5-2020

The Effects of Bilingualism in Post-Stroke Aphasia Patients: Clinical Implications Within the United States

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By

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An Undergraduate Thesis Submitted in Partial Fulfillment
of the Requirements for the
Fine and Performing Arts Scholars Program
Honors College
East Tennessee State University

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Abstract

The consistent increase of cultural diversity and immigration within the United States over the last fifty years has contributed to a societal shift towards a growing bilingual population. The growth of this population has generated a need to evaluate current assessment and treatment plans for bilingual post-stroke aphasia patients within the United States to ensure that these individuals are receiving effective healthcare. This study aims to investigate the current knowledge gap surrounding appropriate methods of assessing and treating bilingual post-stroke aphasia patients within the United States and suggest potential approaches based on existing research. In order to synthesize information regarding current methods of assessing and treating bilingual post-stroke aphasia patients and to suggest areas for future research, a review of previously published literature was conducted. To illustrate the association between bilingualism and approaches to healthcare, potential and previously studied assessment and treatment plans for bilingual post-stroke aphasia patients within the United States were evaluated based on the likelihood of their success in a physical clinical setting. Because minimal research currently exists concerning intervention in bilingual aphasic adults, SLPs in the United States are forced to provide services without the knowledge necessary to provide efficacious healthcare to this population. As a result, there is currently a critical need for the development of consistent, culturally relevant assessments and treatment approaches for bilingual post-stroke aphasia patients and for large-scale empirical studies to be conducted in the United States that examine the validity of these assessment and treatment protocols.

Acknowledgements

I wish to express my gratitude towards the members of my thesis committee, Dr. Matthew Fehskens and Professor Liv Halaas Detwiler, for their continued guidance and support throughout the research process and for assisting me in defining my research goals. Their enthusiasm, extensive knowledge, and desire to help me succeed have been monumental in my development as a writer, researcher, and foreign language student. Additionally, I am indebted to my parents for their unconditional love, patience, and support for the past twenty-one years. Without their encouragement and words of wisdom, completing this research and pursuing my dreams would not have been possible.

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Introduction

The consistent increase of cultural diversity and immigration within the United States over the last fifty years has contributed to a societal shift towards a growing bilingual population. The growth of this population has generated a need to evaluate current assessment and treatment plans for bilingual post-stroke aphasia patients within the United States to ensure that these individuals are receiving effective healthcare. According to data collected by the U.S. Census Bureau between 2013 and 2017, approximately 13.4% of the United States population consisted of individuals born outside of the country. This percentage of immigrants residing within the United States has steadily increased over the last fifty years; only 4.7% of the total population consisted of immigrants in 1970 compared to 13.7%, or approximately 45 million people, in 2017 (Migration Policy Institute, 2019). As this trend continues, culture and languages spoken within this country will continue to diversify. This diversity can be seen in the significant portion of the U.S. population that claims to speak a language other than English at home. It is estimated that 21.3% of the U.S. population ages five years and older speak a language other than English at home, yet only 8.5% of these individuals report speaking English "less than very well" (United States Census Bureau, 2017). This information suggests that at least 12.8% of the total population ages five years and older, equivalent to approximately 38.5 million United States residents, would consider themselves proficient in speaking more than one language. Of these individuals who speak a language other than English at home, approximately 70% are between the ages of 18 and 64, and 11% are ages 65 and older (United States Census Bureau, 2017). This high concentration of adults speaking a language other than English at home indicates that as this population ages in the next several decades, the United States will experience an increase in bilingual individuals within the older demographic category.

In addition to the substantial aging bilingual population found within the U.S., this society is experiencing a high rate of growth in the older population across all races. A recent graph released by the U.S. Census comparing age distribution by race in 2010 and 2018 shows an overall increase from 2010 to 2018 of approximately 10 million individuals within the 65 years and older category. The rapid growth within this cohort is accompanied by an increase for each of the races included. In contrast, a far less dramatic increase in overall population size is seen in other age groups, in some cases including a decrease in population for certain races. The data indicates that the population of individuals under the age of 18 appears to slightly decrease from 2010 to 2018, while the 18-39 and 40-64 age categories appear to slightly increase over time (United States Census Bureau, 2019). The information presented within this graph clearly illustrates that the United States is experiencing a shift towards an aging population.

