ABSTRACT

Title of Dissertation:	RESEARCHING LISTENING FROM THE INSIDE OUT: THE RELATIONSHIP BETWEEN CONVERSATIONAL LISTENING SPAN AND PERCEIVED COMMUNICATIVE COMPETENCE.
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Listening research has been a challenge, as there is lack of agreement as to what constitutes listening (Glenn, 1989; Witkin, 1990). This lack of agreement has spawned over 50 definitions and models for listening, but not one testable theory. Most models and definitions were developed in the early 1970s, and listening researchers grounded their work in the popular attention and memory theorists of the day including Broadbent, Treisman, and Kahneman. Attention and memory models of this time period were linear in nature and popularized with the notion of short-term memory/long-term memory (Driver, 2001). The Working Memory theory (WM) was introduced by Baddeley and Hitch in 1974, and by 1980 it had become the dominant theoretical perspective. WM is a fixed-capacity system accounting for both processing and storage functions. However, a close inspection of past and present listening definitions and models reveal that they all

are built, implicitly or explicitly, on the unsupported linear attention and memory research.

This study first provides a comprehensive chronological overview of both listening models and attention and memory models. A cognitive listening capacity instrument, the Conversational Listening Span (CLS), is proposed, tested, and validated. The CLS is grounded in WM and acts as a proxy measure for the biological construct of conversational listening capacity. Conversational listening capacity is defined as the number of cognitive meanings that one can hold active and respond to within the course of a conversation.

Communibiologists assert that communication behaviors are a function of biological systems (Beatty & McCroskey, 2001). Thus, the CLS, a biological measure, is used to predict perceived communicative competence. Thus, this study (N=467) investigates the role of CLS on perceived communicative competence.

Four hypotheses are advanced and ultimately supported:

H_1: Conversational Listening Span will have a direct relationship with the reading span, the listening span, and the speaking span.

H_2: Conversational Listening Span will have a direct relationship with perceived interpersonal competence as well as communicative competence.

H_3: Listening Span and Conversational Listening Span will predict one's communicative competence.

H_4: Those with greater interest (high) in their conversational topic area will score higher on the CLS than those with lower interest in their topic area.

RESEARCHING LISTENING FROM THE INSIDE OUT:

THE RELATIONSHP BETWEEN CONVERSATIONAL LISTENING SPAN AND

PERCEIVED COMMUNICATIVE COMPETENCE

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TABLE OF CONTENTS

List of Tables

List of Figures

Chapter I: Introduction

Listening has not achieved legitimacy as an area of study in the discipline of communication. In disciplinary terms, legitimacy is gained by the number of publications in prestigious journals, the number of professors and researchers who specialize in a specific area, the number of graduate students, both Masters and Ph.D.'s who graduate with the specialization, as well as the number of conference papers and a special interest group that national and international associations sponsor. On most of these counts, listening does not fare well. Though the exact reason for listening's lack of legitimacy is not clear, there are at least three reasons that deserve mention.

First, the study of listening suffers from a lack of a theoretical framework (Brownell, 2002). This is not to suggest that there are not theoretical perspectives from which to view listening. In fact, a landmark book in listening (Wolvin & Coakley, 1993) displayed 13 solid theoretical perspectives. The difficulty, however, is that the theoretical perspectives have not generated falsifiable and testable theories, and without these theories a social science cannot progress.

A second reason for listening's lack of legitimacy is that listening scholars have not done service to the construct of listening by sharing information across disciplinary boundaries (Brownell, 2002; Janusik, 2002a). Listening primarily is a cognitive activity that is perceived behaviorally, and cognitions and behaviors are not always congruent (Witkin, 1990). Successful cognition research began in psychology, and beginning in the 1970s, most of the early listening models were grounded in psychological attention and memory research (Janusik, 2002a, 2003). With the addition of working memory theory, (Baddeley & Hitch, 1974), attention and memory models in psychology have changed significantly in the past 25 years; yet listening models have not reflected this change.

Finally, listening has not gained legitimacy in communication research because listening research has been significantly ambiguous in the areas of measurability (Bostrom & Bryant, 1980). Many argue that most listening tests measure memory or intelligence as opposed to listening because they are tailored to recall (Fitch-Hauser & Hughes, 1988; Kelly, 1965; Thomas & Levine, 1994). In prior research, effective listeners have been evaluated by how much they correctly recollect (Bostrom & Waldhart, 1980, 1983; Brown & Carlsen 1955; Cooper, 1988; Miller, 2001; Miller & DeWinstanley, 2002; Steinbrecher Willmington, 1997; Educational Testing Service, 1955; Watson-Barker, 2000). In essence, this is measuring the listening product as opposed to the listening process (Witkin, 1993). If listening is a construct, and an active process, then it must be measured by more than recall, a different construct. With better conceptualization and parameters, listening could be measured more effectively.

The lack of a modern theoretical framework that produces validated instrumentation has meant that many areas of listening research have gone untapped. For example, little research exists on conversational listening, the type of listening used in interpersonal communication. Linear models of communication (Shannon & Weaver, 1949) are the foundation of current listening tests, where the listener's goal is to receive the message. However, when the listener is placed in a transactional context, like a conversation, then message reception is not sufficient; the listener also must respond (See Appendix A for a glossary of terms used in this study). The goals of linear and mediated listening are different than the goals of conversational listening, for conversational listening moves one from being a receiver of the message to placing one within the transactional communication process (Berlo, 1960).

When the listener moves from being responsible only to receive the message, as in linear and mediated listening models, to an interactive communicator, as in conversational listening, then he is simultaneously responsible for all aspects of the communication process attributed to both the source and the receiver. However, evaluation of competent communicators primarily has been source-centered. For example, a compilation of 13 interpersonal communication competence measures (Rubin, Palmgreen, & Sypher, 1994) displays no instrument, and few questions on listed instruments, as receiver-centered. Thus, what is not known is the effects of one’s listening abilities on overall competence evaluations.

Therefore, before a model of conversational listening can be developed and before listening’s role in communicative competence can be determined, listening researchers must reconsider the foundation of the field, which is not consistent with what is known about cognition through working memory theory (Baddeley & Hitch, 1974; Miyake & Shah, 1999).

In addition, the discipline of communication is based on observable patterns of behavior, yet listening cognitions cannot be observed; they can be operationalized and measured only through observable behaviors. This presents a major challenge, as listening cognitions and listening behaviors are not always congruent.

Thus, the current perceptual measures of communication competence are based on perceptions and are not solely sufficient to measure listening cognitions and behaviors. What is needed is a measure that more adequately taps listening cognitions so that the relationship between listening cognitions and perceptions of competence can be further investigated.

This study will address the legitimacy issue of listening by incorporating cross-disciplinary advances regarding working memory theory. In addition, a listening instrument to measure conversational listening capacity will be proposed. Finally, the link between conversational listening capacity and communicative competence will be examined.

Goal

The goal of this dissertation is twofold. First, a conversational listening span instrument will be developed that is grounded in WM theory and capable of measuring one's conversational listening capacity. This instrument eventually will provide the base for developing the first listening model grounded in WM research. This model will assist listening researchers in studying listening in ways currently not possible.

The second goal of the dissertation is to clarify the relationship between conversational listening span and communicative competence by investigating whether the measure from the conversational listening instrument can predict one's perceived communicative competence.

Chapter II: Review of Literature

The second goal of this study, to investigate the effect of listening cognitions on communicative competence, is predicated on achieving the first goal, to produce and validate an instrument to measure listening ability. This section first will establish the listener as a conversational participant. Then it will address the literature that supports the need for a listening instrument grounded in WM. Finally, it will explicate why listening capacity should, in part, predict communicative competence.

Conversation and Listening

Communication and information exchange is dynamic (Schiffrin, 1999), and conversation is more than one person responding to another. Conversation is connected talk. In conversation, the participants often exchange sentences or utterances, which might be words or phrases that are not grammatically correct but still carry meaning. An utterance is understood relative to its context (Olson, 1972).

Requirements of Conversation

A conversation requires at least two interacting people (Nofsinger, 1991), and the two people take turns as a speaker and a listener (Sacks, 1992). Grice (1975) refers to “connected remarks” as the first general principle of talk exchanges, and he asserts that one critical feature of talk exchange is that the contributions of both parties should be dovetailed. Hence, every utterance is made in reference to a previous utterance or an expected utterance (L. Drake, personal communication, September 1, 1999). Because the talk is reactionary and responsive, conversations are interactions, not a collection of actions (Nofsinger, 1991). This idea is consistent with the relational perspective of communication (Brownell, 1999; Rhodes, 1993).

Conversation as Rule-Governed

As a collection of actions, all conversation is normative, which is learned and patterned behavior that is not universal. Likewise, all conversational exchanges are rule-governed, and the individual norms determine the rules (Searle, 1965). Thus, if both parties involved in the conversation are a part of the system, and if the speaker's utterances are rule-governed, then listening behaviors must be rule-governed as well, or the system will not function properly.

The listener's role in the conversation often is overlooked, as so much communication research focuses on the speaker or the message (Rubin, 1990). The listener is not a repository for the message, but a co-creator of the meaning (Resnick & Klopfer, 1989). In fact, in the transactional model of communication, the role of listener is eliminated in favor of the role of communicator. Thus, in a conversation, listening is what a communicator does.

The Historical Foundation of Listening Definitions and Models

Listening Definitions

There is a lack of consensus regarding the definition of listening among communication scholars; however, there are consistent elements found in most definitions of listening. A content analysis of 50 definitions of listening found that the five most used elements in the definitions were perception, attention, interpretation, remembering, and response (Glenn, 1989). However, it is important to note that no definition has been validated or universally accepted. Further, it is important to note that of the five most used elements to define listening, the first four are strictly cognitive in nature.

A further examination of listening definitions over the past 50 years demonstrates that the basic elements included in a listening definition have not changed. Consider the following definitions:

….. an attachment of meaning to oral symbols (Nichols, 1948)

… the complete process by which oral language communicated by some source is received, critically and purposefully attended to, recognized, and interpreted (or comprehended) in terms of past experiences and future expectancies (Petrie, 1961).

"The selective process of attending to, hearing, understanding, and remembering aural symbols (Barker, 1971, p. 17).

When a human organism receives verbal information aurally and selects and structures the information to remember it (Weaver, 1972).

"The process of receiving, constructing meaning from, and responding to spoken and/or nonverbal messages" (An ILA Definition of Listening, 1995, p. 4).

"The process of receiving, attending to, and assigning meaning to aural and visual stimuli" (Wolvin & Coakley, 1996, p. 69).

Listening is the "acquisition, processing, and retention of information in the interpersonal context" (Bostrom's 1997, p. 247).

Listening is hearing, understanding, remembering, interpreting, evaluating, and responding (Brownell, 2002).

"The listening act really consists of four connected activities – sensing, interpreting, evaluating and responding" (Steil, Barker, & Watson, 1983, p. 21).

Each definition consistently cites cognitive functions to define the listening process. These functions include: attending to, interpreting, assigning meaning, and understanding. Because communication and listening scholars are not expected to perform primary research on brain activity, an investigation of the references these researchers used for these listening definitions (Janusik, 2002b) show that they are grounded in one of two ways. First, authors cited psychological researchers, such as Broadbent (1958), Treisman (1960, 1964), Deutsch and Deustch (1963), and Kahneman (1973). Second, those that did not directly cite the psychological researchers instead cited listening theorists whose foundations are based in those psychological researchers, such as Barker (1971) and Weaver (1972).

To fully understand the importance of this historical foundation, it is necessary to understand the psychological research, theories, and models cited.

Psychological Attention and Memory Research 1950 – 1974

In the 1950's, psychological research investigated listening as part of attention and memory research. Broadbent, one of the first researchers to investigate attention and memory, set out to solve a practical problem (Driver, 2001). The problem under examination asked why some World War II pilots could understand and execute radio messages fraught with static while other pilots could not. This line of inquiry became known as the 'cocktail party' phenomenon and asked why one who is attending a cocktail party can effectively have a conversation and block out competing and distracting noise except when he hears something familiar, such as one's name (Driver, 2001; Moray, 1970). The most popular theory to test the 'cocktail party' phenomenon was Broadbent's filter theory (1958, 1971), because it was one of the first theoretical models that related psychological phenomena to information-processing concepts of mathematics and computer science (Driver, 2001).

Broadbent’s (1958, 1971) filter theory of attention and memory assumed a sequence of three factors: the sensory register, short-term memory, and long-term memory, which became known as the multi-store model. The sensory registry was responsible for receiving and registering stimuli from various sensory input, such as hearing and seeing. Because humans cannot perceive all stimuli at once, a selective filter would strain the stimuli based on a most important physical characteristic, such as the largest or the loudest stimuli. These stimuli would then enter the short-term memory, where it could only reside less than a minute. These stimuli then would enter either the long-term memory or be forgotten. Broadbent assumed the multi-store model to be linear in nature, meaning that stimuli could only enter through the sensory register, move into short-term memory and then into long-term memory. Stimuli could not by-pass any of the steps, nor could steps move in reverse. Broadbent also proposed that the multi-store model had a limited-capacity equal to one stimulus at a time.

Broadbent's theory was popular, in large part because it was easily testable. However, through testing, evidence quickly mounted against the filter theory, and Treisman (1960) proposed a modification. The simple modification suggested that the filter did not only let one stimulus through, but it could let multiple stimuli through. However, only one of the stimuli could be perceived at a time. The non-primary stimuli would be attenuated as opposed to eradicated. Treisman's adaptation suggested that humans were capable of processing unattended stimuli more deeply than expected (Driver, 2001), meaning that even if a stimulus was not perceived, it somehow could have reached the long-term memory and be recalled at a later time. In fact, most of the cellular evidence today, particularly in the more posterior area of the visual cortex, supports Treisman's concept of attenuation as opposed to total elimination of sensory responses to unattended stimuli (Lavie, 1995, 2000).

The filter theory, with Tresiman’s revision, continued as the dominant perspective of selective attention and memory until 1963 when Deutsch and Deutsch modified it. Their model suggested that one could perceive multiple stimuli, but could only respond to one of them. Additionally, the concept of the "most important signal" was added. This suggested that danger signals, like “fire” and special signals, such as one’s name, could penetrate consciousness by overpowering one’s selective perception. In effect, the filter was still in place and could filter multiple stimuli simultaneously; however, one stimulus, dubbed the “most important signal”, would always be dominant.

Kahneman (1973) offered the next major shift in selective attention and memory and proposed a capacity model that posited attention as a limited-capacity resource. Attention was allocated based on conscious and unconscious rules. In essence, this was the predecessor to what is referred commonly to today as multi-tasking. Kahneman's model changed the theoretical perspective of attention research from linear to flexible and dynamic. Until Kahneman’s adaptation, it was believed that stimuli had one way into long term memory and could only be processed one at a time. The new understanding was that humans could process multiple stimuli at once; however, each of the stimuli would get only partial attention.

Each of the theories reviewed above was appropriate for information known at the time. As with any discipline, developers of current knowledge are indebted to prior researchers. The initial linear theories (Broadbent, 1958, 1971; Deutsch & Deutsch, 1963) were critical to understanding how cognitive processes might work, thereby developing a vocabulary (sensory-register, short-term memory, long-term memory) that persists today. Treisman (1960) acted as the link from a linear-based, single focus model to a multi-focus model by suggesting unattended stimuli are attenuated as opposed to eradicated. Kahneman's (1973) contributions of limited-capacity, as well as allocation, helped pave the way for working memory theory (Baddeley & Hitch, 1974). Working memory theory was introduced in 1974, and by 1980, it became the dominant theoretical perspective of attention and memory research (Miyake & Shah, 1999).

Psychological Attention and Memory Research 1974 – Present

Prior to 1974, linear models of attention and memory dominated the cognitive psychology field. These included the models of Broadbent (1958), Treisman (1960), and Deutsch and Deutsch (1963). Kahneman's (1973) attempt to shift the notion of attention as singular perception to attention as allocation, permitting one to comprehend two or more stimuli simultaneously, paved the way for the Baddeley and Hitch's (1974) introduction of working memory theory. Working memory (WM) is a dual-task system accounting for both the processing (attention) and storage (memory) functions. By 1980, WM became the dominant theoretical approach and remains so today (Gathercole, 1997). The simplicity of the original WM model (Baddeley & Hitch, 1974) has withstood empirical tests and replication with only minor modifications (Baddeley, 1986, 1992, 2000, 2001; Baddeley & Logie, 1999). WM differs from the previous models in that it is dynamic and transactional, not linear, in nature.

To understand working memory theory and the important contributions it could make to listening research, it is necessary to review the basic premise of working memory and the development of the model over the past 30 years.

Basic Premise of Working Memory

Baddeley and Hitch's (1974) contribution to attention and memory research was offering Working memory (WM) to supplant linear attention and memory models. They posited that WM was a dual-task system involving processing and storage functions (Baddeley & Hitch, 1974). In WM, attention is allocated, and resources can be used simultaneously for processing and for storage. This was different than Kahneman's (1973) concept of allocated attention, as in Kahneman's model, multiple stimuli could be perceived at once; however, memory followed attention. In Baddeley and Hitch's (1974) WM, attention could be allocated to multiple stimuli while other stimuli were being stored and/or information was being retrieved from long-term storage. Both processing (attention) and storage (memory) occurred simultaneously, not in a linear fashion. The notion of the WM also encompassed what used to be referred to as short-term memory. Working memory was a dynamic system used not only to shift stimuli and subsequent understanding from and into long-term memory, but also as the way to create new meanings that could then be either forgotten or stored.

Research with WM suggests that retrieval of stimuli (i.e. recall) through WM is typically associated with general intelligence, increased learning, and greater comprehension (Conway, Cowan, & Bunting, 2001; Daneman & Carpenter, 1980; Daneman & Merikle, 1996). Over the past 30 years, the simplicity of the original WM model (Baddeley & Hitch, 1974) has withstood empirical testing and replication with only minor modifications (Baddeley, 2000, 2001; Baddeley & Logie, 1999).

Working Memory Model – Baddeley and Hitch, 1974

Working memory (WM) "refers to a brain system that provides temporary storage and manipulation of the information necessary for such complex cognitive tasks as language comprehension, learning, and reasoning" (Baddeley, 1992, p. 556). Baddeley and Hitch's (1974) first conceptualization of working memory was twofold: the working memory general (WMG) and the working memory specific (WMS). When an individual was performing a cognitive processing task, such as considering how to give directions to the center of the city, the WMG acted as a temporary storage of information, very similar to the former idea of short-term memory. The other WM storehouse, WMS, purportedly offered a more detailed model of the structure and processes of WMG (Baddeley, 1986). However, Baddeley and Hitch's inability to find evidence to support a single store prompted them to introduce the initial working memory model with the articulatory loop and the visuo-spatial sketch pad.

Their initial three-part WM model can be seen in figure 1.

Figure 1. Baddeley and Hitch's (1974) working memory model

The initial three-part WM model consisted of the Central Executive (CE) as well as two "slave" systems: the visuospatial sketchpad, and the phonological loop (Baddeley and Hitch, 1974). The central executive was initially conceived as a conceptual depository, where any concept outside of the domain of the specific WMS parts was thought to reside. Its primary role was to coordinate information from the two slave systems. The visuospatial sketchpad was a temporary holding area for visual images, and the phonological loop was a temporary holding area for words. Both the visuospatial sketchpad and the phonological loop were initially conceptualized as buffers to the CE. Thus, excess images and words that were important to the CE, though not imminently needed, could temporarily be stored in one of the buffers and then retrieved when needed.

Changes to the WM Model – 1975 through 1995

By the mid 1980s, the concept of the Central Executive (CE) changed to imply a scheduler or supervisor, one more capable of selecting and prioritizing (Baddeley, 1986). Thus, the CE was an attention-controlling system, and it coordinated the information from the slave systems, which were the visuospatial sketchpad and the phonological loop (Baddeley, 1992). The visuospatial sketchpad manipulated visual images and the phonological loop stored and rehearsed speech-based information. The phonological loop often was equated with the former notion of short-term memory in that the phonological loop could temporarily store a word or number-based meaning, like a telephone number, until one could write it down. Once the telephone number was written down, the phonological loop would erase the information. Note that the stimuli was not believed to be attenuated, as Treisman (1960) proposed. Rather, the stimuli and subsequent temporary meaning simply vanished. The individual may remember knowing the telephone number and writing it down, but it would be impossible for the individual to recall the telephone number from the long-term memory because it simply was not there.

Changes to the WM Model – 1996 through 2000

The meaning of the phonological loop shifted in the mid 1990's, and its primary purpose was to store unfamiliar sound patterns for a temporary time (Baddeley, Gathercole, & Papagno, 1998). This shift was important in the development of the newer model, as it was recognized that the phonological loop no longer stored words and meanings, rather that task was given to the CE in combination with coordinating long-term memory. However, when that part of the system could not work, for example, when one is presented with a word or group of words for which no immediate meaning can be assigned, then the word or words reside in the phonological loop until meaning can be assigned or they are eliminated from the system.

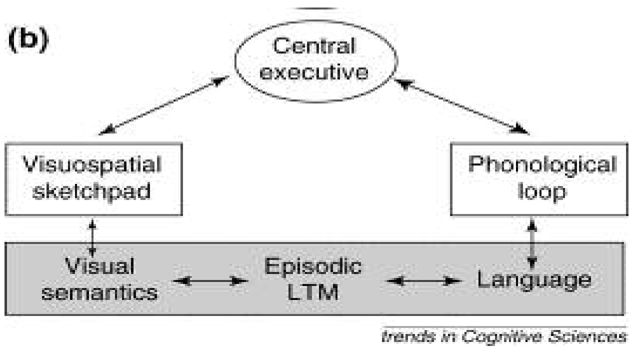

Figure 2. Working Memory Model, Baddeley (2000)

The updated version of the WM model (see figure 2) contained the initial elements of the central executive (CE) and the two slave systems: the visuospatial sketchpad the phonological loop. It adds the notion of the episodic buffer, consisting of episodic long-term memory, visual semantics, and language (Baddeley, 2000). The CE is still an attention-controlling system, and it coordinates the information from the slave systems. The visuospatial sketchpad still manipulates visual images and the phonological loop temporarily stores and rehearses unfamiliar sound patterns. There were a number of phenomena not captured by the original model, so the episodic buffer was added. For instance, the Central Executive cannot store information, so the episodic buffer was added to demonstrate how information is stored temporarily. The episodic buffer is represented by the bottom shaded bar, and it includes visual semantic, episodic LTM, and language.

Additionally, episodic long-term memory was deemed distinct from LTM; they are not the same system (Baddeley, 2000). The episodic LTM draws from LTM; but it was not the activated portion of LTM, as previously believed. The WM model could not function without the notion of LTM, which is the place from which meanings are retrieved and put into play in the episodic LTM, but the WM model does not attempt to explain LTM.

In this version of the model (Baddeley, 2000), the shaded areas represent the crystallized systems, which symbolize the LTM systems. The crystallized systems are the cognitive systems that can accrue long-term knowledge. The non-shaded areas represent the fluid systems, which are included in the explanatory powers of the WM model. The fluid systems are temporary and cannot accumulate knowledge; they can only process knowledge from the LTM systems and the incoming stimuli. Thus, the LTM systems are necessary for the WM system to function; however, WM theory does not seek to explain the LTM system.

Changes to the WM Model– 2001 to Present

The most recently revised model (Baddeley, 2001) further defines the distinction between the epidosic buffer and long-term memory (LTM). The model shifts the focus from the isolation of the subsystems to the processes of how information is integrated. (See figure 3).

This new model addresses the challenge of previous models in that the phonological loop had limited explanatory power in terms of articulatory suppression, which should prevent the loop’s ability to register visual material and audio stimuli simultaneously (Baddeley, 2000). Because suppression was not complete, it suggested that the phonological and visual information somehow were combined. The episodic buffer in the new model helps to explain this relationship, as both visual and phonological information can reside in episodic long-term memory (LTM).

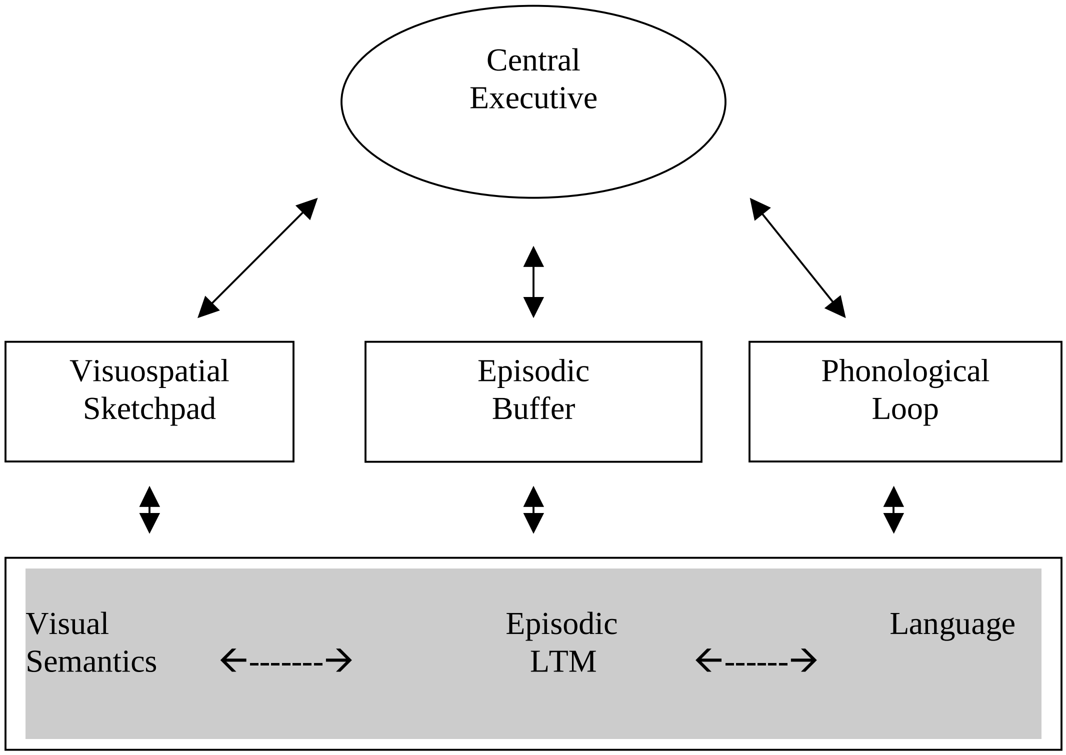

Figure 3. Working Memory Model (2001). From Baddeley, A.D. (2001). Is working memory still working*? American Psychologist, 56*(11), 851- 857.

