comments regarding the program and any skills which she felt she had acquired from participating in this study.

The post therapy interview was individually conducted by the investigator with each hearing-impaired subject and the intervention communication partner at the end of the fifth evaluation session. The interviews were conducted in the audiology lab room with the participant and the investigator comfortably seated facing one another. Each interview was audiorecorded and transcribed later for analysis.

Instrumentation

A GSI 16 audiometer, model 1716, was used in the presentation of the ICP's or CCP's live voice for the tracking, TOPICON, and verbal protocol evaluation activities. Any taped test materials and competing noise were presented using a Yamaha KX-500 U cassette deck routed through the audiometer. A diotic presentation of the live voice/taped material and competing noise to the hearing-impaired subjects was

used in both the tracking and TOPICON evaluation activities. All audiorecordings of the evaluation activities used a Marantz 420 taperecorder and PZM microphone (33-1090B). For the audiorecordings of the tracking and TOPICON activities, the taperecorder was placed on the communication partner's side of the sound booth on a chair next to the investigator out of view of the hearing-impaired subject and communication partner.

ANALYSIS PROCEDURES

Concepts of Use, Benefit, and Satisfaction

This section describes the conceptual framework of the evaluation protocol employed in the present study, while the operational definitions of outcome measures will be presented in the next section. To investigate the effectiveness of the this rehabilitation therapy a three level evaluation protocol was employed. The protocol was adapted from a hearing aid evaluation protocol (Oja & Schow, 1984) that was used to assess three levels: use, benefit, and satisfaction with treatment for hearing aid users. These three factors are not necessarily well correlated, therefore, a three level approach is necessary to provide a comprehensive evaluation. For example, a hearing-aid user may not be satisfied with a fitted hearing aid, even though benefit is demonstrated and vice versa. Use was defined as the reported amount of time the hearing aid was utilized during the day. Benefit was defined as the improvement in a measure in the aided condition as compared to the unaided condition (i.e. speech intelligibility scores, functional gain, self-reports of communicative performance, etc.). Two approaches to the assessment of satisfaction were considered: 1) obtaining a client's response which represents general satisfaction with the treatment (i.e. fitted amplification), and 2) obtaining responses from the client regarding a variety of factors assumed to be related to satisfaction. Oja and Schow chose the first approach. These three

levels were redefined for the purposes of the present study.

Use

In the present study "use" is defined as the extent to which the subjects used the targeted communication techniques during the evaluation sessions and in their everyday conversational interactions post-treatment. The communication techniques include not only requests for clarification and repair strategies, but also top-down processing strategies (use of contextual information) and metacommunication strategies. A basic assumption Erber (1988) makes is that a person can increase his/her awareness of such strategies and use them to participate more fully in conversations, thereby becoming a more efficient and fluent communicator. Therefore, an important aspect of the evaluation of the communication program employed in the present study is to examine whether or not the subjects' use of such communication strategies changed in relation to any observed benefit.

Benefit

Benefit is defined as the improvement the subject experiences in his/her ability to understand conversation, such that more efficient and fluent communication is achieved. As noted previously, Erber (1988) defines a fluent conversation as "one in which information, ideas, feelings, and attitudes are exchanged in an efficient and coherent manner" (p. 187). Furthermore, as discussed in Chapter 1, aural rehabilitation can target three aspects of hearing loss: impairment, disability, and handicap. Benefit may be experienced by a hearing-impaired person in any one or all of these areas. Based on Erber's definition of fluent conversation and the recognition that benefit may be observed in the areas of impairment, disability and/or handicap, it is proposed that benefit will be observed in terms of: 1)

improved efficiency of conversations, where efficiency is defined as the rate of information exchange; 2) improved fluency of conversations, where fluency is defined as the degree to which ideas, feelings, and attitudes are exchanged in an efficient and coherent manner as suggested by the subjects' communication behaviours; 3) improved comprehension, or an increase in the amount of conversation understood; 4) a reduction in processing or listening effort on the part of the hearing-impaired subjects; and, 5) a reduction in hearing disability. These indicators of benefit will be operationalized in the next section.

Satisfaction

The present study employed both aspects of satisfaction suggested by Oja and Schow: general satisfaction with treatment and satisfaction with factors assumed to be related to general satisfaction. Therefore, the construct of satisfaction in the present study consists of two components: 1) the subjects' general "happiness" or "satisfaction level" with the communication therapy program, and 2) their satisfaction with specific abilities targeted by treatment, which will be operationalized in the next section.

Outcome Measures

Each tracked text and TOPICON conversation was orthographically transcribed by the investigator in order to facilitate the analysis procedures. Because the evaluation sessions were only audiorecorded and not videorecorded, the subjects' visual communication and gestures were not transcribed. In addition, the verbal protocols and post therapy interviews were also orthographically transcribed by the investigator. The transcription process was done in the investigator's home using a Yamaha cassette

Table 2.2 Evaluation protocol and outcome measures.

Evaluation Level		Outcome Measures: Objective	Outcome Measures: Subjective	Evaluation Activity
Use		-increase in types of clarification requests and repair strategies used by the HI subjects and the ICP	reported increase in types of requests for clarification and repair strategies the HI subjects and ICP used post therapy	Tracking TOPICON Post Interview
Benefit	Efficiency	-increase in mean text tracking rates -decrease in median rate/repaired presentation utterance -decrease in median rate/nonrepaired presentation utterance -decrease in median #turns/repaired presentation utterance -decrease in % repaired presentation utterances		Tracking
		-increase in Clauses/Minute and Clauses/Turn -decrease in the number of Communication Breakdowns -decrease in the % of Clauses Spent on Repair Sequences		TOPICON
	Fluency	-decrease in the number of Communication Breakdowns -decrease in the number of Interruption Overlaps -decrease in the number of Turns with No Responses -decrease in the number of Gaps(>3secs) Before Response -increase in Information Questions by the HI subjects -balanced use of Topic Initiations/Shifts between participants	-increase in fluency ratings	TOPICON
	Comprehension	-improved comprehension scores	-improved comprehension ratings	Tracking
		-improved comprehension scores in conversations with CCP -increase in the number of Turns as Acknowledgment Only -increase in the number of Backchannel Responses	-improved comprehension ratings	TOPICON
	Listening effort		-decrease in rated effort	Tracking
			-decrease in rated effort	TOPICON
	Hearing disability		-improved score on HPI	HPI
Satisfaction			-general satisfaction with program -satisfaction with specific abilities post treatment	Post Interview

deck. The analysis of the evaluation activities yielded both objective and subjective outcome measures. The outcome measures obtained from the analysis of each of the evaluation activities and their relationship to the evaluation protocol, as displayed in Table 2.2, will now be discussed.

Use Outcome Measures

As previously note, the three specific measures of the use construct are top-down processing strategies (i.e. use of syntactic, semantic and contextual cues), requests for clarification, and repair strategies. Because it is difficult to quantify the use of top-down processing strategies, this evaluation focused on analyzing the subjects' use of requests for clarification and repair strategies. Clarification requests and repair strategies are the most easily quantifiable demonstrations that communication techniques introduced in therapy were used by the subjects.

The analysis of the tracking and TOPICON activities yielded objective measures of use, while the analysis of the accompanying verbal protocols yielded subjective measures of use. The analysis of the post therapy interview provided subjective data on measures of use in the subjects' post-treatment day-to-day conversational interactions. Measurement of the use of the top-down communication strategies and conversational principles introduced in therapy was based on the subjects' reported usage as indicated on the verbal protocols. Each of these evaluation activities and the corresponding measures of use will now be discussed.

Measures of Use: Tracking and TOPICON Evaluation Tasks

The tracking and TOPICON evaluation activities provide objective data on measures related to

conversational repair sequences (i.e. requests for clarification and use of repair strategies). In the tracking activity the frequency of various types of requests of clarification used by the hearing-impaired subjects' were analyzed. As well, the frequency of various types of repair strategies used by the ICP and CCP were analyzed. In the TOPICON activity, unlike the tracking activity, the frequency of various types of requests for clarification and repair strategies used were analyzed for both the hearing-impaired subjects and the ICP and CCP. The hypotheses with respect to use were: 1) that the hearing-impaired subjects would increase the size of their repertoire of requests for clarification and repair strategies, and 2) that the ICP would increase the size of her repertoire of repair strategies, while the CCP would not.

Defining a Repair Sequence

Evidence of use of clarification requests and repair strategies is provided by the subjects' performance in the tracking and TOPICON activities. Analysis of each tracked text and dyadic conversation involved identifying the occurrence of communication breakdowns and the resulting repair sequences.

Due to the different nature of the tracking and TOPICON evaluation activities, the definition for a communication breakdown differs for each activity. The TOPICON activity involves a spontaneous conversational interaction between two conversational partners; therefore, a communication breakdown in the dyadic conversations is defined as an interruption in the flow of conversation resulting from either conversational partner's misperception of the other partner's message (Gibson & Caissie, 1994). This was evidenced by either the use of a request for clarification, inappropriate responses to the speaking partner's turn, or unintended abrupt topic shifts. In contrast, the tracking activity does not involve a spontaneous interaction, but rather one conversational partner (the hearing-impaired subject) who repeats

verbatim the text as presented by the other conversational partner (the normal-hearing subject). Therefore, in the tracking activity a communication breakdown is defined as the failure of the hearing-impaired subject to correctly repeat verbatim the passage of text presented by the normal-hearing communication partner. This was evidenced by a request for clarification by the hearing-impaired subject, the hearing-impaired subject's failure to correctly repeat the passage of text verbatim as presented by the communication partner, or no response from the hearing-impaired subject.

For each communication breakdown the resulting repair sequence was analyzed. A repair sequence can be viewed as a type of contingent query consisting of a three-step sequence (Garvey, 1977). Given two conversational partners, the first step is speaker 1's utterance or the intended message for speaker 2 which is the occasion for the query. Step 2 is a contingent query by speaker 2 or the request for clarification regarding the content of speaker 1's utterance. Step 3 is speaker 1's response (i.e. repair strategy) to speaker 2's request for clarification. The form of the request for clarification is seen to exercise two functions: 1) a selectivity function, which selects the content of the clarification request with respect to the misperceived message (i.e. nonspecific versus specific), and 2) a determining function, which requests a particular type of repair strategy (i.e. requests for repetition, confirmation, specification, or elaboration). As such, the coding of the repair strategy employed must take into account the interpretation of the preceding request for clarification. However, even though the form of the request for clarification acts to determine the function of the repair strategy used, the form of the repair strategy is ultimately chosen by the conversational partner giving the repair strategy. Therefore, in this study the definitions of the repair strategy categories were largely determined by form, with consideration given to the function as suggested by the preceding request for clarification.

In the tracking exercises and TOPICON conversations, respectively, a repair sequence included the initial utterance which failed to be repeated verbatim in the case of tracking or one that was misunderstood in the case of the TOPICON conversations, and the repair sequence included all subsequent utterances used to clarify the misunderstanding. More than one clarification request and/or repair strategy may have been used in a repair sequence.

Coding Requests for Clarification

For the present study, a taxonomy was developed for coding the types of requests for clarification and repair strategies based on the work of Garvey (1977), as outlined above, and definitions used by Caissie and Rockwell (1993). In the case of the TOPICON conversations, requests for clarification and repair strategies were coded for both the hearing-impaired and normal-hearing subjects in order to reflect the interactional nature of communication. However, given the artificial nature of the tracking activity, only requests for clarification that were initiated by the hearing-impaired subjects were coded and only repair strategies employed by the normal-hearing communication partners were coded.

Requests for clarification were classified according to their selectivity function as being either nonspecific or specific. Nonspecific requests for clarification do not direct the partner to the misperceived portion of the message, while specific requests for clarification do. Specific clarification requests were further classified according to their determining function as one of the following types: Request of a Specific Constituent, Requests for Confirmation of the Form, Request for Explanation, and Request for a Change in the Manner of Presentation. Definitions and examples of the coding categories for requests for clarification are displayed in Table 2.3.

TABLE 2.3. Coding categories for requests for clarification.

Category	Definition(function)	Form(s)
Nonspecific:		
Request for Repetition	An utterance which requests the conversational partner to repeat the message, but which does not direct the partner to the part of message specifically misperceived.	a)Direct question (e.g. "What?", "Huh?", "Could you repeat that?") b)Indirect statement (e.g. "I didn't hear you.").
Specific:		
Request for Repetition of a Specific Constituent	An utterance which requests repetition only of the specific information of the message which was misperceived.	a)Wh-question that targets the misperceived portion (e.g. "We'll meet at 6.; "At what time?"). *b)Partial exact repetition of an utterance up to the point of the communication breakdown ending with a rising intonation.
Request for Confirmation of the Form	A request for confirmation from the partner that the message was perceived correctly. It does not specifically request any new/additional information presented in the original utterance.	*a)Full repetition of the message ending with a rising intonation. b)Partial or full repetition preceded by "Did you say" (e.g. "We'll meet at 6."; "Did you say 6?").
Request for Confirmation of the Topic	An utterance which inquires about whether the partner is talking about a particular topic.	Wh-question (e.g. "Are you still talking about tomorrow night's party?").
Request for Explanation	An utterance used to acquire new/additional information that was not presented in the original utterance in order to facilitate understanding.	a)Wh-question b)Direct statement (e.g. "I'm not sure I understand. Could you explain it?"). c)Indirect statement (e.g. "I still don't understand what you mean").
Request for a Change in the Manner of Presentation	An utterance that identifies the source of the difficulty and requests a modification of the partner's speech.	a)Direct wh-question (e.g. "Could you please speak up?") b)Indirect statement ("I can't hear you very well over the noise").

Based on Garvey (1977) and Caissie and Rockwell (1993).
Note: * Refers to forms more typically used in tracking due to the task of repeating verbatim.

Coding Repair Strategies

Repair strategies used in the TOPICON conversations were classified as two principal types: spontaneous repairs and elicited repairs. Spontaneous repairs are those that are self-initiated by the speaker where there has been no explicit request for clarification by the listener, while elicited repairs are brought about by an explicit request for clarification. The repair strategies were further coded according to their function and form into one of the following seven categories: Exact Repetition of Entire Utterance, Paraphrase of Entire Utterance, Syntactic Simplification, Partial Repetition, Confirmation, Elaboration, and Spelling.

Clarification is needed to highlight the difference between Partial Repetitions and Syntactic Simplifications. While it may be that Partial Repetitions and Syntactic Simplifications appear similar in form, in the present study the speaker's goal in employing these two strategies was taken to be different. In the case of Partial Repetitions, the contingent query suggested to the speaker that the listener required only some of the content, so the speaker used a Partial Repetition. However, in the case of Syntactic Simplifications, the contingent query suggested to the speaker that the listener did not receive any or almost none of the content. Consequently, the speaker selected to repeat the entire utterance using chunking of information to help the listener understand the utterance. Therefore, Syntactic Simplification can be viewed as a special case of Partial Repetition, with the primary goal being chunking information to ease processing demands needed by the listener. The coding of repair strategies used in the tracking activities was based on these same seven categories, but due to the artificial nature of the tracking task, it was not meaningful to code them as members of the spontaneous or elicited categories. Definitions and examples for each category are included in Table 2.4.

TABLE 2.4. Coding categories for repair strategies.

Category (per Caissie and Rockwell, 1993)	Definition	Determining Function (per Garvey, 1977)
Exact Repetition of Entire Utterance	Full repetition of the original misperceived message in response to a request for repetition. Example: Partner: "I prefer to eat at Earl's" Hearing-Impaired (HI): "What?" Partner: "I prefer to eat at Earl's"	Repetition
Paraphrase of Entire Utterance	Rephrasing the original misperceived message using words of similar meaning without providing any new information (i.e. synonyms, antonyms, word associations). Example: Partner: "I went to visit my parents in Banff" Hearing-Impaired: "What?" Partner: "I travelled to Banff to see my mom and dad"	Repetition
Syntactic Simplification	Simplification of the syntax of the original utterance by "chunking" or breaking the message into shorter segments. Example: Partner: "I went to see my parents in Ontario" Hearing-Impaired: "Pardon?" Partner: "I went to see my parents" Hearing-Impaired: "yeah" Partner" "in Ontario"	Repetition
Partial Repetition	Repetition of a portion of the misperceived message. Includes keywords and phrases. Example: Partner: "I went to see my parents in Banff" HI: "You visited your parents?" Partner: "yeah, in Banff"	Repetition
Confirmation	Providing a yes/no response to a partner's request for confirmation. Partner: "I'll meet you at six" HI: "Did you say six?" Partner: "Yeah"	Confirmation
Elaboration	Expressing new or additional information not present in the original message in order to provide supplementary cues to facilitate understanding (e.g. explanations, descriptions, definitions, grammatical cues). Example: Partner: "I went to Greece for my holidays last year" Hearing-Impaired: "What?" Partner: "I have friends in Greece, so I spent my holidays last year visiting them"	Elaboration
Spelling	Providing the first sound or letter of a word or the spelling of a word. Example: Partner: "I just love calamari" Hearing-Impaired: "You love what?" Partner: "Calamari, C-A-L-A-M-A-R-I"	Repetition

Based on Garvey (1977) and Caissie and Rockwell (1993).

Reliability Procedures

A sample of a TOPICON and tracking interaction provided the data for judging intra-rater reliability for coding of requests for clarification and repair strategies. Each sample was coded twice, on separate occasions, by the researcher and the agreement in counts for each measures was calculated. Measures of intra-rater reliability for coding of requests for clarification in tracking ranged from 86 to 100%, while in the TOPICON intra-rater reliability was 100%. Measures of intra-rater reliability for coding repair strategies in tracking ranged from 82 to 100% and from 88 to 100% in the TOPICON interaction. The intra-rater reliability data are presented in Appendix M.

Measures of Use: Post Therapy Interview

Further subjective evidence of the use of communication techniques was provided by each subject's report in the post therapy interview. The hypothesis was that the hearing-impaired subjects would report that they were using a greater variety of requests for clarification and repair strategies more effectively in nonlaboratory contexts post-treatment.

Benefit Outcome Measures

Benefit was defined as the improvement the subject experiences in his/her ability to understand conversations. Evidence of benefit is provided by an analysis of the subjects' performance in the tracking, TOPICON, HPI, and post therapy interview evaluation activities. As previously discussed, benefit will be indicated by: 1) an improvement in efficiency; 2) an improvement in conversational fluency; 3) an increase in the amount of conversation understood (i.e. comprehension); 4) a reduction in listening effort; and, 5) a reduction in hearing disability. The outcome measures obtained from the

analysis of each appropriate evaluation activity will be discussed in relation to which aspect of benefit it provides supporting evidence for.

Measures of Benefit in the Tracking Task

Eight outcome measures were obtained from the analysis of the tracked texts that can be viewed as offering supporting evidence for benefit: 1) mean text tracking rate; 2) the median rate per repaired presentation utterance in each text; 3) the median rate per nonrepaired presentation utterance in each text; 4) the median number of turns per repaired presentation utterance; 5) the percentage of repaired presentation utterances in each text; 6) the reported effort rating for each text, as obtained from the verbal protocol; 7) the comprehension score for each text, derived from the scoring of the multiple-choice questions; and, 8) a reported comprehension level for each text, as indicated from the verbal protocol.

The measure of mean text tracking rate was developed by DeFilippo and Scott (1978), while the measures of median rate per nonrepaired and repaired presentation utterance, the median number of turns per repaired presentation utterance and the percentage of repaired presentation utterances were developed by the researcher. The use of measures of effort, comprehension score, and comprehension level were based on a study by Pichora-Fuller and Johnson (1993). The definitions of the outcome measures derived from the analysis of the tracking activity and their relationship to the four parameters of benefit (efficiency, fluency, comprehension, and listening effort) follow.

Mean Text Tracking Rate:

The mean text tracking rate in words per minute (WPM) and syllables per minutes (SPM) was calculated

for each text by dividing the total number of words or syllables by the time taken to complete the text. Although tracking rates are typically reported as WPM, it was felt that the SPM measure would provide a more accurate measure because the texts were equated for number of syllables instead of words. This objective measure is the primary index of efficiency in the tracking exercises: the faster the mean text tracking rate (i.e. the faster the information exchange), the greater the efficiency.

Median Rate per Repaired Presentation Utterance:

For the purposes of calculation of the measures of median rate per repaired and nonrepaired presentation utterances, a presentation utterance corresponds to the unit of written text that the normal-hearing communication partner chose to orally present for tracking. A presentation utterance does not necessarily equate to the written lines of the text, as the communication partners were allowed to present the text in units of their own choice. For example, if the written text line to be presented was "It did not take long to discover" and the normal-hearing communication partner chose to break the oral presentation of the line up into the two segments "It did not take long" and "to discover", then this one written text line would have two presentation utterances, as already noted. A repaired presentation utterance is one in which a communication breakdown occurred, thereby requiring a repair sequence. The repair sequences included the presentation utterance.

The time (SPM) for the repair sequence of each repaired presentation utterance in a text was determined and then entered into a computer-run statistics program, which calculated the median and interquartile values for that text. These measures of central tendency and variability were used because the distribution of scores was non-normal (i.e. some repair sequences were extremely easy, while others

were extremely difficult).

This measure provides objective evidence for the efficiency of a conversation: the faster the median rate per repaired presentation utterance, the greater the efficiency of the conversation (i.e. more time spent on information exchange in a conversation than on repair sequences). The hypothesis was that, as a result of therapy, the subjects would exhibit faster rates of repair for communication breakdowns (i.e. a decrease in the median rate/repaired presentation utterance) across the evaluation schedule.

Median Rate per Nonrepaired Presentation Utterance:

A nonrepaired presentation utterance is one in which no communication breakdown occurred; so a repair sequence was not necessary. Therefore, a nonrepaired presentation utterance would elicit a two-turn interaction: one for the presentation utterance by the normal-hearing communication partner and one for the verbatim repetition by the hearing-impaired subject. Both turns were included in the calculation. Nonrepaired presentation utterances do not include those that required repair but were left unrepaired. None of this latter type were observed. The time taken to track each nonrepaired presentation utterance in each text was calculated (SPM) and then the median and interquartile values for each text were calculated. This measure provides objective evidence for efficiency: the faster the median rate per nonrepaired presentation utterance, the greater the efficiency of the conversation. A decrease in the median rate per nonrepaired presentation utterance (i.e. faster exchange of information) across the evaluation schedule would indicate increased efficiency.

Percentage of Repaired Presentation Utterances:

The percentage of repaired presentation utterances is defined as the total number of presentation utterances in a text requiring repair compared to the total number of presentation utterances in a given text. It is calculated by dividing the number of repaired presentation utterances (defined above) by the total number of presentation utterances (defined above) for a given text. It provides an objective measure of efficiency: the smaller the percentage of presentation utterances requiring repair, the greater the efficiency of the conversation (i.e. the greater amount on time spent on information exchange rather than repair sequences). A decrease in the percentage of repaired presentation utterances across the evaluation schedule would indicate increased efficiency.

Median Number of Turns to Repair a Communication Breakdown:

The median number of turns in the repair sequence for each repaired presentation utterance in a given text was also calculated. Within a repair sequence a turn is defined as "all the utterances from when the speaker began to speak (following a turn by the other speaker or a pause of at least 3 seconds after her own last utterance when that utterance had utterance final intonation and was not a filler or other indicator of intention to continue) until the other speaker began to speak or until a pause of 3 seconds meeting the criteria noted above "(Pichora-Fuller & Johnson, 1993). The counting of turns within a repair sequence did not include the hearing-impaired subject's utterance containing the communication breakdown (i.e. the failed attempt to repeat a passage of text verbatim), although the repair sequence was initiated following that utterance with the communication breakdown. This measure provides objective evidence of efficiency: the fewer turns required to repair a communication breakdown, the greater the efficiency (i.e. faster information exchange and more time spent on information exchange than

repair sequences).

Effort Rating:

Each subject rated how effortful the tracking of each text was on a scale from 1 to 10, with 1 being not at all effortful and 10 being extremely effortful. This measure provides subjective evidence for listening effort. As mentioned in Chapter 1, page , effort is considered a secondary index of handicap that results from a hearing-impaired person's adaptation or adjustment to his/her disability. The hypothesis was that the reported effort rating would decrease across the evaluation schedule as a result of therapy.

Comprehension Score:

A comprehension score for each tracked text was calculated from the each subject's performance on the ten question multiple-choice test given after tracking each text. This provided an objective measure of comprehension. A subjective measure of comprehension was also provided by each subjects' self-reported comprehension level as indicated on the verbal protocol.

Measures of Benefit in the TOPICON Task

Benefit-related measures were derived from the verbal protocols and multiple-choice comprehension tests, as well as from a detailed discourse analysis for each TOPICON conversation. A subjective measure of effort was obtained from each subject's self-reported effort rating on the verbal protocols. A subjective measure of comprehension was obtained from each subject's self-reported comprehension level on the verbal protocols, while an objective measure of comprehension for conversations involving the CCP was obtained from each hearing-impaired subject's score on the multiple-choice question test.

Each TOPICON conversation was also rated for its overall fluency. A speech-language pathologist, not directly involved in this study, listened to the audiorecorded conversations and rated each for its overall fluency and fifteen related pragmatic factors on a 5 point scale from low to high (1=low, 5=high) using a fluency assessment form developed by Erber (1988, p.80; see Appendix N). The judge was given general instructions on which factors might contribute to a fluent conversation based on the fluency assessment form. The audiorecordings were randomly arranged so that the judge was not aware of the order in which the conversations occurred. The overall fluency rating provided a subjective measure of conversational fluency for each TOPICON conversation. In addition to rating the overall fluency of each TOPICON conversation, each conversation was also subjected to a detailed discourse analysis in an attempt to objectively quantify some of the pragmatic factors listed on Erber's fluency assessment form. The discourse analysis used in the present study was based on one employed on a study by Pichora-Fuller and Johnson (1994) which examined the comprehension of an 80-year-old hard-of-hearing woman in a TOPICON task. The coding of the selected discourse measures for the present study will now be discussed.

Coding of Discourse Measures for the TOPICON Conversations

The discourse measures selected for coding in the present study have been used in previous studies examining discourse comprehension (Johnson & Pichora-Fuller, in press and Pichora-Fuller & Johnson, 1993). The discourse measures can be seen as either relating to the flow of information in a conversation or to how speakers control the information content of the conversation (Johnson and Pichora-Fuller, in press). In the present study, measures related to the flow of information included Clauses per Turn, Clauses per Minute, number of communication breakdowns, and the percentage of

clauses spent on repair sequences. Measures related to the control of information content included Backchannel Responses, Turns as Acknowledgment Only, Turns with No Response, Gaps Greater than Three Seconds Before Response, Interruption Overlaps, Topic Shifts/Initiations, and Information Questions. Each discourse measure will now be defined and discussed with respect to the supporting evidence it yields for derived benefit.

Turns:

The definition of a turn as outlined previously in this chapter is "all the utterances from when the speaker began to speak (following a turn by the other speaker or a pause of at least 3 seconds after her own last utterance when that utterance had utterance final intonation and was not a filler or other indicator of intention to continue) until the other speaker began to speak or until a pause of 3 seconds meeting the criteria noted above" (Pichora-Fuller & Johnson, 1993). Backchannel responses were not counted as turns. Counting turns does not yield an outcome measure in itself, but allows a clauses per turn measure.

Independent Clauses:

An independent clause consists of a single independent clause which selects independently for mood (e.g. declaratives, imperatives, interrogatives, and exclamations) and its subordinate clause (e.g. relative, complements, and adverbial). Also counted as independent clauses are verbless utterances (e.g. "yeah", "oh") not counted as backchannel responses because they have a sentence intonation contour and represent one idea unit. Counting independent clauses is necessary for the calculation of the outcome measures of clauses/minute and clauses per turn.

Clauses per Turn:

The clauses per turn measure, or mean length of turn in clauses, is calculated by dividing the subject's number of independent clauses in a conversation by her number of turns. It quantifies time-sharing of the conversational floor by the conversational partners (i.e. the amount of talking or amount of information expressed by each partner). It provides a potential objective measure of the efficiency of a conversation in terms of more efficient use of turns to convey information (i.e. the use of fewer turns to convey the same amount of information). The hypothesis was that an increase in clauses/turn would be consistent with improvements in other measures of efficiency such as clauses/minute.

Clauses Per Minute:

The clauses/minute measure is calculated by dividing the total number of clauses in a conversation by the duration (in minutes) of the conversation. As it potentially reflects the amount of talking or amount of information expressed by the conversational partners in a given time, it provides a rough objective measure of the efficiency of information exchange. The hypothesis was that an increase in the clauses/minute measure would indicate increased efficiency because the amount of information expressed in a given time has increased.

