COMPREHENSIBILITY: A POTENTIAL MEASURE FOR IMPROVEMENT IN COMMUNICATION

by

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Abstract

The present study examined the relationship between changes in comprehensibility and changes in intelligibility over time, for an individual with dysarthria. Intelligibility has been the primary focus in the assessment and treatment of dysarthria. This study builds on the work of Yorkston, Strand, and Kennedy (1996) to establish comprehensibility as an alternative or additional focus for dysarthria. It does so within the context of the International Classification of Functioning, Disability and Health (ICF) proposed by the World Health Organization (WHO). The WHO is dedicated to ensuring that individuals meet the highest level of biological, psychological, and physiological health. Comprehensibility has the potential to promote increased health and quality of life by focusing on the communication within a dyad rather than focusing only on the speech signal as intelligibility does.

This study was based on secondary analysis of audio- and videotaped assessment data. The data were collected at two points in time during the externship of a clinical student, G, with a client E, who had mixed spastic hypokinetic dysarthria. The goal of the present study was to establish the clinical utility of comprehensibility in terms of its application in structured assessment, in addition to the reflection of changes in conversation and in judgments of unfamiliar individuals. Two focus groups were recruited for perceptual judgments of conversations. Results revealed that in structured assessment, changes in comprehensibility occurred in the absence of changes in speech characteristics. Changes in comprehensibility were also reflected in conversation in the form of more efficient breakdown resolution strategies of both members of the dyad and in differences in topic control. Both groups of participants rated the second conversation to be more successful, and slightly more proficient, than the first. Ratings on other elements of the conversation, such as comfort, interest, and effort, however, varied between the two groups. Interpretation of these differences, clinical implications, and potential for future research is discussed.

Table of Contents

List of Tables

List of Figures

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1. Introduction

The term dysarthria describes a collection of speech disorders that result from damage in the central or peripheral nervous system. Dysarthria manifests differently in each disorder, and individual for that matter, but is characterized by an inability to control speech muscle movement, rendering oral communication difficult. The current focus of assessment for dysarthria is the measure of intelligibility, a measure that can account for the intelligibility of an individual's speech signal but not their ability to communicate. Intelligibility focuses on the speech signal in isolation, separated from the context in which it occurs. While intelligibility measures have the potential to highlight aspects of a dysarthric individual's impairment, their narrow focus on the speech signal fails to capture the individual's communicative competence (i.e., the ability to effectively convey one's wants, needs, and opinions, for instance, to one's conversation partner(s)). This is particularly problematic with severe dysarthria secondary to degenerative disorders because it gives the clinician and patient virtually nothing to work on. A focus on intelligibility might yield short term results but given that the individual's speech will continue to deteriorate, it will likely not address long term communication needs.

There have been many changes in health care recently, among them, an emphasis on the 'health of individuals.' This change in emphasis encourages proactive involvement, as it puts individuals in charge of maintaining their own health, as well as determining their own treatment plans should medical intervention be necessary. The World Health Organization's (WHO) International Classification of Functioning, Disability, and Health (ICF) provides a framework in which to conceptualize and accomplish an individual-focused approach to assessment and treatment (WHO, 2001).

The WHO has recently revised its definitions of functioning and disability, and this first chapter will begin with a review of their definitions and how they apply to communication. Their

definitions allow an examination and understanding of how factors other than a disability or impairment can influence an individual's quality of life.

Quality of life is often affected by deficits in communication. A holistic approach to assessment and treatment, as proposed by the WHO, has been addressed in areas like aphasia. Much of the research done on communication in this area has focused on functional communication. Unfortunately, this approach has not yet been as productive in areas such as hearing impairment and dysarthria. This study will attempt to highlight the usefulness of a functional approach to the assessment and treatment of dysarthria within the framework of the WHO's ICF.

The assessment of intelligibility for dysarthria addresses only a small portion of the ICF. An alternative or additional approach to assessment is comprehensibility, a measure that focuses on the communication efficiency of a dyad, and which forms the foundation of the current study. With comprehensibility, the focus of analysis is shifted from that of the speech signal of one individual to communication as it exists and develops between two individuals. It considers communication strategies employed by both the speaker and listener, shared knowledge, context, and cues. Currently, this focus is not the norm and this study will emphasize the value of comprehensibility as a viable foundation for the functional assessment and treatment of dysarthria. Comprehensibility has the potential to incorporate all the components of health described in the ICF model.

In the current study, it is hypothesized that changes in comprehensibility can occur in the absence of changes in intelligibility and that is why it needs to be addressed separately. These changes might be revealed by establishing a structured and reliable assessment protocol for comprehensibility, ascertaining whether these changes in assessment are also reflected in conversation, and determining if any changes that occur are apparent to unfamiliar individuals, particularly one's peers.

1.1 A Framework for the Field of Communication Disorders

1.1.1 Description

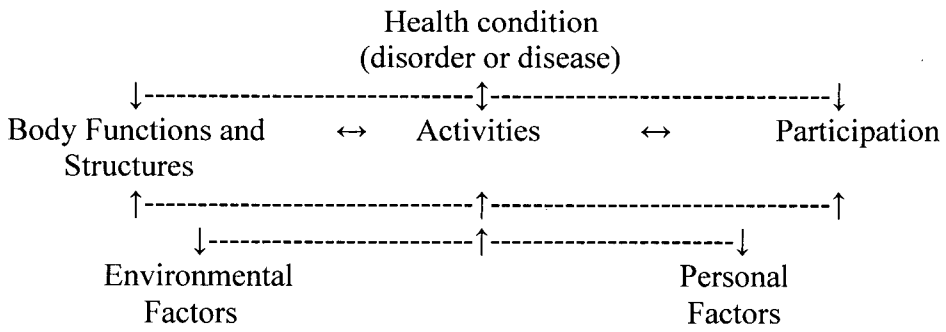
Recent advances in technology and research have enabled individuals to overcome potentially devastating and life-altering effects of disease and disorder. These advances, while remarkable, still often leave individuals with altered body functions and/or structures that impact their participation in everyday activities. This is a problem more because of the views of society than because of the changed functions or structures themselves (WHO, 2001). The WHO has promoted a change in the ideologies surrounding disease and disorder, from a focus on the 'consequences of disease' to an emphasis on health and the components that comprise health.

The WHO, a division of the United Nations, is dedicated to ensuring that individuals reach and maintain the highest possible level of health (WHO, 2001). The WHO's definition of health includes biological, psychological, and social well-being. The ICF was developed in an attempt to provide a universal system that would enable professionals throughout the world to describe health and health-related states using a standard language (WHO, 2001). Universality is made more probable by the fact that ICF is informed by a medical model and a social model of disability, thereby allowing medical professionals to build upon and adapt within their current ideological framework. As defined by the WHO, "the medical model views disability as a problem of the person, directly caused by disease, trauma or other health condition, which requires medical care provided in the form of individual treatment by professionals" (p. 20), whereas "the social model of disability, on the other hand, sees the issue mainly as a socially created problem, and basically as a matter of the full integration of individuals into society" (p. 20).

In further efforts to ensure that individuals reach and maintain the highest level of health, the WHO has recently revised their views and definitions of functioning and disability such that the process of achieving the highest level of health is thought of as being bidirectional,

interactive and evolutionary (see Figure 1.1). "An individual's functioning in a specific domain is an interaction or complex relationship between the health condition and contextual factors (i.e., environment and personal factors) (WHO, 2001, p.19).

Figure 1.1 Interactions Between the Components of ICF (WHO, 2001, p.18)



The WHO has made a concerted effort to include in their definitions aspects of the interaction that take place between the individual and their environment (Chapey & Hallowell, 2001). In other words, rather than describing an individual's disease or disorder, ICF can describe an individual's 'situation.' Such a description is possible because the ICF includes the classifications of body function and structures, activity and participation in addition to considering contextual factors such as environmental and personal factors. Each classification contains a list of domains in which one can experience difficulties and each domain is assigned a code allowing for universal use and understanding. The inclusion of internal and external factors within these levels serves to deemphasize the disease, per se, and allows assessment and treatment to focus on how various factors contribute to an individual's quality of life (Chapey & Hallowell, 2001). Treatment targeted at the individual is essential, and achieving this necessitates an appreciation for how the individual's personal context including, for example, cultural

attitudes and expectations, weighs on perceptions of his or her disorder and its impact on his or her life (Wade, 2001).

1.1.2 Application of the ICF to Communication Disorders

Quality of life (QOL) is often affected by deficits in communication (Cruice, Worrall, Hickson, & Murison, 2003; Sorin-Peters, 2003). Cruice et al. (2003) found that "communication ability at the activity level [...] was most predictive of participants' QOL" (p. 343). According to the ICF, activity is the execution of a task or action. Components under activity/participation and activity/participation limitations are qualified by 'performance' and 'capacity'. Performance indicates how the individual functions in his or her current environment whereas capacity indicates how the individual would function in an adjusted environment (WHO, 2001). The difference between performance and capacity can provide insight into what can be done to the environment to help the individual improve functioning. This may or may not include assistance from devices or individuals. Ultimately, the goal is to increase participation which would improve quality of life.

Sorin-Peters (2003) promotes a holistic approach to assessment and treatment and asserts that "personal growth and development [are important] to improve quality of life" (p. 405). A holistic approach to assessment and treatment, as proposed by the WHO, has been addressed in areas like aphasia (Cruice et al., 2003; Kagan, Black, Duchan, Simmons-Mackie & Square, 2001; Rayner and Marshall, 2003; Sorin-Peters, 2003) and brain injury (Drummond & Boss, 2004; Greenwood, 1999).

In the realm of communication, a holistic approach does not place all the emphasis on one's language or communication skills, but focuses on the exchanging of information and social involvement (Sorin-Peters, 2003). Research has shown that implementing approaches that target communication between family members/volunteers and adults with aphasia has helped to

improve social participation, relationships, and overall quality of life (Kagan et al., 2001; Rayner & Marshall, 2003; Sorin-Peters, 2003). These approaches place individuals with impairments in charge of their treatment rather than having them rely entirely on the decisions of the speech-language pathologist (Sorin-Peters, 2003). For instance, Sorin-Peters (2003) described an approach to working with couples with aphasia that was based on an adult learning model and gave the learner the central role in the treatment process. Therapy targeted emotions, marital issues and communication and resulted in improved quality of life for these couples. The results were evident through rating and observation as well as through questionnaire responses. What we can take away from this and related research is that not only did this type of intervention serve to increase participation and overall quality of life for the individual with aphasia, it helped to change the views of the family members and volunteers with whom they were working (Kagan et al., 2001; Rayner & Marshall, 2003; Sorin-Peters, 2003). A limitation of its use, however, is that many speech-language pathologists do not have any sort of counseling training and may not feel confident in their abilities to target emotional and marital issues. Secondly, improvements in conversation may not necessarily extend to conversations with other familiar individuals. Findings such as these, however, highlight the potential positive outcomes that can result when treatment focuses on functional communication and communication as it manifests between individuals.

Although some research on functional communication has taken place, this approach has not been as productive in areas such as hearing impairment and dysarthria even though the ICF has provided a framework within which to structure it. This is unfortunate given that a functional communication approach has the potential to positively affect an individual's functioning in various environments (e.g., school, home, work, hobby groups), possibly more so than some traditional forms of speech-language treatment. This approach may therefore impact an individual's overall quality of life.

Dysarthria, like aphasia, has the potential to prohibit conversations in social settings which can have an isolating effect on the individual with the impairment. It therefore warrants research in the area of functional communication. Research with individuals with dysarthria has typically focused on speech. This focus has its place within the framework proposed by the WHO but is restricted to the components of 'body functions and structures', shifting in the direction of 'activity'. "Activity is the execution of a task or action by and individual" (WHO, 2001, p. 10), speech being a prime example (see Figure 1.1). Other examples of activities include: comprehending verbal and nonverbal messages, such as body language and drawings, producing nonverbal messages, such as gesture, signs and drawings, and starting, maintaining or ending a conversation (WHO, 2001).

1.2 Intelligibility

1.2.1 Clinical Assessment

Intelligibility has long been used as a means of assessing the severity of speech deficits, primarily in those with dysarthria (Yorkston, Strand, & Kennedy, 1996). It is noteworthy that Yorkston et al.'s (1996) work drew on a slightly different version of the WHO than the current research, so they have not discussed their research within the ICF model. While generally, intelligibility has been defined both narrowly and broadly, Yorkston et al. have defined it in narrow terms as "the degree to which the acoustic signal (the utterance produced by the dysarthric speaker) is understood by a listener" (p. 55). They describe intelligibility as a combination of two components, those being the impaired mechanism and the compensatory strategies used because of the impairment. In a clinical setting, this narrow definition permits a focus on the component of activity and enables the clinician to evaluate how impairment in structure/function impacts the activity level and develop treatment to specifically target the impairment.

Yorkston and Beukelman (1981) developed the Assessment of Intelligibility of Dysarthria Speech (AIDS) for clinical assessment. In the process of assessment, individuals are asked to produce standard or randomly selected single words and sentences, which are recorded (auditory only) and then orthographically transcribed by unfamiliar listeners (Yorkston & Beukelman, 1981). Typically, intelligibility is determined by the number of words correctly understood by the listener as a proportion of the total number of words read. This yields a percentage that reflects the overall intelligibility of the individual's utterances, as judged by the listener.

In the clinical process of determining intelligibility, all signal-independent information, such as environmental, physical, and semantic context, is held constant. While holding these variables constant permits the isolation of the speech signal, the results are not necessarily an indication of how well an individual is understood outside the clinic where environment, visual cues, and context come into play (Yorkston et al., 1996).

1.2.2 Factors Affecting Intelligibility

Others have looked at intelligibility differently. In research settings the focus has typically been an attempt to isolate factors involved in intelligibility. Assessments of intelligibility have varied in their definitions and the extent of their focus or inclusion of factors (e.g., prosody, voice quality, nasality etc.). Many researchers have reported satisfaction with the use of intelligibility as a general concept, with each having a different focus and goals. For instance, Roy, Leeper, Bloomgren, and Cameron (2001) studied intelligibility through a very detailed analysis and in doing so were better able to determine the specific features of dysarthric speakers' intelligibility deficits.

Roy et al. (2001) considered intelligibility to be a reflection of the integration of phonetic, acoustic and physiological elements and used multiple-choice word recognition as well as the

traditional orthographic transcription method to determine intelligibility ratings. Through phonetic, acoustic and physiological analyses, they determined the loci of the intelligibility deficit (i.e., respiratory, laryngeal, articulatory, velopharyngeal) and then developed a treatment regimen targeted at the deficits impairing the speech of individuals with spastic dysarthria. While the speech of those with spastic dysarthria can be characterized by a slowed speech rate, formant changes, and vowel distortion, these individuals varied in the nature of their deficits in these areas (Roy et al., 2001). Although there was recognition of individual factors and differences in characteristics in this research, the focus nonetheless fell only within the body functions/structures and activity components of the ICF model. Consequently, such a system of analysis might allow for detailed information that can be used to manage the intelligibility deficit as well as provide a quantitative evaluation of the improvements made throughout the treatment process (Roy et al., 2001), but the end result will not necessarily influence an individual's environment and promote increased participation.

While intelligibility may have a place in assessment and treatment within the ICF as described, it has its flaws. Weismer and Laures (2002) report that results from intelligibility studies cannot be compared as they all have a different standard against which the speech stream is compared (e.g., different speakers/utterances) and/or a different way of evaluating intelligibility. For instance, Weismer and Laures used direct magnitude estimation (DME), which is a perceptual scaling method that uses a "standard or reference stimulus, chosen as a good exemplar of "midrange" intelligibility" (p.1), over the more traditional orthographic transcription because they felt it was more sensitive to nonsegmental information that contributes to intelligibility, such as voice quality. Similarly, De Bodt, Hernandex-Diaz Huici, and Van De Heyning (2002) used a 4-point rating scale to reveal the influence of individual dimensions, such as voice quality, articulation, nasality and prosody, on intelligibility.

Due to the many interacting variables involved in producing an utterance or speech stream, reliably pinpointing a deficit (Weismer & Laures, 2002) and obtaining a reliable measure of intelligibility is difficult (i.e., it is difficult to know what individual variables are affecting intelligibility and how) (De Bodt et al., 2002). This means that intelligibility scores may not be an accurate indication of functioning at the activity level. If additional factors were considered, intelligibility measures might have the ability to indicate the impact of communication difficulties in a more general sense which would move us along the ICF continuum and bring us closer to the component of participation. The integration of components and inclusion of environmental and additional personal factors is not yet recognized and targeted in the literature, however.

De Bodt et al. (2002) argue that intelligibility scores can be used to determine how an individual's impairment is affecting their communicative abilities. Their view of intelligibility is more functional than some as it evaluates speech at the passage level rather than creating a percentage based on the number of words correctly understood in a sentence. Like Weismer and Laures (2002) and Roy et al. (2001), they view speech intelligibility as a combination of variables (voice quality, articulation, nasality, prosody). Specifically, De Bodt et al. looked at the variables as weighted perceptual dimensions that would each contribute differently to overall intelligibility. These researchers' results revealed that articulation is most strongly correlated with intelligibility and that intelligibility can be expressed as a linear combination of these weighted variables. De Bodt et al. proposed this type of analysis as a way of describing speech as a function of multiple components, which is perhaps more useful than describing a method of identifying a specific area of deficit.

Although she did not refer to intelligibility in her study on dysarthric speech, like the other research described in this section, Patel (2002) analyzed a single element of the speech stream. She took a different approach to analyzing severely dysarthric speech by asking

participants to differentiate questions from answers based on the prosodic cues available in the speech stream. Results indicated that speakers with severe dysarthria were able to convey important information through the use of prosodic cues such that listeners could distinguish between their pitch contours used for questions and those used for statements. Perhaps then, these measures and other intelligibility measures, in the broad sense, have the potential to highlight the current abilities of a speaker with dysarthria that can then be built upon to increase a listener's understanding.

To date there has been little research on functional communication assessment in speakers with dysarthria, although researchers have expressed the need for more research in this area (De Bodt et al., 2002; Garcia & Cannito, 1996; Garcia & Dagenais, 1998; Hustad, Jones, & Dailey, 2003 (b)). Fortunately, there appears to be an increasing realization that the impact of a speaker's communication abilities is better realized under more naturalistic circumstances involving more functional utterance evaluation (e.g., sentence level) (De Bodt et al., 2002; Yorkston et al., 1996). Thus far, this realization is present in the literature in the form of a greater variety of utterances used (e.g., words, sentences etc.).

As described above, De Bodt et al. (2002) chose to take a more functional approach to intelligibility by analyzing connected speech using a passage made up of sentences as opposed to single words or single sentences. Similarly, Weismer and Laures (2002) analyzed a wider repertoire of factors in the speech signal by employing a scaling method that was sensitive to nonsegmental factors such as voice quality and prosody. Though this type of analysis still fails to account for environmental factors that can impact intelligibility and understanding, it is nonetheless a step toward a more complete picture of the elements that come into play for a speaker's communicative functioning.

1.2.3 A Broader View of Intelligibility

The inclusion of visual in addition to auditory information, although infrequent in the literature, has shed light on the impact that additional cues have on intelligibility (Garcia & Cannito, 1996; Garcia & Dagenais, 1998; Yorkston et al., 1996). Garcia and Cannito (1996) and Garcia and Dagenais (1998) used both visual and auditory information in examining the effects of context on intelligibility. Both measured intelligibility by determining the percentage of words correctly transcribed in auditory and video presentation modes.

Garcia and Dagenais (1998) studied changes in sentence intelligibility of speakers with dysarthria by varying message predictiveness and the use of iconic gestures with auditory and visual presentation. Their results indicated that additional information afforded by gesture, semantic predictiveness, and visual representation aided listeners' comprehension of the dysarthric speakers' sentences. This effect was seen in speakers with mild to profound dysarthria and lends further support to the importance of signal-independent factors in communication. Signal-independent factors include those not directly linked to the speech signal, such as semantic context, syntactic context, and situational cues. Importantly, different combinations of cues worked differently for each speaker, demonstrating the value of an individual specific approach to assessment and treatment (Garcia & Cannito, 1996; Garcia & Dagenais, 1998).

