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# Intervention strategies and psychosocial factors for a client with Broca's aphasia and apraxia of speech: A case study

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*Intervention strategies and psychosocial factors for a client with Broca's aphasia and apraxia of speech: A case study*

A Thesis Presented to  
The Graduate Faculty of Minnesota State University Moorhead

By

Erin Olson

In Partial Fulfillment of the  
Requirements for the Degree of  
Master of Science in Speech Language Pathology

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## ANNOUNCEMENT OF ORAL EXAM

Name of Candidate:	Erin Olson
Degree Program and Major:	Master of Science Speech-Language Pathology
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Location:	Murray Hall, XX
Examining Committee:	Dr. Nancy Paul, Ph.D. M.S./CCC-SLP, Chair Dr. Nandita Bezbaruah, Ph. D. M.SW, M.PA, B.A. Joni Mehrhoff, M.S., CCC-SLP Vicki Riedinger, M.S., CCC-SLP

Thesis Abstract

The purpose of this case study was to explore the intervention techniques and psychosocial factors present throughout a person with aphasia's treatment which promoted consistent improvement while attending speech-language therapy across eleven years. The participants in the case study included: a 60-year-old male post onset of a left hemisphere cardiovascular accident (CVA) resulting in moderate-severe Broca's Aphasia and verbal Apraxia of Speech (AOS); his spouse; and his primary speech-language pathologist. A comprehensive review of speech-language pathology files and in-depth interviews with each participant were completed and analyzed to gather quantitative and qualitative data to determine factors which contributed to the participant with aphasia's consistent improvement. Analysis of the data was completed using a narrative format. The results revealed documented improvements in formal and informal assessments across time and common psychosocial themes across three interviews.

## Acknowledgements

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### Chapter 1

#### Introduction

Aphasia is described as “an acquired communication disorder caused by brain damage, characterized by an impairment of language modalities: speaking, listening, reading and writing” (Hallowell & Chapey, 2008, p. 3). Aphasia can be caused by damage to the left hemisphere of the brain and cause the individual to become isolated and lonely if not treated (Hallowell & Chapey, 2008). Apraxia of speech (AOS) is described as a “neurological speech disorder that reflects an impaired capacity to plan or program sensorimotor commands necessary for directing movements that result in phonetically and prosodically normal speech” (Duffy, 2013, p. 269). AOS affects roughly 6.9% of individuals with impairments to the left hemisphere of the brain (Duffy, 2013).

Therefore, damage to the left hemisphere of the brain may result in a co-occurrence of aphasia and AOS due to common lesion sites (Duffy, 2013). Both disorders can negatively impact an individual’s ability to communicate with others without intervention (Duffy, 2013; Hallowell & Chapey, 2008). With intervention, individuals with co-occurring aphasia and AOS may improve their communication skills with various communication partners, thereby improving their overall quality of life (Duffy, 2013; Hallowell & Chapey, 2008).

A case-study design was used to explore the experience of a client diagnosed with co-occurring Broca’s aphasia and AOS receiving speech-language intervention. This study aimed to investigate the intervention strategies and psychosocial factors impacting the client which contributed to his consistent improvement while attending speech-language therapy across 11 years. This case study sought to answer the question: “Which speech-language intervention strategies and psychosocial factors led to the participant’s steady improvement?”

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### Chapter 2

#### Literature Review

##### Overview of aphasia

As aphasia with co-occurring apraxia of speech is a complex disorder with many facets, it is vital to review current literature to outline operational definitions for each disorder, as well as review components of current assessment and interventions regarding these conditions.

Hallowell and Chapey (2008) defined aphasia as “an acquired communication disorder caused by brain damage, characterized by the impairment of language modalities: speaking, listening, reading, and writing; it is not the result of sensory or motor deficit, a general intellectual deficit, confusion, or a psychiatric disorder” (p. 3). The American Speech-Language-Hearing Association (ASHA) defined aphasia as “an acquired neurogenic disorder resulting from an injury to the brain- most typically, the left hemisphere” (ASHA, 2017a, para.1) involving impairment in the primary areas: spoken language expression, spoken language comprehension, written expression and reading comprehension. Although there are varying degrees of severity, aphasia is a language disorder impacting the individual’s ability to comprehend and use language to effectively communicate with various communication partners, thereby significantly impacting his/her quality of life (ASHA, 2017a; Duffy, 2013; Hallowell & Chapey, 2008). Damage to the left hemisphere, which is the dominant hemisphere for language in approximately 90% of the population, often results in presence of aphasia (Duffy, 2013; Hallowell & Chapey, 2008).

Aphasia is an overarching term that is frequently broken into two main subtypes: fluent and nonfluent aphasia (ASHA, 2017a; Duffy, 2013; Hallowell & Chapey, 2008). Diagnosis of fluent aphasia is considered during an evaluation when an individual with aphasia’s (IwA)

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speech during spontaneous conversation is “without abnormal pauses, abundant nonmeaningful filler phrases, or long periods of silence” (Hallowell & Chapey, 2008, p. 7). Individuals with fluent aphasia frequently produce long periods of connected speech, however their use of language lacks meaning (ASHA, 2017a; Hallowell & Chapey, 2008). For diagnostic purposes, several subtypes of fluent aphasia were created depending on lesion to the brain and speech characteristics (Hallowell & Chapey, 2008). Subtypes of fluent aphasia include: Wernicke’s aphasia, Conduction aphasia, Transcortical Sensory aphasia and Anomic aphasia (ASHA, 2017a). However, individuals with aphasia may not be easily placed in these categories, due to the highly individualized nature of their speech characteristics and varied speech characteristics across time with intervention (Hallowell & Chapey, 2008).

Contrastively, nonfluent aphasia is considered when an IwA has a “reduced rate of speech” and expresses “less communicative content per unit of time than normal speakers” (Hallowell & Chapey, 2008, p. 7). Speech characteristics of an individual with nonfluent aphasia could include, but are not limited to: restricted vocabulary, agrammatism or lack of function words (e.g. adjectives; pronouns), syntactic errors (e.g., misuse of verb tenses), perseveration (e.g., frequent repetitions of words which lack meaning), and phonemic and global paraphasias (i.e., production of words with substituted sounds or words) (Hallowell & Chapey, 2008). Subcategories of nonfluent include: Broca’s aphasia, Transcortical Motor aphasia and Global aphasia (ASHA, 2017a). As stressed earlier, IwA may not be easily placed in these categories due to the changing nature of the disorder with intervention.

### **Broca’s aphasia**

For the purpose of this study, literature was reviewed primarily regarding Broca’s aphasia due to the nature of the client’s disorder in this case study. Broca’s aphasia is defined as, “a

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severe disruption of language output which far exceeded a difficulty in language comprehension” (Damasio, 2008, p. 20). In other words, an individual with Broca’s aphasia has primarily an impairment in the production and formulation of language (i.e., expressive language) rather than the comprehension of language (Hallowell & Chapey, 2008); however, depending on the severity of the lesion in the brain, language comprehension may be impaired (Webb & Adler, 2008). Individuals with Broca’s aphasia typically have lesions in the inferior frontal lobe, including Broca’s area (Brodmann area 44 and 45), which assists in the coordination of fluent production of spoken language (Webb & Adler, 2008). Therefore, individuals with Broca’s aphasia may have agrammatism, telegraphic speech, uncoordinated articulation, and restricted vocabulary (Duffy, 2013; Hallowell & Chapey, 2008). However, auditory and reading comprehension are strengths and remain relatively intact (Hallowell & Chapey, 2008). Individuals with Broca’s aphasia are often aware of their deficits and are at risk for depression (Hallowell & Chapey, 2008).

### **Apraxia of speech**

Due to the proximity of motor association pathways and Broca’s area, apraxia of speech and Broca’s aphasia commonly co-occur when damage extends beyond Broca’s area and into the frontal lobe (Webb & Adler, 2008). Approximately 6.9% of individuals with a communication disorder caused by damage to the left hemisphere present with apraxia of speech (AOS) (Duffy, 2013). Thus, it is relatively common for an individual with a left hemisphere pathology to exhibit characteristics of AOS.

Duffy (2013) defined apraxia of speech as “a neurological speech disorder that reflects an impaired capacity to plan or program sensorimotor commands necessary for directing movements that result in phonetically and prosodically normal speech” (p. 269). Webb and Adler

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(2008), add this impaired capacity to motor plan occurs in individuals who do not exhibit paralysis or weakness in their speech mechanisms. Hallmark speech characteristics of AOS remain controversial among researchers, due to the variability of errors across individuals (Mauszycki, Wambaugh, & Cameron, 2010; Shuster & Wambaugh, 2008). However, primary deficits in the areas of articulation, rate, prosody and fluency are noted as common speech errors among individuals with AOS (Ballard, et al., 2015; Bauman-Waengler, 2012; Duffy, 2013). Some of the most essential speech characteristics of AOS are an impaired ability to motor plan movements to adequately produce speech and unnatural use of prosody when speaking (Ballard, et al., 2015; Duffy, 2013). Specific errors such as inconsistent articulatory breakdowns, attempts at self-correction, articulatory groping and increased errors with increased length are typically present in the speech of individuals with AOS (Duffy, 2013). For many individuals, AOS is caused by a stroke and is typically a chronic condition causing a significant impact on an individual's ability to effectively communicate with others (Ballard, et al., 2015).

### **Co-occurrence of Broca's aphasia and AOS**

Although an individual may be diagnosed with aphasia and AOS separately, it is common for these communication disorders to coexist (Duffy, 2013). As stated before, co-occurrence of aphasia and AOS is caused by a lesion to a common area of the brain (Duffy, 2013). This is supported by research conducted by Trupe, et al. in 2013. In this study, 34 participants with chronic AOS and Broca's aphasia resulting from a left supratentorial stroke were evaluated using *Apraxia Battery for Adults II* and concurrent magnetic resonance imaging (MRI) to map brain lesions. Trupe, et al. discovered there was an association between AOS characteristics and damage to Brodmann's areas 44 and 45 (i.e., Broca's area) in the brain. This area is associated with a person's ability to motor program for functional speech. Trupe et al., stated a lesion to

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areas 44 and 45 in the brain may be important to relearning motor programming. Lesions to areas 44 and 45 often indicates the individual exhibits signs of Broca's aphasia. Therefore, it is not uncommon for a lesion to areas 44 and 45 in the brain to cause occurrence of both Broca's aphasia and AOS in an individual.

AOS in the purest form does not exhibit a deficit in language, or aphasia (Bauman-Waengler, 2012; Webb & Adler, 2008). Due to the frequent co-occurrence of AOS with Broca's aphasia, it is important to consider how the exhibited behaviors of a client have elements of each disorder. Assessment and treatment tools must be selected to evaluate each disorder.

### **Assessment**

The World Health Organization (WHO) created the *Practical Manual for Using International Classification of Functioning, Disability and Health Framework (ICF)* (2013), which outlined a standard framework to organize and document information regarding an individual's functioning or disability. The WHO stressed the importance of examining the individual's health condition as well as environmental and personal factors relating to their health to effectively evaluate their overall functioning. This includes collecting information regarding the individual's body functions and structures (e.g., brain functioning), activities and participation (e.g., limitations to language modalities), environmental factors (e.g., physical factors, attitudes of IWA and significant others) and personal factors (Hallowell & Chapey, 2008).

In order to, collect information regarding these concepts, standardized and nonstandardized procedures are used. ASHA stated standardized assessments are "empirically developed evaluation tools with established statistical reliability and validity" (ASHA, 2017b, para. 2). These assessments can be viewed as formal assessments as there is a highly structured

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and universal procedure to complete the assessment. Standardized assessments can be used to measure ICF key concepts through measuring the individual's skill to complete task and the impact of disorder on daily activities or quality of life (Hallowell & Chapey, 2008).