Communication Breakdowns:

A communication breakdown was previously defined in the Use section of this chapter. A count of the number of communication breakdowns in a conversation provides an objective measure of the efficiency of the conversation. The greater the number of communication breakdowns in a conversation, the less efficient the conversation because more time will be devoted to repair sequences than to information

exchange.

Percentage of Clauses Spent on Repair Sequences:

This measure was calculated by dividing the number of clauses spent on repair sequences by the total number of clauses in a given conversation. It provides a measure of the efficiency of the TOPICON conversations, with a reduction in the percentage of clauses spent on repair sequences suggesting improved efficiency (i.e. more clauses directed at information exchange than conversational repair). It also provides a measure of efficiency of repair sequences.

Backchannel Responses:

A Backchannel Response is defined as an acknowledging or affective remark (e.g. "yeah", "oh", etc.) which may not occur at transition relevant points (e.g. appropriate points to change speakers, after pauses, etc.), is not an attempt to take control of the conversational floor, and does not result in the speaker who is holding the conversational floor yielding it. Included as Backchannel Responses are those acknowledging or affective remarks which follow an other-speaker clause with rising intonation but no pause, suggesting that the other-speaker's intention was to not yield the conversational floor.

Backchannel Responses may be used to show understanding of a message, to participate in a conversation (showing interest and attention) without actual understanding of the message, or they may be a feature of an individual's conversational style. For the purposes of this study, the frequency of Backchannel Responses is taken as a potential objective measure of comprehension. However, due to variety of communicative functions Backchannels may serve, its interpretation as a measure of

comprehension must take into account and be consistent with other available measures of comprehension. For example, a high count of Backchannel Responses could be consistent with a high comprehension level as indicated by a comprehension score on a multiple-choice test if Backchannel Responses were used to show understanding of a message.

Turns as Acknowledgment Only:

These turns consist of an acknowledgment (e.g. "yeah") of the previous speaker's contribution with no additional content included and they result in the other speaker yielding the floor. In contrast to Backchannel Responses, they do count as real turns because they occur at transition relevant points and the other speaker stops talking. Turns which are acknowledgments only may be used by a listener to signal comprehension of a message or they may be used as a strategy, particularly by hard-of-hearing persons, to use conversation as a means of social interaction. In this latter case, a hard-of-hearing individual can converse and socially interact without having to understand the conversation or adding new information to the conversation. As such, this measure is only a potential objective measure of comprehension. As with Backchannel Responses, its interpretation must take into account and be consistent with other measures of comprehension. For example, a high count of turns as acknowledgment only would be consistent with a high comprehension level indicated on a multiple-choice test or reported by the subject if turns as acknowledgment only were used to show understanding of a message.

Turns with No Response:

These are turns in which the speaker who holds the floor has either paused and yielded the floor or has

elicited a response from the other speaker, but because the other speaker fails to respond within an appropriate time (i.e. 3 seconds) the previous speaker resumes talking (i.e. takes another turn). The failure of the speaker to take her appropriate turn might be due to her missing the turn-taking cues (either due to inattention or hearing difficulties) or to a lack of comprehension of the preceding message. Therefore, this measure provides objective evidence for conversational fluency. Fluent conversations typically involve a smooth interchange of turntaking. Therefore, a conversation with a high number of turns with no response might be judged as being less fluent than one with a low number of turns with no response. In this study, a reduction in the number of turns with no response is taken to indicate an increase in fluency.

Gap (>3 secs) Before Response:

This measure is defined as a pause of 3 or more seconds between the turns of the speakers, not within turns, which is then followed with a turn by either speaker. It may indicate that the prior utterance was not completely understood or heard or that the prior utterance provoked a thoughtful response. In either case, extra time was required to formulate a response. This measure provides objective evidence of conversational fluency. A conversation would be most likely be considered more fluent if it contained a lower count of Gaps Greater than Three Seconds Before Response because of more efficient turntaking dynamics. Therefore, a reduction in the number of Gaps (> 3 secs) Before Response is taken to indicate an increase in fluency.

Interruption Overlaps:

An Interruption Overlap is defined as an instance where the two speakers speak at the same time in the

middle of one speaker's turns resulting in a disruptive interruption (i.e. the interruption does not occur at a transition relevant point). Interruption overlaps may occur for a variety of reasons. They may indicate an eagerness to contribute to the conversation or they may be the result of misjudging the end of the other speaker's turn, thereby potentially indicating lack of comprehension. They may also indicate an attempt to hang onto or control the conversational floor in a desire to speak rather than listen. Often, this is the case with hearing-impaired individuals, as it presumably requires less effort on their part when they are talking as opposed to listening (Erber, 1988). Finally, a large number of Interruption Overlaps may be the result of an individual's conversational style.

A conversation with numerous Interruption Overlaps may be subjectively judged as being less fluent than one with few Interruption Overlaps because the smooth exchange of ideas and feelings may be interrupted. The coherency of the conversation may be adversely affected. Consequently, in the present study, the frequency of Interruption Overlaps is considered to be a potential objective measure of the fluency of a conversation. A reduction in the number of Interruption Overlaps across the evaluation would be consistent with improved conversational fluency ratings.

Topic-Shifts/Initiations:

Conversations are typically characterized by a gradual topic drift, with each speaker contributing to the conversation in terms of the existing topic framework (i.e. main topic) and her own personal subtopics (Brown & Yule, 1983). A topic shift or initiation occurs when one speaker contributes new information that is discontinuous with the information in the preceding turn, thereby reducing the conversational fluency. Although there is a subtle difference between a topic shift and initiation, they both signal

conversational discontinuities and if there is uptake on the introduced topic, then the speaker who changed the topic takes control of the conversational floor.

A topic discontinuity may be motivated by a variety of reasons; for example, the speaker may wish to communicate some ideas brought to mind by the ongoing conversation, the speaker may not have understood the content of the prior turn and may therefore unintentionally change the topic, or the speaker may desire to be in control of the content of the conversation.

Ideally, a fluent conversation is one in which there is a balance or shared responsibility in introducing topics with neither conversational partner having excess control of the content of the conversation. Although guiding the topic selection can be advantageous to hearing-impaired individuals because it allows them to use personal knowledge of familiar topics to help resolve misperceptions more efficiently, it should probably not be used to dominate conversations. Hearing-impaired individuals may use domination of a conversation as a strategy to reduce their listening effort because it requires less effort for them to speak than to listen. Thus, the number of Topic Shifts or Initiations may provide a measure of fluency in that a fluent conversation may be one that consists of a balanced use of Topic Shifts/Initiations between conversational partners.

Information Questions:

An information question is a question which the speaker asks to obtain new information from a conversational partner in relation to the content of the conversation. The primary purpose of an information question is to advance topic development and encourage the exchange of information (i.e.

it is not a clarification request used to repair a conversation). The use of specific information questions, especially in the case of a hard-of-hearing person, may also serve as a strategy for (i.e. relying on contingent responses and topic familiarity) to improve comprehension and prevent misperceptions. The result might be a more fluent and coherent exchange of information and feelings between conversational partners (i.e. improved conversational fluency). However, it is important to keep in mind the social interaction component of conversational interactions. Asking information questions may be more a matter of personal style or reflect the power relations between conversational partners, rather than efficient and fluent communication.

In the present study, the use of information questions is taken to be a potential objective measure of conversational fluency. However, any interpretation of the use of information questions must take into account and be consistent with other measures of fluency. For example, an increase in the use of information questions by a hearing-impaired subject could be consistent with improved fluency ratings if the information questions were used as a strategy to increase comprehension and prevent communication breakdowns.

Reliability Procedures for Discourse Analysis Measures

Initial inter-rater reliability measures based on the definition developed by Pichora-Fuller and Johnson (1993) with respect to the counting of clauses and Backchannel Responses was poor. The discrepancies appeared to originate in the definition of a Backchannel Response. The researcher's count of Backchannel Responses included those acknowledging utterances which followed an other-speaker clause that ended with rising intonation (i.e. final utterance intonation) with no pause, suggesting control

of the conversational floor was not yielded by the other-speaker. The second coder counted these utterances as acknowledgements with turn status; therefore, counting fewer backchannel responses, more clauses, and more turns. In addition, the counting of Backchannel Responses was further complicated by the methodological problem of noise overlay on the tapes making it difficult to hear and transcribe all of the Backchannel Responses. This caveat emphasizes the importance of set-up: taping the conversations without the noise and videotaping the conversations might have yielded more consistent and reliable inter-coder agreement. Consequently, caution should be taken in the interpretation of the measure of Backchannel Responses, as the measure is most likely an underestimate. Conversely, a count of Turns as Acknowledgment Only is most likely an overestimate.

The poor inter-rater reliability agreement led to the refinement of the definition for backchannel responses and to measures of intra-rater reliability. Intra-rater reliability measures for one sample TOPICON conversation were high ranging from 84 to 100% (see Appendix O), suggesting internally consistent coding.

Measures of Benefit: Hearing-Performance Inventory

Although there are questions in the Hearing Performance Inventory for each of the domains of impairment, disability, and handicap, the majority of the questions are related to querying disability, specifically, hearing performance or speech comprehension abilities (i.e. auditory consequences of the impairment). Therefore, the analysis of the HPI questionnaires pre and post therapy in the present study was taken to be an index of the disability a hearing-impaired person experiences in real-life situations. The subjects rate their hearing performance, or ability to comprehend speech or hear sounds, in various

everyday situations. Subjects rate their hearing performance in a given situation described in the questionnaire using the following scale, in which a lower score indicates a better ability to comprehend speech or hear sounds:

1. Practically always (or always)
2. Frequently (about three-quarters of the time)
3. About half the time (about half the time)
4. Occasionally (about a quarter of the time)
5. Almost never (or never)

The questions can be grouped into thirteen subtests to provide a profile of the subject's hearing abilities. The subtests scored in this study include:

1. Intensity - hearing performance in conditions of different sound intensity;
2. Social - hearing performance in social situations;
3. Personal - personal attitudes about hearing loss;
4. Raf - response to auditory failure or how a person responds to not hearing;
5. Speech - hearing performance as it relates to hearing speech;
6. Visual - communication when it is possible to see the other person;
7. Nonvisual - communication when it is not possible to see the other person;
8. Oneone - communication performance in a one to one situation;
9. Many - communication performance with many persons at a time (group);
10. Familiar - communication performance with familiar persons;
11. Stranger - communication performance with strangers;
12. Quiet - communication performance in quiet conditions;
13. Noise - communication performance in noise conditions.

The score for each subtest was the mean response for all the applicable questions. A score of 1 indicates little disability, while a score of 5 indicates great disability. The hypothesis was that each hearing-impaired subject's reported hearing disability would decrease post therapy as a result of becoming a more efficient and fluent communicator.

Measures of Satisfaction

The scoring of the post therapy interviews provided subjective evidence regarding each hearing-impaired

subject's satisfaction level with respect to: 1) the communication therapy program in general, and 2) her ability to use the targeted communication techniques in her everyday conversations to improve efficiency, fluency, and comprehension, and to reduce listening effort and handicap. The scoring of reported satisfaction values was based on a numerical scale of 1 (highly dissatisfied) to 10 (highly satisfied), respectively.

RESTATING GENERAL HYPOTHESES

The general hypotheses put forth at the end of Chapter 1 can now be restated more specifically to reflect the methodology used in this study:

Use

1. It was hypothesized that the hearing-impaired subjects would increase the types of requests for clarification and repair strategies (i.e. repertoire size) they used post-treatment.
2. It was hypothesized that the ICP would increase the types of clarification repair strategies she used post-treatment.

Benefit

1. As a result of using the targeted communication techniques, it was hypothesized that the hearing-impaired subjects would benefit by improving their ability to understand conversations, thereby achieving more efficient and fluent communication. It was proposed that benefit would be indicated by:

   A. Improvement in efficiency, specifically:
      -an improvement in the mean text tracking rates
      -a decrease in the median rate/repaired presentation utterance

-a decrease in the median rate/nonrepaired presentation utterance
-a decrease in the median number of turns/repaired presentation utterance
-a decrease in the percentage of repaired presentation utterances
-an increase in clauses/minute in conversations
-an increase in clauses/turn
-a decrease in the number of communication breakdowns.

B. Improved fluency of conversations, specifically:
-an increase in fluency ratings
-a decrease in the number of communication breakdowns
-a decrease in the number of Interruption Overlaps
-a decrease in the number of Turns with No Response
-an increase in the number of information questions used by the hearing-impaired subjects if consistent with improved fluency ratings (the underlying assumption was that the hearing-impaired subjects used information questions as a strategy to improve the fluency of their conversations)
-a decrease in the number of Gaps Greater than 3 Seconds before Response
-equal distribution of topic shifts/initiations.

C. Increases in the amount of conversation understood (i.e. comprehension), specifically:
-improved comprehension scores and ratings in the tracking exercises
-improved comprehension scores and ratings in the TOPICON conversations with the ICP
-improved comprehension ratings in the TOPICON conversations with ICP
-an increase in Backchannel Responses if consistent with improved comprehension scores and/or ratings (the underlying assumption was that the Backchannel Responses were being used to show understanding)
-an increase in Turns as Acknowledgment Only if consistent with improved comprehension scores and/or ratings (the underlying assumption was that Turns as Acknowledgement Only were used to show understanding)

D. A reduction in listening effort, specifically:
-a decrease in self-reported effort in the tracking and TOPICON tasks

E. a reduction in hearing disability as indicated by lower scores on the HPI post-treatment

2. It was hypothesized that greater benefit would be derived by the hearing-impaired subjects in those interactions with the ICP than in those with the CCP because of the ICP's use of the targeted communication strategies. It was proposed that additional benefit would be indicated by:

A. a greater improvement in the efficiency of the interactions with ICP than with CCP, specifically:
   -greater improvements in mean text tracking rates
   -a greater decrease in the median rate/repaired presentation utterance
   -a greater decrease in the median rate/nonrepaired presentation utterance
   -a greater decrease in the median number of turns/repaired presentation utterance
   -a greater decrease in the percentage of repaired presentation utterances

B. a greater improvement in the fluency of the interactions with ICP than with CCP, specifically:
   -a greater increase in the fluency ratings
   -a greater decrease in the number of communication breakdowns
   -a greater decrease in the number of Interruption Overlaps
   -a greater decrease in the number of Turns as No Response
   -a greater decrease in the number of Gaps Greater than 3 Seconds Before Response
   -more equitable distribution of topic shifts/initiations.

C. a greater improvement in the amount of conversation understood in interactions with ICP than in those with CCP, specifically:
   -greater improvement in the comprehension scores and ratings in the tracking
   -greater improvement in the comprehension ratings in the TOPICON
   -a greater increase in the number of Backchannel Responses used by the hearing-impaired subjects
   -a greater increase in the number of Turns as Acknowledgement Only used by the hearing-impaired subjects.

D. a greater reduction in the hearing-impaired subjects' self-reported listening effort in conversations with ICP than in those with the CCP.

3. It was hypothesized that the outcome measures and evaluation methods would be sufficiently sensitive and selective to indicate if benefit occurred. The validity of the chosen outcome measures and appropriate application of the evaluation methods used will be critically examined. Furthermore, the construct of conversational fluency will be examined by comparing the measures of benefit derived from the discourse analysis with the qualitative measures used to subjectively judge conversational fluency.

Satisfaction

It was hypothesized that the hearing-impaired subjects general satisfaction with the therapy program would be high and that they would be highly satisfied with their specific abilities to use the targeted communication strategies post-treatment in their everyday conversations such that efficiency, fluency, and comprehension would be improved and listening effort and hearing handicap would be reduced.

CHAPTER 3

RESULTS

The objective of the present study's communication-based aural rehabilitation program was to improve the hearing-impaired subjects' ability to understand conversation, thereby achieving more efficient and fluent communication. Evaluation of the program's effectiveness employed an evaluation protocol based on use, benefit, and satisfaction. As previously outlined in Chapter 2, five evaluation sessions were administered with the CCP, but only three evaluation sessions were administered with the ICP. Consequently, it was decided that the data for only the shared evaluation sessions (i.e. one, three, and fine) would be presented in this report. This chapter presents the results of the evaluation and analysis procedures within the framework of the evaluation protocol, with each level and the applicable outcome measures being presented.

USE

Use was defined as the extent to which the subjects used the targeted communication techniques during the evaluation sessions and in their everyday conversational interactions post-treatment. Objective measures were collected from the tracking and TOPICON evaluation tools, while subjective measures (i.e. self-reports) were collected from the verbal protocols and post therapy interview.

Use of Requests for Clarification

Use of Requests for Clarification in the Tracking

The data for requests for clarification made by S1 and S2 in the tracking exercises are presented in

Tables 3.1 and 3.2 respectively. S1 demonstrated an increase in the types of clarification requests she used across the evaluations, specifically a trend of increased use of Requests for Explanation and Change in Manner of Presentation across the evaluations. However, S2's use of the different types of clarification requests was fairly consistent across the evaluations, suggesting that her use of different types of clarification requests did not increase.

Although only S1 demonstrated an increase in repertoire size, both S1 and S2 demonstrated a reduction in the percentage of Nonspecific Requests they used across the evaluations in both text types with CCP and in narratives with ICP. The one exception for both S1 and S2 was in the tracking of restaurant reviews with ICP in which there was an increased use of Nonspecific Requests. The most frequent specific clarification request used by both S1 and S2 was Request for Repetition of a Specific Constituent, followed by Request for Confirmation of the Form. The least frequently used was Request for Explanation. This observed trend is consistent with reports by both S1 and S2 in the verbal protocols for evaluations three and five, that even though they were both conscious of making an effort to use a variety of requests, they found that the nature of tracking (i.e. a timed activity with verbatim repetition) favoured what was most expedient (i.e. ask for specific repetitions).

The verbal protocols provided subjective comments on the use of strategies relying on the use of context and knowledge. S1 reported attempting to use the associative strategies introduced in therapy in the tracking of the restaurant review in evaluation 3 with CCP, but found it too difficult with the unfamiliar and unexpected terminology and the deviant sentence structures typical of the restaurant review texts (i.e. "the words don't come together in a logical way for me"). In evaluations 3 and 5 with CCP, S2

Table 3.1 Requests for clarification used by S1 in tracking with CCP and ICP as percent of all requests used.

Type of Request	Narratives						Restaurant Reviews					
	CCP			ICP			CCP			ICP		
	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5
Nonspecific Request for Repetition	28.6%	30.0%	16.7%	23.5%	16.7%	21.7%	25.0%	13.3%	10.8%	4.2%	22.2%	24.1%
Specific Requests:												
Request for Repetition of a Specific Constituent	51.4	45.0	50.0	64.7	58.3	50.00	58.3	60.0	70.3	79.2	55.6	62.1
Request for Confirmation of the Form	14.3	10.0	11.1	11.8	25.0	15.2	13.9	10.0	5.4	16.6	16.7	13.8
Request for Explanation	--	5.0	11.1	--	--	2.2	--	3.3	13.5	--	--	--
Request for a Change in the Manner of Presentation	5.7	10.0	11.1	--	--	10.9	2.8	13.4	--	--	5.5	--
Total number of Requests	35	20	18	17	12	46	36	30	37	24	18	29

Table 3.2 Requests for clarification used by S2 with CCP and ICP in tracking as a percent of all requests used.

Type of Request	Narratives						Restaurant Reviews					
	CCP			ICP			CCP			ICP		
	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5
Nonspecific Request for Repetition	--	28.6	20.0	33.3	40.0	16.7	23.5	28.0	9.1	12.9	14.3	36.4
Specific Requests:												
Request for Repetition of a Specific Constituent	57.1	57.1	60.0	50.0	40.0	54.2	47.1	60.0	86.4	64.5	64.3	54.5
Request for Confirmation of the Form	42.9	14.3	20.0	11.1	20.0	25.0	29.4	12.0	4.5	22.6	21.4	9.1
Request for Explanation	--	--	--	--	--	4.1	--	--	--	--	--	--
Request for a Change in the Manner of Presentation	--	--	--	5.6	--	--	--	--	--	--	--	--
Total number of Requests	14	14	15	18	20	24	17	25	22	31	14	11

reported that she attempted to "establish certain contexts" in order to "find out a word that would just make sense". In evaluation 3 with ICP she reported trying to use the strategies introduced in therapy "around the blank spot to help (me) hone in on it", while in session 5 with ICP she reported "thinking more associatively" and risking more guesses based on top-down processes.

Use of Requests for Clarification in the TOPICON

Table 3.3 and Table 3.4 display the frequency of requests for clarification used in TOPICON conversations involving S1 and S2, respectively. Because of the limited data, the repertoire of types of clarification requests used by S1 and S2 across the evaluations cannot be reliably evaluated. Based on the limited data, neither S1 or S2 appear to have increased their repertoire of types of clarification requests. However, based on the limited data, there was a trend for reduction in the use of Nonspecific Requests by both S1 and S2, as in the tracking exercises. Furthermore, as in the tracking exercise, the most frequently used Specific Requests by S1 and S2 were Request for a Repetition of a Specific Constituent and Request for Confirmation of the Form.

In the verbal protocols S1 did not report the use of many top-down strategies in the TOPICON conversations. In evaluation 3 with ICP she reported that even though she was conscious of making an effort to incorporate such strategies, her initial reaction was to "simply ask for a repetition in order to give myself a chance to just get in on the second try" and not have attention drawn to her hearing difficulties. In the conversations with ICP in evaluation sessions 3 and 5 she reported using her knowledge about the topic (both familiar to her) to fill in some misperceptions. For the most part, S2 also reported not being aware of using many top-down strategies. She reported that requesting a repetition or confirmation

Table 3.3 Frequency of requests for clarification used in TOPICON conversations by S1 with CCP and ICP.

Type of Request	CCP						ICP					
	Evaluation 1		Evaluation 3		Evaluation 5		Evaluation 1		Evaluation 3		Evaluation 5	
	S1	CCP	S1	CCP	S1	CCP	S1	ICP	S1	ICP	S1	ICP
Nonspecific Request for Repetition	3	--	1	--	2	1	13	--	--	--	--	--
Specific Requests:												
Request for Repetition of a Specific Constituent	--	--	2	--	1	--	2	--	1	--	1	--
Request for Confirmation of the Form	2	--	1	--	--	--	4	--	--	--	--	--
Request for Explanation	--	--	--	--	--	--	--	--	--	--	--	--
Request for a Change in the Manner of Presentation	--	--	--	--	--	--	--	--	--	--	--	--
# of Communication Breakdowns	4		3		2		9		1		1	

Table 3.4 Frequency of requests for clarification used in TOPICON conversations by S2 with CCP and with ICP.

Type of Request	CCP						ICP					
	Evaluation 1		Evaluation 3		Evaluation 5		Evaluation 1		Evaluation 3		Evaluation 5	
	S2	CCP	S2	CCP	S2	CCP	S2	ICP	S2	ICP	S2	ICP
Nonspecific Request for Repetition	4	--	--	--	1	--	3	--	1	--	--	--
Specific Requests:												
Request for Repetition of a Specific Constituent	6	--	3	1	5	--	2	--	2	--	2	--
Request for Confirmation of the Form	4	2	4	--	4	--	--	1	1	--	2	--
Request for Explanation	--	--	--	--	1	--	1	--	--	--	--	--
Request for a Change in the Manner of Presentation	--	--	--	--	--	--	--	--	--	--	--	--
# of Communication Breakdowns	13		6		10		5		4		4	

was usually sufficient to clarify the misperceptions. She reported using Requests for Confirmation as a means of "cutting down on the whole feeling of miscomprehension". S2 did report one instance of using associative techniques in the conversation with CCP in evaluation 3 to understand the general notion or "gist" of what CCP was talking about ("I had a vague notion about what she was talking about and yet I don't think I could repeat her word for word").

There were few clarification requests used by either the CCP or ICP. The CCP used three clarification requests: two Requests for Confirmation of Form and one Request for a Repetition of a Specific Constituent. The only clarification request used by the ICP was one for Confirmation.

Use of Requests for Clarification: Post Therapy Interview

Both S1 and S2 reported their involvement in the program had increased their awareness of the variety of communication techniques, both clarification requests and strategies relying on the use of context or knowledge, that they might be able to use to prevent and repair conversational breakdowns in their everyday communication. Furthermore, both reported using some of the strategies discussed in therapy on a few occasions in their everyday conversational interactions. However, both subjects also reported that the opportunities to practice these techniques in natural settings had not yet arisen. Both subjects reported that more time and practice was needed before they would be able to use the techniques spontaneously. S2 reported that she was not yet familiar enough with the techniques to spontaneously use them in her everyday interactions or in the classroom. She commented, "They're not second nature to me. It takes time to think about it and the conversation is going at such a fast rate."

Summary of Use of Requests for Clarification

Neither S1 nor S2 demonstrated an increase in the types of clarification requests they used across the evaluations in either the tracking or TOPICON evaluation activities, even though both reported in the verbal protocols that they had attempted to do so. However, results from the TOPICON conversations are inconclusive because of the limited data. Both S1 and S2 reported in the post therapy interviews that therapy had increased their awareness of the variety of communication techniques that they could use to prevent and repair conversational breakdowns. However, both S1 and S2 reported that the use of these strategies within their everyday conversational interactions would require continued practice before they felt that they would be able to use them spontaneously.

Although neither S1 nor S2 demonstrated an increase in the size of their repertoires, they did demonstrate a change in the distribution of the types of clarification requests they used across the evaluations. Both S1 and S2 exhibited a reduction in the use of Nonspecific Requests in both the tracking and TOPICON activities from the initial to final evaluation. In both the tracking and TOPICON activities, the most frequently used Specific Requests were Requests for Repetition of a Specific Constituent and Request for Confirmation of the Form. The least frequently used Specific Requests were Requests for Explanation and Requests for a Change in the Manner of Presentation. Both CCP and ICP used few clarification requests in the TOPICON conversations.

Self-reports by S1 and S2 in the evaluation one and three tracking verbal protocols indicated that they were aware of actively attempting to used top-down processing strategies (i.e. semantic and/or syntactic associations and context) to fill in blanks and make logical guesses. However, neither subject reported

being aware of using such strategies very often in the TOPICON conversations, although they did report using their knowledge of the topic to make associations and assist in clarifying misperceptions.

Use of Repair Strategies

The definition of a repair sequence may be found in Chapter 2, page 65). Recall that repair sequences in the tracking exercise included those instances in which the hearing-impaired subject failed to repeat verbatim the utterance presented by the communication partner, while in the TOPICON conversations they included those instances in which either conversational partner required clarification to understand the message. More than one clarification request and/or repair strategy may have been used in a repair sequence. This section only examines the increased use of types of repair strategies. The relationship of any observed changes in the use of strategies to measures of efficiency will be examined later in the benefit section.

Repair Usage in the Tracking Exercises

Tables 3.5 and 3.6 present the data for repair strategy usage by CCP and ICP, respectively. Both CCP and ICP used the full range of repair strategies chosen for evaluation throughout the evaluations. Some minor exceptions were demonstrated; for example, CCP did not use Spellings in evaluation 1 and 3 with S2. Partial Repetition was the most frequently used repair strategy by both CCP and ICP in all evaluation sessions. Although neither CCP nor ICP increased the types of repair strategies they used across the evaluations, both of them did change the distribution of the strategies they had in their repertoires. CCP increased her use of Syntactic Simplifications and Spellings for both text types and she reduced her use of Confirmations and Elaborations in both text types over the evaluation schedule. ICP increased her

Table 3.5 Number of uses of repair strategies by CCP with S1 and S2 in tracking as percent of all strategies used.

Repair Strategy	Narratives						Restaurant Reviews					
	S1			S2			S1			S2		
	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5
Exact Repetition of Entire Utterance	4.65	22.92	4.92	8.00	11.11	4.92	7.59	4.46	7.14	8.70	8.70	5.26
Paraphrase of Entire Utterance	3.49	8.33	5.71	2.00	--	3.29	3.45	3.57	--	2.90	--	5.26
Syntactic Simplification	10.47	2.08	14.75	10.00	25.93	9.83	8.97	16.07	15.71	10.41	10.87	12.28
Partial Repetition	54.65	56.25	54.10	68.00	55.56	63.93	51.72	50.89	60.00	66.67	63.04	64.91
Confirmation	16.28	6.25	3.28	6.00	7.40	1.63	6.90	2.68	1.43	4.34	5.43	3.51
Elaboration	6.98	--	4.92	6.00	--	4.92	10.34	6.25	2.86	5.80	3.26	1.76
Spelling	3.48	4.17	13.11	--	--	11.48	11.03	10.72	12.86	1.45	8.70	7.02
Total Number of Uses of Strategies	86	48	61	50	27	61	145	106	70	69	92	57

Table 3.6 Number of uses of repair strategies by ICP with S1 and S2 in tracking as percent of all strategies used.