This "greying of America" trend, in conjunction with the previously stated increase in bilingualism and the high concentration of older adults speaking a language other than English at home, indicates that the bilingual population within the U.S. will also likely experience growth in older age categories. Increased age is a well-established risk factor for developing health issues and incurring higher healthcare expenditures, which means that the aging bilingual population will also experience these issues. As a result, the need to address equal access to healthcare for the aging bilingual population will be critical. For example, the risk of an individual suffering from a stroke increases with age, with 66% of the over 795,000 individuals hospitalized for stroke in 2009 being above the age of 65 (Centers for Disease Control and Prevention, 2017). As this aging bilingual population continues to grow, it is statistically likely that the rate of stroke victims within this group will increase as well, which will require modifications in standardized assessment and treatment plans.

Stroke patients in particular will sustain tissue damage in areas of the brain that are important in language production and comprehension. Consequently, it is possible that these patients will develop aphasia, an "impairment of language, affecting the production or comprehension of speech and the ability to read or write" (National Aphasia Association, n.d.). Aphasia is most commonly seen in older adults, particularly those who have suffered a stroke, and varies in severity from mild to severe communication impairment depending on the size of brain tissue damage (National Aphasia Association, n.d.). With approximately 45,000 new bilingual aphasia cases expected per year, developing specialized treatment plans for this understudied and growing population of post-stroke bilingual aphasia patients within the United States will be critical to ensure that effective healthcare is provided to this population (Lorenzen & Murray, 2008). While efficacious treatment plans exist for monolingual English-speaking patients, research concerning the development of bilingual aphasia assessments is currently limited, despite the significant growth of this population. Currently, there is a gap between the knowledge base and development of effective treatment plans for bilingual aphasia patients in the United States.

Although various large-scale studies of bilingual post-stroke aphasia patients have been conducted in other countries, such as India and South Africa, limited research currently exists within the United States. This information gathered from studies conducted in other countries regarding developing effective assessments for bilingual post-stroke aphasia patients is valuable; however, the societies in which these assessments were conducted vary significantly from that of the U.S. To illustrate this variation, in these countries it is typical for residents to be bilingual, whereas the U.S. bilingual population consists of largely first and second-generation immigrants. Society exerts a tremendous influence on an individual's communicative patterns and habits, and

as a result, societal differences within the United States could potentially alter the methods necessary to assess and treat the bilingual post-stroke aphasia population. With the percentage of bilingual residents in this country on the rise, understanding the biological implications associated with being bilingual is crucial in developing more effective assessment and treatment plans for bilingual post-stroke aphasia patients.

Methodology

The rising population of aging bilingual individuals within the United States has created a need to evaluate the efficacy of current methods for assessing and treating bilingual post-stroke aphasia patients. Various methods have been suggested in previous studies; however, these studies were primarily conducted in other countries. Due to the small-scale nature of the few studies previously conducted within the United States, limited resources exist discussing the effects of adjusting assessment and treatment plans for this population while also accounting for this specific society's influence on its bilingual residents' communicative habits. This study aims to investigate the current knowledge gap surrounding appropriate methods of assessing and treating bilingual post-stroke aphasia patients within the United States and suggest potential approaches based on existing research.

In order to synthesize information regarding current methods of assessing and treating bilingual post-stroke aphasia patients and to suggest areas for future research, a review of previously published literature was conducted. Articles included in this review were chosen to illustrate current research in aphasia rehabilitation methods for bilingual patients and describe the relationship between bilingualism and language usage. These articles were also used to define key terms or concepts, such as "bilingualism," its cultural context within the United States, and various types of aphasia and strokes. To gather this information, a search was conducted through the East Tennessee State University online library databases, as well as the associated linguistics database, using the keywords "bilingualism", "stroke", "aphasia", "cognition", "executive function", "assessment", "treatment", and "bilingual". Demographic information regarding languages spoken, age, and immigration rates was retrieved from the United States Census Bureau website and the provided "American Fact Finder" data platform, in particular the

"Language Spoken at Home: 2013-2017 American Community Survey 5-Year Estimates" and "Place of Birth by Nativity and Citizenship Status: 2013-2017 American Community Survey 5-Year Estimates" tables. Remaining demographic information regarding strokes and aphasia was retrieved from the American Stroke Association, Centers for Disease Control and Prevention, and National Aphasia Association websites.