Nonstandardized assessments are those which do not have a standard procedure, such as observations in different environments (ASHA, 2017b). These assessments can be viewed as informal assessments and can also be used to gather information regarding WHO ICF categories, however conducting assessment in a more natural environment.

Due to the common occurrence of Broca's aphasia and AOS, it is essential for speech-language pathologist to evaluate and assess the severity of both disorder types. As part of best practice, ASHA states clinicians should select appropriate tools to assess the client's speech and language ability based on the individual's age, cultural background, values, communication deficit, severity of disorder and related factors regarding language (e.g. hearing and cognition) (ASHA, 2017b). In order to accurately assess these areas, standardized assessments, self-reported measures, interviews and/or dynamic assessment should be completed. Patterson and Chapey (2008) outlined the importance of completing assessment which measures how the individual uses the components of communication (i.e., cognitive, linguistic, and pragmatic), as well as using tools to evaluate the individual's quality of life. Therefore, as best practice, a series of standardized measurements should be utilized to measure both the individual's communication skills/behaviors and quality of life.

### **Efficacy of treatment**

Due to the high occurrence of both disorder types, extensive research has been completed regarding the effectiveness of specific treatment approaches treating either Broca's aphasia or AOS. Although, many studies contain participation of individuals with Broca's aphasia and co-

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occurring AOS, the aim of the studies are primarily placed on the efficacy of treatment for one of the disorder types. However, it is essential to treat both disorders for widespread improvement in the client's overall communication. Therefore, literature has been reviewed regarding the efficacy of specific treatment approaches for Broca's aphasia or AOS primarily, with regard to how each approach may also affect the co-occurring/secondary disorder type. Research was also compiled regarding specific treatment approaches implemented with the client in the current case study.

### **Oral reading for language in aphasia approach.**

An approach used to improve communication in adults with nonfluent aphasia is Oral Reading for Language in Aphasia (ORLA). In 2010, Cherney (2010) investigated the effects ORLA had on improving the communication of individuals with varying severity levels of nonfluent aphasia. The researcher included participation of 25 individuals with chronic aphasia (aphasia occurring 12 months post-onset) ranging between the ages 35-81 years. Each participant completed 24 one-hour sessions of ORLA intervention. All 25 participants with nonfluent aphasia of varying severity levels decreased their severity level on the *Western Aphasia Battery* (WAB), the primary outcome measure, from pre- to post-treatment using ORLA. Seven of the 25 participants made a 5-point or greater change on their WAB-AQ severity rating ranging from 6.2 points to 16.3 points. The study concluded, high intensity was needed for consistent and greater improvement, however progress was shown when the intensity of ORLA was low. The researcher also indicated improvements in reading comprehension for individuals with severe aphasia while participating in the ORLA approach. Noticeable improvements in rate and discourse in narrative activities for individuals with moderate and mild-moderate aphasia using the approach was noted upon conclusion of the study. Overall, Cherney (2010) provided

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evidence towards the use of ORLA approach to improve an individual with nonfluent aphasia's communication, regarding their use of language, reading comprehension and speaking rate.

### **Integral stimulation approach.**

Wambaugh, Kalinyak-Fliszar, Michelene, West and Doyle (1998) sought to investigate the efficacy of treatment of sound errors with individuals with co-occurring aphasia and apraxia of speech. Researchers selected three participants between the ages 52- 63, with 20-67 months post onset of left cerebrovascular accident in a multiple baseline design. All participants presented with chronic apraxia of speech and chronic Broca's aphasia, established through administration of the Western Aphasia Battery (WAB). A pretreatment screening of consonant production was completed before baseline measurement to establish target sounds in treatment. Baseline measurements were completed at word, phrase and oral reading levels regarding three targeted sounds for each participant. During intervention, 10 target items were selected for each target sound and minimal contrast sounds were chosen based on targeted items. A traditional hierarchical approach was then used to increase correct production of target sounds. Modeling and imitation of the sound was the first step. If modeling did not increase accuracy, a printed picture of the sound/cue was provided. If accuracy remained low, integral stimulation, modeling with silent coarticulation or verbal articulatory placement cues were provided. Forty-five to sixty minute individual intervention sessions containing seven trials of each 10 stimuli sets were completed three times a week for 27 sessions before post-testing was administered.

Researchers concluded following intervention all participants had increased correct productions of target sounds when producing trained and untrained words, excluding two sounds. Generalization across untrained sounds, in particularly fricatives (i.e., "sh") and glide sounds (i.e., /w/ and /l/) remained limited for two participants. However, this does support evidence in

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which the traditional hierarchical approach with integral stimulation provided improvement in decreasing speech sounds errors in individuals with co-occurring aphasia and AOS.

### **Script training approach.**

Youmans, Youmans, and Hancock conducted two separate studies in 2011 investigating the effects of script training. The script training approach included creating a four to five-line script containing five to eight words per line, regarding a topic of interest the individual would like to communicate to several partners. Once creating the individualized script, the individual completed blocked practice with a speech language pathologist (SLP), where the first line was orally read by the SLP, then orally read together, followed by the individual orally reading independently, and finally the individual independently produced the line without visual cues of the printed words. Once the first line was completed with 90% accuracy independently, the following steps were repeated including the first and second lines. This cuing approach was continued until the individual produces the entire script independently with 90% accuracy or greater.

One of the primary objectives for script training was to create moments of uninterrupted, fluent speech within conversation when talking about personal topics with various communication partners (Youmans, Youmans & Hancock, 2011a). The first multiple baseline design study sought to discover if script training was an effective treatment approach to use with individuals with AOS (Youmans, et al., 2011a). Three participants were involved in the study, all presented with moderate to severe AOS and secondary mild nonfluent aphasia. Each participant attended 60-minute therapy sessions twice a week individually. Results indicated all participants increased their accuracy with number of script words correct and mastered three scripts within 45 weeks of therapy (Youmans, et al., 2011a). Speech sound errors became more stable during

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maintenance probes for each participant. Speaking rate remained variable for each participant after baseline and maintenance probing. The study concluded script training was a promising treatment procedure for individuals with AOS and coexisting mild aphasia. Youmans, et al. (2011a) stated “script training was successful, functional, and practical for these participants” (p.31). Fully mastered scripts were produced by each participant with less struggle, increased fluidity and fewer errors. After completing the course of treatment, all participants met this goal. Two of the participants completed self-rating forms following treatment. Both participants reported improvement in the naturalness of their speech and increased confidence conversing with others by using their mastered scripts. Overall this study provided strong support for the efficacy of implementing script training for these individuals with primary AOS and secondary mild aphasia.

In the second study, Youmans, Youmans, and Hancock (2011b) investigated the social validity of script training among naïve listeners. A group of 124 adult naïve raters listened to 12 audio clips of an 81-year-old woman with moderate to severe AOS during baseline and treatment stages of script training. After each recording, the 124 participants rated four aspects of the speech on the recording subjectively using a performance continuum (i.e., not good at all to very good). The four aspects of speech were understandability, effortless, naturalness, and overall quality. As the speaker continued with script training the naïve raters found her speech to increase in understandability, used less effort, sounded more natural and increased in overall quality. The raters understood more of the recording as the speaker’s rate increased as well as perceived higher naturalness which in turn increased the overall quality of speech. The study reinforced that script training appeared to be a socially valid approach, with potential to improve communication with others.

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Both of Youmans, Youmans and Hancock's studies were examined in Ballard, et al. (2015) systematic review regarding treatment of acquired AOS between the years 2004 and 2012, which identified there were an increasing amount of studies conducted regarding efficacy of AOS treatment, however more research was needed studying the long-term effects of each approach, as well as, studies measuring the effects of each approach at a systematic group-level rather than a single participant level.

Cherney (2012) also investigated the implementation of script training. Cherney reviewed eleven studies between 2001 and 2011 investigating the intensity and dose parameters of script training. Only three studies included the number of times script training teaching was conducted throughout the session, while others recorded the duration of each session and number of weeks intervention that was completed in their study. Cherney found no definitive conclusion regarding the intensity of treatment or dose parameters for implementing script training among IWA.

### **Group therapy.**

Another therapy intervention used among individuals with aphasia and AOS is participating in group therapy. Rotherham, Howe, and Tillard, (2015) conducted a study aimed to explore the benefits of attending group therapy for individuals with aphasia (IWA) including all groups in which they have chosen to participate post-stroke (i.e., speech/language therapy related groups as well as community-based groups) as perceived by the IWA and his/her family members. Sixteen participants (10 IWA; 6 family members) chosen through criterion sampling in New Zealand participated in the study. A qualitative descriptive approach was used to collect information regarding information about various groups individuals with aphasia participated in and the effect of the group on their communication. Groups reported by the participants included: speech language pathologist (SLP) facilitated groups, large peer stroke groups

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(community stroke clubs, community stroke activity group, physiotherapy stroke therapy group, community gym groups with individuals who have had a stroke) and general groups (service organizations, choir, golf club, yacht club, exercise group, informal groups of family and friends) (Rotherham, et al., 2015).

Results from the study indicated several reported benefits of participating in SLP facilitated groups. Participants reported SLP facilitated groups helped create a positive communication environment and some participants preferred SLP facilitated groups to other groups. A need for a trained facilitator was identified for individuals with aphasia with recent onset of stroke to actively participate in the group. Allowing an SLP as a facilitator increased the participants' comprehensibility of speech among the group. SLP facilitated groups allowed individuals with aphasia to focus on communication goals and provide opportunities to practice intervention techniques in a functional and spontaneous way. Thereby, allowing individuals with aphasia to try multimodality communication with others with aphasia in a low anxiety environment (Rotherham, et al., 2015). This study supported the need for increased availability of both SLP facilitated aphasia groups as well as others for individuals with aphasia. Individuals with aphasia reported they needed a group to connect with others who have aphasia and groups provide regularly scheduled times for social contact which may otherwise not be available.

### **Psychosocial effects of aphasia and AOS**

Although improving speech and language is one of the primary goals SLPs consider when treating individuals with aphasia and AOS, psychosocial and emotional wellbeing is another pivotal factor to evaluate an individual's functioning (WHO, 2013). Therefore, it is essential to consider the effects a communication disorder can have on an individual's emotional wellbeing to also improve their quality of life.

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Cahana-Amitay, Oveis, Sayers, Pineles, Sipro III, and Albert (2015) conducted a “proof of concept” case study to investigate the presence of linguistic anxiety when an IwA converses with others. The study consisted of the participation of a 68-year-old male with anomic aphasia and no evidence of apraxia or depression. The participant’s anxiety was monitored through measuring heart rate, skin conductance levels and using a 10-point self-rating Likert scale for anxiety when completing a series of linguistic and non-linguistic tasks. The results indicated the participant presented with low anxiety on a self-rating scale, however he had a high heart rate and skin conductance levels during a peak linguistic activity (creating a speech). Thereby indicating, there was a complex relationship between the participant’s level of anxiety when completing linguistic tasks which may affect the individual’s language performance across a variety of settings (Cahana-Amitay, et al., 2015). Thus, it stands to reason, if high levels of anxiety appear in individuals with mild aphasia, this anxiety may be present or even heightened within an individual with a more severe aphasia diagnosis.

In the earlier study, exploring the benefits of group therapy, Rotherham, et al. (2015) reported psychosocial benefits of participating in group for individuals with aphasia within their study. Participants reported SLP facilitated aphasia, peer-facilitated aphasia, volunteer-facilitated aphasia, stroke, and general groups were beneficial because they provided a moment for social interaction. This indicated a lack of social contact for individuals with aphasia. SLP facilitated groups allowed individuals with aphasia to speak without feeling embarrassed and allowed participants to relate to people outside of their family. The study also identified a lack of confidence when speaking with others among IwA due to reports that groups increase confidence when speaking in group. In fact, one participant reported developing a self-worth through

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attending group. Thereby, indicating there are psycho-emotional needs that should be addressed to promote effective communication with others.