Repair Strategy	Narratives						Restaurant Reviews					
	S1			S2			S1			S2		
	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5
Exact Repetition of Entire Utterance	5.09	2.86	3.03	16.05	3.84	9.43	5.44	5.13	6.90	8.82	5.00	18.61
Paraphrase of Entire Utterance	7.63	5.71	9.09	--	5.77	--	1.36	7.69	5.74	5.88	5.00	--
Syntactic Simplification	6.78	8.57	9.09	12.36	11.54	11.32	6.80	15.38	14.94	6.62	17.50	18.61
Partial Repetition	50.00	57.14	51.52	43.21	38.46	50.95	49.66	41.03	49.43	52.94	50.00	39.53
Confirmation	5.09	14.29	10.61	1.23	11.54	16.98	4.76	7.69	9.20	2.94	15.00	13.95
Elaboration	22.03	8.57	9.85	19.75	23.08	9.43	24.49	20.51	10.34	14.71	7.50	9.30
Spelling	3.38	2.86	6.81	7.40	5.77	1.89	7.49	2.57	3.45	8.09	--	--
Total Number of Uses of Strategies	118	35	132	81	52	53	147	39	87	136	40	43

use of Syntactic Simplifications in the restaurant reviews but not in the narratives; she increased her use of Confirmations, and she reduced her use of Elaborations. The reduction in ICP's use of Elaborations was greater than that of CCP's from the initial to final evaluation.

Use of Repair Strategies in the TOPICON Task

Due to the limited number of requests for clarification by CCP and ICP (see Table 3.3 and 3.4), the repair usage of S1 and S2 will not be discussed. The use of repair strategies in the TOPICON conversations by CCP and ICP is displayed in Table 3.7.

The number of communication breakdowns in the TOPICON conversations was minimal in comparison to the tracking exercises, especially in evaluation five. Consequently, changes in the types of repair strategies used by either CCP and ICP cannot be reliably evaluated. The frequency of elicited repairs was much greater than spontaneous repairs for both CCP and ICP, suggesting that both were concerned with maintaining the subjects' understanding of the conversation. Based on the limited data, CCP appeared to use Partial Repetitions and Confirmations most frequently, while using Paraphrases of Entire Utterances, Elaborations and Spelling least frequently. Throughout the evaluations, ICP appeared to equally use Exact Repetitions of Entire Utterances, Partial Repetitions of Entire Utterances and Confirmations and she did not use any Paraphrases of Entire Utterances or Spellings in any evaluation sessions. ICP appeared to use more Elaborations in evaluation 1 than in 3 and 5, suggesting a reduction in the use of Elaborations.

Table 3.7 Frequency of repair strategies used by CCP and ICP in TOPICON conversations.

Repair Strategy	CCP						ICP					
	Subject 1			Subject 2			Subject 1			Subject 2		
	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5
Elicited Repairs:												
Exact Repetition of Entire Utterance	1	1	--	2	--	1	5	--	1	2	1	1
Paraphrase of Entire Utterance	--	--	--	--	1	--	--	--	--	--	--	--
Syntactic Simplification	--	--	1	1	--	1	--	--	--	1	--	--
Partial Repetition	2	2	1	4	1	4	2	1	--	2	1	1
Confirmation	1	1	1	7	5	4	6	--	--	--	1	2
Elaboration	--	--	--	1	--	--	7	--	--	1	2	--
Spelling	--	--	--	2	--	--	--	--	--	--	--	--
Spontaneous Repairs:												
Syntactic Simplification	--	--	1	1	--	--	--	--	--	--	--	--
Partial Repetition	--	--	--	1	--	--	--	--	--	--	--	--
Elaboration	--	--	--	1	--	--	1	--	--	--	1	--
Total Number of Repairs	4	4	4	20	7	10	21	1	1	6	6	4
Number of Communication Breakdowns	4	3	2	6	10	5	9	1	1	5	4	4

Reported Use of Repair Strategies: Post Therapy Interview

In the post therapy interview ICP reported an increased awareness of the variety of repair strategies she could use to help repair conversational breakdowns. She also reported using the strategies in her work environment, which involved counselling hearing-impaired seniors on hearing aid use. However, she felt that continued practice was needed to improve her skills.

Summary of Use of Repair Strategies

Neither CCP nor ICP increased their repertoire of types of repair strategies in the tracking exercises. Both of them used the full range of repair strategies chosen to be evaluated throughout the evaluations. Increases in the types of repairs used by CCP and ICP in the TOPICON conversations could not be reliably evaluated due to limited data.

Although no change in the types of strategies used was observed in the tracking exercises, changes in the distribution of repair strategy usage was demonstrated by both CCP and ICP. CCP increased her use of Syntactic Simplifications and Spellings, while reducing her use of Elaborations and Confirmations. In contrast, ICP increased her use of Syntactic Simplifications and Confirmations, while reducing her use of Elaborations and Spellings.

Changes in the distribution of the repairs in the TOPICON conversations could not be evaluated due to limited data. Consequently, it is not possible to determine whether or not the observed trends in the tracking exercises would have also been observed in a more "naturalistic" conversational environment. However, ICP did report in the post therapy interview that therapy had increased her awareness of the

variety of repair strategies she could use to repair conversational breakdowns, but felt she needed continued practice in the use of them.

BENEFIT

Benefit was defined as the improvement experienced by the subject in ability to understand conversations, with an associated increase in the efficiency and fluency of their conversations. It was proposed that benefit would be indicated by: 1) increased efficiency; 2) improved conversational fluency; 3) improved comprehension; 4) decreased listening effort; and, 5) decreased hearing disability. In order to provide a composite picture of the tracking exercises and TOPICON conversations, all of the benefit related measures for each evaluation procedure are displayed in Tables 3.8 to 3.11. The data for each area of proposed benefit will also be presented separately in the appropriate section.

Efficiency

Efficiency was defined as the rate of information exchange. Efficiency was measured in both the tracking exercises and the TOPICON conversations.

Efficiency Measures in Tracking

The primary index of efficiency in the tracking exercises was the mean text tracking rate in syllables per minute. Secondary measures which relate to and help to explain any observed changes in efficiency include: median rate per repaired presentation utterance, median rate per nonrepaired presentation utterance, median number of turns per repaired presentation utterance, and the percentage of repaired

Table 3.8 Measures of benefit for the tracking exercises by S1 with CCP and with ICP.

Measures of Benefit	Narratives						Restaurant Reviews					
	CCP			ICP			CCP			ICP		
	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5
Mean text tracking rate (spm)	54.26	65.79	58.41	31.14	65.74	29.57	33.78	42.81	56.81	28.63	61.56	50.22
Median rate/repaired presentation utterance (spm) (Interquartile range)	50.50 (31.67)	46.67 (41.20)	44.21 (44.40)	29.40 (28.76)	51.10 (34.96)	29.14 (27.19)	34.91 (29.77)	35.50 (21.61)	45.58 (22.49)	30.56 (24.55)	50.72 (35.13)	43.64 (20.77)
Median rate/nonrepaired presentation utterance (spm) (Interquartile range)	108.00 (39.00)	102.86 (27.38)	100.00 (28.93)	86.67 (24.29)	97.50 (21.33)	90.00 (31.26)	96.00 (53.57)	94.67 (36.00)	95.90 (20.56)	84.00 (37.15)	102.86 (29.98)	102.86 (39.00)
Median #turns/repaired presentation utterance (Interquartile range)	4.00 (4.25)	2.00 (2.00)	4.00 (7.00)	7.50 (9.25)	2.00 (2.50)	8.00 (8.50)	4.00 (8.00)	5.00 (5.50)	4.00 (4.00)	7.50 (8.25)	3.50 (4.00)	4.00 (4.00)
Percentage of repaired presentation utterances	56.60	44.26	44.23	57.14	39.13	83.33	60.61	61.29	50.00	76.92	38.30	55.34
Effort rating	7	8	3	8.5	5	9	10	9	5	9	7	5
Comprehension score in percent correct *	90	100	100	60	100	60	80	100	90	80	90	90
Comprehension rating (1=poor; 10=good)	9.5	9	8	5	9.5	7	8.5	7	9	7.5	9	10

* Based on n questions in cases where the text was not completely transmitted in the alotted time.

Table 3.9 Measures of benefit for the tracking exercises by S2 with CCP and with ICP.

Measures of Benefit	Narratives						Restaurant Reviews					
	CCP			ICP			CCP			ICP		
	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5
Mean text tracking rate (spm)	60.75	74.36	58.41	46.83	55.32	62.43	52.34	49.09	62.91	46.14	69.35	60.25
Median rate/repaired presentation utterance (spm) (Interquartile range)	45.34 (18.51)	51.10 (23.22)	46.67 (27.77)	42.00 (21.50)	38.18 (26.80)	49.71 (26.92)	38.82 (16.95)	35.50 (22.31)	50.00 (33.29)	37.14 (23.94)	56.00 (26.90)	50.00 (27.25)
Median rate/nonrepaired presentation utterance (spm) (Interquartile range)	100.00 (27.50)	92.15 (30.65)	98.46 (22.50)	90.00 (40.00)	88.34 (30.00)	96.00 (40.00)	101.43 (42.50)	96.00 (36.00)	102.86 (24.00)	100.00 (32.42)	96.00 (38.81)	93.00 (37.86)
Median #turns/repaired presentation utterance (Interquartile range)	4.00 (4.25)	2.50 (2.00)	4.00 (4.00)	4.00 (5.00)	4.00 (3.00)	4.00 (4.00)	4.00 (4.00)	5.50 (7.00)	2.00 (3.00)	6.00 (6.75)	4.00 (4.00)	2.00 (2.00)
Percentage of repaired presentation utterances	43.14	31.25	49.02	54.00	32.20	37.5	40.35	47.62	48.33	51.56	39.58	43.86
Effort rating	8	8	9	9	8	8	10	9	10	9	9	8
Comprehension score in percent correct *	90	90	100	90	90	90	90	100	70	90	100	100
Comprehension rating (1=poor; 10=good)	8	9	9.5	9	9	8	8	8	8	8.5	9	10

* Based on n questions in cases where the text was not completely transmitted in the alotted time.

Table 3.10 Measures of benefit for the TOPICON conversations by S1 with CCP and with ICP.

Measures of Benefit	CCP						ICP					
	Evaluation 1		Evaluation 3		Evaluation 5		Evaluation 1		Evaluation 3		Evaluation 5	
	S1	CCP	S1	CCP	S1	CCP	S1	ICP	S1	ICP	S1	ICP
Turns	51	51	37	36	72	73	41	44	46	47	34	35
Clauses	90	101	69	104	148	174	67	65	84	81	82	69
Clauses/Turn	1.8	2.0	1.9	3.0	2.1	2.4	1.6	1.5	1.8	1.7	2.4	2.0
Duration	11 min 35 sec		12 min 16 secs		19 min 16 sec		9 min 15 sec		10 min 19 sec		9 min 40 secs	
Clauses/Minute	16.5		14.1		16.7		14.3		16.0		15.6	
Backchannels	14	5	24	14	42	8	4	1	15	8	11	13
Turns-No Response	--	--	--	--	--	1	2	--	--	--	--	--
Turns as Ackn. Only	6	--	6	1	5	2	6	2	3	5	5	1
Gaps Before Response	--	--	1	--	--	1	2	--	--	--	--	--
Topic Init./shifts	2	9	4	9	3	12	1	8	6	3	3	5
Interruption Overlaps	3	1	3	1	7	--	2	1	2	1	2	1
Information Questions	4	17	7	4	15	5	4	8	8	9	3	7
Compr. Score (%) *	90	NA	71 (n=7)	NA	89 (n=9)	NA	NA	NA	NA	NA	NA	NA
Comprehension Rating	5.5	NA	7.5	NA	10	NA	7	NA	10	NA	10	NA
Effort Rating	4	NA	4	NA	1	NA	9	NA	2	NA	1	NA
# Comm. Breakdowns	4		3		2		9		1		1	
Fluency Rating	4.5		5		4.5		2.5		5		4	

* Based on n questions in cases where the text was not completely transmitted in the alotted time.

Table 3.11 Measures of benefit for the TOPICON conversations by S2 with CCP and with ICP.

Measures of Benefit	CCP						ICP					
	Evaluation 1		Evaluation 3		Evaluation 5		Evaluation 1		Evaluation 3		Evaluation 5	
	S2	CCP	S2	CCP	S2	CCP	S2	ICP	S2	ICP	S2	ICP
Turns	70	72	40	39	50	50	44	44	38	39	21	23
Clauses	117	125	60	125	111	132	81	101	70	102	66	60
Clauses/Turn	1.7	1.7	1.5	3.2	2.2	2.6	1.8	2.3	1.8	2.6	3.1	2.6
Duration	13 min 8 sec		10 min 35 sec		15 min 17 sec		11 min 40 sec		10 min 32 sec		10 min 2 sec	
Clauses/Minute	18.4		17.5		15.3		15.6		16.3		12.7	
Backchannels	37	9	50	3	62	6	44	12	46	9	26	9
Turns-No Response	--	1	1	--	--	--	--	--	--	--	1	--
Turns as Ackn. Only	4	4	3	--	4	3	3	--	5	1	2	1
Gaps Before Response	2	--	--	--	--	--	--	--	--	--	--	--
Topic Init./Shifts	4	11	5	5	4	10	6	5	3	5	2	5
Interruption Overlaps	2	2	--	2	3	1	1	1	1	--	1	--
Information Questions	9	11	9	7	7	10	10	12	9	5	1	7
Compr. Score (%) *	89 (n=9)	NA	90	NA	100	NA	NA	NA	NA	NA	NA	NA
Comprehension Rating	5.5	NA	9	NA	8	NA	8	NA	9	NA	8.5	NA
Effort rating	6	NA	7	NA	4	NA	3	NA	2	NA	5	NA
# Comm. Breakdowns	13		6		10		5		4		4	
Fluency Rating	3.5		4		4.5		5		5		5	

* Based on n questions in cases where the text was not completely transmitted in the alotted time.

presentation utterances in a given text. Please refer to Chapter 2, p. 72 to 76, for definitions of these measures.

The mean text tracking rates in syllables per minute are displayed in Table 3.12 and Figure 3.1 for S1 and in Table 3.13 and Figure 3.2 for S2. The data indicates that tracking rates for all pairings (i.e. S1:CCP, S1:ICP, S2:CCP, and S2:ICP) improved over the course of therapy. Tracking rates improved (i.e. increase in SPM) in tracking exercises with S1:CCP, S1:ICP, S2:ICP for both text types, but only for the restaurant reviews in the S2:CCP trackings. However, an examination of the tracking rates in the S2:CCP:Narratives condition shows that, even though slower tracking rates were observed from evaluation three to five, the tracking rate from evaluation one to three improved significantly; thereby, following the trend of improved tracking rates.

Table 3.14 shows the difference in the efficiency measures between evaluation sessions for all eight tracking conditions. The differences show that improvements in the tracking rates from evaluation one to five for the restaurant reviews were substantially greater than for the narratives, with the exception of the S2:ICP condition. In addition, the improvement in the tracking rates for three out of four tracking conditions with ICP and CCP were greater for S1 than for S2 (i.e. S1:CCP:Narrative, S1:CCP:Restaurant Review, and S1:ICP:Restaurant Review). The one exception was the narrative tracking condition with ICP in which the improvement in tracking rate was greater for S2 than for S1. However, as previously mentioned, S1 found this a very difficult text because of the specific vocabulary. Consequently, there is a very low tracking rate for this session compared to all of her other evaluation five tracking rates (see Table 3.12), which has tended to skew the results for this tracking condition.

Table 3.12 Measures of efficiency for the tracking exercises by S1 with CCP and with ICP.

Measures of Efficiency	Narratives						Restaurant Reviews					
	CCP			ICP			CCP			ICP		
	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5
Mean text tracking rate (spm)	54.26	65.79	58.41	31.14	65.74	29.57	33.78	42.81	56.81	28.63	61.56	50.22
Median rate/repaired presentation utterance(spm) (Interquartile range)	50.50 (31.67)	46.67 (41.20)	44.21 (44.40)	29.40 (28.76)	51.10 (34.96)	29.14 (27.19)	34.91 (29.77)	35.50 (21.61)	45.58 (22.49)	30.56 (24.55)	50.72 (35.13)	43.64 (20.77)
Median rate/nonrepaired presentation utterance(spm) (Interquartile range)	108.00 (39.00)	102.86 (27.38)	100.00 (28.93)	86.67 (24.29)	97.50 (21.33)	90.00 (31.26)	96.00 (53.57)	94.67 (36.00)	95.90 (20.56)	84.00 (37.15)	102.86 (29.98)	102.86 (39.00)
Median number of turns/repaired presentation utterance (Interquartile range)	4.00 (4.25)	2.00 (2.00)	4.00 (7.00)	7.50 (9.25)	2.00 (2.50)	8.00 (8.50)	4.00 (8.00)	5.00 (5.50)	4.00 (4.00)	7.50 (8.25)	3.50 (4.00)	4.00 (4.00)
Percentage of repaired presentation utterances	56.60	44.26	44.23	57.14	39.13	83.33	60.61	61.29	50.00	76.92	38.30	55.34

Table 3.13 Measures of efficiency for the tracking exercises by S2 with CCP and with ICP.

Measures of Efficiency	Narratives						Restaurant Reviews					
	CCP			ICP			CCP			ICP		
	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5
Mean text tracking rate (spm)	60.75	74.36	58.41	46.83	55.32	62.43	52.34	49.09	62.91	46.14	69.35	60.25
Median rate/repaired presentation utterance(spm) (Interquartile range)	45.34 (18.51)	51.10 (23.22)	46.67 (27.77)	42.00 (21.50)	38.18 (26.80)	49.71 (26.92)	38.82 (16.95)	35.50 (22.31)	50.00 (33.29)	37.14 (23.94)	56.00 (26.90)	50.00 (27.25)
Median rate/nonrepaired presentation utterance(spm) (Interquartile range)	100.00 (27.50)	92.15 (30.65)	98.46 (22.50)	90.00 (40.00)	88.34 (30.00)	96.00 (40.00)	101.43 (42.50)	96.00 (36.00)	102.86 (24.00)	100.00 (32.42)	96.00 (38.81)	93.00 (37.86)
Median number of turns/repaired presentation utterance (Interquartile range)	4.00 (4.25)	2.50 (2.00)	4.00 (4.00)	4.00 (5.00)	4.00 (3.00)	4.00 (4.00)	4.00 (4.00)	5.50 (7.00)	2.00 (3.00)	6.00 (6.75)	4.00 (4.00)	2.00 (2.00)
Percentage of repaired presentation utterances	43.14	31.25	49.02	54.00	32.20	37.5	40.35	47.62	48.33	51.56	39.58	43.86

Figure 3.1 - Tracking rates in syllables per minute for Subject 1

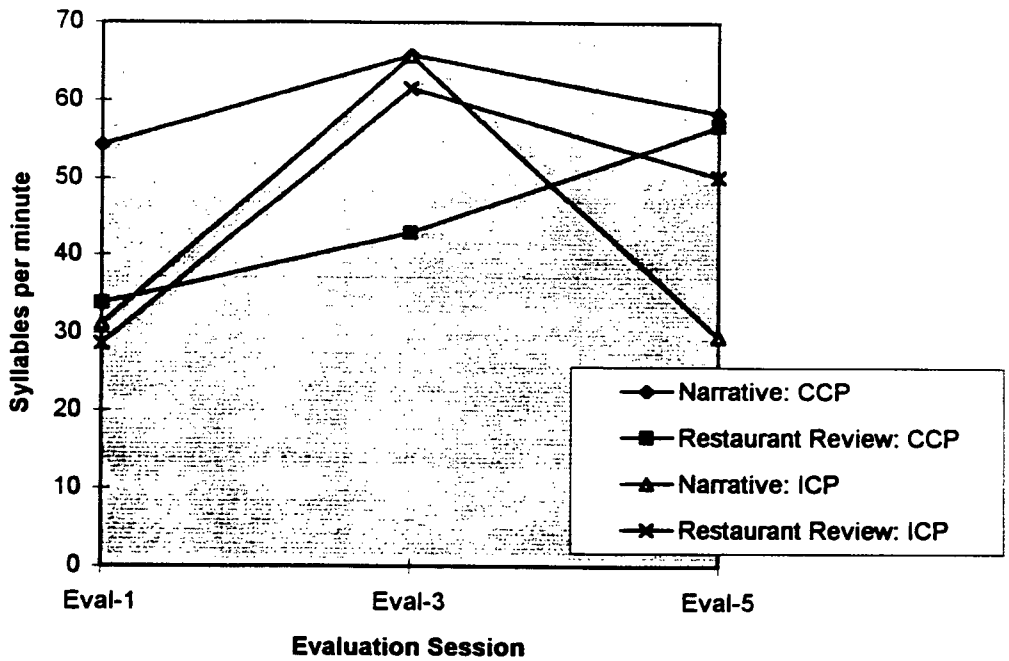


Figure 3.2 - Tracking rates in syllables per minute for Subject 2

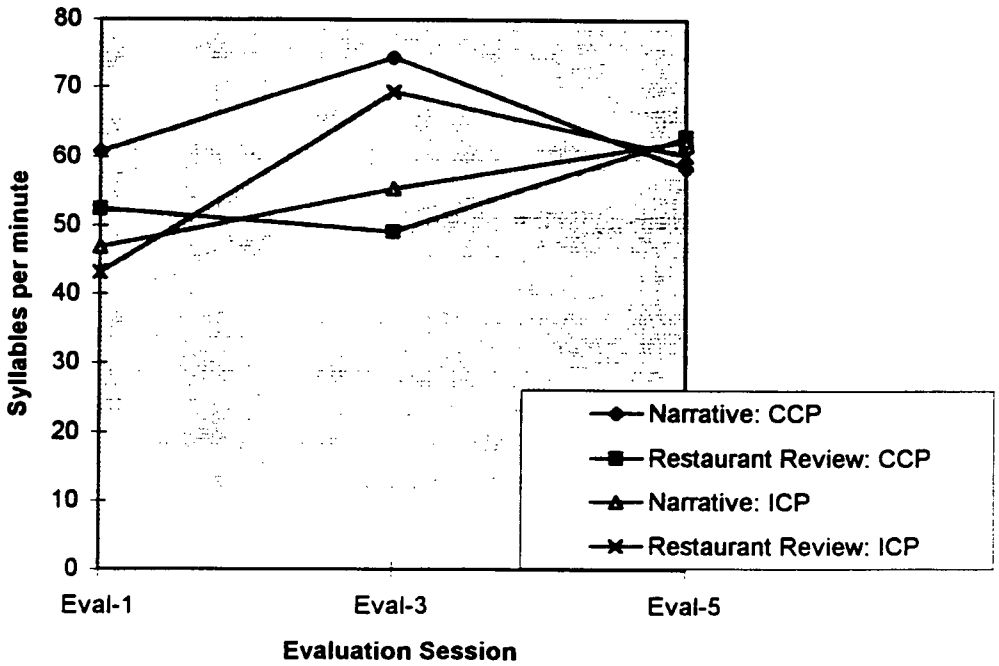


Table 3.14 Differences in efficiency measures from the first to final evaluation in the tracking exercises for each subject with each partner.

Measures of Efficiency Expressed as Differences ("+"=improvement; "-"=decline)	Narratives				Restaurant Reviews			
	CCP		ICP		CCP		ICP	
	S1	S2	S1	S2	S1	S2	S1	S2
Difference in Mean text tracking rate (SPM)	+4.15	-2.34	+1.57	+15.60	+23.50	+10.57	+21.59	+14.11
Difference in Median rate per repaired presentation utterance (SPM)	-6.29	+1.33	-0.26	+7.71	+10.67	+11.18	+13.08	+12.86
Difference in Median rate per nonrepaired presentation utterance (SPM)	-8.00	-1.54	+3.33	+6.00	-0.10	+1.43	+18.86	-7.00
Difference in Median number of turns per repaired presentation utterance	--	--	+0.50	--	--	-2.00	-3.50	-4.00
Difference in the Percentage of repaired presentation utterances	-12.37	+5.88	+26.19	-16.50	-10.61	+7.98	-21.58	-7.70

The average improvement in the mean tracking rate (i.e. increase in SPM) for narratives with CCP was 13.59 syllables per minute and 11.58 syllables per minute with ICP, while it was 6.63 syllables per minute for restaurant reviews with CCP and 14.86 syllables per minute with ICP. Therefore, the average improvement in the tracking rate of exercises with CCP was 10.11 syllables per minute, while it was 13.22 syllables per minute with ICP.

Examination of the other secondary measures of efficiency provided further insight into the improved tracking rates (see Table 3.14). Four out of the seven tracking conditions that exhibited improved tracking rates also demonstrated an increase in the median rate per nonrepaired presentation utterance (see Table 3.14). One out of the three conditions with CCP with improved tracking rates also exhibited improved median rates for nonrepaired presentation utterances, while three out of the four conditions with ICP with improved tracking rates also exhibited improved median rates for nonrepaired presentation utterances. This finding suggests that, in general, ICP was tracking faster than CCP in later evaluations. Five out of the seven tracking conditions that exhibited improved mean tracking rates displayed a reduction in the percentage of presentation utterances needing repair (i.e. a reduction in number of communication breakdowns). Furthermore, in the one condition exhibiting a slower tracking rate (S1:CCP:Narratives), the major contributing factor appeared to be the increased percentage of presentation utterances needing repair. Therefore, the data suggests a relationship between tracking rate and percentage of presentation utterances needing repair: the fewer the lines needing repair (i.e. communication breakdowns), the faster the tracking rate. In general, those tracking conditions with ICP which exhibited improved tracking rates displayed a greater reduction in the percentage of presentation utterances needing repair than those with CCP did.

Improved tracking rates were not only accounted for by a reduction in percentage of presentation utterances needing repair, but also by more efficient repair sequences, as indicated by improvements in the median rate per repaired presentation utterance (i.e. faster rates) and reductions in the median number of turns per repaired presentation utterance. Improved efficiency of repair sequences was a contributing factor to improved tracking rates in two of the three tracking conditions with CCP exhibiting faster tracking rates (i.e. S1:CCP:Restaurant Reviews and S2:CCP:Restaurant Reviews) and two of the four conditions with ICP exhibiting faster tracking rates (i.e. S1:ICP:Restaurant Reviews and S2:ICP: Restaurant Reviews). The average improvement in median rate per repaired presentation utterance was greater for ICP (8.35 SPM) than CCP (4.22 SPM), suggesting that the average improvement in the efficiency of repair sequences was greater for ICP than CCP.

Reexamination of the findings on requests for clarification used by S1 and S2 (see "Use" section, p. 100) indicates that the improved efficiency of repair sequences in the tracking was not a function of the types of requests for clarification used by S1 or S2. In the tracking conditions with CCP which exhibited improved efficiency of repair sequences (i.e. S1:CCP:Restaurant Reviews and S2:CCP:Restaurant Reviews), both S1 and S2 decreased their use of NonSpecific Requests and Confirmations of Form, but increased their use of Request of Repetition for a Specific Constituent. However, in the tracking exercises with ICP exhibiting more efficient repair sequences (S1:ICP:Restaurant Reviews, S2:ICP:Narratives, and S2:ICP:Restaurant Reviews) S1 and S2 demonstrated a reverse pattern in which they increased use of Nonspecific Requests and reduced their use of Requests for Repetition of a Specific Constituent in the restaurant reviews. In addition, they both reduced their use of Requests for Confirmation of Form as they did with CCP.

Reexamination of the findings on repair usage by CCP and ICP in the tracking exercises (see Tables 3.5 and 3.6) indicated that the improved efficiency of repair sequences was a function of repair usage by the communication partners. In both conditions with CCP (S1:Restaurant Reviews and S2:Restaurant Reviews), CCP reduced her use of Confirmations and Elaborations and increased her use of Syntactic Simplifications and Spellings. In the three conditions with ICP which exhibited improved efficiency of repair sequences (S1:Restaurant Reviews, S2:Narratives, and S2:Restaurant Reviews) ICP, like CCP, reduced her use of Elaborations and increased her use of Syntactic Simplifications. However, unlike CCP, ICP reduced her use of Spellings and increased her use of Confirmations. The data tends to suggest that improved efficiency of repair sequences was a function of the type of repair strategies used by the communication partners, specifically increased usage of Syntactic Simplifications and reduced use of Elaborations.

Efficiency Measures in TOPICON

Measures of efficiency collected from the TOPICON conversations include clauses/turn, clauses/minute, the number of communication breakdowns, and the percentage of clauses spent on repair sequences. The clauses/minute measure is taken to be the primary index of efficiency, while the others are secondary measures. Definitions for these measures are provided in Chapter 2, pp. 79 and 80. The data for TOPICON conversations with S1 and S2 are presented in Tables 3.15 and 3.16, respectively.