Baddeley (2001) contends that when we retrieve memories from LTM, they can come in episodes complete with words and visual images. The current WM model includes the episodic buffer where both words and images could be stored together. This model suggests that individuals also can store words for which no meanings are attached. For example, if one hears the word “heretic” in a conversation and does not know what it means, one could temporarily store it in the phonological loop, which is still responsible for temporarily storing unfamiliar sound patterns. If, by the end of the conversation, meaning still is not made for “heretic”, then the individual could visualize how the word might be spelled and store the word in long-term memory until a dictionary could be consulted. Thus, the recall would come from the episodic long-term memory by way of the episodic buffer.

This newer model also addressed the second challenge with previous models concerning prose recall (Baddeley, 2000). Specifically, in numerous studies where individuals were asked to recall unrelated words, participants made errors when the number of words exceeded five or six. However, when the words were placed in meaningful sentences, then the recall ability was dramatically increased to an average of 16 words. An explanation for this increase focused on Miller's (1956) idea of 'chunking' information. The chunked information could not reside in the phonological loop, but it could reside in the episodic buffer, which could support serial recall with surrounding contexts (Baddeley, 2001).

The episodic buffer is assumed to be controlled by the CE, and it is considered to integrate both visual and phonological information (Baddeley, 2000). Further, because the CE cannot store information (Baddeley, 2001), the episodic buffer is assumed to temporarily store 'episodes,' visual and phonological information that is integrated across place and time (Baddeley, 2000). Thus, the CE can consciously retrieve visual or phonological information, separately or combined, from the episodic buffer. Additionally, since the buffer retrieval assumes conscious awareness, the episodic buffer is also the location where meaning can be modified and adjusted. Current functional magnetic resonance imaging (fMRI) research supports the existence of the episodic buffer (Prabhakaran, Narayanan, Zhao, & Gabrielli, 2000). The fMRI research differs from MRI research in that the former measures the magnetic properties of organic tissues in motion (i.e. the brain movement caused by thinking) as opposed to the MRI research, which measures the physical structure (Gazzaniga, Ivry, & Mangun, 2002).

The Roles of Working Memory and Long-Term Memory in Comprehension

This study focuses on WM, not long-term memory (LTM), so LTM will be addressed only as it refers to understanding this study. Long-term memory (LTM) represents “everything a person knows and remembers” (Kintsch, 1998). The knowledge or memory can be stored as information, emotions, or sensory experiences.

Long-term memory, in itself, is not a part of the WM system, but the WM system depends upon LTM to function fully. Specifically, when a communicator receives an aural stimulus, the individual attempts to make sense of the stimulus by matching it to meaning stored in the LTM. Brownell (2000) describes the sense-making as comprehension. Thus, it would be virtually impossible to make sense of stimuli without pulling previous experiences and information from LTM to match it to the incoming stimuli.

Much information may be stored in LTM, but it is of no use unless it can be activated, and the LTM is activated by working memory. All information contained in one’s LTM cannot be activated at once by WM, or there would be a system overload. Systems, such as schemas, appear to prevent overload. A schema is a cognitive template that assists one in organizing, interpreting, understanding, and storing information (Fitch-Hauser, 1990).

Communication and Channel Capacity

A channel is the means by which one receives stimuli, and the channels of interest in this study are visual and auditory, the channels primarily used for conversational listening. Researchers have been interested in capacities, the maximum amount that the mind can hold, for over 50 years. Because research has spanned linear attention and memory models as well as working memory, each will be addressed separately below.

Channel Capacity Prior to Working Memory

Prior to working memory theory, researchers understood that individual's channel capacities were limited. In terms of communication, Miller (1956, 1994) argued that when an individual's input was roughly equal to his output, then he was involved in a good communication system. The input was described as the stimuli received, which would be the message sent from the speaker. The output was the listener's understanding of the message. Thus, the greater the correlation between the intended message and the received message, the greater the understanding. In terms of the communicator, when the amount of information received was increased, the amount of understanding would also increase. This would occur until the individual had reached his channel capacity, the asymptotic point at which he could no longer receive stimuli and understand it. The channel capacity was the greatest limit at which one's input and output correlated. The stimuli not correlated were affected by noise. When an individual reached his channel capacity, he would near the point of confusion, which is where he could no longer comprehend the incoming stimuli.

Channel capacities were believed to be between four bits or chunks of information (Broadbent, 1975) and seven bits or chunks of information (Miller, 1956, 1994). A bit of information is one piece, and bits may be combined to form chunks. A chunk of information, regardless of the number of bits it contains, counts for only once piece of information. For example, area codes, when familiar, are three bits of information, but one chunk of information. What was not understood was exactly how one decoded a chunk of information into bits and then recoded it again to chunks.

The variation in the maximum pieces of information may depend upon the channel and the task. For example, Pollack (1952) used numbered tones. When an individual heard a tone, he had to respond with its corresponding number. Confusion was rare with four tones, but frequent for five or more tones. This could be interpreted as an average individual having a tone channel capacity equal to five. However, when the tone was only auditory, then thechannel capacity increased to 7.2 (Pollack & Ficks, 1954). With auditory-only single syllable English words, the channel capacity was nine; however, when words are increased to multiple syllables, the capacity dropped to five (Hayes, 1952). Finally, in a visual-only task, judging the size of squares, the channel capacity was about five (Eriksen & Hake, 1955).

Hence, the search for channel capacity began with the foundation of linear attention and memory models. With the introduction of working memory theory, the search for channel capacity continued.

Functional versus Total Channel Capacity and Working Memory

With the introduction of working memory theory (WM), researchers became interested in the channel capacity of both processing and storage functions, now believed to be one system instead of two.

Working memory resources contain processing and storage functions, and the combination of both equals one's capacity. Just and Carpenter (1992) argued that WM was a capacity-restricted system. Therefore, each individual has his own capacity for processing and storage functions. One's capacity was believed to be static in that the overall capacity of the processing and storage system could not increase. However, one could learn to process more efficiently, which would permit a greater portion of the WM capacity to be allotted to storage.

Extended training could increase one's chunking ability by developing and automating sophisticated coding strategies (Chase & Ericsson, 1982). The Capacity Theory of WM is supported by fMRI research (Just, Carpenter, & Keller, 1996).

With WM theory, researchers became interested in how the combination of the processing and storage components worked together to determine capacity. The focus shifted from maximum capacity to functional capacity (Daneman & Carpenter, 1983). Though only recall could be counted, the capacity is a function of processing and storage. The more quickly one processes, the more capacity is left for storage. The maximum number of items was no longer appropriate to study, as working memory is not a general system with a unitary capacity, but one that fluctuated based on the efficiency of the task (Daneman, 1991).

The current study is focused on language-processing, so the emphasis of explanation will be on the language-processing capacity tests. It is important to note, however, that functional capacity has been measured through non-language tasks including operation span (Turner & Engle, 1989) and counting span (Case, Kurland, & Goldberg, 1982). However, all of the span tasks appear to tap the similar construct of working memory, as regardless of the type of span task (language processing or arithmetic), the correlations are significant (Baddeley, 1992).

The most simple language-processing span task is the word span, where the participant listens to a list of words and must recall them in serial order, or in the same sequence in which they were read (Haarman, Davelaar, & Usher, 2003). The word span task is a storage-only measure, as no text comprehension is required or testes. The functional capacity of recalling words heard aloud, independent of a context, was about 5 items; however, when placed within the context of sentences, word recall could increase to as high as 16 words (Baddeley, 2001). Evidence suggests that chunking occurs in the recall of sentences, which could account for the significant increase (Aaronson & Scarborough, 1977). For communication research, words placed within the context of sentences would be more appropriate, as “sentences, not words, are the essence of speech just as equations and functions, and not bare numbers, are the real meat of mathematics” (Whorf, 1956, pp. 258-259).

The two most popular language-processing tasks that measure functional capacity include the reading span task and the listening span task. In terms of reading span, where the focus is on reading sentences aloud and recalling the last words of unrelated sentences, functional spans ranged from 2 – 5.5 words recalled (Daneman & Carpenter, 1980; Daneman & Green, 1986; Just & Carpenter, 1987). When the sentences were recorded and listened to without visual stimuli, the functional span ranged from 2 – 4.5 (Daneman & Carpenter, 1980).

In addition to determining the amount of functional capacity, working memory span research also has shown that individuals with greater functional capacities "can comprehend a more complex story; retain subtle subplots, even if irrelevant to the main plot; and connect related propositions, even those separated by time and context" (Engle, Cantor, & Carullo 1992, p. 991). Individuals with larger functional capacities also are better at ignoring distracting stimuli, and more focused in task-oriented assignments (Conway et al, 2001).

In summary, channel capacity has been important to researchers for many years. When the foundation was linear attention and memory models, total channel capacity was based strictly on recall because processing and storage were believed to be two separate systems. However, with the shift to working memory, the dual-task system accounting for processing and storage functions, the focus became the functional capacity. Individuals have fixed total capacities, and their functional capacities can vary depending upon the task. Though the total fixed capacity cannot increase, one can be taught skills to increase the processing portion thereby allowing more of the total capacity to be dedicated to storage.

Summary of Working Memory Theory

With the advent of working memory theory (Baddeley & Hitch, 1974), the study of attention and memory shifted from a linear model that separated processing and storage functions to a dynamic model that encompassed processing and storage functions in one system. The capacity theory of working memory (Just & Carpenter, 1992) furthered research by suggesting that one’s capacity was fixed; however, one could learn skills to increase the processing function, which would increase the storage function. The former linear models of attention and memory were highly contested because they were not supported through research. However, working memory theory quickly became the dominate theoretical perspective of attention and memory because it was empirically tested with successful replication.

The application of working memory theory to listening research holds great promise because it would provide a testable foundation from which to develop listening theories. The next section will provide an historical review of cognitive and behavioral listening models and benchmark working memory theory against their foundation.

Listening Models

Listening theorists have used the work of the early attention and memory researchers to ground their definitions. Listening definitions using this foundation led to listening models. Some listening researchers were content to model the cognitive elements of listening, creating what could be called cognitive listening models. Others situated listening within the context of communication and added the response component, and these models could be called behavioral listening models.

Both cognitive and behavioral listening models are used for teaching and researching listening. However, the models are not appropriate for either teaching or research, as they are still based on the work of the early attention and memory theorists.

Two classes of models currently explain listening. The first model accounts for "what is going on in the listener at the moment of listening" (Witkin, 1990, p. 19) and could be called the cognitive model of listening. Researchers employing cognitive models include Bostrom (1990), Goss (1982), Lundsteen (1979), Taylor (1964), Wolff, Marsnik, Tracey, and Nichols (1983). The second type of model is concerned with a more global picture, involving "the interaction of the listener with the speaker and the environment, and with affect" (Witkin, 1990, p. 19) and could be called a behavioral model of listening. The behavioral model always contains components of the cognitive model; however, it is distinguished by its inclusion of a response. Researchers employing this type of model include Barker (1971), Maidment (1984), Steil et. al (1983), and Wolvin and Coakley (1988, 1996).

Both cognitive and behavioral models permit one to visualize how a process not visible to the naked eye might look. The steps that many models use to depict the process, like perception, attention, interpretation, remembering, and response (Glenn, 1989), sound intuitive and easy to comprehend. In fact, much listening training and education has centered on selecting a step in the process and suggesting ways to enhance that step (Brownell, 1990; Coakley & Wolvin, 1989; Wolvin & Coakley, 1979).

However, both cognitive and behavioral listening models have two weaknesses. First, with two exceptions (Brownell, 1996; Wolvin & Coakley, 1988, 1996), neither class of model has been scientifically tested, leaving validity and generalizability in question. Second, the models are based on former linear attention and memory models and do not capitalize on the WM theory, and this failed to account for listening as a dynamic process.

Cognitive Listening Models

Many cognitive listening models exist to depict the process in an individual's mind at the time of listening (Bostrom, 1990; Goss, 1982; Lundsteen, 1979; Taylor, 1964; Wolff et. al, 1983; Wolvin & Coakley, 1988, 1993).[1] Most of the models share similar components, and almost all are consistent with the five most used elements in listening definitions: perception, attention, interpretation, remembering, and response (Glenn, 1989).

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[1] For a more thorough review of individual models, see *Wolvin, A.D. (1989). Models of the listening process.* In C.V. Roberts and K.W. Watson (Eds.) Intrapersonal communication processes (*pp. 508-527*).

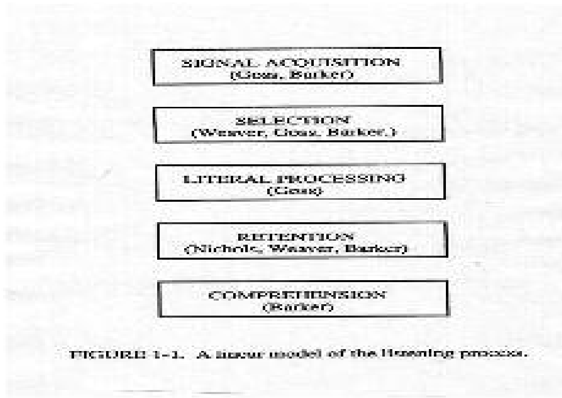

Figure 4. Bostrom's Cognitive Model. From: Bostrom, R. N. (Ed.). (1990). *Listening behavior: Measurement and application*. NY: Guilford.

For example, Bostrom's (1990) model (figure 4) contains five sequential steps. Each step is based on the work of one or more theorists. Theorists cited include Barker (1971), Nichols (1948, 1957), and Weaver (1972), three listening researchers, and Goss (1982), a theorist from linguistics. All of these cited researchers base their conceptualization of the listening process on the linear attention and memory theorists including Broadbent (1958), Treisman (1960, 1964), Deutsch and Deutsch (1963), and Kahneman (1973). In Bostrom's model, he clearly depicts the linear nature of the listening steps as well as how the explanation of the listening process moves from reception (signal acquisition) through understanding (comprehension). He explains his placement of retention prior to understanding as a step similar to short-term memory. That is, the listener temporarily stores the words until meaning can be assigned to them individually and collectively.

Another example of a cognitive model is that of Wolvin and Coakley (1993, 1996) (see figure 5). At first glance, the model appears to be behavioral because of the overt response, which generally signifies a listening behavior. However, Wolvin and Coakley (1993) chose a two-part model with the top half representing the listener in the communication interaction, and the bottom half representing the same person once he became the source. Wolvin and Coakley (1993) argue that listening ends at the point of response, for once the listener responds, then he becomes the speaker.

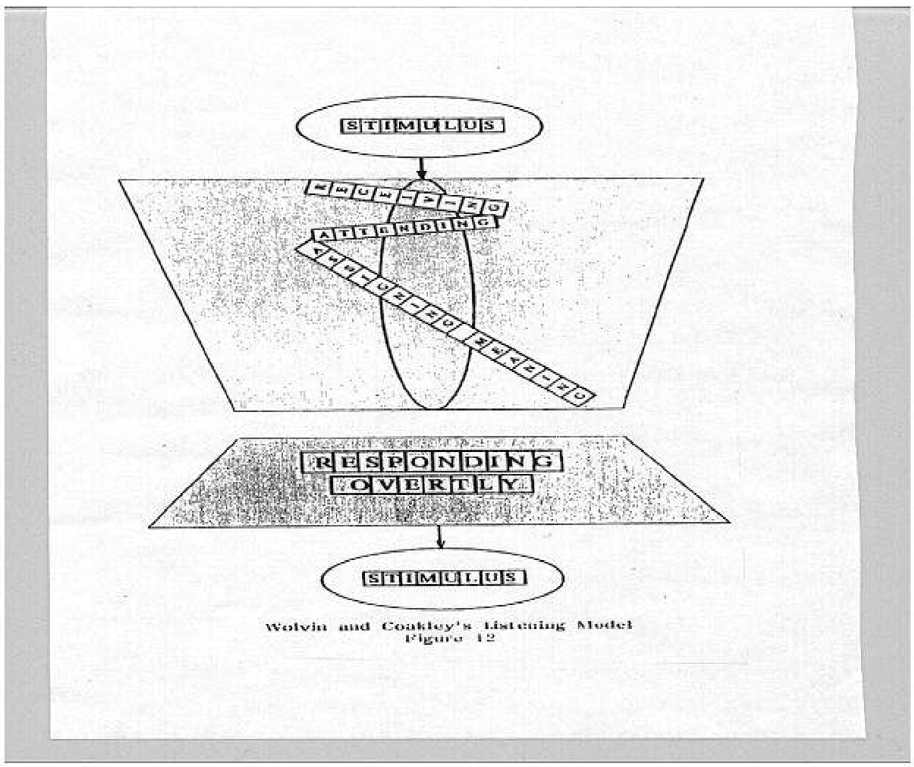

Figure 5. Wolvin & Coakley's model (1993). From Wolvin, A.D., & Coakley, C.G. (Eds.). (1993). *Perspectives on listening.* College Park, MD: Ablex Publishing.

Other cognitive listening models exist (Goss, 1982; Lundsteen, 1979; Taylor, 1964; Wolff et. al, 1983), and they share similar representations and steps to the models developed by Bostrom (1990) and Wolvin and Coakley (1993, 1996). However, all cognitive listening models share three weaknesses.

The first weakness of cognitive listening models is that none of them has been empirically validated. Attempts to validate the Wolvin and Coakley (1988, 1996) model failed (Janusik & Wolvin, 2001). Bostrom (1990) did publish empirical research that he interpreted as being consistent with his model (Bostrom & Bryant, 1980; Bostrom & Waldhart, 1980); however, the studies did not validate his model for two reasons. First, he did not attempt to validate his model, which is a different process from testing ideas about the model. Second, his foundation was the unsupported attention and memory research, so any conclusions must be interpreted in light of an unsupported foundation. Without testing, models carry little respect in the social scientific community.

A second weakness of cognitive listening models is that none of the models has successfully distinguished listening from cognitive processing. Some (Fitch-Hauser & Hughes, 1988) have conceptualized cognitive processing as a part of listening, but not as the entire process. Disciplinary boundaries are often permeable, but they must be staked to include items that are solely studied in the discipline. What makes the study of listening within the context of interpersonal communication unique from cognitive processing is that the response, whether covert or overt, is perceived by the other to be a response to the communication interaction. The necessity of a response is evidenced in the International Listening Association’s definition of listening as “the process of receiving, constructing meaning from, and responding to spoken and/or nonverbal messages” (An ILA Definition of Listening, 1995, p. 4). Thus, if cognitive listening models depict anything, they would depict cognitive processing during listening, but not listening itself from a communication perspective.

A third weakness of the cognitive models is that none of the models are based on

WM theory, the current theoretical perspective in attention and memory research. Research must build upon research, and these cognitive models do not build upon the supported research of WM theory. Those that do explicate their psychological foundations cite Broadbent (1971), Kahneman (1973) and Treisman (1960). Those that do not explicate psychological foundations generally cite former listening models and theorists who cite the aforementioned psychological researchers (Janusik, 2002a, 2002b). Thus, implicitly or explicitly, the cognitive models are built upon a foundation that was found to be unsupportable by cognitive psychological researchers.

Thus, no cognitive model has a solid theoretical base that is consistent with the interactive, dynamic perspective of WM, rendering all of them inappropriate for conversational communication research. In addition to cognitive models, listening researchers have proposed behavioral models.

Behavioral Listening Models

Behavioral listening models are cognitive models with the additional component of response. Behavioral models include Barker (1971), Brownell (1985, 2002), Maidment (1984), Steil et. al (1983) and Wolvin (2002).[2] Most of the models are heavily weighted towards the cognitive components and list "response" simply as the final step of the process. For example, Barker's (1971) model is perhaps one of the most extensive behavioral listening models, too extensive to even include a figure. However, close inspection shows that the only behavior identified is the "response" at the bottom of the model. By far, the majority of the model is dedicated to cognitive components.

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[2] See *Wolvin, A.D. (1989). Models of the listening process.* In C.V. Roberts and K.W. Watson (Eds.) Intrapersonal communication processes (pp. 508-527).

Another example of a behavioral listening model, and far simpler than Barker's model, is the SIER model by Steil, Watson, and Barker (1983) (see Figure 6). SIER is an acronym for the four-step model: Sensing, Interpreting, Evaluating, and Responding. The SIER model was developed for private industry.

The first step, Sensing, is similar to audio and visual reception of the stimuli. The second step, Interpreting, is equivalent to assigning meaning. The business context makes the third step, Evaluating, particularly appropriate. The final step, Responding, signifies that the message was received and understood.

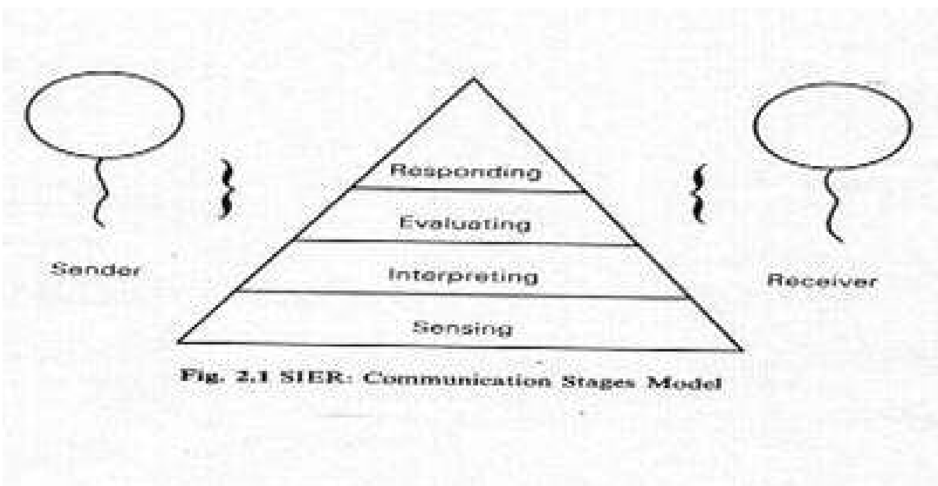


Figure 6. Steil, Watson, & Barker's SIER model (1983).

Wolvin (2002) proposed an updated version of the Wolvin and Coakley (1996) model. (See figure 7). His model contains the familiar cognitive components of Reception, Attention, Perception, and Interpretation, as well as the Response component. "Influencers" are filters that constantly affect every step of the process such as psychological noise, environmental noise, etc. Similar to the Wolvin and Coakley (1996) model, Wolvin believes that the response may be covert. The only change the he would

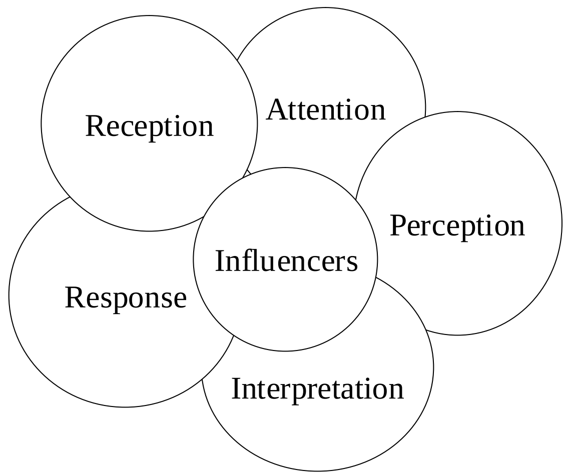


Figure 7. Wolvin's Listening Model (2002)

make to this model would be to make the element of "Perception" a filter that influences Attention and Interpretation (A.D. Wolvin, personal communication, January 15, 2004). This is consistent with research that attempted to validate the Wolvin and Coakley model (1996), which failed to find support for the element of perception (Janusk & Wolvin, 2001).

The sole listening model that has been validated is Brownell's (1996) HURIER model (see figure 8). HURIER is an acronym for her six-step listening process: Hearing, Understanding, Remembering, Interpreting, Evaluating, and Responding. Brownell's model was developed for private industry and validated through a factor analysis.

Brownell developed her model by first consulting the literature and identifying numerous statements that had been used to depict the listening process. A sample of over 1,000 business employees responded to her instrument using a Likert- type scale. An exploratory factor analysis showed support for five factors (Brownell, 1985). After reducing the statements to the 26 items with acceptable eigenvalues, she performed a confirmatory factor analysis, which again showed support for the factors. Each item targets characteristics perceived to be possessed by effective and ineffective listeners.

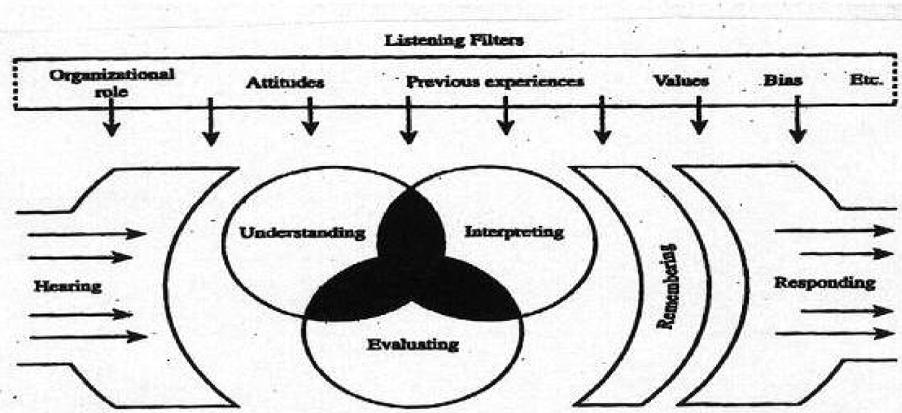


FIGURE 1.2 A model of the six-component HURIER listening process.

Figure 8. Brownell's HURIER Model. From Brownell, J. (2002). *Listening: Attitudes, principles, and skills (2nd ed.).* Boston: Allyn and Bacon.

Brownell's intent was not to create a theory of listening, but rather to identify the factors in the listening process. Despite the success of the factor analysis, there are two weaknesses to Brownell's model in terms of identifying it as a listening model.

First, Brownell reports support for five factors, but the HURIER model contains six factors. Nowhere does she indicate the sixth factor that she added or why she added it.