These resources were analyzed to explain several concepts that are critical in understanding the relationship between bilingualism and biological or societal pressures. This relationship will in turn affect the healthcare provided to this population. To illustrate the association between bilingualism and approaches to healthcare, options for assessment and treatment plans for bilingual post-stroke aphasia patients within the United States were reviewed based on the likelihood of their success in a physical clinical setting. The inaccessibility to this population in the area within the United States in which this specific review was generated restricted the possibility of conducting research on live patients. Consequently, future studies will need to be conducted utilizing the suggested approaches to assessment and treatment of these individuals to evaluate their effectiveness in practice.

Review of Pertinent Literature

Bilingualism Overview

Multiple studies assessing the role of bilingualism in cognitive function and post-stroke aphasia outcomes defined an individual as being bilingual if the individual spoke two or more languages (Paplikar et al., 2018). This definition has frequently been expanded to specify that all languages spoken must be utilized in different settings, such as at home or at work, and that the individual must possess functional fluency, or the ability to converse and engage in similar activities, in each language (Penn, Barber, & Fridjhon, 2017). Although learning a second language does require linguistic competence, cultural knowledge and social usage are also crucial in attaining fluency. There are several societal influences and other variables that will affect language acquisition. Studies assessing the role of bilingualism on cognitive function have been conducted in countries where bilingualism is the norm and multiculturalism is supported in order to more easily control and isolate these variables. Variables that have been controlled in these studies include education, immigration, language use and exposure, language proficiency, and language combination. These variables can affect an individual's ability to perform linguistic and nonlinguistic tasks, as well as their pattern of brain activation (Paplikar et al., 2018). Studying these populations in other countries provides the ability to compensate for these confounding variables and better understand the sole influence of bilingualism in post-stroke aphasia patients. Despite this benefit, it is difficult to translate the results of these studies into practice in the United States due to the impact of immigration and societal pressures on cognitive function in bilinguals. Bilingualism in the United States is largely present because of immigration rather than the existence of an established multicultural society.

In societies where bilingualism is supported, studies have typically reported cognitive advantages in bilingual individuals when compared to monolinguals. In contrast, more variability exists in the United States due to the discrimination one may endure as a result of speaking multiple languages (Paplikar et al., 2018). It is possible that adults in the United States, depending on their geographic region, may feel pressured to speak English when visiting a store due to the negative interactions that they may encounter with other individuals if they were to speak another language, such as Spanish. Children in schools may also feel this acculturation stress, or the pressure to adopt the majority culture. A study of fifth-grade Hispanic[1] students in Arizona revealed that 47% of this population claimed to experience this acculturation stress, impacting their language choice and usage, and by extension potentially negating the cognitive advantages often seen in bilinguals (Arizmendi et al., 2018).

The frequency of an individual's exposure to or usage of language, as well as their degree of language proficiency and the age at which the second language was acquired, have been shown to affect the way languages are processed within the brain. Research indicates that those who acquire both languages before the age of 12, or simultaneous bilinguals, will demonstrate different bilingual advantages from that of late, or sequential, bilinguals (Penn, Barber, & Fridjhon, 2017). Age of acquisition also affects syntactic processing within the brain. Early bilinguals, such as those typically found in multicultural societies where bilingualism is supported, demonstrate implicit processing. On the other hand, late bilinguals, such as many first and second-generation immigrants within the United States, rely on more cognitive control to process their second language due to their inability to process this secondary language

[1] The terms "Latino" and "Hispanic" are frequently used interchangeably, although there is debate with regard to their precise meaning. For the purposes of this paper, terminologies used within the original sources were maintained.

automatically. Consequently, late bilinguals who acquire post-stroke aphasia may experience additional syntactical impairments (Tschirren et al., 2011). The impact of immigration on language use and exposure, language proficiency, language combination, and age of acquisition in determining the cognitive effects of bilingualism underscores the importance of quantifying these variables in the United States. Quantifying these variables will assist in determining how the assessment and treatment of bilingual post-stroke aphasia patients differs in the United States in comparison to bilinguals in multilingual societies. In multilingual societies such as India, the immigration rate is lower, languages spoken are more homogenous, age of acquisition of a second language is lower, and language use, proficiency, and exposure are increased.

Bilingualism and Cognitive Functions

The acquisition of a second language has been proven to alter various cognitive processes within the brain. These alterations occur largely in one's executive functions, or cognitive functions that allow an individual to organize their behavior and control their actions to fulfill long-term goals. Cognitive functions include, but are not limited to, working memory, attention control, inhibition of impulses, performance monitoring, goal-directed behavior, and follow through (Hungerford & Gonyo, 2007). These executive functions allow individuals to make choices concerning their actions, such as in planning, setting goals, creative thinking, abstract thinking, cognitive flexibility, or problem-solving. Studies comparing the accuracy and reaction time of bilingual and monolingual individuals completing tasks related to the use of executive functions have resulted in the understanding of a bilingual advantage. This bilingual advantage has been explained by various theories (Arizmendi et al., 2018).