In the TOPICON conversations clauses/minute decreased from the initial to final evaluation in two of the conditions (both with S2), remained the same in one (S1:CCP) and increased in one condition (S1:ICP). Generally, the clauses/minute measures were greater in conversations with CCP than in those with ICP

Table 3.15 Measures of efficiency for the TOPICON conversations by S1 with CCP and with ICP.

Measures of Efficiency	CCP						ICP					
	Evaluation 1		Evaluation 3		Evaluation 5		Evaluation 1		Evaluation 3		Evaluation 5	
	S1	CCP	S1	CCP	S1	CCP	S1	ICP	S1	ICP	S1	ICP
Clauses/Turn	1.8	2.0	1.9	3.0	2.1	2.4	1.6	1.5	1.8	1.7	2.4	2.0
Clauses/Minute	16.5		14.1		16.7		14.3		16.0		15.6	
# of Communication Breakdowns	4		3		2		9		1		1	
% of clauses spent on repair sequences	6.28		5.20		1.24		2.05		1.82		1.97	

Table 3.16 Measures of efficiency for the TOPICON conversations by S2 with CCP and with ICP.

Measures of Efficiency	CCP						ICP					
	Evaluation 1		Evaluation 3		Evaluation 5		Evaluation 1		Evaluation 3		Evaluation 5	
	S2	CCP	S2	CCP	S2	CCP	S2	ICP	S2	ICP	S2	ICP
Clauses/Turn	1.7	1.7	1.5	3.2	2.2	2.6	1.8	2.3	1.8	2.6	3.1	2.6
Clauses/Minute	18.4		17.5		15.3		15.6		16.3		12.7	
# of Communication Breakdowns	13		6		10		5		4		4	
% of clauses spent on repair sequences	16.12		9.73		12.35		8.24		6.98		9.52	

for both S1 and S2. In all four conditions clauses/turn increased for all subjects (S1, S2, CCP, and ICP) from the initial to final evaluation. Furthermore, CCP exhibited more clauses/turn than S1 and S2 in their conversations, while ICP exhibited fewer clauses/turn than S1 and S2 in their conversations. The findings that the clauses/minute measures were greater in conversations with CCP than with ICP and that CCP exhibited more clauses/turn that S1 and S2, while ICP did not, most likely reflects the need for CCP to introduce ten predetermined personal facts into her conversations or some other idiosyncratic conversational behaviour characteristic of CCP.

Another means of measuring conversational efficiency was to examine the number of communication breakdowns and the efficiency of their repairs. The number of communication breakdowns in the TOPICON conversations was significantly less than in the tracking exercises. Consequently, the limited data restricts conclusions. Even though the numbers are small, generally the number of communication breakdowns decreased over the course of evaluations. However, in two of the four conditions, the reduction was only by one or two. The conversations with CCP tended to exhibit more communication breakdowns than those with ICP. From the initial to final evaluation there was a slight reduction in the percentage of clauses spent on repair sequences, which corresponds to observed reductions in the number of communication breakdowns. In addition, throughout the evaluations all repair sequences consisted of three or less turns. This would suggest that the efficiency of repair sequences did not change over the course of evaluations, just the number of them.

Summary of Efficiency

Improvements were observed in the median tracking rates (i.e. increases in SPM) for both S1 and S2

with both CCP and ICP. The average improvement in the median tracking rates with ICP was greater than that with CCP. Improvements in the tracking rates were attributable to a reduction in the percentage of presentation utterances needing repair (i.e. fewer communication breakdowns) and improved efficiency of repair sequences as evidenced by reductions in the median rate per repaired presentation utterance and/or median turns per repaired presentation utterance. Overall, the reduction in the percentage of presentation utterances needing repair was greater in tracking exercises with ICP. Improved efficiency of repair sequences was not a function of the types of clarification requests used by S1 and S2, but rather it was a function of the repair strategy usage of both CCP and ICP, specifically reduced use of Elaborations and increased use of Syntactic Simplifications.

In the TOPICON conversations, measures of clauses/minute decreased from the initial to final evaluation in two of the conditions (S2: CCP and S2:ICP), remained the same in one condition (S1:CCP) and increased in one condition (S1:ICP). Clauses/minute measures were greater in conversations with CCP than in those with ICP for both S1 and S2. In all four conditions clauses/turn increased for all of the subjects (S1, S2, CCP, and ICP), but CCP exhibited more clauses/turn than S1 and S2 in their conversations, while ICP exhibited fewer clauses/turn than S1 and S2. Based on the limited data, there was a trend for a reduction in the number of communication breakdowns, but the efficiency of repair sequences did not change.

Fluency

Measures of Fluency in TOPICON

Fluency was defined as the degree to which ideas, feelings, and attitudes are exchanged in an efficient

and coherent manner as suggested by the subjects' communication behaviours (see Chapter 2, pp. 80-85). The TOPICON conversations, the most naturalistic evaluation tool used in this study, provided the data for measures of fluency. Measures of conversational fluency were based on subjective fluency ratings and on an analysis of the subjects' communication behaviours in the conversations. A speech-language pathologist, not directly involved in this project, listened to the audio recordings of the conversations and judged each for its overall fluency on a scale of 1 to 5 (low to high fluency). Analysis of the conversations yielded the following measures of conversational fluency: Turns with No Response, Gaps Greater than 3 Seconds Before a Response, Topic Initiations/Shifts, Interruption Overlaps, Information Questions, and Number of Communication Breakdowns. Tables 3.17 and 3.18 display the data for the measures of conversational fluency for TOPICON conversations with S1 and S2 respectively.

Before presenting the results it should be noted that the judge reported having difficulty judging the fluency of conversations with CCP because of the perceived unnatural or "forced" conversational style adopted by CCP in order to embed her personal facts. Given this caveat, no general trend in the fluency ratings made by the judge for the TOPICON conversations was observed. Fluency ratings improved for the S1:ICP and S2:CCP conversations, but the rater saw little or no overall change in the S1:CCP and S2:ICP conversations. The fluency ratings given for conversations with S1 were higher for CCP than ICP, while those given for conversations with S2 were higher for ICP than CCP.

Examination of the qualitative categories on the fluency assessment form used by the judge to rate conversational fluency showed that in the S1:ICP condition the improved fluency rating appeared to be due to improved ratings for the Receptive Abilities and Metacommunication awareness of S1, while the

Table 3.17 Measures of fluency for the TOPICON conversations by S1 with CCP and with ICP.

Measures of Fluency	CCP						ICP					
	Evaluation 1		Evaluation 3		Evaluation 5		Evaluation 1		Evaluation 3		Evaluation 5	
	S1	CCP	S1	CCP	S1	CCP	S1	ICP	S1	ICP	S1	ICP
Turns-No Response	--	--	--	--	--	1	2	--	--	--	--	--
Gaps Before Response	--	--	1	--	--	1	2	--	--	--	--	--
Topic Init./ Shifts	2	9	4	9	3	12	1	8	6	3	3	5
Interruption Overlaps	3	1	3	1	7	--	2	1	2	1	2	1
Information Questions	4	17	7	4	15	5	4	8	8	9	3	7
Number of Communication Breakdowns	4		3		2		9		1		1	
Fluency Rating	4.5		5		4.5		2.5		5.0		4.0	

Table 3.18 Measures of fluency for the TOPICON conversations by S2 with CCP and with ICP.

Measures of Fluency	CCP						ICP					
	Evaluation 1		Evaluation 3		Evaluation 5		Evaluation 1		Evaluation 3		Evaluation 5	
	S2	CCP	S2	CCP	S2	CCP	S2	ICP	S2	ICP	S2	ICP
Turns-No Response	--	1	1	--	--	--	--	--	--	--	1	--
Gaps Before Response	2	--	--	--	--	--	--	--	--	--	--	--
Topic Init./Shifts	4	11	5	5	4	10	6	5	3	5	2	5
Interruption Overlaps	2	2	--	2	3	1	1	1	1	--	1	--
Information Questions	9	11	9	7	7	10	10	12	9	5	1	7
Number of Communication Breakdowns	13		6		10		5		4		4	
Fluency Rating	3.5		4		4.5		5		5		5	

improved fluency ratings in the S2:CCP condition were related to improved ratings in Receptive Abilities for S2, timesharing, independent repair, and turntaking. Reexamination of benefit measures in Tables 3.10 and 3.11 support improved receptive abilities for both S1 and S2 in these conditions as indicated by improved comprehension ratings and comprehension scores. However, in the S1:CCP condition, S1 also exhibited an improvement in her comprehension rating, but the fluency rating did not change. Furthermore, in the S2:CCP condition there was little or no change in the ratio of turns or clauses/turn to suggest a change in the timesharing or turntaking dynamics from evaluation one to evaluation five. In both of the conditions, S1:ICP and S2:CCP, there was a reduction in effort rating reported by both S1 and S2. However, there was also a reduction in effort rating in a condition in which the fluency rating did not change.

Examination of the data does not illuminate any particular relationship between the other measures of fluency (i.e. Turns with No Response, Gaps Before a Response, Topic Initiations/Shifts, Interruption Overlaps, Information Questions, and Number of Communication Breakdowns) and the improved fluency ratings. Although both conditions with improved fluency ratings exhibited a reduction in communication breakdowns from the initial to final evaluation, a reduction of communication breakdowns was also observed in the S1:CCP condition which exhibited no change in the fluency ratings from initial to final evaluation. Also, as mentioned previously in the "Efficiency" section, there was no improvement in the efficiency of repair sequences; therefore, this could not account for improved fluency ratings. In addition, changes in the distribution of Topic Initiations/Shifts or Information Questions between the hearing-impaired subjects and communication partners do not correspond to changes in the fluency ratings.

In summary, there was no relationship between the measures of fluency based on the analysis of communication behaviours and the judge's subjective fluency ratings. Further examination also indicated no strong relationship between the qualitative categories on the fluency assessment form used by the judge and the objective measures of fluency and other measures of benefit.

Comprehension

Measures of Comprehension in Tracking

Measures of comprehension in the tracking exercises were based on a written multiple choice test administered to S1 and S2 following each tracking session and on subjective ratings reported in the verbal protocol following each tracking session which queried how much of the tracking content S1 and S2 thought they had understood on a scale of 1 (poor) to 10 (good). The measures of comprehension for S1 and S2 in the tracking exercises are presented in Tables 3.19 and 3.20.

Little change was observed in the comprehension scores (i.e. in the percentage of questions answered correctly) across evaluation sessions in the tracking exercises, suggesting that both S1 and S2 demonstrated high levels of comprehension throughout the sessions even though there were numerous and often extended repair sequences. This suggests that both subjects were attempting to understand the content, rather than just simply repeating the text. Both S1's and S2's comprehension ratings of how much of the text they felt they had understood closely corresponded to their comprehension scores on the tests, suggesting that both had an awareness of how much of the content they were processing.

S1 did demonstrate a lower comprehension score in the tracking of a narrative text with ICP in evaluation

Table 3.19 Measures of comprehension for S1 in the tracking exercises.

Measures of Comprehension	Narratives						Restaurant Reviews					
	CCP			ICP			CCP			ICP		
	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5
Comprehension Score (percent correct)*	90	100	100	60	100	60	80	100	90	80	90	90
Comprehension rating (1=poor; 10=good)	9.5	9	8	5	9.5	7	8.5	7	9	7.5	9	10

* Based on n questions in cases where the text was not completely transmitted in the alotted time.

Table 3.20 Measures of comprehension for S2 in the tracking exercises.

Measures of Comprehension	Narratives						Restaurant Reviews					
	CCP			ICP			CCP			ICP		
	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5
Comprehension Score (percent correct)*	90	90	100	90	90	90	90	100	70	90	100	100
Comprehension rating (1=poor; 10=good)	8	9	9.5	9	9	8	8	8	8	8.5	9	10

* Based on n questions in cases where the text was not completley transmitted in the alotted time.

5, than might be expected based on the observed trend. However, S1 reported in the verbal protocol that she found this text particularly difficult because of the vocabulary (i.e. "the words were more difficult to anticipate"). This might be the case because the text used in this session was a personal narrative of someone's trip to a particular location. Consequently, the vocabulary tended to be very "situation" specific. Although all the texts were equated for readability and grade levels, they were not equated for vocabulary.

Measures of Comprehension in TOPICON

Measures of comprehension in the TOPICON conversations with CCP were based on a written multiple choice test completed by the hearing impaired subjects following each conversation and on the hearing-impaired subjects' rating of how much they thought they understood on a scale from 1 (poor) to 10 (good) as reported in the verbal protocol following each TOPICON conversation. The content of the multiple choice test was based on the ten predetermined personal facts CCP introduced into each TOPICON conversation. The measures of the hearing-impaired subjects comprehension in TOPICON conversations with ICP were based only on the subjects' comprehension ratings reported in the verbal protocol, as the ICP did not introduce ten predetermined personal facts into her conversations. In addition, for conversations with both CCP and ICP, the conversations were analyzed for the number of Turns as Acknowledgment Only and Backchannel Responses. Table 3.21 presents the measures of comprehension for S1 and S2 in the TOPICON conversations with CCP and ICP.

As in the tracking exercises, neither S1's nor S2's comprehension scores changed as a function of therapy, as indicated by little change in the comprehension scores obtained by S1 and S2. In addition,

Table 3.21 Measures of comprehension for S1 and S2 in TOPICON conversations with CCP and ICP.

Measures of Comprehension	Subject 1						Subject 2					
	CCP			ICP			CCP			ICP		
	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5
Comprehension Scores in percent correct *	90	71 (n=7)	89 (n=9)	NA	NA	NA	89 (n=9)	90	100	NA	NA	NA
Comprehension Ratings	5.5	7.5	10	7	10	10	5.5	9	8	8	9	8.5
Turns as Acknowledgment Only	6	6	5	6	3	5	--	1	--	--	--	1
Backchannel Responses	14	24	42	4	15	11	37	50	62	44	46	26
Number of Communication Breakdowns	4	3	2	9	1	1	13	6	10	5	4	4

* Based on n questions in cases where the CCP did not transmit all ten of her personal facts in the alotted time.

both S1 and S2 obtained high comprehension scores throughout the evaluation sessions, suggesting that they were both attending to and processing the content of the conversation. However, both S1's and S2's comprehension ratings improved from the initial to final evaluation in conversations with both CCP and ICP, although greater improvements were observed with CCP. Furthermore, unlike the tracking, the comprehension ratings did not correspond to the obtained comprehension scores in conversations with CCP. In evaluation one both S1's and S2's comprehension ratings were considerably lower than their comprehension scores.

The other two potential measures of comprehension based on the analysis of the TOPICON conversations are Turns as Acknowledgment Only and Backchannel Responses. Because of limited data, changes in the number of Turns as Acknowledgment Only cannot be reliably evaluated. The data shows a general trend of increased use by both S1 and S2 (with the exception of S2 with ICP) from the initial to final evaluation. However, S2 used considerably more Backchannels than S1 did. This general trend of increased use of Backchannels corresponded to the improved comprehension ratings.

Summary of Comprehension

Neither S1 nor S2 demonstrated improvements in their comprehension scores in either the tracking exercises or TOPICON conversations. However, both subjects obtained high comprehension scores throughout the evaluations, suggesting that both of them were attending to and processing the content of the exchanges. Changes in the measure of Turns as Acknowledgment Only could not be reliably evaluated because of limited data.

In the tracking exercises the comprehension ratings corresponded to the comprehension scores, suggesting that both hearing-impaired subjects were aware of how much of the content they were understanding. However, the comprehension ratings in the TOPICON conversations did not correspond to the comprehension scores in that the ratings showed improvement across the evaluation schedule, whereas the scores did not. A general trend on increased use of Backchannel Responses corresponded to the improved comprehension ratings.

Listening Effort

Following each tracking exercise and TOPICON conversation S1 and S2 were asked to rate their listening effort on a scale of 1 (low) to 10 (high). The reported effort ratings for the tracking exercises are presented in Table 3.22, while those for the TOPICON conversations are presented in Table 3.23.

Measures of Listening Effort in Tracking

Effort ratings by S1 decreased in all conditions for both CCP and ICP from the initial to final evaluation, except in narratives with ICP. However, the S1:ICP:Narrative in evaluation five, as previously mentioned, was a particularly difficult text for S1. Examination of changes in effort rating from evaluation one to three in this condition would be consistent with a pattern of reduced effort ratings by S1. In the restaurant review condition, the reduction in S1's effort rating was greater with CCP than with ICP. S2's effort ratings exhibited no significant change in the ICP tracking conditions. In general, S2's effort ratings were higher than S1's, regardless of communication partner. The average change in effort rating with CCP was -2.3, while that with ICP was only -1.6.

Table 3.22 Effort ratings reported by S1 and S2 in tracking with CCP and ICP.

Subject	Narratives						Restaurant Reviews					
	CCP			ICP			CCP			ICP		
	Ev I	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5
Subject 1	7	8	3	8.5	5	9	10	9	5	9	7	5
Subject 2	8	8	9	9	8	8	10	9	10	9	9	8

Table 3.23 Effort ratings reported by S1 and S2 in TOPICON conversations with CCP and ICP.

Subject 1						Subject 2					
CCP			ICP			CCP			ICP		
Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5	Ev 1	Ev 3	Ev 5
4	4	1	9	2	1	6	7	4	3	2	5

Measures of Listening Effort in TOPICON

Table 3.23 displays the effort ratings reported by S1 and S2 for the TOPICON conversations. S1 reported a reduction in effort across the evaluations in conversations with both CCP and ICP, while S2 only reported a reduction in effort in conversations with CCP. S2 reported increased effort in conversations with ICP across the evaluations. However, a reduction for S2 in the S2:ICP condition was observed from evaluation one to three, supporting a trend of a reduction in effort for S2. The average change in effort rating with CCP and ICP was the same (-2.5). Examination of the data in Table 3.10 fails to show any strong connections between effort ratings and the number of communication breakdowns or the distribution of information questions and topic initiations/shifts, suggesting they are not contributing factors to the observed reduction in effort.

Summary of Listening Effort

Effort ratings decreased for S1 in both the tracking exercises and TOPICON conversations, while effort ratings for S2 only decreased in the TOPICON conversations. In the tracking exercises, S2's effort ratings were generally higher than S1's. In the tracking exercises, the average change in effort rating was -2.3 with CCP and -1.6 with ICP, while the average change in effort rating in the TOPICON conversations was the same with CCP and ICP (-2.5).

Hearing Disability

Hearing Performance Inventory

The Hearing Performance Inventory (HPI) questionnaire was completed by S1 and S2 pre and post therapy. The scoring of the HPI provided a subjective measure of each subjects' hearing disability. The

HPI consists of thirteen subtests which ask the subject to rate his/her hearing performance in a variety of everyday listening situations. Please refer to Chapter 2, page 87 for the definitions of the thirteen subtests. The scores for each subtest were arrived at by determining the mean of all the applicable item responses. A score of 1 indicates little disability, while a score of 5 indicates great disability. The pre and post therapy scores for S1 and S2 on the HPI are presented in Table 3.24.

S1's answers to the questions pre therapy indicated a mild disability in all the conditions, with the exception of "Response to Auditory Failure" in which she indicated greater disability. There was little change (i.e. <.10) in three subtests, higher scores in eight subtests, and improved scores (or lower) in the two subtests "Social Situations" and "Response to Auditory Failure". The increased scores in the eight subtests suggest increased problems after therapy. However, in the post interview, S1 reported that in answering the questionnaire it pointed out to her the situations over the years that she had chosen to avoid as a means of handling her hearing disability. Therefore, the results in these subtests may indicate an increased awareness of problem areas by S1 because of her participation in the therapy, rather than increased disability. The improved scores in the "Response to Auditory Failure" and "Social Situations" subtests suggest that therapy may have helped improve her ability to communicate in social situations and to handle communication breakdowns more effectively.

S2's answers to the questions indicated a mild to moderate disability, with the highest pre therapy scores being in the categories "No Visual", "Many", and "Noise". There was little change in five subtests (i.e. <.10), higher scores in the three subtests "Intensity", "One to One Situation", and "Strangers", and lower scores (>.10 reduction) in the five subtests "Social Situations", "Many Persons", "Noise", "No Visual", and

Table 3.24 Responses on Hearing Performance Inventory before and after therapy.

Subtest	Before Therapy		After Therapy	
	Subject 1	Subject 2	Subject 1	Subject 2
Intensity	1.684	2.211	2.105	2.316
Social Situations	2.750	2.489	2.596	2.333
Personal	2	2	2	2
Speech	1.957	2.250	2.141	2.183
Response to Auditory Failure	3.400	2.533	3.161	2.621
Visual	1.652	2.000	1.854	1.896
No Visual	2.565	2.889	2.739	2.783
One to One	1.930	1.925	2.159	2.045
Many Persons	2.050	2.875	2.050	2.250
Familiar	2.250	1.952	2.292	1.917
Strangers	1.909	2.222	2.091	2.364
Quiet	1.739	2.100	1.870	2.000
Noise	2.400	2.800	2.600	2.680

"Visual". Many of the therapy activities (and evaluations) with S2 involved using noise and no visuals. In addition, a few therapy sessions incorporated small group discussions (2 or 3 people) to simulate her educational environment. This would suggest that therapy helped S2 to communicate in the situations of "Many persons", "No Visual", and "Noise". There is no clear reason why S2 would have reported increased problems (i.e. higher scores) after therapy in the three subtests "Response to Auditory Failure", One to One" and "Strangers", other than due to an increased awareness of her communication

difficulties. This is supported by her comments in the post interview that the therapy program had made her realize how much of the content of her conversational interactions she had been missing.

Even though scores for S2 on the HPI indicated improvement in eight of the thirteen subtests, of which only six demonstrated an improvement of greater than .10, in the post interview she reported that she had not had the opportunity to apply the techniques learned in therapy in her educational setting, which is where she experiences her greatest disability. Whether or not S2 can transfer the use of the communication skills learned in this program to her educational environment to help reduce her disability is a an important question for follow-up.

SATISFACTION

Post Therapy Interview

Following the completion of therapy and evaluation sessions S1 and S2 were individually interviewed with respect to their general satisfaction with the therapy program and their ability to use the targeted communication strategies in their everyday conversational interactions post therapy to improve efficiency, fluency and comprehension, and to reduce effort and hearing handicap. Satisfaction levels were based on a scale of 1 (low) to 10 (high). S1's and S2's reported satisfaction ratings are presented in Table 3.25.

Both S1 and S2 gave high satisfaction ratings (7 and above) for their ability to use the skills to improve their comprehension. Both reported their improved comprehension could be contributed in some part to an their increased willingness to more fully participate in conversations. Both reported they felt this was

because of the increased confidence they had gained in their ability to participate in and manage conversations as a result of the strategies they learned from their involvement in the therapy program. S1 reported that before therapy she would just let the other person speak and she would play along, whereas since her participation in the program she felt she could direct conversations to help give her an edge.

Table 3.25 Satisfaction ratings reported by Subjects 1 and 2 in post therapy interview.

	Subject 1	Subject 2
Reduction in hearing handicap	3	1
Improved efficiency of communication	5	6
Improved conversational fluency	5	3
Reduction of listening effort	6	9
Improved comprehension	7-8	7
General Satisfaction with program	8-9	9

Moderate satisfaction levels were reported by both subjects for using the targeted strategies to improve efficiency. Satisfaction levels were reported as moderate to high for using the strategies to reduce listening effort. S1 reported being only moderately satisfied with her ability to use the strategies to reduce her listening effort in her everyday conversations. She reported still needing to use considerable effort when conversing, but she thought that her involvement in therapy had increased her confidence, thereby decreasing her anxiousness and stress. Even though she felt she still had to put the effort in, she

thought that it had reduced because of the reduced stress. In contrast, S2 reported high satisfaction with her ability to use strategies to reduce her listening effort. She reported, that because of her involvement in the program, she had become much more aware of the process of listening and had become a better listener on the whole. Therefore, she felt this aspect of the program had been quite successful for her. However, S2 reported that she had not had opportunities to use the strategies and information discussed in therapy in the one setting where information exchange was important to her, her educational setting. Therefore, this had not been an area of great satisfaction for her.

Low satisfaction ratings (5 and below) were reported by both S1 and S2 with respect to their ability to use the targets strategies to improve conversational fluency and to reduce their hearing handicap. Based on both subjects' comments, the major reason for these low ratings was that even though both S1 and S2 thought that therapy had increased their awareness of the variety of communication strategies to help effect more fluent conversations, they had not had sufficient time or opportunities outside of the therapy to practice these techniques so that their use would become spontaneous or "second nature" to them. Consequently, neither S1 nor S2 thought any actual change had occurred in their everyday conversational interactions yet. Furthermore, S2 reported not having the opportunity to use the strategies in her educational setting, which was where she felt the most hearing handicapped. Both subjects were optimistic and thought that more time was needed before actual changes in conversational fluency and hearing handicap would occur.

The general satisfaction levels with respect to the therapy program were high for both S1 and S2. Both subjects reported that the greatest benefit they had obtained from participating in the program was an

increased confidence to participate in conversations and to manage conversational breakdowns. S1 reported feeling very negative and frustrated with her hearing prior to therapy, but felt much more positive and in control as a result of her participation in the program. S2 reported that the program had been very good for her and that the advantages she had derived from participating in the program could not necessarily be measured, but were more of an attitude or approach that one adopts.

SUMMARY OF RESULTS

Use

Neither S1 nor S2 demonstrated an expansion in the types of clarification requests used in either the tracking or TOPICON tasks as a result of therapy, even though both reported in the verbal protocols that they had attempted using as many of the different types as possible. ICP also did not demonstrate an increased repertoire of repair strategies as a result of therapy in either evaluation task. However, all three subjects reported using some of the strategies in their conversations outside of therapy. All three reported in the post interviews that their participation in the therapy program resulted in an increased awareness of the various conversational strategies which could be used to achieve more efficient and fluent conversations, but all felt more time was needed to practice these strategies in everyday conversations before their use became spontaneous. Even though the repertoires did not increase, the distribution of requests for clarification used by S1 and S2 and of repair strategies used by ICP changed as a function of therapy. S1 and S2 demonstrated a reduction of Nonspecific Requests for Repetitions, while ICP demonstrated a reduction in her use of Elaborations and an increase in the use of Confirmations and Syntactic Simplifications.

Benefit

Efficiency

Improved median tracking rates were observed for both S1 and S2 with both communication partners. The average improvement in the tracking rates with ICP was greater than that with CCP. Factors which contributed to the improved tracking rates were improvements in the median time per nonrepaired presentation utterance (i.e. faster rates for nonrepaired lines), a reduction in percentage of presentation utterances needing repair (i.e. fewer communication breakdowns) and improved efficiency of repair sequences as indicated by improvements in the median rate per repaired presentation utterance, all of which were greater for ICP than CCP. Improved efficiency of repair sequences was not a function of the frequency or types of clarification requests used by S1 and S2. However, it was a function of the repair strategies used by both CCP and ICP, specifically a reduction in the use of Elaborations and increased use of Syntactic Simplifications. However, a greater reduction in the use of Elaborations was demonstrated by ICP than by CCP.

In the TOPICON conversations, measures of clauses/minute only showed improvement in one condition (S1:CCP). Clauses/minute measures were greater in conversations with CCP than with ICP for both S1 and S2. Clauses/turn increased for all subjects, but more clauses/turn were exhibited by CCP than S1 and S2, while ICP exhibited fewer than S1 and S2. Based on the limited data, there was a reduction in the number of communication breakdowns, but the efficiency of repair sequences did not change.

Fluency

Two out of the four conditions demonstrated improved fluency ratings from the initial to final evaluation

(S1:ICP and S2:CCP). Fluency ratings were generally high throughout the evaluations. The fluency ratings given for conversations with S1 were higher for CCP than ICP, while those given for conversations with S2 were higher for ICP than CCP. There was no connection between the objective measures of fluency and the judge's subjective ratings. Furthermore, there was no strong connection between the qualitative categories on the fluency assessment form used by the judge and other measures of fluency.

Comprehension

Neither S1 nor S2 demonstrated improvements in their comprehension scores in either the tracking or TOPICON tasks. Comprehension scores were high for both S1 and S2 throughout the evaluation schedule in both the tracking and TOPICON activities, suggesting both were attending to and processing the content of the exchanges. In the tracking exercises, the comprehension ratings corresponded to the comprehension scores, suggesting that both of the hearing-impaired subjects were aware of how much of the content they were understanding. However, the comprehension ratings in the TOPICON conversations did not correspond to the comprehension scores. The comprehension ratings were lower than the objective scores for both S1 and S2 in evaluation one and then showed improvement, with convergence of the ratings and scores occurring in later evaluation sessions.

Measures of Turns as Acknowledgment Only could not be reliably evaluated because of limited data. The data indicated a general trend of increases in Backchannel Responses by both hearing-impaired subjects, corresponding to the improved comprehension ratings. However, S2 used considerably more Backchannel Responses than S1 did.