Garcia and Cannito (1996) came to comparable conclusions in their study on the influence of contextual factors on intelligibility. They too examined how gesture use and message predictiveness impacted intelligibility in addition to analyzing the influence of sentences related to specific situational contexts. All three factors were found to combine differently with mode of presentation (auditory or visual) to increase the understanding of dysarthric speakers' messages.

Although both of these studies employed predetermined sentences in a largely unnatural context, their results point to the influence that contextual cues can have on understanding

spoken messages. Although they are speaker focused studies, this is nonetheless an important step as it embraces the notion that factors other than the speech stream can impact communication and participation.

Likewise, recent research considering the effectiveness of physical cueing has revealed that these cues also have a positive impact on listener understanding (Hustad, 2001; Hustad, Auker, Natale, & Carlson, 2003 (a); Hustad & Beukelman, 2002; Hustad et al., 2003 (b)). These researchers viewed intelligibility as a product of speaker and listener factors, involving the acoustic signal as well as linguistic and contextual factors. The contexts examined by these researchers included no cues, alphabet cues, topic cues, and combined alphabet and topic cues. Results suggested that combined cues had the greatest positive impact on intelligibility scores (calculated as percentage of words correct based on the total number of words) (Hustad, 2001; Hustad et al., 2003 (a,b), Hustad & Beukelman, 2002). The benefit of combined cueing was an increase in listener comprehension by as much as 40% (Hustad et al., 2003 (a); Yorkston et al., 1996).

Tjaden and Liss (1995) determined that familiarity also impacts intelligibility judgments. Specifically, they investigated whether familiarization with a speaker with dysarthria influenced the perceptions of dysarthric speech post-treatment. The speaker in their study was a female with "moderate-severe mixed dysarthria with spastic and ataxic components" (p. 41). It was determined that her decreased intelligibility was due to respiratory-phonatory control and she was taught a breath-group strategy by the investigators to increase her intelligibility. Participants included those without experience listening to dysarthric speech. They were divided into three experimental groups; the control group listened to and transcribed sentences that were produced without the breath-group strategy, the treatment group listened to and transcribed sentences produced with the breath-group strategy and the familiarization group listened to a familiarization paragraph and then transcribed sentences produced with the breath-group

strategy. Results revealed that the familiarization group performed better than the treatment group and the treatment group performed better than the control group. Tjaden and Liss suggest that these findings highlight familiarity as an important variable in intelligibility. These researchers appeared to recognize that a conclusive statement about their findings is premature. Given that the study employed only the speech of one individual, it is unknown whether the results would be similar if done with those who had different severities of dysarthria. More research of this nature is necessary to determine the relationship between listener familiarization and intelligibility and clarify what other factors might also influence a change in intelligibility judgments. Ultimately, the concept of familiarization has implications for treatment and the involvement of family members, for instance, but also suggests that clinicians need to consider their familiarity with the speaker with dysarthria when making judgments about the outcomes of treatment.

Collectively, these findings indicate that a shift in focus away from the speech stream in isolation can have marked positive effects on listeners' understanding of speakers with dysarthria, possibly translating into changes in participation due to environmental and activity factors. These studies imply that the use of cues can be beneficial for individuals with severe to profound dysarthria resulting from various disorders, which may have further implications for treatment (Hustad, 2001; Hustad et al., 2003 (a,b); Hustad & Beukelman, 2002). Using contextual information such as speech supplementation strategies provides the listener with linguistic information that may reduce the effect of decreased intelligibility which is experienced by many dysarthric speakers with degraded speech production (Hustad et al., 2003 (a,b); Yorkston et al., 1996). Familiarization and cues such as message predictiveness, grammatical cues or gesture, are signal-independent. This helps to underscore the breadth of what has been termed 'comprehensibility' and validates the use of comprehensibility over the sole use of intelligibility as a measure for the communicative abilities of individuals with dysarthria.

1.3 Comprehensibility

1.3.1 Definition

According to Yorkston et al. (1996), if the context is rich in information then understanding will be higher even if the speech stream is degraded (see Figure 1.2). They have termed this notion comprehensibility. Comprehensibility may impart a more reliable indication of an individual's communication abilities than intelligibility scores of any description (see Figure 1.3). Comprehensibility can be distinguished from intelligibility "by the fact that comprehensibility incorporates signal-independent information such as syntax, semantics, and physical context" (Yorkston et al., 1996, p. 55). In addition, the focus of analysis is shifted from that of the speech signal of one individual to communication, as it exists and develops between two individuals. In this sense, comprehensibility recognizes all components on the ICF model and the interactions that take place within it.

The concept of comprehensibility could be used to target an individual's performance and his or her own environment, including communication partners. In other words, comprehensibility could address both impairments and environmental factors which have an effect on one's activity as well as one's social participation. According to Eadie (2001), however, for this to happen there first needs to be a decrease in the use of ambiguous terms employed by speech-language pathologists so that results across patients and clinicians can be compared. This is particularly true when assessing overall communicative ability as there is currently no standardized assessment measure that can do this (Eadie, 2001). Comprehensibility and the development of a coding system for conversation, which will be elaborated on shortly, may help to bridge the gap and decrease the use of ambiguous terminology around the communication abilities of individuals with dysarthria. To better appreciate the potential role of comprehensibility in assessment and treatment, a deeper understanding of what comprises 'comprehensibility' is essential.

Figure 1.2 The Contribution of Information from the Acoustic Signal and the Signal-Independent Information to the Comprehensibility of the Dysarthric Speaker. (Adapted from Lindbolm 1990 by Yorkston et al., 1996, p. 60).

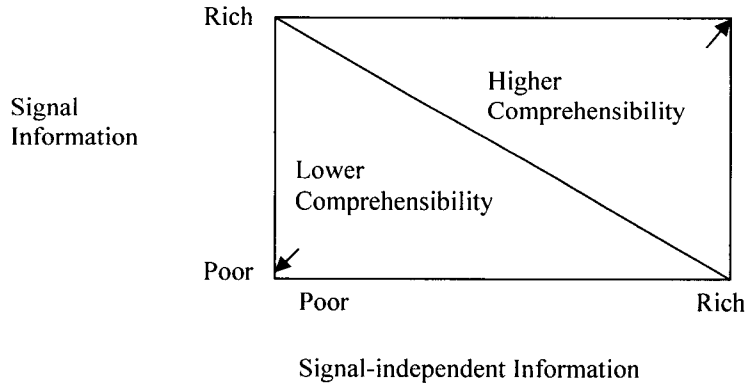
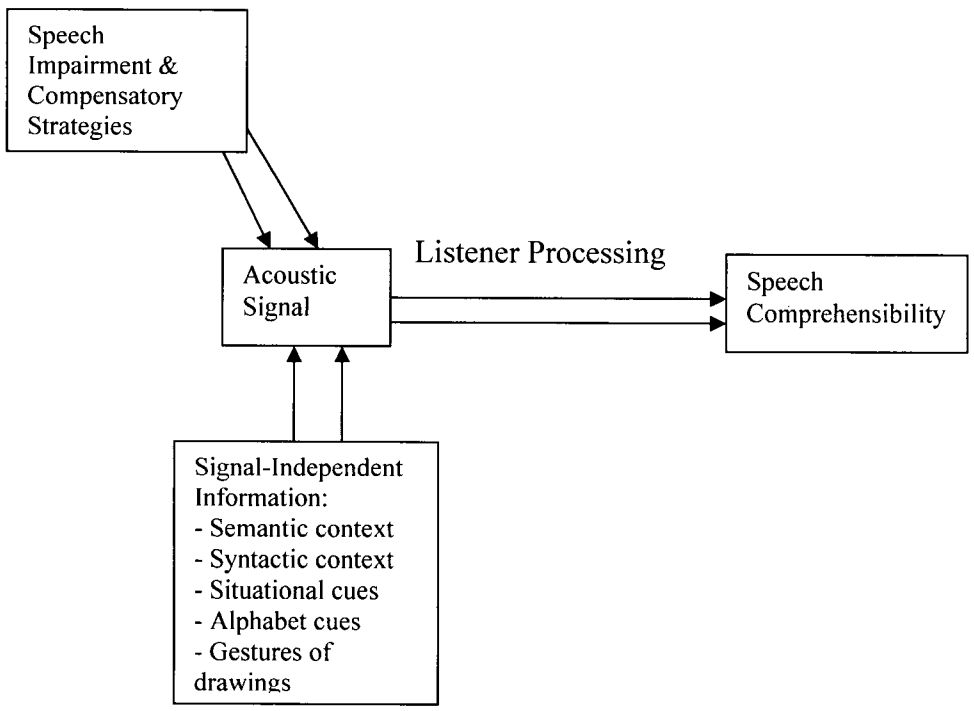


Figure 1.3 A Model of Factors that Contribute to the Comprehensibility of Individuals with Dysarthria (Yorkston et al., 1996, p. 56)



1.3.2 Comprehensibility and the Focus on Dyads

Comprehensibility measures assess communication ability within a dyad (verbally and nonverbally). In doing so, the communication strategies employed by the speaker and listener, the context, and shared knowledge are taken into account. Furthermore, comprehensibility alludes to how an individual functions communicatively in natural environments, and assessment and treatment are meant to target all environments in which clients may find themselves, as opposed to one or two specific social situations (Yorkston et al., 1996). The influence of context on communication in the form of familiarity, shared knowledge, and cues is recognized in the literature (Comrie, Mackenzie, & McCall, 2001; Garcia & Cannito, 1996; Garcia & Dagenais, 1998; Hustad, 2001, Hustad et al., 2003 (a,b); Flynn, 1999; Yorkston et al., 1996).

Although some of the research studies discussed thus far have approached a functional communication focus, those which have investigated the outcomes of partner training to enhance communication skills have truly targeted functional communication. Although the training employed was speaker focused and not dyadically focused, these training approaches facilitated some interaction between components in the ICF model. Hunt and Alwell (1991) developed a conversation training program for three severely disabled high school students, two with intellectual impairment and one with cerebral palsy and visual impairment. Peer partners were trained to 'comment, cue, and wait' using a communication book designed to facilitate communication and ensure understanding by the conversation partner. Following training, turn taking became more balanced and this generalized to conversations at home and at school.

Shared knowledge and familiarity between communication partners can be present and influential in many ways. As described in the previous study, shared knowledge of the purpose and information in the communication book as well as familiarity of the strategies and the individual, had a positive impact on communication abilities, thereby promoting increased social participation. These same principles also formed the basis of an adult learning approach designed

by Sorin-Peters (2003). Given the lack of dysarthria research focusing on dyads, we shall examine the impact of a dyadic focus for the treatment of aphasia.

Research has shown that training family members and volunteers as conversation partners for individuals with aphasia worked to increase communication participation of that individual (Kagan et al., 2001; Rayner & Marshall, 2003; Sorin-Peters, 2003). Sorin-Peters (2003) acknowledged that those closest to an individual with a communication impairment, such as a spouse, can play an important role in treatment and help to increase the social participation and quality of life of the partner with aphasia. Sorin-Peters developed a learner-centered approach for adults with aphasia that focused on regaining balanced conversations, overall participation, and quality of life. Spouses gained a better understanding of their partners' aphasia and together they learned strategies that would enable them to communicate and share memories. Over time, knowledge and use of these strategies, in addition to an acceptance of the partner's change, promoted increased communication and quality of life for couples dealing with aphasia (Sorin-Peters, 2003). Much of the improvement seen in communication stemmed from increased familiarity with aphasia itself. Studies by Kagan et al. (2001) and Rayner and Marshall (2003) produced similar findings. These researchers found that educating volunteers about aphasia and training them how to promote and support communication with individuals with aphasia had a positive effect on the participation and social skills rating of their conversation partners with aphasia (Kagan et al., 2001; Rayner & Marshall, 2003).

The impact of communication strategy training is further exemplified in the area of augmentative and alternative communication (AAC). Not unlike the speech of those with dysarthria, voice output devices can impact conversation flow by increasing pause times (Todman, 2000) and minimizing the amount of redundant information available for the listener to decode the message (Lindblom, 1990). Conversation partners rated conversations more positively when the rate of the conversation was faster (Todman, 2000). Todman (2000)

analyzed the speech rate and pause time of an individual using a voice output computer device with thirty conversation partners. The pause times were identified in order to identify a treatment focus for training sessions. The training sessions focused on communication strategies of the AAC user, such as turn-arounds and perspective shifts to name a few, and resulted in increased conversation rate with a decrease in pauses throughout conversations. Interestingly, for the individual in the study, practice alone had no effect on increasing her conversation rate, but training did, further validating the prospect of individual 'communication' focus in treatment.

A dyad focus is also apparent in studies of hearing impairment. Flynn (1999) looked at contextual cues in his analysis of speech perception in a communicative context with hearing impaired individuals. Like hearing impaired listeners, the partners of speakers with dysarthria deal with degraded speech streams and may not adequately receive a message from the dysarthric speaker. Flynn determined that adjacency pairs in conversation provided individuals with hearing impairment with sufficient context and cues, as evidenced by improved speech perception scores. The first part of the adjacency pair (e.g., question, greeting) contained cues such as grammatical structure, semantic content, and pragmatic purpose, which limited the number of possible appropriate responses (Flynn, 1996).

The ability to engage in a successful conversation relies somewhat on the feedback exchanged between the conversation partners (Yorkston et al., 1996). For instance, conversation partners must establish a means to reliably communicate that a message is not understood and determine what strategies might rectify the problem and promote understanding (Yorkston et al., 1996). Extracting information from cues in the environment and the structure of the message, in addition to establishing shared knowledge of topics and/or communication strategies, may help to improve the comprehensibility within the dyad.

Training communication strategies as opposed to strictly speech strategies has been shown to be effective for individuals with speech deficits and their conversation partners

(Comrie et al., 2001, Hustad & Beukelman, 2002; Hustad et al., 2003; Todman, 2000) and could potentially help to increase the communicative success experienced by these dyads. What needs to be the target and has typically not been, however, is the dyad and not strategies for just one individual. The need for an increased focus on communication or conversation in the assessment and treatment of dysarthria has been addressed only minimally in the literature (Comrie et al., 2001; Yorkston, Bombardier & Hammen, 1994; Yorkston et al., 1996).

The work of Comrie et al. (2001) is perhaps the only research to date that has investigated dysarthria dyadically and therefore warrants particular attention. Comrie et al. examined the conversational turn-taking contributions of dysarthric speakers and non-dysarthric elderly individuals. Results showed that although both sets of subjects took the same number of turns, the speakers with dysarthria took more minimal turns, such as 'yeah, mhm etc.', as opposed to major turns. In addition, the dysarthric speakers' turns were shorter. However, Comrie et al.'s (2001) classification of minimal versus major turn is open to question as it was too broad to adequately account for conversational contribution of the speakers. For instance, one-word answers to questions were counted as minimal turns just as were tokens, such as 'mhm', because it was assumed that using a one-word response was a way of passing a turn rather than contributing. This could be an erroneous assumption especially when we consider situations, such as answering in breakdown/repair sequences, where all that is required is one word. For the non-dysarthic participants in Comrie et al.'s study, the use of single words, such as 'pardon', were not counted as minimal, with the authors claiming that those speakers were not using a single word to avoid conversational contribution. This difference in classification for the two groups of speakers suggests inequality in counting but also a priori bias of the quality of contribution, and therefore, possibly inaccurate results. Regardless of this potential drawback to the study, the findings point to the significance of investigating and targeting conversational

interaction. Also included in their discussion on turn taking was recognition of the value of familiarity between partners and strategies to facilitate conversation (Comrie et al., 2001).

The model of comprehensibility can be informed by findings from many populations. The research on functional communication in areas like aphasia, hearing impairment, and AAC may be relevant to other areas of research such as dysarthria. These populations share, among other things, a potential disruption in the acoustic signal as a result of their impairments, a disruption that could affect their ability to communicate effectively. Effective communication necessitates conversation skills such as strategies to effectively signal understanding or lack thereof. Communication, as opposed to just speech, forms the basis of comprehensibility. Although not dealing explicitly with comprehensibility, communication strategies have most often been researched and discussed in terms of the types of breakdowns and repairs found in conversation.

1.3.2.1 Communication Breakdowns

Much of the research done on conversation breakdowns has focused on the hearing impaired population. Those with speech impairments and their partners face similar challenges when conversing. Breakdowns have been examined in the context of within-utterance disruptions (Dollanghan & Campbell, 1992), turn taking differences (Caissie & Rockwell, 1993), turn taking functions (Caissie, 2000; Caissie & Gibson, 1999; Caissie & Rockwell, 1993; Pichora-Fuller, Johnson, & Roodenburg, 1998), and topic shifts (Caissie, 2000; Caissie & Gibson, 1999; Caissie & Rockwell, 1993; Pichora-Fuller et al., 1998). A more in-depth look at these sources of breakdown brings to light the individual and combined impacts they could have on communication. This focus on communication, as it exists within the dyad, is a necessary and essential component of comprehensibility. Comrie et al.'s (2001) research involving individuals with dysarthria parallels that done with individuals with hearing impairment. Comrie et al.

commented that breakdowns can be related to turn-taking differences and topic shifts, for example, and found that the conversational contribution of those with dysarthria was influenced by their intelligibility, such that those who were more intelligible contributed more to conversation. Breakdowns in the form of within-utterance disruptions manifest as pauses (filled or silent), repetitions, revisions, and orphans (i.e., unidentifiable units) (Dollanghan & Campbell, 1992). One can imagine that the speech of an individual with severe-profound dysarthria would be largely characterized by pauses and orphans, greatly minimizing message transmission. The profiled use of each of these disruptions can provide not only valuable information for assessment and treatment but also a means by which to monitor progress.

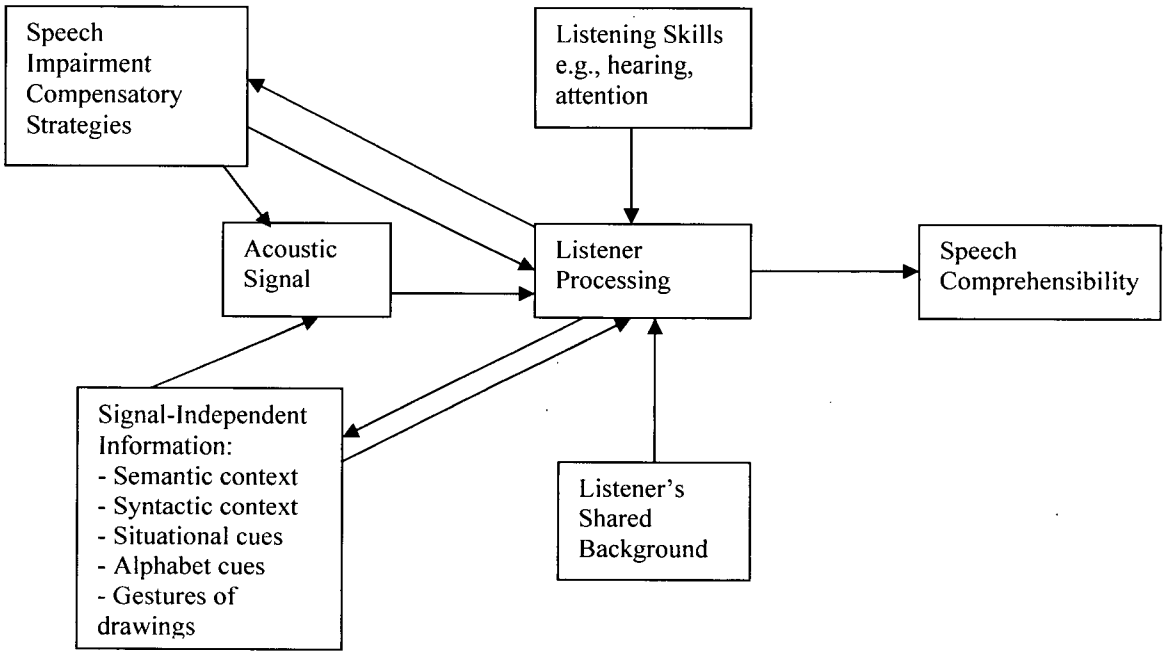
Those with a hearing impairment frequently attempt to control the conversation, thus decreasing the chance of a misunderstanding due to missed information provided by their conversation partners (Caissie & Rockwell, 1993; Pichora-Fuller et al., 1998). This conversation pattern can have an effect on the quality of the conversation and overall enjoyment by both members of the dyad (Pichora-Fuller et al., 1998). When breakdowns do occur they can often be associated with topic shifts, according to Caissie (1997) and Caissie and Gibson (2000). According to Caissie and Rockwell (1993), "breakdowns are defined as speaking turns that interrupt conversational flow" (p. 204). The subsequent sentence(s) following the breakdown can be further categorized as repaired or unrepaired (Caissie & Rockwell, 1993). Whether or not the initial breakdown leads to a conversation standstill is essentially dependent on the number of turns it takes to repair the breakdown (Caissie & Gibson, 1997; Caissie & Rockwell, 1993; Pichora-Fuller et al., 1998).