Second, Brownell's model is similar to all of the non-validated listening models before hers. This could be a function of its development because she selected statements from the literature, so an exploratory factor analysis would support the literature. Thus, what she may have done is validate the theoretical literature more than the true process of listening.

Finally, Brownell's model is primarily cognitive in nature. Her instrument taps the perception of how her sample felt that they listened, not necessarily the reality of how they listen. As Woelfel and Fink (1980) indicate, self-report instruments may not reflect reality for many reasons. Thus, how an individual believes cognitions flow through his brain may not indicate how cognitions actually flow through his brain. More sophisticated instrumentation than one's perception is needed to assess cognitions.

Overall, behavioral listening models have drawbacks similar to the cognitive models: First, only one of the models (Brownell, 1985, 1996, 2002) has undergone scientific testing, and though her study was statistically sound, there are weaknesses with her study's design. Second, as with the cognitive listening models, if they are grounded in psychological theory, they are grounded in the contested linear attention and memory perspectives posed by Broadbent (1958), Treisman (1960), and Deutsch and Deutsch (1963). Like cognitive models, their foundation is unsupported, which means that research based on the models is unsupported as well. Behavioral listening models would benefit greatly from a foundation of working memory theory (WM). WM could account for the processes that occur from the time one receives an auditory stimulus (hears) to making meaning of the stimuli through responding to the stimuli. In addition, the research on channel capacity could assist communication researchers in understanding the limitations of a communicator in a conversation.

Summary Critique of Current Listening Models

Although none of the current listening models, cognitive or behavioral, may yet be considered appropriate for listening research because they are based on an unsupported foundation, important information can be gleaned from them. The early listening theorists (Barker, 1971; Lundsteen, 1979; Wolff et. al, 1983) who grounded their work in attention and memory research sought a solid theoretical foundation for a communication behavior that was not observable directly but through communicative behaviors. This type of interdisciplinary research should be lauded, as communication scholars do not have the expertise or resources to study cognitions from a physiological level. The major weakness, however, is that the initial listening researcher, and all of those who built on these seminal models, were negligent by not keeping current with the major shifts in psychological attention and memory research. The psychological attention and memory research shows a clear shift from linear models to the more dynamic model, introduced as working memory theory by Baddeley and Hitch in 1974.

The Application of Working Memory to Listening Research

Because listening is primarily a cognitive activity that is manifested and perceived behaviorally, it is logical that listening theorists grounded their research in the strong empirical work of cognitive psychology. The early listening researchers who used the linear attention and memory research as foundations did just this. However, as attention and memory theories shifted from linear to dynamic in the form of working memory (WM), listening research did not keep pace. Intuitively, one knows that listening is not a linear process, and WM theory provides a more accurate model of the cognitive functions that underlie listening.

Working memory theory and capacity theory can provide the new foundation for listening models that would benefit communication and listening scholars because testable theories could be developed. Verbal and nonverbal communication behaviors are manifestations of internal cognitions, and cognitions precede verbal and nonverbal communication behaviors. WM theory and capacity theory are cognitive theories, and they are operationalized through verbal behaviors (i.e. verbal recall). The span tasks permit a cognitive measure through non-intrusive means. Therefore, what is needed is a listening instrument grounded in WM that can measure listening ability. A listening instrument, similar to other span tasks, could move listening research from perception research to a stronger empirical-based research.

Therefore, the first goal of this dissertation is to create and validate the Conversational Listening Span (CLS), an instrument that is based in WM and that can measure one's functional capacity of conversational listening. The CLS instrument would not replace current listening instruments, but it would add the ability to measure the process as it was occurring as opposed to the product, which is the correct recall of stimuli. Measuring the listening product is one of the primary criticisms of current listening instruments. The next section will discuss the challenges and criticisms of current listening instruments and methods.

Challenges and Criticisms of Current Listening Measurement

One of the barriers to advances in listening research is the lack of a unique measure that taps the cognitive aspect of the listening process as opposed to the listening product (i.e. recall) or other's perceptions of the listener. To understand fully this dilemma, it is important to consider the types of instruments used to assess listening, as well as the criticisms that have been leveled against each.

Current instruments used to measure listening are one of three kinds: recall tests, observational assessments, and self-report. Each will be discussed separately in the section below.

Listening as Recall

A widely used type of listening assessment is the recall test, as demonstrated by the Brown-Carlsen Listening Comprehension Test (Brown & Carlsen 1955), the Kentucky Comprehensive Listening Test (KCLT) (Bostrom & Waldhart, 1983), the NIU Listening Exam (Cooper, 1988), the Steinbrecher-Willmington Listening Test (Steinbrecher & Willmington, 1997), the STEP III test (Educational Testing Service, 1979), and the Watson-Barker Listening Test (Watson & Barker, 2000). Each of these tests is presented in an audio or audio-video format. In general, the audio-visual instruments first show a scene with a person or people talking, and then a series of questions based on the scene are asked. The questions are shown on the screen, as are the possible answers. Each test takes between 30 and 60 minutes to complete, and each instrument measures something slightly different. For example, the Watson-Barker (2000) instrument tests such areas as evaluating message content, following directions, and understanding and remembering lectures, while the Steinbrecher-Willmington (1997) instrument measures comprehensive, empathic, and critical listening skills. Though the area of listening measured differs, all of the instruments are based on the same premise.

That is, evaluating listening effectiveness through comprehension and correct *recall* of the message.

Weaknesses of Listening as Recall Instruments

The major weakness with the listening as recall instruments is their lack of validity. Validity refers to the extent that the instrument measures what it purports to measure (Shannon & Davenport, 2001). An early correlation of the STEP II test (Educational Testing Service, 1955) and the Brown-Carlsen test (1955) indicated that the instruments correlated more with mental ability than with each other (Kelly, 1965), which called into question their efficacy as listening tests as opposed to intelligence tests. This claim has been made by others as well (Fitch-Hauser & Hughes, 1988; Kelly, 1965; Thomas & Levine, 1994) Additionally, a factor analysis of three popular listening instruments (Brown-Carlsen, 1955; STEP III, 1979; KCLT, 1983) indicated that none of the instruments loaded on the number of factors specified (Fitch-Hauser & Hughes, 1987). A further factor analysis of four listening instruments (Brown-Carlsen, 1955; STEP III, 1979; KCLT, 1983; Watson-Barker, 1984) indicated that the only factor shared by all instruments was the factor of memory. Roberts (1988) criticized the instruments as offering nothing but face validity; however, the factor analyses suggested that even face validity would be called into question. What was clear is that each of the instruments measured the product or result or result of listening, rather than the process or activity of listening.

A second weakness of listening as recall instruments is that they rely too heavily on reading and writing processes (Faires, 1980), as potential responses are often read from the screen (KCLT, 1983) and responses must be hand-written (Brown-Carlsen, 1955; STEP III, 1979; KCLT, 1983; Watson-Barker, 1984). Historically, good readers have been good listeners, and vice versa, suggesting that some of the processes in reading and listening overlap (Jackson & McClelland, 1979; Just & Carpenter, 1987; Sticht, 1972). However, it is not appropriate to assume that the processes are isomorphic, because listening and reading are different communication modes and require different cognitive processes and threshold stimuli (Engle, Kane, & Tuholski, 1999; Posner & Raichle, 1994; Weaver, 1987; Wiskell, 1989). For example, listening differs from reading in that the listener cannot adjust the speaker's rate nor return to a word or phrase not understood (Wiskell, 1989). In essence, readers can adjust their pace to the comprehension process, but listeners cannot make that adjustment (Just & Carpenter, 1987). Additionally, reading is usually linear, complete and succinct, while listening in conversations is often non-linear, redundant, and incomplete (Rhodes, Watson, & Barker, 1990). Thus, reading and listening may have some processes in common; however, they both have distinct components as well, and the listening as recall instruments do not parse out the listening process from the reading process.

A third weakness of the listening as recall instruments is that they are based within a linear listening context not an interactional or transactional context, which is not representative of daily listening interactions (Villaume, Fitch-Hasuer, Thomas, & Engen, 1992). With these instruments, the one who is tested as the listener is actually an observer (Janusik, 2002b). Though some of the instruments do attempt to model dynamic interactions, the respondent is never directly involved in the conversation, so he cannot respond from the communication process represented.

Therefore, listening as recall instruments suffer from internal validity issues. Their inability to meet internal validity casts doubt on their ability to test effective listening.

Observational Instruments

The second type of listening instrument is an observational instrument that measures one's perception of another's listening skills. Two types of instruments have been validated (Emmert, Emmert, and Brandt, 1993; Rubin, 1982), and this study will focus only on these.

Rubin's instrument is part of the Communication Competency Assessment Instrument (CCAI), which is administered orally. The CCAI was designed to test college students' communication proficiency, and those who were deemed proficient, as measured by the CCAI, were excluded from the basic communication course requirement. In the CCAI, three professors assess a student at the same time. The listening component entails a professor speaking a command, such as "ask a question of your advisor" and then the student is expected to execute the command. An additional listening component of the CCAI involves the student watching a brief lecture and answering questions based on the lecture.

The second validated instrument is the Listening Practices Feedback Report (LPFR) (Emmert et. al, 1993). The LPFR is different from other perception instruments in that the items included were generated by business people's perceptions of others as listeners. The items target areas such as appropriateness, attentiveness, lack of interruptions, and responsiveness. Another unique feature of the instrument is that managers complete an instrument as self-report, and their subordinates complete the same instrument as their perception of how well their boss listens. Scores are calculated to determine how well managers' and employees' perceptions are similar.

Weaknesses of Observational Instruments

Observational instruments serve an important purpose because communicative and listening competence are perceived by others (Cooper & Husband, 1993; Spitzberg & Cupach, 1984). However, observational research cannot explain why one is perceived to be more or less competent than another except through further observation. Triangulation, or multiple confirming perspectives of the same phenomenon, is often critical to good research. Thus, observational research must be buttressed by stronger research methods. For example, it could be argued that the first component of the CCAI (Rubin, 1982), where a student is given a command and expected to execute it, is really testing the student's ability to follow directions as opposed to listen. Further, the second component of listening to a lecture and answering questions suffers from the same criticisms as the listening as recall instruments.

The LPFR (Emmert et. al, 1993) is a sound observational instrument to measure the perceptions of another as a listener. However, it does not tap information about the listening process and how the process might affect perceptions of effectiveness.

Self-Report Instruments

The final type of listening instrument is a self-report, and it measures one's perception of oneself as a listener. One of the more widely used instruments is the Receiver Apprehension Test (Wheeless, 1975). This instrument measures one's apprehension to listen or receive information, and has withstood a number of reliability tests (Beatty, 1994). Two more recently validated instruments include the Willingness to

Listen scale and the Listener's Preference Profile. The Willingness to Listen Scale measures one's perception of receiving information from intimates and non- intimates in professional, educational, and personal contexts (Roberts & Vinson, 1998). The Listening Preference Profile assesses one's perceived listening style, including people, action, content and time orientations (Barker & Watson, 2000; Watson, Barker & Weaver, 1995). Additional self-report instruments measure one's perception of self as manager (Barker, Pearce, & Johnson, 1992), where one breaks down in the listening process (Brownell, 1990), and what one believes she/he does as a listener as well as what one thinks she/he should do as a listener (Glenn & Pood, 1989).

Weaknesses of Self-Report Instruments

All of the self-report instruments are helpful in understanding how one perceives the self as listener. However, self-report instruments may or may not correlate with observational or recall measures, calling into question their validity (Woelfel & Fink, 1980).

In addition, all self-report instruments, like the observational and recall instruments, implicitly or explicitly are based on a linear view of attention and memory research, which is unsupported. Though they may be helpful to an individual, they do not assist researchers with understanding more about the actual listening process, but simply how one believes his/her listening process might occur.

Summary of Criticisms against Current Listening Measures

None of these instruments is delivered in a transactional model of communication, the model that best replicates face to face communication. It is important to study listening as a relational concept within the total context of the communication process

(Brownell, 1999; Rhodes, 1987). The recall instruments are based in a linear model of communication, where the listener is actually an observer of the communication process. The observation and self-report instruments are reflective of past experiences, and thus are void of context. No published listening test provides for total interaction between participant and stimulus (Thomas & Levine, 1994). Each instrument measures something after the process, which calls into question what it is really measured. It is clear, though, that listening and verbal recall are not isomorphic constructs, so it is important to begin teasing listening out from memory.

The listening process includes both cognitive and behavioral aspects, and none of the instruments reviewed above is able to tap into these aspects simultaneously. Listening cognitions and listening behaviors are linked more through assumption, than through empirical research (Dittmann & Llewellyn, 1968). Only scientific testing can support or deny this assumption.

Therefore, none of these instruments is appropriate for measuring the conversational listening process, which is the focus of this study. Listening researchers need an instrument that can tap into both cognitive and behavioral components in real-time during the communication interchange. The proposed Conversational Listening Span (CLS) instrument is designed to meet these needs. The CLS combines the power of the span instruments grounded in working memory, so it contains a solid and supported foundation. Additionally, the CLS produces a cognitive measure of listening capacity that is manifested behaviorally, through the participants' responses. This allows for a real-time cognitive capacity measure as opposed to the retrospective measure of all other listening instruments.

Developing the Conversational Listening Span Instrument

The goal of the Conversational Listening Span (CLS) instrument is to provide a valid measure of functional cognitive conversational listening capacity. This is defined as the maximum processing and storage capacity required for an individual to comprehend and respond to aural stimuli within the context of an interpersonal conversation. Thus, the CLS measure will represent the number of items that one can hold active and respond to within a conversation.

The instrument also must meet the aforementioned needs to tap into the cognitive listening process within the course of a conversation. First, it must be grounded in working memory, the dominant paradigm of attention and memory research. Second, it must provide a reliable measure of cognitive capacity through an observable behavioral indicator. Third, it must tap into the cognitive capacity within the course of the interaction, not after the interaction. Finally, it must simulate the transactional model of communication, the model most representative of a conversation. Language-processing measures that meet the first three requirements do exist, but they are not appropriate as designed for conversational listening capacity because they are linear in nature and do not require comprehension.

The following section first will provide an understanding of measuring the cognitive capacity of working memory. Next, it will detail the language-procesing capacity instruments that meet the first three requirements identified above, and detail their weaknesses for measuring conversational listening. The section will close with an explanation of the measure that will meet all four requirements.

Working Memory Capacity Measurement

The processing and storage function of working memory (WM) has been measured in a variety of ways, but the most popular method that has gained considerable support is that of a span task. A span task is designed to produce a measure of the total number of items that one can recall after processing a number of relevant and irrelevant items. Those with larger capacities, as represented by higher spans, can process more quickly and hold more multiple items in temporary storage than those with smaller capacities, as represented by lower spans. For example, with language processing components, one with a higher span might be able to hold four words active while one with a lower span could only hold two words active. Various symbolic span instruments have been designed including the conceptual span (Haarman et. al, 2003), operation span (Turner & Engle, 1989), and counting span (Case, Kurland, & Goldberg, 1982). However, this study concerns language comprehension, the basis of communication. Thus, the most appropriate span instruments to consider are those that are language based: reading span, speaking span, and listening span.

Reading Span Instrument

The reading span instrument (Daneman & Carpenter, 1980), which taxes processing and storage functions, has been used to measure WM for over 20 years. The reading span task was developed "to assess the functional capacity of working memory" (Daneman & Carpenter, 1983, p. 562). One's reading span has been correlated with general intelligence **(**Conway et. al, 2001), reading comprehension, and verbal SAT scores (Daneman & Carpenter, 1980; Daneman & Merikle, 1996). The instrument consists of a number of unrelated sentences, read aloud one at a time by the participants.

The participants must retain the final word of each sentence in memory, and then is asked to recall the final words aloud. Reading spans of college students generally range from 2 – 5.5 words recalled (Just & Carpenter, 1987).

The reading span task is a valuable and valid measure of functional working memory capacity. It taps the processing function by requiring the participant to read aloud, and this requires the participant to engage the long term memory, where meanings and pronunciation of words are stored, as well as working memory, where the new meaning of the sentence is created. The reading span task also taps the storage function, as while reading the second sentence aloud, the participant must still keep active the last word of the first sentence.

Instruments are most valid when designed and used for their intended purpose (D. Duran, personal communication, October 10, 2002). The reading span task is appropriate for reading research, as reading is a solitary activity. However, research documents the differences between reading and listening (Devine, 1978; Lundsteen, 1971; Rubin, Hafer, & Arata, 2000). Therefore, the reading span task, by itself, is not appropriate for a measurement of conversational listening capacity.

Listening Span Instrument

Less frequently employed as a measure of the functional capacity of WM in language comprehension is the listening span instrument (Daneman & Carpenter, 1980). The listening span instrument was designed similarly to the reading span instrument, but the presentation differed. Specifically, the sentences were audiotaped, and the participants were required to listen to the sentences and retain the final word. To decrease the possibility that participants simply listened for the final word and did not process the meaning of the sentence, some sentences made sense and others did not. Participants were required to listen to each sentence, identify if the sentence was true or false, and retain the final word of the sentence until prompted to recall.

Measures of the listening span have significant correlations with measures of the reading span (*r* = .80, Daneman & Carpenter, 1980). However, most studies that employ the listening span instrument do not use other span tasks. Instead, they were used to assess the parts of the brain affected with aural stimuli (Osaka, Osaka, Koyama, Nambu, Nakatani, & Kakigi, 1995; Osaka, Osaka, Koyama, Okusa, & Kakigi, 1999), how eating affects students' listening span scores (Morris, & Sarll, 2001), or comprehension in a second language (De Beni, Palladino, Pazzaglia, & Cornoldi (1998).

This instrument, though identified as a listening instrument, would not be an appropriate measure for a conversational listening capacity. First, the process is linear in nature in that the participants become the repository of the stimuli and simply recall it upon demand. This is not reflective of listening as a transactional process, which takes place within the context of communication where the communicators are actively involved in sending and receiving messages. Second, the instrument only requires that the participants remember and recall one word, not the meaning of the sentences. This is not reflective of what one is asked to do in a conversation, as in a conversation, one is constantly juggling meanings. Some meanings are stored in the long-term memory and other meanings are encoded as a message to the conversational partner. Finally, the inability of participants to recall the last word does not mean that the listening process did not occur; it simply means that the specific requirement of the process was not met. In daily conversation, communicators often remember and recall ideas that were synonymous with what was said, but not the actual word said. Thus, the listening span might be appropriate for linear communication research, but not for conversational communication research.

Speaking Span Instrument

A third measure of the functional capacity of WM in language comprehension is the speaking span instrument (Daneman, 1991; Daneman & Green, 1986; Fortkamp, 1999; Lustig, 2002). One's speaking span has correlated significantly with one's reading span (r = .57; Daneman, 1991; r = .64; Daneman & Green, 1986). The speaking span instrument is different than the reading and listening span instruments in that it employs more than one channel of delivery. The important contribution of the speaking span instrument over the reading and listening span instruments is that it not only requires attention and memory, but production of language beyond the stimulus words as well. That is, in the reading and listening span tasks, the participants must recall the final word of the stimulus sentence. However, in the speaking span task, the participants are provided only with a set of 7-letter words, and then they must produce a grammatically correct sentence that contains each word, one sentence for each word. All of the words in the sentence beyond the stimulus words are considered language production, as the participants are producing something that did not exist in the stimulus. The production component may confound psychological research because prior knowledge and experiences can contaminate incoming stimuli (H. Haarman, personal communication, February 12, 2002). However, because one's communication is based on one's prior knowledge and experiences, prior knowledge and experiences can be considered integral to the study of communication and conversational listening.

In general, the speaking span instrument is appropriate for communication research, as it targets one's ability to produce meaningful utterances. However, it, too, is linear in nature, and thus not an appropriate measure for conversational communication research. Additionally, the stimulus words are presented on a computer screen, so the listening channel is not employed. Therefore, the speaking span would not be appropriate to assess functional conversational listening capacity.

Conversational Listening Span Instrument

The proposed conversational listening span instrument (CLS) is grounded in working memory theory, and it will attempt to provide a reliable measure of cognitive conversational listening capacity through an observable behavioral indicator. The CLS is measured in real-time, and it simulates the transactional model of communication. Additionally, the CLS is framed by the relational perspective of communication, which suggests that speaker and listener alternate positions and respond to each other (Rhodes, 1993). The development of the CLS is similar to the traditional span instruments: reading span, listening span, and speaking span tasks. However, the CLS differs in three important ways that simulate conversation. First, unlike the reading and listening span sentences, the CLS sentences and questions will be related. Second, participants will be asked to recall ideas, not specific words. Finally, the researchers will act as a conversational partner and respond to the participants. (See Appendix D for sample script).

First, topic areas were selected that would be suitable for conversation with the sample. The selected topics included Sports, Life at the University, Television, Music, and World Leaders and Politics. Next, questions were designed not only to tap the topic area, but also sub-topic areas. For example, a sub-topic area of Music is “People say that Some Musicians Write to Send Messages; Let’s Talk about that.” The subsequent probes were “Describe a ‘good message’ that is currently being sent by a popular song,” and “Why do you think that ‘gangster rap’ promotes more or less drug use and/or violence than country music?” Ten individuals reviewed all questions and sub-topic areas and offered suggestions for revisions. Questions were revised until there was agreement that all questions could be comprehended by the average young adult, whether or not they could be answered.

Additionally, each question was coded as “open” or “closed”, referring to the amount of responses necessary. A closed sentence would require a brief response, such as “What musical instruments have you taught yourself or taken lessons in?” An open question would require explanation, such as “What five players from any team do you think would make the best NBA line up and why?” To assure consistency, the pattern of open and closed questions was the same in all of the five topic areas.

To reduce researcher effect and increase internal consistency, specific instructions for data collectors were inserted in the same place for each of the topic areas. Instruction included both nonverbal and verbal components. For example, a nonverbal direction could be “lean back” or “place your elbows on the table” or “display a facial expression appropriate to the participant’s utterance.” A verbal direction could be “verbally disagree with something that was said,” or “provide your own personal response to one of the participant’s responses.”

Measurement of the CLS was consistent with other span tasks; however, the range of acceptable responses was greater. To indicate that the participants at least understood the stimuli, they were asked to paraphrase each stimulus and then respond to it. The response could be what they knew or how they felt. If participants understood the question but did not know the answer, an acceptable response was paraphrasing the question and then saying “I don’t know” or something similar. This range of greater responses is more in keeping with the verisimilitude of a conversation.

Thus, the CLS is not measuring what is activated from LTM in terms of specific content, but it is activating the basic schema for conversation, which permits listeners to focus more on what is said than on how the flow of a conversation should go (Miller & de Winstanley, 2002). As long as the question was paraphrased and some type of response was provided, then full credit was given. Prior knowledge and learning may be a contaminant to memory research; however, it should not act as a contaminant for this study since no prior knowledge was necessary for a correct response. In real-life conversations, participants are not expected to know everything, and responses such as “I don’t know” are acceptable. Thus, full credit was given for paraphrasing and responding, which is a skill that closely approximates one’s ability to listen within the context of a conversation versus one’s ability to know.

Compared to the traditional language processing span tasks, the design of the CLS replicates the reading and listening span tasks in terms of complete sentences and/or questions offered as probes. It differs from these two in that participants are not asked to recall the final word, but they must recall the gist of the question, paraphrase it, and then respond to it. However, the actual CLS task most closely resembles the speaking span task, as both the speaking span task and CLS have a production component. Participants must produce a thought that was not part of the stimulus.

If the CLS is found to be a valid measure of conversational listening capacity, then the instrument would have a multitude of uses to communication researchers. One application addressed in this study will be the relationship between one’s CLS score and perceived communicative competence.

Conversational Listening Span and its Relationship to Communicative Competence

Beatty and McCroskey stated, “In a nutshell, we propose that communication is driven by inborn, neurobiological processes" (2001, p. 3). If this is true, then all communication actions are, in part, determined by one’s biology. The portion that is not explained by biology might be explained by free will based on knowledge. Communication is an interaction that encompasses both cognitive and behavioral processes. Thus, a logical application of the CLS would be to investigate the effect of conversational listening capacity on communicative competence. Critical to understanding conversational processes is “identifying the cognitive activities that occur as individuals interact” (Daly, Weber, Vangelisti, Maxwell, & Neel, 1989, p. 227). The difficulty has been tapping into concurrent cognitions. The CLS, grounded in working memory, is an instrument to measure capacity. Working memory capacity is fixed (Just & Carpenter, 1992); thus, the CLS instrument is a proxy measure for an innate biological system. Communication activity is a function of brain activity, and "all communicative acts are preceded by a neurological event" (Beatty & McCroskey, 2001, p. 73). Thus, if communication follows brain activity, and the CLS is a function of brain activity, then the CLS should take part in predicting communication competence.

To understand fully the proposed relationship between CLS and communicative competence, it is first necessary to explore what is meant by communicative competence, who should evaluate competence, and when competence should be evaluated.

What is Communicative Competence?

According to McCroskey (1984), the importance of communicative competence has been recognized for thousands of years and studied extensively in the discipline of communication. Communication competence has been defined in several ways, yet no single definition has emerged. In part, this is because the construct is studied from a variety of perspectives including communication, psychology, gerontology, education, management, and marketing (Wilson & Sabee, 2003). Three schools of thought dominate the discussion of competence: structuralist and functionalist. A structuralist's definition of competent communicators is those that succeed "in making their intentions understood, in seeming coherent, in seeming communicatively usual, in eliciting communicatively relevant responses from others, and in distinguishing random movement from purposeful action" (Wiemann & Bradac, 1989, p. 265). Thus, competence is conceptualized as something that the communicator is and something that the communicator does. In essence, competence is a trait.

This perspective of competence as a trait has been a popular approach (Parks, 1994), and it originated from personality theory in the field of psychology (Infante, Rancer, & Womack, 1997). In the trait approach, competence is context-free and the competency is in the communicator, though it also may be influenced by the context (Infante et. al, 1997; Spitzberg & Cupach, 1984), which includes the relationship between the communicators (Buhrmester, Furman, Wittenberg, & Reis, 1988).

Conversely, the functionalist believes that no one is competent all of the time, and because competence varies by context, functionalists seek to identify skills and strategies that would assist a communicator in reaching his goals (Cooper & Husband, 1993; Wiemann & Bradac, 1989). Thus, competence is context-dependent (Wolvin, 1989). In this perspective, competence is a state, but it is still something that the communicator does.