Listening Effort

Rated effort decreased in seven of the eight tracking conditions for S1, as well as in the TOPICON conversations with both CCP and ICP. Furthermore, there was a greater reduction in S1's effort ratings in the tracking exercises with CCP than in those with ICP. Reported effort by S2 in the tracking exercises did not show significant change across the evaluations, but reductions in her effort were observed in the TOPICON conversations with CCP from the initial to final evaluation, but only from evaluation one to three with ICP. In the tracking exercises, the average change in effort rating was -2.3 with CCP and -1.6 with ICP, while the average change in effort rating in the TOPICON conversations was the same for CCP and ICP (-2.5).

Hearing Disability

Of the thirteen subtests for S1 two showed substantial improvement (i.e. greater than .01), three showed some improvement (i.e. less than .01) and five indicated increased disability. S2 demonstrated substantial improvements five subtests, lesser improvement in five subtests, and greater disability in three of the subtests. Both subjects demonstrated improvements in the subtests concerned with Response to Auditory Failure and Social Situations, suggesting that therapy may have improved their ability to handle conversational breakdowns and to communicate in social situations. Both subjects reported that therapy had improved their awareness of their hearing difficulties, which might explain why both subjects demonstrated poorer scores in some of the subtests.

Satisfaction

Both S1 and S2 were highly satisfied with their ability to use the targeted communication strategies to

improve their comprehension. Both subjects reported that improvements in comprehension were due to their increased confidence to participate in and manage conversations as a result of their involvement in the program. However, both S1 and S2 reported low satisfaction levels in terms of their ability to use the strategies to improve conversational fluency and reduce hearing handicap. Both subjects reported that they felt this was due to insufficient time and opportunities to practice the conversational strategies introduced in therapy to the point that they could use them spontaneously. Therefore, they thought that little change had actually occurred in their everyday communications. Moderate satisfaction levels were reported with respect to using the strategies to effect improvements in the efficiency of communication, while satisfaction levels with respect to using the strategies to reduce listening effort were moderate to high. S1 reported being moderately satisfied in terms of using the target strategies to reduce listening effort. She reported a reduction in anxiety and stress, which she thought was related to the reduction in effort she experienced. S2 reported being highly satisfied in terms of using the strategies to reduce listening effort. General satisfaction levels with respect to the therapy program were high for both subjects. Both subjects attributed this high satisfaction to the increased confidence that they had gained in their ability to participate in and manage difficult conversation situations as a result of their involvement in the therapy program. S2 further reported that she thought that the greatest benefit she had gained was not readily measurable because it was more of an attitude or approach one adopts than a specific skill or technique.

CHAPTER 4

CONCLUSIONS AND DISCUSSION

RESTATING PURPOSE OF STUDY AND HYPOTHESES

This purpose of the present study was to examine the effectiveness of an aural rehabilitation program (based on Erber, 1988) for working-aged mild-to-moderately hearing-impaired subjects who were experiencing communication difficulties in their work and/or educational environments. There are two underlying assumptions of Erber's approach, and of the present study: first, that a hearing-impaired client's metalinguistic (knowledge of language structure and use) and metacommunication awareness (knowledge of how language is used in conversations) can be improved, and second, that the hearing-impaired person can use this knowledge and related strategies to participate in more efficient and fluent conversations. Furthermore, given the interactive nature of conversation, Erber assumes that providing therapy to a familiar communication partner of the hearing-impaired client is an important aspect of the aural rehabilitation process. However, the hearing-impaired subjects who participated in the present study experienced the greatest communication difficulties in their work and/or educational settings where the majority of their conversational interactions are with unfamiliar communication partners. Therefore, the present study examined whether the aural rehabilitation approach would be of benefit to such hearing-impaired clients whose difficulties involve unfamiliar communication partners.

This research was concerned with two aspects of program evaluation. First, it was concerned with an evaluation of treatment effectiveness, measured by whether or not the hearing-impaired subjects received benefit in their conversational interactions with unfamiliar communication partners as a result of the

therapy program; specifically it was concerned with whether greater benefit would be obtained with an unfamiliar communication partner who received therapy compared to one who did not receive therapy. Second, it was concerned with appraising the validity of the evaluation methods and outcome measures used in the study. An evaluation protocol examining aspects of use, benefit and satisfaction was employed in the program evaluation. Based on these two aspects of program evaluation, the following hypotheses were posed at the end of Chapter 2:

Use:

1. It was hypothesized that the hearing-impaired subjects would increase the types of requests for clarification and repair strategies (i.e. repertoire size) they used post-treatment.
2. It was hypothesized that the ICP would increase the types of clarification repair strategies she used post-treatment.

Benefit:

1. As a result of using the targeted communication techniques, it was hypothesized that the hearing-impaired subjects would benefit by improving their ability to understand conversations, thereby achieving more efficient and fluent communication. It was proposed that benefit would be indicated by:

   a) Improvement in efficiency;
   b) Improved fluency of conversations;
   c) Increases in the amount of conversation understood;
   d) A reduction in listening effort;
   e) A reduction in hearing disability.

2. It was hypothesized that greater benefit would be derived by the hearing-impaired subjects in

their interactions with the ICP than in those with the CCP because of the ICP's use of the targeted communication strategies. It was proposed that additional benefit would be indicated by:

a) A greater improvement in the efficiency of the interactions with ICP than with CCP;
b) A greater improvement in the fluency of the interactions with ICP than with CCP;
c) A greater improvement in the amount of conversation understood in interactions with ICP than in those with CCP;
d) A greater reduction in listening effort in conversations with ICP than in those with the CCP.

3. It was hypothesized that the outcome measures and evaluation methods would be sufficiently sensitive and selective to indicate if benefit occurred. The validity of the chosen outcome measures and appropriate application of the evaluation methods used will be critically examined. Furthermore, the construct of conversational fluency will be examined by comparing the measures of benefit derived from the discourse analysis with the qualitative measures used to subjectively judge conversational fluency.

Satisfaction

It was hypothesized that the hearing-impaired subjects general satisfaction with the therapy program would be high and that they would be highly satisfied with their specific abilities to use the targeted communication strategies post-treatment in their everyday conversations such that efficiency, fluency, and comprehension would be improved and listening effort and hearing handicap would be reduced.

In the following section, the findings for each level of the evaluation protocol, as summarized at the end of Chapter 3, will be interpreted in terms of whether or not they support the proposed hypotheses.

INTERPRETATION OF RESULTS

Use

The hypotheses regarding benefit are based on underlying assumptions regarding the hearing-impaired subjects' and the ICP's ability to use the targeted strategies. Therefore, this section considers whether the hypotheses regarding use are supported by the research findings. The use of communication strategies by the hearing-impaired subjects will be discussed first, followed by the use of repair strategies by the ICP.

Use of Requests for Clarification by the Hearing-Impaired Subjects

The findings in the present do not indicate that there was any expansion in either of the hearing-impaired subjects' repertoire of the types of clarification requests used. S1 increased her repertoire in the tracking exercises, but not S2 and neither subject increased her repertoire in the TOPICON conversations. However, both subjects reported being aware of actively attempting to use these strategies during the tracking exercises, but not during the TOPICON conversations.

However, the findings nevertheless indicated that both S1 and S2 changed the distribution of the kinds of clarification requests they used: both demonstrated a reduction of Nonspecific Requests for Repetition. Since the use of Specific Requests over Nonspecific Requests was a part of the therapy program, this change seems likely to be the result of therapy. The increased use of Specific Requests can be considered to be a positive change because previous aural rehabilitation research has suggested that Specific Requests for clarification are more effective than Nonspecific requests in resolving conversational dysfluencies (Erber, 1988; Gagné & Wyllie, 1989; Owens & Telleen, 1981).

There are four possible explanations for the lack of change in repertoire size. The first explanation relates to subject selection. Both of the hearing-impaired subjects had some post-secondary education. Furthermore, S1 worked in a university research environment and S2 was majoring in English Literature. Therefore, it is highly possible that both subjects entered the therapy program with a good knowledge of language, conversational interaction, and/or communication strategies to assist them with their hearing difficulties. Perhaps they entered the program already possessing the full range of clarification requests selected for evaluation in the present study. The data on S1 in the tracking exercises in evaluation one seems to support this, as she used the full range of possible clarification requests. Consequently, pre-therapy ceiling effects are a possibility; thereby, leaving less potential for improvement in expanding the repertoire of types of clarification requests used.

A second explanation for a lack of change in the size of the hearing-impaired subjects' repertoire of clarification requests relates to the set-up of the TOPICON procedure. The same S/N ratio for each subject was used throughout both the tracking and the TOPICON procedures. The idea was to select a S/N ratio that would make the evaluation tasks sufficiently difficult that possible treatment effects could be observed (i.e. avoid ceiling and floor effects). Based on the number of communication breakdowns observed in the tracking exercises, it can be assumed that ceiling effects did not occur in the tracking exercises. However, there were significantly fewer communication breakdowns in the TOPICON conversations than in the tracking exercises, suggesting the possibility of ceiling effects in the TOPICON conversations. Even though the selected S/N ratio was sufficiently difficult in the tracking task, it apparently was not so difficult in the TOPICON task.

One reason why one selected S/N ratio might not be appropriate for both the tracking and TOPICON tasks relates to the difference in processing demands of the two tasks. Tracking involved verbatim repetition on the part of the hearing-impaired subjects, while the TOPICON task did not. Verbatim repetition is very dependent on analytical bottom-up processing because the linguistic pattern of the speaker's utterance must be exactly replicated by the listener. In contrast, the dependence on bottom-up processing in the TOPICON task was most likely not as great because of the greater contextual support from the developing conversation and greater conformity to sentence structure usage and vocabulary usage typical of conversations (unlike that in the narrative and restaurant texts). A greater dependency on bottom-up processing might increase the processing demands or effort required by the listener, while a shift towards top-down processing might reduce the effort required. This is supported by the finding that both hearing-impaired subjects rated effort was substantially greater in the tracking exercises than in the TOPICON tasks. Therefore, because of the subjects' ability to use top-down processing in the TOPICON task, the S/N ratio used in the tracking task was insufficient for the TOPICON task. However, it was not possible to raise the level of the babble noise during the TOPICON task because both subjects reported any level higher than 65 dBHL was intolerable to listen to for extended periods. This difficulty with the S/N ratio does emphasize the importance of considering that task difficulty may vary with each evaluation activity and that the set-up procedures may have to vary accordingly.

The third explanation is related to the effect of a particular evaluation procedure on the choice of strategies. While the communication strategies selected to be evaluated are probably appropriate in most communication situations, it is not necessarily the case that they are always appropriate. The nature of tracking (i.e. timed verbatim repetition) seemed to favour the use by the hearing-impaired subjects of

Requests for a Specific Constituent and Confirmation of the Form, while not favouring the use of request for Explanation or Change in the Manner of Presentation. In contrast, the more "natural" conversational interaction in the TOPICON procedure would probably tend to encourage the use of a wider variety of communication strategies. However, it appears that the hearing-impaired subjects' personal biases might have still favoured the use of some clarification requests over others. Both subjects reported that in their daily conversations the use of Requests for Repetition of a Specific Constituent and Confirmation were usually sufficient to clarify misperceptions. These two request types were also the one that were most frequently used by both hearing-impaired subjects in the tracking and TOPICON activities.

A possible fourth factor is that the eight week time period of the study was not sufficient for change to occur in the use of communication strategies. Both hearing-impaired subjects reported they needed more time to practice the techniques before they would be able to spontaneously use them in a conversational interaction. Although evaluation five was done two-week post-therapy, it would have been valuable to do a follow-up evaluation at a later time such as two to four months.

Use of Repair Strategies by the Communication Partners

The findings of the present study indicated that the size of the repertoire of repair strategies used by CCP and ICP did not increase in either the tracking or TOPICON tasks. However, ICP did report that therapy had increased her awareness of the communication strategies she could use. Because both communication partners used the full range of repair strategies pre-therapy (i.e in evaluation one sessions), it is reasonable to assume that they each entered the program already possessing the range of repair strategies to be evaluated. As with the hearing-impaired subjects, this suggests possible pre-

therapy ceiling effects. One explanation might be that both communication partners entered the program with a good knowledge of language and communication. Both of them had post-secondary education and a background in the field of communication: CCP was a student entering the Audiology and Speech Sciences program and ICP had a background in broadcasting and had just started work in a project working with hearing-impaired seniors when she was recruited to participate in the present study. Furthermore, it is possible that ceiling effects were observed in the TOPICON procedure because of insufficient task difficulty as previously discussed.

Even though CCP's and ICP's repertoire did not increase during the tracking exercises, the distribution of the types of repair strategies they used did. Of particular interest is that both CCP and ICP increased their use of Syntactic Simplifications and reduced their use of Elaborations (ICP more so than CCP). Furthermore, ICP demonstrated a trend of reducing her use of Elaborations in the TOPICON conversations. Therapy sessions with ICP involved a discussion of the effect of various strategies on the listener based on reports by both S1 and S2 on several occasions in the verbal protocols and therapy sessions, in particular with respect to the use of Elaborations. Both S1 and S2 reported that they found that the use of Elaborations to repair conversational breakdowns was frustrating and ineffective, especially in the tracking exercises, because their use tended to confuse their thinking processes and divert them away from the context of the text. Consequently, the noticeable reduction of the use of Elaborations by ICP can be taken to indicate that therapy did effect a change in ICP's use of repair strategies. One possible explanation for the changes in CCP's distribution is that as the evaluations progressed CCP became more familiar with the tracking procedure such that she might have developed biases for preferred strategies or developed a sense of which strategies were most efficient for her.

A possible problem with interpreting the findings on efficiency of repair sequences in the tracking evaluations relates to the nature of the tracking task. Tracking involves the timed verbatim repetition of text. The sender is very much in control of the presentation of the text. It is the responsibility of the sender to ensure that the listener repeats the text verbatim. In contrast, the listener does not direct the interaction, but rather responds to the sender. This control/respond relationship is also a part of the repair sequences. Furthermore, the timed nature of the activity demands that repair sequences be as expedient as possible. Expediency is more likely attained if the sender controls the repair sequences because the sender knows the specific information to be relayed. Furthermore, the necessity of timed verbatim repetition may bias the type of clarification requests and repair strategies employed. It is not expedient to use strategies or requests involving elaborations, while breaking the text segments into smaller chunks (i.e. Syntactic Simplifications) may be expedient in the sense that it may prevent communication breakdowns. Therefore, even though the change in ICP's pattern of use was likely influenced by her participation in therapy, the possibility that the tracking procedure favoured the use of these two strategies cannot be entirely ruled out as a contributing factor because both CCP and ICP demonstrated the same change in their distribution of types of repair strategies used. It may be that the nature of tracking was not only influential in the choice of clarification requests, but also in the choice of repair strategies.

In conclusion, ceiling effects in performance during the TOPICON activity and the possible influence of the tracking procedure on the selection of strategies limits the strength of any conclusions regarding Use that can be drawn. The findings do tend to suggest that both the hearing-impaired subjects and the intervention communication partner were capable of using all of the communication strategies introduced

in therapy and had increased their awareness of such strategies as a result of therapy.

Benefit

Efficiency

The findings do not provide convincing evidence to support the hypothesis that the hearing-impaired subjects would benefit by becoming more efficient communicators. Even though improved efficiency was evidenced by improved median tracking rates in the tracking exercises for both S1 and S2 with both CCP and ICP, the improved efficiency cannot be directly attributed to the hearing-impaired subjects performance.

The improved tracking rates in the tracking exercises were attributed to two factors: the improved efficiency of repair sequences and a decrease in the number of communication breakdown as evidenced by reductions in the percentage of repaired presentation utterances. The improved efficiency of repair sequences was not due to the frequency and types of clarification requests used by the hearing-impaired subjects, but rather to the types of repair strategies used by the communication partners. This finding does not provide evidence that the hearing-impaired subjects became more efficient communicators in terms of repairing communication breakdowns. However, tracking is very much a sender-initiated and controlled interaction, especially the repair sequences, because the sender must get the listener to repeat specific text verbatim. Consequently, the listener has little control during the repair sequences. Furthermore, as discussed in the "Use" section in this chapter the tracking procedure itself may favour the use of certain clarification requests. Consequently, the tracking procedure may not provide the most appropriate communicative context to evaluate the hearing-impaired subjects ability to be efficient

communicators.

With respect to the second factor contributing to improved efficiency of repair sequences in the tracking exercises, a reduction in the number of communication breakdowns, it is difficult to separate out the relative contributions of the hearing-impaired subject and the communication partner. Because there was a greater reduction in the percentage of repaired presentation utterances with ICP than with CCP, it is reasonable to assume that ICP's communication behaviour contributed to some extent to the observed reduction in communication breakdowns. However, objective evidence does not exist to support this assumption. Since both hearing-impaired subjects reported that they were aware of attempting to use top-down processes in later evaluations, it may be that their use of such top-down strategies also contributed, to some extent, to the reduction in communication breakdowns. However, the use of such top-down processing is difficult to quantify.

Unlike the tracking exercises, in which improved efficiency was directly attributed to the communication partners, measures of efficiency in the TOPICON conversations did not provide convincing evidence of improved efficiency of communication for either S1 or S2 with either CCP or ICP. Increases in clauses/minute were not observed. Furthermore, improved efficiency was not observed in terms of fewer communication breakdowns or more efficient repair sequences. However, ceiling effects in the TOPICON task limits any conclusions regarding the hearing-impaired subjects' use of clarification requests to become more efficient communicators. Even though there was an increase in clauses/turn exhibited by both S1 and S2 across the evaluations with both communication partners, suggesting that the amount of information per turn for S1 and S2 increased, the number of turns decreased across the evaluations

such that there was not an increase in the total amount of information exchanged in the conversations. Although the increase in clauses/turn may be indicative of more efficient use of turns to convey information (i.e. longer but fewer turns), it does not support improved efficient as defined here and by Erber (1988) (i.e. the rate of information exchange).

The findings were also inconclusive with respect to the hypothesis that greater benefit would be derived by the hearing-impaired subjects in terms of greater improvements in the efficiency of their interactions with ICP than in those with CCP. Greater improvements in the efficiency of the tracking exercises with ICP than with CCP was supported by the findings, but the findings in the TOPICON task were inconclusive because of ceiling effects. In the tracking exercises, the average improvement in the efficiency of tracking with ICP was greater than that with CCP and was associated with greater reductions in the number of communication breakdowns for ICP than CCP and with changes in the repair strategies used by ICP and CCP, specifically a reduction in use of Syntactic Simplifications and increased use of Elaborations. Even though both communication partners exhibited the same pattern of repair usage, ICP reduced her use of Elaborations more so than CCP did. Although ICP reduced her use of Elaborations much more so than CCP across the evaluations, the initial level for ICP was much higher leaving greater potential for improvement. Furthermore, because both ICP and CCP demonstrated similar changes in their pattern of use, the possibility that the improved efficiency of repair sequences, hence overall efficiency of tracking, cannot solely be attributed to the effects of specific therapeutic exercises for ICP.

The major problem in measuring efficiency in the TOPICON task relates to the validity of measuring efficiency as it is defined by Erber (i.e. the rate of information exchange). While ,the rate of information

Benefit

Efficiency

Improved median tracking rates were observed for both S1 and S2 with both communication partners. The average improvement in the tracking rates with ICP was greater than that with CCP. Factors which contributed to the improved tracking rates were improvements in the median time per nonrepaired presentation utterance (i.e. faster rates for nonrepaired lines), a reduction in percentage of presentation utterances needing repair (i.e. fewer communication breakdowns) and improved efficiency of repair sequences as indicated by improvements in the median rate per repaired presentation utterance, all of which were greater for ICP than CCP. Improved efficiency of repair sequences was not a function of the frequency or types of clarification requests used by S1 and S2. However, it was a function of the repair strategies used by both CCP and ICP, specifically a reduction in the use of Elaborations and increased use of Syntactic Simplifications. However, a greater reduction in the use of Elaborations was demonstrated by ICP than by CCP.

In the TOPICON conversations, measures of clauses/minute only showed improvement in one condition (S1:CCP). Clauses/minute measures were greater in conversations with CCP than with ICP for both S1 and S2. Clauses/turn increased for all subjects, but more clauses/turn were exhibited by CCP than S1 and S2, while ICP exhibited fewer than S1 and S2. Based on the limited data, there was a reduction in the number of communication breakdowns, but the efficiency of repair sequences did not change.

Fluency

Two out of the four conditions demonstrated improved fluency ratings from the initial to final evaluation

(S1:ICP and S2:CCP). Fluency ratings were generally high throughout the evaluations. The fluency ratings given for conversations with S1 were higher for CCP than ICP, while those given for conversations with S2 were higher for ICP than CCP. There was no connection between the objective measures of fluency and the judge's subjective ratings. Furthermore, there was no strong connection between the qualitative categories on the fluency assessment form used by the judge and other measures of fluency.

Comprehension

Neither S1 nor S2 demonstrated improvements in their comprehension scores in either the tracking or TOPICON tasks. Comprehension scores were high for both S1 and S2 throughout the evaluation schedule in both the tracking and TOPICON activities, suggesting both were attending to and processing the content of the exchanges. In the tracking exercises, the comprehension ratings corresponded to the comprehension scores, suggesting that both of the hearing-impaired subjects were aware of how much of the content they were understanding. However, the comprehension ratings in the TOPICON conversations did not correspond to the comprehension scores. The comprehension ratings were lower than the objective scores for both S1 and S2 in evaluation one and then showed improvement, with convergence of the ratings and scores occurring in later evaluation sessions.

Measures of Turns as Acknowledgment Only could not be reliably evaluated because of limited data. The data indicated a general trend of increases in Backchannel Responses by both hearing-impaired subjects, corresponding to the improved comprehension ratings. However, S2 used considerably more Backchannel Responses than S1 did.

Listening Effort

Rated effort decreased in seven of the eight tracking conditions for S1, as well as in the TOPICON conversations with both CCP and ICP. Furthermore, there was a greater reduction in S1's effort ratings in the tracking exercises with CCP than in those with ICP. Reported effort by S2 in the tracking exercises did not show significant change across the evaluations, but reductions in her effort were observed in the TOPICON conversations with CCP from the initial to final evaluation, but only from evaluation one to three with ICP. In the tracking exercises, the average change in effort rating was -2.3 with CCP and -1.6 with ICP, while the average change in effort rating in the TOPICON conversations was the same for CCP and ICP (-2.5).

Hearing Disability

Of the thirteen subtests for S1 two showed substantial improvement (i.e. greater than .01), three showed some improvement (i.e. less than .01) and five indicated increased disability. S2 demonstrated substantial improvements five subtests, lesser improvement in five subtests, and greater disability in three of the subtests. Both subjects demonstrated improvements in the subtests concerned with Response to Auditory Failure and Social Situations, suggesting that therapy may have improved their ability to handle conversational breakdowns and to communicate in social situations. Both subjects reported that therapy had improved their awareness of their hearing difficulties, which might explain why both subjects demonstrated poorer scores in some of the subtests.

Satisfaction

Both S1 and S2 were highly satisfied with their ability to use the targeted communication strategies to

improve their comprehension. Both subjects reported that improvements in comprehension were due to their increased confidence to participate in and manage conversations as a result of their involvement in the program. However, both S1 and S2 reported low satisfaction levels in terms of their ability to use the strategies to improve conversational fluency and reduce hearing handicap. Both subjects reported that they felt this was due to insufficient time and opportunities to practice the conversational strategies introduced in therapy to the point that they could use them spontaneously. Therefore, they thought that little change had actually occurred in their everyday communications. Moderate satisfaction levels were reported with respect to using the strategies to effect improvements in the efficiency of communication, while satisfaction levels with respect to using the strategies to reduce listening effort were moderate to high. S1 reported being moderately satisfied in terms of using the target strategies to reduce listening effort. She reported a reduction in anxiety and stress, which she thought was related to the reduction in effort she experienced. S2 reported being highly satisfied in terms of using the strategies to reduce listening effort. General satisfaction levels with respect to the therapy program were high for both subjects. Both subjects attributed this high satisfaction to the increased confidence that they had gained in their ability to participate in and manage difficult conversation situations as a result of their involvement in the therapy program. S2 further reported that she thought that the greatest benefit she had gained was not readily measurable because it was more of an attitude or approach one adopts than a specific skill or technique.

CHAPTER 4

CONCLUSIONS AND DISCUSSION

RESTATING PURPOSE OF STUDY AND HYPOTHESES

This purpose of the present study was to examine the effectiveness of an aural rehabilitation program (based on Erber, 1988) for working-aged mild-to-moderately hearing-impaired subjects who were experiencing communication difficulties in their work and/or educational environments. There are two underlying assumptions of Erber's approach, and of the present study: first, that a hearing-impaired client's metalinguistic (knowledge of language structure and use) and metacommunication awareness (knowledge of how language is used in conversations) can be improved, and second, that the hearing-impaired person can use this knowledge and related strategies to participate in more efficient and fluent conversations. Furthermore, given the interactive nature of conversation, Erber assumes that providing therapy to a familiar communication partner of the hearing-impaired client is an important aspect of the aural rehabilitation process. However, the hearing-impaired subjects who participated in the present study experienced the greatest communication difficulties in their work and/or educational settings where the majority of their conversational interactions are with unfamiliar communication partners. Therefore, the present study examined whether the aural rehabilitation approach would be of benefit to such hearing-impaired clients whose difficulties involve unfamiliar communication partners.

This research was concerned with two aspects of program evaluation. First, it was concerned with an evaluation of treatment effectiveness, measured by whether or not the hearing-impaired subjects received benefit in their conversational interactions with unfamiliar communication partners as a result of the

therapy program; specifically it was concerned with whether greater benefit would be obtained with an unfamiliar communication partner who received therapy compared to one who did not receive therapy. Second, it was concerned with appraising the validity of the evaluation methods and outcome measures used in the study. An evaluation protocol examining aspects of use, benefit and satisfaction was employed in the program evaluation. Based on these two aspects of program evaluation, the following hypotheses were posed at the end of Chapter 2:

Use:

1. It was hypothesized that the hearing-impaired subjects would increase the types of requests for clarification and repair strategies (i.e. repertoire size) they used post-treatment.
2. It was hypothesized that the ICP would increase the types of clarification repair strategies she used post-treatment.

Benefit:

1. As a result of using the targeted communication techniques, it was hypothesized that the hearing-impaired subjects would benefit by improving their ability to understand conversations, thereby achieving more efficient and fluent communication. It was proposed that benefit would be indicated by:

   a) Improvement in efficiency;
   b) Improved fluency of conversations;
   c) Increases in the amount of conversation understood;
   d) A reduction in listening effort;
   e) A reduction in hearing disability.

2. It was hypothesized that greater benefit would be derived by the hearing-impaired subjects in

their interactions with the ICP than in those with the CCP because of the ICP's use of the targeted communication strategies. It was proposed that additional benefit would be indicated by:

a) A greater improvement in the efficiency of the interactions with ICP than with CCP;
b) A greater improvement in the fluency of the interactions with ICP than with CCP;
c) A greater improvement in the amount of conversation understood in interactions with ICP than in those with CCP;
d) A greater reduction in listening effort in conversations with ICP than in those with the CCP.

3. It was hypothesized that the outcome measures and evaluation methods would be sufficiently sensitive and selective to indicate if benefit occurred. The validity of the chosen outcome measures and appropriate application of the evaluation methods used will be critically examined. Furthermore, the construct of conversational fluency will be examined by comparing the measures of benefit derived from the discourse analysis with the qualitative measures used to subjectively judge conversational fluency.

Satisfaction

It was hypothesized that the hearing-impaired subjects general satisfaction with the therapy program would be high and that they would be highly satisfied with their specific abilities to use the targeted communication strategies post-treatment in their everyday conversations such that efficiency, fluency, and comprehension would be improved and listening effort and hearing handicap would be reduced.

In the following section, the findings for each level of the evaluation protocol, as summarized at the end of Chapter 3, will be interpreted in terms of whether or not they support the proposed hypotheses.

INTERPRETATION OF RESULTS

Use

The hypotheses regarding benefit are based on underlying assumptions regarding the hearing-impaired subjects' and the ICP's ability to use the targeted strategies. Therefore, this section considers whether the hypotheses regarding use are supported by the research findings. The use of communication strategies by the hearing-impaired subjects will be discussed first, followed by the use of repair strategies by the ICP.

Use of Requests for Clarification by the Hearing-Impaired Subjects

The findings in the present do not indicate that there was any expansion in either of the hearing-impaired subjects' repertoire of the types of clarification requests used. S1 increased her repertoire in the tracking exercises, but not S2 and neither subject increased her repertoire in the TOPICON conversations. However, both subjects reported being aware of actively attempting to use these strategies during the tracking exercises, but not during the TOPICON conversations.