Communication breakdowns are closely linked to the type of repair strategies used by the members of the dyad (Caissie et al., 1999; Caissie & Gibson, 1999; Gagne, Stelmacovich, & Yovetck, 1991; Hunt & Alwell, 1991; Tye-Murray, 1994; Yont, Hewitt, & Miccio, 2000). For instance, specific repair strategies such as requests for clarification were found to be more

effective for breakdown resolution than general strategies such as nonverbal cues (Caissie & Rockwell, 1993; Gagne et al., 1991; Tye-Murray, 1994). Although Caissie and Gibson (1999) established that repair strategies such as nonspecific requests for confirmation were effective in that they successfully resolved misperceptions, specific requests for repetition and requests for confirmation were also effective.

One could arguably improve the use of repair strategies through direct treatment and/or repeated practice. For communication partners, the question still remains as to whether changes in the use of repair strategies result in changes in communicative success. Increased participation in social exchanges with family and friends, for instance, may indicate the usefulness of these strategies. It would require a noticeable change by the individual with the communication deficit as well those with whom he or she is communicating. In order to accomplish a change in communicative success, and therefore comprehensibility, an acknowledgment of the influencing factors is necessary (see Figure 1.4). This revised model draws attention to the interactivity between the elements that affect comprehensibility. The feedback loops depicted in Figure 1.4 represent the interactivity that is often necessary to ensure understanding in conversations. Feedback between communication partners can greatly influence communication. For instance, an individual's speech impairment impacts a listener's processing. The feedback provided by the listener cues the speaker to what was not understood and may prompt the use of an effective compensatory strategy to promote message comprehension. Information in the speech signal may also cue the speaker. For instance, factors such as volume, breath control, and sound distortions can affect the intelligibility of the speech signal. These factors may be perceptible to the speaker and might indicate to him or her that a revision is necessary, for example, in order to better ensure listener understanding. This feedback loop is not depicted in Figure 1.4 but might be a worthwhile addition.

Figure 1.4 A Model of Factors that Affect Comprehensibility of Individuals with Dysarthria (Purves, 1999)



1.4 Personal and Partner Judgments

Perception of ability is an important factor for those with speech and communication difficulties, both their own and others' perception of their abilities. Regardless of the level of impairment, people's perceptions of their own communicative competence, as well as how they are received by those with whom they communicate, may largely determine their involvement in conversation. Standardized test results, rather than self- and other- perceptions, are often taken to be indicators of communicative ability. However, there may be a mismatch between the results of these tests and the perceptions of the individual with the speech or communication impairment. The use of standardized measures for communication analysis may (Bishop & Adams, 1989; Pederson, Vinter, & Olsen, 2001; Ross & Wertz, 1999) or may not (Aftonomos, Steele, Appelbaum, & Harris, 2001; Flynn, 1999; Ross & Wertz, 1999) coincide with perceived improvement or level of deficit. An example within the realm of communication but outside that

of dysarthria is Bishop and Adams' (1989) research on inappropriate communication characteristics in children with semantic-pragmatic disorder. They demonstrated that raters can reliably identify children with semantic-pragmatic disorders by analyzing the appropriateness of their utterances. Similar findings have been cited for the Communicative Effectiveness Index (CETI) (Lomas, Pickard, Bester, Elbard, Finlayson & Zoghaib, 1989), a set of questions that allows a family member or friend of an individual with aphasia to rate their communication functions. Pederson and Olsen (2000), and Sorin-Peters and Berhmann (1995) have reported that the CETI highly correlates with several popular standardized measures of assessment, including the Western Aphasia Battery (Kertesz, 1982), the Porch Index of Communicative Abilities (Porch, 1967), and Communicative Abilities in Daily Living (Holland, 1980). In other words, the CETI, a judgment based instrument, can detect change in communicative ability (Pederson et al., 2001) by showing a change in performance ratings of certain communicative functions.

Ross and Wertz (1999) also looked at the perceptions of improvement for individuals with aphasia. They found that a change in severity on only certain standardized measures of impairment correlated with socially perceived change as judged by unfamiliar listeners and did not indicate overall communicative ability. Flynn (1999) commented that in the area of speech perception, traditional test results do not coincide with actual perception because they are void of environmental context. What we can draw from all of these findings is that definitions, specificity, and environmental factors affect perception and, more importantly, perception of change in speech and communication ability. Therefore, assessment procedures should include both standardized and informal approaches. Additionally, increased participation may be related to linguistic ability as well as the individual's feelings about their communicative abilities (Flynn, 1999).

As mentioned, the CETI has been shown to be a valuable tool in analyzing change in communicative ability and social participation. Studies have shown that for individuals with

dysarthria and hearing impairment, the attitudes of conversation partners (Comrie et al., 1999; Gagne at al., 2001; Todman, 2000; Yorkston et al., 1994) can change depending on various elements of speech and conversation. Even in less structured perceptual analysis, the perceptions of those individuals communicating with someone whose speech is impaired are influenced by breakdowns (Gagne et al., 1991), conversation rate (Todman, 2000), and conversational contribution in terms of turn structure (Comrie et al., 2001). Therefore, familiar and unfamiliar individuals may provide valuable insight into the effectiveness of one's communication skills and/or the effectiveness of treatment.

The extent of the influence of other people's perceptions may be related to the severity of dysarthria. Yorkston et al., (1994) studied the perceptions of speakers with dysarthria and found that those with severe dysarthria found others' reactions to their communication to be more helpful, punishing, or solicitous than those with less severe dysarthria.

Studies have shown that both familiar and unfamiliar partners are sensitive to cues in communication and that their perception of a speaker changes when the speaker increases his/her use of cues and communication strategies (Aftonomos et al., 2001; Hustad, 2001; Lomas et al., 1989; Pederson et al., 2001; Todman, 2000). As discussed, the use of visible cues that supplement speech, such as combined topic and alphabet cues, has the effect of increasing listener understanding of their communication partner's message (Hustad, 2001). Moreover, participants in these studies expressed that they were more willing to communicate with these speakers when cues were used (Hustad, 2001; Hustad et al., 2003 (a,b)). Comparable findings were presented by Todman (2000), such that treatment aimed at increasing the rate of communication of an AAC user was positively correlated with participant and observer ratings of increased quality and competence. Perhaps most importantly, the perception of abilities by others and of one's self is a good indication of the level of handicap or participation limitation experienced with a speech and communication deficit, whether this perception coincides with

more objective measures or not (Aftonomos et al., 2001; Bishop-Adams 1989; Coupland, Wiemenn, & Giles, 1991; Demorest & Erdman, 1986; Demorest & Erdman, 1987; Demorest & Walden, 1984; Flynn, 1999; Munro & Derwing, 1995; Pichora-Fuller et al., 1998; Ross & Wertz, 1999; Saunders & Cienkowski, 2002; Sorin-Peters & Behrmann, 1995; Yorkston et al., 1994).

Familiar and unfamiliar partners may differ in their sensitivity to strategy use in conversation. A study by King and Gallegos-Santillan (1999) is particularly relevant in that it is one of very few to examine dyadic interactions including speakers with dysarthria. Their study aimed to determine what strategies speakers with dysarthria reported using in conversation, whether these strategies were actually used, what strategies were used by the conversation partners and whether strategies used by the speakers with dysarthria differed with unfamiliar partners versus familiar partners. Familiar partners included those who had had many interactions with the speaker while unfamiliar partners included those who had no previous interaction with the speaker. Seven speakers and fourteen conversation partners took part in the study. The seven speakers engaged in one fifteen minute conversation each with an unfamiliar partner and a familiar partner. Both the speakers with dysarthria and the conversation partners completed a questionnaire that asked them to describe what strategies they used in conversation. The last ten minutes of each videotaped conversation were coded by one of the researchers to identify the strategies actually used in conversation. Strategy use for speakers with dysarthria included using complete sentences, rephrasing messages, and avoiding abrupt shifts in topic, for example. Strategy use for the conversation partners included watching the speaker, letting the speaker repair a breakdown, and finishing the speaker's sentences, to name a few. The researchers determined that more strategies were used with unfamiliar partners than with familiar partners. However, no statistical significance was reported in the differences in strategy use between the unfamiliar and familiar partner groups. There was considerable variability in the intelligibility scores reported for the speakers with dysarthria and this may have affected the need

for strategy use. Results for individual speakers were not reported so it is impossible to know what kind of impact this may have had. The analysis of more conversations for each speaker would be necessary to establish a baseline (i.e., several conversations with the familiar partner and conversations with several unfamiliar partners). This might serve to strengthen the results reported. Of interest is that the strategy use reported for speakers and their conversation partners rarely matched that of observed strategy use, indicating that perceptions may not always be an accurate reflection of what is happening in conversation. Perhaps increased familiarization with the concept of strategy use would help to rectify this imbalance. Another important consideration for future research is whether others' perceptions match those of the individual with dysarthria. Although there were some limitations to the King and Gallegos-Santillan study, the results imply that those speakers with dysarthria may not need to use as many strategies with familiar partners because the familiar partners may better understand their speech.

The literature discussed in this section suggests that both standardized measures and perceptual judgments can provide important information about how individuals' speech or communication impairments might affect their ability to communicate with those around them. In order to obtain an accurate picture of communicative competence or change of same, both standardized measures and perceptual judgments should be considered. In the case of dysarthria, this might necessitate examining intelligibility and comprehensibility, as well as how the individual with dysarthria and those with whom they communicate feel about their conversational interactions. The potential for changes in each of these domains would most likely differ. A focus on comprehensibility and communication as it exists and evolves between two individuals has the potential to promote positive changes at the participation level. Increased participation and enjoyment of conversation for those with speech or communication impairments might improve their overall quality of life. Improved quality of life in the realm of communication is an important step in achieving one's highest possible level of health.

1.5 Research Questions

Verbal communication is a highly complex and multi-dimensional process that includes factors present in the speech signal and the environment. This realization forms the basis of comprehensibility and the focus of the current research. In light of the research discussed, the goal of this study is to further establish comprehensibility as a plausible and reliable means of assessing and treating speech and communication deficits associated with dysarthria. The proposed study will analyze the relationship between changes in comprehensibility and changes in intelligibility over time by addressing these three objectives:

Objective 1. To establish a system to measure changes in comprehensibility reliably using structured measures and to determine whether changes in intelligibility are related to changes in comprehensibility. It is possible that intelligibility and comprehensibility may be independent.

Rationale:

Establishing a reliable system of assessment of comprehensibility provides a baseline measure from which to structure a dyadic treatment focus that meets both individuals' needs and against which to mark progress. Improvements in intelligibility alone, if present, may not serve to increase listener understanding. The assessment would provide information about the dyad's functioning in the test environment. By comparing quantifiable measures such as, for example, the time taken to communicate a given message and the number of errors that occur, we can begin to evaluate the changes in communication between two people that take place over time.

Objective 2. To determine if changes in comprehensibility measures are reflected in conversation in a way that can be demonstrated.

Rationale:

Based on the ideals put forth by the WHO, treatment plans built on findings from a structured assessment that is individually focused might only be valuable if they are reflected in a meaningful way for that individual and the people with whom they communicate. Comprehensibility embraces participation and acknowledges the personal and environmental factors that impact conversation. By focusing on these factors and emphasizing participation rather than activity or body function and structure, use of these skills in a greater number of contexts is more likely.

Objective 3. To examine how people judged perceived changes, if any, in conversation between a person with dysarthria and his or her conversation partner.

Rationale:

An improvement in quality of life for a client should be the primary goal of clinical intervention. In order to achieve an improvement in quality of life, assessment and treatment must target all areas of an individual's life (i.e., all domains of the ICF model with recognition of the links between them). A clinician working with an individual may overestimate the improvement seen in treatment given his or her familiarity with the client (Tjaden & Liss, 1995). It is therefore important to determine whether changes in conversation are reflected in unfamiliar clinicians' perceptions because this will facilitate understanding of how those changes might be meaningful in client participation and quality of life.

2. Method

The following chapter describes the experimental participants and conditions employed in this study. This study was broken into three components, namely Component 1, Component 2, Component 3. The design, procedures and data analysis employed in each component are explained in detail.

2.1 Overview

This study was based on the secondary analysis of data collected during the externship of G, a speech-language pathology student. G and a client, E, now deceased, who had mixed spastic hypokinetic dysarthria secondary to multi-system degeneration, met on a weekly basis to work on speech and communication strategies. They were videotaped for three sessions, one at the beginning and two at the end of a six-week externship. Portions of all three videotaped sessions were used in this study. The first two videotaped sessions included a structured assessment of comprehensibility, which was developed for the treatment program, followed by a conversation sample. The last videotaped session included only a conversation sample. The individuals involved in the sessions had given permission for the use of these tapes for teaching and research purposes and approval from the Research Ethics Board for the current research has been received.

In addition to video recordings, audiotape recordings were obtained prior to the initial videotaped session and at the end of the six-week externship, to establish intelligibility scores. E was asked to read preselected sentences from the Assessment of Intelligibility of Dysarthria Speech (AIDS) (Yorkston & Beukelman, 1981), as previously described. His intelligibility scores will be discussed in the next section.

This study has three components, each to address one of the three objectives listed at the end of the first chapter. The first component aims to establish the reliability of the structured assessment of comprehensibility designed during the externship, and to systematically describe any changes observed in comprehensibility that may have taken place over the course of six weeks. The second component addresses comprehensibility in conversation; various coding schemes were used to determine whether changes in comprehensibility observed in the structured assessments were reflected in conversation. The third component addresses how unfamiliar individuals judged the changes in comprehensibility. A clinician who is working with a client may notice changes in the clinical setting but be unsure if they are recognized by those not familiar with the client (Tjaden & Liss, 1995). Unfamiliar individuals, in this sense, represent the members of G's peer group who are familiar with dysarthric speech and treatment strategies, but were not familiar with the client.

2.2 Component 1

The structured portions from the first two videotaped sessions were used in this component in their entirety. In the initial analysis of the data, during G's and E's intervention program, G and her clinical supervisor, B, designed a scoring system and compared the two tapings to measure any changes in comprehensibility. At that time, they noted a change between the first and second structured assessment in the quantitative scores but also in the communication strategies employed by each of the participants. The communication strategies, however, were not formally analyzed.

2.2.1 Structured Assessment of Comprehensibility

In the structured assessment of comprehensibility E read randomized preselected sentences from the AIDS test. G then repeated these sentences back and E confirmed whether the

sentence was correct or not. Prior to starting, the dyad was informed about the procedure and what would be measured. They were encouraged to do whatever they felt would help them to communicate (e.g., gesture, sentence revision, alphabet board, asking questions, giving feedback). The dyad was responsible for deciding when to move on to the next sentence. The two structured assessments (i.e., time one (T1) and time two (T2)) were matched for words, each consisting of three five-word sentences, one six-word sentence, one seven-word sentence, two eight-word sentences, and two nine-word sentences, totaling 62 words. The sentences were presented in random order.

2.2.2 Establishing the Scoring Method, Including Inter-rater Reliability

For the current study, the structured assessments were orthographically transcribed. Two raters agreed on the transcription prior to scoring. Each sentence was scored based on the following categories developed by the clinicians: number of extra listener words (G), number of extra speaker words (E), number of problem words encountered by the dyad, number of incorrect guesses (G), the amount of time it took to do the sentence (dyad), and the number of words in the original sentence correctly agreed upon. Total scores for the nine sentences were calculated to note any differences between T1 and T2. Although not formally analyzed, the strategies employed by each speaker in T1 and T2 were also qualitatively described.

The transcription for the first structured assessment was initially scored by two independent raters, Purves and Visser, based on original definitions of the categories. Questions arose in the categories of time, problem words, error words and extra listener words. The definitions were mutually redefined and the sentences then rescored individually by the two raters. The final agreed upon explicit criteria are listed in Appendix A. The transcription for the second structured assessment was then scored independently by both raters to establish inter-rater reliability of the refined criteria.

2.2.3 Comparing the Comprehensibility and Intelligibility Data

Intelligibility scores for E were calculated at the beginning of G's six week placement. G and C, an individual unfamiliar to E, both rated E's intelligibility. These results permitted a comparison between the intelligibility data and the comprehensibility data.

2.3 Component 2

This component was designed to establish whether changes in comprehensibility from the structured assessment were reflected in conversation in a way that could be measured. To determine if such changes were reflected in conversation, turns, breakdown and repair sequences, and topic moves for two conversations were analyzed. The conversations included one at the beginning and one at the end of the six-week externship.

2.3.1 Selection of Data

Component 2 included the conversation sample that immediately followed the first structured comprehensibility assessment, and the third conversation, which occurred in isolation. The third conversation occurred within days of the second structured comprehensibility assessment and conversation sample. It incorporated a revised alphabet board with additional items, developed as part of the intervention program, to help E communicate more effectively. The second conversation was excluded from analysis as it was not suitable for the third component, because it included a lengthy discussion of sensitive personal information that signaled a closer relationship between G and E than that of the first conversation. Further, it did not incorporate the altered alphabet board that resulted from the dyad's six weeks of interactions.

The first and third conversation samples were transcribed (all transcripts available from author). The transcription system used was modified from that developed by Gumperz and Berenz (1993) (see Appendix B). For instance, a second column parallel to the verbal utterances

was added to indicate non-verbal information. In other words, included in the transcriptions were all verbal utterances and nonverbal actions of the dyad. Transcripts were also marked for intonation changes and pauses. A second modification of Gumperz's and Berenz's transcription system involved the intonation transcription; two intonation categories (i.e., slight fall and final fall) were collapsed into a single category, as the distinction between the two was very difficult and could not be done reliably. Each line of the transcript was numbered. The transcripts were then coded separately into turns, breakdown/repair sequences, and topic. These have been shown to be relevant to functional communication for those with hearing impairment and dysarthria. Agreement between two researchers was reached on the content and coding of the transcripts.

2.3.2 Turns

"Turn-taking forms the basic organization of conversation" (Sacks, Schegloff, and Jefferson, 1974, p. 700) and is therefore an important element of the analysis. Turns were identified and established based on ideas or turn rules discussed by Sacks et al. (1974). They noted that turn size is not exact and turn selection can be accomplished in a number of ways. For the purposes of this study, Sacks et al.'s description of turn allocation was used to identify whether a long string of speech was a single turn or comprised two or more turns (see Table 2.1). Sacks et al. note that if the current speaker has not selected a next speaker and no other individual self-selects as the speaker then the current speaker may continue, allowing for turns of varying lengths. If in a string of speech, a question was asked by the speaker, no reply was forthcoming after a significant pause, and the speaker then continued to talk, this was counted as two turns. The same was true if there was a pause and then the speaker changed topic, thereby taking the conversation in a new direction. If the speech stream had continued with no questions or topic changes, regardless of how many pauses took place, it would still be counted as a single turn.