These psychosocial and emotional needs are present for individuals with AOS as well. Haley, Shafer, Harmon and Jacks (2016) investigated the two-year recovery period of a 29-year-old woman with acquired AOS following a traumatic brain injury. Three concepts were discovered while reviewing the participant's blogs across the two-year period. Themes included, "speech improvement," "possibility that full recovery might not occur" and "active speech practice and therapy." Across treatment, the participant experienced strong emotions regarding her speech, such as frustration, however was motivated to continue therapy due to small improvements to her speech. Overall, this study identified the need for more research addressing a participant's response to rehabilitation by measuring his/her performance, while also addressing rehabilitation as a "lived experience".

Even though psychosocial and emotional factors of communication disorders have a significant impact on intervention, an SLP's role when addressing these factors are not clear. Sekhon, Douglas, and Rose (2015) sent surveys to SLPs who worked with individuals with aphasia across Australia. The aim of the survey was to explore intervention practices addressing psychosocial impacts of aphasia in adult clients, determine the SLPs' role when addressing psychosocial factors of aphasia and identify any additional sources for educating professionals regarding intervention techniques addressing psychosocial elements. One hundred and one surveys were analyzed. Researchers discovered SLPs agreed individuals with aphasia were at high risk for "poor psychological well-being" (Sekhon, et al., 2015). However, 63.7% of SLP's reported being under-skilled when managing their client's psychological well-being. Another theme discovered within the study was an unclear role and clinical practice boundaries for an

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SLP addressing psychosocial well-being of clients. All in all, although assessment and treatment are highly researched areas, psychosocial and emotional aspects of communication disorders must also be addressed.

### **Time post onset of CVA**

Common terminology used to describe the duration of an illness are: chronic and acute. The WHO defines a chronic disease as “[a disease] not passed from person to person... are of a long duration and generally slow progression” (WHO, 2018, para. 1). The WHO accepts the definition of acute services as “all promotive, preventive, curative, rehabilitative or palliative actions, whether oriented towards individuals or populations, whose primary purpose is to improve health and whose effectiveness largely depends on a time-sensitive and, frequently, rapid intervention” (Hirshon, et al., 2013 para. 3). Allen, Mehta, McClure and Teasell (2012) conducted a literature review examining the current research regarding efficacy of treatment introduced more than six months post onset of a stroke. Criteria for a study to be considered included over 50% of participants in the study must present with acquired aphasia due to stroke, mean onset time of aphasia must be six months prior or more and 50% or more of participants presented with a stroke six months prior to intervention. A total of 21 randomized controlled studies qualified for review and included five categories of intervention techniques (i.e., language and communication therapies, technological interventions, pharmacotherapies, brain stimulation techniques and constraint-induced aphasia therapy). Mean time post-onset of stroke across the studies ranged from a year and a month to eight years and six months. The researchers concluded there can be gains made through aphasia interventions during chronic stage of stroke. Computer-based treatments, such as the one containing a participant eight years and six months post-onset, constraint-induced aphasia treatment, group language therapy, and training

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conversational partner programs were identified interventions which led to an increase in the IwA's communication skills six months or more post onset of stroke. However, the authors concluded more research was needed regarding multiple randomized controlled studies examining the effects of intervention several years post onset of stroke.

### **Case study design**

After reviewing current research, it was evident more information must be gathered regarding the effect of assessment and treatment of individual's with Broca's aphasia and AOS across an extended period. Also, the need to identify the impact psychosocial factors have on intervention and how these factors change across time within individuals with communication disorders should be assessed. Therefore, a case study was identified as the most logical research design to accomplish this task. Yin (2009) explained a case study should be used when a research question aims to explain a present condition that requires a thorough description of a social phenomenon. A case study seeks to explain why or how a phenomenon occurs within real-time. The current study aimed to discover how specific assessment, treatment techniques and psychosocial factors led to improvement in a single participant. Therefore, a case study was chosen as an acceptable design to answer the current research question: "Which speech-language intervention strategies and psychosocial factors led to the participant's steady improvement?"

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### Chapter 3

#### Methodology

##### Case Study Design

This study aimed to explore the intervention techniques and psychosocial factors present throughout a person with aphasia's treatment which promoted consistent improvement while attending therapy across eleven years at a university Speech-Language & Hearing Clinic and a hospital in the Midwest. This study investigated how specific treatment approaches, as well as his attitudes and beliefs affected the PwA's progress and why he had consistent improvement over an extended period. Yin (2009) described a case study is best used when the study is rooted in explaining the "why" or "how" of a phenomenon. A case study method allowed for deep analysis of a proposed phenomenon (Yin, 2009). In this study, the phenomenon explored was the PwA's continued improvement during treatment of his communication disorders (i.e., aphasia and apraxia of speech). Typically, a client has a period when there is little to no improvement, which is referred to as a plateau. Therefore, a case study was needed to identify factors that have led to the PwA's consistent improvement.

Another argument to use a case study design, was this study examined events that have happened and cannot be manipulated by the researcher. A case study design also aligned with the nature of this study, because of the access to interviews, reports and observations. These materials are described by Yin (2009) as "a variety of evidence" that are not available in a history design. A chronological time series analysis was used to discover causal inferences of the PwA's treatment (Yin, 2009) as documentation included specific dates. Information gained from this study was represented in the chronological structures: early, middle and present stages of treatment to compare data and significant change across time.

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### **Participant**

This study involved the participation of a 60-year-old male (PwA) post onset of a left hemisphere cardiovascular accident (CVA) resulting in severe Broca's Aphasia and verbal Apraxia of Speech (AOS), his primary communication partner (CP) (i.e., his spouse) and his ASHA certified speech-language pathologist (SLP) from the university clinic. Currently, the PwA exhibits signs of moderate Broca's Aphasia and moderate AOS, with accompanying hearing loss. The PwA has impaired auditory comprehension and continues to exhibit telegraphic and monotone speech characteristics. He has been attending speech-language therapy services since 2006.

### **Procedures**

#### **Documentation review.**

The researcher reviewed the PwA's comprehensive SLP files including in-depth review of previously documented treatment plans and recertification reports. Additional documentation (e.g., lesson plans) was reviewed when available. An electronic medical record system was implemented and paper copies of lesson plans were destroyed. Throughout intervention, assessment was completed through formal and informal measures during each semester the PwA attended therapy. The scores and analysis of these tests were organized chronologically in an Excel document using the heading "formal assessment", according to date, test name, and nature of the test (i.e., skill-based or participation and quality of life measurements). Scores were analyzed to mark progression across time. Scores from an assessment tool that was utilized more than once were indicated across the document in to mark trends in the PwA's scores across time. Re-administration of standardized assessments was completed for assessments conducted more than once across treatment. Data from these assessments documented his current status and were

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compared to prior assessment results in a narrative format. The PwA was informed there was no charge for this additional testing. It was his choice to participate in any additional assessments, based upon his availability. He participated in five re-assessments.

Informal assessments were collected and analyzed throughout the participant's treatment. Informal assessments included conversational speech samples, among other forms of assessment detailed in Chapter Four. Results of informal assessments were analyzed using a narrative format and included specific examples of implementation of these procedures which indicated progress.

Goals and results of specific treatment approaches, such as script training (Youmans et al., 2011a) and Oral Reading for Language in Aphasia (Cherney, 2010) were reported in treatment plans and recertification reports. Each treatment objective was categorized chronologically into the main categories of: motor speech, language or a combination of the two. In addition, subcategories for each main category were developed as patterns emerged. For example, under the language category, logical subcategories included: auditory comprehension, reading comprehension, writing, and verbal language. Type and severity of the PwA's communication disorder were also noted.

It should be noted that documented daily lesson plans and subjective, objective, assessment and plan (SOAP) notes were shredded for many of the semesters the PwA received therapy. Subjective, objective, analysis, and plan (SOAP) notes from only the last few years were available, due to implementation of electronic medical record system.

### **Interviews.**

Research procedures also involved separate interviews with the PwA, his primary communication partner (CP) and his SLP from the university clinic to collect information regarding psychosocial effects of treatment both at MSUM and previous medical facilities. The

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interviews discussed the PwA's motivation to continue therapy and possible overarching emotions attached to attending therapy.

An interview of the PwA was conducted. Props from previous intervention strategies were provided during the interview of the PwA, as a visual support to elicit well-rounded responses and help eliminate comprehension barriers. A visual analog scale (i.e., Likert scale, similar to pain rating) with the numbers one through five across a line indicating a spectrum was provided to assist the client in indicating degree of severity. The PwA was asked the following questions:

### **Intervention-**

- a. *How do you think attending therapy has affected your life?*
- b. *Which therapy techniques do you think have been most beneficial?*
- c. *Which activities/techniques do you consider the least beneficial?*
- d. *Is there anything you would have liked changed to the treatment you have received?*
- e. *What has been the greatest motivator to continue therapy?*
- f. *What do you think are some of the causes for your consistent improvement?*
- g. *How much do you think your speech therapy has contributed to your improvement?*

### **Psychosocial**

- h. *How has your stroke affected how you talk to people in your life?*
  - i. *And has this changed across time?*

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- i. What has been the biggest adjustment in your life you've had to make since your stroke?*
- j. What were some feelings and emotions you felt after your stroke?*
- k. How has your stroke affected how you see yourself?*
- l. What factors do you think have helped improve communication?*
- m. Can you describe some emotions you have felt attached to the treatment process?*
- n. Is there anything else you would like to share?*

The CP was asked the following questions. Props from intervention strategies were provided to elicit full, well-rounded responses during the interview.

### **Intervention**

- a. What changes have you seen in [the PwA's name] communication while attending speech-language services?*
- b. How has [the PwA's name]'s communication changed across time?*
- c. What factors do you think has caused his consistent improvement across time?*
- d. How much do you think speech therapy has contributed to [the PwA's name]'s improvement?*
- e. What technique or therapy goal has been the most beneficial to improving the client's communication at home?*
- f. What has been the least beneficial goal/technique?*
- g. Looking back, is there anything you wish would have been different about his treatment?*

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### **Psychosocial**

- h. How has [the PwA's name]'s participation in speech-language therapy changed his communication with other people?*
- i. What emotions have you observed [the PwA's name] have regarding his communication?*
  - i. Can you give some examples?*
  - ii. What have been some emotions you have experienced related to [the client's name] receiving speech-language services?*
- j. How has [the PwA's name]'s stroke affected your life?*
- k. What has been the biggest adjustment you have had to make since [the PwA's name]'s stroke? And why?*
- l. Is there anything else you would like to share?*

The following questions were asked during the interview with the SLP:

### **Intervention**

- a. What has been the greatest change you have observed in the PwA's communication across time?*
- b. How did you select the approaches/techniques you have implemented?*
- c. Are there any changes you wish you could have made to the PwA's treatment?*
- d. What do you feel has been the most important factor to the PwA's improvement?*
- e. Are there treatment approaches available now you would have implemented in the beginning of [the PwA's name]'s treatment that were not available?*
- f. What technique or approach do you think has led to the greatest gains in [the PwA's name]'s communication?*

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- g. Which approach/technique do you feel has been the least beneficial in [the PwA's name]'s treatment?*
- h. What have been some barriers to [the PwA's name]'s improvement?*
- i. What have been some facilitators to [the PwA's name]'s improvement?*

### **Psychosocial**

- j. What emotions have you observed [the PwA's name] have during therapy?*
  - i. Have these emotions changed over time?*
- k. Can you share any additional affects psychosocial factors had during intervention?*
- l. Is there anything else you would like to share?*

Each interview was audio recorded and transcribed verbatim for analysis.

### **Data Analysis**

Quantitative data collected from each formal standardized assessment and informal assessment data from conversational speech samples was provided through a narrative format. A comprehensive chart was used to represent trends in standardized scores. Qualitative data describing the PwA's progress using specific objectives and therapy approaches across time was shown in a narrative format using a chronological structure as described by Yin (2009).