One theory, the Bilingual Inhibitory Control Advantage hypothesis, states that for bilinguals, the continuous process of selecting which language to use requires the ability to

overcome any interference between the two languages. This contributes to more efficient inhibitory processing, or the ability to monitor these interferences and shift actions when necessary. Another theory, the Bilingual Executive Processing Advantage, proposes the existence of an advantage in executive functions across all domains in bilinguals. For instance, studies have shown that when given tasks requiring symbolic flexibility, bilinguals have generally performed better. This is potentially a result of their capacity to utilize two or more symbols for each concept and switch between languages if necessary, which increases their proficiency in numerous skills that are crucial in conversation. These skills include forming concepts, possessing flexibility in thinking, controlling and managing conflicts, thinking abstractly, and developing compensatory strategies (Arizmendi et al., 2018).

This consistent switching required between languages in bilingual individuals and the necessity to maintain attention to the target language often enhances executive. Both languages are activated in bilingual individuals, so the ability to detect subtle environmental differences and develop a selection mechanism, or executive functions, to discriminate between these two languages is crucial in preventing interference between them (Bialystok, 2015). In addition to predicting academic success, executive functions may also impact the severity of aphasia symptoms and an individual's rehabilitation potential. This is evident in the belief that bilingual individuals may be more resistant to damage from a stroke based on their enhanced cognitive reserve. In some cases, a bilingual individual who possesses inhibition deficits may experience selective recovery of language, or their weaker language may be more at risk due to the inability to exhibit language control or prohibit interference from the more proficient language (Penn, Barber, & Fridjhon, 2017). Because of these significant cognitive effects, studies detailing the

relationship between executive function and bilingualism should be considered when developing assessment and treatment plans for post-stroke aphasia patients within the United States.

In addition to considering the role of executive functions, it is important to consider the site and size of the brain lesion in a bilingual stroke patient. Since the left hemisphere of the brain is central to language processing, an infarction in this hemisphere can result in potentially severe language impairment, such as in language comprehension or production. Though the right hemisphere contributes to language processing to a lesser extent than the left hemisphere, an infarction in this hemisphere can also affect language comprehension or production. In situations where damage occurs in language processing areas within the left hemisphere, such as Broca's area or Wernicke's area, the plasticity of the brain will cause the right hemisphere to be activated. This will allow for a greater quantity of language processing to be transferred to the right hemisphere, which can aid in post-stroke recovery (Uruma, Kakuda, & Abo, 2010). While monolingual and bilingual individuals utilize similar language networks in the brain, bilinguals may be more sensitive to lesion damage or may possess damage not present in monolingual individuals. This can be explained by their usage of regions in the brain that are not typically included in the language networks of monolinguals. Additionally, the need to control and manage interference between languages can be attributed to limited recovery of both languages in situations where these control networks are damaged (Hope et al., 2015). For this reason, considering the location of a lesion is important when assessing impacted language processing and cognition in bilingual post-stroke aphasia patients.

Bilingualism and Post-Stroke Aphasia

When studying the relationship between bilingualism and post-stroke recovery, it is most common to study individuals who have suffered an ischemic stroke. This type of stroke occurs as

a result of the artery carrying oxygen-rich blood to the brain becoming blocked by a blood clot or debris of tissue, leading to a reduction or termination of blood flow to the brain. On the other hand, a hemorrhagic stroke occurs as a result of the rupture of an artery in the brain, filling the brain tissue with blood. This rupture or leakage can be caused by high blood pressure, also known as hypertension, or weak spots in the walls of the blood vessels, known as aneurysms. Additional risk factors for stroke include lifestyle factors, such as smoking or poor diet, or medical conditions, such as diabetes (National Aphasia Association, n.d.). Recently, studies comparing stroke incidence in United States residents of Latino and non-Latino white descent have revealed that individuals of Latino descent are twice as likely to suffer an ischemic stroke as a result of higher rates of inactivity, obesity, and diabetes (Lorenzen & Murray, 2008).