However, the findings nevertheless indicated that both S1 and S2 changed the distribution of the kinds of clarification requests they used: both demonstrated a reduction of Nonspecific Requests for Repetition. Since the use of Specific Requests over Nonspecific Requests was a part of the therapy program, this change seems likely to be the result of therapy. The increased use of Specific Requests can be considered to be a positive change because previous aural rehabilitation research has suggested that Specific Requests for clarification are more effective than Nonspecific requests in resolving conversational dysfluencies (Erber, 1988; Gagné & Wyllie, 1989; Owens & Telleen, 1981).

There are four possible explanations for the lack of change in repertoire size. The first explanation relates to subject selection. Both of the hearing-impaired subjects had some post-secondary education. Furthermore, S1 worked in a university research environment and S2 was majoring in English Literature. Therefore, it is highly possible that both subjects entered the therapy program with a good knowledge of language, conversational interaction, and/or communication strategies to assist them with their hearing difficulties. Perhaps they entered the program already possessing the full range of clarification requests selected for evaluation in the present study. The data on S1 in the tracking exercises in evaluation one seems to support this, as she used the full range of possible clarification requests. Consequently, pre-therapy ceiling effects are a possibility; thereby, leaving less potential for improvement in expanding the repertoire of types of clarification requests used.

A second explanation for a lack of change in the size of the hearing-impaired subjects' repertoire of clarification requests relates to the set-up of the TOPICON procedure. The same S/N ratio for each subject was used throughout both the tracking and the TOPICON procedures. The idea was to select a S/N ratio that would make the evaluation tasks sufficiently difficult that possible treatment effects could be observed (i.e. avoid ceiling and floor effects). Based on the number of communication breakdowns observed in the tracking exercises, it can be assumed that ceiling effects did not occur in the tracking exercises. However, there were significantly fewer communication breakdowns in the TOPICON conversations than in the tracking exercises, suggesting the possibility of ceiling effects in the TOPICON conversations. Even though the selected S/N ratio was sufficiently difficult in the tracking task, it apparently was not so difficult in the TOPICON task.

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In conclusion, ceiling effects in performance during the TOPICON activity and the possible influence of the tracking procedure on the selection of strategies limits the strength of any conclusions regarding Use that can be drawn. The findings do tend to suggest that both the hearing-impaired subjects and the intervention communication partner were capable of using all of the communication strategies introduced

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The improved tracking rates in the tracking exercises were attributed to two factors: the improved efficiency of repair sequences and a decrease in the number of communication breakdown as evidenced by reductions in the percentage of repaired presentation utterances. The improved efficiency of repair sequences was not due to the frequency and types of clarification requests used by the hearing-impaired subjects, but rather to the types of repair strategies used by the communication partners. This finding does not provide evidence that the hearing-impaired subjects became more efficient communicators in terms of repairing communication breakdowns. However, tracking is very much a sender-initiated and controlled interaction, especially the repair sequences, because the sender must get the listener to repeat specific text verbatim. Consequently, the listener has little control during the repair sequences. Furthermore, as discussed in the "Use" section in this chapter the tracking procedure itself may favour the use of certain clarification requests. Consequently, the tracking procedure may not provide the most appropriate communicative context to evaluate the hearing-impaired subjects ability to be efficient

communicators.

With respect to the second factor contributing to improved efficiency of repair sequences in the tracking exercises, a reduction in the number of communication breakdowns, it is difficult to separate out the relative contributions of the hearing-impaired subject and the communication partner. Because there was a greater reduction in the percentage of repaired presentation utterances with ICP than with CCP, it is reasonable to assume that ICP's communication behaviour contributed to some extent to the observed reduction in communication breakdowns. However, objective evidence does not exist to support this assumption. Since both hearing-impaired subjects reported that they were aware of attempting to use top-down processes in later evaluations, it may be that their use of such top-down strategies also contributed, to some extent, to the reduction in communication breakdowns. However, the use of such top-down processing is difficult to quantify.

Unlike the tracking exercises, in which improved efficiency was directly attributed to the communication partners, measures of efficiency in the TOPICON conversations did not provide convincing evidence of improved efficiency of communication for either S1 or S2 with either CCP or ICP. Increases in clauses/minute were not observed. Furthermore, improved efficiency was not observed in terms of fewer communication breakdowns or more efficient repair sequences. However, ceiling effects in the TOPICON task limits any conclusions regarding the hearing-impaired subjects' use of clarification requests to become more efficient communicators. Even though there was an increase in clauses/turn exhibited by both S1 and S2 across the evaluations with both communication partners, suggesting that the amount of information per turn for S1 and S2 increased, the number of turns decreased across the evaluations

such that there was not an increase in the total amount of information exchanged in the conversations. Although the increase in clauses/turn may be indicative of more efficient use of turns to convey information (i.e. longer but fewer turns), it does not support improved efficient as defined here and by Erber (1988) (i.e. the rate of information exchange).

The findings were also inconclusive with respect to the hypothesis that greater benefit would be derived by the hearing-impaired subjects in terms of greater improvements in the efficiency of their interactions with ICP than in those with CCP. Greater improvements in the efficiency of the tracking exercises with ICP than with CCP was supported by the findings, but the findings in the TOPICON task were inconclusive because of ceiling effects. In the tracking exercises, the average improvement in the efficiency of tracking with ICP was greater than that with CCP and was associated with greater reductions in the number of communication breakdowns for ICP than CCP and with changes in the repair strategies used by ICP and CCP, specifically a reduction in use of Syntactic Simplifications and increased use of Elaborations. Even though both communication partners exhibited the same pattern of repair usage, ICP reduced her use of Elaborations more so than CCP did. Although ICP reduced her use of Elaborations much more so than CCP across the evaluations, the initial level for ICP was much higher leaving greater potential for improvement. Furthermore, because both ICP and CCP demonstrated similar changes in their pattern of use, the possibility that the improved efficiency of repair sequences, hence overall efficiency of tracking, cannot solely be attributed to the effects of specific therapeutic exercises for ICP.

The major problem in measuring efficiency in the TOPICON task relates to the validity of measuring efficiency as it is defined by Erber (i.e. the rate of information exchange). While ,the rate of information

exchange seems to be a more reasonable outcome measure in the tracking procedure because the primary goal of the tracking exercises is to track the text as quickly as possible, in contrast, the primary focus of the TOPICON procedure is to capture a naturalistic conversational interaction in which the rate of information exchange may not be such an important aspect. Language serves several functions including not only transactional (information exchange) but also interactional (social or interpersonal) functions (Brown & Yule, 1983). Furthermore, natural conversation involves pauses to formulate one's responses and to reflect on the exchange of ideas. The conversational partners' conversational or speaking styles might also contribute to rate of information exchange. Consequently, the validity of measuring the efficiency of a typical conversational interaction in terms of some index of the rate of information exchange, such as clauses/minute, is questionable. It seems that a much more valid definition of efficiency in conversation might be the proportion of a conversation devoted to conversational repairs versus information exchange.

In conclusion, the findings do not conclusively support the hypotheses that the hearing-impaired subjects would benefit by becoming more efficient communicators and that additional benefit would be derived as a result of greater efficiency in their interactions with ICP than with CCP. Evidence from the tracking exercises provides limited support for the first hypothesis and substantial support for the latter hypothesis. However, because of the limited data in the TOPICON conversations due to ceiling effects and the questionable validity of measuring efficiency as the rate of information exchange in natural conversations, the findings from the TOPICON task are inconclusive with respect to both of the above hypotheses.

Fluency

The evidence does not conclusively support the hypothesis that the hearing-impaired subjects would benefit by being able to engage in more fluent conversation. Only two out of the four TOPICON conditions demonstrated improved fluency ratings from the first to final evaluation (i.e. S1:ICP and S2:CCP). The evidence does not support the hypothesis that greater benefit would be gained because of greater improvements in the fluency of their conversations with ICP than with CCP because fluency ratings given for S1 were higher for CCP, while those given for S2 were higher for ICP.

Measures of fluency derived from the discourse analysis of the conversations did not indicate improved fluency. Furthermore, no relationships were observed between the improved fluency ratings and the discourse measures of fluency. While inconclusive, there seemed to be some correspondence between improvements in the judge's fluency ratings and reductions in communication breakdowns. In addition, no strong relationship between the qualitative elements on the fluency assessment form used by the speech-language pathologist to judge fluency and the discourse measures of fluency were observed.

However, potential relationships were observed between the changes in qualitative elements on the form and other measures of benefit other than the fluency measures. For example, the improved fluency ratings for the conversations with S1 and ICP and those with S2 and CCP seemed to be related to improved ratings for receptive abilities of S1 and S2. Improved comprehension scores and ratings in these two conditions suggest the possibility of improved receptive abilities. Furthermore, in both TOPICON conditions for which improved fluency ratings were given there was also a reduction in effort rating reported by both S1 and S2.

Interestingly, two aspects which both hearing-impaired subjects were moderately to highly satisfied with was their ability to use the targeted communication strategies to improve their comprehension and to reduce the effort required to participate in a conversation. Both hearing-impaired subjects reported that they thought the improved comprehension was related to their improved confidence as communicators, specifically in their ability to use the targeted strategies to prevent and manage conversational breakdowns. The result of this increased confidence as an effective communicator might be fewer communication breakdowns, which would presumably lead to more fluent conversations. With respect to the satisfaction ratings for use of the strategies to reduce listening effort, S1 reported that she thought the reduction in effort was more related to feelings of reduced stress. This reduction of effort or stress may result in a more relaxed or comfortable interaction which might lead to the impression of greater conversational fluency. However, as the speech-language pathologist's fluency ratings were only based on audiorecordings, she did not have access to nonverbal communication such as body language which might have suggested reduced effort or stress. Therefore, it is unclear how much such a qualitative element might have contributed to the judgements of conversational fluency.

Given the inconclusive evidence for improved conversational fluency, there are three problems that might have hampered the assessment of conversational fluency in the TOPICON conversations: ceiling effects, the vagueness and subjectiveness of defining conversational fluency, and differing TOPICON procedures for CCP and ICP. Ceiling effects appear to have occurred in the TOPICON conversations due to insufficient task difficulty, as previously discussed. The subjects were able to carry on a conversation with minimal difficulties and few communication breakdowns. Consequently, there might have been little potential for improvement in measures of fluency, as the conversations were already quite fluent pre-

therapy. The second problem relates to the subjectiveness of rating fluency and the difficulty of specifying which specific communication behaviours contribute to conversational fluency. In the present study there was no strong agreement between the judge's subjective fluency ratings and the selected discourse measures of fluency. Further research is needed to better specify the conditions of conversational fluency, so that it can be more reliably measured.

The third factor which might have hampered the assessment of fluency in the present study relates to the validity of comparing the fluency of TOPICON conversations with CCP and with those with ICP because of differences in procedure. CCP, but not ICP, embedded ten personal facts in the conversation to allow for the assessment of the hearing-impaired subjects' comprehension following each conversation. An approximate time limit of ten minutes was encouraged for all of the TOPICON conversations, regardless of whether they were with CCP or ICP. These two factors might have resulted in CCP adopting an unnatural conversational style (i.e. abrupt topic shifts within the conversation, uneven timesharing, etc.) which might have affected the judge's impressions of fluency. Consistent with this explanation, the judge's comments about the conversations with CCP in evaluation one indicate that she found it difficult to judge fluency because of CCP's "unresponsive self-centered style". The difference in timesharing between CCP's and ICP's conversations is exemplified by the finding that CCP exhibited more clauses/turn than S1 and S2 in their conversations, while ICP exhibited fewer clauses/turn than S1 and S2 in their conversations.

The procedure differences in the TOPICON conversations may have inadvertently encouraged more repair sequences in the conversations with CCP than with ICP. One aspect of conversational fluency

is the number of communication breakdowns and the efficiency of the repairs. In the conversations with CCP, the hearing-impaired subjects were aware that a comprehension quiz would be administered following each conversation. Both subjects were also aware that there would be no comprehension quiz following the conversations with ICP. Both subjects were highly motivated to do their best in all aspects of the program, both in therapy and in the evaluations; however, the knowledge that they would be tested on the quiz might have given them greater incentive to attend to and clarify specific details in the CCP conversations than in the ICP conversations. Furthermore, during therapy both subjects reported that they did not feel it was necessary to get all the specific details in a typical conversation, as exemplified by the ICP conversations, but that it was more important to get the gist of the meaning and to socially interact. Therefore, the task difference may have been a factor contributing to the finding that fewer communication breakdowns were observed for both S1 and S2 in the conversations with ICP than in those with CCP.

In conclusion, even if a difference in conversational fluency had been observed between conversations with CCP and ICP, the validity of comparing the results is questionable because of the different TOPICON procedures for CCP and ICP. Either no comprehension quiz should have been administered with CCP or one should have been administered with both communication partners.

Comprehension

Comprehension scores and ratings in the tracking exercises did not indicate that there were improvements in comprehension for either S1 or S2. Furthermore, comprehension scores for S1 and S2 in the TOPICON conversations with CCP also did not indicate improved comprehension. A strong

agreement between the scores and ratings in the tracking tasks was observed, suggesting that the hearing-impaired subjects had a good awareness of how much of the text they were understanding. However, in the TOPICON conversations, the hearing-impaired subjects' comprehension ratings in conversations with CCP did not correspond to their comprehension scores such that in evaluation one both S1's and S2's comprehension ratings were lower than their quiz scores. Their comprehension ratings with CCP and ICP in the TOPICON conversations improved, with greater improvements observed with ICP.

The finding that the hearing-impaired subjects' comprehension scores in the TOPICON conversations were higher than their comprehension ratings suggests that, even though they were attending to and processing the content of the conversation, they still experienced a lack of comprehension. This lack of comprehension seemed to decrease as a function of therapy, as indicated by improvements in comprehension ratings for both subjects. Furthermore, greater improvements in the hearing-impaired subjects' comprehension ratings for conversations with ICP than for those with CCP suggest that the hearing-impaired subjects perceived that they were understanding more of their conversations with ICP than CCP. One difficulty with this interpretation is that in the conversations with ICP the hearing-impaired subjects had input into selecting the topic based on their familiarity with it. It may be that the chosen topics in later evaluations were ones which were more familiar to them, so their perception of their comprehension increased. The finding that therapy seems to have decreased the hearing-impaired subjects' feelings of miscomprehension is consistent with their high satisfaction with their ability to use the targeted communication strategies to improve their comprehension in their everyday conversations.

One explanation for the observed improvements in the hearing-impaired subjects' perception of their comprehension might be related to greater control of topic selection (i.e. choosing familiar topics) or more control in terms of directing the conversation (e.g. asking specific questions). However, the distribution of Topic Initiations/Shifts and Information Questions is not consistent with these explanations. Another explanation might be that there was reduction in communication breakdowns which corresponded to the hearing-impaired subjects' improved comprehension ratings. However, this does not seem plausible because there was only a minimal number of communication breakdowns in the conversations, even pre-therapy. A third explanation relates to the hearing-impaired subjects' high satisfaction with the improvement in their confidence in their ability to participate in conversations and to manage communication difficulties and reduce their listening effort. Although speculative, it may be that this greater confidence in themselves as effective communicators and the reduced effort required when conversing allowed the hearing-impaired subjects to channel more of their energy or resources into processing the content of the conversation. Furthermore, both subjects reported that therapy had increased their awareness of how much of their conversations they had been missing. Therefore, their motivation to comprehend the content of their conversations might have increased as the study progressed, thereby contributing to the improved comprehension ratings.

Besides the comprehension scores and ratings, other measures of comprehension were Turns as Acknowledgment Only and Backchannel Responses. The limited data on Turns as Acknowledgment Only restricts any conclusions which can be drawn with respect to the validity of it as a measure of comprehension. In contrast, there was a trend of increased use of Backchannels by both S1 and S2 in the TOPICON conversations which corresponded to the increased comprehension ratings. This trend

suggests that a measure of Backchannels may be a valid indicator of perceived comprehension. However, noise overlay on the audiotapes and the intra-reliability difficulty in measuring Backchannels present problems with this interpretation. These difficulties led to the refinement of the definition for Backchannel Responses, such that some acknowledging remarks coded as Backchannels by the researcher might otherwise have been coded as Turns as Acknowledgment Only using the unrefined definitions. Therefore, it may be that the use of acknowledging remarks in general, whether they be Backchannels or Turns as Acknowledgment Only, provides an indication of perceived comprehension. This is supported by comments reported by S2 in the verbal protocols that she uses a strategy of confirmation as a means of reducing her "general feeling of miscomprehension" even when she is fairly confident she has understood the message. Since S2 used considerably more Backchannels than S1, this may be a communication behaviour which she favours.

A possible problem with interpreting the results on comprehension is to determine what is an accurate measure of comprehension and whether what we comprehend varies with the communicative environment. As discussed in chapter one, comprehension involves understanding not just the content of the speaker's message, but also the speaker's intent in performing a linguistic act. The comprehension tests used in this study in the tracking and the TOPICON conversations with CCP were designed to measure the listener's understanding of the content. However, the hearing-impaired subjects' perception of comprehension (i.e. their ratings) might have been based on factors other than just their comprehension of the content. One factor which might in part explain the greater agreement between the comprehension scores and ratings in the tracking procedure than in the TOPICON procedure is that the verbatim repetition in the tracking might have increased the hearing-impaired subjects' awareness

of how much of the content they had understood. As both the scores and ratings were based on understanding of content, it might be expected that there would be good agreement between them.

Furthermore, what aspect of comprehension one attends to might vary with the communication context. For example, it may be that in an occupational or educational communication environment (emulated more by the tracking procedure than the TOPICON procedure), we might put greater emphasis on understanding the content of an communication interaction, while at a casual party greater emphasis might be put on understanding the social acts underlying communication. The communicative context of the TOPICON conversations with CCP and ICP were different: in conversations with CCP the hearing-impaired subjects expected a comprehension quiz, while they knew there would be no quiz following their conversations with ICP. These two communicative contexts might have set up different expectations for the hearing-impaired subjects and influenced how they attended to and judged their understanding of the conversation.

In conclusion, even though the objective comprehension measures (i.e. the scores) do not support the hypotheses that the hearing-impaired subjects would benefit by improvements in the amount of conversation they understood and that additional benefit would be gained in terms of greater improvements in the amount of conversation understood in their interactions with ICP than in those with CCP, the evidence is suggestive that therapy decreased the hearing-impaired subjects' feelings of miscomprehension. That is, they perceived that they were understanding more of their conversations. Furthermore, the evidence is suggestive of greater reductions in the hearing-impaired subjects' feelings of miscomprehension in their interactions with ICP than in those with CCP.

Listening Effort

While not conclusive, the findings do provide limited evidence to support the hypothesis that the hearing-impaired subjects would benefit in terms of reduced effort. Reduced effort as a function of therapy was observed for S1 in both the tracking and TOPICON tasks, but only in the TOPICON conversations for S2. These findings are consistent with the moderate to high satisfaction reported by the hearing-impaired subjects in terms of their ability to use the targeted strategies to reduce listening effort in their everyday conversations post-treatment. Because effort could be considered to be one aspect of hearing handicap (see Chapter 1), the findings are suggestive of a reduction in hearing handicap for both subjects. However, the findings do not provide evidence to support the hypothesis that the hearing-impaired subjects would receive additional benefit in terms of greater reductions in effort in their interactions with ICP than with CCP. The average change in effort rating in the tracking exercises was greater with CCP than ICP, but the same with both communication partners in the TOPICON conversations.

Hearing Disability

The evidence provides limited support for the hypothesis that the hearing-impaired subjects would benefit from therapy in terms of reduced hearing disability. S1 demonstrated substantial improvement (i.e. a reduction greater than.10) in two of the thirteen subtests and less substantial improvements in three other subtests, while S2 demonstrated substantial improvement in five subtests and lesser improvements in five other subtests. The two subtests of the HPI which both hearing-impaired subjects demonstrated improvements in were the Response to Auditory Failure and Social Situations subtests, suggesting that therapy might have improved their ability to handle conversational breakdowns and to communicate in social situations. However, other evidence, with respect to other measures which might be assumed to

contribute to the assessment of hearing disability (i.e. conversational fluency, efficiency, and comprehension) because they reflect the subject's ability to engage in fluent conversations, is not consistent with a reduction in hearing disability.

There are two possible explanations for why the hearing-impaired subjects did not experience a more substantive reduction in hearing disability as a result of their participation in the therapy program. First, in order for there to be improvement on any self-report measurement tool, the pre-therapy impressions of the subject have to be a realistic representation of the measure to be evaluated. In the case of the HPI, the subject's responses should realistically reflect the hearing difficulties experienced by the subject. However, this may not have been the case with either hearing-impaired subject. In the post-therapy interview, S1 reported that her involvement in the program had made her realize that she avoided certain communication situations as a means of coping with her hearing disability and S2 reported that the program had made her realize how much of her conversations she had been missing. Consequently, the lack of improvement, and in some cases even a lower score, may be partly attributed to increased awareness of their hearing difficulties post-therapy. Another follow-up HPI questionnaire (e.g. two months) would have been useful. The results could have been compared to the post-therapy HPI scores, which might reflect the hearing-impaired subjects' impression of their hearing difficulties more realistically than the pre-therapy HPI scores did.

The second explanation relates to time constraints of the study and the hearing-subjects ability to use the targeted strategies to actually make changes in their everyday conversations. Not only did the findings on Use not provide evidence of any significant changes in the use of strategies by the hearing-

impaired subjects, but both subject reported in the post interview that they felt they needed more time and opportunities to practice the strategies before they would be able to use them spontaneously in their conversations. It appears that the subjects' use of strategies did not generalize from the therapy setting to either the evaluation setting or to their everyday conversational interactions. Consequently, it is not too surprising that the subjects failed to report reductions in their hearing disabilities. Once again a follow-up HPI questionnaire, after a reasonable time period to allow further refinement of the use of the strategies and information, may have provided further insight into possible effects of therapy on hearing-disability.

It is also recommended that further research on this topic use a self-report tool which more specifically examines hearing difficulties within the occupational environment, such as the longer version of the Hearing Performance Inventory. Although the version of the HPI used in this study examines hearing performance in a variety of communication contexts, it does not specifically examine hearing performance in the occupational/educational environment, the communication environment in which both subjects experience their greatest hearing disability. If the subjects had reported a reduction in the hearing disability, it is not necessarily the case that the improvements would generalize to an occupational and/or educational communication environment.

Satisfaction

The evidence supports some aspects, but not all, of the hypothesis that the hearing-impaired subjects would be highly satisfied with their ability to use the target strategies to make changes in their conversational interactions post-treatment. Both subjects were not highly satisfied with their ability to use

the target strategies such that improvements were experienced in their everyday conversational interactions in terms of increased efficiency and fluency and reduced hearing handicap. Measures of efficiency, fluency, and hearing disability are consistent with these findings. However, they were moderately satisfied with their ability to use the target strategies to reduce their listening effort and increase the amount of their conversations that they understood. Measures of conversational effort and the subjective comprehension ratings concur with these findings, but the objective measures of comprehension do not. The subjects reported that the primary reason for their dissatisfaction was insufficient time and opportunities to practice the strategies so that they could be used spontaneously. Both subjects were optimistic that with time change would occur. Once again, a follow-up questionnaire might have provided further insight into whether or not more time would have improved their satisfaction level regarding their use of the strategies to achieve change in their everyday conversations.

Even though the hearing-impaired subjects were satisfied with certain aspects of their ability to use the strategies, their general satisfaction with the program was high. Both subjects attributed their satisfaction with the therapy to the increased confidence they gained in terms of their ability to participate in conversations and to manage difficult communication situations. S2 referred to this gained benefit as an "attitude or approach one adopts". Perhaps the attitude that one has towards impairment and disability affects the type and degree of handicap experienced by an individual. For example, S1 reported that therapy had increased her awareness that she avoided certain communication situations as a means of coping with her hearing difficulties. The change in attitude of viewing herself as a more confident and effective communicator may help her choose to not avoid these situations. Although speculative, a change in one's attitude may potentially result in a change in the level of handicap that is experienced.

However, at the time of the post-therapy evaluation, neither subject felt that their handicap had been reduced.

The outcome measures selected to evaluate efficiency, fluency, comprehension, effort and hearing disability in the present study were designed to measure performance, not attitude. For the most part, the measures for each proposed area of benefit corresponded to the subjects' satisfaction with their performance (i.e. use of abilities) in those areas. However, it seems that the greatest benefit derived by the hearing-impaired subjects was not realized in terms of the proposed performance measures, but rather in terms of a change in attitude.

SUMMARY OF CONCLUSIONS OF HYPOTHESES

Use

While inconclusive, the findings do not support either of the hypotheses with respect to Use. Neither the hearing-impaired subjects nor the ICP demonstrated an increase in the size of their repertoire of clarification requests and repair strategies used, respectively. The strength of these conclusions regarding use is limited because of ceiling effects in performance in both the tracking and TOPICON tasks and the possible influence of the tracking procedure on selection of strategies. Nevertheless, the findings indicated that both hearing-impaired subjects and the ICP demonstrated a change in distribution of the kinds of clarification requests or repair strategies, respectively, that they used as a result of the effects of therapy.

Benefit

Hypothesis One

The results of this research support some aspects, but not all, of the hypothesis that the hearing-impaired subjects would benefit in terms of their improved ability to understand more of their conversations such that more efficient and fluent communication was achieved. The evidence was not strong enough to conclude that either subject had become a more efficient communicator. Improved efficiency was demonstrated in the tracking evaluation, but this was largely attributable to the communication partners becoming more efficient at repairing conversational breakdowns. Efficiency, defined as the rate of information exchange, did not show improvement in the TOPICON conversations. While subjective fluency ratings provided limited evidence of improved fluency, the objective measures were inconsistent with this claim. However, the assessment of fluency might have been hampered by ceiling effects in the TOPICON evaluation and the imprecise definition of fluency and its constituents.

Objective measures did not provide evidence of improved comprehension for either hearing-impaired subject, but the subjective comprehension ratings in the TOPICON procedure suggest that therapy decreased the feelings of miscomprehension that they experienced. The findings provided conclusive evidence of reduced effort for S1 in both the tracking and TOPICON evaluations, but only provided limited evidence of a reduction in effort for S2. The findings also provided limited evidence of reductions in hearing disability, with stronger evidence of reduced hearing disability being observed for S2 than S1. Furthermore, there was some suggestion that therapy might have improved both subjects' ability to handle conversational breakdowns and to communicate in social situations.

Hypothesis Two

The findings provides limited support for some aspects of the hypothesis that greater benefit would be experienced by the hearing-impaired subjects in their communication interactions with ICP than in those with CCP. Greater efficiency with ICP than with CCP was exhibited in the tracking exercises, but findings based on the limited data from the TOPICON conversations were inconclusive because of ceiling effects. Even though ICP's change in distribution of use of repairs was one of the factors that contributed to the observed to improved efficiency of repair sequences in the tracking evaluations, hence overall efficiency, the possibility that the tracking procedure biased the use of specific repairs cannot entirely be ruled out because both communication partners demonstrated the same change in pattern of Use. There was no evidence of greater improvements in conversational fluency in the hearing-impaired subjects' interactions with ICP than in those with CCP. Objective measures of comprehension did not provide evidence of greater improvements in the hearing-impaired subjects' comprehension in interactions with ICP. However, the subjective comprehension ratings in the TOPICON evaluations were suggestive of greater reductions in the hearing-impaired subjects' feelings of miscomprehension in their conversations with ICP than in those with CCP. Measures of effort did not provide evidence of greater reductions in rated effort by the hearing-impaired subjects in their interactions with ICP than in those with CCP.

Hypothesis Three

It was hypothesized that the selected outcome measures and evaluation procedures would indicate if benefit occurred. Benefit was primarily measured in terms of the subjects' communication performance in a variety of communication contexts (i.e. tracking, TOPICON conversations, everyday listening situations). However, the results do not provide evidence of gain in benefit in terms of improved

communication performance, but rather in terms of a change in the hearing-impaired subjects' attitude. Because one's attitude toward a disability may act to define the handicap experienced, this change in attitude may be viewed as a potential change in handicap. Since the outcome measures selected to be evaluated in this study primarily assessed the performance abilities of the subjects in terms of impairment and disability, they would not have detected this type of benefit. Therefore, Benefit was not realized in terms of the proposed outcome measures. There are a variety of factors which might account in some part for why benefit was not realized as proposed.