Transcribed interviews from the PwA, CP and the SLP were analyzed by summarizing the key themes. Analysis of the interviews was summarized using a narrative format.

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### Chapter 4

#### Results

##### Formal Assessment

Upon reviewing the PwA's chart, an Excel document was created outlining each formal or standardized assessment, the year the assessment was given and the outcome of the assessment (see Table 1). To be considered standardized assessment ASHA (2017b) stated, assessments must have "established statistical reliability and validity" and requires all participants "to answer the same items/questions in the same way and that is scored in a standard or consistent way, thus making it possible to compare the relative performance of individuals or groups of individuals" (para. 2). Two categories were made within standardized assessment: skill-based measurements and quality of life measurements, as there was a difference in purpose of each assessment. Refer to Table 1 for specific outcomes of each assessment.

##### **Skill-based measurements.**

The purpose of each formal assessment was to assess specific communication skills of the individual as compared to norms of corresponding age groups and medical diagnoses. The following skill-based assessments were given during the participant's intervention at MSUM (arranged from most frequently to least frequently administered): *Western Aphasia Battery (WAB)*, *Communication Activities of Daily Living-2 (CADL-2)*, *Aphasia Language Performance Scales (ALPS)*, the *Boston Diagnostic Aphasia Examination (BDAE) Short Form*. The nature of all administered formal assessments was to measure aphasia characteristics.

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Table 1

*Results of Formal Assessments*

Chronological Time (Year)	Formal assessment and corresponding outcomes										
	Skill-based measures										
	Western Aphasia Battery (WAB)	Communication Activities of Daily Living-2 (CADL-2)		Aphasia Language Performance Scales (ALPS) [Subtests: Listening, Talking, Reading, Writing] <sup>a</sup>							
				Listening		Talking		Reading		Writing	
	Aphasia quotient	Stanine	Percentile	Severity	Score	Severity	Score	Severity	Score	Severity	Score
2006											
2007	48.4										
2008				mod.- severe	4.5	mod.- severe	5	mild	8	mild- mod.	9
2009	51.7			mod.- severe	5	mod.- severe	5	mild	9	mild- mod.	6
2010											
2011	61.6	5	55								
2012		7	86								
2013											
2014	70.6 (spring)* 62.7 (fall)*										
2015	59.5*										
2016	62.4*	6	62								
2017	65.2*	7	84	mod.- severe	5	mild	7.5	mild- mod.	7	mild	8

*Note.* The table represents the scores of each formal assessment completed by the PwA across speech/language intervention including associated subtest scores.

<sup>a</sup>The severity levels for each subtest are listed with the scores. Moderate was abbreviated as mod.

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Table 1

*Results of Formal Assessments*

Chronological Time (Year)	Formal assessment and corresponding outcomes							
	Skill-based measures					Participation and quality of life measures		
	Boston Diagnostic Aphasia Examination (BDAE) Short Form					Quality of Life Communication scale		Communication Effectiveness Index (CETI)
	Auditory comprehension	Repetition	Naming	Reading	Writing	Mean	Self-rating	Score
Score	Score	Score	Score	Score				
2006	16/32	1/7	2/37	19/39	60/73			
2007								
2008								
2009								
2010						3 (spring) 2.6 (fall)	4 (spring) 3.5 (fall)	49/100 (spring) 48/100 (fall)
2011								42.7/100
2012								
2013								
2014								
2015								
2016								
2017	25/32	3/7	18/37	31/39	65/73	3.15	4	

*Note.* The table represents the scores of each formal assessment completed by the PwA across speech/language intervention including associated subtest scores.

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### *Western aphasia battery.*

#### *Aphasia quotient.*

The WAB assessed many different aspects of language, such as spontaneous speech, auditory verbal comprehension, repetition, and naming/wordfinding. Upon completion of the assessment an overall aphasia quotient (AQ) was calculated. The AQ measurements across time indicated an improvement in the participant's communication, as the participant's AQ of 48.4 from the initial assessment in 2007 increased to 65.2 during the most recent evaluation in 2017. However, overall outcomes/scores for each formal assessment fluctuated across time. These fluctuations were most present in the outcomes of the WAB, as his AQ appeared to increase and decrease several times across the intervention period. For example, his AQ scores steadily increased until spring 2014 (70.6). His AQ scores then decreased until 2015 (59.5) when it began improving again. Although fluctuations were present, the participant's quotient did not decrease past his initial assessment, and the initial and most recent scores clearly demonstrated an overall pattern of improvement across time.

There were other factors that may have impacted the fluctuation in scores. Potential reasons are further discussed in depth in Chapter Five in terms of interobserver reliability, the change in edition of the assessment tool, and how AOS impacted the consistency of errors of articulation.

#### *Severity level.*

Another indication of improvement was severity level. The WAB-R Examiner's manual by Kertesz (2007) indicated severity level according to AQ: 0-25 indicated very severe, 26-50 indicated severe, 51-75 indicated moderate and an AQ of 76 and above indicated mild severity level. The participant's AQ was 48.4 after the initial assessment in 2007 (severe). The initial AQ,

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after the administration of the revised WAB-R in the spring of 2014 was 70.6 and was within the top range of the moderate severity level. His AQ in the fall of 2014 was 62.7, which although a lower score, was still within the range for a moderate severity level. This change could be due to test re-test reliability due to the introduction of a few changes in stimuli and a new scoring system. The most recent three AQ scores indicated the participant remained in the top end of the moderate severity level range. Although the participant's AQ varied from 2014 to 2017 he remained in the moderate severity level throughout this period.

### *Communication Activities of Daily Living-2.*

A similar pattern occurred with the participant's stanine and percentile scores during the CADL-2 (see Table 1). Although this assessment was first given during the middle of the intervention period (five years post onset) and not close post onset of the stroke, data showed one score that was higher than the adjacent percentiles (i.e., 55%, 86%, 62% to 84%). The CADL-2 did not include a distinct severity level scale and instead provided a Likert scale measuring level of functional communication according to the participant's percentile rank. His percentiles indicated he was between the mean for a relatively high level of functional communication. Again, factors impacting fluctuating scores could have been interobserver reliability and the changing nature of the client's speech sound errors. However, there was a trend of improvement across the scores from the first to the most recent administrations.

### *Aphasia language performance scales.*

Contrasted to the overall AQ, stanine and percentile rank of the WAB and CADL-2, the ALPS was divided into individualized scores and severity levels for each of the four subtests. These subtests included listening, talking, reading and writing. Each subtest consisted of 10 items, which allowed assessment time to be brief. Also, unlike the WAB and the CADL-2, the

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ALPS was not used throughout the treatment period, but rather only administered twice during the early and most recent phases of intervention. An increase in subtest scores occurred in all subtests except reading (i.e., initial score of 8, current score of 7). However, this decrease was within one point, which was not a substantial difference. Therefore, these two administrations of the assessment demonstrated his improvement across time.

### *Severity levels.*

The severity levels and scores across each section of the ALPS are indicated in Table 1 (Keenan & Brassell, 1975). He remained consistently within the moderate-severe level in the listening subtest (auditory comprehension), decreased severity to mild in the talking subtest (verbal expression), increased severity to mild to moderate in the reading subtests and remained relatively consistent in the mild range during the writing subtest. It should be noted again, the decrease in reading subtest was within one point and although it changed severity rating, was not a substantial difference. A factor that may have influenced the scoring of this test may have been interobserver reliability as well as inconsistent errors as discussed in Chapter Five.

### *Boston diagnostic aphasia examination.*

The BDAE short form, like the WAB, was divided into several subtests as it was an impairment-based assessment tool. Therefore, scores were included for each subtest and presented as the overall total for the subtest. The BDAE short form was administered at the beginning of intervention and re-administered once more within the last year for comparison. There was improvement in each subtest, in particular within the naming and reading subtests. Although there was a chance of inter-observer reliability being a factor in the change of scores, this was likely not as significant as compared to other assessments, as only two separate

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clinicians administered the assessment and the same short form was used as the initial assessment.

### *Severity levels.*

Severity levels for BDAE were only available for the conversation portion of the assessment and in Likert scale format. However, the original form used during the initial assessment was not available, therefore a comparison of severity scores could not be made. The outcomes of skill-based testing indicated there was an overall increase in the PwA's communication performance across time. Although the outcomes of the assessments fluctuated, it was evident the participant had continued to make progress towards improving his communication skills by attending speech-language intervention.

### **Participation scales and quality of life measurements.**

Two formal assessments were used to measure the impact of the communication deficit on quality of life. The first and most frequently used measurement was the *Quality of Communication Life Scale* (Paul, et al., 2004). The second quality of life measurement administered was the *Communication Effectiveness Index (CETI)* (Lomas, et al., 1989) completed by the participant's spouse, who will be referred to throughout this paper as his main communication partner (CP).

The *Quality of Communication Life Scale* aimed to provide information regarding how the individual's communication disorder affected his/her relationships with others, social interactions, participation in social activities, and overall quality of life. He read series of statements and indicated (e.g., pointing) on a five-point Likert scale either yes, he agreed, or no, he did not agree with the statement. For example, the first statement was "*I like to talk with people.*" (Paul, et al., 2004, p. 8). The individual then pointed on the five-point scale regarding

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how he felt about the statement. In 2010, this assessment was utilized to determine if there was a difference in the participant's performance at the beginning of a recertification period (typically lasting six weeks) as compared to the end. During this time, his scores decreased. However, this may have indicated the PwA obtained an increased awareness of his communication impairment. When administered again in 2017, the results showed there was not a significant change in the assessment's outcome.

The CETI, like the *Quality of Communication Life Scales*, required the CP to rate a series of statements with a visual analog scale. The CP must judge each statement whether the PwA was able to complete the activity in the statement and mark on the scale using a pen/pencil. However, instead of yes or no, the scale ranged from “*not at all able*” or “*is able to as before*”. Her responses were calculated by a scale based on Lomas, et al. (1989) which converted into a percentage. She rated the PwA communication a 49/100, or 49%, at the beginning of intervention in January 2009. After a semester of intervention, the CP completed the CETI again, rated the PwA's communication as 48/100 (48%). Again, this assessment aimed to mark the progress of the PwA's communication outside of therapy across a recertification period and the impact of the communication deficit on activities of daily life. However, because the questions required the CP to remember the PwA's abilities before the traumatic event and compare that time to the PwA's recent abilities, this assessment became increasingly difficult emotionally for the participant's spouse to complete. Therefore, this assessment was discontinued. Although this assessment was not used excessively, it did provide insight to the spouse's perception of the participant's speech. The outcomes at the time of the assessment indicated she believed the participant's speech was 50% effective during activities of daily living. The results of the quality of life measurements showed the participant's communication has had a consistent impact on the

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participant's daily life as reported by the participant in self-rated scores and his spouse through a questionnaire format.

### **Informal Assessment**

Along with a variety of standardized assessments, non-standardized assessments were conducted across the targeted intervention period. Non-standardized assessments allowed for individualized data to be collected that could not be compared to standardized norms of individuals with similar skills. From these non-standardized assessments, objectives were created and modified across time depending on the PwA's progress. For example, a number of objectives were created to expand his language through using verb forms. This was measured in a variety of forms across time. Through examining the informal assessment measures, it was evident several treatment approaches were used with the PwA (e.g., integral stimulation, traditional stimulus/response, Sentence Production Program for Aphasia). Therefore, informal measures were used to monitor the effectiveness of the targeted treatment technique and evaluate his progress regarding the objectives.

### **Conversation sample.**

A conversational speech sample was the most frequently used informal assessment throughout intervention. However, the duration of the conversational speech sample was either not provided in documentation (i.e., progress notes) or the duration of the sample varied across time. Conversational speech samples ranged from one 5 to 10-minute sample to a series of 10-minute samples, while other samples were discontinued after participant verbalized 150 words. Also, these conversational speech samples were assessed using a variety of methods, such as, but not limited to: number of occurrence of targeted behavior, Lexical Richness Percentile (Helms-Estabrooks & Albert, 2004) and Communication Effectiveness Profile (CEP) (Helms-Estabrooks

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& Albert, 2004), lexical efficiency and mean length of utterance. Methods of evaluating the sample were chosen depending on the targeted objectives at that time and varied across time as new clinicians formed original treatment plans.