These studies also indicated that individuals of Mexican descent, the most rapidly growing Latino population in the United States, possess a slightly higher rate of stroke overall, at 1.63% compared to 1.36% in non-Latino white individuals. Prior data indicated that this population is also 33% less likely than non-Latino individuals to receive necessary health care services in the United States, in part due to a lack of health insurance, interpreters, and translators (Lorenzen & Murray, 2008). Although Section 1557 of the Patient Protection and Affordable Care Act of 2010 included protections to ensure that individuals with limited English proficiency are provided with access to language assistance services, this provision has not been fully realized (U.S. Department of Health & Human Services, 2010). According to a 2016 survey of 4,586 hospitals conducted by the American Hospital Association, only 56% of these hospitals provided linguistic and translation services (Eldred, 2018). However, it has been shown that access to language assistance services in hospitals decreases monthly expenses due to a decrease in readmission rates of individuals with limited English proficiency (Karliner, Pérez-Stable, &

Gregorich, 2017). Encountering these individuals with limited English proficiency is not uncommon in the United States healthcare system. A survey distributed by the Center for Studying Health System Change states that approximately 97% of responding physicians treat "at least some non-English speaking patients" (Reschovsky & Boukus, 2010). This data, combined with the increasing bilingual population and immigration rate within the United States, conveys the need to assess current healthcare measures provided to this population and address these barriers to ensure equal access to healthcare is provided.

Individuals suffering from a stroke are likely to develop aphasia due to damage in areas of the brain that are important in speech and language processing, primarily in the left hemisphere. The size of this damage affects the severity of an individual's loss of language capabilities and the quantity or rate at which they can regain these functions. The location of this damage determines the type of aphasia and resulting symptoms an individual will develop, which also affects the recovery process. The type of aphasia will in turn determine the management strategies utilized to target the specific functional deficit. To illustrate, those who develop Wernicke's or 'fluent' aphasia may exhibit difficulties producing meaningful utterances due to the usage of wrong words or combining words into phrases that do not convey meaning, though producing connected speech is unaffected. On the other hand, those who develop Broca's or 'non-fluent' aphasia as a result of damage to the frontal regions of the left hemisphere may possess effortful speech and struggle to form sentences or long utterances. Broca's aphasia is characterized by the omission of words necessary to complete a sentence or the usage of words that are close to their intention but are not exact, such as saying the word "car" when the concept of "truck" is intended. Along with experiencing difficulty completing sentences, this population experiences deficits in comprehending others' utterances or following directions (American

Stroke Association, 2018). A more severe type of aphasia, Global aphasia, is the result of damage to the front and back regions of the left hemisphere. Individuals with Global aphasia struggle to comprehend and form words and sentences, as well as possess an inability to read or write. Other less common types of aphasia in stroke patients include Mixed non-fluent aphasia, Anomic aphasia, and Primary Progressive Aphasia (National Aphasia Association, n.d.).

Because strokes are the leading cause of aphasia, recognizing the relationship between lesion size and location and resulting language difficulties, as well as the impact bilingualism has on these impairments during the recovery process, is important when developing effective treatment plans. The inability for individuals with aphasia to communicate with family and friends can be detrimental to their mental health. This social isolation can exacerbate this population's already increased likeliness to develop anxiety or depression. Ensuring that bilingual post-stroke aphasia patients receive equal access to effective treatment methods to regain these language abilities is important in providing these individuals with communication as a coping mechanism for anxiety or depression post-stroke (Hope et al., 2015).

Discussion

The prevalence of aphasia diagnoses in stroke patients in the United States combined with the increasing bilingual population has generated a need to review current measures utilized in assessing and treating bilingual post-stroke aphasia patients. According to the American Speech-Language-Hearing Association (ASHA), more than 180,000 individuals are diagnosed with aphasia annually in the United States, and one in every 250 people are currently living with aphasia. Developing aphasia post-stroke becomes more common as age increases; 15% of individuals below 65 years of age develop aphasia after their first ischemic stroke, whereas 43% of individuals older than 85 years of age experience aphasia after stroke ("Aphasia: Incidence and Prevalence", n.d.). As the population within the United States shifts towards an older demographic and the bilingual population continues to rise, incidence of aphasia diagnoses in bilingual stroke patients will increase. When assessing and treating this population, it is the goal of the healthcare professional to accurately differentiate between communication disorders and normal linguistic variations. An additional goal of the healthcare professional is to generate treatment plans that most effectively allow for linguistic recovery and "minimize the extent of the functional impact of the disorder" ("Language in Brief", n.d.).