A third school of thought removes competence from the individual, where the structuralists and functionalists placed it, and argues that competence is the impression that one has of the other (Cooper & Husband, 1993; Spitzberg & Cupach, 1984) Thus, competence is not intrinsic in the communicator, and neither is competence a state or a trait owned by the communicator. Competence is a condition perceived by the other in the interaction.

The CLS is framed by the relational perspective of communication (Brownell, 1999; Rhodes, 1993), which suggests that the interaction is more important than the speaker, the listener, or the message by itself. It is the interaction that is communication, and it is the interaction that assists in creating meaning. Knowledge may be co-constructed based on observable behaviors, both verbal and nonverbal. As was previously established, cognitions precede behaviors (Beatty & McCroskey, 2001), and the CLS is a capacity-limited system. While few would be bold enough to suggest that 100% of communication behaviors are determined by our biology, Beatty and McCroskey's (2001) position of communibiology argues that communication is 80% genetic and 20% environmental. While this author of this study would not agree with the percentages, she does agree agree that part of our communication behaviors are determined by our biologic (genetic) makeup.

If the CLS is part of the genetic component, then one's conversational listening capacity would restrict or enhance one's communicative behaviors. However, this study also situates competence as the impression that one has of the other (Cooper & Husband, 1993; Spitzberg & Cupach, 1984), not as a state or trait intrinsic within the communicator. Thus, competence is perceived by the conversational partner, but the observable behaviors that dictate the perception could be based on a biological system, that is, one's conversational listening capacity.

Therefore, if communication competence is perceived, and perception occurs within the individual, it is impossible to select a definition of competence that would be consistent for all people and all contexts. However, it is appropriate to review appropriateness and effectiveness, which are two components of competence that are consistently included in competence definitions. The relationship between appropriateness, effectiveness and the CLS also will be discussed.

Competence as Appropriate and Effective

Rubin argued that "virtually every definition of communicative competence includes the mandate that communication be both appropriate and effective" (1990, p. 108). Many theorists do agree that relationally competent communicators are perceived to be appropriate as well as effective (Carrell & Willmington, 1996; Coakley, 1998; Cooper & Husband, 1993; Infante et. al, 1997; Spitzberg & Cupach, 1984). Appropriate communication is that which is socially sanctioned, meaning following society's rules and norms for any given situation (Rubin & Morreale, 1996; Spitzberg & Cupach, 1984).

Appropriate communication may be verbal or nonverbal, and the outcome must result “in no loss of face for the parties involved” (Infante et. al, 1997, p. 124).

On the other hand, effective communication is commonly defined in terms of goals met (Infante et. al, 1997; Rubin & Morreale, 1996) and/or relational satisfaction as an interdependent process (Cooper & Husband, 1993; Rhodes, 1993; Spitzberg & Cupach, 1984). Spitzberg and Cupach (1984), as well as Rhodes (1993), situate listening as part of competence, because the communicator, when listening, must recognize how to adapt to be effective in the interdependent process. Consistent with the ambiguity surrounding how to characterize competence, definitions of appropriate and effective are ambiguous and imprecise (Chen & Starosta, 1996).

Appropriateness seems a hallmark for any definition of competency. According to the Coordinated Management of Meaning Theory (Pearce, 1976), it would be unlikely to be perceived as competent if the communication was not socially sanctioned. The definition of effective involving goals met is a very source-centered perspective, and it assumes that the listener does not have goals. The listener is paramount in this study; thus, the concept of appropriateness will be accepted, and the latter definition of effective, that of relational satisfaction as an interdependent process (Cooper & Husband, 1993; Rhodes, 1993; Spitzberg & Cupach, 1984), will be accepted as well. Within this perspective, listening is a critical component of interpersonal appropriateness and effectiveness, as one must listen first to recognize what a socially sanctioned response would be and in order to gauge the other’s relational satisfaction.

Both appropriateness and effectiveness probably fall on a continuum. That is, a response may be determined to be more appropriate than another response. In the same way, a response can assist one if feeling more or less relational satisfaction. Neither is an all or none proposition.

If the basis of working memory (Baddeley, 2003) is correct, and one's capacity is limited (Just & Carpenter, 1992), then it logically follows that individuals have differing abilities to hold multiple meanings in temporary storage for recall. It would make sense, then, that those with greater capacities can hold more meanings active than those with lesser capacities. Many of these meanings will frame the response, and it previously was determined that responses can be more or less appropriate or effective. Thus, those who have larger conversational listening capacities can hold more meanings active, and, if consciously choosing the response, can select a more appropriate and more effective response than those who have a smaller capacity, and consequently, fewer options from which to choose.

However, having greater knowledge of options does not mean that one will consciously choose the best for response, nor does it meant that one will respond at all. Thus, ultimately competence relies on the communicator/listener having the knowledge of more competent communication, having the ability to select the more competent options, and then enacting the options. In communication competence literature, this is the debate concerning competence as knowledge, skills, and behaviors.

Competence as Knowledge, Skills, and Behaviors

Knowledge refers to knowing what to do; skills refer to taking the knowledge and applying it; and behaviors are the physical manifestations that are perceived by others. Some argue that competency includes demonstration of both cognitive and behavioral aspects of the skill (Cooper, 1988; McCroskey, 1982; Rhodes; 1987; Rhodes et. al, 1990;

Ridge, 1984, 1993; Wiemann & Backlund, 1980). However, others argue that it is unrealistic to develop theories which suggest people have a high conscious awareness when interacting (Spitzberg & Cupach, 1984); rather, awareness is most likely on a continuum (Toulmin, 1974).

In addition to knowledge, skills, and behaviors, Wolvin and Coakley added the fourth component of attitude – "the willingness to engage as a communicating listener" (1994, p. 151). The attitude would precede the skill and behaviors, and if the attitude is not appropriate, then the manifestation of the behavior would not be appropriate.

Because the position of competence as perceived was taken, the awareness and intentionality of competence becomes moot. It is only the behavior that can be perceived by others. Thus, for the purposes of this study, verbal and nonverbal behaviors that are perceived as competent by the conversational partner are what constitute competence.

Thus, in terms of the CLS, one who has a greater capacity can hold more options in temporary storage. If one is consciously selecting responses, then one can consciously select the response that is more appropriate and more effective for the communication context. This response will be enacted as a verbal and nonverbal behavior to be evaluated by the conversational partner.

The final position of competence is who should be the judge of the communication behaviors? Should it be the self, the other, or a third-party observer?

Who Should Evaluate Competence?

As with the concept of competence and what it entails, another area of disagreement is who should evaluate communication behavior and decide if it is competent or not (Bentley, 1997). Should it be the self, the other conversational partner, or third-party observer? If competence is perceived by the other (Cooper & Husband, 1993; Spitzberg & Cupach, 1984), which is the position of this paper, then it follows that the conversational partner would be the most appropriate person to evaluate communicative competence. Thus, the self and the observer first must be eliminated as the appropriate evaluator of competence.

The Self as Evaluator

Self-reports of competence generally focus on a feeling of satisfaction in terms of objectives met (Parks, 1994). This is a very speaker-oriented method of evaluation, as goals are considered more important than relational satisfaction. Additionally, there is little to no correlation between self-reports and other reports of competence, whether they are with the conversational partner (Spitzberg, 1982, 1989; Spitzberg & Hecht, 1984) or with an observer (Curran, 1982; Powers & Spitzberg, 1986; Spitzberg & Cupach, 1985).

A major problem with self-report measures is that participants often have difficulty providing valid data on what they do (McCroskey, 1984). This might be the result of participants being unaware of what they do (Roloff & Kellermann, 1984) or due to self-esteem measures (McCroskey, 1984). Thus, if self-report data is inconsistent with measuring the construct of competence, then the self as evaluator of competence would have little reliability. More importantly, competence is perceived, so the self would be a better evaluator of the conversational partner's competence than one's own.

Observer(s) as Evaluator

Before the possibility of a third party observer as evaluator is addressed, it is first important to distinguish the definition of an observer. Some may view an observer as a third-party who views a communication exchange through a medium (videotape, television, etc.), while others may view the interaction in person and act as part of the context, but not part of the interaction. This “overhearer” has no speaking rights or expectations to respond (Rost, 1990). Overhearers are present on a daily bases in contexts such as a person on public transportation, or an employee in a restaurant.

While observers may be the best way to gain an "objective" assessment (Spitzburg, 1988), observers lack the relationship knowledge necessary to make assessments (Sptizburg & Cupach, 1984). Additionally, observer evaluations are influenced by culture and differ greatly from self-reports (Martin, Hammer, & Bradford, 1994; Timmer, Veroff & Hatchett, 1996). Thus, their reliability is low.

Consistent with the notion that competence is perceived, an observer could very well be an evaluator of competence. In fact, this probably happens multiple times on a daily basis. In the work environment, a third party may observe an interaction in which he is not a participant, and it would be natural for him to evaluate competence on all of the communicators in the interaction. Though this competence evaluation would probably not be known to many, it would likely affect the way that the observer acts in future interactions with either of the conversational participants.

However, the observer is not directly involved in the communication interaction; thus, the observer is viewing the interaction much like a movie. As was previously established, this study focuses on conversational listing, which requires and communicative interaction. Thus, the observer as an evaluator of competence would be inappropriate for conversational listening research.

The Conversational Partner as Evaluator

As Spitzberg so clearly notes," as communication educators, we should recognize that our students gain approval or disapproval as social beings and as employees, not by how they evaluate themselves, but as they are observed to perform" (1988, p. 69). This suggests that the evaluator of competence is a non-issue, as the conversational partner automatically evaluates on a continual basis. In daily life, the conversational partner most often is the evaluator of competence, and this is consistent with the position taken in this study that competence is perceived as opposed to a communicator-owned attribute.

The other as the evaluator of competence is established, and solid reasons were presented on why the self or a third-party observer should not be the sole evaluator of competence. However, would it be more reliable to have the other and another, either the self or a third-party observer, be the evaluator of competence?

Some argue that a combination of self-report and other-reported data is superior (Buhrmester et. al, 1988, Guerrero, 1994). However, the dual-reporting method has shown inconsistent results, as some show a correlation between self-reported data and other-reported data (Buhrmester et. al, 1988, Guerrero, 1994) and others show little relationship (Berryman-Fink, 1993; Carrell & Willmington, 1996; Rubin & Graham, 1988; Rubin, Graham, & Mignerey, 1990). Thus, reliability is in question, and it is not sound scientific inquiry to propose a method that has been known to fail without knowing why it has failed. Why it has failed is not known yet.

Thus, this study is based on the notion that competence is a perceived factor by the other who is involved in the communication interaction. This study, then, is designed to have only two individuals: the participant and the researcher. Hence, the conversational partner will evaluate competence. Because the focus of this study is on the conversational listening span (CLS) and its relationship to communicative competence, and because only the participant will be tested, the researcher will be the sole evaluator of the perceived communicative competence of the participant. The next decision to made is when the researcher should evaluate the competence of the participant.

When Should Competence Be Evaluated?

Time is a function of context, and the reality is that a conversational partner is making conscious and unconscious evaluations as the communication is occurring (Spitzberg, 1988). Time-related issues that may affect judgment include the specific situation, the relationship of the communicators at that moment, and the time in history (Knapp & Vangelisti, 2000; Stephen, 1994). In a real-time situation, competence is being perceived in the moment, but judgments of competence may shift with time. For example, if one is being laid-off from work, he may think of his manager as the worst communicator, and the employee’s emotions would be affecting the evaluation of competence. Perhaps months later, the employee may reflect on that instance and recognize, sans emotions, that the manager was truly effective. Thus, the behaviors and skills did not shift, but the perception of competence may shift.

In a study situation, it makes sense to record perceptions of competence directly after the interaction. Competence cannot be assessed prior to the interaction, and assessment within the interaction, according to the rule of reciprocity, would cause some shift in the participant’s behavior, which likely would affect the participants subsequent behaviors. In addition, the researchers will be interacting with a large number of participants, the majority of which they have never before met. On a 25-item instrument, it virtually would be impossible for the researchers to recall a specific person with the clarity necessary to make a sound judgment. Thus, for this study, competence will be evaluated via a paper and pencil instrument directly after the interaction.

Communicative Competence and Listening

Up until the early 1980’s, recognition tasks, as opposed to recall, were used for conversational memory studies (Stafford & Daly, 1984). Since then, many studies that attempt to link communicative competence and listening operationalize listening as verbal recall (Miller, J.B., & deWinstanley, 2002; Miller, deWinstanley, & Carey, 1996; Thomas & Levine, 1994, 1996; Stafford & Daly, 1984; Stafford, Waldron, & Infield, 1989). There is evidence that one' perception of the other's competence correlates with one's memory for conversational details (Miller et. al, 1996); however, only as small positive relationship has been found between interpersonal competence and recall of the other's remarks (Miller, J.B., & deWinstanley, 2002). In fact, most conversationalists only remember an average of 10% of what their conversational partner said right after the conversation (Stafford, Burggraf, & Sharkey, 1987; Stafford & Daly, 1984). Participants who are instructed to remember do remember more of their conversional partner’s remarks (Stafford, Waldron, & Infield, 1989), and as conversational time increases, participants remember more gist of the conversation rather than specific words or phrases (Miller & deWinstanley, 2002; Miller et. al, 1996).

The relationship between listening and communicative competence has been distilled from individual’s perceptions of competence. Listening accounts for approximately one-third of the characteristics perceivers use to evaluate communication competence in others (Hass & Arnold, 1995, p. 123).

Another facet of listening and communicative competence is competence perceived based on response. “The reality of listening is that we are measured as listeners by how we respond as listeners” (Wolvin, 2002, p. 3). Conversational partners assess the other to be competent or not by the other’s response (Rhodes et. al, 1990). Thus, within the context of conversational communication, an appropriate behavioral response is necessary to assess listening as well as communicative competence.

Miller and deWinstanley (2002) and Miller et. al (1996) speculated that more competent conversationalists have a better schema for processing conversations, thus, less memory allocation is needed for the conversation content. Thus, "interpersonal competence appears to improve memory because competent communicators, relative to less competent communicators, require fewer resources to manage interaction and can expend more on their partner's remarks" (Miller, 2001, p. 407). Conversely, it could be that those who have greater working memory capacities are perceived to be a more competent.

Summary of Communication Competence

One’s conversational listening capacity may be constrained by one’s attention and memory because an individual may have a limited capacity to process and understand aural stimuli (Just & Carpenter, 1992). Thus, one’s communicative competence may be compromised if his ability to follow a discussion with multiple ideas is limited. It may be that those who are perceived to be better listeners are those that have the ability to maintain multiple ideas, which gives them a greater opportunity to respond in a more appropriate or effective manner. Thus, an individual with a larger span has a better probability of recognizing more appropriate and more effective behaviors, and, if enacted, would be perceived to be more competent than an individual with a lesser span and a lower probability of recognizing more appropriate and effective behaviors.

Research Hypotheses

The researcher has two goals with this dissertation. The first is to develop a conversational listening span instrument that is grounded in working memory theory and able to measures one's conversational listening capacity. The second goal is to investigate the effect of one's conversational listening span on one's perceived communicative competence

Four research hypotheses will be advanced for this study. Following is a brief explanation for the basis of each hypothesis as well as the hypothesis.

Compared to the traditional span instruments, the CLS most closely resembles the speaking span instrument, as they both have a production component. Participants must produce a thought that was not part of the stimulus. However, the taxing of the processing and storage functions of the CLS is consistent with all three language comprehension instruments. Thus,

H_1: Conversational Listening Span will have a direct relationship with the reading span, the listening span, and the speaking span.

If the CLS can achieve statistically significant correlations with all three communication span tasks, then it will have achieved criterion validity (Stanford University School of Medicine, 2003). A further detailing of its foundation may also provide construct validity for the instrument (Chronbach & Meehl, 1955; Dick & Hagerty, 1971).

One's communicative competence is evaluated based on one's communicative behaviors. Cognitions precede behaviors, but behaviors are based on cognitions (Beatty & McCroskey, 2001). Further, conversational listening capacity precedes communicative behaviors that form the basis of competence perception. Thus,

H_2: Conversational Listening Span will have a direct relationship with perceived interpersonal competence as well as communicative competence.

Even if the CLS is shown to have a relationship with the two competence scores, correlation does not indicate causation. The three rules for causation state that 1) the independent variable must precede the dependent variable; 2) the independent and dependent variable must covary in a meaningful way, and 3)a change in the dependent variable must be as a result of a change in the independent variable and not some other variable (Frey, Botan, & Kreps, 2000). CLS and perceived communicative competence meet the first criteria for causation because cognitions precede behaviors (Beatty & McCroskey, 2001); thus, CLS precedes the communicative behaviors on which the conversational partner evaluates competence. The second assumption can be met only through this project's pilot study, as there has been no other former research investigating the two. In the pilot study (N=26), perceived interpersonal competence significantly correlated with CLS scores ($r = .384$, $p < .05$). Finally, if communibioligists' assertions that biology, in part, determines communication (Beatty & McCroskey, 2001), then the change in the competence score can be a viewed as a result from the change in the CLS score. Thus,

H_3: Listening Span and Conversational Listening Span will predict one's communicative competence.

The rationale for designing different topic areas in the CLS is to tease out the effect of interest on span scores. Intuitively, it seems as if one who is more interested in a topic area would score higher than one who is not interested in the topic. Research supports that interest does affect recall (Miller, 2001; Prakash, 1957; Willoughby, Motz, & Woods, 1997) and does not affect recall (Schultz, 1953). However, the CLS is designed to assess capacity, not performance mediated by interest. Thus, the author asserts that topic area discussed, whether it be high or low, will have no impact on CLS span scores. Because one cannot test a null hypothesis (Cohen, 1988) the alternate hypothesis will be advanced:

H_4: Those with greater interest (high) in their conversational topic area will score higher on the CLS than those with lower interest in their topic area.

Chapter II: Method

To prepare for the main study, data collectors were certified and two pilot studies were conducted. This section will first review the researcher certification process as well as both pilot studies. The section will conclude with a description of the methods for the main study

Data Collector Certification

A major criticism of human research studies involving various data collectors is the lack of control over the dynamics of the individuals. Although no amount of training could eliminate the threat, a certification test was designed to increase fidelity and minimize differences caused by different data collectors. All data collectors were required to attend three training sessions and pass a certification test prior to collecting data (Appendix G). The first meeting focused on administering and scoring the four span tasks. Data collectors were taught specific phrases to use to minimize participants' anxiety on test participation. This meeting also addressed the need to exhibit similar verbal and nonverbal communication skills throughout the CLS. Each specific notation (i.e., put arms on table, provide personal feedback, etc.) was identified, and acceptable and unacceptable behaviors were defined. Most data collectors successfully passed this part of the training in three hours.

The second training was devoted to the Communicative Competence Scale. The norming of the instrument took approximately three hours. The scale is subjective in nature, so the training session consisted of reviewing each of the items and identifying verbal and nonverbal behaviors that should be considered for each item. Data collectors then viewed videotapes and were asked to rate one target in the taped interaction. Results were discussed item by item until norming had occurred. Norming was defined as all data collectors being within one point of each other on the nine point Likert scale for each individual item. Initial scores were varied, but by the end of the training, data collectors' perceptions were calculated to have an intercoder reliability of .83, which met the acceptable level for communication research (Frey et. al, 2000).

The final training session was devoted to the other items on the checklist. Data collectors were taught how to build rapport and create comfortable small talk, as well as to be on their best communicative behavior during the entire experiment. They recognized the importance of the rule of reciprocity, and they knew that if participants were to put forth some of their best communicative competence, then the data collectors would have to do so as well. Data collectors were trained to operate the Experimetrix software program, which enabled them to know the names of the participants and grant the participants participation credit at the end of the study. Data collectors were trained in working the video camera as well as the audio tape recorders. They also learned the importance of the Informed Consent Form and ID Demographic form, and how to explain the interest rating component.

During the final training session, each researcher was required to run an abbreviated test run on another researcher who privately was told places to make mistakes. The author of this study personally shadowed each researcher to assess competency

Pilot Studies

Two pilot studies were conducted. The first pilot study was designed to assess the instrument used to measure communicative competence, and the second pilot study was conducted to investigate the design and instruments.

Study 1: The Communicative Competence Scale

The purpose of the first study was to test the reliability of Wiemann's (1977) Communicative Competence Scale, the instrument selected to assess competence for the main study. Because the focus of this study was assessing an appropriate instrumentation, the selection of the instrument first will be discussed, followed by the study that tested it.

Instrumentation

Three criteria were used to select the instrument to measure communicative competence. First, the instrument had to be a valid instrument. Second, the instrument had to provide a general measure of perceived communicative competence. Listening is a part of perceived communicative competence (Rhodes, 1993; Spitzberg & Cupach, 1984), so any general measure required probes that targeted listening. Finally, the instrument was to be completed only by the researcher, consistent with the position that competence is perceived by others. It is important to note that this study is measuring listening capacity, not perceived listening, which is a part of the communicative competence measure.

Numerous instruments collected in the *Communication Research Measures: Sourcebook* (Rubin et. al, 1994) were reviewed, and Wiemann's (1977) Communicative Competence Scale met all three criteria. The original competence scale tapped five dimensions of interpersonal competence: general competence, empathy, affiliation/support, behavioral flexibility, and social relaxation. However, subsequent validation of the scale indicated support for only two factors: general competence and relaxation (Rubin et. al, 1994). Additionally, the instrument contained items specific to listening such as "the participant listens to what people say to him/her" and "the participant pays attention to the conversation." Finally, the instrument was to be completed by the observers (i.e. data collectors), not the participants, which was consistent with the notion that competence is perceived by the other communicator.

Participants

Participants were college students enrolled in two sections of an interpersonal communication course during the spring, 2003 semester, as well as students enrolled in one section of a basic communication course during the winter of 2003. Students were not given extra credit in exchange for their participation, and participation was voluntary. A total of 72 students volunteered to participate in the study. The mean age was 19.83 (*SD* = 1.27), and the sample consisted of 48 women and 24 men.

Procedure

On the second day of class for each semester, students were instructed to select a conversational partner that they did not know. This resulted in 36 dyads. Participants were asked to engage in a 10-minute conversation on topics of their choice. After 10 minutes, participants were provided with Wiemann's (1977) original 36-item scale, and they were asked to complete the instrument based solely on their 10 minute conversation with the other person. Measurement of each of the 36 statements was by a Likert-type scale anchored by 1 *strongly disagree* to 9 *strongly agree*.

In addition, students were asked to provide comments about the instrument, its ease of use, and its appropriateness for assessing communicative competence.

Results

An analysis of the comments detected two problems. First, participants felt that some of the items could not be assessed within the context of the study because the items asked the individual to assess characteristics that could not be obtained easily from a 10-minute conversation with a stranger. For example, “Subject usually does not make unusual demands on his/her friends” and “Subject enjoys social gatherings where he/she can meet new people.” Second, participants mentioned that the instrument was too long, and they admitted to fatigue towards the end. An inspection of the instrument and process indicated that the concerns were valid. Thus, a confirmatory factor analysis was conducted to determine if the instrument could be reduced without affecting its validity and reliability (Kim & Mueller, 1978).

The instrument claimed to measure two factors, general competence and relaxation (Rubin, 1994), so data were subjected to a confirmatory factor analysis using a maximum likelihood rotation (Kim & Mueller, 1978). Though six factors with eigenvalues over one emerged, there was one clear factor (λ= 21.660) with a second eigenvalue of 2.056. An orthogonal rotation yielded similar results. This study required a general competence measure, and the data clearly suggested one dominant factor (α =.873). An inspection of the items that loaded on the first factor suggested that they tapped the general competence factor as opposed to the relaxation factor. Thus, the scale was reduced to the 25 items that loaded on the first factor. (See Appendix F).

Discussion

The revised version of the communicative competence scale (Wiemann, 1977) was deemed appropriate for this study as a valid measure of perceived communicative competence. First, the confirmatory factor analysis justified its use as a valid measure, as only the items that loaded on the first factor were included. Rubin et. al (1994) asserted that the instrument measured two factors: general competence and relaxation. Due to the intent of the instrument as well as the factor loadings, and an inspection of the items, it was concluded that the 25 items that loaded on the first factor assessed general competence. Second, the instrument contained some listening-oriented items. This inclusion was critical for this study, as it was established that listening is a part of communicative competence. This scale will measure perceived communicative competence. In essence, it measures the appropriateness and effectiveness of the enacted behaviors of the participant. This is different from the Conversational Listening Span, the instrument developed for this study, as the latter measures conversational listening *capacity*. Capacity may have a relationship to competence, but it is not competence.

Study 2: Power Analysis

A second pilot study was conducted in March, 2003, to determine the number of participants needed for the main study.

Participants

Participants were drawn from two different sections of an interpersonal communication class during the spring of 2003. These were the same students involved in the first pilot study, and they were offered extra credit in exchange for their participation. A total of 26 students volunteered. The sample included 18 females and 8 males with a mean age of 20.61 (SD = .983).

Design and Procedures

The design was correlational (Campbell & Stanley, 1963). Participants were randomly assigned to the order in which they participated in the speaking span task, reading span task, and listening span task. Participants then moved to another room where they completed the conversational listening span task. Participants were debriefed, and after they left, the data collectors assessed the perceived communicative competence of the participants by using the modified Wiemann (1977) scale.

Instrumentation

The instruments used in this pilot study included the ID and Demographic form, the readings span task, the listening span task, the speaking span task, the conversational listening span task, and the modified Wiemann's (1977) Communicative Competence Scale. A more thorough description of these instruments can be found in study #3.

Results

There were two goals for this study. The first goal was to inspect the correlations (see appendix H) among the four span tasks and the Communicative Competence Scale to assess whether it was reasonable to conduct the main study. The second goal of this study was to perform a power analysis to determine the number of participants needed for the main study.

The hypotheses for the main study included the statistical tests of correlation, regression, t-tests, and analysis of variance (ANOVA). ANOVA, the *F*-test, has the most stringent power requirements; thus, sample size was determined based on a 2 x 2 design. Following the guidelines of Kraemer and Thiemann (1987) and Cohen (1988), sample size was calculated. The final sample size (N = 360) provided a .01 level of significance and .99 power with a Δ of .707. In other words, the sample size will ensure that if the null hypothesis is true, there is only a 1% chance that it will be rejected (α error), and if the alternative hypothesis was true, there was only a 2% chance that it could be rejected (β error).