One example of how a conversational speech sample was used as an informal assessment was in April 2010. He completed a 5-10-minute conversational speech sample containing topics of interest (i.e., hunting, fishing, attending church). A sample was collected at the beginning of the certification period (the end of the March) for a baseline measurement and collected again at the end of the certification period (end of April) for comparison. The CEP was used to analyze the sample. His baseline was 2.9 using CEP in March and 2.3 in April. Although, it appeared he did not improve, the second sample in April showed an increase in spontaneous correct grammatical endings which pertained to a targeted objective.

A more recent example of when conversational speech samples were used was in spring 2016. A nine-minute conversational/discourse sample was used to measure the accuracy of obligatory verb tenses in the PwA's conversation. He had a baseline of 56% accuracy, increasing to 78% accuracy during conversation at the end of the treatment period. This same sample was used to measure improvement in MLU throughout the treatment period. He had a baseline MLU of 4.80 and increased to 5.05 by the end of the treatment period. In each of these two examples of evaluating a conversational sample, the length of the sample changed, as well as the purpose of the sample.

### **Probes for target behavior.**

Another frequently used informal assessment completed was probing various behaviors. This was done to mark the percent correct of the targeted behavior based on the written objective (e.g., number of verbs used correctly when describing a picture). Various probing techniques

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included: prompting to describe pictures (e.g., BDAE cookie theft picture), utilizing Sentence Production Program for Aphasia (SPPA) probing protocol (Helms-Estabrooks & Albert, 2004), oral reading tasks, and stating probe question to initiate a script. A description of the cookie theft picture allowed samples to be compared across time. Data collected regarding targeted behaviors included number of total words, correct number of content units, number of grammatical endings, index of lexical efficiency and index of grammatical support. The use of SPPA targeted a range of behaviors with increased difficulty across time. For example, SPPA was first used to calculate the correct use of imperative intransitive statements at the sentence level in 2009 and increased in difficulty to calculating the correct use of the interrogatives *when* and *where* later that year. Oral reading tasks targeted eliciting behaviors such as, percentage of correct articulation of targeted words/phrases. Finally, stating a probe question to initiate a script allowed for the percentage of script correct to be calculated. However, the documentation within progress notes of informal assessment procedures became less specific during the most recent two years of intervention and were often left unspecified. This may have been the result of the clinic implementing an electronic medical record system for which detailed procedures for each session were visible only to the supervisor/clinician and not retained by the system across time.

An example of informal assessment administered across time is provided below. In April 2010, the cookie theft picture from the BDAE (Goodglass, et al., 2001) was used multiple times to probe for targeted behaviors. During each probe, the PwA described the picture while a sample was collected. The cookie theft picture was used as a consistent prompt to elicit connected speech from the participant. Although a speech sample was collected, it was not classified as a discourse sample, as there were no conversational turns between the PwA and the clinician. From this sample, an index of lexical efficiency was calculated by dividing the number

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of novel words by the number of total words, then multiplying by 100 to form a percentage. See Table 2 for a graph containing the outcomes of the probe across 4 months.

Table 2

*Outcomes of Cookie Theft Picture Probe from January 2010- April 2010*

Month	Total number of words	Number of correct content units	Number of correct grammatical endings	Index of lexical efficacy
January	20	10	1	2.0
February	50	13	0	3.8
March	82	20	2	4.1
April	71	26	4	2.7

In the documentation provided, it was unclear why the PwA had a slight decrease in two of the three areas from March to April. However, he improved in all areas comparing outcomes from January to April, which demonstrated he responded positively to the specific intervention provided within this period. It is important to note the participant typically had a two-week vacation at the end of January into early February each year.

### Goals/Objectives

Objectives were used to increase the PwA's communication skills to meet his long-term objective. Objectives were measurable and served as an increasing progression of difficulty throughout the treatment period. Therefore, the participant's objectives were reviewed to mark the improvement of his communication across time. Four main categories were identified to effectively organize the progression of objectives: motor speech; language; a combination of the two; and other.

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### **Motor Speech**

As mentioned previously, AOS in the purest form, does not exhibit impairments in language (Bauman-Waengler, 2012; Webb & Adler, 2008). Therefore, intervention for AOS should be grounded in improving the individual's motor sequencing skills, as the ability to motor plan movements necessary for speech is the primary impairment (Ballard, et al., 2015; Duffy, 2013). With this understanding, short-term objectives were written focusing mainly on utilizing a traditional, hierarchical approach to improve the PwA's oral motor sequencing skills.

During the beginning phase of intervention objectives mainly targeted increasing his accuracy producing automatic speech (e.g., counting), vowels and simple consonant-verb-consonant (CVC) words. Objectives were written modeling a traditional articulation approach of increasing accuracy at the sound level progressing to word and phrase levels before reaching sentence and conversational levels. Once target accuracy was obtained, supports (e.g., level of cueing) were slowly faded until skill was mastered or met criterion.

The middle phase of intervention continued to focus on increasing accuracy producing targeted sounds and CVC words. Although this behavior was targeted before, the difficulty was increased as objectives targeted the use of CVC words in a variety of tasks (i.e., reading, delayed reading, imitation, delayed imitation and answering questions). Also, terminology shifted from purely producing vowels or phonemes to correctly motor sequencing sounds and words. Once word level was mastered, objectives focused on increasing accuracy producing functional words and word combinations (i.e., phrase level), with occasional focus on increasing accuracy motor sequencing specific clusters (i.e., /sk/). Again, objectives included decreasing levels of support when skill was mastered. It was unclear how frequently functional words used for the stimuli changed during this time.

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During the present phase, emphasis changed to correctly motor sequencing functional words and connected speech in a variety of language activities (e.g., script training and ORLA approach) discussed further in the combination category. Script training allowed for extended drill practice of scripts five to six sentences long containing five to eight words/sentence. Drill practice allowed the PwA to establish the correct motor sequencing to produce speech accurately. This approach also allowed for extended drill practice with ranging difficulty levels from word level to sentence level. Drill practice of high frequency, functional words was completed in therapy with the goal the PwA would be able to accurately and efficiently produce these words spontaneously in conversation at home and in other environments. He used the ORLA approach within the last year and half and mastered three separate word lists at a five to eight-word sentence level.

### **Language.**

The following subcategories of language were included below to demonstrate varying emphasis in therapy: auditory comprehension; reading comprehension; writing and verbal language.

#### ***Auditory comprehension.***

Auditory comprehension was primarily targeted during the early phase of intervention, from 2006 to 2009, as this area improved and the PwA's motor speech then was the primary focus of therapy. Increasing comprehension of simple yes/no questions and two-step directions were mainly targeted. However, this progressed to increasing comprehension of comparative concepts through answering yes/no questions and completing two-three step directions.

Elements of auditory comprehension continued into the middle phase of intervention. Objectives targeted increasing comprehension of noun/pronoun, verb, noun and prepositional

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phrase sequences. However, objectives were met and focus on auditory comprehension faded during this phase. Comprehension of time increments was targeted through auditory comprehension and has continued to be a motivating goal for him. However, his performance plateaued, as this objective was modified several times to include written and auditory comprehension strategies with limited improvement.

The PwA's auditory comprehension during the present stage of intervention was stronger than his verbal expression (i.e., motor speech and verbal language skills) which was consistent with Hallowell and Chapey's (2008) conclusions for an individual with Broca's aphasia. Therefore, more emphasis has continued to be placed on verbal expression, such as expanding syntax and motor speech aspects.

### ***Reading comprehension.***

Similar to auditory comprehension, reading comprehension was primarily targeted during the early phase of intervention. The primary focus of objectives in this subcategory was increasing reading comprehension of printed material to a five-paragraph level. This quickly expanded to a seven to eight paragraph level. Complexity of language within the printed material also increased during this time. Once mastered, objectives shifted to increasing reading comprehension through home practice activities. Reading material was then used to help increase motor speech during middle and present stages of intervention as reading printed material assisted motor planning.

### ***Writing.***

Increasing accuracy of writing skills was targeted during the early stage of intervention. Objectives initially targeted writing grammatically correct three-word phrases (targeting both writing and syntax). Then objectives focused on improving writing skills at word and phrase

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level with correct grammar, before targeting writing multisyllabic words and functional four to five-word sentences. Broad objectives were also created to decrease amount of telegraphic pattern in his written messages, before being used as a compensatory strategy to increase motor sequencing skills. During the present phase of intervention, his writing has remained effortful and telegraphic during longer writing attempts. The PwA has continued to use many spontaneous written words to self-prompt when attempting to verbalize a challenging word (e.g., writing Arizona allowed him to read the word aloud to produce the correct motor sequence).

### *Verbal language.*

Although the participant's verbal language was limited by a motor speech impairment, his verbal language was also influenced by impairments in wordfinding, repetition and syntax. Therefore, this subcategory represents objectives which targeted expanding his utterances by reducing the overall telegraphic nature of his speech when able to produce connected utterances, specifically targeting his use of syntax during spontaneous connected utterances.

During the early stage of intervention, syntax was targeted through writing activities as the participant was at a sound in isolation level and could not orally produce single words. Verbal speech was addressed primarily through motor speech interventions rather than verbal language-based interventions at that time. Therefore, language treatment primarily focused on auditory comprehension, reading and writing at that time until two-word verbal utterances were established.

However, during the middle phase once the participant improved enough to produce more words verbally, focus of objectives was to increase lexical richness of single word and two-word utterances to decrease the telegraphic nature of the participant's message. Objectives targeted increasing use of adjectives, pronouns, and verb tenses (past, present and future).

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Objectives were specific at times focusing solely on one component at a time, however broadened to increasing use of all components to increase overall lexical richness and mean length of utterance. Sentence Production Program of Aphasia (Helms-Estabrooks & Albert, 2004) was used during this phase and was calculated through a percentage of correctly answered probes.

During the present phase of intervention, focus shifted to increasing informational content through use of scripts and the correct use of a variety of verb tenses in conversational speech. Script training allowed the PwA pockets of uninterrupted, accurate speech through drill practice. By doing so, it expanded his utterances from one-two word phrases to five-eight-word sentences. Scripts also allowed the conversational partner to prompt the PwA for more meaningful conversation to follow. Currently, he has mastered six scripts containing five-six sentences each with an established prompt. He has continued to be motivated by this approach. The PwA has also independently used past, present and future tense verbs in phrases and has begun to target this skill at sentence and conversational levels.

### **Combination of both motor speech and language performance.**

Throughout the PwA's intervention, motor speech and language elements were continually targeted. However, there were times, especially in the late middle to present phases of intervention, when both categories were targeted in unison.

### ***Script training.***

For example, motor sequencing and expanding syntax were targeted through using the script training protocol. The participant chose the topic of each script (e.g., fishing, hunting, grandchildren) in order for the scripts to remain functional within his daily life. The PwA's input regarding script topics increased his motivation to practice and use each script with various

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communication partners (e.g., neighbors, new members at church). The script training protocol allowed him structured practice to solidify the motor movements required to accurately produce the script, as well as, provided an avenue to increase his use of language and naturalness within conversation (Youmans, et al., 2011b).

### *Oral reading for language in aphasia (ORLA).*

Increasing motor sequencing, syntax and oral reading skills were targeted in combination through the implementation of ORLA. This approach focused on increasing accuracy of motor sequencing required to produce functional, high frequency words the PwA used in his home environment (Cherney, 2010). The approach also required high frequency drill for best outcomes, which allowed him to solidify the motor plan for each word. The ORLA started at word level and expanded to phrase and sentence levels which increased in syntactic difficulty and modeled use of expanded language. This approach also targeted oral reading skills as it required the PwA to read stimuli out loud.