In the transcripts, each line of a speaker's turn was marked with his or her initial (i.e., G, E, B). The end of a turn was indicated by a break in the utterance and a new line was started for the next turn (see Table 2.1). Non-verbal information (e.g., shift in eye gaze, laughter) was coded by initial as well but was not counted as a turn unless it signaled a request for information, such as leaning in with a puzzling look (Caissie & Rockwell, 1993), or a response, such as a head nod to indicate 'yes'. Those turns or words within turns that were unintelligible were transcribed as syllables marked as 'x' (with one 'x' marking one syllable when possible). In situations where E spoke quickly or softly, for instance, his intelligibility was further reduced and it was difficult to determine, with certainty, the exact number of syllables spoken.

Table 2.1 Turns

One turn	
G	you've got tears in your eyes .. I did .. I cried when I watched it.. it was sad

Two turns	
G	no .. no real big mountain ranges//
<2>	
G	that's neat that you went to Prince George//

Totals of verbal and nonverbal turns for each speaker in both conversations were summed to allow for comparison. Relative percentages could then be calculated. Verbal overlaps were summed and analyzed in terms of content and placement within the conversation, that is, whether they occurred within breakdown/repair sequences or not. Finally, the verbal turns were categorized according to length (1 word, 2-5 words, 6-10 words, greater than 10 words).

As in component 1, letters were counted as words (e.g., when E was spelling and G was confirming). For example, when using the alphabet board, if G said "T I", it was counted in the 2-5 word category. Tokens such as 'oh' and 'hm' were also counted as one word. Restarts were not counted as words. A percentage of E's turns/utterances were unclassifiable due to a lack of

intelligibility. An analysis on syllable length was done to determine if these unintelligible utterances could be categorized meaningfully and compared.

An analysis of overlaps was done to determine if they were a common occurrence for the dyad in question. The number of overlaps was analyzed to determine if there was a difference in the number of overlaps for each speaker. The content of the overlaps was then analyzed to determine if the nature of G's and E's overlaps differed, and if so, how. Lastly, the overlaps were categorized according to whether they occurred during a breakdown/repair sequence or not.

2.3.3 Breakdown/Repair Sequences

Conversational breakdowns frequently occur with dysarthric speakers because of the degraded speech stream. This was particularly true for someone like E, whose intelligibility was so low. "Breakdowns are defined as speaking turns that interrupt conversational flow; that is, turns that express a repair strategy or turns that do not express a repair when one is needed" (Caissie & Rockwell, 1993, p. 204). Caissie and Rockwell (1993) used videotaped conversations and analyzed them for floor control, and breakdown and repair strategies, both verbal and nonverbal.

This study used a modified version of the coding system detailed by Caissie and Rockwell (1993) to mark breakdowns and repairs. The distinction between breakdown and repair sequences as opposed to instances of breakdown and repair is important as separate instances of breakdown and repair can occur within a larger breakdown/repair sequence. This occurred infrequently in this data. Where such instances were part of a larger sequence, they were not counted separately.

Breakdowns were signaled by either G requesting clarification (other-initiated) or E identifying them himself (self-initiated). Breakdowns were coded as either repaired or nonrepaired. Clarification requests were coded as specific or non-specific with various strategies

included under each heading. Repair strategies used in response to clarification requests were then coded as well. Specific definitions of clarification requests and repair strategy responses, including the transcription codes used, can be found in Table 2.2 and Table 2.3. These are based on research compiled by Caissie and Rockwell (1993). Changes in the coding and transcription system were made to accommodate the data. For instance, the 'specific statement of confirmation' category was added to the list of possible requests for clarification. In addition, the category of 'unclassifiable' was added to the list of repair strategy responses. Verbal and nonverbal behaviour that could be classified according to these codes were not coded unless they occurred in a breakdown/repair sequence.

The analysis of this section for T1 and T2 included an examination of the amount of turns spent in breakdown and repair, the number of turns necessary to repair the breakdowns, the frequency of particular repair strategies and responses, and the changing patterns of breakdown and repair that may have taken place from T1 to T2.

Table 2.2 Requests for Clarification (modified from Caissie and Rockwell, 1993)

Type	Definition
Nonspecific (NS)	
Request for repetition (rep)	A neutral request for the partner to repeat the message e.g., Huh?, Could you repeat that?, I didn't get that.
Nonverbal request for clarification (nvc)	Quizzical facial expression or body posture indicating a misunderstanding e.g., leaning in, quizzical facial expression.
Specific (S)	
Request for repetition of a specific constituent (srep)	A wh- or intonational question requesting a specific part of the message that was not understood e.g., "At what time? It's been_"
Specific statement of confirmation of message (sscmsg)	Partial or full repetition of the speaker's message without rising intonation.
Request for confirmation of the message (cmsg)	Partial or full repetition of the speaker's message with rising

	intonation.
Request for confirmation of the topic (ctopic)	Inquiring about topic e.g., "Are you still talking about shoes?"
Request for explanation/elaboration (re/e)	A request for additional information that might promote understanding e.g., "I don't follow. Could you give me more information?"
Request for a change in the manner of presentation (Δman)	A request for the speaker to change his/her delivery of the message e.g., "Could you say that slower? Did you want to use the alphabet board?"

Table 2.3 Repair Strategies (modified from Caissie and Rockwell, 1993)

Type	Definition
Exact repetition (ER)	Exact repetition of a misunderstood utterance.
Partial repetition (PR)	Repetition of part of a misunderstood utterance (e.g., keyword).
Elaboration/explanation (e/e)	Providing additional information or cues to promote understanding.
Confirmation (conf)	Providing a yes/no answer to a request for clarification.
Nonverbal cue (nvcue)	Addition or nonverbal communication (e.g., pointing to an object being spoken about) or nonverbal communication occurring in isolation (e.g., using alphabet board or gesture).
Change in prosodic features (Δpros)	Change in speech to make parts of an utterance more clear (e.g., stressing a word).
Spontaneous repair (SR)	Self-initiated repair when a breakdown occurs and the conversation partner does not request clarification.
Unclassifiable (?)	Not enough of the content of an utterance could be understood to determine for certain what repair strategy was being used.

2.3.4 Topic

A major element of conversation is topic. Topics develop and change in conversations. They do not necessarily evolve in a linear fashion and may be revisited or extinguished during an

interaction (Schegloff & Sacks, 1973). Occasionally, a topic is changed to hold the conversation floor. This is a recognized strategy used by many individuals with hearing impairment (Caissie, 2000). Breakdowns in conversations can result from a degraded stream, for the listener (e.g., hearing impairment) or by the speaker (e.g., dysarthria), and this is exacerbated by frequent topic changes or if the conversation partner has too little information to go on (Caissie, 2000). Topic analysis allows us to examine how a conversation develops and the contributions of both parties that foster that development.

Keenan and Schiefflin (1975) provided a detailed description of topic moves in conversation. The analysis of topic moves within a turn rather than a focus on the turn as one unit allowed for a more accurate description of topic development for this dyad, such that a turn was not restricted to a single code in analysis. It is the nature of any conversation that more than one topic move can occur in a turn. For example, turns can function both to acknowledge the information provided by their conversation partner and to extend the conversation. Only those turns not involved in breakdown/repair sequences were investigated because topic development is often halted during breakdown and repair sequences.

The codes for this section were based on the discourse topic analysis definitions proposed by Keenan and Schiefflin (1975) (see Table 2.4 for specific codes used). Several codes were added and changed to make them more specific and/or to accommodate the data. This allowed for the examination of how topic was changed and maintained for this dyad. Of particular interest was active versus passive involvement, the identification and classification of which were not covered in Keenan and Schiefflin's analysis definitions. Passive/active involvement has been discussed by Comrie et al. (2001) with respect to the contribution of turns between speakers but is nonetheless relevant to topic. Passive moves were those that signaled involvement in the conversation but did not necessarily function to build on the topic and therefore placed more responsibility on the other conversation partner. Topic codes considered passive were

collaboration, non-specific acknowledgement, and specific acknowledgement (see Table 2.4). Active moves were those that functioned to move the topic forward or alter its direction. Those considered active were topic introduction, topic reintroduction, incorporating comment, incorporating question, repair request, topic shift, and topic digression (see Table 2.4). Those turns of E's that were coded as unclassifiable were categorized as active or passive based on the context of the conversation.

With the exception of topic shift, the definitions provided in Table 2.4 were adequate to code to the data. Determining a topic shift requires more considerations. When a topic shift occurs, the topic being discussed is not closed mutually by the parties involved (Schegloff & Sacks, 1973). The shift that occurs is connected to the original topic and it may be a minor aspect of the initial topic that then becomes the focus of conversation (Schegloff & Sacks, 1973). This second topic is not a digression because it is based on the same larger topic as the first topic was. Further, the first topic is not suspended temporally and reintroduced after the second topic is closed as it would be if it were a digression.

Topic boundaries can be marked verbally and non-verbally. The term 'topic boundaries' encompasses topic introduction, topic reintroduction, topic digression, and topic shift. Brown and Yule (1983) analyzed indicators of topic boundaries. They determined that a long pause, speaker gaze and body language, and fillers such as 'mhm', 'you know', and 'er', for instance, functioned to signal a topic boundary. Intonation cues such as raised pitch when starting a new topic or a slower rate when ending a topic, also functioned to indicate a topic boundary. Attention to these indicators facilitated the coding process.

Table 2.4 Topic Analysis (modified from Keenan & Schiefflin, 1975)

Active	
Topic Introduction (TI)	Introduces topic
Topic Digression (TD)	Temporary digression from a topic with not indication that the previous topic has been closed
Topic Reintroduction (RI)	Reintroduces an earlier topic after a digression, topic change, or interruption in conversation
Incorporating Comment (InC)	Speaker comments on a presupposition or the new information of the prior turn
Incorporation Question (InQ)	Speaker asks a question (does not include request for repair)
Request Repair (RR)	Request for repair
Topic Shift (sft)	(see below for detailed description)
Passive	
Collaborating (Col)	A speaker comments on the same object commented on in prior turn (does not provide any new information) (eg. "I think so too"), or a question-answer pair
Non-specific Acknowledgement (NA)	Non-specific acknowledgement of a statement e.g., 'yeah'
Specific Acknowledgement (SA)	Specific acknowledgement of a statement e.g., repetition of part of prior turn
Other	
Non Repair (NR)	Breakdowns that were not signaled and/or no response to requests for repair
Unclassifiable (?)	Unintelligible utterances

2.4 Component 3

The final component of this study involved subjective impressions of E and G's communication abilities by unfamiliar listeners. This was deemed necessary to determine if the changes in conversation were salient for those who are not familiar with this dyad and, if so, whether they led to differences in the extent to which conversations were judged as successful. Particularly of interest, was how members of G's peer group would perceive and evaluate any changes in comprehensibility over the two conversations.

2.4.1 Participants

The participants in this study were individuals considered to be peers of G, the clinician in the dyad. To ensure that they represented G's peers, each participant was required to meet the following criteria:

1. The individual had to have taken at least one course through the School of Audiology and Speech Sciences.
2. The individual had not seen the taped conversations between E and G.
3. The individual was a proficient English speaker.

Signs were posted within and around the school notifying people of the study and requesting involvement. In addition, an email was sent to all undergraduate, graduate, and PhD students enrolled in courses of the School of Audiology and Speech Sciences.

Those who responded were asked to review and sign a consent form (see Appendix C) left for them at the School of Audiology and Speech Sciences. Fifteen participants took part in Component 3, three of whom participated in a pilot study. Fourteen of the participants were graduate students and one was a PhD student. Of the participants, thirteen were female and two were male.

2.4.2 Study Design

Participants for the study were seen in two groups of six. Due to time constraints in the semester, the first six participants to respond to the ad following the pilot study were included in the first group. An additional group of six was formed with subsequent respondents following a second email.

Each group of six individuals together viewed predetermined video clips, described below, from two conversations. Each group viewed the conversations in different orders to control for order effect. That is, one group viewed clips from the earlier conversation followed

by clips from the later conversation while the other group viewed clips from the later conversation followed by clips from the earlier one. They were unaware of the order of presentation but were aware that the conversations occurred at two different points in time. Prior to viewing the tapes the participants were given a brief description about how the session would proceed and an explanation about intelligibility and comprehensibility, and they were instructed to focus on communication within the dyad as opposed to the speech or communication of just E. This was done to prevent the participants from basing their judgments entirely on the degraded speech stream, which would go against a comprehensibility focus. Participants were then given a questionnaire (see Appendix D) to review and were provided with the opportunity to ask questions about it prior to viewing the clips. An audiotaped focus group discussion followed the completion of the questionnaire.

The questionnaire consisted of questions that addressed perception of communicative proficiency, effort, comfort, interest and success, with proficiency, effort, comfort and interest thought to be related to overall perceptions of success. The overall design of this component was based on the work of Lasker and Beukelman (1999). They conducted a similar study which looked at participants' perceptions of aphasic individuals' storytelling and assessed the participants' willingness to participate in storytelling conversations with these individuals with aphasia. The individuals with aphasia ranged in communicative ability, some using speech, and others using different types of alternative and augmentative communication (AAC). The investigators asked their participants to rate the aphasic individuals' storytelling on communicative competence, effectiveness, their own comfort level, understanding, and their willingness to converse with the aphasic individual. Focus group discussions following the questionnaire revealed that factors such as understanding, comfort, and familiarity influenced the perceptions of aphasic individuals' adult peers. It was hypothesized that similar factors would

affect the perceptions of G's peers. The questionnaire for this study addressed similar factors but the design was based on the unique characteristics of this dyad.

2.4.3 Selection of Video Clips

The video clips were taken from the first and third conversations as described in section 2.3.1. Although the third conversation did not occur immediately following a structured assessment, any comfort issues associated with starting a new conversation were judged to be minimal due to familiarity and time spent talking prior to taping.

Two clips from each conversation were recorded onto a separate tape. Clips from the conversations were matched for length and topic control. The lengths of the clips were sufficient to show the establishment of a topic and/or topic development. The clip boundaries occurred at natural breaking points in the conversation to maintain a natural feel to the conversation. The combined length of the clips for each conversation sample was just under ten minutes. This was considered to be enough time to develop an accurate perception of the dyad's conversation but short enough to prevent boredom. The clips were also matched on the inclusion of brief comments made by a third, unseen speaker (B, a clinical supervisor). One clip from each conversation sample included such a comment. Neither of these comments took away or added to the conversations and they were therefore not considered to have the potential to alter the participants' perception of the conversation. A post study examination of the samples revealed that they had a roughly equal number of turns spent in breakdowns (T1 – 6% of turns spent in breakdown/repair sequences; T2 – 7% of turns spent in breakdown/repair sequences).

One conversation disruption involving all three people included in the taping was removed from one clip as it was a tangential comment referring to an earlier conversation, potentially giving clues to the order of the conversations; the spliced out portion was just under

thirty seconds and comprised, mainly laughter. The splicing out of the disruption was such that it was difficult to notice unless made aware of it.

2.4.4 Questionnaire

In designing the questionnaire, there was a choice between a Likert scale and a visual analogue scale (VAS). A scale was chosen over an open-ended question for the questionnaire because it would more likely produce specific and quantifiable results with less possibility of incorrect completion (Gumpel, Wilson, & Shalev, 1998). Likert scales are frequently used in research to examine perception. This type of scale has good reliability and validity (Lee, Brown & Perantie, 2002). With the Likert scale, an investigator can restrict the participants' responses to five or seven choices, in theory. For example, the first point on the scale might read 'Strongly Agree', the second, 'Agree', the third, 'Neutral', and so on. Potential drawbacks to this type of scale, however, are that it is forced choice and the responses given may not accurately depict a participant's true impressions, it is difficult to score as many participants make selections mid-point, and it is time consuming for the participant and investigator (Lee et. al, 2002).

The VAS is like the Likert scale in that each end represents an extreme. For example, one end of the scale might read 'Strongly Agree' while the other end reads 'Strongly Disagree', with no points marked in between (See Appendix D). VASs are 10 cm in length and the line can be divided into one-centimeter increments for qualitative and/or quantitative analysis. VASs have long been used to measure perception in areas like quality of life (Verri et al., 1999), pain (Shields, Cohen, Harbeck-Weber, Powers, & Smith, 2003), and improvement in disability or handicap (Edwards, Playford, Hobart, & Thompson, 2002; Lomas et al., 1989; Pederson et al., 2001). Problems such as midpoint selection (Demorest & Erdman, 1986; Pederson et al., 2001; Verri et al., 1999), and misunderstandings of the use of the scale (Shields et al., 2003) have been

reported with the visual analogue scale. Problems reported with this scale are often related to insufficient cognitive ability (Shields et al., 2003; Verri et al., 1999).

Strengths of the VAS are that it can reduce artificial distribution of responses (Bond & Lader, 1974), it does not restrict choices (Bond & Lader, 1974; Lomas et al., 1989; Shields et al., 2003), and it promotes relative comparisons (Bond & Lader, 1974; Lomas et al., 1989). This scale was considered primarily because the comparative nature of the tasks warranted less restrained selection (Lomas et al., 1989). Given the drawbacks and potential reduced reliability and validity of the VAS, however, a 5-point Likert scale was used initially.

2.4.5 Pilot Study

A pilot study was conducted with the first three respondents. The group was made up of two females and one male. The procedure for the pilot study was the same as that described in section 2.4.2. In addition however, participants were asked to comment on the length of the clips and the questionnaire. The participants relayed that the clips were long enough to provide an accurate depiction of the dyad's communication skills but not long enough to induce boredom. In terms of the questionnaire, the pilot study confirmed that the topics targeted in the questions were suitable, but the participants felt that the use of the 5-point Likert scale did not allow them to representatively mark the two conversations. Two of the participants used the scale as a VAS and ignored the points altogether. To remedy this, the visual analogue scale was used for subsequent focus groups.

2.4.6 Focus Group Discussion

After viewing the clips and filling out the questionnaire, the participants took part in a focus group discussion. A focus group involves a small number of people engaged in a discussion on a particular topic. The investigator acts as a facilitator, encouraging discussion

between the participants while being careful not to 'guide' the conversation. According to Wilkinson (2003), "the particular advantage of focus groups is the more comprehensive elicitation of individuals' ideas, opinions and understandings than is possible in one-to-one interviews (more comprehensive in the sense that co-participants are likely to trigger memories, stimulate debate, facilitate disclosure and generally encourage the production of elaborated accounts)" (p. 187). Focus groups, like other qualitative methods, provide "... a systematic way of exploring complex issues that cannot be separated from the context in which they occur" (Klasner & Yorkston, 2000, p. 261-2).

This study aimed to explore the perceptions of individuals but this was achieved only in part with the questionnaire; focus group discussions facilitated deeper understanding of how participants arrived at their judgments, any other factors that influenced their judgments, and how those judgments were reformulated with input from their peers. The participants were encouraged to share their impressions of the clips and/or any of the topics addressed in the questionnaire. This information could then be used to understand how participants arrived at their judgments and what factors other than those targeted in the questionnaire were considered.

The conversations were taped using a Marantz recording device with two table microphones. The investigator present also took notes during the conversation. Following the focus group discussion, the tapes were transcribed. The transcriptions were then coded into topics and themes according to a technique described by Bogdan and Bilken (1992) and Lasker and Beukelman (1999) to allow for content analysis. 'Topics' refers specifically to the questionnaire related topics (i.e., proficiency, comfort, effort, interest, success) presented to the participants and 'themes' refers to global themes that developed during the focus group discussion (i.e., understanding the conversation and forming perceptions, order, arriving at an answer). Initially, the transcripts were coded per speaker turn according to content (e.g., comfort, awkward laugh, order of presentation). They were then grouped into their respective coding

categories based on the questions covered in the questionnaire (topics) as well as more global coding categories (themes). The line number of the transcript containing the code was recorded so as to reveal the number of times the code arose and in what context. This allowed for a subjective impression of which factors proved most important when arriving at a judgment for a given question. It also highlighted links to other topics. For instance, 'comfort' was a major topic discussed. It was also discussed in the context of 'success' and is therefore included under the topic of 'success' as well. The transcripts were coded and organized into topics and themes for each group to allow for any comparison between the two focus groups. The topic and theme categories were each combined across the two groups when it was realized that aside from the amount of time spent discussing particular topics, the groups were comparable on the themes that arose.