Discussion

The necessary N for this study was based on power analysis that determined the critical effect between high and low span scorers. Previous published studies were not useful in determining the sample size for two reasons. First, previous studies range from 20 to 30 participants, and though this is adequate for a pilot study, it is not large enough to generalize results. Second, the Conversational Listening Span was developed for this study, so no literature existed on the instrument. It was assumed that the CLS task scores would correlate significantly with the initial span task scores. Though the results indicated a significant correlation for the CLS with only the speaking span, it was reasoned that the correlation was more understandable, as both the CLS and speaking span had production components and the reading and listening span tasks did not. Further, the reading and listening span tasks were retained for the main study even though they were not statistically significant in relationship to the CLS in the pilot study. In particular, the reading span has been used more widely than the other span instruments, so more literature is available. The listening span task was determined critical, as it reflected linear listening, a different model from transactional listening, which is the basis of conversation.

Study 3: The Main Study

Between March and October, 2003, a study was conducted in a laboratory to test the Conversational Listening Span task and investigate if it predicts perceived communicative competence. Eighteen data collectors collected data from 467 participants. Each researcher tested one participant at a time, for a total of over 450 hours of data collection. Participants, procedures, and Instrumentation will be discussed in the following section.

Study Design

Working memory theory or the valid measures of WM language comprehension capacity (reading span, listening span, speaking span) have not been used by any study in the communication discipline. Thus, as the initial study, this proposed research was exploratory in nature. The design of the study was The Posttest-Only Control Group Design, a full-experimental design (Campbell & Stanley, 1963). It met the three requirements of a full-experimental design including randomization, two or more levels of the independent variable, and measurement of the dependent variable.

Variables

Independent Variables

Independent variables, or predictor variables, predict the influence or change of the dependent variable (Lomax, 2001). This study contained one latent independent variable: working memory capacity. As a latent variable, working memory capacity was measured by scores on the reading span task, listening span task, speaking span task, and conversational listening span task. This latent variable was present in both goals of the study as well as all four hypotheses.

A second independent variable was the interest (high/low) level of the topic discussed for the CLS. Participants were assigned randomly to their most or least favorite topic.

Dependent variables

Dependent variables, also known as response variables or outcome variables, are predicted by the independent variable (Lomax, 2001). Communicative competence was the dependent variable in this study. This dependent variable was used in the third hypothesis to determine to what extent one's language-processing capacities, as measured by the CLS, predicted one's communicative competence.

Participants

Participants were students at a large Eastern university. To obtain sufficient power for the analyses, a representative sample of 360 participants was needed. However, to obtain 360 complete cases, over sampling was required. Data were gathered from 467 college student participants, and all data were used in this analysis. Of the 467 participants, 296 were females and 169 were males. The participants ranged in age from 18 to 49 (M =21.08, SD = 4.538).

Procedures

The study took place in two rooms, and participants never completed any tasks with anyone else in the room except the researcher. The first room contained a computer on a desk and two chairs. It was a private room with a door that could be secured. The second room was adjacent to the first room, and it was about double the size. The room was set up with one table and two chairs. An audiotape recorder was on the table next to the researcher's chair. The second room had three doors: one to the first study room, one to the hall, and one to a storage closet. A video camera was set up in the storage closet, and it was focused on the participants. The door to the closet was slightly ajar to obscure the camera, but the camera was clearly visible to anyone with a keen eye.

The study included three consecutive parts, and all three parts were completed by participants in one session. Part one addressed the first goal of the study; part two addressed both goals; and part three addressed the second goal. The total study time was between 35 and 60 minutes per participant, and only one participant at a time completed the study.

Part One

Part one of the study included the required paperwork and the three traditional language-processing span tasks. Data collectors met the participants by name in the hall. Data collectors spent approximately 1 – 3 minutes building rapport with the participants. This included greeting them by name and using small talk. Data collectors then provided the ID Form and Informed Consent form for the participants to complete. The data collectors reviewed the forms for completion, and if any item was not completed, data collectors were instructed to say, “I notice that you left this blank. Did you mean to do that?” Participants were then permitted to complete it if they wished, but participants were never forced to provide information.

The data collectors provided participants with a piece of paper and a code number written on it. Data collectors explained that from this point, participants’ names and scores would not be able to be tied to each other, as all scores would be recorded on the back of the ID form, which did not have the participants’ names. The participants’ ID numbers were written on top of the ID form. Participants were then asked to come into the first study room, instructed where to sit, and the door to the hall was closed.

In the first study room, participants completed the traditional language-processing span tasks: reading span, listening span, and speaking span. These tasks will be explained in detail in the next section. These span task instruments are well established in measuring WM language processing capacity, and they were used to assess criterion-related validity for the Conversational Listening Span (CLS), consistent with the first goal and first two hypotheses of this study. Because the tasks were similar in design, there was a concern that participants might become accustomed to the process and score higher on their final task. To control for order effects, participants were randomly assigned to one of six orders. Participants were asked to roll a dice, and the dice roll determined the order of the three span tasks.

Directions for the reading span task were printed on the computer screen, and they were read aloud by the data collectors to the participants, who checked for understanding. Participants were taken through two practice sessions, and the data collectors corrected any process mistakes and answered any questions.

Directions for the speaking span task were printed on the computer screen. As with the reading span task, the directions were read aloud by the data collectors to the participants, and participants were permitted a practice session with constructive feedback.

The directions for the listening span task were recorded on the audiotape, and the data collectors stopped the tape to confirm understanding. This task required that participants turn over their card with their ID number, and draw a line down the center, labeling the left side true and the right side false. Participants were instructed to listen to each sentence, retain the final word of the sentence, and place a hash mark in the appropriate column (True or False) to identify the sentence. Nonsense sentences were to be coded as false. As participants completed the listening span task, data collectors observed if the participants were coding the sentences. If they were not, data collectors pointed to the card as a reminder.

The coding of the listening span sentences is irrelevant to data analysis. However, the rationale behind it is that if they listening without a forced activity, participants could listen for the final word of the sentence and not enacts all processing capacity to understand the sentence (Daneman & Carpenter, 1980). When forced to code the sentences, participants had to understand the sentence, retain the final word, and assess the sentence's validity. When the listening span task was completed, participants were told to keep their cards, as they would need their codes for the next part of the study.

After completion of the span tasks, participants were asked to wait in room one while the data collectors went into room two to set up the recorder. Data collectors went into room two and shut the door behind them. Data collectors performed two actions in this room alone. First, they assessed the participants Perceived Interpersonal Competence (PIC) and assigned a PIC score on the scoring sheet. Second, they turned on the video camera, and then returned to room one and asked the participants to join them in room two. The data collectors told the participants where to sit, and the audio tape recorder was conspicuous on the table.

Part Two

Part two of the study took place in the second room, and it consisted of the conversational listening span task (CLS) and the debrief. Data collectors told the participants that this part of the study would be audio taped, and participants were asked to read their ID number as a form of consent when the tape was turned on. Data collectors asked the participants to roll a die that determined if they would talk about the participants' most or least interesting topic. The purpose of this was to rule out the effect of interest consistent with the fourth hypothesis.

Data collectors had the instructions and questions memorized, but they were permitted to use index cards as a reference. The index cards were bound, and only 3" x 5" in size, so they did not greatly interfere with the conversational nature of the task. Participants were told that they would be asked anywhere from two to five sentences, and they had to paraphrase the sentence and then answer it. Their answers should be based on what they knew or felt, and if they did not know, they were instructed to respond with something similar to "I don't know." Participants were instructed not to paraphrase all questions at once, but to paraphrase-answer, paraphrase-answer. This was done to rule out what Bostrom (1990) would have called short- term memory in his listening task. He defined it as lasting only 15 seconds, so if participants had to paraphrase-answer, paraphrase-answer, their ability to retain the question in working memory could last longer than 15 seconds without rehearsal could. Participants also were told that they could respond in any order. To confirm understanding, the data collectors asked the participants to paraphrase the directions, and if the participants could not do so, the data collectors explained them again until the participants successfully could paraphrase what was being asked of them.

As with the other span tasks, participants were provided with two practice rounds. At the end of each practice round, the data collectors provided constructive criticism.

To control for researcher effects, the CLS script of each topic area had designated verbal and nonverbal responses. Some were specific, such as "lean forward and put elbows on the table" and others were more general, such as "provide positive feedback on one of the participant’s responses.” Data collectors were trained consistently to follow these directions, thus minimizing the effect of the data collectors.

After the participants were finished with the task, the data collectors thanked the participants for their participation and provided a debrief form. The data collectors allowed time for the participants to review the form, and then the participants were asked if they had any questions. Data collectors answered all questions honestly. Participants were encouraged not to talk about the study to others.

Part two of the study was videotaped. Participants signed a video release on the consent form notifying them that any section of the study may be audio or video recorded, but they were not told specifically which areas were taped unless they asked. The placement of the audio tape recorder on the table was to draw their attention away from the video camera in the closet, and most participants did not notice or mention the video camera. Use of the videotaped data will not be used for this study, but for subsequent studies.

Part Three

Part three of the study took place after the participants left. The data collectors immediately completed the 25-item revised version of Wiemann’s (1977) communicative competence instrument. They were instructed to take into account the participants’ entire behaviors throughout the study. Data collectors placed the participant’s ID on the form so that it could be linked to their span task scores.

Materials and Instrumentation

The necessary materials and instrumentation to run this study included an ID, Demographic, and Coding Information sheet, Student Release Form, Debriefing Script, four span tasks (reading, listening, speaking, and conversational), Interpersonal Competence Perception Score, and the Communicative Competence Scale.

ID, Demographic, and Coding Information, and Student Release Form

The ID, Demographic, and Coding Information form (Appendix C) was used to gain basic demographic information on participants that would be useful for this and subsequent studies.

Reading Span Task

The reading span task consisted of 64 sentences presented in sets. The sets were arranged in three groups of two sentences, three groups of three sentences, up to and including three groups of seven sentences. There were an additional two set of two sentences used for practice. The sentences were between 11 and 18 words long, and each sentence scored a Flesch-Kincaid grade level between 10 and 12 (Flesch, 1974; University of Louisville, Department of English, 2003). The formula for the Flesch-Kincaid Grade Level score is: (.39 x ASL) + (11.8 x ASW) – 15.59, where ASL = average sentence length, and ASW = average number of syllables per word. The final Flesch-Kincaid score was equivalent to the text that would be appropriate for a grade level in the U.S. For example, a ‘10’ would indicate that the sentence was appropriate for the 10^{th} grade. The Flesch-Kincaid reading level is only computed through 12^{th} grade; no higher education computations exist. Thus, this study used its upper bounds of 10 through 12.

Sentences were presented individually with a blue background on an IBM computer. This presentation allowed for clarity of the words without the stark contrast of black and white. Sentences were double-spaced in Times New Roman style with a font size of 32. All specifications, with the exception of the Flesch-Kincaid reading level, were consistent with Daneman (1991). Daneman has found reliability and validity with her presentation methods, so they were duplicated. The Flesch-Kincaid was added for this study for the sake of consistency and for justifying sentences appropriate to the target sample.

Listening Span Task

The 64 sentences for the listening span task met the same criteria as those for the reading span task with one exception. The only difference is that some sentences made sense, while others did not. For example, one nonsense sentence was “Professionally speaking, it is customary to shake the interviewer’s leg when it is extended to you.” The nonsense sentences were randomly placed in the order.

The sentences were audio-recorded by a female voice at a rate of one word per second with the recorded prompt of “recall” after each set. The females was a trained actor, and she was selected for her vocal control. Specifications for the creation and taping of the listening span task were consistent with Daneman and Carpenter (1980).

Speaking Span Task

The speaking span task consisted of 64 seven-letter words grouped consistent with the order for the reading and speaking span tasks. Words were presented individually on an IBM computer. Words were centered and presented on a blue background with a font size of 44. After each set of words, a screen consisting of mountains in blue tones acted as the recall prompt. With the exception of the blue hills, specifications were consistent with Daneman (1991). The blue hills were selected because the word “recall” may have been misconstrued as another word in the set; thus, visual prompt was desirable.

Conversational Listening Span Task

The conversational listening span task (CLS) was created for this study, and it consisted of 64 closed and open-ended questions presented in sets. The sets were arranged consistent with the other span tasks, beginning with sets of two questions and ending with sets of five questions. Both open-ended and closed questions were used to better simulate a conversation. There was one additional set of two and another additional set of three used for practice.

The CLS was different from the other span tasks in two ways. First, unlike the reading and listening span tasks, sentences in a set were of a related topic. This is more consistent with a conversation. Second, five different topic areas were represented: Music, Sports, Television, the University of Maryland, and World Leaders and Politics. Participants were exposed only to one topic area, based on random assignment per their self-reported interest on the ID form, and this information was used to task the fourth hypothesis. (For a sample script, see Appendix C).

Span Tasks Rules and Scoring

Strict span task scoring rules require participants to recall verbally in the order the words were presented, but lenient rules permit participants to recall in any order. In this study, lenient scoring rules, consistent with Daneman (1991), were employed because in a conversation, there generally is no requirement to order of response. Thus, span scores were calculated consistent with Whitney, Ritchie, and Clark (1991). If the participants achieved two out of three correct in a set, then they advanced to the next set. This continued until they got zero or one correct in a set. The score was the whole number for the set where two out of three were achieved. If the participants scored one out of three on the highest set, then ½ point was added to the final score. For example, if participants achieved 2 out of 3 sets at the second level, and only 1 out of three sets at the third level, then their score was 2.5.

Perception of Interpersonal Competence

The Perception of Interpersonal Competence (PIC) score was a Likert-type scale ranging from (1) *not competent* to (9) *extremely competent*. The score depicted the data collectors' overall perception of the participants' communicative behaviors, and it was recorded on the back of the ID form. Data collectors were trained to assess items such as the participants' ability to initiate a conversation, participate in a conversation, comfort level, eye contact, and rate of speaking. The PIC was designed to act as a check to the final Communicative Competence Scale.

Communicative Competence Scale

The modified version of Wiemann's (1977) Communicative Competence Scale, as developed in the first pilot study, was used (Appendix F). Data collectors were trained to identify communicative behaviors similarly on the Likert-type scale, adding to the reliability of the measure.

Debriefing Script

At the end of the study, participants were given a brief oral description of the study. They were presented with a written form as well (Appendix E). The written form reminded students that parts of the study could be video and/or audio taped, and it gave them the right to revoke their participation and have the tapes destroyed.

Chapter III: Results

Data examination was performed through several sequential steps. First, the data were examined to assess their fit to the general linear model, a necessary condition for the statistical tests employed. Data that do not fit the general linear model generally are transformed. Next, various statistical tests, including correlations, regression, and an analysis of variance (ANOVA), were conducted. SPSS, version 11.5 was the software used for all tests unless otherwise indicated. This section will address the general linear model assumptions as well as the tests for the four hypothesis and the controls.

General Linear Model Assumptions

There are three basic assumptions for data used in a general linear model (Lomax, 2001).

1. The normality assumption assumes a symmetric distribution of the observations. This assumption is confirmed through various methods including graphical box plots, histograms, normal PP plots, and the Shapiro-Wilk test. Additionally, kurtosis and skewness scores are examined.
2. The Homogeneity of Variance assumption is that of homoscedasticity; that is, variances in observations across groups are equal. This assumption is determined through Levene's Test for Equality of Variances for both the ANOVA and t-tests.
3. The Random and Independent Errors assumption states that residuals are nonautocorrelated. This is determined though an examination of the residuals for each variable as well as the Durbin-Watson test for autocorrelation.

Inspection of the General Linear Assumption

All variables used for the statistical tests were analyzed individually for each general linear assumption. The variables included the Reading Span, Listening Span, Speaking Span, Conversational Listening Span, and Communicative Competence. The assumption of normality was tested through a visual inspection of histograms, stem and leaf plots, and normal PP plots. For each variable, the visual displays represented a normal distribution. In addition, kurtosis and skewness scores were examined. (See appendix I).

Skewness, a measure of symmetry, for all variables was less than |1.5|, the necessary condition for symmetry (Lomax, 2001). Kurtosis, a measure of the peakedness of a distribution, for all variables but one (reading span) was less than |1.5|. The kurtosis of the Reading Span variable was 2.674. Although this is higher than the preferable limit of |2.00| (Brown, 1997), kurtosis has minimal effect on computations (Lomax, 2001), so reading span task scores were not transformed.

Therefore, assumptions underlying the general linear were met (Bauer & Fink, 1983).

Inspection of the Homogeneity of Variance

When performing the *t*-test and ANOVA, Levene's test for equality of variance was consulted. In all instances, variances of the groups were found not to be significantly different; thus, the assumption was maintained. Specific statistics will be reported in the hypothesis testing section.

Inspection of Random and Independent Errors

The final assumption, which concerns the errors, was determined though examining the residuals for each variable as well as the Durbin-Watson (DW) test. The DW test for residual correlation among the variables, and it identifies if a pattern exists, suggesting that the relationship between the variables might not be linear. The DW statistic for the regression was 1.913, within the range of the expected 1.5 – 2.5 (Shannon & Davenport, 2001). In addition, a visual inspection of the partial regression plots, which plot the residuals of the tested variables, showed no obvious patterns. Consequently, the assumption of random and independent errors was met.

Thus, all variables met the three assumptions of the general linear model, save the kurtosis statistic for the reading span task scores. The reading span was administered to assess convergent validity, and because it had a significant correlation with raw scores, data transformation was not necessary.

Hypothesis Testing

Various statistical tests were employed for the different hypotheses. Specifically, H_1, investigating the relationship between the CLS and the three traditional span tasks; and H_2, investigating the relationship between the CLS and perceived communicative competence were determined by correlations. H_3, predicting communicative competence from the CLS, was determined by regression. Finally, H_4, assessing the effect of interest on one's CLS score, was determined by an independent sample t-test.

The purpose of including the reading span, speaking span, and listening span tasks in this study was to establish validity for the CLS. The tests were based on the same premise and followed the same format, with the exception of communication channel, so it was important to rule out order effects. Participants were assigned randomly to the order of the first three tests (reading, speaking, and listening). Two different ANOVAs were used to investigate this data.

A one-way ANOVA was conducted using the six order positions as the independent variables and the scores for each span test as the dependent variables.

Results showed no statistical significance for the reading span task scores $F(5, 459) = .663$, $p > .05$, *ns*, the speaking span task scores $F(5, 459) = .824$, $p > .05$, *ns*, the listening span task scores $F(5, 459) = .824$, $p > .05$, *ns*, or the conversational listening span task scores $F(5, 460) = .920$, $p > .05$, *ns*. The Levene statistic for the homogeneity of variance was not significant for each variable (reading span, .413; speaking span, 1.203; listening span, .189; and CLS, .593; all $p > .05$). These results suggest that the mean of each separate span test was not significantly different based on whether the task was tested in the first, second, or third condition. To determine if the order of the tasks affected an individual's score on any of the span tasks, a mixed-model ANOVA was used to assess the within-subjects and between-subjects effects.

With the mixed-model ANOVA, the results indicated a slight violation of sphericity, suggesting that the significance test might be biased. Due to these sphericity violations, the Greenhouse-Geisser criteria were used. Results show a significant test effect $F(1.78, 804.94) = 71.45$, $p < .01$, which means that at least one of the span task scores (reading, listening or speak span) is significantly different from the other two. An inspection of the means indicates that participants scored lower on the reading span task ($M = 2.46$, $SD = .75$) than the speaking span task ($M = 3.00$, $SD = .64$) and the listening span task ($M = 2.89$, $SD = 1.04$). However, the order interaction is not significant, $F(8.81, 804.94) = 0.61$, *ns*, which suggests that the general trend for all three tests was the same across order conditions. In addition, there is no significant effect of the order $F(5, 457) = 1.02$, *ns*). Therefore, the order of the particular test did not play a role in the individual's score on any of the tests.

The first hypothesis was advanced to establish criterion validity for the Conversational Listening Span task (CLS). If the CLS positively correlates with all three communication span tasks, then the CLS exhibits criterion validity (Stanford University School of Medicine, 2003), which is the first step towards construct validity (Cronbach & Meehl, 1955).

Typically, alpha (α) is set at the $p < .05$ level. Due to the large sample size, $p < .01$ was used to ensure significance. All four span tasks showed statistically significant correlations at the $p < .01$ level. Thus, H_1, was supported, as the CLS task scores were significantly correlated with reading span task scores, $r(463) = .184$, p < .01; listening span task scores, $r(464) = .260$, p < .01; and speaking span task scores, $r(463) = .269$, p < .01. Correlations for the span tasks are shown in Table 1.

Table 1

Correlations of Span Instruments

Instrument	Reading	Listening	Speaking	CLS
Reading	1.00			
Listening	.211*	1.00		
Speaking	.317*	.249*	1.00	
CLS	.185*	.261*	.270*	1.00

* $p < .01$ level (two-tailed)

The second hypothesis addressed the relationship of perceived communicative competence and the conversational listening span. Perceived communicative competence was assessed by the perceived interpersonal competence and communicative competence scores. Two competence instruments were used to achieve greater reliability.

Table 2

Correlations of Competence Measures

Instrument	PIC	CLS	Communicative Competence (CC)
PIC	1.00		
CLS	.166*	1.00	
CC	.644*	.186*	1.00

*$p < .01$ level

Results are shown in Table 2. The CLS showed statistically significant correlations at the $p < .01$ level with both perceived interpersonal competence as well as communicative competence ($r = .166$ and $r = .179$, respectively, one tailed). Thus, H_2, was consistent with these data, supporting that CLS scores do have a relationship with communicative competence scores.

The third hypothesis asserted a causal relationship, positing that one's CLS could predict one's communicative competence score. CLS and competence scores correlated significantly correlated in this study, $r = .186$, $p < .01$(See Table 2). Communicative competence and CLS share 3.5% of the variance. CLS significantly predicted perceived communicative competence scores, $\beta = .186$, $t(463) = 30.171$, $p < .001$. The regression equation is Perceived Communicative Competence = 6.309(CLS score) + 143.414. Hence, and individual who scored 4.5 on the CLS would be predicted to have a Perceived Communicative Competence score of 171.804. ($F = 16.717$, $p < .001$; $t = 30.171$, $p < .001$).

Further, the Durbin-Watson statistic was 1.947, suggesting that the residuals were independent and did not correlate, which is important to rule out residual correlation. A visual examination of the P-P plots (Appendix I) also indicated residuals followed a normal distribution. Both are important to confirm that no patterns exist in the residual that would indicate anything but a linear relationship. Thus, H_3, which posed that CLS could predict one's communicative competence, was supported.

The final hypothesis, H_4, addressed the effect of interest on CLS score, suggesting that those who discussed their high interest topic would score higher on the CLS than those who discussed their low interest topic. An independent sample *t*-test showed no significant different in CLS scores for the high interest group ($M = 2.935$, $SD = .935$) versus the low interest group ($M = 2.959$, $SD = .864$); F (1.964, 465, *ns*), $t = -.283$, $p > .05$, *ns*. Therefore, those who discussed the topic they ranked as most interesting scored no differently than those who discussed the topic they ranked as least interesting.

Finally, the last test assessed the data collectors' ratings of competence scores. There were significant differences in the perceived competence scores assigned by the data collectors; F (16, 450) = 5.089, $p < .001$. A post hoc test, Tukey b for unequal cell sizes, indicated significantly different scores in 22 out of the 153 pairwise comparisons. A closer inspection indicted that researcher two accounted for 14 of the 22 significant differences, and her scores were, on average, 122.77 compared to the average mean of 162.00.

In summary, statistical tests provided support for all four hypotheses and one of the two experimental control features. The interpretation and discussion section will address these results in greater depth and provide conclusions, implications, and recommendations for future research.

Chapter IV: Interpretation and Discussion

The purpose of this dissertation was twofold. The first goal was to create an instrument to measure validly one's conversational listening capacity. The second purpose was to investigate the relationship between one's CLS and one's perceived communicative competence. The results suggest that both purposes were met. In addition, four hypotheses were advanced, and all four were supported.

Experimental controls were implemented to minimize risks inherent in all research. These controls and their effects first will be addressed, and then the results of the statistical tests will be discussed in light of the two main goals and four hypotheses of this study.

Effects of Experimental Controls

Control is the hallmark of an experiment, and many attempts were made to control various aspects of this experiment. To test the hypotheses of this study effectively, the study was designed to increase the benefits of what could be learned while reducing the threats to validity. The established controls included minimizing the effects of the data collectors, considering order effects, accounting for topic of CLS test, and the construction of the testing instruments. Each will be addressed below.

Minimizing Researcher Effects

In terms of researcher effects on the perceived communicative competence scale, there were significant differences in 22 out of the 153 pair wise comparisons, with one researcher accounting for 14 out of the 22 differences. Upon closer inspection, this particular researcher scored her participants significantly lower than the other data collectors did. Her scores accounted for 18 of the 467 scores. Though efforts were made to equalize researcher ratings through a rigorous certification process, it is difficult to tell if her ratings were as a result of her failure to norm to the agreed upon standards or if her participants would be perceived similarly by others. The data collectors collected data as early as 8 AM and as late as 7 PM, so it is possible that the researcher was scheduled at a time when a certain type of participant would sign up. Regardless, her scores accounted for less than 4% of the total competence scores, so it is unlikely that deleting her scores would result in greater correlations for the rest of the participants. Of more practical significance is the support for the theory that competence is perceived (Cooper & Husband, 1993; Spitzberg & Cupach, 1984). However, the data collectors were to be consistent in their perceptions, and the communicative competence scores or data collector 2 were inconsistent. However, further research could explore these differences.

Another researcher effect is the interaction between the data collectors and the participants. The use of recorded stimulus materials, instead of live data collectors, may have provided more fidelity. However, listening and communication are both dynamic processes, so the cost of conducting the study in a linear model of communication was outweighed by the benefit of a transactional model of communication, which better simulates true conversational listening. To minimize humans' individualized effects on this study, data collectors were required to memorize stimulus materials and provide consistent verbal and nonverbal feedback.

In summary, the decision to use live data collectors was calculated to create an instrument that more accurately reflects the constructs of conversational listening and perceived communicative competence as they occur in daily conversations. In this study, the benefits outweighed the costs.