Subject selection was one possible contributing factor. Three of the four subjects had a strong background in language and/or communication. This might have resulted in pre-therapy ceiling effects in terms knowledge and use of strategies, thereby decreasing the potential for observable improvement. If use of strategies does not significantly change, then it is highly unlikely that measures of benefit based on use will change. In addition, ceiling effects were present in the TOPICON conversations. As a result, there may have been little potential or incentive for the subjects' communication behaviours to change. Equating the tracking texts for vocabulary might also have obscured the results. The texts were equated for reading level based on grammatic criteria, but not for vocabulary. S1 commented that she found the vocabulary of one narrative text particularly difficult and the outcome measures were consistent with her comments. Because this text was used in evaluation five, the difficulty of the text may have offset improvements in benefit that might have been observed. The time-frame of the study also appears to be a factor in why benefit might not have been consistently observed in terms of the proposed outcome measures. Both of the hearing-impaired subjects and the intervention communication partner reported that more time and practice was needed before the strategies could be used spontaneously.

Other factors which might explain why benefit, in terms of performance, was not indicated are related to the procedures and outcome measures themselves. The findings of the present study suggested that nature of tracking was not only influential in the choice of clarification requests, but also in the choice of repair strategies used. Consequently, although the tracking procedure provides a valuable training tool for the use of repair strategies and clarification requests, it may not necessarily provide a valid communicative context for examining the efficiency of repair sequences nor for examining a subject's repertoire of strategies.

In contrast to the tracking procedure, the TOPICON procedure provided a more naturalistic communicative context for the evaluation of subjects' conversational abilities as they might actually be in everyday conversations. An assumption behind the use of the TOPICON task is that a person's communication behaviours can be measured and that the selected outcome measures are valid in the sense that they reflect the selected communication behaviours to be evaluated. The lack of gained benefit may be in part be due to the weak validity and/or definitions of the chosen outcome measures, in particular efficiency and conversational fluency. The validity of measuring conversational efficiency in terms of the rate of information exchange is questionable. Furthermore, because we have not yet determined which communication behaviours are reliable indices of fluency, the objective outcome measures selected as indicators of fluency may not necessarily be appropriate measures of fluency. It may be that subjective ratings of fluency are at present the most valid means of assessing conversational fluency. However, if subjective ratings are the primary indicator of fluency then the communicative contexts being compared must be equivalent.

Satisfaction

The findings provided evidence of some aspects, but not all, of the hypothesis that the hearing-impaired subjects would be highly satisfied with their ability to use the target strategies post-treatment. There was evidence of high general satisfaction with respect to the increased confidence they gained in terms of their ability to participate more fully in conversations and to manage and prevent communication breakdowns. It seems that the greatest benefit realized by the hearing-impaired subjects was one of attitude: the increased confidence in themselves as effective communicators.

COMPARISON OF RESULTS WITH OTHER RESEARCH

In this section, the results of the present study will be compared with a thesis (Feldbruegge, 1994) in which an aural rehabilitation program based on methods outlined by Erber (1988) was also evaluated. However, there are first a few differences between the studies that should be noted. First, Feldbruegge's study was a true reflection of Erber's philosophy because it involved a familiar communication partner of the hearing-impaired subject. Some of their therapy was jointly administered. Second, the degree and onset of the hearing losses of the subjects differed in the studies. The hearing-impaired subjects in this study had acquired bilateral mild-to-moderate hearing losses, while the subject in Feldbruegge's study had a congenital bilateral severe-to-profound hearing loss and the subject had worn hearing aids for most of his life. Third, in terms of procedures, the tracking and TOPICON procedures differed in Feldbruegge's study in that they were done in quiet with no babble noise. In addition, the post interview questions and formats differed slightly. For both studies, the expected benefits were similar in terms of anticipated gains in efficiency, comprehension, and fluency. Because the current study only examined the benefit realized by the hearing-impaired subjects, this is the only aspect of the two studies which will be compared and

discussed.

The primary common finding of the two studies was that despite little benefit being observed through the use of the planned outcome measures, in both studies the hearing-impaired subjects reported benefit in terms of a change in attitude. All of the hearing-impaired subjects reported benefiting in terms of increased confidence in their ability to participate more fully in conversations and to manage conversational breakdowns. Furthermore, all three of the hearing-impaired subjects demonstrated improved scores on the "Social Situations" subtest of the Hearing-Performance Inventory, suggesting that a valuable aspect of the conversation-based therapy was that is helped improve their ability to communicate in social situations. The increased confidence may be a contributing factor in this improvement. It seems that in both studies benefit was not realized in terms of the proposed performance outcome measures. This common finding of the two studies has clinical implications for defining successful therapy outcomes which will be discussed later in the "Implications" section.

Other points of convergence and divergence involve measures of efficiency, conversational fluency, and comprehension. Efficiency was defined in both studies as the rate of information exchange. In both studies the efficiency of tracking improved, in terms of improved tracking rates and improved efficiency of repair sequences. The improved efficiency of repair sequences was due to repair usage by the communication partners in both studies, rather than to the use of clarification requests by the hearing-impaired subjects. This provides further grounds for questioning the use of the tracking procedure as a valid communicative context for examining the hearing-impaired subjects ability to efficiently repair communication breakdowns. Measures of efficiency in the TOPICON conversations, in terms of rate of

information exchange (i.e. clauses/minute), did not indicate benefit in either study. This raises further questions about whether efficiency in conversational interactions in terms of an overall indicator of rate of information exchange is a valid outcome measure.

Subjective measures of conversational fluency in Feldbruegge's study indicated fluency improved, while the findings of the present study only provided limited evidence of improved fluency. However, the TOPICON procedure in Feldbruegge's study did not appear to be plagued by possible ceiling effects as in this study. There was no strong agreement between the subjective ratings of fluency and the objective analysis measures proposed to be indicators of fluency in either study. For the most part, the selected analysis measures in the two studies were the same, as were their definitions. Due to the intra-reliability difficulties encountered in the present study, the definitions for Backchannels and Turns as Acknowledgement Only differed in the studies. However, these two measures were not used as indicators of fluency in the present study, but rather as indicators of comprehension. This common finding of disagreement between subjective and objective measures of fluency, highlights the inadequateness of understanding and defining what constitutes conversational fluency.

In terms of benefit seen by improved comprehension, the objective measures (i.e. comprehension scores) of both studies did not provide evidence that the hearing-impaired subjects understood more of the content of their conversations. However, in both studies, the hearing-impaired subjects were highly satisfied with respect to their ability to understand more of their conversations. Furthermore, although the subjective comprehension ratings by the subject in Feldbruegge's study concurred with the comprehension scores, the comprehension ratings for the hearing-impaired subjects in the present study

did not concur with the comprehension scores, in particular they showed improvement in the TOPICON conversations. As discussed earlier in the chapter, the comprehension questions on the tests examined comprehension in terms of what content was remembered. Yet, the subjective ratings and satisfaction ratings might have captured a different aspect of the subjects' comprehension (e.g. understanding the linguistic intent of the speaker).

In conclusion, the major contribution of the findings of both studies is that the benefit was not realized as proposed in terms of performance or measures of communication abilities. Instead, benefit was realized as a change in the hearing-impaired subjects' attitude: all experienced increased confidence in their ability to more fully participate in conversations and to manage communication breakdowns. Both studies also question the validity of measuring the efficiency of conversations in terms of rate of information exchange and highlight the need to more adequately define conversational fluency. The findings of both studies also question the validity of using the tracking procedure as a communicative context to examine communication strategies employed in repair sequences.

GENERAL LIMITATIONS OF THE STUDY

The main limitation of the current study is than only two subjects were used. Consequently, it is not possible to reliably generalize the findings of this project to the general population of working-aged adults with acquired hearing loss. Although some of the major findings of the present study agree with the results of a similar study by Feldbruegge (1994), the difference in research design of the two studies, the subject variables and use of communication partners, limits the possibility of making general claims.

A second limitation is that the results cannot be reliably generalized to communication contexts not emulated by the evaluation procedures used in this study. The hearing-impaired subjects in this study experienced their greatest hearing disability and handicap in their occupational and educational communication environments. In these settings, the subjects must understand and remember complex and specific details in order to perform work-related duties. The primary function in this communicative context is one of information exchange. In many ways the tracking procedure is more representative of such an communication context than the TOPICON procedure because it requires the subject to attend to specific details and be able to recall them. However, the verbatim repetition of the task and lack of a purposeful communication goal (e.g. attaining information to perform a meaningful task, social interaction, etc.) reduces the ecological validity of the procedure as an evaluation tool.

IMPLICATIONS

Future Research

Some of the inconclusive results of the present study appeared to be related to issues of methodology and design. Following are some guidelines for designing future research studies based on the real and potential difficulties of this study:

i) Subject selection is a key element in any efficacy research studying human behaviour (Doehring, 1988). Although it would be clinically unethical to select subjects based on their potential to demonstrate improvement, this is not the case in research. One of the primary goals of efficacy studies is show whether treatment was effective or not. To do so requires that the selected subjects have some potential to gain benefit. In the case of efficacy studies on communication behaviour, some important subject

variables to consider are the subject's current level of knowledge of communication and of communication skills.

ii) If an aspect of the research is to compare communication behaviours with different communication partners, it is suggested that the procedures be the same so that the validity of comparing results is not compromised. Different tasks might generate different mind-sets or expectations with the subjects and inadvertently result in differing performance in the two conditions.

iii) Communication performance is not only verbal, but nonverbal as well (e.g. body language, gestures, etc.). It is recommended that future studies videotape the conversational interactions, as well as audiorecording them. The difficulties encountered in the current study in counting Backchannels might have been rectified if videotaping had been available.

iv) A longer evaluation time frame is recommended in future efficacy research on communication performance, perhaps at two and four month post-therapy intervals. It appears that even though the subjects' awareness of strategies improved, there was insufficient time for them to reach a level of spontaneous use. Follow-up evaluations might have captured changes in use, hence performance measures of benefit, not captured by the current study.

There are also implications for the outcome measures used in future research. Efficiency, defined here as the rate of information exchange, does not appear to be a useful outcome measure for evaluating conversational interactions. Future research employing the TOPICON procedure might consider

redefining efficiency in terms of the proportion of conversation devoted to conversational repair versus information exchange. Perhaps the distinction between the amount of new and old information might also be a more meaningful measure of the efficiency of conversations. This research also suggests a need to specifically determine the properties which govern conversational fluency.

Lastly, the current research highlights the need for the development of a more ecologically valid measurement tool than the tracking procedure in aural rehabilitation, especially if the therapy program employs a conversation-based approach. Although the TOPICON procedure is a major step in this direction, it is limited in representing the communicative context of the occupational/educational environments in which working-aged hearing-impaired adults experience their greatest hearing disability and handicap. The tracking procedure appears to be more representative of these contexts than the TOPICON procedure, but lacks ecological validity. One suggestion for an evaluation tool which employs a more meaningful communicative context than the tracking procedure is a barrier activity, a therapy activity used extensively by speech-language pathologists as a therapy activity to improve their clients' communication skills within purposeful communicative contexts.

Barrier activities remove the unnatural verbatim repetition of tracking, thus providing a more natural communication interaction. Typically, barrier activities use some physical barrier between a sender and a listener. The sender sends verbal information which the listener must receive, interpret and act upon to correctly perform a task. The task should be one which is meaningful and valid to the client such as having the speaker give instructions or information in order for the listener to fill out a form or asking questions which the listener then has to find information for and respond to appropriately. In the case

of a hearing-impaired client, the barrier need not be a visual one, but rather the use of background noise. The communication interaction could be timed so that efficiency could still be measured. In an occupational environment, verbal interactions often have to be done as expediently as possible. Social interaction is often not a primary function of communication in these contexts. Therefore, employing the definition of efficiency as the rate of information exchange may be more valid in a barrier activity than in the TOPICON procedure. Barrier activities may also provide a more ecologically valid communicative context than the tracking procedure in which to examine efficiency in terms of repair sequences. Unlike the tracking procedure, barrier activities lend themselves to conversational analysis methods. Both the current study and Feldbruegge's study used adapted versions of barrier activities as therapy tools. The use of an adapted version of a barrier activity as an aural rehabilitation assessment tool is a consideration for future research.

Clinical Implications

The results of the current study show that an aural rehabilitation program based on the communication therapy approach espoused by Erber (1988) provided some benefit to adults with acquired mild-to-moderate hearing loss of working age in their communication interactions with unfamiliar communication partners. No greater benefit was observed in their interactions with an unfamiliar communication partner who received therapy than in those with one who did not participate in the therapy program. Although Erber's approach was primarily designed for use with hearing-impaired clients and familiar communication partners, the results of the current study imply that it can still be beneficial if it is only administered to the hearing-impaired clients. Given the current need to be fiscally responsible, the results of the present study provide some justification for offering such a conversation-based aural rehabilitation to only the

hearing-impaired clients without targeting unfamiliar communication partners because no greater benefit was obtained if the unfamiliar communication partner also participated in treatment.

A further implication of this study's results, as well as Feldbruegge's, is in the area of determining what constitutes a successful therapy outcome. In both studies the greatest benefit obtained by the hearing-impaired subjects was a change of attitude: they reported increased confidence in terms of their ability to more fully participate in conversations and to manage and prevent communication breakdowns. The subjects' satisfaction was not consistent with the performance measures of use and benefit. Benefit was not realized in terms of the proposed performance measures. However, effectiveness of therapy may not only depend on the expectations of the clinicians, but also on those of the clients.

As researchers and clinicians there is an increasing need for us to be fiscally accountable in our delivery of therapy. Consequently, it has been customary for us to use formal assessments and seek out concrete and objective measures of benefit (i.e. performance measures). We tend to view a positive change in such performance measures as the most valid indicators of the effectiveness of therapy. However, effectiveness also has to be considered in terms of the personal relevancy of the proposed benefits for a client (i.e. the needs of the client) (Smith and Leinonen, 1992). Smith and Leinonen contend that three types of client needs, in pragmatic terms, can be identified: 1) the confident client who is aware that his or her communicative ability is impaired in some particular aspect, in which case the clinician's task is to verify the client's perception and provide information, strategies or perhaps therapy to target the impaired aspects; 2) the confident client who is either unaware of his or her communication disability such that his or her communication ability is disturbing to other people, in which case the

clinician attempts to alter his or her behaviour while maintaining his or her self-esteem so as to take account of the communication partners' needs and attitudes; and, 3) the nonconfident client (e.g. low self-esteem, communication phobia, low expectation of communication success), in which case treatment might be a combined approach of improving confidence through experiences of communication success and from linguistic exercises designed to improve the likelihood of communication success.

If a hearing-impaired client fits into the third category of client types based on needs, then improvement in performance measures taken to be indicators of benefit in the absence of a change in attitude in terms of increased confidence as a communicator, may be an inadequate therapy outcome from the client's perspective. Furthermore, a change in one's attitude may have much greater long-term benefits to a client with a communication handicap than improvement in some preselected measure of communication performance (e.g. efficiency) because of the potential it has to alter the degree and type of handicap experienced by the client in the future. Smith and Leinonen contend that in pragmatic-based communication therapy, such as the aural rehabilitation program employed in the present study, "therapy is effective if the client experiences enhanced self-esteem and confidence in communicative situations and if people interacting with the client perceive the interactions as being more successful than in the period prior to therapy" (p. 233). Although performance measures to tap benefit are an integral and important aspect of efficacy studies, the client and those close to him/her ultimately have the final say as to whether or not any real benefit has occurred in the client's life based on their needs. It may be that the most successful therapy outcome is one in which the client and significant others are satisfied that benefit was obtained even though proposed measures of fail to provide evidence of benefit.

Further to this discussion, it may be unrealistic to expect changes in performance measures in terms of use and benefit until the client experiences a fundamental change in their attitude or "belief system". According to a model developed to predict a patient's health-seeking behaviour, the Health Belief Model (Rosenstock, 1974 and 1990 as cited in Noe, Gagné & Kasper, 1994), a range of health behaviours can be predicted based on information with respect to perceived threat of illness, perceived benefits/barriers associated with engaging in a behaviour, and self-efficacy. Of particular relevance to the present study is the concept of self-efficacy. Self-efficacy refers to "beliefs in one's capabilities to mobilize the motivation, cognitive resources, and courses of action needed to meet given situational demands" (Bandura, Cioffi, Taylor, & Brouillard, 1988, p.479 as cited in Noe et al., 1994). Essential to self-efficacy is the concept of volitional control: that a person's confidence in their ability to perform a behaviour (e.g. a specific type of clarification request) influences whether they actually engage in that behaviour (Bandura, Adams, Hardy, & Howells, 1980 as cited in Noe et al., 1994). Consequently, until a client is satisfied with her ability to perform a skill, she may not use that skill and benefit based on performance measures may not be observed. In the present study, benefit was generally only realized in those aspects in which the subjects were satisfied with their ability to use the skills (i.e. comprehension and effort). The observed incongruity between use, benefit and satisfaction in the present study suggests that the therapeutic process in clinical aural rehabilitation may need to be restructured in terms of a more psychosocial approach, such as the Health Belief Model, rather than the more traditional medical model of impairment, disability, and handicap.

The last clinical implication to be discussed relates to the need to use a variety of evaluation procedures and measures in treatment efficacy studies in aural rehabilitation research based on a communication

approach such as Erber's. Communication is a complex process. Improved communication performance may be indicated by a variety of communication behaviours. The use of certain communication behaviours may be more valid in one communication context than in another. Furthermore, benefit may be indicated in the areas of impairment, disability, and/or handicap. Therefore, the assessment of communication skills in conversation requires evaluation procedures which reflect a variety of communicative contexts and allow for a variety of outcome measures.

SUMMARY AND CONCLUSIONS

This research evaluated the effectiveness of an aural rehabilitation program based on a conversation-based approach espoused by Erber (1988) with working-aged adults with acquired mild-to-moderate hearing losses experiencing communication difficulties with unfamiliar communication partners in their occupational and/or educational environments. This approach is linguistically bases and attempts to improve the hearing-impaired subject's metalinguistic knowledge and knowledge of how language is used in conversation such that the amount of their conversations that they understand improves, thereby achieving more efficient and fluent communication. Erber's approach includes a familiar communication partner in the therapy process. The current research adapted Erber's program by having an unfamiliar communication partner receive therapy, but not with the hearing-impaired subjects. Two hearing-impaired subjects participated in this research, as well as two unfamiliar communication partners, one who received therapy. This research investigated whether benefit was obtained by the hearing-impaired subjects, whether greater benefit was obtained in their communication interactions with an unfamiliar communication partner who participated in the therapy program than in those with an unfamiliar communication partner who did not receive therapy, and the validity of the selected evaluation methods

and outcome measures.

The results indicated that although the hearing-impaired subjects only received limited benefit in terms of improvement on the proposed performance measures, they did report satisfaction with a change in their attitude or belief system. Both subjects reported increased confidence in terms of their ability to more fully participate in conversations and to manage and prevent communication breakdowns. Two aspects of benefit which were observed for both hearing-impaired subjects were reductions in listening effort and feelings of miscomprehension. The results did not conclusively indicate that greater benefit was derived by the hearing-impaired subjects in their communication interactions with the unfamiliar communication partner who received treatment than in those with the one who did not receive treatment.

Examination of the selected evaluation methods and outcome measures indicated some areas of concern. The communication context of the tracking procedure may not be a valid one for examining changes in use of communication strategies or repair sequences due to the nature of tracking itself. Although the TOPICON procedure has much more ecological validity than the tracking procedure, it is limited in how adequately it represents the communicative context which proved to be most difficult for this target population, their work environment. Further research is needed to develop a more ecologically valid evaluation tool.

The validity of measuring efficiency in conversations as the rate of information exchange was seriously questioned in this research. Redefinition of the measure in this communicative context is suggested in future research. Measuring conversational fluency also proved to be problematic. Subjective and

objective measures of fluency did not show consistent agreement. The possibility that the selected objective measures were not valid indicators of fluency cannot be ruled out. Future research needs to attempt to specifically determine the defining properties of conversational fluency so that these may be adequately defined and measured.

Some clinical implications were generated by the results of this current research. First, even though the primary focus of Erber's conversation-based approach is to help improve the conversational interactions between hearing-impaired individuals and their familiar communication partners, the results of this study hearing-impaired subjects who experience communication difficulties with unfamiliar communication partners can still benefit from this therapy approach. A second clinical implication is that evaluating the communication success of a client requires evaluation procedures which reflect a variety of communicative contexts and allow for a variety of outcome measures. Communication success is a complex subjective process which no one single measure can capture. Another clinical implication of this research is that as researchers and clinicians we may have to redefine what constitutes a successful therapy outcome. Even though fiscal accountability, as well as professional respect, dictates that clinicians have concrete and quantifiable indicators of benefit in terms of improved performance, defining a successful therapy outcome in terms of a change in a client's belief system or attitude may be equally valid because of the long-term potential it has for changing the handicap experienced by a client. Lastly, the present findings suggest a need for the therapeutic process in aural rehabilitation to be driven by a more psychosocial perspective, rather than the more traditional medical model perspective of impairment, disability, and handicap.

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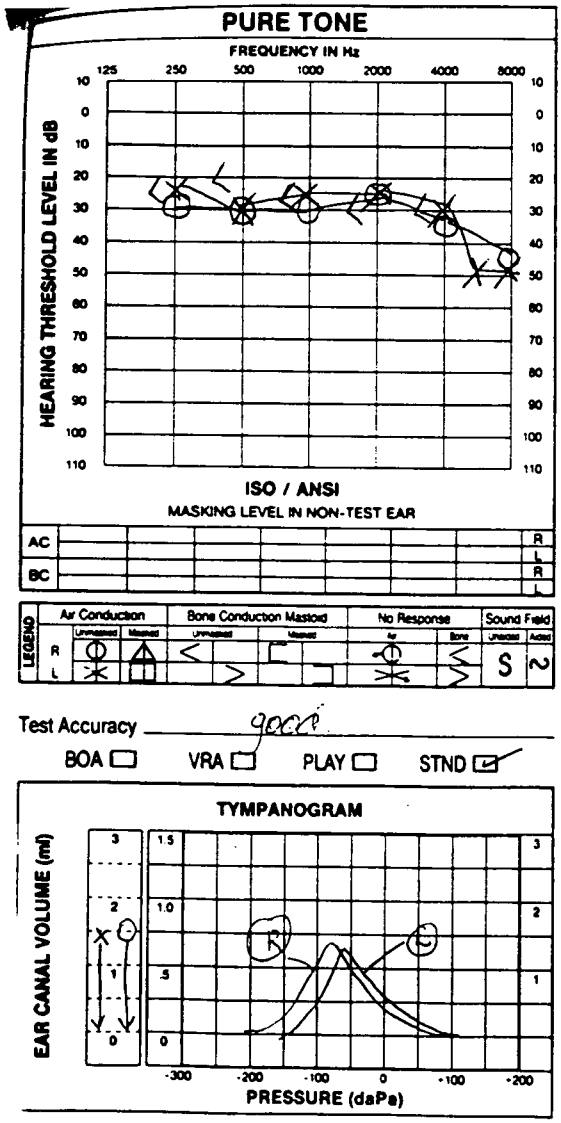
APPENDICES

Appendix A: Audiological Profiles for the Hearing-Impaired Subjects

Audiological Profile for S1



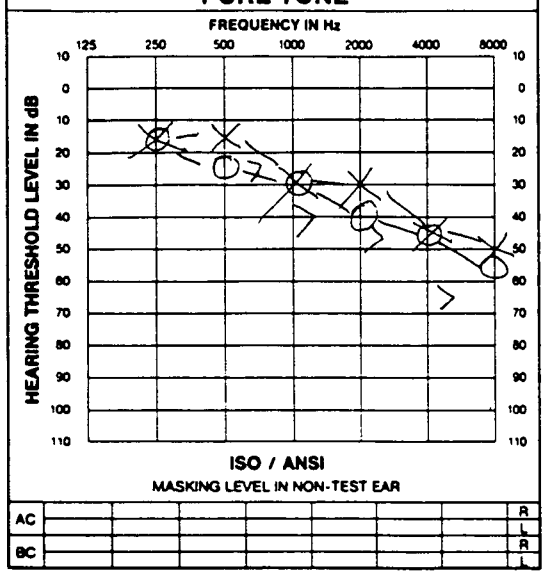
SPEECH AUDIOMETRY	Right Ear	Left Ear	Bone	Unaided (FF)	Aided (FF)
SRT	- Could not test due to				
SAT	malfunction of				
Mask	room to room				
MCL	communication				
UCL	system -				
Word List	Word Discrimination ☐ SL ☑ HL				
	100 %	92 %	%	%	%
	60 dB	60 dB	dB	dB	dB
	%	%	%	%	%
NU-6	dB	dB	dB	dB	dB
LV ☐	%	%	%	%	%
Tape ☑	dB S/N	dB S/N	dB S/N	dB S/N	dB S/N
Other ☐	%	%	%	%	%
	dB S/N	dB S/N	dB S/N	dB S/N	dB S/N
Mask	- Did not record masking level -				

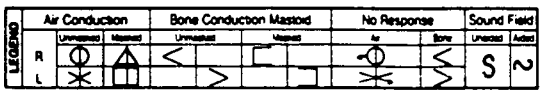
written response

Acoustic Reflex Thresholds						
LEFT EAR				RIGHT EAR		
Reflex Decay	LE CONTRA Tone Left Probe Right	LE IPSI Tone Left Probe Left	Hz	RE IPSI Tone Right Probe Right	RE CONTRA Tone Right Probe Left	Reflex Decay
	75		500		65	
	70	65	1000	65	70	
	75	65	2000	80	85	
	80		4000		80	

Audiological Profile for S2

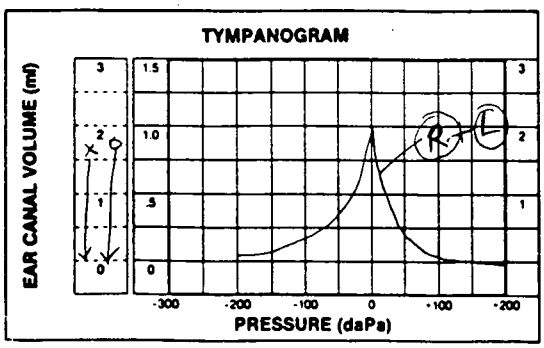
PURE TONE





Test Accuracy good

BOA ☐ VRA ☐ PLAY ☐ STND ☑



SPEECH AUDIOMETRY

	Right Ear	Left Ear	Bone	Unaided (FF)	Aided (FF)
SRT	25	25			
SAT					
Mask					
MCL					
UCL					
Word List	Word Discrimination ☐ SL ☐ HL				
	76 %	76 %	%	%	%
	50 dB	50 dB	dB	dB	dB
	%	%	%	%	%
NU-6	dB	dB	dB	dB	dB
LV ☐	%	%	%	%	%
Tape ☑	dB S/N	dB S/N	dB S/N	dB S/N	dB S/N
Other ☐	%	%	%	%	%
	dB S/N	dB S/N	dB S/N	dB S/N	dB S/N
Mask					

Acoustic Reflex Thresholds

LEFT EAR				RIGHT EAR		
Reflex Decay	LE CONTRA Tone Left Probe Right	LE IPSI Tone Left Probe Left	Hz	RE IPSI Tone Right Probe Right	RE CONTRA Tone Right Probe Left	Reflex Decay
	DNT		500		DNT	
	↓	75	1000	75	↓	
	↓	75	2000	80	↓	
	↓		4000		↓	

APPENDIX B: Therapy Log for the Hearing-Impaired Subjects

This appendix presents a brief description of the therapy process and activities for the hearing-impaired subjects. Therapy consisted on two aspects: 1) information components which involved introducing the conversational principles employed by Erber (1988); specifically, problem solving and clarification requests, semantic and syntactic strategies, situational and contextual factors, and sequential contingencies, and 2) practice activities for the application of the new knowledge and skills. Please refer to Chapter 2 for a description of each information component. Therapy was structured such that all the information components were introduced before the mid evaluation, while the two weeks of therapy following mid evaluation provided further intensive practice in the application of the target communication strategies and incorporated activities and materials intended to address specific concerns of the subjects. Please refer to Erber (1988) Chapter 4 "Communication Practice" pp. 87-142 for complete descriptions of Erber's clinical activities that were used in the present study.

Following is a general description of each therapy session for each subject. Many of the therapy activities were done in a sound booth with background babble noise administered over the loudspeaker system to make the activities more difficult.

THERAPY SESSION 1

Subject 1:

1. Discussed philosophy of communication therapy and subject's goals.
2. Discussed different sources of communication breakdowns (e.g. message structure or content, environmental issues, speaker issues) and possible solutions. A handout was provided.
3. Discussed problem-solving approach for resolving communication breakdowns (i.e. identification of source of difficulty, selection of appropriate strategy, and evaluation of effectiveness of the chosen strategy). A handout was provided.