The speech-language pathologists (SLPs) responsible for executing these goals are required by ASHA to demonstrate cultural competence through "understanding and appropriately responding to" all forms of cultural diversity. This includes language, culture, dialect, and immigration status or national origin, and can be accompanied by linguistic diversity ("Cultural Competence: Overview", n.d.). Likewise, ASHA's Code of Ethics dictates that all SLPs are required to "provide culturally and linguistically appropriate services to their clients", "consider how communication disorders or differences might be manifested, identified, or

described in the client's/patient's cultural and linguistic community", and utilize this information in assessing, diagnosing, and treating the client. By following these policies, SLPs should gain competence at providing effective assessment and treatment options ("Bilingual Service Delivery: Key Issues", n.d.). Because of the recent demographic shifts in the United States, exhibiting cultural competence is becoming increasingly important in all fields of healthcare to ensure that all individuals, including bilingual post-stroke aphasia patients, are accurately assessed and receiving equally effective treatment plans ("Cultural Competence", n.d.).

As part of offering effective assessment and treatment options to bilingual post-stroke aphasia patients within the United States, the patient must be provided with language access services. Legally, the Office of Civil Rights requires all organizations or providers funded by the U.S. Department of Health and Human Services to provide patients who are not proficient in English with language access services. This includes those funded by Medicare Part A, federally funded clinical trials, Children's Health Insurance Program (CHIP), and Medicaid, among others. To ensure that these individuals possess equal access to healthcare services, it is expected that bilingual staff and/or interpreters are supplied in a timely manner at no cost to the patient ("Language in Brief", n.d.). These language access services must also be provided to the bilingual or non-English speaking population according to Section 1557 of the 2010 Patient Protection and Affordable Care Act (U.S. Department of Health & Human Services, 2010). Despite these regulations, as stated previously, studies have shown that an alarming number of healthcare facilities throughout the United States are not adequately providing linguistic and translation services to patients (Eldred, 2018).

In various cases, it is possible that a bilingual service provider will be available to provide services to a bilingual client without the need of an interpreter. However, as the

population of bilingual individuals within the United States rises, the quantity of individuals requiring services in a language other than English will exceed the quantity of available bilingual providers ("Collaborating with Interpreters: Overview", n.d.). ASHA's study of all certified SLPs and audiologists in 2018 revealed that only 12,242 of the 191,904 members, or 6%, claimed to be bilingual service providers. Moreover, only 43% of these bilingual service providers were employed in healthcare settings where assessment and treatment of post-stroke aphasia patients occurs. Although the greatest quantity of bilingual SLPs were located in states that correspond with the highest percentages of residents speaking a language other than English at home, such as California, New York, and Texas, 19 states possessed less than 25 bilingual SLPs ("Demographic Profile of ASHA Members", 2019). This data illustrates the shortage of bilingual SLPs in the United States healthcare system and the resulting need to collaborate with interpreters to ensure that bilingual post-stroke aphasia patients receive services in the most appropriate language(s).

Because potential difficulties may arise from collaborating with an interpreter, such as complications with the reliability of the interpreter or the extent of their training, it is preferable to utilize the skills of a proficient bilingual clinician when treating bilingual clients (Lorenzen & Murray, 2008). Unfortunately, the requirements to receive accreditation as a bilingual service provider vary by state, and bilingual training programs for SLPs are not currently regulated or accredited by ASHA. In the event that a bilingual clinician is not readily available, it is possible that a clinician who is not fluent in the client's target language still possesses the skills necessary to provide effective healthcare to the client. It is the responsibility of the clinician to determine whether they possess sufficient proficiency in the target language to meet the needs of their

client and the client's family, or if it is necessary to pursue the assistance of a certified interpreter ("Bilingual Service Delivery: Key Issues", n.d.).

To be considered a bilingual clinician, the clinician must be capable of communicating in their primary language and another language with native or near-native proficiency in lexicon, phonology, morphology, semantics, and pragmatics. They must also be capable of distinguishing between communication differences and disorders when choosing, administering, and interpreting culturally and linguistically appropriate assessments. Lastly, they must competent in creating treatment plans in the language most appropriate for the client and describing the process of oral and written language acquisition for both monolingual and bilingual speakers ("Bilingual Service Delivery: Key Issues", n.d.). If the SLP is fluent in only one language utilized by the client or does not possess sufficient proficiency in the target language, their unfamiliarity with the client's target language could result in them incorrectly perceiving it as impaired. In various situations, utilizing a monolingual SLP is ideal, such as in the assessment of bilingual aphasia patients suspected of pathological switching. If the SLP only speaks Spanish and is assessing the patient's Spanish skills, they would not assume that the patient switching to English is intentional (Lorenzen & Murray, 2008).