Order Effects

Another attempt at control in this study was preventing order effects for the first three tasks, as this is a threat to internal validity (Campbell & Stanley, 1963). All three tasks are similar in terms of the number of sets and recall of stimulus. It was possible that participants could become accustomed to the order and score better on the third task. Participants were assigned randomly to one of six orders, and subsequent testing indicated that participants did not score higher on their third test than their first (Reading Span $F = .663$, ns; Speaking Span $F = .824$, ns; Listening Span $F = .920$, ns). Thus, random assignment to order significantly reduced the testing threat on the study's internal validity.

The CLS was, by design, the final span task. It was not included in the random assignment to order because it required a different room and different resources. However, subsequent statistical tests indicated that individual's scores on the four span tasks were not significant; thus, placing the CLS last did not affect an individual's score to be higher or lower ($F = .990$, ns).

CLS Topic

The CLS was designed to be a measure of working memory capacity, and capacity should have no relevance to interest. While interest is an issue in long-term learning, the CLS does not purport to measure learning or long-term memory. Thus, interest should have no effect on capacity. The statistical tests support this notion: one's CLS score is not affected by one's interest in the topic discussed. Conversely, where one's interest might affect this study is in one's perceived communicative competence. That is, one might believe that individuals who like a topic would be more engaged in discussing it, and that engagement would increase perceived communicative competence scores. However, subsequent statistical tests did not support the idea that those who discussed their favorite topic were perceived to be different in communicative competence than those who discussed their least favorite topic ($F = 1.352$, ns). Though this does not directly support Tirre and Pena's (1992) findings that prior exposure assists recall, it is consistent with their findings that if participants have an intact schema, they will spend less time processing and have more capacity left for storage. The design of the CLS required schema knowledge of a conversation; it did require content-specific knowledge. The participants' ability to paraphrase and respond, "I don't know", allowed the thought to count, but their inability to answer correctly did not penalize their score, as in the Tirre and Penna (1992) study.

Thus, further studies that use the CLS would not require use of different topic areas; however, it would be recommended. The participants' interest rating of the topics and subsequent random assignment to topic gave participants an illusion of control that may have reduced the Hawthorne effect. Future research could investigate whether or not random assignment to topic area affects CLS scores.

Construction of the Testing Materials

Despite designing the span tasks consistent with past research, the correlations in this study were significantly lower than previous studies. For example, previous studies indicated a correlation of speaking span with reading span at $r = .57$, $p < .05$ (Daneman, 1991), $r = .64$, $p < .05$ (Daneman & Green, 1986) and $r = .65$, $p < .05$ (Daneman, 1991). In this study, the correlation was .317. Further, previous research indicated correlations for the reading and listening span at $r = .80$, $p < .05$ (Daneman & Carpenter, 1980), greater than this study's correlation of r =.211, $p < .01$. This raised the question as to why the correlations in this study were not as strong.

Correspondence with M. Daneman (personal communication, March 3, 2003 through September 29, 2003) uncovered two possibilities. These include the floor effect as well as differences in the samples.

The floor effect occurs when participants consistently score at the lower end of a variable (Frey et. al, 2000). In her studies, Daneman did not use the Flesch-Kincaid reading level, or any other control, to ensure consistency in the sentences and appropriateness for target sample. A subsequent analysis of sentences sent by Daneman displayed Flesch-Kincaid levels ranging from 1st – 10^{th} grade reading levels. In this study, the sentences were required to meet a 10^{th} through 12^{th} grade level. Thus, it is possible that less processing capacity was used by Daneman's participants, which left greater capacity for storage in both the reading and listening spans. The speaking span scores should not have been affected, as both studies simply used 7-letter words. Further research could assess if the reading level does affect reading span scores.

However, the floor effect should account only for the mean differences in the reading and listening span tasks, not the correlation between them, if the shift in means is consistent. The mean of the reading span task in this study was 2.457, different from the means of previous studies ranging from 2.9 (Daneman & Carpenter, 1983) to 3.63 (Waters & Caplan, 1996b). The mean of the listening span task was 2.885, between previous studies ranging from 2.4 (Morris & Sarll, 2001) to 2.95 (Daneman & Carpenter, 1980). Thus, a major question emerges and requires further investigation: Why did the more complex development of the instruments only affect the reading span scores and not the listening span scores? Daneman's suggestion of the floor effect does not seem a reasonable explanation for the correlation of the two span tasks.

A more reasonable explanation for the differences in correlations is that they were the result of the sample sizes. Though some of the difference may have been due to the differences between Canadian and American students, a more plausible explanation is the number of participants in each study. Daneman's various studies included 20 to 29 participants, and Caplan and Water's (1996a, 1996b) studies ranged between 65 and 94 participants. This study included 467 participants. The central limit theorem suggests that larger sample sizes approach a normal distribution (Upton & Cook, 2002), and normal distributions increase the generalizability and external validity of a study (P. A. Olmas, personal communication, March 4, 2004).

To further investigate the likelihood that the mean sample scores could be representative of the theoretical population, confidence intervals (CI) were developed using this study's statistics. This study was chosen to generate the confidence intervals because of its large sample size. In terms of reading span scores, the CI was 2.388 – 2.526 (2-tail, *p*. = .05), suggesting that none of the other reading span task scores were drawn from the same population (Daneman & Carpenter, 1980, x = 3.15 in 1st study and 2.76 in 2nd study; Daneman & Carpenter, 1983; x = 2.9; Daneman & Green, 1986, x = 3.5; Waters & Caplan, 1996a, x=3.2; Waters & Caplan, 1996b, 3.25 and 3.63).

The CI for the listening span task was 2.791 – 2.979 (2-tail, *p*. = .05), which could include the mean of 2.95 in one previous study (Daneman & Carpenter, 1980), but not the means of 2.4, 2.5, 2.6, and 3.1 (Morris & Sarrl, 2001).

Finally, the CI for speaking span was 2.939 – 3.057 (2-tail, *p*. = .05), which could not include the mean of 3.28 from previous research (Daneman & Green, 1986).

Of particular interest is that all of Daneman's studies, as well as both of Waters and Caplan's studies, used Canadian university students. All of their studies produced higher means in all three language comprehension span tasks than this study, which used American University students. Differences in schooling may play a factor, or it may be difference in instrument construction. Further research should explore all of these possibilities.

Thus, the means produced by this study might be more reflective of the general population, but the fact that the confidence intervals produced by these means do not include means produced from previous research deserve further investigation to ferret out the differences.

The hypotheses of this study were supported, and the CLS was found to significantly correlate with the other language-processing measures of cognitive capacity. However, the validation of the CLS must be further examined to support its general use. significant

Validity and the Conversational Listening Span

Validity refers to an instrument measuring what it claims to measure. Technically speaking, an instrument is not validated, but validity is gained by "the measuring instrument in relation to the purpose for which it is being used" (Carmines, & Zeller, 1979, p. 17). The CLS was designed to measure one's cognitive listening capacity within the context of working memory. Working memory, the dual-task system, accounts for processing and storage functions, and the previous span tasks (reading, speaking, listening) all claim to measure cognitive capacity. In the original listening and reading span tasks, capacity was determined by the total number of words that one could retain and recall when prompted. For the speaking span task, capacity was the number of words one could recall and use in a grammatical correct sentence. For the CLS task, conversational listening capacity was defined as the number of questions to which one could paraphrase and respond. Powerful arguments have been made for the original span tasks, but it is impossible to claim definitively that any of these span tasks measure what they say they measure. The question driving this study is "does the CLS task measure conversational listening capacity?" The author's position is that the CLS task does measure conversational listening capacity, and this assertion is supported through content validity, criterion-related validity, and construct validity. It offers greater ecological validity than other listening tests; however, it could be improved.

Content Validity

Inevitably, content validity rests mainly on appeals to reason regarding the adequacy with which important content has been sampled and on the adequacy with which the content has been cast in the form of test item (Nunnely, 1978, p. 93).

An instrument that claims to measure any part of listening is difficult, as listening is a cognitive process that cannot be observed except within the context of communication. Even then, cognitions and behaviors are not always congruent. For this study, the construct of listening was defined as "the process of receiving, constructing meaning from, and responding to spoken and/or nonverbal messages" (An ILA Definition of Listening, 1995, p. 4). The CLS task addresses each of these components as follow:

The process of receiving.

The CLS was designed so that the participants would receive a message sent by another student.

Construction meaning from.

The task required that the participants assign meaning to the message received, as the participants were asked to respond to questions. A critical component is that the participants were not required to interpret the message in any specific way. Nor was prior knowledge necessary to answer the question correctly because one could simply paraphrase and state, “I don’t know” and be awarded full credit. The demand on the long-term memory was simply a basic understanding of the English language as well as a schema for conversation. The participants were not required to recall content-specific information from long-term memory. Recall came from the participants’ working memory, where the phonological loop may have stored the part of the response that was understood to be an English word, but not understood within the context of assigning meaning. For example, in the pilot study, the speaking span used the word “heretic”, and many students did not know the pronunciation or the meaning. However, most students could recall the word and place it in a sentence like, “I don’t know what heretic means.” There were no words such as this in the CLS. Participants could clearly understand and paraphrase the question (i.e., You asked me who Barbara Jordan is, and I don’t know) even if they could not provide an answer from their long-term memory.

Responding to spoken and/or nonverbal messages.

The CLS purposefully was developed as a face-to-face instrument so that participants could respond to a communicator’s verbal and nonverbal messages immediately. The desired form of response (paraphrase-answer, paraphrase-answer) was provided and practiced until the participants understood it. Data collectors were trained to provide consistent nonverbal communication in terms of interest throughout, as well as specific nonverbal behaviors, like put elbows on the table, at specific times.

Thus, it is clear that the construct of listening was contained within the CLS task. Further, the CLS purports to measure conversational listening capacity, defined as the number of items that one could respond to in a conversation. Conversations with Daneman, the originator of the language-processing span tasks and a span-test scholar, as well as listening scholars (Andrew Wolvin, Charles Roberts, Richard Halley) all agreed that that the instrument measured what it said it measured. Thus, face validity, a type of content validity (Brinberg & Mcgrath, 1985), albeit a weak one, was achieved (Frey et. al, 2000).

Criterion-Related Validity

Criterion-related validity estimates the behavior to the criterion (Carmine & Zeller, 1979). In this study, the criterion is conversational listening capacity, and the behavior is verbal recall, which is used as a proxy measure of the cognitions present in working memory that were created through listening. Generally, abstract concepts have little hope of achieving criterion-related validity (Carmines & Zeller, 1979). The CLS does not measure the abstract construct of listening, but the more concrete concept of conversational listening capacity. Capacity refers to an amount, and the CLS measures the amount of items that one can recall, paraphrase and respond to within a conversation. The scores on the CLS achieved a normal distribution with non-significant skewness and kurtosis, suggesting that the variable is distributed normally in the population. Its normal distribution indicates that the CLS accurately estimates the criterion of capacity; thus, criterion-related validity has been achieved.

In addition, another form of criterion-related validity is convergent or concurrent validity. Convergent validity is met when scores of a new measure correlate with scores from an existing measure that is deemed to measure validly a criterion (Frey et. al, 2000). The reading span task is considered a valid indicator of functional cognitive capacity, and the listening span and speaking span are considered valid because of their significant correlation to the reading span task. All three purport to measure functional cognitive capacity. The CLS achieved statistical significance with each of the three span tasks.

Construct Validity

Much of construct validity requires matching the concept to the methodological domain or fitting a conceptual domain to a prior structure (Brinberg & McGrath, 1985). Further, a test has construct validity if the relationships between scores obtained on it and various other measures entering into the theoretical formulation turn out to be significant and in the predicted direction (Tyler, 1965, p. 41). Construct validity is used to validate theory or hypothetical constructs not seen by the naked eye (Dick & Hagerty, 1971).

The CLS is grounded in working memory theory, the dominant attention and memory theory. The span tasks consistently have been used to measure functional working memory capacity for over 20 years. The CLS is based on the same premise as the other span tasks in that working memory, a limited capacity system, accounts for processing and storage. Processing precedes storage, and the proxy measure of storage, the verbal response, indicates how little or how much of the capacity was spent processing. Those with higher spans process more quickly, and those with lower spans process more slowly. The CLS significantly correlates with the three previously validated span tasks, and they are all based on the foundation of working memory theory. Thus, the

CLS has achieved construct validity.

Ecological Validity

A study's ecological validity indicates how similarly the procedures and processes mirror daily life (Frey et. al, 2000). The benefit of the CLS study is that it simulates conversational listening and scores are recorded in real-time. This is different from all other listening tests that clearly measure comprehension and memory (Watson & Barker, 2000; Steinbrecher-Willmington, 1997) through linear, videotaped stimulus. The CLS is a face-to-face interaction where the data collectors respond in realistic ways. Thus, the CLS can claim more ecological validity than the other listening tests, but improvements still must be made.

Certainly, the CLS study was a contrived context. In real-life situations, people are not required to paraphrase questions prior to repeating them. In addition, people often have multiple incoming stimuli in the form of statements or questions on the same topic, but rarely is it as sequential and calculated as the CLS study. In addition, participants were aware that they were involved in a study and they were asked to do their best, which also does not simulate real life. However, the context can be defended, as the study was interested in assessing capacity, and it is difficult to imagine a context more appropriate than a test to stimulate participants to do their best.

In terms of communicative competence, participants were not aware that their communication skills also would be assessed. Data collectors were trained in communicative behaviors that would encourage, but not determine, the participants' competence. In addition, the study was designed so that the data collectors would be perceived as the people in power, and one generally tries to be on one's best behaviors in these circumstances. Thus, the communicative competence scores were higher in ecological validity than the CLS scores.

Summary of the Validity of CLS

The Conversational Listening Span (CLS) has gained convergent validity as a proxy measure for the language-processing component of working memory. This makes the CLS the first listening instrument that taps processing and storage measures as opposed to product measures, and it begins to satisfy the criticism that listening tests simply measure memory (Fitch-Hauser & Hughes, 1988; Kelly, 1965; Thomas & Levine, 1994).

While the CLS measures working memory capacity, responses are not dependent upon knowledge stored in long-term memory. For example, in all of the validated listening tests (Bostrom & Waldhart, 1980, 1983; Brown & Carlsen 1955; Cooper, 1988; Steinbrecher Willmington, 1997; Educational Testing Service, 1955; Watson-Barker, 2000) participants listen, and often view, an interaction. In the Watson-Barker (2000) test, for instance, a male gives instructions on fixing a jammed photocopy machine, and in the Steinbrecher-Willmington (1997) test, a female gives step by step instructions on how to perform a lateral chest x-ray. Participants must then answer specific questions that require them to recall where the photocopier repair number is located on the copy machine or how high one must place the plate for the x-ray. If participants could not recall the exact detail, then the answer is incorrect. The CLS differs in this aspect, as participants need only paraphrase the question and respond with “I don’t know.” This is a better indicator of the realistic process of listening, as it shows that the question was comprehended, and it provides a response to the conversational partner. Much like real-life, the conversational partner is not expected to know everything, but the conversational partner is expected to display an attempt to understand the question.

Additionally, responses in the CLS are not content schema-dependent like the other video versions of the validated listening tests (Steinbrecher Willmington, 1997; Watson-Barker, 2000). In the CLS, the only schema necessary is one for conversation. Students have expressed frustration with the previously validated listening tests, as those with past experience in operating a photocopy machine have an easier time recalling where the service information is than those who have no experience. Participants' past experiences would provide a schema that could make it easier for them to store and remember the right answer, similar to the notion that a more sophisticated template assists increased recall (Miller, 2001; Miller & deWinstanley, 2002). In addition, one might be able to assess the correct answer from knowledge stored in long-term memory, regardless of the stimuli presented (Carroll, 1972). One might argue that the CLS is schema-dependent as well, and this may be true to the extent that one must have a basic understanding of the English language. Specifically, the content is not required from long-term memory, just a basic understand of English words. In the CLS, recall comes primarily from WM, and the phonological loop assists in recalling the words, like "heretic", with meanings unknown yet recognized as English words.

Thus, the first goal of this study, to create an instrument that could measure validly one's conversational listening capacity was met. The second goal of this study was to investigate the effect of the CLS on one's perceived communicative competence.

The Effect of Conversational Listening Span on Perceived Communication Competence

The second focus of this dissertation, that one's Conversational Listening Span

(CLS) could predict one's perceived communicative competence, also was significant, albeit minimal. From a research perspective, this has greater practical significance than statistical significance. The CLS is a cognitive, capacity-restricted measure manifested behaviorally. As such, it is in line with Beatty, and McCroskey's (2001) counsel to pursue lines of research that are consistent with neurobiological research. This study supports the notion espoused by communibiology that one's behaviors, in part, are determined by one's biology. In this study, biology's contribution is 3.5%. That is to say, 3.5% of participants' communicative competence comes from their conversational listening capacity, and 96.5% comes from other factors. From the perspective of a communibiologist, this may be disappointing. However, from the perspective of an interactionist (nature and nurture determine behavior), the results suggest that effective communicators are developed, not born. These results confirm one of the communication discipline's quest to teach and train individuals how to be competent.

This study used two measures of competence: an overall competence rating, and another calculated from a revised version of Wiemann's (1977) Communicative Competence Scale. The correlation was .644 ($p < .01$), considered to be moderately positive (Hinkle, Wiersma, & Jurs, 1998). If competence is a condition perceived by the other in the interaction (Cooper & Husband, 1993; Spitzberg & Cupach, 1984), then further investigation is needed to assess why the instruments were not more strongly related. Of course, the contrived conversation that required participants to paraphrase and then respond to each question may have affected subsequent competence scores. To tease out the differences in the future, another unstructured conversation with a different researcher may provide a more true measure.

Additionally, some argue that competence requires both the knowledge of the correct skill and the behavior of enacting it (Cooper, 1988; McCroskey, 1982; Rhodes et. al, 1990; Ridge, 1984, 1993; Wiemann & Backlund, 1980). There is the possibility that those with higher spans know which response is more appropriate but choose not to enact it. Simply because participants have the knowledge of competent behavior does not mean that they choose to act consistent with that knowledge. Further research should investigate this.

Summary of Discussion

This study was conducted for two reasons. First, to create a listening instrument, grounded in working memory, that could validly measure cognitive listening capacity. Second, to assess the effect of one's listening capacity on one's perceived communicative competence. The results indicate that the conversational listening span task (CLS) is a valid measure of cognitive listening capacity. Additionally, the CLS does account for a portion of perceived communicative competence. The most significant contribution of this study, however, is updating a foundation from which testable theories and models can be developed.

Chapter V: Contributions and Significance of the Work

The conversational listening span instrument can make a significant contribution to the disciplines of communication and cognitive psychology. First, for communication research, this validated listening capacity instrument marks a theoretical shift in how listening can be conceptualized, researched, measured, and taught. The CLS, which measures cognitive listening capacity, can provide a significant foundation upon which to build further listening research in the areas of interpersonal communication and listening. It has the potential to build testable theories as well as more scientific models of the listening process. Second, interpersonal communication research generally focuses on the speaker or the message, and now the CLS, a dynamic, real-time instrument, may provide further insight into the individual as communicator as opposed to as a speaker or as a listening. The relationship between listening capacity and communicative competence also may be pursued further. Finally, few listening data collectors conduct cross-disciplinary research in psychology, yet the fields are interdependent. This CLS adds another instrument that can measure cognitive capacity validly. The results also raise some provocative questions about the channel’s effect on working memory as well as how different geographic locations and varying schemas may affect capacity measures. With continued research, the CLS may help the area of listening become more legitimate within the communication discipline.

Appendix A: Terms

Some terms are critical in the study of listening, and they will be used as defined below.

Context – The context of a communication event includes the people present, the physical environment, and the emotional environment (Berko, Wolvin, & Wolvin, 2001). In another sense, the context also includes the knowledge that an individual communicator has in terms of the conventionalized social setting (van Dijk & Kintsch, 1983). This internalized information, whether it be conscious or unconscious, includes schemas by which one makes meaning.

Construct – A construct, or hypothetical construct, "is a concept which is thought to represent reality, to structure reality and to give it meaning" (Infante et. al, 1997, p. 104). The purpose of a hypothetical construct is to explain a communicative event. In this study, *Conversational Listening Span* is the newly created construct used to explain one's listening capacity.

Dynamic – Dynamic is constantly changing (Berlo, 1960). In the context of listening, this means that the initial interpretation of meaning changes with additional stimuli, whether from the outside world or from the long-term memory. Cognitive states constantly change as individuals attend to, understand, and react to messages (Biocca, David, & West, 1994).

Conversational Listening – Based on the transactional model of communication (Berko et. al, 2001) where two or more people are involved in creating meaning by taking turns listening and speaking. Conversations are collaborative discourse (Rost, 1990), and the conversational listener is one who listens to a conversation and contribute to the conversation. (See also “Listener” below).

Interactional – In Interactional Communication, the listener is a part of the communication process (Motley 1990), and thus the communication process is transactional. Interactional and Transactional Communication assume that the individual is acting as both a speaker and a listener. When one is speaking, one is also listening, and when one is listening, one is also making meaning.

Linear Listening – Based on the linear model of communication (Shannon & Weaver. 1949), linear listening suggests that there is only one source and the listener is not offered the opportunity to consistently provide verbal feedback. Lectures are representative of linear listening.

Listener – One who engages in the activity of receiving and making meaning of aural discourse. A listener may be characterized as a participant, addressee, auditor, or overhearer (Rost, 1990), and the distinction among these is one of involvement based on a number of factors including motivation, invitation, and ability. A listener may be characterized as reciprocal or non-reciprocal (Lynch, 1998). Because this study focuses on face-to-face conversations, a listener will always have a response, as the response is perceived by the other, and no overt response still carries strong meaning in face-to-face communication.

Paradigm – A paradigm is a “grand model” or “worldview.” Each paradigm contains theoretical assumptions that are used to guide research (Kuhn, 1963).

Appendix B: Informed Consent Form

Project/Title	Conversational Listening Span: A Proposed Measure for Conversational Listening
Statement of Age of Participant (parental consent needed for minors)	I state that I am 18 years of age or older, in good physical health, and wish to participate in a program of research being conducted by Andrew Wolvin and Laura Janusik in the Department of Communication at the University of Maryland College Park, Maryland 20742-7635.
Purpose	The purpose of the research is to investigate validating an aural instrument, the conversational listening span, a measure of working memory.
Procedures	The procedures involve a reading, speaking, and listening test, a conversation that will be videotaped with my permission, and two recall tests. I understand my participation will require approximately 1 hour.
Confidentiality	All information collected in the study is confidential, and my name will not be identified at any time. The data I provide will be grouped with data others provide for reporting and presentation. Since the study will involve both audio and video taping, I understand that I may be recognized by the researcher(s) when they review the data; however, they will always refer to my responses by my assigned code instead of my name. Records and data will be securely stored to protect my identity. Records and data will be kept for a minimum of 5 years after today and/or 5 years after any publication using this data, whichever is longer.
Risks	I understand that there are no foreseeable personal risks associated with my participation.
	I understand that portions of the study may be videotaped and audio taped, and I give my permission to be audio and/or videotaped. At the end of the study, I will be made aware of exactly what was taped, and I will be given the choice to approve or disapprove the use of these materials. Since my image and voice might be recognizable by the researchers when they are reviewing the data, I understand that anonymity is not guaranteed. Further, I understand and give my consent to have these tapes used for subsequent studies conducted only by the primary researcher and/or the graduate student researcher, and I understand that my responses and identity will remain confidential. I understand that the audio and videotapes will be stored and kept in accordance with the explanation in the "confidentiality" section above.
Benefits	I understand that the experiment is not designed to help me personally, but that the investigator hopes to learn more about an alternate measure for working memory.
Benefits, Freedom to Withdraw, & Ability to Ask Questions	I understand that I am free to ask questions and/or to withdraw from participation at any time without penalty and/or decline to answer certain questions and/or decline to release my audio or videotape for use in this study.
Principal Investigator	*Dr. Andrew* Wolvin, Department of Communication, 2130 Skinner Building, University of Maryland, College Park, MD 20742-7635 Phone: *301-435-6521*; E-mail: *awolvin@deans.umd.edu*
Obtaining research results	I understand that I may obtain a copy of the results of this research after *May 2004* by contacting *Laura Janusik* at the above listed address or at "Janusik@wam.umd.edu".

Printed Name of Participant ________________________**Signature of Participant**______________________

Date ____

I have read and agree to the provisions under "Taping" on this page ______________ (Initial)

Appendix C: ID, Demographic, and Coding Information

You have been assigned a code, and all information will be linked only to your code, not to your name. This will help to ensure confidentiality. Your code will not be able to be matched to your name. Your code appears at the top of this page.

Please complete the information below. Completion is not required, but it will assist us in gaining a mixed sample of participants for the study.

Age: _____ Gender: ______Female ______Male

Estimated GPA from all college courses: ______

You identify primarily as: (check one below)

_____ American Indian or Alaska Native	_____ Hispanic
_____ Asian (Check one below)	_____ Cuban, Cuban- American
_____ Chinese, Chinese American	_____ Mexican, Chicano
_____ Filipino/Pilipino, Filipino-American	_____ Puerto Rican
_____ Korean, Korean-American	_____ South American
_____ South Asian (Indian, Pakistani, Bangladeshi, etc.)	_____ Spanish/Hispanic/Latino
_____ Black, non-Hispanic or African American	_____ Other
_____ Japanese, Japanese-American	_____ Middle Eastern
_____ Southeast Asian (Laotian, Cambodian/Kampuchean, etc.)	_____ Mixed-ethnicity
	_____ Native Hawaiian or other Pacific Islander
_____ Vietnamese	
_____ Other Asian	_____ White, non-Hispanic

English is my first language: _____Yes _____No

I was born in the country of ____________________________________.

My Mother was born in the country of _____________________________________.

Appendix C continued

INTEREST RATING

Think of the topic that you most like to discuss in life. It can be anything. Assume that you like to talk about that topic 100 units. Now, assign your interest level in each of the topics below in comparison to your topic. You may assign any number from 0 (no interest) to ∞ (infinite, most interested).

_____ Music

_____ Sports

_____ Television

_____ Life at the University of Maryland

_____ World Leaders, World Events, and Politics

FOR RESEARCHERS' USE ONLY. DO NOT WRITE BELOW THIS LINE.