4. Therapy activity in which the subject had to identify sources of difficulty and supply appropriate solutions in response to a passage of text orally read by the researcher. The researcher created various difficulties based on the sources previously discussed in the sessions.
5. a) Discussed different types of requests for clarification. Handout provided (Kaplan et al., 1985).
   b) Erber's QUEST?AR activity (see Erber, p. 124) which provides simulated interactive practice with question-answer sequences. The purpose of its use in this session was for the practice of clarification requests and identification of sources of communication breakdowns (S/N ratio: -15 (45/60 dB, no visuals).
6. Review and discussion of the session.

Subject 2:

Same as for subject 1, with the exception that there was insufficient time for the QUEST?AR activity (5b).

THERAPY SESSION 2

Subject 1:

1. Reviewed handout on requests for clarification.
2. a) Simulated conversation (QUEST?AR) with the researcher to practice use of clarification requests (S/N ratio: -15, no visuals). Conversation was audiorecorded.
   b) Play back of taped conversation and discussion with respect to difficulties and used of clarification requests.
3. a) Discussion of use of word associations as a communication strategy (syntactic awareness). Handout was provided.
   b) Therapy activity in which the subject, using her knowledge of word associations, had to supply appropriate missing words in lists and sentences spoken by the researcher.
4. a) Discussed use of word order (semantic awareness).
   b) Therapy activity in which the researcher orally read nonsense sentences with gaps (missing words) and the subject had to supply appropriate words to fill the gaps based on her knowledge of word order and word/phrase associations.
   c) Same therapy activity as described in (b) except using real sentences.
5. Review of session.

Subject 2:

1. Discussed subject's concerns with respect to classroom and seminar communication difficulties.
2. Reviewed handout on requests for clarification.
3. a) Tracking activity to practice use of clarification requests (S/N ratio: -15, no visuals) with attending audiologist as the speaker. Tracking exercise was audiorecorded.

b) Play back of taped tracking exercise and discussion of communication difficulties and use of clarification requests.

4. a) Simulated conversation (QUEST?AR) with researcher for practice of use of clarification requests (same S/N as above). Conversation was audiorecorded.
   b) Play back of taped conversation and discussion.
5. Review of session.

THERAPY SESSION 3

Subject 1:

1. a) Discussion of the use of contextual and situational cues as communication strategies. Discussed how context in the form of the situation and the people involved in the conversation influences what is said and the meaning of what is said. A handout was provided.
   b) Context therapy activity: subject was given a the same utterance in different situations and had to supply and compare the predicted responses.
   c) Context therapy activity: given two different utterances in the same context, the subject had to supply and compare the predicted responses.
2. a) Simulated conversation within a barrier activity framework. This activity was meant to simulate the subject's work environment and a typical interaction involving information exchange that she might be required to do on a daily basis. The researcher orally read written instructions for a task and the subject had to write down the key points. The researcher wore a face mask, brought from the subject's work environment, during the activity. (S/N ratio: -15, visuals allowed but the mask covered the speaker's mouth). Conversation was audiorecorded.
   b) Play back of taped conversation and discussion.
3. Review of session and discussion. Homework sheet given on using anticipatory strategies to set up a meeting room for the best listening conditions possible (Kaplan et. al., 1985).

Subject 2:

1. a) Discussion of use of word associations as a communication strategy (syntactic strategy). Discussed how sometimes a word that is not heard in conversation may be guessed or anticipated based on word/phrase associations. Handout was provided.
   b) Therapy activity in which the subject, using her knowledge of word associations, had to supply appropriate missing words in lists and sentences spoken by the researcher.
2. a) Discussed use of word order (semantic awareness) and how one's knowledge of it may be used to sometimes guess what a misperceived word might be.
   b) Therapy activity in which the researcher orally read nonsense sentences with gaps (missing words) and the subject had to supply appropriate words to fill the gaps based on her knowledge of word order and word/phrase associations.
   c) Same therapy activity as described in (b) except using real sentences.
3. a) Simulated conversation (QUEST?AR) with the researcher as the speaker to practice the application

of the target strategies introduced in therapy so far. (S/N ratio: -17 45/62 dB, no visuals). Conversation was audiorecorded.

b) Play back of taped conversation and discussion with respect to target strategies.

4. Review of the session and discussion.

THERAPY SESSION 4

Subject 1:

1. a) Discussion of pragmatic strategies, specifically sequential contingencies with respect to response pairs with topical and situational constraints and utterance types and expected responses.
   b) Erber's Con-tingent Activity (see Erber, p. 134). Materials included cards with general statements, yes/no questions, choice questions and specific content questions. The cards were read by the subject and the clinician responded appropriately.
   c) discussion of therapy activity in terms of why some responses were more difficult to understand than others and how this related to conversational sequences.
2. a) Erber's Con-descending Activity (see Erber, p. 136). Materials included a list of common topics. The subject made statements and asked questions pertaining to each topic in order to practice formulating clarification questions as it relates to sequential contingencies (S/N ratio: -15 45/60 dB, no visuals).
   b) Discussion of therapy activity.
3. Discussion of homework sheet on the use of anticipatory strategies to set up a meeting room for the best possible listening conditions.
4. Review of session and discussion.

Subject 2:

1. a) Discussion of pragmatic strategies, specifically sequential contingencies (see subject 1, session 4).
   b) Erber's Con-descending Activity (S/N ratio: -17, 45/62 dB, no visuals).
   c) Discussion of activity.
2. a) Discussion of use of contextual and situational cues as communication strategies. Handout provided.
   b) Context therapy activity: subject was given a the same utterance in different situations and had to supply and compare the predicted responses.
   c) Context therapy activity: given two different utterances in the same context, the subject had to supply and compare the predicted responses.
3. Review of session and discussion.

THERAPY SESSION 5

Subject 1:

1. a) Therapy activity: tracking exercise in which the material was a current magazine article. The attending audiologist orally read the article. (S/N ratio: -15, no visuals).
   b) Discussion of the tracking activity in terms of the target strategies introduced in the first four sessions of therapy.
2. a) Simulated conversation (TOPICON) between the subject and attending audiologist (speaker). The focus was on directing a conversation using one's knowledge of sequential contingencies. A high-interest, familiar topic was chosen. (S/N ratio: -15, no visuals). Conversation was audiorecorded.
   b) Play back of the taped conversation and discussion.
3. Review of session.

Subject 2:

1. a) Review of pragmatic communication strategies (i.e. sequential contingencies).
   b) Therapy activity: Erber's Con-tingent Activity.
   c) Discussion of therapy activity in terms of sequential contingencies.
2. a) Simulated conversation (TOPICON) between subject and attending audiologist (speaker) with the focus on directing a conversation using one's knowledge of sequential contingencies. (S/N ratio: -18, 45/63 dB, no visuals). Conversation was audiorecorded.
   b) Discussion of the therapy activity in terms of target strategies.
3. a) Simulated group conversation with 3 participants (the subject, the audiologist, and the researcher) in the sound booth with background noise. The attempt was to simulate a classroom discussion and noise environment. The topic was a discussion of movies that the participants had recently seen. The background noise was presented over the loudspeaker system at 65 dBHL. The conversation was videotaped.
4. Review of session and discussion of personal issues of concern.

THERAPY SESSION 6

Subject 1:

*Therapy sessions 6, 7, and 8 were combined into 2 one-and-a-half hour sessions for subject 1.

1. a) Simulated conversation (TOPICON) with unfamiliar speaker (volunteer instructor) on a familiar topic. (S/N ratio: -15, no visuals).
   b) Discussion of the conversation in terms of target strategies and communication difficulties.
2. a) Therapy activity: simulated conversation in interview-style format. The subject had to interview an unfamiliar speaker on her occupation (S/N ratio: -15, no visuals).
   b) Discussion of the conversation.

3. a) Therapy activity: Erber's Con-descending Activity (S/N ratio: -15, no visuals).
   b) Discussion of the therapy activity.
4. Review of session and discussion of personal issues of concern.

Subject 2:

1. Play back and discussion of videotaped conversation from session 5 (simulated conversation in noise with three participants) with respect to the target communication strategies.
2. a) Simulated conversation (TOPICON) with unfamiliar speaker (volunteer graduate student) on a interesting familiar topic (S/N ratio: -18, no visuals).
   b) Discussion of the conversation in terms of use of target communication strategies.
3. Review of session and discussion of personally relevant issues.

THERAPY SESSION 7

Subject 1:

See note in therapy session 6.

Subject 2:

1. Review and discussion of therapy sessions up to this point.
2. a) Simulated conversation (TOPICON) with unfamiliar speaker and unfamiliar topic (S/N ratio: -18, no visuals).
   b) Discussion of conversation.
3. a) Simulated conversation in interview-style format with unfamiliar speaker. The subject had to interview the speaker on her travel adventures. (S/N ratio: -18, no visuals).
   b) Discussion of the conversation.
4. Review of session and general discussion of therapy.

THERAPY SESSION 8

Subject 1:

1. a) Simulated conversation: interview-style format. The subject interviewed the attending audiologist (a familiar speaker) to find out more about her personally. (S/N ratio: -15, no visuals).
   b) Discussion of the conversation.
2. a) Simulated conversation (TOPICON) with researcher on familiar topic (S/N ratio: -15, no visuals). The conversation was audiorecorded.
   b) Discussion of taped conversation.

3. Review and discussion of the therapy program. Discussion of personally relevant issues for the subject.

Subject 2:

1. a) Simulated conversation group conversation: three person conversation simulating a seminar type discussion on an article handed out in the previous therapy session to the participants (the subject, the attending audiologist, and a volunteer graduate speech-language student). Background noise presented over the loudspeaker into the sound booth at 65 dBHL.
   b) Discussion of the group conversation.
2. a) Simulated conversation (TOPICON) between subject and the researcher (speaker) on a familiar topic (S/N ratio: -18, no visuals).
   b) Discussion of the conversation in terms of target strategies and problem-solving.
3. Review and discussion of the therapy program in relation to personally relevant issues for the subject.

APPENDIX C: Therapy Log for the Intervention Communication Partner

Therapy with the intervention communication partner (ICP) involved four areas of focus: 1) problem-solving approach to resolving communication breakdowns; 2) types of repair strategies; 3) sequential contingencies in relation to how the communication partner's response might vary in their intelligibility for the listener; and, 4) opportunities to experience a simulated hearing-loss with the HELOS equipment in order to foster a greater appreciation of communication difficulties experienced by a hearing-impaired individual. The ICP's therapy sessions were separate from the hearing-impaired subjects therapy sessions. Following are the ICP's therapy sessions.

THERAPY SESSION 1 (two hours)

1. Discussion of philosophy of communication-based aural rehabilitation.
2. Discussion of the role of the communication partner in communicating with a hearing-impaired individual. Materials were taken from Kaplan et. al. (1985).
3. Discussion of the problem-solving approach to resolving communication breakdowns (handout same as with the hearing-impaired subjects).
4. Discussion of sources of communication difficulties, especially those pertinent to the speaker, and possible solutions (handout same as with hearing-impaired subjects).
5. a) Tracking therapy activity with the HELOS. The attending audiologist was the speaker, while the ICP was the listener with a simulated hearing loss. The speaker created various sources of communication difficulties (based on the preceding discussion) and the ICP had to practice identifying the sources, selecting a solution, and evaluating the appropriateness and effectiveness of the solution. Done with and without visual cues. Materials were magazine articles.
   b) Same activity but with the ICP as the speaker and the audiologist as the person with a simulated hearing loss. The researcher held up cue cards to signal to the ICP how to alter her presentation style.
   c) Discussions followed both activity (a) and (b).
6. Discussion of the types of repair strategies that a speaker can use to help resolve communication breakdowns. A handout was provided based on materials from Kaplan et. al. (1985).
7. Tracking therapy activity with HELOS for ICP to practice use of repair strategies. The researcher was the listener with a simulated hearing loss, while the ICP was the speaker. Materials were magazine articles.

THERAPY SESSION 2 (two hours)

1. Tracking activity with HELOS to practice use of repair strategies. For procedure and materials, see session 1, number 7.
2. Instruction activity with HELOS for repair strategy practice. The researcher was the listener with a simulated hearing loss, while the ICP was the speaker. The ICP had to provide instructions to the listener. Because the ICP was involved in a project instructing elderly hearing-impaired persons on how to use and care for hearing-aids, this was the chosen topic (familiar topic).
3. Simulated conversation (TOPICON) with HELOS using an unfamiliar topic. ICP was the speaker for first part of conversation, with the attending audiologist as the listener. They switched roles half-way through the conversation. The purpose was to practice repair strategies and gain appreciation of communication difficulties for a hearing-impaired listener with unfamiliar topics.
4. Simulated conversation (TOPICON) with HELOS using a familiar topic. Procedure as above. Discussed how knowledge of the topic and situational factors can influence a listener's comprehension and strategies that the speaker might be able to do support the listener's comprehension.

THERAPY SESSION 3 (two hours)

1. Discussion of sequential contingencies and how a speaker's responses to a listener may vary in intelligibility for the listener (same handout as for hearing-impaired subjects).
2. Erber's Con-descending Activity with HELOS. The ICP was the listener, while the researcher was the speaker. Discussion followed with respect to use of sequential contingencies.
3. Simulated conversation (TOPICON) with HELOS: the researcher was the listener, the ICP the speaker. Practice of repair strategies and sequential contingencies. Discussion followed.

THERAPY SESSION 4 (one hour)

1. Tracking activity with HELOS: ICP was the speaker and had an unfamiliar communication partner as the listener (volunteer instructor). The purpose was to provide the ICP with an communication partner, other than the researcher and audiologist, to practice the target strategies with. Materials were magazine articles.
2. Simulated conversation (TOPICON) with HELOS: ICP as speaker, unfamiliar listener, and familiar topic. The purpose was to provide an conversational context for the ICP to practice the application of the target strategies.
3. Simulated conversation (TOPICON) with HELOS: ICP as the listener, the audiologist as the speaker, and unfamiliar material to ICP but not the speaker. The purpose was to provide the ICP with an appreciation of the communication difficulties associated with hearing-loss and how the strategies discussed in therapy might help lessen them.
4. Review of the therapy sessions and discussion of program.

Appendix D: Example of Narrative Text

It was a few years ago
that I spent an unfortunate day
on a construction site.
I had set off with the intention
of interviewing everyone who works there,
and to investigate the world of the construction crane.
It did not take long to discover
that cranes are the heart of any construction site.
The crane is always at the center of things.
Once construction commences
nothing can proceed without it.
I am referring to the cranes you see suspended
high over modern buildings;
the ones that wave in the wind
like giraffe necks.
A lot of people on construction sites
think that individuals
who operate cranes are insane.
They are crazy, at least
in my estimation,
to climb up into their cranes.
I was introduces to Alex
who drives one of the cranes
on the site I was visiting.
Every morning Alex climbs hand over hand
up the crane
and he remains there the entire day.
He doesn't stop for a lunch break
because without the crane
the whole construction site would grind to a halt.
The only time he comes down early
is when the wind starts to blow,
and then he descends pretty quickly.
I knew I should attempt to climb the crane
and get into the gondola with Alex.
In order to join him I had to climb
about as high as a nine story building.
I was somewhat nervous,
but nevertheless, I found myself
holding onto the ladder with one foot still planted on the ground.
The entire crane was swaying

as I climbed to a landing
about a third of the way up.
No matter how desperately I tried,
I was unable to let go of the ladder.
The whole crane was swinging
about an inch back and forth.
I clutched it for dear life.
I climbed down,
I admitted to Alex that I was scared.
He said, "It wasn't even moving
where you were.
At the top it's moving about six inches."
The following morning I tried again
and this time I was prepared.
On this occasion I ascended to the second platform,
approximately two thirds of the way up.
The whole structure seemed to be swinging,
and I got a bit woozy.
I thought I was going to perish,
so I climbed down.
No sense in taking unnecessary, foolish risks.
Alex called me on his radio from the gondola,
then he got out
and started dancing a jig on the boom of his crane.
I felt my knees go loose
as he danced
nine storied above the ground.
No sense in taking foolish risks, indeed.
To be a construction crane operator
you've got to possess more than a little bit of nerve
and it also helps to be a bit crazy.

Appendix E: Example of Questions for Narrative Text

1. When was the visit to the construction site

a. a few days ago
b. a few months ago
c. a few years ago
d. yesterday

2. The heart of a construction site is

a. the coffee room
b. the crane
c. the foreman
d. the blueprints

3. The name of the crane operator is

a. George
b. Frank
c. Ken
d. Alex

4. The crane operator gets to the top of the crane by

a. taking an elevator
b. walking up stairs
c. climbing hand over hand
d. using a remote control hoist

5. The crane operator

a. remains in the gondola all day
b. comes down for lunch and coffee breaks
c. stops frequently for breaks
d. may stay overnight on occasion

6. He comes down in a hurry

a. when the weather turns cold
b. if the wind starts to blow
c. if he is needed to help on the ground
c. to make repairs to the crane

7. The gondola is about as high up as

a. a nine story building
b. 75 feet
c. a three story house
d. a very tall building

8. The first landing on the way up the crane is

a. about half way up
b. about a quarter of the way up
c. about one third of the way up
d. just a few feet above the ground

9. At the top the crane is swaying back and forth

a. about six feet
b. about a foot
c. about six inches
d. about two inches

10. Alex called on his radio and then

a. got out on the boom and waved down
b. got out on the boom and danced a jig
c. got out on the boom and stood on one leg
d. got out on the boom and stood on his head.

Appendix F: Example of Restaurant Review Text

Ever have those evenings when you want to eat out
but still crave that homey atmosphere.
No exotic dishes with ingredients you've never heard of
let alone names you can't pronounce.
You may even have some of your paycheque left over when you're finished.
Well, welcome to Mama's Kitchen
a comfortable restaurant that whips up comfort food.
It's a cheery little spot nestled in City Park
with checkered clad tables arranged around a gas fireplace,
allowing ample room for eating and for private chit chats.
The walls are mounted by neon signs proclaiming its specialties:
chicken and ribs, home-made pies, and of course breakfast.
A variety of get-down and eat dinners are available.
The barbecued ribs and chicken is your basic lumberjack meal.
Featured is tender juicy rotisseried chicken
with crisp golden lightly seasoned skin
and out of this world back ribs
with meat than just falls off and melts in your mouth.
Not to mention the finger licking good garlic sauce.
Also included with this meal:
a good sized baked potato piled high with your favourite toppings:
sour cream, green onions, and crunchy bacon bits.
The home-made chicken pot pie is soothing fare,
A flaky crust filled with white chicken morsels, peas, and carrots in a creamy sauce.
And for those with smaller appetites,
an order of chicken fingers and fries is a good bet.
It includes enormous sticks of lightly breaded chicken

served with a fruity dipping sauce
and a sizeable platter of spicy Mexican fries.
Even finicky children will finish off their plates.
Satisfying home-made pies are where it's at for desserts.
There's always the tried and true stand-bys:
blueberry, apple or pumpkin pie al a mode.
Some extremely good unusually selections are also available.
Black bottom pie is a definite winner,
layers of chocolate cream and rum flavoured custard
topped with meringue and shaved melted bittersweet chocolate.
There's also the unbelievable Sour Cream Blueberry and Apple pie,
tangy and fruity, yet not too sweet.
Mama's Kitchen also serves fantastic breakfasts:
pecan pancakes swimming in fresh strawberry sauce,
belgian waffles topped with fresh fruit and devonshire cream,
or crepes filled with ricotta cheese, strawberries and sour cream.
All must have been heaven sent.
For good down home cooking at prices that won't break you
Mama's Kitchen is where it's at.

APPENDIX G: Example of Questions for Restaurant Review Text

1. Mama's specialties are proclaimed by

a. billboards
b. neon signs
c. a chalkboard
d. posters

2. Mama's is described as a

a. cheery spot located downtown
b. homey spot nestled by the lake
c. run-down hole in the wall
d. cheery spot in city park

3. The chicken pot pie is loaded with

a. chicken, peppers, and carrots
b. chicken, beans, and carrots
c. chicken, celery, and peas
d. chicken, peas, and carrots

4. If you want soothing food order the

a. chicken fingers and fries
b. barbecued ribs and chicken
c. hot chicken sandwich
d. chicken pot pie

5. The chicken fingers are served with

a. plum dipping sauce
b. sweet and sour dipping sauce
c. fruity dipping sauce
d. the special house sauce

6. One of the tried and true desserts is

a. cherry pie
b. blackberry pie
c. Black Bottom pie
d. pumpkin pie
7. The Black Bottom pie is topped with

a. shaved bittersweet chocolate
b. a bittersweet chocolate sauce
c. bittersweet chocolate chips
d. milk chocolate mini-chips

8. The breakfasts at Mama's are

a. extremely good
b. hearty
c. fantastic
d. comforting

9. According to the review, Mama's Kitchen

a. serves exotic dishes at reasonable prices
b. has reasonably priced down home cooking
c. is only for those with large appetites
d. is a good place to go for a classy dinner

10. The pecan pancakes were topped with

a. devonshire cream and strawberries
b. maple syrup
c. strawberry sauce
d. whipped cream and fresh fruit.

Appendix H: Verbal Protocol

1. a. Overall how much of the conversation do you think you understood? (all=10, none=0)

   b. Overall, how much of the conversation do you think the conversational partner understood?

2. a. Overall, how effortful or tiring was the conversation? (extremely = 10, not at all = 0)

   b. Overall, how effortful or tiring was the conversation for the conversational partner.

3. What are the advantages and disadvantages of discussing a familiar/unfamiliar topic?

4. Who talked more during the conversation? Why?

5. Who asked more questions during the conversation? Why?

6. Who answered more questions during the conversation? Why?

7. What caused problems understanding during the conversation?

8. What parts of the conversation were easiest? Why?

9. What parts of the conversation were hardest? Why?

10. What solutions to problems understanding were tried and how well did they work?

11. What was the effect of the noise on you on a scale of 1 to 10? (1=no effect, 10=extreme effect) Were you aware of it? How distracting was it?

Appendix I: Equating of Narrative and Restaurant Review Texts for Tracking

Texts	Total # words	Total # syllables	# lines	Flesch's Readability Score	Reading Grade Level
Narrative Texts:					
Taxi	367	487	47	67	N/A*
Teepee Day	407	594	41	70	8
Prairie Treks	511	577	41	66	8
Johnny Inhouse	383	567	43	66	8
Off to Victoria	388	575	39	65	8
Milkman	427	548	64	74	7
The Pencil	366	535	52	72	6
High Anxiety	459	624	72	75	7
Popsicle	369	543	52	69	8
Jewel Thief	497	554	48	72	N/A
Restaurant Review Texts:					
Ninth Street Cafe	380	540	51	69	N/A*
Siggy's Place	372	567	45	63	N/A*
Mrs. T's	410	568	55	70	N/A*
Triple Delight	368	553	42	61	9
Mama's Kitchen	389	586	46	62	9
Cafe Barimba	372	592	42	61	9
Presto's	351	565	41	61	8
Picnics from Culinary Capers	342	526	58	65	8
Japanese Bistro	382	562	53	71	7
Bishop's	347	482	55	75	7
El Caravan	451	515	50	65	9

* These texts were borrowed from Howarth (1992) in which specific reading grade levels were not determined, rather a Flesch's readability score of 60 - 70 was interpreted as a standard reading score for 7th and 8th grades.

Appendix J: Example of Questions for TOPICON Conversations

1. When eating at MacDonald's I order

a. milkshake and Big Mac
b. burger and fries
c. combo meal
d. salad and a drink

2. I prefer to eat at the Keg or Earl's. I usually have

a. fish and breaded chicken
b. burger and fries
c. steak and potatoes
d. steak and seafood

3. The appetizer that I order at the Keg is _____ and at Earl's is _____

a. potato skins and fries
b. calamari and shrimp
c. mushroom caps and zucchini sticks
d. caesar salad and garlic bread

4. The restaurant I would like to try in Vancouver is

a. Milestones
b. Umberto's
c. English Bay Cafe
d. Windows on the Bay

5. I also enjoy Greek and Japanese restaurants, such as

a. Millos and Suehiro's
b. The Greek Connection and Jan Jan
c. Athene's and Koji
d. Athene's and Maiko Gardens

6. I have not tried Indian food because

a. I do not like curry
b. I just haven't gotten around to it yet
c. I have trouble digesting spicy food
d. I do not like Indian food

7. We often use the Entertainment Guide when eating out. It saves us

a. 20% off our meal
b. 25% off our meal
c. We get one entree free
d. We get one entree 25% off

8. When I go out for dessert, I often order

a. pie and coffee
b. cheesecake and herbal tea
c. torte and juice/spring water
d. cheesecake and cappuccino/special coffee

9. My worst experience while dining involved

a. the waiter spilling our drinks on the table
b. the waiter spilling our drinks on me
c. rimming our drinks with salt
d. bringing us the wrong drinks

10. One of my favourite restaurants back home is

a. Suisha Gardens
b. Mother Tucker's
c. The Silver Spoon
d. La Cave

Appendix K: Familiarity Ranking List of Topics for TOPICON Conversations with ICP

____ restaurants

____ cats

____ family parties

____ real estate

____ holidays

____ cigarette smoking

____ moving

____ unemployment

____ tax

____ shopping

____ diets

____ education

____ cooking

____ computers

____ weather

____ babies

Appendix L: Post Therapy Interview Questions

1. In terms of skills, what do you think you learned throughout the program?

2. How satisfied are you with the program in terms of how it met your personal goals for participating in this program, as discussed in session 1? Rate your satisfaction on a scale of 1 to 10: 1 being highly dissatisfied and 10 being highly satisfied.

3. In terms of your satisfaction on a scale of 1 to 10, 1 being highly dissatisfied and 10 being highly satisfied, how satisfied are you with your ability to use the skills discussed in therapy to:

a. improve the efficiency of your conversations?
b. improve the fluency of your conversations?
c. improve your comprehension?
d. decrease your listening effort?
e. decrease your hearing handicap?

3. How would you rate your general satisfaction with the therapy program on a scale of 1 to 10, 1 being highly dissatisfied, 10 being highly satisfied?

Appendix M: Intra-Rater Reliability Data for Coding of Requests for Clarification and Repair Strategies in Tracking and TOPICON

Intra-reliability Data for Coding of Requests for Clarification in Percent Agreement
(Sample: S2 with ICP in Evaluation 3)

	Tracking	TOPICON
Nonspecific request	86%	100%
Specific Requests:		
Request for specific constituent	93%	100%
Request for confirmation	100%	100%
Request for explanation	100%	100%
Request for change in manner of presentation	100%	100%

Intra-Rater Reliability Data for Coding of Repair Strategies in Percent Agreement
(Sample: S1 with ICP in Evaluation 3)

	Tracking	TOPICON
Exact repetition	100%	100%
Paraphrase	82%	90%
Syntactic modification	100%	100%
Partial repetition	84%	100%
Confirmation	100%	100%
Elaboration	88%	88%
Spelling	100%	100%

Appendix N: TOPICON Fluency Assessment Form

TOPICON FLUENCY ASSESSMENT

Name:_____ Evaluation:_____ Date:_____
Room: ___ Topic_____ Condition _____ Score:_____

	Rating				
	Low				High
Overall "fluency" of discourse:	___	___	___	___	___
Factors related to fluency:					
a. **presupposition** (savvy about situation)	___	___	___	___	___
b. **receptive abilities** (A,V, A-V)	___	___	___	___	___
c. **expressive abilities** (clarity, rate, syntax, semantics)	___	___	___	___	___
d. **motivation, attention** (concentration, attitude, fatigue)	___	___	___	___	___
e. **turntaking** (silent intervals/interruptions)	___	___	___	___	___
f. **specificity/accuracy** (names referents, not vague)	___	___	___	___	___
g. ***new* vs *old* information** (adds new info; avoids repetition)	___	___	___	___	___
h. **non-verbal communication** (gesture, eye contact, expression)	___	___	___	___	___
i. **topic meintenance** (smooth, socially appropr. transitions)	___	___	___	___	___
j. **cooperation** (honesty, interacts w/o joke & pretense)	___	___	___	___	___
k. **time-sharing** (balance in control of conversation)	___	___	___	___	___
l. **verification** (reports/inquires re understanding)	___	___	___	___	___
m. **independent repair** (i.d.'s probs., uses good repair strategy)	___	___	___	___	___
n. **meta-communication** (can analyse conversation)	___	___	___	___	___
o. other_____	___	___	___	___	___

Comments:

_____

_____

Appendix O: Intra-Rater Reliability Data for Coding of Benefit Measures for TOPICON Conversations in Percent Agreement (Sample: S1 with CCP in Evaluation 3)

	% Agreement
Turns	92%
Clauses	98%
Backchannels	84%
Turns with No Response	100%
Turns as Acknowledgement Only	100%
Gaps > 3 seconds	100%
Topic Initiations/shifts	100%
Interruption overlaps	100%
Information questions	98%
Communication breakdowns	100%