3. Results

This chapter describes the results of the three components, namely Component 1, Component 2, and Component 3. Outcomes of the analyses pertaining to each component are discussed in detail.

3.1 Component 1

3.1.1 Structured Assessment of Comprehensibility – Quantitative Results

Table 3.1 Structured Assessment Score Totals

	T1	T2
Total extra speaker words	121	37
Total extra listener words	195	91
Total problem words	35	22
Total error words	35	5
Total ultimate agreement	7/9 sentences	9/9 sentences
Total time	581 seconds	275 seconds

As described earlier, the sentences for the structured assessment of comprehensibility were matched for length. Table 3.1 depicts the totals for the structured assessment. The totals are based on the agreed-upon scores of the nine sentences used in the assessment for T1 and T2. The results showed that there was a dramatic decrease in all of the categories scored, which translates into a marked increase in comprehensibility. Results based on the individual sentences revealed that in T2 there were fewer extra speaker words for eight of the nine sentences (89% of the sentences), fewer extra listener words in 68% (6/9) of the sentences, fewer problem words in 68% (6/9) of the sentences, fewer error words in 68% (6/9) of the sentences, a greater number of sentences correctly agreed upon (T1 – 78%; T2 – 100%), and a greater number of sentences

(56% or 5/9) were agreed upon in less time. These numbers were not tested for significance but do suggest greater comprehensibility in the second structured assessment.

3.1.2 Structured Assessment of Comprehensibility – Inter-rater Reliability

The scoring of the first structured assessment of comprehensibility (T1), based on initial criteria definitions, resulted in 100% agreement for speaker extra words, 78% agreement for extra listener words, 89% agreement for problem words, 89% agreement for error words, 100% agreement for ultimate correct and 11% agreement for time. The definitions for extra listener words, problem words, error words, and time were then redefined using more explicit criteria (see Appendix A). Because time measures had shown the largest discrepancy, the sentences were timed again and rescored using the refined criteria. The second scoring of time showed 100% agreement.

The second structured assessment of comprehensibility (T2) was scored to verify reliability of the revised scoring criteria. 96% agreement was reached overall. Results showed 100% agreement for speaker extra words, 100% agreement for extra listener words, 89% agreement for problem words, 100% agreement for error words, 100% agreement for ultimate correct and 89% agreement for time. A new circumstance accounting for the difference in agreement for problem words emerged during the scoring of T2 and is now included in the final version of the defined criteria.

3.1.3 Intelligibility Scores

E's intelligibility scores were calculated at the time of the initial analysis of this data (see Table 3.2). The sentences were transcribed by G as well as by a second clinical student, C, who had not worked with E. In the initial test of intelligibility G and C both rated E's intelligibility as 7%. Intelligibility ratings at the end of the six week placement were 22% for G and 9% for C.

Based on G's scores, E was more intelligible at the end of their six weeks of sessions. Based on C's scores, E's intelligibility did not really change. While comprehensibility did improve over the six weeks as determined by the structured assessment of comprehensibility, intelligibility remained relatively unchanged, particularly for C. The difference in G's scores most likely reflects the effect of familiarity, an important component of comprehensibility.

Table 3.2 Intelligibility Scores

	T1	T2
G	7%	22%
C	7%	9%

3.1.4 Structured Assessment of Comprehensibility – Qualitative Results

Although not analyzed quantitatively, differences in the strategies used by the members of the dyad to prevent or repair breakdowns were examined. In the first sentence reading in T1, E repeated the whole sentence when E realized that G had not understood all of it. This strategy proved ineffective for resolving the breakdown and he changed his strategy immediately to giving only a small phrase or word at a time. This strategy was subsequently used both for initial reading of the sentence and when repairing breakdowns. No other instances of an entire sentence repetition occurred in T1 or T2.

The use and nature of feedback from E to G evolved between T1 and T2. In T1, E used repetition of a word or phrase most commonly as negative feedback (i.e., when G was incorrect); he was also observed to use gesture and a phonemic cue each once. Little evidence of positive feedback was observed. In T2, E gave more specific feedback, such as 'excellent' and 'good'. G's strategy use also changed from the first to the second structured assessment. For instance, G

made many guesses during the first assessment, which is evident in the number of error words. She made fewer guesses in T2 and was instead more likely to ask for repetition. G also requested that E use the alphabet board less often in the second assessment. Board use was always facilitated by G and never spontaneously used by E. During both structured assessments, G frequently repeated the last part of an utterance that she understood to indicate to E which words she misunderstood.

A change was also detected in the ratio of extra speaker words to extra listener words between T1 and T2 (see Table 3.1). The ratio in T1 was roughly 1:1.5 and 1:3 in T2, indicating that greater responsibility shifted to G. This change can also be attributed to E's and G's change in strategy use, that is, E gave specific feedback rather than using repetition in T2, and G more often repeated words to ensure she understood.

To summarize, inter-rater reliability was established with 96% agreement overall. Unique circumstances prevented 100% agreement for all categories scored. Improvement was seen in all nine sentences in the T2 structured assessment in the absence of paralleled changes in intelligibility as judged by an unfamiliar listener. G's intelligibility scores indicated that, for her, E's intelligibility increased between T1 and T2. Also of interest was the increased ratio of extra speaker words to extra listener words in T2.

3.2 Component 2

3.2.1 Turns

In order to investigate whether the conversations differed with respect to the distribution of talk between speakers, the total number of turns per minute was calculated for each conversation (see Table 3.3). The results showed that a comparable number of turns per minute occurred in each conversation with slightly more turns per minute taking place in the second conversation (T1 - 25.49/min; T2 – 26.43 turns/min). The relative distribution of talk was

tabulated based on the number of verbal and non-verbal turns taken by each speaker in both conversations (see Table 3.4). The conversational contribution of the members of the dyad was determined by calculating the number of verbal and non-verbal turns taken by each speaker in both conversations and converting those numbers into percentages based on the total number of turns taken in each conversation. The percentage of turns taken by each speaker was comparable with G responsible for 50% of turns in T1 and E 49%, and G responsible for 46% of turns in T2 and E 47%. The clinical supervisor involved in the initial data collection took part more in the second conversation than in the first (T1 - 1%; T2 - 7%) which accounts for the slightly lower percentages for both G and E in T2. The number of turns was virtually equal for both speakers in T1 and T2 which is what would be expected in most two-party conversations.

Overlaps in conversation are common. To investigate if this was also be the case for this dyad, where the speech of one conversation partner was compromised, the number of overlaps in verbal turns in each conversation was summed. They were then converted into percentages based on the total number of verbal turns for each conversation. There proved to be no meaningful difference in the percentage of overlaps that took place in each conversation with 6% of overlaps occurring in T1 and T2. Similarly, each speaker was responsible for a similar percentage of overlaps. This suggests that the number of overlaps that occurred was not affected by changes in comprehensibility.

The content of the overlaps was analyzed to examine whether there were any changes in the nature of the overlaps between T1 and T2. Content of the overlaps was based on the topical contribution, as described in the method section. In T1, G's overlaps were primarily requests for repair whereas E's overlaps appeared to be a combination of questions, comments and non-specific acknowledgement. A change was observed in the content of the overlaps for T2 with G making fewer requests for repair and more comments. The content of E's overlaps also differed

from T1 with the majority of his overlaps in T2 being answers to G's partially completed questions.

Table 3.3 Turn Totals

	T1	T2
Total verbal turns	248	339
Total nonverbal turns	26	24
Total Turns	274	363
	T1	T2
Overall time	645s	824s
	T1	T2
Turns per minute	25.49	26.43

*some verbal turns also incorporated non-verbal cues/gesture

Table 3.4 Verbal and Non-verbal Turns

	G		E		B	
	T1	T2	T1	T2	T1	T2
*Verbal turns	137	165	109	148	2	26
Non-verbal turns	0	0	26	24	0	0

The overlaps were then categorized according to whether they occurred during a breakdown/repair sequence or not. In both T1 and T2, more of G's overlaps of E occurred within a breakdown/repair sequence (T1 – 83% of overlaps; T2 – 60% of overlaps). E's pattern of overlap from T1 to T2 differed somewhat with 50% occurring during breakdown/repair sequences in T1 and 40% in T2. Overall, a greater number of overlaps occurred during breakdown/repair sequences in T1 (64%) than in T2 (50%).

In addition to examining overlaps, the verbal turns of each speaker were categorized according to length (see Table 3.5 and Figure 3.1). Note that the percentages shown in Table 3.5 are based on the total number of verbal speaker turns. Those turns where E used only the alphabet board, for instance, were entirely nonverbal. Turns also occurred where an utterance co-occurred with use of the alphabet board. The number of words spoken in those turns were counted into the appropriate word category. G's and E's turns for both conversations fell largely in the 2-5 word category. E also had a large number of words in the 1-word category. While the percentage of utterances for G remained virtually the same for the 2-5 and 6-10 word categories, she had fewer one-word utterances and more utterances greater than ten words in T2. Only small differences were noted in E's utterance length between T1 and T2, with most of his utterances falling in the 1-word and 2-5 word categories. Noteworthy is that collectively, the number of completely or partially unclassifiable utterances increased for E in T2. This was particularly true for utterances that were entirely unclassifiable.

The unclassifiable utterances for both conversations were further analyzed (see Figure 3.2). As described in the method section, the unclassifiable utterances were transcribed, when possible, as syllables. For the purpose of analysis, these utterances were categorized as being equal to or greater than four syllables or less than four syllables, as up to four syllables could be more reliably identified than larger numbers of syllables. Results showed that although there was a greater number of unclassifiable utterances in T2, there was not a meaningful difference in length of these utterances between T1 and T2 (T1 – 79% $\geq$ 4 syllables; T2 – 81% $\geq$ 4 syllables). What is important to recognize, however, is that the unclassifiable utterances tended to be longer utterances, which means that a substantial percentage of E's utterances most likely fell in the longer word categories.

Table 3.5 Turns (% of speaker's total verbal turns)

	G		E	
	T1	T2	T1	T2
1 word	36 (26%)	36 (22%)	38 (35%)	45 (30%)
2-5 words	59 (43%)	70 (42%)	39 (36%)	51 (35%)
6-10 words	28 (20%)	32 (19%)	12 (11%)	18 (12%)
>10 words	14 (10%)	27 (16%)	2 (2%)	3 (2%)
unclassifiable				
partial			11 (11%)	14 (9%)
all			7 (6%)	17 (11%)

Figure 3.1 Turns

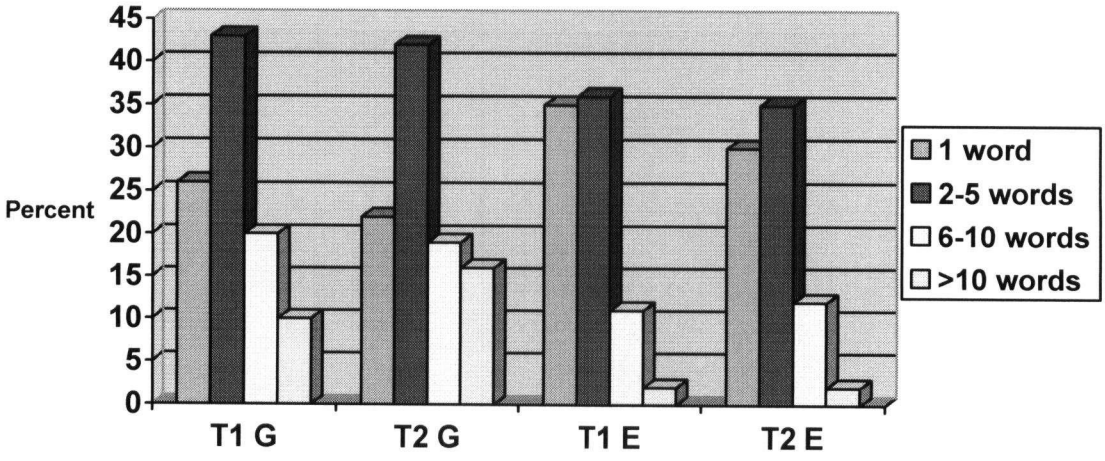
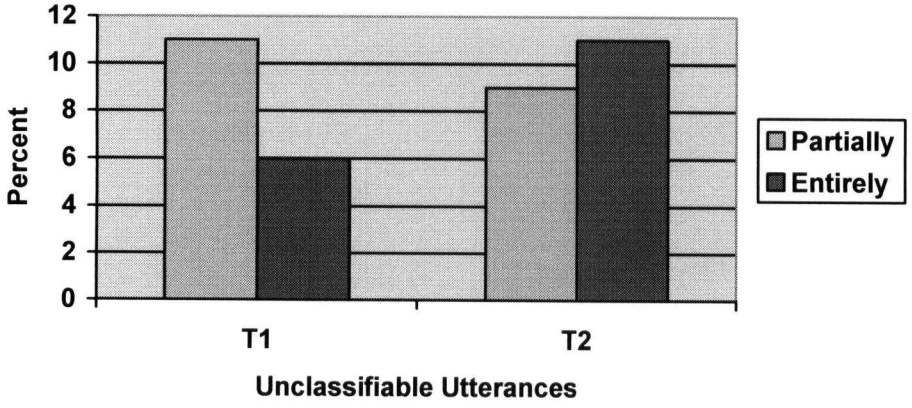


Figure 3.2 Unclassifiable Turns



3.2.2 Breakdown and Repair Sequences

Breakdowns are common in conversation but can occur more frequently when the speech of one partner is impaired. One might expect this to be particularly true between unfamiliar individuals. To determine whether this was true for this dyad the number of breakdowns per minute was calculated. This calculation showed that the number of breakdowns that occurred per minute was approximately the same for each conversation (T1-1.4 breakdowns/min.; T-2 1.5 breakdowns/min.). Further analysis revealed that this was not an accurate depiction of the amount of time actually spent in a breakdown/repair sequence. A percentage of the total number of turns involved in breakdown repair sequences revealed that 67% of T1 was devoted to breakdown and repair compared to 52% in T2. The clinical supervisor also provided brief input during some breakdowns. When those sequences involving her were removed, the percentages still suggest that the dyad repaired breakdowns more quickly in T2 than in T1 (T1- 49% of time spent in breakdown/repair; T2- 43% of time spent in breakdown/repair).

This finding was further substantiated by looking at the number of breakdowns resolved in equal to or less than five turns. It is important to note that the number of turns taken to repair a breakdown ranged from two to over fifty in both conversations (i.e., T1 – 2-52; T2 – 2-58). The

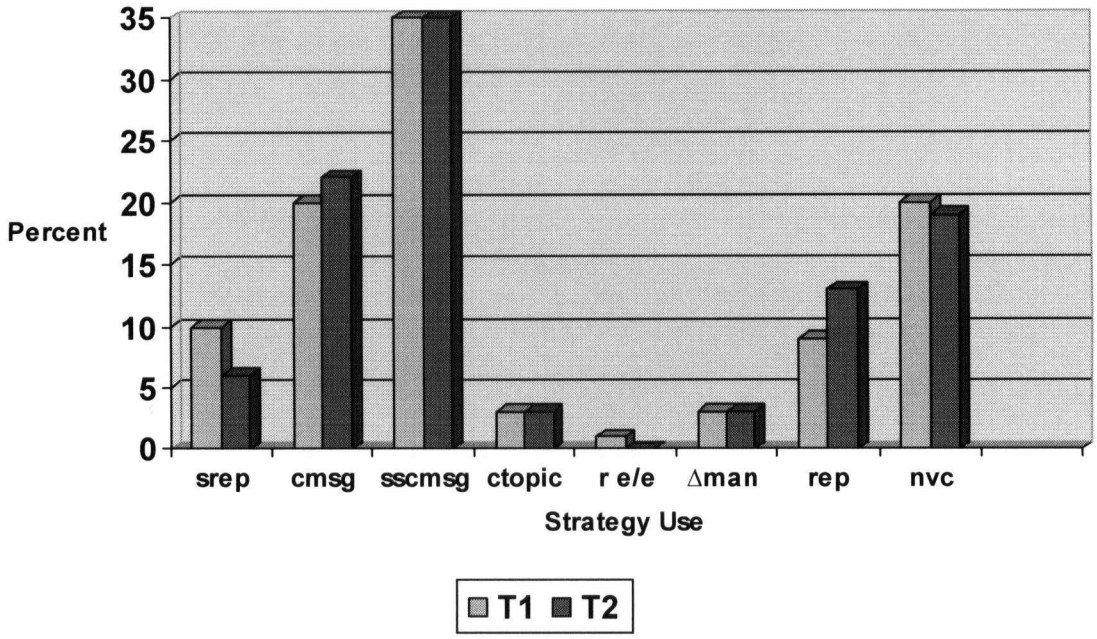
analysis revealed that in T1, 53% of breakdowns were resolved in equal to or less than five turns, if those breakdowns involving the clinical supervisor were included, and 47% if not (the clinical supervisor was involved in only one of 13 breakdown/repair sequences and she made a very minor point in that very long repair). In comparison, in T2, 57% of breakdowns were resolved in equal to or less than five turns, or 52% if those involving that the clinical supervisor were not included. This portion of the breakdown and repair analysis indicates that, comparing T2 with T1, less time overall was spent in breakdowns as breakdowns were resolved more quickly.

As detailed in the previous chapter, breakdowns can be signaled and repaired using a variety of strategies. The use of strategies for both members of the dyad was analyzed to explore any changes in strategy use that may have happened between T1 and T2 (see Figure 3.3). In both conversations, G was more involved in signaling the repair whereas E was more involved in responding to that signal. G's reliance on several strategies (e.g., confirmation of message, specific statement of confirmation of message) remained the same but certain strategies changed slightly from T1 to T2. In T1, G used specific requests for repetition more often than in T2 (T1- 10%; T2- 6%). Her use of nonspecific request for repetition, however, increased from T1 to T2 (T1- 9%; T2- 13%). This is interesting because nonspecific requests for repetition typically place more burden on the other member of the dyad to determine what has been misunderstood.

E's profile of response to clarification requests differed in a number of categories between both conversations as well, but as was the case with G, most of the changes in percentage were relatively small. The most frequently used strategies for each conversation are shown in Figure3.4. To repair the breakdowns E relied more on exact repetitions in T1 than T2 (T1- 10%; T2-6%). Conversely, he used partial repetition as a strategy more in T2 than in T1 (T1- 15%; T2- 23%). Although this is not a substantial change, it may be that partial repetition was realized as a more successful strategy. E attempted to explain or elaborate on the utterance that prompted a repair request somewhat less in T2 than T1 (T1- 12%; T2- 9%). Although

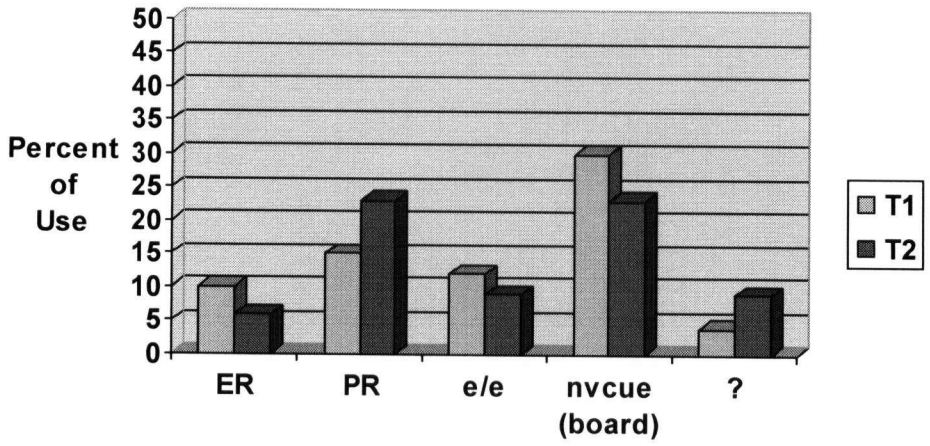
alphabet board use was a frequently used response strategy in both conversations, E relied less on the alphabet board to repair breakdowns in T2 compared to T1 (T1- 30%; T2- 23%).