### *Group therapy.*

Objectives were also written regarding motor sequencing of functional words and various verb forms in spontaneous conversation during group therapy. Once a week, the PwA attended therapy with a group of two to three clients with aphasia of the same severity. He actively participated in conversations with group members which allowed measurement of targeted objectives as well as carryover of skills first targeted in individual sessions. Objectives with a combination of motor sequencing and language skills were present throughout the middle and present phases of intervention.

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### **Other.**

This category was created to include valuable objectives regarding elements of assistive technology and client/caregiver education. Throughout the early stages of the PwA's intervention, when his communication deficits were more severe, there was a focus on introducing augmentative and alternative communication (AAC) device options to assist in verbal communication. Devices, such as the Enkidu, were trialed and used during treatment. Ultimately, he decided on other compensatory measures to assist in oral communication and the goal was discontinued. During the middle phase of intervention, AAC was considered again, with implementation of general, low-tech approaches. Documented objectives targeted utilizing facilitation strategies (i.e., writing key words, stating the topic, use of gestures) to increase the efficiency and effectiveness of his communication.

The second focus was client/caregiver education regarding effects of stroke on communication and compensatory strategies. This objective was only officially targeted during the beginning phase of treatment. However, it may be that education continued throughout intervention without a specific objective.

### **Type and Severity of aphasia documented**

Another indicator of progress was whether the severity and/or type of aphasia changed across time. As discussed in the review of literature there are several subcategories of aphasia. Each subcategory of aphasia has a different impact on expressive and receptive language, as well as a variety of severity levels.

Before the PwA started intervention at MSUM in 2006, his communication impairment was originally labeled as severe to profound anomic aphasia with moderate oral apraxia and severe verbal apraxia of speech at the acute care hospital. In early December 2005, the label

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changed to severe global aphasia and severe AOS. In late December 2005, this changed to severe receptive and expressive aphasia and verbal apraxia and was not changed until starting intervention at MSUM.

Upon starting intervention at MSUM, his communication impairment was labeled as moderate aphasia and moderate to severe verbal apraxia. In December 2006, his communication impairment was described as Broca's aphasia with the same severity levels. Due to high frequency of student clinicians, the PwA's communication has been described as: Broca's aphasia with severe AOS, moderate Broca's aphasia with telegraphic speech, and Broca's aphasia and AOS. Although the PwA's communication impairment has been labeled and described in a variety of ways, his severity level has changed from severe to moderate within the middle stage of intervention indicating improvement.

### **Interviews**

Following the review of previous assessments and objectives throughout the PwA's intervention, three face-to-face interviews were completed. An interview was completed with the PwA, his spouse (CP), and the primary SLP at the university clinic. The aim of these interviews was to gain further insight regarding the effectiveness of assessment and intervention procedures as well as identify psychosocial factors that were present throughout intervention.

#### **Commonalities among interviews.**

Throughout the three interviews described below, common themes arose. The first theme that emerged was speech-language intervention positively impacted the PwA's communication overall. Another theme that carried across the interviews was all treatment materials and techniques were judged as beneficial. The PwA's avoidance of some communication partners was included or alluded to in the responses from each participant. The PwA's avoidance of some

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CPs, his perception of being considered less intelligent and frustration were alluded to in the responses from each participant. However, other overarching themes mentioned across the three interviews was the PwA's drive to continue intervention and his consistent, unwavering work ethic.

### **Perspective of the participant with aphasia.**

A twenty-eight-minute interview was conducted with the PwA. Previous therapy materials and a Likert scale ranging from one (low) to five (high) were provided as visual supports during the interview to increase comprehension of interview questions and expand the PwA's answers. Gestures and pauses were utilized by the researcher to also increase his comprehension of the questions. Most questions were understood by the PwA, however when the question became too long he asked "*Pardon?*" and the question was restated in a shorter format.

The PwA used multimodal communication throughout the interview, often writing words if he was not able to accurately produce the word verbally. He independently used the Likert scale to communicate his point when answering interview questions. The Likert scale was also used to clarify his message with prompts from the researcher. Follow-up questions were asked by the researcher in a yes/no format for clarification occasionally throughout the interview, as well. The familiarity of the researcher as his assigned clinician for the semester preceding the interview seemed to facilitate communication and resulted in fewer communication breakdowns when support was provided as described above.

### ***Intervention based responses.***

When answering questions regarding intervention strategies, the PwA indicated therapy positively impacted his life as his quality of life right after his stroke started at a one on the Likert scale (i.e., very difficult) and has improved to a three after attending speech-language

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services. He indicated targeting reading and writing verbs in sentences has been the most beneficial. The PwA indicated his use of verbs was at a one on the Likert scale (i.e., very difficult) and has improved to a four (i.e., less difficult/easier) currently. Also, targeting improving his motor sequencing when producing frequently used sentences when babysitting his grandkids has been beneficial. Using pictures as visual supports have been beneficial in improving his comprehension of the task. In contrast, the PwA reported no therapy activity/technique was the least beneficial. He also reported he would not change the intervention he has received.

The PwA indicated the greatest motivator for continuing speech-language services was improving the comprehension of his message and increasing his understanding of a CP's message, as it is difficult for him to comprehend conversation in a group with a fast rate. Also, improving his understanding of time concepts has continued to be a strong motivator to continue treatment. He reported his "*teacher's help*" (i.e., student clinicians and SLP supervisor) was the primary cause for consistent improvement. He indicated speech-language intervention has contributed to his improvement ranging from a five to a four on the scale (i.e., between a lot and some).

### ***Psychosocial based responses.***

The PwA indicated his stroke affected his life as it limited the number of communication partners in his daily life. He stated he likes talking to his spouse, his son and daughters, a friend and fellow aphasia group members as they talk slower. In contrast, before his stroke, the PwA's occupation was a salesman and he was frequently on talk radio and television programs. Therefore, his social circle was vast. Post-onset, this circle has decreased due to his comfort level conversing with others.

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He reported “*I’m sorry, I’m not stupid you know, but you know um spark-spark-smart [said in unison with interviewer] right here [points to all group members in picture]*”. When asked what he considered other people’s views of him were he stated, “*Stupid.*” He also stated other extended family members have thought he was stupid because of his communication deficits. He also stated his stroke affected him returning to work. The PwA retold a story of one of his spouse’s coworkers returning to work after a stroke, but he can no longer go back to work because of his stroke.

When asked what helped him immediately following the stroke he stated, “*For speech right here, school and I fishin huntin in my head... peace, peace.*” This quote indicated he found peace when hunting and fishing. Again when asked what has been the biggest adjustment in his life since his stroke, he answered “Peace, peace, because [headaches] bad after stroke.” When asked about emotions he felt after his stroke, he immediately answered, “*Mad.*” He stated this emotion changed “*a little*” across time as he found “*quiet and peace...my head you know*” He revealed being frustrated starting as a one on the Likert scale (i.e., very bad) and improved to a three (i.e., neutral) currently.

Upon conclusion of the interview, the PwA indicated he wanted to continue speech-language services for another 11 years so he can keep improving to reach a five on the Likert scale (i.e., easy). He also was internally motivated to continue therapy for himself, even though it was difficult. He stated, “*Yeah, yeah. Cuz uh [pause] me. I’m sorry but me*” when answering the question “Why do you keep coming?”

### **Perspectives of the spouse of the participant with aphasia.**

An interview was conducted with the PwA’s spouse (i.e., CP) which lasted an hour and thirty-three minutes. The interview was audio recorded and transcribed verbatim following the

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interview. Gestures and follow-up questions were used for clarification of answers and as a prompt to provide more details. Often, the CP responded with stories related to communication, however not related to specific interview questions, due the conversational nature of the interview. During the interview, she occasionally had to take brief breaks as she stated, “*It’s an emotional thing with me*” remembering how life had changed after the stroke.

### ***Intervention based responses.***

The interview began by asking what changes she had observed in the PwA’s communication while attending speech-language services. She indicated noticing a change from the individual with aphasia (PwA) not being able to form single sounds to now forming full words. She also noticed a change in the PwA’s language as “*he didn’t understand how to put the English language together*” initially. She has witnessed a “*huge improvement*” across the years, however this has led to others believing the PwA has fully recovered and able to communicate like he did before the stroke. The CP stated she noticed fear in other people’s faces when they did not understand what the PwA was saying. This also occurred when others realized the PwA did not understand what they said, because of their increased rate.

She noted a change in the PwA’s confidence when speaking post-onset as the PwA was very outgoing and now has become more hesitant. However, she indicated if the PwA had stopped attending speech-language services he would not have improved as much as he has, instead his communication skills would have regressed.

When asked about how the PwA’s overall communication has changed the CP responded she has noticed a change in the PwA’s auditory comprehension as he understands approximately 70% of the message as compared to understanding 100% before the stroke. The CP also noticed the PwA has “*gotten skills of covering it up [auditory comprehension]. He’s gotten trickier and*

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*trickier cuz he doesn't want to be embarrassed. That he doesn't want people to think that he's dumb or to give up talking to him.*" She explained the PwA has relied on observing his environment, because he does not want to be considered dumb or be embarrassed. Only recently, has the PwA revealed to his spouse when he does not understand what someone has said. He has not revealed this to anyone other than to the CP.

Due to this change in auditory comprehension, the CP stated she has used a white board at home to convey important messages about planned social interactions (e.g., visiting friends) and other important information about schedules. She reported the PwA first used this in the hospital to understand who was coming in and out of the room and she has carried it over to the home environment. She reported the PwA has referred to the white board many times a day.

The CP also indicated a change in the PwA's memory as the PwA told her he forgets things frequently. She stated she added "*key notes*" to the white board (e.g., names of friend's children, what friends/distant relatives have been doing before meeting friends and family) to help the PwA remember. She has noticed other immediate family members, like her grandchildren, have begun to use the white board and writing to help the PwA remember and understand their messages.

Another change she has noticed after the PwA's stroke was a change in his personality. She reported the PwA was very outgoing and now has become more introverted until he feels comfortable with the communication partner. She stated, "*how he communicates changes to how comfortable he feels around the people.*"

When asked about what she feels has led to the PwA's consistent improvement across eleven years, the CP responded with a narrative. She stated the PwA was concerned she would leave him because "*he was dumb now.*" However, she responded by telling him "*Absolutely not.*"

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*I married you because I love you and I made a promise that I would stick with you forever no matter what happens and I am not going back on that promise... Now you have to make me a promise. Um and that promise is that you never stop trying to get better... because moment you stop [referring to trying to get better] that's all the better you're gonna get."* She stated that has been a recurring theme to motivate the PwA, on top of the PwA's already strong work ethic. The CP stated the PwA has a huge drive which is part of his personality and has led to his improvement.

The CP included the influence their grandchildren have made on the PwA's improvement as well. She stated the PwA was very concerned that his grandchildren would think he was dumb. However, the CP told the PwA "*Their [grandchildren] are learning it [to communicate] just along with you"* and this changed his perspective. She then noted she has had a conversation with each of her grandchildren about the PwA's speech and how his brain has caused him to speak the way he does, because her grandchildren have noticed a difference in his speech. The CP stated she has seen her grandchildren communicate differently with the PwA (e.g., writing things down, drawing pictures, speaking quietly when he has a headache). During this time, the CP stated "*...my whole family is very respectful of him"* and as a family "*we just kind of surround him with people that give him respect."*

The next interview question was how much does the CP think speech therapy has contributed to the PwA's improvement? She responded it has helped find a new/best way for the PwA to communicate. The CP also stated during speech therapy at the acute care hospital, she observed sessions and how the SLP emphasized to the PwA there are different forms of communication. The CP then began to implement strategies used in therapy at home (i.e., writing on white board) and she has continued to try to implement therapy techniques at home. Later in

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the interview, she included how speech-language intervention targeting the PwA's auditory comprehension and communication skills required to pass the driving examination, greatly contributed to his improvement. Accomplishing his goal to drive independently increased the PwA's confidence.