Prior to being assessed and treated by a SLP, stroke patients are initially screened by a professional to determine if they have developed aphasia. It is expected that this screening is conducted in all languages spoken by the patient and that cultural and linguistic diversity are considered. One common tool utilized during the screening process of monolingual English-speaking patients is the Mississippi Aphasia Screening Test (MAST). Though it is commonly used, this screening test has only been adapted in the Czech, Spanish, Telugu, and Persian languages (Nursi et al., 2019). Additionally, the Bilingual Aphasia Test (BAT) Screening test

can be used when evaluating patients who speak a language other than English. The BAT Screening test currently possesses versions in Arabic, Spanish, English, French, German, Italian, Korean, Portuguese, and Russian. These versions contain subtests from the BAT, including tests of commands, syntactic comprehension, repetition, and spontaneous speech. The language options currently provided are culturally and linguistically equivalent, but variations for numerous commonly spoken languages within the United States, including Spanish, have yet to be published (McGill University, 2019).

Another screening tool that has been used in bilingual post-stroke aphasia patients to evaluate various cognitive domains is Addenbrooke's Cognitive Examination-Revised (ACE-R) (Paplikar et al., 2018). ACE-R was originally developed in English, but it is also available in various other languages. This screening tool has since been revised, resulting in a third version, ACE-III. ACE-III has been adapted into multiple languages; however, no standardized criteria for adapting this screening tool exists, resulting in numerous adaptations that do not adequately consider cultural variations (Dozzi Brucki, 2019). Although Paplikar (2018) claims that the version of ACE-R that was utilized in their study possessed "culturally appropriate modifications", Dozzi Brucki (2019) indicates that numerous other studies utilizing variations of the ACE have not provided that disclaimer. The lack of culturally adapted screening tools is problematic for bilingual post-stroke aphasia patients within the United States, as healthcare providers will be unable to accurately evaluate the patient's need for further assessment and treatment. If appropriate screening measures are used and the results indicate that an individual needs further assessment, the patient is typically referred to a SLP or other professional to perform a comprehensive assessment of the patient's speech, language, swallowing, or cognitive-communication abilities.

Assessment

When assessing a post-stroke aphasia patient, it is common to begin by completing a case history in the native language of the patient, which details the patient's medical history, education, occupation, and cultural and linguistic backgrounds. Additionally, a comprehensive assessment typically includes a self-report or caretaker questionnaire. This questionnaire describes the patient's difficulties with functional communication and its resulting impact on others in their environment, as well as the environmental context in which these concerns are present. Other information gathered includes the languages utilized by the patient, their language usage prior to the stroke, and their goals or preferences. Next, an oral-motor examination will be conducted to assess the individual's steadiness, tone, and accuracy of movements for tasks. This exam will also evaluate sequential movement, repetitions and the strength, speed, and range of motion of their oral-motor system. Lastly, the professional will assess the individual's expressive and receptive skills in spoken and written language in varying contexts ("Aphasia: Assessment", n.d.). When performing an oral-peripheral examination of these abilities with bilingual clients, it is important to recognize the impact of cultural differences on the client's perception of requested tasks. For instance, if a client is requested to stick out their tongue, it might be necessary to visually model the task and to explain its purpose ("Language in Brief", n.d.). The initial portion of the comprehensive assessment should consider important factors such as endurance, pain level, and motor speech, cognitive, and sensory impairments. Other considerations include medications, upper extremity hemiparesis, depression, and the impact of any impairments on quality of life ("Aphasia: Assessment", n.d.). For example, considering endurance and fatigue is important when assessing post-stroke aphasia patients in the acute phase because these patients typically are easily fatigued. This information impacts the type and length

of assessment that is selected to accurately and efficiently assess the patient's language capabilities.