Figure 3.3 G's Strategies for Signaling Breakdown



srep - Request for repetition of a specific constituent
cmsg - Request for confirmation of the message
sscmsg - Specific statement of confirmation of message
ctopic – Request for confirmation of the topic
r e/e – Request for explanation/elaboration
Δman – Request for a change in the manner of presentation
rep – Request for repetition
nvc – Nonverbal request for clarification

Figure 3.4 – Response Use by E



ER – Exact repetition
PR – Partial repetition
e/e – Elaboration/explanation
nvcue – Nonverbal cue
? – Unclassifiable utterance

A final difference observed involved those turns falling in the unclassifiable category. More unclassifiable turns occurred within breakdown/repair sequences in T2 than in T1 (T1- 4%; T2- 9%). It is important to recognize that these unintelligible utterances may have actually belonged in one of the response categories, which would have affected the final percentages reported here. In general, these findings suggest that both parties had learned, or were in the process of learning, which strategies proved effective and ineffective for them and this may be reflected in the differences noted between T1 and T2.

The vast majority of breakdowns in T1 and T2 were signaled by G and repaired by E (i.e., other-initiated, self-repaired) (Schegloff, Jefferson, & Sacks, 1977). While the other-initiated, self-repaired pattern is preferred over others, such as other-initiated, other-repaired, it is not as preferred as self-initiated, self-repaired. In both conversations, E spontaneously repaired

utterances several times that may have otherwise resulted in breakdowns. The occurrence of self-repaired utterances was comparable between T1 and T2 with six occurring in T1 and four in T2.

3.2.3 Topic

To examine topic development in these conversations, only those turns not involved in a breakdown/repair sequence were analyzed. This was done because breakdowns were analyzed separately in detail and because topic development can be essentially halted while a breakdown is being repaired. Initially the number of topic moves for each category (see Table 3.6) was summed. Percentages based on the speakers' total number of topical turns were then calculated (see Table 3.6). Although there were changes between T1 and T2 in the distribution of topic moves for each speaker, these numbers alone did not prove meaningful. Based on her introduction, reintroduction and shifting of topics, it appeared that G controlled both conversations. To more accurately account for the speakers' role in topic maintenance and development, the topic moves were categorized as either active or passive, the inclusion criteria for which were previously described.

Calculations for the conversations as a whole revealed that G was more actively involved in T2 as compared to T1 (T1- 58% active topic moves; T2- 75% active topic moves) (see Table 3.7). The calculations in Table 3.7 are based on verbal and nonverbal topic moves (e.g., nonverbal request for repair might include G handing E the board) and include unclassifiable utterances. It is possible that this change may reflect less inhibition about controlling the floor and/or an increased comfort level. E seemed to maintain the same level of active involvement across conversations and was slightly more passive than G in both conversations.

Results, with the elimination of the clinical supervisor's input, showed that a greater percentage of E's unclassifiable utterances were active in both T1 and T2 (T1- 67%; T2- 86%) (see Table 3.8; also see Table 3.9 for an example of what was considered to be an active

unclassifiable utterance). If unclassifiable utterances were included with his other turns, the results showed only a small difference with 52% active involvement in T1 and 49% in T2. If unclassifiable utterances were excluded results showed that 45% of E's topic moves were active in T1 and 40% in T2. However, eliminating unclassifiable utterances from the calculation does not provide an accurate depiction of E's topic moves because 14% of his turns were unclassifiable.

Table 3.6 Topic Moves

	G		Overall		E		Overall	
	T1	%	T2	%	T1	%	T2	%
Active Moves								
Topic Introduction	2	3%	4	6%	0		0	
Topic Digression	0		0		0		0	
Topic Reintroduction	2	3%	1	1%	0		2	3%
Incorporating Comment	14	25%	25	36%	13	24%	14	20%
Incorporating Question	9	16%	15	22%	3	6%	6	9%
Request for Repair	1	2%	1	1%	0		0	
Topic Shift	5	9%	6	9%	4	7%	0	
Passive Moves								
Collaboration	5	9%	5	7%	15	28%	24	34%
Nonspecific Acknowl.	9	16%	5	7%	9	17%	6	9%
Specific Acknowledgement	10	18%	7	10%	0		3	4%
Other								
Non-repair	0		0		1	2%	1	1%
Unclassifiable Utterance	0		0		9	17%	14	20%
Total	57		69		54		70	

Table 3.7 Active versus Passive Topic Moves (including unclassifiable utterances)

	G				E			
	T1	%**	T2	%	T1	%	T2	%
Passive	24	42%	17	25%	27	48%	35	51%
Active	33	58%	52	75%	29	52%	34	49%
Total	57		69		56		69	

** percent of speaker's total topic moves

Table 3.8 E's Partially or Entirely Unintelligible Utterances – Active versus Passive

	T1	%	T2	%
Total	9		14	
Passive	3	33%	2	14%
Active	6	67%	12	86%

Table 3.9 Example of an Active Unclassifiable Utterance

	**Verbal	Nonverbal
G <2>	#that's neat that you went to Prince George//#	#smiles and leans back#
E	#yeah I followed sixteen I think.. sixteen or ninety seven #x x x x #	#smile # points off into distance/eyes follow then looks back at G#

** see Appendix B for transcription notes

To summarize, turns provided the basis for the breakdown/repair and topic move analysis. No meaningful differences were noted in the analyses done on turns. In terms of the breakdown and repair sequences, a greater proportion of turns was spent in breakdown/repair in T1, which indicated improvement in T2. With respect to topic, G was more active than E in both

conversations. Her proportion of active to passive topic moves increased in T2 indicating that she took greater responsibility for the conversation.

3.3 Component 3

3.3.1 Questionnaire: Quantitative Results

Means and standard deviations were calculated for each question on the questionnaire for both focus groups, and are reported in Table 3.10 (see Appendix C for a copy of the questionnaire). Measurements were taken from the points marked by the participants on each VAS (10 cm in total) to determine numbers necessary for mean calculations. The far left side of the VAS was marked 'Strongly Agree' and the far right side was marked 'Strongly Disagree' for the questions pertaining to perceived proficiency, comfort between the dyad, and interest of the dyad. The scale was measured from ten to zero with ten corresponding to 'Strongly Agree' and zero to 'Strongly Disagree', therefore, the larger the mean value, the stronger the agreement. For the question pertaining to effort, the scale included three descriptions with 'More effort on his part' on the far left of the scale, 'Equal effort' in the center, and 'More effort on her part' on the far right of the scale. Therefore, larger means indicated that the participants felt there was more effort on his part, means in the mid-range (i.e., ~5) signified equal effort and smaller means indicated more effort on her part. The question on success was labeled with a binary choice (Very Successful and Not Successful), each placed on the far ends of the scale. A higher mean indicated greater perceptions of success and lower means indicated perceptions of less success. Based on these means, both groups judged the dyad to be more successful in T2. T2 was also judged to be more proficient but the positive difference between T1 and T2 was minimal.

Agreement in terms of T2 being rated higher than T1 between the two focus groups was not seen on the questions targeting perceived comfort, interest and effort. In addition, there was possibly less change in perception for the focus group that saw clips of T2 before T1. The means

for Focus Group 1 revealed perceptions of greater comfort for conversation sample in T1 over T2, while the means for Focus Group 2 showed perception of greater comfort in T2 (see Table 3.10). For the question on interest, Focus Group 1 had roughly equal means for T1 and T2, while Focus Group 2's means indicated the perception of less interest in T1 and more interest in T2. For the question on effort, Focus Group 1 rated T1 as equal effort but there was a slight shift in T2 suggesting more effort on G's part. Contrarily, Focus Group 2 had means indicating more effort on her part in T1 and roughly equal effort in T2. Of interest is that the difference in means between T1 and T2 for Focus Group 1 were typically smaller than those seen for Focus Group 2. The ranges for both groups varied considerably.

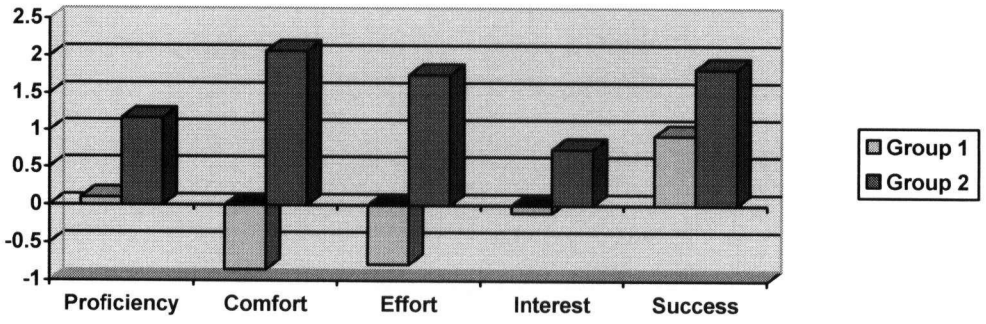
A closer examination of mean differences between T1 and T2 for both focus groups produced interesting findings (see Figure 3.5). When T1 was marked as greater than T2 by the participants, it was calculated as a negative difference whereas the reverse was calculated as a positive difference. Focus Group 1 had many negative scores both for individual participants and as collective means. Contrarily, Focus Group 2 had only three negative individual scores but positive collective mean values for all of the questions. Moreover, the positive collective mean differences were quite large compared to the negative mean differences. This variation may indicate a lack of confidence in the answers of Focus Group 1 and this is presumably related to the order of presentation. This idea is in part supported by the focus group discussion, the results of which are presented in the following section.

Table 3.10 Summary Table for Means and Range for each Questionnaire Question

	Mean		Range	
	** Focus Group 1 N=6	Focus Group 2 N=6	Focus Group 1	Focus Group 2
Proficiency				
T1	6.85	6.40	5.2-8.5	5.0-7.6
T2	6.95	7.60	6.5-7.3	5.2-8.8
Comfort				
T1	7.58	6.60	6.0-9.4	3.6-9.0
T2	6.75	8.70	4.0-8.5	6.9-9.7
Effort				
T1	5.02	3.77	4.2-5.7	2.4-5.0
T2	4.28	5.50	2.7-5.4	4.9-6.2
Interest				
T1	7.28	6.88	5.5-9.5	4.5-10.0
T2	7.2	7.52	6.3-8.4	4.3-10.0
Success				
T1	5.75	6.07	3.8-8.2	4.2-8.0
T2	6.73	7.87	5.6-7.9	5.0-9.3

** Group 1 saw conversation T2 then T1; Group 2 saw conversation T1 then T2

Figure 3.5 Questionnaire Mean Differences From T1 to T2 by Group



3.3.2 Focus Group Discussions – Topics and Themes

The qualitative information for this component resulted from two focus-group discussions. As described in the method section, each focus group included six participants and the information that resulted from their discussion was grouped into topics and themes. Below are the topics, corresponding to the questionnaire items that were discussed and three more global themes that emerged from the content analysis. There was considerable overlap of content

in many of the topics and global themes discussed, so a factor considered in arriving at a judgment for one question may also have been considered for another question as well. The information derived from analysis for topics and themes has been grouped collectively, rather than for each focus group, to capture what the participants considered when they were watching the clips and answering the questionnaire. Although the topics and themes were apparent in both groups, Focus Group 1 spent a considerable amount of time discussing the true order of the video clips. Participants in this group seemed compelled to provide rationale for the relative positioning of B to A on the questionnaire. Some individuals shared that they maintained the ordering of conversation A and B (i.e., B occurred later so was therefore more successful etc.), even if their perceptions of the conversations did not parallel this pre-established order. This may represent a response bias in addition to highlighting assumptions about what would be considered 'ideal' results for the researcher to obtain. Focus Group 2 spent less time in such discussion and instead focused on how the two conversations were different and on the difficulty in establishing a baseline for answering the questions on the questionnaire. In other words, Focus Group 2 participants were more concerned with the relative positioning of both conversations to the endpoints of the scales themselves.

3.3.2.1 Topics Corresponding to the Questionnaire Items

Topic 1 - Proficiency

The participants were asked in the questionnaire to rate perceived proficiency of communication. The following discussion points reflect what peers described when they gave higher proficiency ratings:

- The speakers focused on the message
- Equal participation
- Adherence to the topic

- Effort and effectiveness
- Shared knowledge

Topic 2 - Comfort

Many participants commented that comfort could be analyzed for each individual as well as for the dyad. The presence of visual cues appeared to influence perceptions of comfort, as indicated by the following:

- Proximal positioning and posture
- Nature of laughter (i.e., nervous versus humor related)
- Shifting gaze to the clinical supervisor
- Enjoyment
- Interest
- Facial expression (e.g., smiles/happiness)
- Ease of conversation

Perceptions were also based on predictions or assumptions about:

- Experience
- Familiarity
- Self-comparisons

Topic 3 - Effort

Most participants discussed effort as a component of conversation that exists for all dyads. Effort was conceptualized differently for each speaker in light of the influence that dysarthria had on these conversations. The factors common to most conversations were:

- Production versus comprehension
- Communication breakdowns
- Energy expenditure

More closely related to these particular conversations were:

- Alphabet board use (i.e., effectiveness, independent use, tracking message, overuse, efficiency e.g., giving cues, confirmation)
- Strategy use (e.g., repetition with and without variation, pursuing message versus giving up and moving on)
- Message delivery (i.e., speed, strain)
- Use of all skills available to convey/interpret message

Topic 4 - Interest

The topic of interest arose out of discussions related to other factors. Some key points that surfaced that influenced ratings of interest included:

- Related to topic (i.e., shared versus individual driven)
- Facial expression
- Comfort
- Setting
- Familiarity
- Active participation
- Presence of laughter
- Signs of attention (e.g., asking questions, maintaining topic)
- Enjoyment of the dyad and for the participant to watch

Topic 5 - Success

Participants relayed that notions of success are established in light of all other factors discussed. Many also commented that perceptions of success vary depending on context and were ultimately difficult to arrive at. In addition, the participants believed that their

impressions of success may be different from those who have not had formal training in speech and language related domains. Factors discussed in relation to success included:

- Proficiency
- Comfort
- Setting/Situation
- Message delivery (e.g., number of tries, pursuit of message, using different options to achieve goal, speed and amount of information transfer)
- Breakdowns
- Sharing versus dominating in the conversation
- Enjoyment
- Equal effort
- Presence of laughter and joking
- Alphabet board use (e.g., reliance, effectiveness)

3.3.2.2 Global Themes

Global Theme 1 - Understanding the Conversation and Forming Perceptions/Impressions

The participants' impressions of the conversations in general formed the basis on which they answered the questions posed in the questionnaire. The participants spent a noteworthy portion of the discussion sharing information that they felt contributed to their perceptions and impressions of the conversations. Below are the main points that influenced their perceptions and impressions along with examples:

- Comparisons (i.e., to self, to normal speakers, across situations, between clips)
    - "I thought she seemed more comfortable speaking than I would have I know" (Focus Group 2 (FG 2).

- "Yeah because if you considered it compared to the normal population it was xx right. I mean I thought there was not much going on there but given the constraints it was quite good" (FG 2).

- Personal attributes/personality of the members of the dyad
  - I felt that she seemed more tense for the first video and that when she was laughing in the first it was more tension and when she was laughing in the second it was more, you know, because the situation was funny. Or even when she figured out what he meant there wasn't the same tension around from the laughing I thought than the first time. (another speaker) Yeah it's true (FG 2).
- Assumptions (e.g., order of presentation, training)
  - I think too when I saw the second one I assumed that it was post some sort of training so I'm sure that that had some effect on the ratings I gave because it followed second in time, you know, there had been some sort of intervention otherwise they wouldn't have done two tapes or something (FG 2).
- Details about the video data
  - "So, was she a student?" (FG 1)
  - "I was wondering how long they'd been working together" (FG 1).
- Nature of the alphabet board and its use (i.e., knowledge of, competence, effectiveness)
  - "He seemed to do it on his own though more in the first one than in the second one. Like he didn't go to the board in the first one unless she was like sort of showed it" (FG 1).
- Topics of discussion
  - "I thought there was equal numbers of different distinct topics in both. I thought there was kind of one of his topics and one of her topics in each conversation" FG 1).

- Determining what was said
    - "I think he wanted [to know about] the actual course in Prince George". (another speaker) "I interpreted that as what she was doing at UVic and what her undergraduate degree was in but now I don't know" (FG 1).

Global Theme 2 – Order

The participants were told that they were seeing clips of conversations taken at two points in time. They were not, however, aware of the order in which they were viewing the clips. As indicated in the previous theme, regardless of the possibility of order of presentation, several individuals based their impressions on assumptions about the order of presentation. The establishment of perceived order was also based on comparisons between the sets of clips. A considerable portion of the focus group discussions, partially in Group 1, who saw the later conversation first, was spent comparing the conversations and determining their true order. The following comments highlight participant assumptions:

- Comfort
    - "I was thinking of the second clip as a later meeting so therefore they should be more comfortable" (FG 1).
- Clues about the order
    - "But there's a bit of a clue too because you watch the first one and she said 'after watching the video of us together' so then maybe they had-" (FG 1).
- Knowledge of research design methods
    - "I questioned it. I thought well maybe she's gonna present it reversed order so I tried to be more objective thinking given that it's a study, you never know" (FG 2).
- Intelligibility

- I know we weren't supposed to focus on one speaker or the other but I thought he spoke better in the second one, but maybe that was because like you were saying {name} I imposed this idea because it's the second one (FG 1).
- "It's interesting how many of our own expectations we impose on conversations" (FG 1).

Global Theme 3 – Arriving at an Answer

Understanding how other participants used the information in the clips to arrive at the answer also proved to be a topic of discussion. The participants shared that they had a difficult time answering the questions because their answers needed to reflect the samples comparatively. As demonstrated by the following points, participants used a variety of strategies to capture their views of the clips in each sample:

- Averaging/shifting across the conversation samples
  - "For both of them actually the two parts were a little bit different in my mind, like there weren't- I wouldn't have scored them all exactly the same so I sort of made an average between the two" (FG 2).
- Setting a baseline with the first conversation sample (i.e., placement on scale)
  - "Like with the very first time we saw, we didn't know what to compare it to, to normal conversations. You know, he's got dysarthria and given that he's doing very well. But with B you can't help but compare it to the first one" (FG 1).
- Relative comparison between the sets of clips
  - "In a way the ratings make more sense one relative to each other than where I exactly positioned them on the scale or even approximately positioned them" (FG 2).
- Answering the questions individually or establishing a consistent pattern of placement

- "Once I'd come to the conclusion that B was an earlier one and A was a later one then it changed. They were all kind of related the same way, B was just that much worse". (another speaker) "See I didn't do that" (FG 1).

- Influence of schooling
  - I think for the past just after our schooling and stuff I think originally you would think conversation is like a lay person, let's say would judge that as very poor but now that we know what conversation and communication is about, more than just like you words or something, then you're like oh, he was an effective communicator because he did a lot of effort, he tried to get the message across (FG 1).