When asked about which therapy technique was the most beneficial, the CP responded, "*Well it's all the little tricks [cues/prompts] you guys have taught him when he can't, like "h- h- h- h [phonemic cue to produce /h/]."*" She stated the PwA frequently practiced scripts and targeted words at home however did so in private areas. When asked which technique was the least beneficial, she responded she thought everything has been beneficial. The CP commented the PwA has said some student clinicians were hard to understand because of their high voices and they talked too fast. That was the only negative aspect the CP noted about speech-language therapy.

An aspect the CP would have liked to change about speech-language services was to have started group therapy sooner and the group could continue outside of treatment rooms (i.e., "field trips"). By doing this, the CP believed it would increase each group member's confidence.

She then continued into a narrative regarding attending a stroke support group and how she witnessed spouses of group members with strokes being impatient and not understanding how improvement takes time. In particular, she witnessed a spouse of a PwA show impatience resulting in very low self-esteem and depression for the PwA. She stated, "*I picked up on it right away that she doesn't realize she isn't contributing to his depression and his lack of not getting better because of how she treats him.*" The CP indicated the need for more training for spouses of individuals who have had strokes to promote positive self-esteem.

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### *Psychosocial based responses.*

When asked how speech-language services changed the PwA's communication with others, the CP replied, "*I think it's given him more confidence.*" She stated it changed his perspective of thinking he was dumb, to understanding when there is a communication breakdown, which increased his confidence.

The CP gave multiple answers when asked about what emotions she has witnessed from the PwA regarding his communication. She has witnessed anger, frustration, embarrassment as well as pride, increased confidence and happiness. She has observed him hold back and adjust conversation as well as avoid certain situations (e.g., restaurants). Towards the end of the interview, the CP alluded to the PwA's depression after his stroke. She included how accomplishing his goal to drive independently was a pivotal point to reduce his depression.

When asked about what emotions she has experienced related to the PwA attending speech-language services, the CP explained she had a variety of emotions. She revealed feeling glad he was attending services and frightened for when the services will discontinue. The CP reported she witnessed regression during the summers he did not attend therapy and she was afraid this regression would continue if he stopped attending therapy.

When asked how the PwA's stroke affected her life, the CP stated she felt incredibly needed immediately following the first stroke. When the PwA started to improve she was shocked that she became sad she was not needed as much, but also very happy the PwA had increased independence. She noted becoming more patient after the stroke and having even more empathy than before. Upon reflection, she stated she smiled and laughed more before the stroke and how the impact of the stroke made her more serious all the time. She was forced to become more extroverted, and pushed out of her comfort zone.

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She revealed she was worried about the health of the PwA, as he is likely to have another stroke, as well as her own health. She worried who would take care of the PwA if something were to happen to her. The CP also has planned steps for the PwA to complete if something were to happen to her. She stated, *“I’m always planning for the worst, but trying to keep positive.”* Later in the interview, the CP explained an adjustment she made was *“letting go of the fear that he was going to suddenly die on me... that’s the biggest adjustment... I have to live each day. Just thankful, that he’s here and that I can’t see the future.”* She stated she is the PwA’s biggest advocate when describing changes in health to medical staff.

The CP reported the PwA and herself would spend hours talking in the past. She felt a loss of not having someone to *“talk my deep feelings with”* after the PwA’s stroke. She has reminded herself frequently they can still have meaningful conversations, just in a different way. The CP described a shift in mentality after talking with her priest and has understood that she and the PwA are dealing with issues older individuals face much younger than expected. The CP described how their priest guided them through this change in mentality and the importance of remembering their marriage vows during this experience. She later revealed, the PwA has made a lot of progress because of his personality and the amount of people praying for him. It touched her heart how people she has not met have continued to pray for the PwA and how others think the PwA is kind and considerate.

### **Perspectives of the speech-language pathologist.**

A forty-minute interview was conducted with the ASHA certified SLP who supervised the majority of the PwA’s treatment while at MSUM.

### ***Intervention based responses.***

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The interview began with the SLP describing the greatest changes she has seen in the PwA's speech across time. She indicated the PwA has made the most gains expanding his mean length of utterance and increasing the variety of verb forms he uses in his utterances. She stated his utterances are not as telegraphic as they were initially. Also, his auditory comprehension improved more quickly than his verbal expression, which was a turning point as he could then follow concrete conversation.

When describing how she chose approaches and techniques, the SLP reported initially, she followed the care plan of the SLP who had supervised the PwA before, however changed the plan after conducting her own research. The SLP described a change in philosophy of treating various individuals with aphasia to include functional goals/stimuli. Therefore, she continued to include the PwA's input regarding goals, strategies and stimuli as much as possible. She described how intervention for AOS was established in principles of motor learning and a hierarchical approach, which is more traditional. Therefore, she understood she started with certain sounds and increased the complexity of tasks, while having periodic retesting completed to evaluate progress. Also, an important factor of the PwA's improvement involving traditional motor learning approach was "*he [PwA] is willing to come in the number of times he- that he is coming in is crucial for motor speech to improve... if he would have said 'I can only come in one time a week or two times a week' uh I think we would've hit a plateau.*" As for aphasia treatment, the SLP reported "*seemed to be a bit secondary, except for the auditory comprehension.*" The SLP commented she would research various approaches, utilized ASHA's evidence-based practice site, and selected the best approaches based on her expertise and the PwA's input. The SLP stated, "*we would always ask him if it was something that sounded good to him,*" as well as, explored which social situations were most difficult for the PwA.

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The SLP further described how the PwA brought an approach he witnessed on television for children regarding oral reading. Although that specific approach was not appropriate since it was based on stimuli for children, the SLP sought out a program similar and discovered ORLA which was designed for adults. Another instance of when the PwA provided input was when he wanted to learn common prayers from church. The SLP described how a focus of intervention was improving his motor planning when producing selected prayers, making intervention functional.

When asked if the PwA responded better to systematic approaches or more functional approaches across time, the SLP responded his communication initially was a barrier for him to share his opinions. However, a turning point was utilizing the Life Interest and Value Cards (LIV cards) (Haley, Womack, Helms-Estabrooks, Caignon & McCulloch, 2010). The LIV cards were designed to allow the individual with a communication impairment to identify which activities of daily living were the most meaningful in his/her life. Black and white illustrations of common life activities were displayed on cards and categorized into categories (i.e., home and community, creative and relaxing, physical, and social). The individual with the communication impairment indicated which activities were the most meaningful through ordering each activity from greatest to least. This nonverbal communication allowed for informal goals to be created regarding functional activities to increase participation. After using these cards, the PwA began to understand the SLP and student clinicians wanted to make therapy more functional. From this exercise, and considering the PwA's input, the SLP stated the PwA has now trusted her and the student clinicians to guide the path of intervention. The SLP revealed she would have liked to have asked for the PwA's input sooner as well as utilize the LIV cards earlier, when asked what she would change in intervention.

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As for the most important factor in the PwA's improvement, the SLP identified his attitude and work ethic has caused him to improve while others she worked with have plateaued or discontinued therapy. Also, his increased confidence and hope that he will continue to improve has impacted his progression. Upon reflection, the SLP stated "*if your client doesn't believe they can improve and won't invest the time in it um I don't think that you would keep on improving. Um, so, he's the most important thing.*"

Treatment approaches she wished she could have implemented at the beginning of treatment was the constraint induced approach and communication partner training. However, she was unclear if the constraint induced approach would have benefited the PwA, as it possibly would have constrained him to one communication modality. The SLP indicated she wanted to pursue communication partner training, especially with the PwA's daughters or friends, as his spouse was already a good facilitator. Towards the conclusion of the interview, the SLP added how she wished they had implemented more technology and computer applications within intervention.

The SLP identified motor speech intervention in a hierarchical approach helped lead the PwA to make the greatest gains and has continued to be beneficial. She was not able to identify a specific approach that was least beneficial, however recognized an objective that was not as beneficial as she hoped. The concept of time has been an objective that has been approached in several ways, however the PwA has not made a lot of progress. Therefore, the SLP believed the next step was to teach compensatory strategies (e.g., using visual supports) as this was a motivating goal for the PwA.

When asked about barriers to the PwA's improvement, the SLP reported his auditory comprehension may at times be a barrier especially towards carryover into the home

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environment with more complex instructions. The SLP stated he did not always understand conversation and was not aware of when to demonstrate what he has learned spontaneously.

Another potential barrier was not attending therapy in the summer. However, this also prevented burnout. The SLP stated, *“You don’t see a lot of spontaneous improvement over the summer. You don’t see a lot of regression either.”* Other barriers included: fatigue and headaches (secondary consequences of stroke) and hearing loss.

Some facilitators for the PwA’s improvement included: his personality, his drive, work ethic, family support (especially support from his spouse), he independently drove to therapy and his insurance coverage. The SLP described how the PwA could drive to therapy independently, which allowed dependable attendance and increased independence. She also stated his progress was a facilitator as this has instilled hope in the PwA. Lastly, customized treatment plans allowed the PwA to increase the difficulty at his own pace.

### ***Psychosocial based responses.***

The SLP has witnessed frustration and embarrassment from the PwA when others did not understand him while in therapy, as well as, avoidance of social situations. When the PwA presented frustration in therapy it was typically inward when he was being challenged more, and towards his speech and language impairment. Also, the PwA became hesitant when a new objective was introduced. However, frustration was rarely seen in group therapy. The SLP has also seen the PwA assume a mentoring role in group therapy with new/younger members with aphasia. She has seen the PwA show pride in his accomplishments and gratification when he was able help others.

Other psychosocial factors the SLP identified during the interview were the PwA’s need to feel a sense of purpose and that his life was meaningful. She has witnessed a shift in the

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PwA's life roles as he was a full-time employee before his stroke and now has been on disability services. He then transitioned to a bigger role within the family (e.g., cooking, cleaning, taking care of cars), especially after the birth of his grandchildren as he frequently babysat them. The SLP revealed the PwA seemed proud of these accomplishments. The shifted role allowed increased self-esteem and the need to improve communication. The SLP reported the PwA chose topics like grandparenting and volunteering in church as functional stimuli in therapy. Also, the SLP indicated family encouragement to be more social (e.g., going fishing, being with friends, aphasia group) was important for the PwA to be out in the community.

When asked further about group therapy, the SLP indicated the PwA benefited the most when the group was small and included individuals with similar severity levels. Group allowed the PwA to become a mentor to others, which aligned with the typical role for his age. Also, it allowed the PwA to be more natural and immediately carry over skills targeted in one on one therapy. This has helped the SLP and student clinicians truly understand his level of communication during conversation.

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### Chapter 5

#### Discussion

Although assessment and intervention techniques have varied across time, the participant has made significant improvements in his communication while attending intervention across 11 years. These improvements have been documented in assessment results from early, middle and late stages of intervention, from functional treatment objectives achieved with increased difficulty across time, and from decreased severity of his communication diagnosis. Other factors that have impacted the course of the participant's intervention in a positive manner were revealed during interviews and included: the participant's consistent attendance, internal motivation/drive to improve and the support of his family and friends. The participant's prognosis to continue to make gains towards his goals with intervention remained positive, due to his relentless work ethic, the use of dynamic assessment and focus on functional objectives using techniques established in the literature.

#### **Results from formal assessments yielded valuable information**

##### **Skilled-based assessments revealed gradual progress through objective information.**

Through the use of skill-based formal assessments, improvements in the participant's communication, such as his auditory comprehension, spontaneous speech, and repetition was documented across a variety of assessment tools. This indicated improvements can be made regarding communication deficits caused by presence of aphasia with intervention following a year or more post onset of a stroke. This correlated with Allen, et al. (2012) literature review where 21 studies were reviewed to discover if improvements in communication could be made at least six months post stroke. Researchers found studies documented improvement with intervention for individuals with aphasia ranging from 13 months to 8.5 years post stroke. The

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results of the current case study indicated gradual improvements in communication were noted 11 years post onset of stroke.