Reading Span	1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7
Speaking Span	1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7
Listening Span	1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7
Perceived Interpersonal Competence (Likert)	1 2 3 4 5 6 7 8 9
Communicative Competence	See attached
Conversational Listening Span	1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7

Appendix D Sample CLS Script

TELEVISION
2 practice Let's start off talking about *Friends.*
Explain who your favorite character on *Friends* is and why. (10/6)
What is Phoebe's twin sisters' name?
"Good" or Correct them by reminding them what would be correct (6/2.4)

2 practice I'd like to ask you some questions about TV Violence
If it were up to you, explain why you would have more, less, or the same amount of violence on TV.
Explain why you would say that the fights on "Jerry" are staged or real.
What is one of the most violent TV show airing today?

We've just finished the practice session. Do you have any further questions before we begin for real? I'd like to remind you to do the best that you can. However, I will not be able to answer anymore questions after this.

2 Let's talk about watching TV "I know I watch more than I sometimes care to admit!"
How many hours of television would you say that you watch daily?
What's the name of the last educational program that you watched?

2 Now I'd like to ask you about TV shows that you like. Lean forward.
Tell me what is your favorite television show of all time is and why.
Detail which family television show your personal family most resembles?
Brief personal feedback

2 Let's talk about Reality TV shows Move back from forward lean
How real do you believe reality shows are?
A recent article in the *Washington Post* said that the reality shows are pushing people to consume a lot of liquor so they'll act out. How would you respond to that statement?

3 I'd like to ask some questions about the News. Elbows on table
Who is your favorite weatherman?
Explain for what season you believe weather reports are more accurate.
If you could only get your news from one news station for the rest of your life, which station would it be and why?
Brief personal response & remove elbows

Appendix E: Debriefing Script

Thank you for participating in this Listening Span study. As you probably guessed, we are interested in attention and memory and the role that they play in the listening process. The different span studies that you participated in at the beginning of this study are methods that are popularly used to measure Working Memory. Our asking you to recall your conversation with the other student is our attempt to develop a conversational listening span measure that is valid and reliable. As you probably figured out, that other student was actually a confederate in the study.

The ultimate goal of our research is to build the foundation for a new listening model that is based in dynamic theories of attention and memory. If we can figure out how students listen in daily conversations, then we can develop methods to help them increase their listening efficiency.

Thank you very much for your participation today. We would like to remind you that all of your scores and responses will be aggregated with other students' scores and responses, and they were coded with an individual code that cannot be tied back to you. This means that no one will be able to tie your scores back to your identity. The video and audio recording will only be viewed by researchers, and though your identity cannot be disguised, your responses will be held in confidentiality, and they will only be coded by number, not by name.

If, for any reason, you feel uncomfortable having your response used in this important research project, please alert an experimenter immediately. Your scores will be deleted, and your audio and video will be taped over.

We feel free to have you discuss any issues or reactions that you have with us. You can also contact Laura Janusik at Janusik@wam.umd.edu for further information on this study.

Finally, because we want our participants to be as natural as possible throughout the experiment, we would appreciate it if you did not talk about any parts of this experiment with other UMD students. They may be future participants, and we would not want their performance affected in any way.

Again, we thank you for your participation today.

Appendix F: Communicative Competence Scale

Participant's Code: __________________ Researcher's Code: ________________

Instructions: Always keep the participant in mind while you answer these questions, and base your responses only on your interaction with him/her from this study. Base it on the ENTIRE study, and try not to be swayed by the previous rating and/or perception you gave him/her. (P = Participant.)

Use the following scale. You may use the left or right blanks, but stay consistent.

Strongly Disagree =		Disagree =		Undecided or Neutral =		Agree =		Strongly Agree =
1	2	3	4	5	6	7	8	9

_____ 1. P finds it easy to get along with others (me). _____

_____ 2. P can adapt to changing situations _____

_____ 3. P is "rewarding" to talk to for me. _____

_____ 4. P can deal with others (me) effectively _____

_____ 5. P is a good listener. (verbal AND non-verbal) _____

_____ 6. P's personal relations are warm and inviting (to me). _____

_____ 7. P is easy (for me) to talk to. _____

_____ 8. P's conversation behavior is "smooth." _____

_____ 9. P lets others (me) know s/he understands them (me). _____

_____ 10. P understands other people. (me) _____

_____ 11. P is relaxed and comfortable when speaking. _____

_____ 12. P listens to what people (I) say to him/her. _____

_____ 13. P likes to be close and personal with people (me). _____

_____ 14. P is an effective conversationalist. _____

_____ 15. P is supportive of others (me). _____

_____ 16. P does not mind meeting strangers (me). _____

_____ 17. P pays attention to the conversation. (verbal AND nonverbal) _____

_____ 18. P is generally relaxed when conversing with a new acquaintance (me). _____

_____ 19. P is interested in what others (I) have to say. _____

_____ 20. P follows the conversation well. _____

_____ 21. P enjoys social gatherings where s/he can meet new people. _____

_____ 22. P is a likeable person. _____

_______ 23. P is flexible. _____

_______ 24. P is not afraid to speak with people in authority (me). _____

_____ 25. (I) People can go to P with their problems. _____

APPENDIX GAppendix G: Researcher Certification

CERTIFICATION TRAINING CHECKLIST Name: ___________________

Spring 2003

Int.	Date	Competency
_____	______	STUDENT RELEASE FORM (INFORMED CONSENT) Check that participant has initialed the taping portion
_____	______	ID AND DEMOGRAPHIC SHEET Explain the interest rating Make sure ALL areas are completed (ask)
_____	______	DICE ROLL MEANINGS
_____	______	LISTENING SPAN (TRADITIONAL) Scoring Run Through
_____	______	READING SPAN (TRADITIONAL) Scoring Run Through
_____	______	SPEAKING SPAN (TRADITIONAL) Scoring Run Through
_____	______	PIC
_____	______	CONVERSATIONAL LISTENING SPAN Start with student ID number Consistent Communication Behaviors
_____	______	DEBRIEF
_____	______	COMMUNICATIVE COMPETENCE SCALE
_____	______	VIDEO CAMERA Make sure it is on
_____	______	MASTER CHECKLIST
_____	______	EXPERIMETRIX

Appendix H: Pilot Study Results

N = 26

Pilot Study Correlations of Span Instruments and CC

Instrument	Reading	Listening	Speaking	CLS**	CC**
Reading	1.00				
Listening	.260	1.00			
Speaking	.184	.376*	1.00		
CLS	-.043	-.006	.343*	1.00	
CC	.186	-.022	-.091	.220	1.00

* $p < .05$ level (one-tailed)

** Conversational Listening Span (CLS)

Communicative Competence (CC)

Appendix I: Tests for Assumptions of Normality

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std.	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
READSPAN	465	1.0	6.5	2.457	.7531	1.082	.113	2.647	.226
SPEAKSPA	465	1.0	5.0	2.998	.6409	-.097	.113	-.026	.226
LISTSPAN	466	1.0	7.0	2.885	1.0417	.266	.113	-.160	.226
CLS	467	1.0	5.0	2.946	.9002	.052	.113	-.354	.225
CC	467	55.00	225.00	162.0021	30.48665	-.829	.113	.650	.225
Valid N (listwise	463								

Descriptive Statistics

	Mean	Std. Deviation	N
READSPAN	2.457	.7531	465
SPEAKSPA	2.998	.6409	465
LISTSPAN	2.885	1.0417	466
CLS	2.946	.9002	467
CC	162.0021	30.48665	467

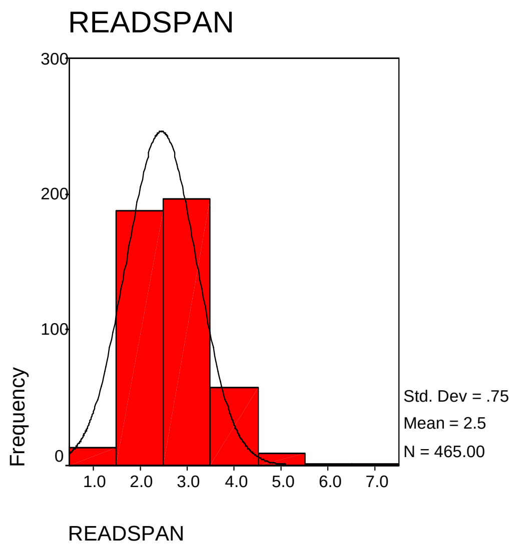
Correlations

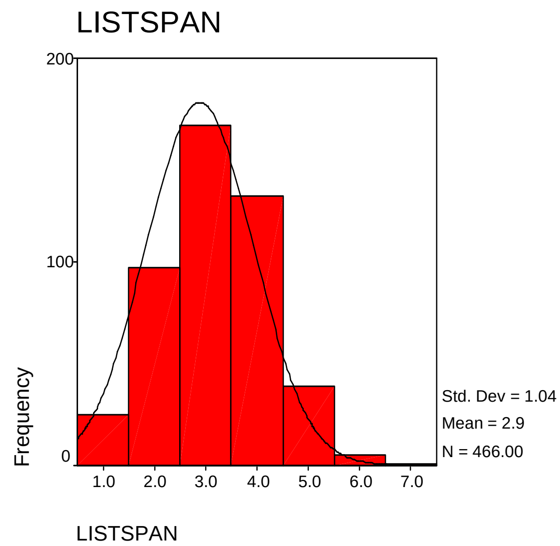
		READSPAN	SPEAKSPA	LISTSPAN	CLS	CC
READSPAN	Pearson Correlation	1	.317**	.211**	.184**	.036
	Sig. (2-tailed)	.	.000	.000	.000	.439
	N	465	463	464	465	465
SPEAKSPA	Pearson Correlation	.317**	1	.249**	.269**	.111*
	Sig. (2-tailed)	.000	.	.000	.000	.017
	N	463	465	465	465	465
LISTSPAN	Pearson Correlation	.211**	.249**	1	.260**	.141**
	Sig. (2-tailed)	.000	.000	.	.000	.002
	N	464	465	466	466	466
CLS	Pearson Correlation	.184**	.269**	.260**	1	.186**
	Sig. (2-tailed)	.000	.000	.000	.	.000
	N	465	465	466	467	467
CC	Pearson Correlation	.036	.111*	.141**	.186**	1
	Sig. (2-tailed)	.439	.017	.002	.000	.
	N	465	465	466	467	467

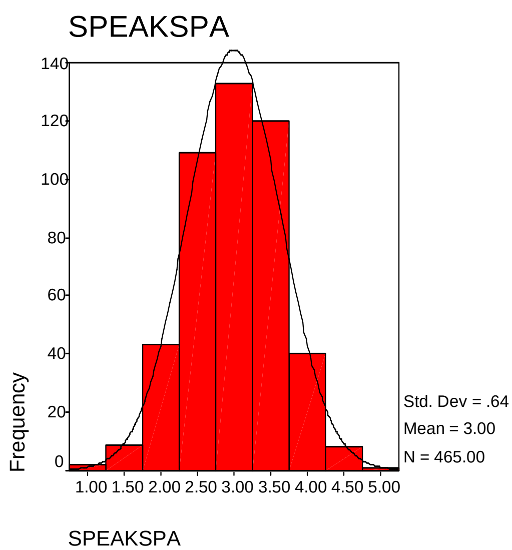
**. Correlation is significant at the 0.01 level (2-tailed).

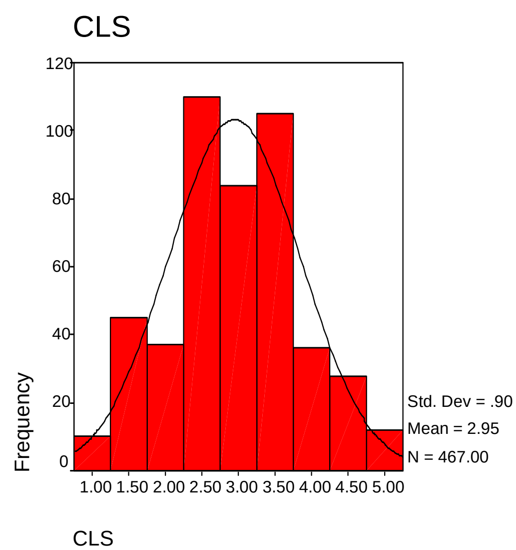
*. Correlation is significant at the 0.05 level (2-tailed).

Appendix I Continued



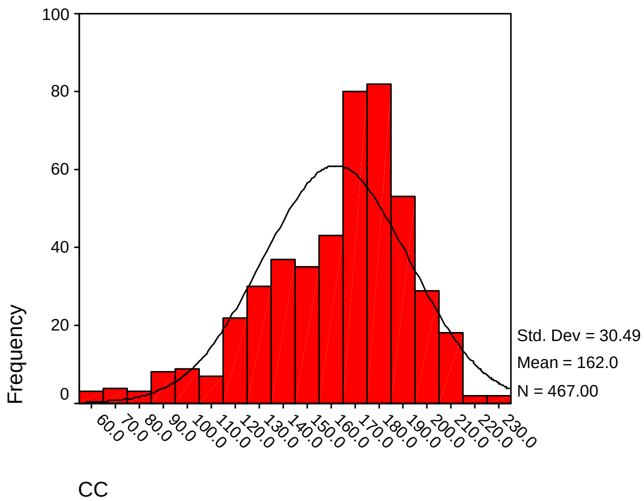






Appendix I Continued

CC



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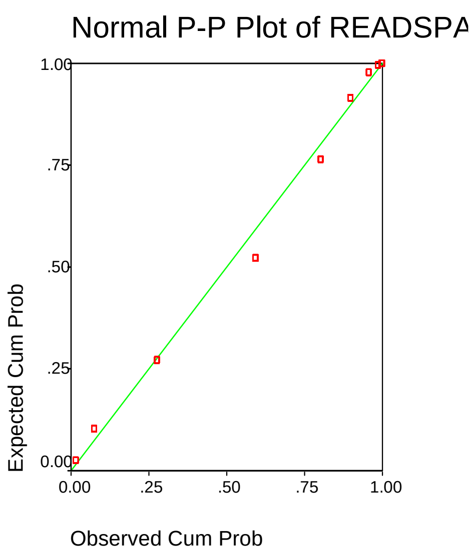
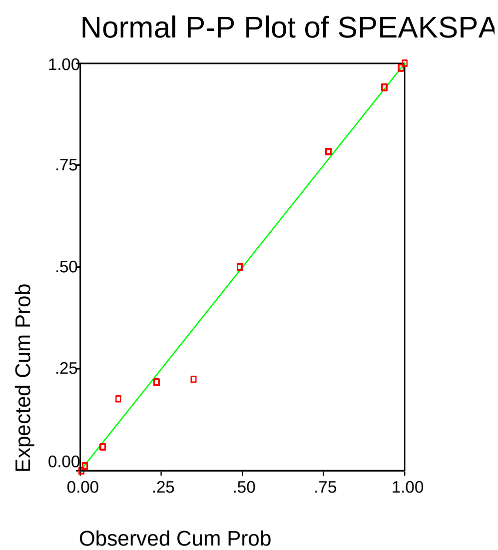
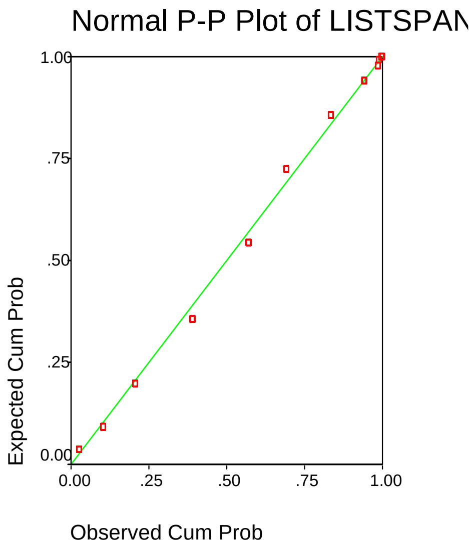
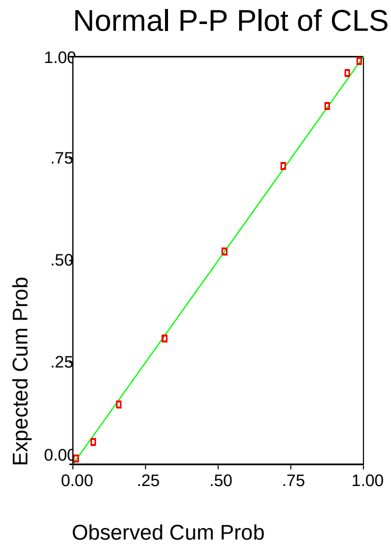
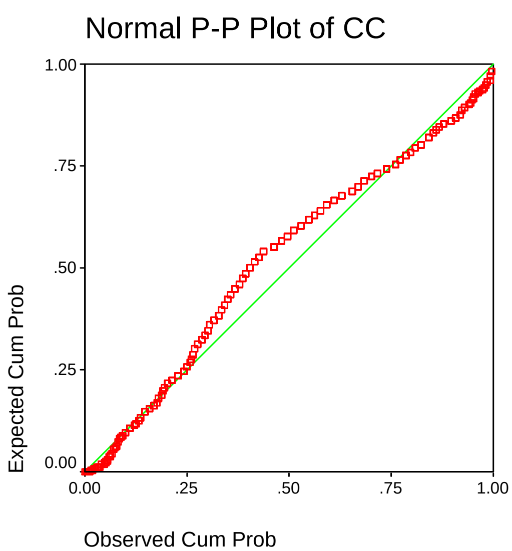




Appendix I Continued







References

Aaronson, D., & Scarborough, H.S. (1977). Performance theories for sentence coding: Some quantitative models. *Journal of Verbal Learning and Verbal Behavior, 16*, 227-303.

An ILA definition of listening. (1995, April). *Listening Post, 53*, 4.

Baddeley, A.D. (1986). *Working memory*. New York: Oxford University Press.

Baddeley, A.D. (1992). Working memory. *Science, 255*, 556-559.

Baddeley, A.D. (2000). The episodic buffer: A new component of working memory? *Trends in Cognitive Sciences*, *4*(11), 417-423.

Baddeley, A.D. (2001). Is working memory still working? *American Psychologist*, *56*(11), 851-857.

Baddeley, A.D. (2003). Working memory and language: An overview. *Journal of Communication Disorders, 36*(3), 189 - 208

Baddeley, A.D., & Hitch, G.J. (1974). Working memory. In G.H. Bower (Ed.), The psychology of learning and motivation: Advances in research and theory (Vol, 8, pp. 47- 89). New York: Academic.

Baddeley, A.D., & Logie, R. H. (1999). Working memory: The multiple-component model. In A. Miyake & P. Shah, (Eds.), *Models of working memory: Mechanisms of active maintenance and executive control* (pp.28 -61). Cambridge: Cambridge University Press.

Baddeley, A.D., Gathercole, S.E., & Papagno, C. (1998). The phonological loop as a language learning device, *Psychological Review*, *105*(1) 158-173.

Barker, L. (1971). *Listening behavior*. Englewood Cliffs, NJ: Prentice Hall.

Barker, L.L., & Watson, K. W. (2000). *Listen up. How to improve relationships, reduce stress, and be more productive by using the power of listening*. New York, NY: St. Martins Press.

Barker, R.T., Pearce, C.G., & Johnson, I.W. (1992). An investigation of perceived managerial listening ability. *Journal of Busines and Technical Communication, 6(*4), 438-457.

Bauer, C.L., & Fink, E.L. (1983). Fitting equations with power transformations: Examining variables with error. In R.N. Bostrom (Ed.), *Communication yearbook 7* (pp. 146-199). Beverly Hills, CA: Sage.

Beatty, M.J. (1994). Receiver apprehension test. In R.B. Rubin, P. Palmgreen, & H. Sypher, (Eds.), *Communication research measures: A Sourcebook* (pp. 304-307). NY: Guilford Press.

Beatty, M.J., Mc Croskey, J.C., (with Valenci, K. M.). (2001). *The biology of communication. A communibiological perspective.* Cresskill, NJ: Hampton Press, Inc.

Bentley, S.C. (1997). Benchmarking listening behaviors: Is effective listening what the speaker says it is? *International Journal of Listening, 11*, 51-68.

Berko, R.M., Wolvin, A.D., & Wolvin, D.R. (2001). *Communicating: A social and career focus*. Boston: Houghton Mifflin.

Berlo, D.K. (1960). *The process of communication.* New York, NY: Holt, Rinehart, and Winston.

Berryman-Fink, C. (1993, November). *A comparison of self-report and behavioral measures of interpersonal conflict management style*. Paper presented at the Speech Communication Association convention, Miami Beach, FL.

Biocca, F., David, P., & West, M. (1994). *Continuous response measurement (CRM): A computerized tool for research on the cognitive processing of communication messages.* In A. Lang (Ed.), *Measuring psychological responses to media messages* (pp. 15-64). Hillsdale, NJ: Lawrence Erlbaum Associates.

Bostrom, R. N. (Ed.). (1990). *Listening behavior: Measurement and application*. New York, NY: Guilford.

Bostrom, R. N. (1996). Memory, cognitive processing, and the process of "listening": A reply to Thomas and Levine. *Human Communication Research. 23,* 2, 298-305.

Bostrom, R.N. (1997). The process of listening. In O. D.W. Hargie (Ed.), *Handbook of communication skills* (2nd ed.) (236-258). London: Routledge.

Bostrom, R.N. & Bryant, C.L. (1980). Factors in the retention of information presented orally: The role of short-term listening. *Western Journal of Speech Communication, 44*, 137-145.

Bostrom, R.N. & Waldhart, E. (1980). Components in listening behavior: The role of short-term memory. *Human Communication Research*, *6*(3), 221-227.

Bostrom, R.N. & Waldhart, E. (1983). *The Kentucky Comprehensive Listening Test.* Lexington, KY: The Kentucky Listening Research Center.

Brinberg, D., & McGarth, J.E. (1985). *Validity and the research process*. Beverly Hills, CA: Sage.

Broadbent, D.E. (1958). *Perception and communication*. London: Pergamon Press.

Broadbent, D.E. (1971). *Decision and Stress*. London: Academic Press.

Broadbent, D.E. (1975). The magic number of seven after fifteen years. In A. Kennedy & A. Wilkes (Eds.), *Studies in long-term memory* (pp. 2-18). London: Wiley.

Brown, J.D. (1997). *Skewness and Kurtosis*. Retrieved February 26, 2004 from http://www.jalt.org/test/bro_1.htm**.**

Brown, J.I, & Carlsen, G.R. (1955). *Brown-Carlsen listening comprehension test*. New York, NY: Harcourt, Brace, and World, Inc.

Brownell, J. (1985). A model for listening instruction: Management applications. *ABC Bulletin*, *48*(3), 39-44.

Brownell, J. (1990). Perceptions of effective listeners: A management study. *The Journal of Business Communication, 27*, 401-415.

Brownell, J. (1996). *Listening: Attitudes, principles, and skills*. Boston: Allyn & Bacon.

Brownell, J. (1999, November). *Should Listening be Part of the Communication Discipline? Trends in Listening Theory, Research, and Training.* Paper presented at the meeting of the National Communication Association, Chicago, IL.

Brownell, J. (2002). *Listening: Attitudes, principles, and skills (2nd ed.).* Boston: Allyn and Bacon.

Buhrmester, D., Furman, W., Wittenberg, M.T., & Reis, H.T. (1988). Five domains of interpersonal competence in peer relationships. *Journal of Personality and Social psychology, 55,* 991 - 1008.

Carroll, J.B. (1972). Defining language comprehension: Some speculations. In J.B. Carroll & R.O. Freedle, (Eds.) *Language comprehension and the acquisition of knowledge* (pp. 1-29). New York: John Wiley & Sons.

Campbell, D.T., & Stanley, J.C. (1963). *Experimental and quasi-experimental designs for research.* Dallas, TX: Houghton-Mifflin.

Carmines, E.G., & Zeller, R.A. (1979). *Reliability and validity assessment.* Beverly Hills, CA: Sage.

Carrell,L.J., & Willmington, S.C. (1996). A comparison of self-report and performance data in assessing speaking and listening competence. *Communication Reports, 9*(2), 185-191.

Case, R., Kurland, M.D., & Goldberg, J. (1982). Operational efficiency and the growth of shortt erm memory spa. *Journal of Experimental Child Psychology, 33*, 386-404.

Chamberlin, C.R. (2000). Nonverbal behaviors and initial impressions of trustworthiness in teacher-supervisor relationships. *Communication Education, 49*(4), 352-364.

Chase, W.G., & Ericsson, K.A. (1982). Skill and working memory, In G.H. Bowers (Eds.), *The psychology of learning and motivation*. New York: Academic Press.

Chen, G.M., & Starosta, W.J. (1996). Intercultural communication competence: A synthesis. In B.R. Burelson (Ed), *Communication yearbook 19* (pp. 353-383). Thousand Oaks, CA: Sage.

Chronbach, L.J., & Meehl, P.E. (1955). Construct validity in psychological tests. *Psychological Bulletin, 52*(4), 281-302.

Coakley, C.G. (1998, March 21). *The Teacher as Model Listener.* Paper presented at the meeting of the International Listening Association Convention, Kansas City, MO.

Coakley, C.G., & Wolvin, A.D. (Eds.). (1989). *Experiential listening. Tools for teachers & trainers.* New Orleans, LA: Spectra Incorporated.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Conway, A.R.A., Cowan, N., & Bunting, M.F. (2001). The cocktail party phenomenon revisited: The importance of working memory capacity. *Psychonomic Bulletin & Review, 8*(2), Special Issue: (pp. 331-335).

Cooper, L., & Husband, R. (1993). Developing a model of organizational listening competency. *Journal of the International Listening Association, 7*, 6-34.

Cooper, M. (1988). NIU Listening exam: Assessing college level listening skills. *Journal of the International Listening Association, 2*, 53-74.

Cronbach, L.J., Meehl, P.E. (1955). Construct validity in psychological test. *Psychological Bulletin, 52,* 281-302.

Curran, J.P. (1982). A procedure for the assessment of social skills: the simulated social interaction tests. In J.P. Curran & P.M. Monti (Eds.), *Social skills training* (pp. 348-398). New York, NY: Guilford.

Daly, J.A., Weber, D.J., Vangelisti, A.L., Maxwell, M., Neel, H. (1989). Concurrent cognitions during conversations: Protocol analysis as a means of exploring conversations. *Discourse Processes, 12*, 227-244.