Several other factors also seemed to influence the final outcome:

- Assumptions about order of presentation
  - I had hypotheses about which one was first and how that might like if they would fall into line so one letter would be always on the left of the other depending on- But if I tried to answer each question on it's own then my letters didn't work out that way so even though I had some hypotheses about which one came first and of course she would have been better or worse I didn't feel confident enough in them to go with that (FG 1).
- Changes in perception across samples
  - "I went back, I know, after we saw the second one I changed a little bit, adjusted, tweaked my answers" (FG 1).
- Considerations in rating (i.e., conversation flow, use of available skills, breakdowns)
  - "So it wasn't whether he was using speech or the board, it was whether there was communication that got the message across" (FG 1).

This component produced interesting findings. In sum, there was agreement of perceived positive changes in success and, to a lesser extent, in proficiency, for T2 by both focus groups. Content analysis of the focus groups discussions revealed that both focus groups considered the same factors in arriving at their judgments. However, differences in the influence of order of presentation and assumptions were evident. Participants in Group 1 tended to focus on the order of the clips, while Group 2 focused on setting a baseline with the first clip.

4. Discussion

The present study was based on the models of comprehensibility and the World Health Organization's International Classification of Functioning. Although these models differ in their scope, they share an emphasis on the importance of factors that can impact participation in the social realm. Communication plays an important role in people's lives. It functions to link individuals to those closest to them, such as family members, as well as to other members of society. A communication impairment can result in frustration and isolation. While this may be recognized by the speech-language pathologists who work with these individuals, many speech-language pathology assessments and treatments focus on specific aspects of communication or speech within the clinical setting, with a hope that generalization to environments outside of the clinic will occur. According to the ICF model, this type of focus on assessment and treatment is at the activity level. The WHO is calling for intervention that targets an individual's optimal level of health and functioning, and while this has been embraced in some areas of communication research, as described in earlier sections, it has not been a focus in the area of dysarthria.

For speech-language pathologists working with people with dysarthria, the clinical approach has been primarily the improvement of speech intelligibility, which focuses on the speech signal. This should be an important target in therapy, if deemed appropriate by the client, but there is also a need for a larger focus on communication efficiency and quality of life. A comprehensibility focus has the potential to acknowledge and target all of the domains depicted in the ICF model, with a particular focus on participation rather than the activity level. Given that the research on comprehensibility in dysarthria has been limited, there is a need to validate the measure of comprehensibility. This could be accomplished in a clinical setting. Of greater importance to an individual's social participation is whether comprehensibility intervention at the clinical level is reflected by changes in conversation. To better understand how intervention

is reflected in conversation, it is also necessary to determine whether these changes are perceptible at the participation level by unfamiliar individuals. The current study aimed to validate the use of comprehensibility relevant to clinical practice, examining the relationship between intelligibility and comprehensibility and seeking to determine if a change in comprehensibility could be demonstrated in a meaningful way. This is the first step towards a more holistic view of an optimal level of health for those with dysarthria.

4.1 Review of Study Design

To review, the intelligibility and comprehensibility of a single individual, E, who had severe dysarthria, were assessed using a structured assessment (Yorkston & Beukelman, 1981) with G, a speech-language pathology student, at the beginning and end of her six-week clinical externship. The assessment results were analyzed to determine whether any changes occurred in the comprehensibility measures that were not paralleled by changes in intelligibility. The second objective was to establish whether a change in comprehensibility, if present in the structured assessment, was reflected in conversation. This was done by systematically analyzing two conversation samples that took place following the assessments. Lastly, groups of unfamiliar clinicians watched the videotaped conversations to determine whether they perceived any differences in conversation, with a particular focus on teasing out the nature of 'success'.

4.2 Component 1 - Clinical Utility of the Structured Assessment of Comprehensibility

First and foremost, an effort was made to validate the measure of comprehensibility for clinical utility. In a clinical setting, the factors that affect comprehensibility for dysarthria, as depicted in the comprehensibility model, are accounted for, with the exception of 'Listener's Shared Background' (see Figure 1.4). The assessment and treatment of comprehensibility acknowledges the speech impairment and compensatory strategies used by an individual with

dysarthria and how these impact listener processing. The listener's feedback to the individual with the speech impairment is an important component of effective and enjoyable communication. Signal-independent information such as the semantic and syntactic context, in addition to cues such as gesture or use of an alphabet board, can serve to enhance or diminish listener comprehension. The interplay between all of these elements determines how communication within a dyad evolves and whether it is effective and efficient. In this study, it was determined that these factors could be collectively measured in a systematic way.

This study made use of stimuli from Yorkston and Beukelman's (1981) Assessment of Intelligibility of Dysarthria Speech (AIDS) to assess comprehensibility. E and G worked together to ensure understanding and this was accomplished through the use of feedback. The dyad collectively decided when to move on to the next sentence. The sentences from both assessments (i.e., T1 and T2) were scored based on the criteria discussed in the previous chapters. Although 89-100% inter-reliability achieved across all of the categories is acceptable, unique circumstances prevented 100% reliability overall. These results point to the establishment of a reliable assessment method and scoring criteria for this dyad but say little of the extension to other dyads. In a dyad, neither the individual with dysarthria nor their communication partner(s) forms a homogenous group. Accordingly, the criteria used to score the structured assessment for G and E may not encompass the information necessary to score another dyad accurately. For instance, E used an alphabet board to aid communication and another individual with dysarthria might use high-tech AAC device, the use of which is currently not described in the criteria.

Each dyad, and each conversation for that matter, is unique. This warrants the development of an assessment that can adequately measure comprehensibility for most dyads. The recognition of heterogeneity across dyads highlights the necessity of assessing a larger number to determine how the scoring system works for different dyads and to expand the scoring criteria as necessary. The findings suggest that the assessment of comprehensibility may be

suitable for all levels of dysarthria and may be relevant to other areas where a comprehensibility focus is deemed valuable, such as in degenerative disorders.

In areas of analysis where the possibilities are too extensive to capture, such as with strategy use for accurately conveying a message and avoiding breakdowns (e.g., presenting a sentence one word at a time, giving feedback), qualitative description is beneficial. Strategies of this nature that are used within dyads are an open-ended set and that is why they were not quantitatively scored in the present study. Qualitative description permits adaptation as needed and, in fact, could facilitate intervention and outcome measurement if the strategy descriptions were specific to individual or dyad's characteristics and communication needs. The strategies used changed for this dyad between T1 and T2 and this may have resulted in more efficient transfer of information, as depicted by the scores of the structured assessment. Intervention targeted at strategy use for some dyads may be an appropriate means to increase comprehensibility.

In terms of the structured assessment in Component 1, large differences in the scores between T1 and T2 were seen in all categories (see Table 3.1), indicating improvement in comprehensibility in T2. In other words, the dyad was able to agree on the sentence read by E with fewer extra speaker words, extra listener words, problem words and incorrect guesses, and this translated into completion of the structured assessment in a shorter period of time, as compared to T1.

A comparison of comprehensibility scores with intelligibility scores offers some insight into factors contributing to improved comprehensibility. For an unfamiliar listener, C, there were minimal differences in intelligibility ratings between T1 and T2. This indicates that little to no change in E's actual speech took place. If improvements in speech had occurred they should have resulted in higher intelligibility scores for C. In contrast, G's rating of E's intelligibility showed improvement from T1 to T2 (see Table 3.2). These changes in intelligibility can, at least

in part, be attributed to familiarity. Given that intelligibility is related to comprehensibility it is impossible to separate the factors responsible for the improved comprehensibility. It might be that comprehensibility improved because G's ability to understand E had improved. In terms of the model of comprehensibility, a change in familiarity indicates a change within the listener. The same components of the comprehensibility model that were affected in T1 were also affected in T2. In other words, the speech impairment, compensatory strategies, and signal-independent information presumably remained the same, but the listener's familiarity with these elements changed. This signifies the overlap between intelligibility and comprehensibility and implies that familiarity is a necessary element for increased comprehensibility and perhaps intelligibility also. It also illustrates how even intelligibility is not a sole function of the speech signal and that, as suggested by Tjaden and Liss (1995), familiarity with one's client can alter perceptions of positive change in the clinical setting. This is an important consideration with respect to the effect of clinical intervention on an individual's participation and quality of life.

The change in familiarity may also be illustrated by differences that were noticed in the ratio of extra speaker words to extra listener words between the two structured assessments. The ratio of extra speaker words to extra listener words went from 1:1.5 in T1 to 1:3 in T2. This change may have occurred for two reasons. First, a greater number of extra listener words indicates the possibility that more responsibility was placed on G in the second structured assessment. E may have felt confident in G's ability to adequately interpret his utterances and recognize his input as valid. Just as likely, G had gained an understanding of E's activity limitation and recognized that an increase in input on her part fostered increased participation for him.

This change may also be related to a modification in E's strategy use and use of feedback. In T1, E often used repetition of a word or phrase as feedback to G when she had given an incorrect word(s). This may have proved confusing for G in T1 as repetition is often

used to signal confirmation of a message in conversation. By T2 she had become familiar with E's use of repetition to signal a misunderstanding. In addition to using repetition, E also gave specific feedback, such as 'excellent' and 'good' in T2. This confirmed to G that her corrected word/utterance was, in fact, correct. This, in addition to presenting the sentences one word at a time meant that E was producing fewer speaker words.

In spite of this, G frequently repeated the entire sentence once all the words were received and acknowledged as correct to verify that she had heard the sentence correctly. By using this confirmation strategy, there is perhaps further evidence that G was taking on more of the burden. This was done in T1, but more so in T2. In light of these considerations, the larger ratio perhaps best represents both an increase in responsibility placed on G as well as a change in E's strategy use. Additional structured assessments with this dyad, though not possible now, may have allowed for better determination of the influence of each of these possibilities on the change in ratio.

As discussed, both members of this dyad changed the strategies they used between the first and second structured assessment. E used more specific feedback in T2 and G made fewer guesses, instead asking for repetition when she did not understand a word/phrase. In T2 there was less use of the alphabet board which may have been due to reduced need and/or the more frequent use of favored strategies. A change in strategy use translated into more effective communication overall, with quicker recognition and resolution of breakdowns. This corresponds to the feedback loops depicted in the model of comprehensibility (Figure 1.4, p. 24). For example, interactivity was a key element in both models discussed and an increase in that interactivity at many levels may be responsible for positive changes in communication and participation.

4.3 Component 2 – Comprehensibility Changes in Conversation

4.3.1 Turns

Breakdowns and their resolution, in addition to turns and topic, have been shown to be important considerations in conversation analysis. For the current study, the analysis of turns did not reveal any meaningful differences between the two conversations. The results from the turns analysis confirmed expectations that each conversation partner would take a similar number of turns, as would be the case for any two-party conversation, and that G's utterances would be longer than E's. Speech for E required a significant amount of effort so it seems rather obvious that his utterances would be shorter and that he may have avoided talking, to some extent, and allowed G to take greater control over the conversation. Perhaps this type of analysis has use clinically to detect problems in turn allocation for a dyad, keeping in mind that dyad participants have to determine for themselves what level of active versus passive involvement is appropriate for each member. The same can also be said for number and lengths of turns, as well as for floor control. As Yorkston, Bombardier, and Hammen (1994), have suggested, how individuals with dysarthria perceive the reactions of their conversation partners "may be a reasonable means of assessing the degree of handicap associated with dysarthria" (p. 30). Although their discussion was not based on the current ICF model, it suggests that the members of the dyad are most responsible for judging the success of conversational exchanges.

4.3.2 Signaling and Repairing Breakdowns

Another important component of successful conversations is the ability to signal and repair breakdowns. Although the relative number of breakdowns that took place in each conversation changed only modestly, the proportion of turns spent in breakdowns appeared to be more meaningful. The dyad spent fewer turns in breakdowns in T2 than they did in T1. This indicates that the dyad continued to encounter trouble sources in conversation, which could be

attributed in large part to E's poor intelligibility, but they were able to resolve those breakdowns in a shorter period of time. It was shown that the dyad repaired more of the breakdowns in T2 in five or less turns. This appeared to be related to the strategies used by each member to signal and/or repair the breakdown. Underscoring this change, presumably, is familiarity with each other's communication styles/strategies, shared knowledge of the topics discussed and, for G, increased intelligibility of E's speech. It is possible that greater changes may have been observed if the dyad had had more than six weeks to work with one another.

King and Gallegos-Santillan (1997) found that speakers with dysarthria used more conversation strategies with unfamiliar partners than with familiar partners. The findings for this study are consistent with the King and Gallegos-Santillan study in that less strategy use was necessary in conversation in T2 and that this was most likely related to an increase in familiarity and greater responsibility assumed by the familiar conversation partner. Breakdowns are reflected in both the model of comprehensibility and the ICF model. Fewer breakdowns may indicate more effective feedback, strategy use, and familiarity. In terms of the ICF model, these elements can be interpreted as influential factors in the achievement of higher levels of overall health and participation.

Caissie and Rockwell (1993) assert that repair strategies are "crucial to successful conversational exchanges" (p. 202). They describe specific requests for clarification as being more effective than nonspecific requests to repair breakdowns, seemingly, because they pinpoint the trouble source. Given E's poor intelligibility, it was an expected finding that G was responsible for signaling virtually all of the breakdowns that took place. G used markedly more specific than non-specific requests for clarification in both T1 and T2. The most often used request was a 'specific statement of confirmation of message', which served to indicate which portion of the statement she had understood, thereby indirectly signaling to E which portion of the statement he needed to repeat. G frequently used repetition in the structured assessment also

and this may indicate a generalized strategy to conversation. Noteworthy is that she increased her use of nonspecific requests in T2. This would seem to contradict Caissie and Rockwell's assertion and indicate that G was placing more burden on E for breakdown resolution. Such a change might reflect G's confidence in E's ability to effectively communicate his message. If this were the case, this confidence could stem from experience communicating with E. Initially, G may have underestimated E's communication skills because of his impaired speech. By gaining knowledge about E and his communication skills through communicative interactions, G could then afford E the communicative responsibility that is typically expected of a communication partner. This change in perspective, although speculative, might point to an increased quality of conversation for E which may have promoted increased participation and overall quality of interaction. These questions were not asked of E at the time but would have been interesting. What is known, however, is that members of both focus groups felt that the participants were interested in conversing and participants in the second focus group found interest and enjoyment to be greater for the dyad in T2.

Though G may have been responsible for signaling more of the breakdowns in both conversations, E was certainly more responsible for repairing them. His response strategies evolved between the two conversations. As with G, this cannot be viewed without a recognition and appreciation of the influence that the other member of the dyad imparts on such a change. In T1, E frequently used exact repetition of a phrase in response to a repair request, which was most often a specific request for confirmation. This proved largely inefficient and warranted unnecessary effort on E's part. By repeating a larger portion of a phrase there was a greater chance that intelligibility would be degraded and G would have no more information than she did initially. In T2, E more often repeated only part of the missed utterance at a time. This seemed to work more effectively for this dyad because it reduced the potential for multiple misunderstood words in an utterance and increased the possibility of resolution by focusing on

one or a few words at a time. Also seen less in T2 was the use of explanation/elaboration. There is some evidence to suggest that E's use of explanation/elaboration in T1 was in response to G not understanding the point of his utterance rather than the words.

Although not all of the analyses done on breakdown and repair sequences showed differences between T1 and T2, the change in the number of turns spent in breakdown as well as the change in communication strategies of both members of the dyad indicate that improvements in comprehensibility noted in the structured assessment task were reflected in conversation for this dyad. Both differences most likely stem from successful/unsuccessful attempts throughout their many interactions.

4.3.3 Topic Development and Control

Analysis of topic draws attention to the different conversational contributions of the members of the dyad. Topic control falls exclusively in the participation domain of the ICF model. Increased comprehensibility and more successful exchanges may coincide with the differences in topic moves employed by each member of a dyad. For this dyad, for instance, G was more active and took on a greater burden of the conversation. Her control, however, was such that she introduced topics of particular interest to E as well as topics that were of interest to her. Her increased familiarity with E by T2 permitted discussion of several topics of interest to him and her active role permitted less active involvement on his part. Although it may seem somewhat counterintuitive that a slight decrease in active participation for the individual with the speech impairment and an increase in active participation for the conversation partner might signal an increase in comprehensibility, this change may be in line with the ideals put forth by the WHO. By decreasing the effort required for E to communicate, increased participation in conversation might be encouraged. In spite of G's overall control of topic, E's involvement in the conversations was by no means passive, with roughly half of his topic moves in each

conversation categorized as active. This remained the same for both conversations and may have been related to his perceptions of G.

Yorkston et al. (1994) investigated how people with dysarthria (mild, moderate, and severe) perceive their activity/participation limitation and whether perceptions differed in individuals with different levels of impairment. This was done by means of a questionnaire that targeted areas such as situational difficulty, speech characteristics, beneficial compensatory strategies, and perceived reactions of others. Results were similar for each group with the exception of the 'perceived reactions of others' category; those with severe dysarthria had stronger feelings about others being helpful and/or punishing, for example, than the other groups. Unfortunately, it is not possible to determine if E found G to be a helpful communication partner, and was not bothered by having her take on a larger amount of the burden for conversing. E's poor intelligibility may have also contributed to his less active contribution. This parallels the findings of Comrie et al. (2001). These researchers investigated the influence of dysarthria on turn-taking and conversational contribution and determined that those speakers with greater intelligibility contributed more to the conversation than those with more impaired intelligibility.

While E's active versus passive involvement remained the same for T1 and T2, G's active involvement increased in T2. This may be related to G's decreased use of Nonspecific Acknowledgment in T2 as compared to T1. A drop in Nonspecific Acknowledgments could possibly be associated with an increase in understanding. That is, G may have been using Nonspecific Acknowledgement to conceal her lack of understanding in T1. If this were not the case, the use of Specific Acknowledgement might be expected. An increase in understanding may be a possible explanation in light of the fact that familiarity would increase with each conversation of the dyad. Familiarity has been linked with increased perceptions of intelligibility (Tjaden & Liss, 1995).

According to Yorkston et al.'s (1994) results, demand for intelligibility and partner familiarity are factors that are judged by all speakers with dysarthria to affect communication difficulty. While demand for intelligibility remained fairly high in both conversations, partner familiarity would have increased by T2, making conversation somewhat less difficult. This difference seemed present in the form of more jovial and enjoyed interaction in T2, as recognized by several members of the second focus group.

It is evident from findings in Component 1 that positive changes in comprehensibility occurred and could be measured in a meaningful way, but only a portion of the analyses on both breakdown and topic reflected these changes in comprehensibility in conversation between T1 and T2. It is possible that greater changes were not observed because the elements examined were not particularly sensitive to changes in comprehensibility. It is also possible that the conversation samples available from this dyad simply were not extensive enough to get an accurate picture of the changes in comprehensibility that may have occurred. Every conversation between two people is so distinct that two conversations alone might not provide an accurate account of a dyad's communication skills. Perhaps a larger number of conversation samples over time may have produced more reliable results. Brookshire and Nicholas (1994) found that, to minimize variability and to obtain reliable baseline measures, at least four discourse samples should be analyzed.

While it is important to find a reliable means of measuring comprehensibility, it is also important to establish comprehensibility as a clinical focus that imparts positive change on an individual's functioning in his or her desired social realm. This would be the ultimate goal for comprehensibility intervention. The results from the components discussed thus far suggest that comprehensibility can be measured and that changes in comprehensibility, although variable across the analyses done, were reflected in conversation for this dyad. What remains to be explored is the perception of improvement by others.

4.4 Component 3 - Questionnaire and Focus Group Discussions

Clinicians were chosen as participants in this study because the potential use of comprehensibility for the assessment and treatment of dysarthria is a clinical issue. Questionnaire items addressed factors potentially related to overall perceptions of communicative success. The notion of communicative success is larger than comprehensibility as it can be associated not only with elements of an individual's functioning but also with quality of life. The remainder of the questionnaire items were associated with elements of the comprehensibility and/or ICF models. Proficiency, for instance, can be accounted for at the activity level of the ICF model and in the interactive components of the comprehensibility model. Interest and comfort do not have a place in the comprehensibility model but do relate to participation and environment in the ICF model; if improved comprehensibility leads to greater participation, one might expect to see higher ratings for interest and comfort associated with improvements in comprehensibility. Relative effort may be related to participation, although the nature of that relationship is not clear. For our dyad, for example, G took on a larger burden of the conversation to aid E, thereby possibly promoting his participation in their conversations. These factors did not prove to be equally influential in forming perceptions of success.