### **Participation and quality of life measurements aligned with WHO framework.**

Participation scales and quality of life formal assessments provided a method for the PwA to reveal the perception of his quality of life which was difficult to express due to his language impairment. The WHO addressed the need for dynamic assessment to measure the impact of a disability, in the *International Classification of Functioning, Disability and Health Framework (ICF)*. This framework recognized how every individual is impacted differently by his/her disorder/disability based on environmental and personal factors (WHO, 2013). Therefore, the implementation of participation and quality of life measurements aligned with the ICF to implement dynamic assessment for intervention to have a more widespread impact.

The *Communication Effectiveness Index (CETI)* and the *Quality of Communication Life Scales* were completed three and four years post-onset during the middle stage of intervention. Therefore, a true baseline was not established at the beginning of his intervention. Continued intervention between initial administration to most recent administration may have caused increased awareness of impaired communication skills which resulted in consistent or even decreased scores across time. Therefore, although the scores of the CETI may not have shown improvement, there was improvement in the awareness of the participant's communication. The increased awareness allowed for richer responses to guide intervention to become as functional as possible, aligning with WHO and ASHA viewpoints on intervention.

Also, the results of the CETI may have corresponded with the participant's moderate severity level as indicated in skill-based assessment completed during the same time period. Although the CETI did not indicate a severity level, the PwA's score of 49/100 would seem to be

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consistent with a moderate level of impairment as indicated by the moderate WAB scores that was administered during the same time period. This possible correlation indicated the need for more exploration regarding issues of validity in subjective response of quality of life measurements and how to accurately compare this information to more objective measures to identify trends. Therefore, continued participation scales and quality of life assessments should be used to guide treatment objectives.

### **Informal assessment indicated gradual improvement across time**

Informal assessments (i.e., conversational speech samples and probes of targeted behavior), also documented gradual improvement in the participant's communication across time. These measures indicated increased occurrence of targeted behaviors first in structured environments, which led into more natural environments (e.g., within conversation, producing scripts with unfamiliar communication partners) over time. The use of informal assessment allowed intervention to be individualized and remain functional. Overall, documented informal assessments provided evidence of increased motor sequencing and increased use of progressively complex syntactical structure within the participant's speech consistently over time, following the use of evidence-based practices, such as integral stimulation, script training, and ORLA.

### **Intervention objectives supported the use of traditional approaches with functional stimuli**

Documented intervention objectives displayed a trend of a traditional hierarchical approach to intervention to improve motor sequencing across time, a communication deficit typical of AOS according to Duffy (2013). This hierarchical approach to intervention allowed the participant to solidify correct motor sequences of high frequency words and phrases through implementation of the principles of motor learning (e.g., explicit instruction, drill, specific feedback and consistent practice) as indicated in by Duffy (2013). This ultimately gradually

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decreased the participant's use of telegraphic speech which increased his ability to effectively communicate with others. The improvements made by the participant across time regarding motor sequencing and increasing language use while using techniques such as integral stimulation, script training approach (Youmans, et al., 2011a) and the ORLA approach (Cherney, 2010) provided support for the efficacy of these intervention methods for this participant with Broca's aphasia and apraxia of speech.

There was also a focus of increasing the participant's auditory and reading comprehension and writing skills during the early stages of intervention, for which the participant improved quickly. This supported Hallowell and Chapey's (2008) findings that auditory and reading comprehension are often strengths for individuals with Broca's aphasia. As these areas improved, intervention focused on increasing the participant's verbal language skills to decrease the frequency of the participant's telegraphic speech, one of the hallmark signs of Broca's aphasia (Duffy, 2013; Hallowell & Chapey, 2008). During the middle and late stages of intervention, motor sequencing and verbal language production were often targeted simultaneously using techniques, such as the script training approach (Youmans, et al., 2011a). The treatment objectives indicated a steady improvement across time in a variety of areas as level of cuing and complexity of tasks increased.

Another area that helped increased the participant's use of effective and efficient verbal communication was providing stimuli that was functional for the participant in his everyday life. The use of high frequency words that the participant provided allowed for increased carryover of strategies used in therapy to outside environments and with various communication partners. This led to more widespread progress, instead of progress only in the therapy setting. Functional tasks and prompts throughout intervention also increased the participant's motivation as he

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provided the majority of the targeted words and this allowed the participant to take an active role in intervention.

### **Open ended interviews provided information regarding impact of aphasia**

From the interviews conducted, several themes were identified which influenced the participant's improvement in intervention. The first included comments within both the IWA's and CP's interview which displayed the clear belief attending intervention ultimately led to improvement in PwA's communication. The PwA identified he witnessed the benefit of therapy across time and he attended therapy for himself and not for others. The CP also commented, "The moment you [the participant] stop that's all the better you're gonna get".

Another theme was his unwavering work ethic, which was identified by both the CP and his primary SLP as a factor that contributed toward his improvement. The PwA consistently completed home programming and carryover activities across environments and with multiple communication partners. This was consistent with the theme "active speech practice and therapy" addressed in the Haley, et al. in 2016. Researchers investigated the recovery period of a 29-year old woman with acquired AOS following a traumatic brain injury. Researchers found the individual with AOS had consistent attendance and actively participated in therapy that contributed to improvements in her communication and quality of life.

An important factor which led to improvement was the support of the PwA's family and friends, in particular his spouse. When there were moments of frustration regarding his communication, the CP encouraged him to continue intervention. Together they implemented compensatory strategies at home and in other environments to encourage positive communicative moments. The PwA's immediate family also implemented strategies, such as writing key notes/providing visuals, to assist effective communication.

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Paul and Sanders (2009) completed a study involving a qualitative research design to provide current research concerning communication strategies that helped individuals with aphasia interact with others in their environment without becoming socially isolated. Nine participants were recruited who had been the primary communication partners for an IwA since onset. The results of the study concluded that the environment had a great impact on facilitating or impeding effective communication. Using multiple methods of communication such as visual presentation of information (pointing), gestures, pictures and written information were all common strategies communication partners used to facilitate effective communicate with their loved one. This aligned with strategies used by the PwA's immediate family members in the present study and contributed to his progress. Other themes identified by Paul and Sanders (2009) that correlated to the experiences of the PwA were that his family encouraged the PwA to try to communicate, educated his social circle, encouraged visitors and encouraged him to reenter the community (e.g., attend church). The use of these strategies promoted positive communication interactions for the PwA, which promoted increased participation by the PwA in social situations in multiple environments. This linked to the WHO (2013) framework which included participation as a vital aspect of health.

During the interviews, moments of frustration and embarrassment by the PwA regarding his speech were noted. This was also consistent with emotions addressed in research conducted by Haley, et al. (2016) and Rotherham, et al. (2015), as IwAs noted feelings of frustration and embarrassment. However, other emotions witnessed from the PwA or identified by the PwA regarding his communication were: happiness, confidence and trust. These emotions led to resilience and ultimately led to improvements in his communication.

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The last factor identified within the interviews that led to the PwA's improvement was his involvement in activities outside of therapy, such as hobbies (e.g., hunting, fishing, watching his grandchildren, attending church). These activities provided a sense of purpose as well as active participation in the community. He commented during the early stage of intervention fishing and hunting provided peace. These personal interests facilitated interactions with various communication partners and enhanced the individual's quality of life. Throughout the PwA's intervention, target objectives included activities of interest to him. This allowed the PwA to remain motivated and helped facilitate communication while completing those tasks in everyday life. This factor had a clear correlation to the WHO's ICF which stressed the importance of quality of life and participation in a person's recovery from a communication impairment. These issues were not identified in skill-based assessments (for which the WHO model referred to as assessments of body function and structures) but were revealed to the SLP through the quality of life instruments, and to this researcher through the qualitative interviews.

### **Support for a case study design**

Implementation of a case study research design allowed for in-depth analysis of a single participant's improvements during intervention across an extended period of time to be examined. A case-study design allowed for multiple aspects of the participant's intervention (e.g., assessment tools, targeted objectives, interviews) to be compared to help uncover factors which assisted in the participant's consistent improvement. The data that was evaluated was collected across 11 years, which exceeded the typical time span of case studies and single subject designs discussed earlier. Although a case-study design was lower on the Scottish Intercollegiate Guidelines Network (SIGN) Hierarchy, it was a valuable research design as it allowed "a variety of evidence" (Yin, 2009) to be analyzed to explore one individual with severe

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Broca's aphasia and AOS's experiences while attending speech-language services. Also, qualitative data collected through interviews, yielded information that was not evident from the reviewed records.

### **Limitations of the research**

Due to fact that the participant's experience with speech-language services included attending a university clinic, multiple student clinicians conducted assessments and intervention across time. This impacted the consistency of documentation of the data, as students changed every semester and documentation of assessment results/procedures were not always clearly identified. Due to limited uniformity during assessment procedures it was difficult to make comparisons across time, especially across informal measures. Also, the updated version of the *Western Aphasia Battery* in 2014 with revised scoring requirements, may have affected the validity of participant's documented progress across time, as the WAB was the most common administered assessment throughout intervention. Due to the updated format, there was a slight change in scoring which may have impacted the overall AQ. Another factor which may have impacted the scores of the WAB-R was interobserver reliability. According to Maxwell and Satake (2006), interobserver reliability was most often presented as a percentage "reflecting the proportion of agreements to disagreements between two or more observers" (p. 124) and was "concerned with the accuracy of judgement" (p. 124) of the clinician administering the assessment. According to Kertesz (2007), the average interobserver reliability for each section of the WAB-R was 0.99, except spontaneous speech fluency with a correlation of .98, indicating a strong interobserver reliability. Interobserver reliability must be considered as multiple student clinicians administered the WAB-R. Depending on the clinician, limited experience regarding assessment procedures or scoring, especially in the more subjective aspects, could have

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accounted for the change in scores during the spring of 2014, compared to the fall as there was a semester change.

Another factor that may have impacted variation in scores was the changing nature of the client's speech sound errors due to AOS. According to Duffy (2013), "variability is considered by many to be a hallmark of AOS, at least at less than severe degrees of impairment" (p. 283). The changing speech sound errors may have impacted the scoring of spontaneous speech and repetition tasks, thereby impacting the overall AQ. Due to the influence of these three factors: revision of original WAB; interobserver reliability; and nature of inconsistent errors of comorbid AOS, some fluctuation in scores was understandable. However, interobserver reliability with novel clinicians and inconsistent speech sound errors most likely have influenced overall fluctuations in scores.

Also, due to the implementation of an electronic medical system in recent years, paper copies of lesson plans and daily notes from initial and middle phases of intervention were not available. This limited the amount of information available regarding specific informal assessment procedures to compare across time. The last potential factor limiting this study was the potential bias during interviews with the PwA as the researcher had been one of his former student clinicians. This may have impacted the amount of information shared during the interview in a positive way as well, as he may have been more hesitant to share emotions and details with an unfamiliar researcher.

### **Recommendations for further research**

Based on the results of the case study, more evidence is needed documenting progress of IwA's communication with intervention lasting more than a year post onset of a stroke. Most research reviewed examined the effectiveness of intervention approaches six months to a year

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post onset. This study added evidence that gradual improvement across time in an IwA's communication more than a year post onset occurred, however more research is needed. Also, more research is needed evaluating the effectiveness and use of participation and quality of life measurements with IwA to support the WHO ICF.

### **Conclusion**

This case study addressed factors that led to an individual initially diagnosed with severe Broca's aphasia and AOS to consistently improve while attending speech-language services. The completion of this case study has added to the current research regarding the importance of using quantitative and descriptive information to understand the impact chronic Broca's aphasia and AOS had on an individual. However, more research is needed in this area to support the efficacy of assessment and intervention procedures for individuals with chronic co-occurring aphasia and AOS several years post-onset.

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