Daneman, M. (1991). Working memory as a predictor of verbal fluency. *Journal of Psycholinguistic Research, 20,* 445-464.

Daneman, M., & Carpenter. P.A. (1980). Individual differences in working memory and reading. *Journal of Verbal Learning and Verbal Behavior, 19*, 450-466.

Daneman, M., & Carpenter, P.A. (1983). Individual differences in integrating information between and within sentences. *Journal of Experimental Psychology: Learning, Memory, & Cognition, 9*, 561-584.

Daneman, M., & Green, I. (1986). Individual differences in comprehending and producing words in context. *Journal of Memory and Language, 25*, 1-18.

Daneman & Merikle, P.M. (1996). Working memory and language comprehension: A meta-analysis. *Psychonomic Bulletin and Review, 3*(4), 422-433.

De Beni, R., Palladino, P., Pazzaglia, F., & Cornoldi, C. (1998). Increases in intrusion errors and working memory deficits on poor comprehenders. *The Quarterly Journal of Experimental Psychology, 51A*(2), 305-320.

Deutsch, J.A. & Deutsch, D. (1963). Attention: some theoretical considerations. *Psychological Review, 70,* 80-90.

Devine, T.G. (1978). Listening: What do we know after fifty years of research and theorizing? *Journal of Reading, 21*, 296-304.

Dick, W., & Hagerty, N. (1971). Topics in measurement: Reliability and validity. New York, NY: McGraw Hill.

Dittmann, A. T., & Llewellyn, L. G. (1968). Relationship between vocalizations and head nods as listener response. *Journal of Personality and Social Psychology, 2*, 79-84.

Driver, J. (2001). A selective review of selective attention research from the past century. *British Journal of Psychology, 92*(1), 53-79.

Educational Testing Service. (1955). Sequential tests of educational progress: Listening. Princeton, NJ: ETS.

Educational Testing Service. (1979). STEP III Manual and Technical Report. Menlo Park: CA: Addison-Wesley Publishing Company.

Emmert, P., Emmert, V., & Brandt, J. (1993, special issue). An analysis of male-female differences on the listening practices feedback report. *Journal of the International Listening Association*, 43-55.

Engle, R.W., Cantor, J., & Carullo, J.J. (1992). Individual differences in working memory and comprehension: A test of four hypotheses. *Journal of Experimental Psychology: Learning, Memory, & Cognition, 18*, 972-992.

Engle, R.W., Kane, M. J., & Tuholski, S. (1999). Individual differences in working memory capacity and what they tell us about controlled attention, general fluid intelligence, and functions of the prefrontal cortex. In A. Miyake, & P. Shah, (Eds), *Models of working memory: Mechanisms of active maintenance and executive control* (pp. 102-134). Cambridge: Cambridge University Press.

Eriksen, C.W., & Hake, H.W. (1955). Absolute judgments as a function of the stimulus range and the number of stimulus and response categories. *Journal of Experimental Psychology, 49*, 323-332.

Faires, C.L. (1980). *The Development of Listening Tests*. Paper presented at the annual meeting of the mid-South educational research association, New Orleans, LA.

Fitch-Hauser, M. (1990). Making sense of data: Constructs, schemas, and concepts. In R.N. Bostrom (Ed.), Listening behavior. Measurement and application. (pp. 76 – 90). New York, NY: Guildford Press.

Fitch-Hauser, M., & Hughes, M.A. (1987). A factor analytic study of four listening tests. *Journal of the International Listening Association, 1*, 129-147.

Fitch Hauser, M., & Hughes, M.A. (1988). Defining the cognitive process of listening: A dream or reality? *The Journal of the International Listening Association, 2*, 75-88.

Flesch, R.F. (1974). *The art of readable writing; with the Flesch readability formula*. New York, Harper & Row.

Fortkamp, M.B.M. (1999). *Working memory capacity and L2 speech production.* Urbana, IL: ERIC Clearinghouse.

Gathercole, S.E. (1997). Models of verbal short-term memory. In M.A. Conway, (Ed.), *Cognitive models of memory* (pp. 13 - 45). Cambridge, MA: The MIT Press.

Gazzaniga, M.S., Ivery, R.B., & Mangun, G.R. (2002). Cognitive neuroscience. The biology of the mind (2nd ed.). New York, NY: W.W., Norton & Company.

Glenn, E. (1989).A content analysis of fifty definitions of listening. *Journal of the International Listening Association*, *3*, 21-31.

Glenn, E.C., & Pood, E.A. (1989). Listening self-inventory. *Supervisory Management, 34*(1), 12-15.

Goss, B. (1982). Listening as information processing. *Communication Quarterly, 30*(4), 304 - 306.

Grice, H.P. (1975). Logic and conversation. In P. Cole and J.L. Morgan (Eds.), *Syntax and semantics*, (vol 3): speech Arts (pp. 41-58). NY: Academic Press.

Guerrero, L. (1994). “I’m so mad I could scream”: The effects of anger expression on relational satisfaction and communication competence. *The Southern Communication Journal, 59,* 125-141.

Haarman, H.J., Davelaar, E.J., & Usher, M. (2003). Individual differences in semantic short-term memory capacity and reading comprehension. *Journal of Memory and Language*, *48*(2), 320-346.

Hass, J.W., & Arnold, C.L. (1995). An examination of the role of listening in judgments of communication competence in co-workers. *The Journal of Business Communication*, *32*(2), 123-139.

Hayes, J.R.M.. (1952). Memory span for several vocabularies as a function of vocabulary size. *Quarterly Progress Report*, Cambridge, MA: Acoustics Laboratory, Massachusetts Institute of Technology.

Hinkle, D.E., Wiersma, W., & Jurs, S.G. (1998). *Applied statistics for the behavioral sciences*. Boston, MA: Houghton Mifflin.

Infante, D.A., Rancer, A.S., & Womack, D.F. (1997). *Building communication theory* (3rd ed.). Prospect Heights, IL: Waveland Press.

Jackson, M.D., & McClelland, J.L. (1979). Processing determinants of reading speed. *Journal of Experimental Psychology: General*, *108*, 151-181.

Janusik, L.A. (2002a, November 15). *Reconceptualizing Listening through Working Memory*. Colloquium presented at the University of Maryland at College Park.

Janusik, L.A. (2002b, November 23). *Listening and Cognitive Processing: Is There a Difference?* Panel presentation at the annual conference of the National Communication Association, New Orleans, LA.

Janusik, L.A. (2003, April). *Conversational Listening Span: Can it Really Measure Listening?* Paper presented at the Graduate Student Interaction Day, College Park, MD.

Janusik, L.A., & Wolvin, A.D. (2001, March). *The Janusik/Wolvin listening* I*nstrument. A Journey in Validation.* Paper presented at the annual conference of the International Listening Association, Chicago, IL.

Just, M.A., & Carpenter, P.A. (1987). *A psychology of reading and language comprehension.* Boston: Allyn & Bacon.

Just, M.A., & Carpenter, P.A. (1992, January). A capacity theory of comprehension: Individual differences in working memory . *Psychological Review, 99*, 122-49.

Just, M.A., Carpenter, P.A., & Keller, T.A. (1996). The capacity theory of comprehension; new frontiers of evidence and arguments. *Psychological Review, 103*, 773-80.

Kahneman, D. (1973). *Attention and effort*. Englewood Cliffs, NJ: Prentice Hall.

Kelly, C.M. (1965). An investigation of construct validity of two commercially published listening tests. *Speech Monographs, 32*, 139-143.

Kim, J., & Mueller, C.W. (1978). Factor analysis. *Statistical methods and practical issues 14.* Newbury Park CA: Sage.

Kintsch, W. (1998). Cambridge: Cambridge University Press.

Knapp, M.L., & Vangelisti, A.L. (2000). *Interpersonal communication and human relationships* (4th ed.). Boston: Allyn & Bacon.

Kraemer, H.C., & Thiemann, S. (1987). *How many subjects? Statistical power analysis in research*. Newbury Park, CA: Sage.

Kuhn, T.S. (1963). *The structure of scientific revolutions* (3rd ed.). Chicago: University of Chicago Press.

Lomax, R.G. (2001). Statistical concepts: A second course for education and the behavioral sciences (2nd ed.). Mahwah, NJ: Lawrence Erlbaum.

Lundsteen, S.W. (1971). *Listening: Its impact on reading and the other language arts*. Urbana, IL: National Council of Teachers of English.

Lundsteen, S. (1979). Listening its impact at all levels of reading and the other language arts. Urbana, IL: ERIC Clearinghouse on Reading Communication Skills.

Lustig, C. (2002). Working memory span: The effect of prior learning. *American Journal of Psychology*, *115*, 1, 89-101.

Lynch, T. (1998). Theoretical perspectives on listening. *Annual Review of Applied Linguistics*, *18*, 3-19.

Maes, J.D., Weldy, T.G., & Icenogle, M.L. (1997, January). A managerial perspective: Oral communication competency is most important for business students in the workplace. *The Journal of Business Communication*, *34*(1), 67-80.

Maidment, R. (1984). *Tuning In: A guide to effective listening*. Gretna, LO: Pelican Publishing.

Martin, J.N., Hammer, M.R., & Bradford, L. (1994). The influence of cultural and situational contexts on Hispanic and non-Hispanic communication competence behaviors. *Communication Quarterly*, *42*, 160-179.

McCroskey, J.C. (1982). Communication competence and performance: A research and pedagogical perspective. *Communication Education*, *31*, 1-7.

McCroskey, J. C. (1984). Communicative competence: The elusive construct. In R. Bostrom (Ed.), *Competence in communication: A multidisciplinary approach.* Sage:Beverly Hills, CA.

Miller, G.A. (1956). The magical number seven, plus or minus two: Some limits of our capacity for processing information. *Psychological Review*, *63*, 81-97.

Miller, G.A. (1994). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review*, *101*(2), 343 – 352.

Miller, J, B. (2001). Attachment models and memory for conversation. *Journal of Social and Personal Relationships, 18*(3), 404-422

Miller, J.B., & deWinstanley, P.A. (2002). The role of interpersonal competence in memory for conversation. *Personality and Social Psychology Bulletin, 28*(1), 78-89.

Miller, J.B., deWinstanley, P.A. & Carey, P. (1996). Memory for conversation. *Memory*, *4*(6), 16-31.

Miyake, A. & Shah, P. (Eds.). (1999). *Models of working memory: Mechanisms of active maintenance and executive control*. Cambridge: Cambridge University Press.

Moray, N. (1970). *Attention: Selective processes in vision and hearing*. New York: Academic Press.

Morris, N., & Sarll, P. (2001). Drinking glucose improves listening span in students who miss breakfast. *Educational research, 43*, 2, 201-207.

Motley, M.T. (1990). "Communication as interaction" A reply to Beach and Bavelas. *Western Journal of Speech Communication, 54*, 613-623.

Nichols, R. (1947). Listening: Questions and problems. *Quarterly Journal of Speech, 33*, 83-86.

Nichols, R. (1948). Factors in listening comprehension. *Speech Monographs*, *15*, 154-163.

Nofsinger, R.E. (1991). *Everyday conversation*. Newbury Park, CA: Sage.

Nunnally, J. C. (1978). *Psychometric theory. Educational measurement and evaluation*. New York, NY: McGraw- Hill.

Olson, D.R. (1972). Language use for communicating, instruction, and thinking. In J.B. Carroll & R.O. Freedle, (Eds.) *Language comprehension and the acquisition of knowledge* (pp. 139 - 167). New York: John Wiley & Sons.

Osaka, M., Osaka, N., Koyama, S., Nambu, A., Nakatani, K., & Kakigi, R. (1995, September). Peak alpha frequency of magnetoencephalography (MEG) changes during the performance of verbal working memory tasks. *Electroencephalography and Clinical Neurophysiology/Electromyography and Motor Control*, *97,* 4, 123-124.

Osaka, M., Osaka, N., Koyama, S., Okusa, T., & Kakigi, R. (1999). Individual differences in working memory and the peak alpha frequency shift on magnetoencephalography. *Cognitive Brain research, 8*, 3, 365-368.

Parks, M.R. (1994). Communicative competence and interpersonal control. In *handbook of interpersonal communication*, (2nd ed.), (pp. 589-620). Thousand Oaks, CA: Sage.

Pearce, W.B. (1976). The coordinated management of meaning: A rules-based theory of interpersonal communication. In G.R., Miller (Ed.), *Explorations in interpersonal communication* (pp. 17-35). Beverly Hills, CA: Sage.

Petrie, Jr., C.R. (1961). Listening and organization. *Central States Speech Journal, 15*, 8-9.

Pollack, I. (1952). The information of elementary auditory displays. *Journal of the Acoustical Society of America*, *24*, 745-749.

Pollack, I., & Ficks, L. (1954). Information of elementary multi-dimensional auditory displays. *Journal of Acoustial Society of America*, *26,* 155-158.

Posner, M.I., & Raichle, M.E. (1994). *Images of mind.* New York: Scientific American Library.

Powers, W.G., & Spitzberg, B.H. (1986). Basic communication fidelity and image management. *Communication Research Reports, 3,* 60-63.

Prabhakaran, V., Narayanan, K., Zhao, Z. & Gabrielli, J.D.E. (2000). Integration of diverse information in working memory within the frontal lobe. *Nature Neuroscience*, 3(1), 85-90.

Prakash, R. (1957). The role of interests in the memorization and recall of pictures. *Indian Journal of Psychology, 32*, 223-227.

Resnick, L.B. & Klopfer, L.E. (1989). Toward the thinking curriculum : An overview. In Toward the thinking curriculum : Current cognitive research, L.B. Resnick & L.E. Klopfer, Eds. Alexandria, VA: Association for Supervision and Curriculum development.

Rhodes, S.C. (1987). A study of effective and ineffective listening dyads using the systems theory principle of entropy. *Journal of International Listening Association, 1*, 32-53.

Rhodes, S.C. (1993). Listening: A relational process, In A.D. Wolvin & C.G. Coakley (Eds.), *Perspectives on listening* (pp. 217-240). College Park, MD: Ablex Publishing.

Rhodes, S.C., Watson, K.W., & Barker, L.L. (1990). Listening assessment: Trends and influencing factors in the 1980's. *Journal of the International Listening Association, 4*, 62-82.

Ridge, A. (1984). *Assessing Listening Skills.* Paper presented at the International Listening Association summer Conference, St. Paul, MN.

Ridge, A. (1993). A perspective of listening skills, In A.D. Wolvin & C.G. Coakley (Eds.), *Perspectives on listening* (pp. 1-14). College Park, MD: Ablex Publishing.

Roberts, C.V. (1988). The validation of listening tests: Cutting the Gordian knot. *International Journal of Listening, 2*, 1-19.

Roberts, C.V., & Vinson, L. (1998). Relationship among willingness to listen, receiver apprehension, communication apprehension, communication competence, and dogmatism. *International Journal of Listening, 12*, 40-56.

Roloff, M., & Kellerman, K. (1984). Judgments of interpersonal competence. In R. Bostrom (Ed.) *Competence in communication* (pp. 175-218). Beverly Hills, CA: Sage.

Rost, M. (1990). *Listening in language learning.* London: Longman.

Rubin, R.B. (1982). Assessing Speaking and Listening Competence at the College Level: The Communication Competency Assessment Instrument.*Communication Education, 31*, 19-32.

Rubin, R.B. (1990). Communication competence. In G. Phillips & J.T. Wood (Eds.), *Speech communication: Essays to commemorate the 75th anniversary of the Speech Communication Association* (pp. 94-129). Carbondale, IL: Southern Illinois University Press.

Rubin, R.B. (1994). Communicative competence scale. In R.B. Rubin, P. Palmgreen, & H.E. Sypher, H. (Eds.), *Communication research measures: Sourcebook* (pp. 125-129). New York, NY: Guilford Press.

Rubin**,** R.B., & Graham**,** E.E. (1988). Communication correlates of college success: An exploratory investigation. *Communication Education*, *37*(1), 14-28.

Rubin, R.B., Graham, E.E., & Mignerey, J.T. (1990). A longitudinal study of college students' communication competence. *Communication Education, 39*(1), 1-14.

Rubin, D. L., Hafer, T., and Arata, K. (2000). Reading and listening to oral-based versus literate-based discourse. *Communication Education. 49*(2), 121-133.

Rubin, R.B., & Morreale, S.P. (1996). Setting expectations for speech communication and listening. In Jones, E.A. (Ed.). *Preparing competent college graduates: Setting new and higher expectations for student learning*. (pp. 19-30). San Francisco, CA: Jossey Bass, Inc.

Rubin, R.B., Palmgreen, P., Sypher, H. (Eds.). (1994). Communication research measures: Sourcebook. NY: Guilford Press.

Sacks, H. (1992). *Lecture on conversation*. Oxford: Blackwell.

Schiffrin, D. (1999). Oh as a marker of information management. In A. Jaworski, & N. Coupland (Eds.) *The discourse reader* (pp. 275-288). London: Routledge.

Schultz, D.G. (1953). Predicting academic achievement with a new attitude-interest questionnaire. *Educational & Psychological Measurement, 13,* 54-64.

Searle, J. (1965). What is a speech act? In M. Black (Ed.), *Philosophy in America* (pp. 221-239). Ithaca, NY: Cornell University Press.

Shannon, C.E. & Weaver, W. (1949). *The mathematical theory of communication*.

Urbana: University of Illinois Press.

Shannon, D.M., & Davenport, M.A. (2001). *Using SPSS to solve statistical problems. A self instruction guide.* Upper Saddle River, NJ: Prentice Hall.

Spitzberg, B. H. (1982, May). *Relational Competence: An Empirical Test of a Conceptual Model.* Paper presented at the annual convention of the International Communication Association, Boston.

Spitzberg, B. H. (1986, November). *Validating a Measure of Conversational Skills.* Paper presented at the annual convention of the Speech Communication Association, Chicago.

Spitzberg, B. H. (1988). Communication competence: Measures of perceived effectiveness. In C. Tardy (Ed.), *A handbook for the study of human communication* (pp. 67-105). Norwood, NJ: Ablex.

Spitzberg, B.H., & Cupach, W.R. (1984).*Interpersonal communication competence* Beverly Hills, CA: Sage.

Spitzberg, B. H., & Cupach, W.R. (1985). Conversational skill and locus of perception. *Journal of Psychopathology and Behavioral Assessment, 7*, 207-220.

Spitzberg, B. H., & Hecht, M.L. (1984). A component model of relational competence. *Human Communication Research, 10*, 575-599.

Stafford, L., Burggraf, C. S., & Sharkey, W. F. (1987). Conversational memory: The effects of time, free recall, mode, and memory expectancies on remembrances of natural conversations. *Human Communication Research, 14*(2), 203-229.

Stafford, L., & Daly, J.A. (1984). Conversational memory: The effects of recall mode and memory expectancies on remembrances of natural conversations. *Human Communication Research, 10*(3), 379-402.

Stafford, L., Waldron, V. R., & Infield, L. L. (1989). Actor-observer differences in conversational memory. *Human Communication Research, 15,* 590-611.

Stanford University School of Medicine. (2003). *Research methodology*. Retrieved September 1, 2003 from**.** http://healthpolicy.stanford.edu/RA/research_methodology.htm

Steil, L.K., Barker, L.L., & Watson, K.W. (1983). *Effective listening: Key to your success.* Reading, MA: Addison-Wesley.

Steinbrecher, M.M. & Willmington, S.C. (1997). *The Steinbrecher-Willmington Listening Test*. (2nd ed.). Oshkosh, WI: University of Wisconsin.

Stephen, T. (1994). Communication in the shifting context of intimacy: Marriage, meaning, and modernity. *Communication Theory, 4,* 191-218.

Sticht, T.G. (1972). Learning by listening. In R.O. Freedle & J.B. Carroll (Eds.), *Language comprehension and the acquisition of knowledge.* Washington D.C.: V. H. Winston & Sons.

Taylor, S. (1964). Listening what research says to the teacher. Washington, DC: National Education Association.

Thomas, L. T, & Levine, T. R**.** (1994). Disentangling listening and verbal recall. *Human Communication Research, 21* (1), 103-129.

Thomas, L. T., and Levine, T. R. (1996). Further thoughts on recall, memory, and the measurement of listening: A rejoinder to Bostrom. *Human Communication Research*, *23*(2), 306-308.

Timmer, S.G., Veroff, J., & Hatchett, S. (1996). Family ties and marital happiness: The different marital experiences of Black and White newlywed couples. *Journal of Social and Personal Relationships*, *13*, 335-359.

Tirre, W.C., & Pena, C. M. (1992) Investigation of functional working memory in reading span task. *Journal of Educational Psychology, 84*(4), 462 – 472.

Toulmin, S. (1974). Rules and their relevance for understanding human behavior. In T. Mischel (Ed.), *Understanding other persons* (pp 185-215). Totowa, NJ: Rowan & Littlefield.

Treisman, A.M. (1960). Contextual cues in selective listening. *Quarterly Journal of Experimental Psychology, 12*, 242-248.

Treisman, A.M. (1964). Selective attention in man. *British Medical Bulletin, 20*, 12 – 16.

Turner, M.L., & Engle, R.W. (1989). Is working memory capacity task dependent? *Journal of Memory and Language*, *28*, 127-154.

Tyler, L.E. (1965). The psychology of human differences. New York, NY: Appeleton-Century-Crofts, Inc.

University of Louisville, Department of English (2003, March). Flesch-Kincaid reading measures. Retrieved May 20, 2003, from Louisville University, Department of Education Web site: http: http://www.louisville.edu/a- s/english/dale /601/flesch.htm.

Upton, G., & Cook, I. (2002). *Oxford dictionary of statistics*. Oxford: University Press.

Van Dijk, T.A., & Kintsch, W. (1983). *Strategies of discourse comprehension*. New York, NY: Academic Press.

Villaume, W.A., Fitch-Hauser, M., Thomas, T., & Engen, D. (1992, March). *An Initial Study of Interpersonal Perception, Conversational Listening, and Patterns of Talk*. Paper presented at the International Listening Association, Seattle, Washington.

Waters, G.S., & Caplan, D. (1996a). The measurement of verbal working memory capacity and its relation to reading comprehension. *Quarterly journal of experimental psychology, 49a*, 51 – 79.

Waters, G.S., & Caplan, D. (1996b). Processing resource capacity and the comprehension of garden path sentences. *Memory & Cognition*, *24(*3), 342-355.

Watson, K.W., & Barker, L.L. (1984). *Watson/Barker Listening Test.* New Orleans, LA: Spectra, Inc.

Watson, K.W., & Barker, L.L. (2000). *Watson/Barker Listening Test (2nd ed.).* New Orleans, LA: Spectra, Inc.

Watson, K.W., Barker, L.L., & Weaver, J.B. (1995). The listening styles profile (LSP-16): Development and validation of an instrument to assess four listening styles. *International Journal of Listening*, 9, 1-13.

Weaver, C.H. (1972). *Human listening: Processes and behavior*. Indianapolis, IN: Bobbs-Merrill.

Weaver, C.H. (1987). Someone should do something about that. (A comment on listening research). *Journal of the International Listening Association, 1*(1), 29-31.

Wheeless, L.R. (1975). An investigation of receiver apprehension and social context dimension of communication apprehension. *The Speech Teacher, 24*, 261-265.

Whitney, P., Ritchie, B.G., & Clark, M.B. (1991). Working-Memory capacity and the use of elaborative inferences in text comprehension. *Discourse Processes, 13,* 133-145.

Whorf, B.L (1956). Selected writings. In J.B. Carroll (Ed.), *Language, thought and reality: selected writing of B.L. Whorf.* Cambridge, MA: M.I.T. Press.

Wiemann, J.M. (1977). Explication and test of a model of communicative competence. *Human Communication Research, 3*, 195-213.

Wiemann, J.M. & Backlund, P. (1980). Current theory and research in communicative competence. *Review of Educational Research, 50*, 185-199.

Wiemann, J.M. & Bradac, J.J. (1989). Metatheoretical issues in the study of communicative competence: Structural and functional approaches. In B. Dervin &

Willoughby, T. Motz, M., & Wood, E. (1997). The impact of interest and strategy use on memory performance for child, adolescent, and adult learners. *Alberta Journal of Educational Research, 43*(2-3), 127-141.

Wilson, S.R., & Sabee, C.M. (2003). Explicating communicative competence as a theoretical term. In J.O. Greene & B.R.Burelson (Eds.), *Handbook of communication and social interaction skills* (pp.3-50). Mahwah, NJ: Erlbaum.

Wiskell, W. (1989). The problem of listening. *Journal of the International Listening Association, 3,* 62-70.

Witkin, B.R. (1990). Listening theory and research: The state of the art. *Journal of the International Listening Association, 4,* 7-32.

Witkin, B. R. (1993). Human information processing, In A.D. Wolvin & C.G. Coakley (Eds.), *Perspectives on listening* (pp. 23-59). College Park, MD: Ablex Publishing.

Woelfel, J., & Fink, E. L. (1980). *The measurement of communication processes: Galileo theory and method.* New York: Academic Press.

Wolff, F.L., Marsnik, N.C., Tracey, W.S., & Nichols, R.G. (1983). *Perceptive listening.* New York, NY: Holt, Rinehart & Winston.

Wolvin, A.D. (1989). Models of the listening process. In C.V. Roberts and K.W. Watson (Eds.), *Intrapersonal communication processes: Original essays* (pp. 508-527). New Orleans, LA: Spectra, Inc.

Wolvin, A. D. (2002, March). *Understanding listening: The evolution of a process model*. Paper presented at the International Listening Association, Scottsdale, AZ.

Wolvin, A.D., & Coakley, C.G. (1979). *Listening instruction. Theory and research into practice.* Falls Church, VA: Speech Communication Association.

Wolvin, A.D., & Coakley, C.G. (1988) *Listening* (3rd ed.). Dubuque, IA: Wm C. Brown publishers.

Wolvin, A.D., & Coakley, C.G. (Eds.). (1993). *Perspectives on listening.* College Park, MD: Ablex Publishing.

Wolvin, A.D., and Coakley, C.G., (1994). Listening Competency. *Journal of the International Listening Association*, *8*, 148-160.

Wolvin, A.D., & Coakley, C.G. (1996). *Listening (5th ed).* Dubuque, IA: Brown and Benchmark.