The questionnaire results revealed considerable differences between the two groups of participants. Recall that if improvements in comprehensibility in T2 were perceptible to participants, then relevant items would be rated higher for conversation at T2 than at T1. This was true in both focus groups only for the questions targeting proficiency and success. For the second group, who viewed the earlier conversation first and the second one later, all questionnaire items were rated higher for T2, with the change in rating for effort suggesting more equal participation in T2. The first group, who saw the samples in reverse order (i.e., T2 then T1), rated T2 higher for only the questions targeting proficiency, for which the difference was minimal, and success, for which the difference was closer to that of the second group. They rated

comfort considerably higher for T1, and gave roughly equal ratings for interest. They perceived slightly more effort on G's part in T2. The fact that there were differences between the two groups in some elements but not others might indicate that the elements of proficiency and success, for instance, better reflect changes in comprehensibility over time, for this dyad at least. This was reflected in the focus group discussion, with a considerable amount of discussion being devoted to these questionnaire elements.

The fact that both groups found T2 to be more successful, and that this did not consistently coincide with the results for the other questions, suggests that judgments of success might be related to factors that were not identified here. However, comfort and effort were discussed as factors linked to success in the focus group discussions. Comfort and effort were treated quite differently, with effort being discussed in respect to skills used, energy expenditure and breakdowns, while comfort seemed to be related more to subjective impressions such as laughter (i.e., 'nervous' or not), enjoyment, facial expression as well as assumptions about experience and familiarity. It may be that these factors are difficult to judge in isolation.

Group one seemed less confident in their judgments. This can be seen by the mean difference scores in this group. Not only were the mean differences between T1 and T2 smaller overall, which means that they were placed in closer proximity on the scale, but a high percentage of participants within group one rated items for T1 higher than for T2. This is depicted visually in Figure 3.5. They were more confident in their ratings of success, as indicated by the high positive difference, but as mentioned, were perhaps unsure about what it was related to.

For group two, the parameters seemed to match their perceptions overall. The mean for each dimension varied somewhat with the largest mean differences seen for questions pertaining to comfort, effort, and success. For this group, perhaps the elements of comfort and effort correlate best with judgments of success. It is also possible that these factors are not all related to

each other and assumptions about the relationship between comfort and success, for example, may have biased their judgments. The analysis of the focus group discussion that followed the questionnaire permitted a greater understanding of the influence of order on perception and the elements that were considered when arriving at answers for the questionnaire. The influence of factors such as order indicate the breadth of information considered when arriving at perceptual judgments. This notion is illustrated in the bidirectional nature of the models discussed in this study.

In terms of the focus group discussions, analysis of the transcripts revealed that participants from each group largely considered the same factors in forming their perceptions of the two conversations. Perceptions of both individual and combined comfort appeared to contribute to perceptions of all other topics discussed and may indicate that comfort is a prerequisite for all successful conversations. This is particularly perplexing given that questionnaire ratings of comfort varied between the two groups. Ultimate decisions about success seemed to encompass comfort as well as the successful exchange of information marked by fewer breakdowns in general, but also the active and equal participation of both members of the dyad to resolve any breakdown that may have occurred.

As a point of interest, participants gave the impression that they lacked confidence in their perceptions of the dyad, because each group spent a considerable amount of time comparing the two sets of clips. For group one, this was mainly focused on which conversation occurred first in time whereas group two seemed more concerned about placement on the scales, perhaps because they were more confident about the order in which they occurred. Many erroneous assumptions were made about order and background that may have influenced the final ratings of the conversations. Even though the participants all considered the same factors, they ultimately weighted factors differently. The reliance on assumption sheds light on how those with communication challenges are received by clinicians and may suggest that potentially

different underlying assumptions can affect the perceptions of members of their social group and the community at large.

These participants brought assumptions based on past experiences with research and expectations of intervention to this study. They were aware of research design in general and the possibility that the order of the videos would be reversed. Similarly, they were aware of the importance of solid findings. Several participants in group one commented that they had tried to maintain relative positioning of the two conversations (e.g., T1 needs to be placed before T2 on the scale) to be consistent. In some respects, this represents a response bias in the sense that they may have been trying to maintain consistency for the investigators' benefit. Of perhaps more significance is that they brought expectations about the outcomes of intervention. The participants assumed correctly, as they were aware that G was a student speech-language pathologist, that intervention of some kind took place over G's six-week externship. As such, there was an expectation that the conversation that took place following intervention would be better. The conversation seen second would most likely represent the second conversation in real time. The order effect may have reduced the rating of success for group one but did not deflate it entirely. Contrarily, for group two, the ratings of success may have been inflated.

Tjaden and Liss (1995) studied the influence of familiarity on judgments of treated speech. They found that familiarity is one listener variable that influences judgments of speech, even if the exposure to that speech is minimal. As a result, they cautioned that clinicians be wary of the judgments they make regarding their clients' progress because their continued contact with the client can inflate their perceptions of improvement. This can be compounded by expectations that, with intervention, a client will show improvement. This same assumption was held by many participants in both focus groups, the effects of which are thought to be greater for group two because they viewed the clips in the order in which they occurred and there was less question in their minds about the order of presentation. For this group, the assumption that later in real time

would be better was not complicated by other factors that may have contradicted this notion, as it was for group one.

Individual participants in both groups treated the questionnaire items differently. Some of the participants in group two commented that they were challenged by the questionnaire because they did not have a reference point with which to compare their first conversation. Ratings of conversation T2 were reportedly easier because it could be rated against conversation T1. Some participants were also challenged by whether to answer each conversation individually or maintain a pattern of one conversation being rated higher than another, as was described. Some shared that they changed their answers after viewing the second conversation clips. All of these factors may have resulted in skewed data that are unrepresentative of the participants' perceptions. Alternatively, this indicates the influence of perception on our judgments, perceptions that appear to change with the addition of new information. For instance, some participants commented that they shifted perspective after watching all clips and after conversing with their peers about the clips.

In arriving at judgments of better/worse it seemed that people felt there was a difference between the two conversations but could not necessarily verbalize it. Differences arose around discussion about the communication board. One group thoroughly analyzed use of the board, highlighting positive and negative factors such as reliance versus independent use, which affected their perceptions of the dyad. Importantly, their ratings on paper did not necessarily match the factors of consideration that developed in the focus group discussion. This is evidenced by the global themes that surfaced during the discussions. Participants' ratings also involved factors such as determining how to approach the visual analog scale (VAS), their understanding of research, understanding the background of the dyad and the topics discussed, to name only a few. It seems that perceptions of success in conversations encompass much more than the four dimensions addressed in the questionnaire.

Overall, the participants seemed to consider the same factors when rating their perceptions but the influence of these factors varied between and among members of the focus groups. The focus group discussion facilitated explanation of some of the findings from the questionnaire. Moreover, the group discussions revealed that impressions as represented in the questionnaire do not necessarily match those held by the individual. This was particularly evident when fellow participants shared their impressions. There were conflicting senses over where to put their ratings. A point was chosen as a compromise among factors and the way in which people compromised differed. The focus group discussions also revealed that participants had a difficult time explaining how they arrived at their impressions, and their confidence seemed to waver depending on the views of the other group members. Ultimately, combined use of questionnaire and focus group yielded more information about the targeted areas of interest as well as suggesting how participants' interpretations of scales and questions can influence study results.

4.5 Clinical Implications

The results of the present study suggest that comprehensibility may be an alternative or additional focus for the assessment and treatment of dysarthria. The clinical utility of comprehensibility has the potential to benefit those with various communication impairments because of its focus on communication rather than speech, and its recognition of the importance of environmental and personal factors. For instance, an important addition to speech/language intervention might be treatment directed at the dyad level rather than the individual level. Kagan et al. (2001), Rayner and Marshall (2003), and Sorin-Peters (2003) showed that training the family members and friends of individuals with aphasia served to increase that individual's social participation. Involvement of family members and friends in the intervention process might better ensure that skills targeted in the clinic will extend to environments where the

individual with the communication impairment engages in conversation. Even an understanding of the communication impairment and the strategies used by the individual with the communication impairment might have a positive effect on communication exchanges with family and friends if closer involvement in the intervention is not desired (Sorin-Peters, 2003). This would also be applicable to therapy with children. For instance, a family-centered approach to treatment that focuses on engaging the child and fostering communication rather than 'teaching' might help that child to make gains in various environments.

Strategy use is another possible intervention focus that can extend beyond dysarthria. Caissie and Rockwell (1993) studied the communication strategies employed by adults with hearing-impairment and their communication partners to signal and repair breakdowns. Analysis of this nature allowed them to see who controlled the floor and what communication strategies proved most effective for repairing a breakdown. A targeted analysis of strategies used by a dyad could provide valuable information for the clinician on how to improve strategy use and increase satisfaction with communication and participation. For the present study, it was important to recognize the strategies employed in the structured assessment and determine if they were also used effectively in conversation. The refinement of the strategies used to prevent and repair breakdowns in the structured assessment of comprehensibility by both members of the dyad indicates movement along the ICF continuum from activity to participation. However, refined strategy use is only indicative of ability to function in a structured task.

It cannot be assumed that a change seen in a structured task will translate into changes in conversation. Given the dynamic nature of conversation, analysis to determine such a change, if present, must determine the issues that prevent or promote successful communication exchanges. While it is not expected that clinicians conduct an extensive breakdown/repair analysis with their clients, the findings of the current study do point to a potential intervention focus. Intervention

targeted at effectively signaling and repairing breakdowns will improve the communication efficiency, and potentially, the enjoyment for dyads.

Gaining an impression of topic development and control within a dyad might also help in setting goals for therapy. It is possible that individuals with dysarthria, or any communication impairment for that matter, may take a passive role in conversation because they are not confident in their communication abilities and/or because it requires less effort. Providing the individual with strategies to signal topic, such as topic cues for instance, might increase communication effectiveness and lead to increased participation in communication exchanges. If family members/friends are also involved and become familiar with these strategies, then increased active involvement in conversation is even more plausible.

What is most important perhaps is how the individual and those with whom he or she communicates feel about their conversations. It may be something that they do not consider regularly or feel that they can change. An important first step for clinicians is to determine how dyads view their conversations and this might require the use of a questionnaire, for instance, because perceptions about conversation are often difficult for people to describe. This was revealed by the focus groups involved in the current study.

Participants had a difficult time qualifying their judgments of success in the focus group discussion. Many factors appeared to influence their judgments. It would seem that perceptions of success in conversations encompass much more than the four dimensions addressed in the questionnaire. This is an important consideration for clinicians when gauging how treatment will impact perceptions of peers and unfamiliar partners and participation outside of the clinic. Interpretation of conversational success might vary considerably between individuals. Perhaps what is most important is that there were perceptible differences in the success of the conversations. This validates comprehensibility as a viable clinical focus for the treatment of dysarthria that might promote changes in overall health, functioning and quality of life.

4.6 Future Research

Despite the advantages of using both a questionnaire and focus group discussion, there are some areas in which the third component could be improved if the study were to be done again. The clips used for this component were just segments of conversations and the constraints imposed to make the two samples comparable may have minimized relevant differences.

Future research may examine conversations in their entirety and/or compare the findings with groups that have viewed only clips of conversations to determine if such sampling greatly impacts perceptual judgments. As was stated previously, conducting this same study with more conversation samples could provide more reliable information about any changes in perception that may take place over time. Presenting the conversations/clips in an ABAB (i.e., T1 T2 T1 T2) or BABA design might reduce assumptions relating to order. The instructions given to participants prior to filling out the questionnaire may have addressed the problems that participants found when answering. For instance, they could have been advised not to mark judgments until both conversations had been seen or instructed that the questions were addressing relative, rather than absolute, scores. If nothing else, the use of a focus group discussion highlighted the flaws in questionnaires and the impact that questions themselves can have in shaping participants' perceptions. The focus group proved to be a valuable supplement for this study.

A substantial limitation to this research was that it was a retrospective study, and information on how the members of the dyad felt about their interactions was unavailable. It would have been interesting to know if they found the conversations satisfying and if they found them to be more satisfying by the end of their six-week involvement. This is ultimately the goal of the ICF and the most important factor for individuals with communication limitations. Future research targeting communication within dyads should include the perceptions of the dyad because their judgments and perceptions are undoubtedly the ones that matter. Similarly,

checking the perceptions of E's peers and those individuals who would not be considered peers of either member of the dyad would have provided valuable information.

Another limitation of the current study was that no stable baseline was established at T1, which is particularly important if comprehensibility is to be used as an outcome measure of intervention. Even in the present study, more samples at both T1 and T2 would have clarified the significance of changes that occurred in conversation over time. This would involve analysis of two to three conversations of similar length that took place in a short time period (e.g., a week). Analysis of several conversations would allow a more conclusive statement about patterns found in conversation because with only a single conversation it is unknown whether a breakdown/repair strategy, for example, was used consistently or if it occurred in isolation. Analysis of several conversations at both points in time might also indicate whether familiarity or treatment was more responsible for any changes seen, although it would be difficult to separate the two entirely. The present study makes no claims about the efficacy of intervention,

We are all affected by the perceptions of others. Other people's perceptions of us influence how we react towards them, our willingness to interact with them, and how we feel about ourselves. If potential communication partners in a given environment perceive an individual to be communicatively competent in his or her own right, the opportunity for participation increases regardless of any activity limitation. A measurable change in comprehensibility may or may not be significant in others' perceptions.

Other considerations that could enhance future research of this type would include a reliability check for the structured assessment of comprehensibility with more dyads and raters. This would confirm its use as a valuable assessment tool for dysarthria and other communication disorders where a comprehensibility focus is deemed appropriate. Changes in communication strategies were observed in the structured assessment but not evaluated specifically. Given that

the strategies of the dyad changed, a study looking at the effectiveness of strategy treatment might prove beneficial for both research and clinical practice.

Lastly, the order in which the video clips were viewed had a noticeable influence on the perceptions of the focus group participants and how they responded to the questionnaire. To get a reliable account of group perceptions and minimize the influence of order effect, more focus groups, for example, two focus groups for each ordering of clips, would be beneficial.

4.7 Conclusion

The current investigation used previously collected data to analyze comprehensibility. While the use of secondary data restricted the study in some respects, the objectives were met in large part. This study found a relationship between intelligibility and comprehensibility, namely in familiarity, changes in comprehensibility can and do occur in the absence of significant changes in intelligibility when intelligibility is judged by unfamiliar listeners. This highlights comprehensibility as a valuable avenue for assessing and treating dysarthria. Strengthening the potential use of comprehensibility as a viable evaluation for the treatment of dysarthria were the findings that comprehensibility was reflected in conversation in a way that could be measured. Lastly, and perhaps most important, is that unfamiliar individuals were able to perceive a change in conversation that may relate to changes in comprehensibility, and this was particularly true for the dimension of successful communication. Collectively, these findings move us farther along the continuum from activity to participation, bringing us closer to a multi-dimensional view of assessment and treatment for those with dysarthria. This multi-dimensional type of focus, advocated by the WHO, places an emphasis on how individuals function in their environments and the factors that can impact functioning. An approach like comprehensibility has a greater potential to impact quality of life and promote the highest standard of health, than one that focuses on a single element.

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Appendix A

Scoring criteria: Inclusion/Exclusion factors and Procedures

Measures	Factors/Procedures
(1) Time to do total number of words	a. Include in timing for each sentence ALL comments and feedback from speaker's first presentation to the final "agreement", including reinforcers e.g., 'excellent', 'good', 'right', with the following exception: I. Any interaction with examiner, including false starts where examiner needs to redirect. II. Any external interruption e.g., phone ringing.
(2) Number of problem words	a. Count every word of the target sentence (no more than once) where the listener does not repeat correctly on the presentation (even if part way through the item trial as when, for example, the speaker breaks up the sentence) b. In cases where the speaker says a whole sentence, but the listener says then, for instance: "I didn't get ANY of that", count every word as a problem word. c. Count as a problem word if the person got it right the first time (i.e., seemed to agree with speaker as to the target on first presentation) but subsequently forgets it (indicated by their use of a placeholder e.g., "something") so that the speaker needs to repeat the word again.
(3) Number of extra speaker words	a. First production of the target word in the sentence is NOT included in the count. b. EVERY repetition of the target word (even if "self-correction") is included, and even if the word is embedded in a sentence (e.g., "you got 'he' right": count 'he'). c. Include part words (e.g., if the speak says a syllable) and letters given verbally. d. Do not include other comments, even if related to the task (e.g., "you're close").
(4) Number of extra listener words	a. First production of target word in the sentence is NOT included in the count, even if it comes quite far along in the sequence. b. EVERY repetition of a target word (even if for confirmation at the very end e.g., repetition of the entire sentence) is included, and even if the word is embedded in a sentence (e.g., "did I get 'he' right?": count 'he'). c. Also included in count is every error (see below). d. Also included in count are extra words (but not as errors) are 'placeholders', e.g., "something, something" (to indicate two words not understood and not guessed at). e. Do not include other comments, even if related to task (e.g., "am I close?"). f. Do include oral letters when using alphabet board (e.g., H..A..S..T..). g. Do not include target words included in listener comments once final agreement has been reached (i.e., between trials). Final agreement must be

	determined between the speakers in the dyad and not by a third party listener. Agreement can be signaled verbally (e.g., Right, yeah, you got it) or non-verbally (e.g., Hand gesture, head nod)
(5) Number of words guessed incorrectly	a. Include EVERY incorrect guess at a target (even if it a repetition of an earlier guess). b. Include even where listener documents incorrect guess herself (e.g., "it's not X, is it?" (count X as an error). c. Do NOT include clear placeholder, (e.g., "something X") where the listener does not seem to be offering "something" as a guess at the target. d. Include letters as incorrect guesses.
(6) Ultimate correct	a. Include correct number of words in FINAL presentation. Even if a word was correctly produced earlier by the listener, but in final repetition, is incorrect or omitted, if the speaker accepts it, it is counted as an error word (giving a score of n-1/n, where n it the total number of words in the sentence).

Appendix B

Transcription notes

..	Pauses of < .5 seconds
...	Pauses of < 2 seconds
<n>	Duration of pauses >/= 2 seconds
?	Final rise
,	Slightly rise as in listing intonation (in Verbal column only)
//	Final fall
-	Truncation
_	Level ending
::	Lengthened utterance
=	Indicates overlap, placed at beginning and end of overlapped segments
**	Accent: extra prominence
# #	Demarcates extra-textual information
( )	Additional transcriber comments and descriptions

Speakers

E
G
B
E/G (both E and G)

Consent: Your participation in this project is voluntary and you may withdraw from the study at any time. Your withdrawal will not affect your grades or education status. If you consent, please sign below and return to the investigator, Tiffany Visser, at the School of Audiology and Speech Sciences.

Your signature indicates that you consent to participate in this project.

Your signature indicates that you have received a copy of this consent form and are informed about the project and your role in this research.

_____

Signature Date

_____

Printed name

Appendix D

Questionnaire

1) **Please circle one**: I am a graduate/undergraduate student.

2) Have you had any experience with those with dysarthria?

*Using the letter **A** to represent conversation **A**, and the letter **B** to represent conversation **B**, indicate where you feel that each of these conversations fall on the scales below.*

3) This dyad demonstrates proficient communication skills.

Strongly agree Strongly disagree

|_____|

4) These individuals were comfortable communicating with each other.

Strongly agree Strongly disagree

|_____|

5) Rate the relative effort involved for the communicators in this dyad.

More effort on his part Equal effort More effort on her part

|_____|_____|

6) Both members of the dyad seemed interested in the topics discussed.

Strongly agree Strongly disagree

|_____|

7) This conversation was:

Very Successful Not successful

|_____|