Further assessment tools are also selected by the clinician based on information provided in the case history or based on observations made by the professional. This information includes the client's age, cultural background, values, languages used, severity of their language disorder, and factors related to language functioning, such as cognitive impairment ("Assessment Tools, Techniques, and Data Sources", n.d.). These selected assessment tools can be classified as standardized or non-standardized. Non-standardized assessments are informal tools used to measure an individual's performance and do not provide scores that illustrate the relation between the individual assessed and others who have completed the assessment. In contrast, standardized assessments are consistent and established methods of comparing the results of multiple individuals, and they can be modified to consider cultural and linguistic variables. However, any changes made to the assessment should be documented, and results should be interpreted with regard to these accommodations. Commonly used standardized aphasia assessments in English include the Western Aphasia Battery-Revised (WAB-R), Boston Diagnostic Aphasia Evaluation-3rd Edition (BDAE-3), Cognitive-Linguistic Quick Test (CLQT), Comprehensive Aphasia Test (CAT), and Montreal Cognitive Assessment (MoCA) ("Aphasia Assessment Tools", n.d.). Previously mentioned standardized assessments that possess versions in other languages include the WAB-Spanish Version, CAT, and BDAE-Spanish. Other adaptations of common English assessments include the Multilingual Aphasia Examination-Spanish Version, Psycholinguistic Assessments of Language Processing in Aphasia-Spanish, and the Aachen Aphasia Test. Finally, the BAT possesses versions in numerous languages, including Spanish, which is important for the United States healthcare system (Lorenzen & Murray, n.d.).

When selecting a standardized assessment for the bilingual post-stroke aphasia patient, the culture of and language spoken by the client must be considered. Culturally and linguistically adapted assessments in all languages spoken by the client must be utilized to compare any discovered deficits among languages. These adapted assessments should be linguistically equivalent, such that all subtests are equally challenging and evaluate similar levels of ability in in each of the patient's languages (Lorenzen & Murray, 2008). In many cases, healthcare professionals or researchers are required to adapt a standardized assessment if a verified adaptation does not exist in the language spoken by their patient, such as in the studies of Penn, Barber, and Fridjhon (2017) and Paplikar et al. (2018). Therefore, it is important to evaluate an adapted assessment prior to its usage to ensure that it has been sufficiently culturally and linguistically adapted. If a standardized assessment is directly translated without regard to cultural and linguistic implications, test results will be invalid and cannot be reported. Potential problems that occur as the result of directly translating an English assessment include the frequent lack of equivalent translations and variations in the order of acquisition of vocabulary, morphology, and syntactic structures among languages. Another potential problem is the absence of linguistically equivalent direct translations of minimal pairs, or rhyming words typically used in phonological tasks. Lastly, problems with variations in the syntactic structures among languages, including the absence of structures in other languages that are present in English such as the passive voice, can occur ("Language in Brief", n.d.).

As a consequence of these variations among languages, scores acquired from directly translated assessments can only be used as informal sources of information and cannot be officially reported ("Language in Brief", n.d.). For example, in the study of monolingual versus bilingual stroke patients conducted by Hope et al. (2014), the assessment utilized was adapted

from the CAT into various languages. However, the researchers stated that their unexpected results could be the result of examples or referents used not being common in the patients' native languages. Therefore, utilizing a standardized and properly translated assessment in the language spoken by the client is crucial in order to accurately measure their language capabilities post-stroke ("Aphasia: Assessment", n.d.). The usage of a properly translated assessment can be seen in a study conducted in South Africa that utilized the CAT to assess the participants' language skills. Although the original English version of the assessment was used, adaptations were made to various sections to account for the cultural environment of South Africa, such as the incorporation of South African cities and units of measurement (Penn, Barber, & Fridjhon, 2017).

These English or culturally adapted assessments can be further divided into norm-referenced and criterion-referenced assessments. The norm-referenced test allows the clinician to compare the scores of their client with those of a large group of similarly aged individuals who have also taken the test and rank them through a percentile. In contrast, the criterion-referenced test provides the clinician with a set of standards or descriptions of information an individual should know or tasks they should be able to complete based on their stage of development. The clinician can compare these standards to the performance of their client to assess the client's strengths and weaknesses, as well as to determine whether the client meets all expected standards ("Aphasia: Assessment", n.d.). For both norm-referenced and criterion-referenced tests, if the client does not fall within the demographic used to establish the assessment's standards, such as in the case of a Spanish-speaking client completing an English assessment translated directly into Spanish, the client's test scores are invalid. Despite the invalidity of the test scores, these

assessments are still able to provide useful information regarding the client's strengths and deficits in the language of the administered assessment ("Language in Brief", n.d.).

In addition to norm-referenced and criterion-referenced tests, obtaining speech and language samples in all languages spoken by the client, often through the assistance of an interpreter, is beneficial in determining an individual's functional communication capabilities. These samples should include single-word and connected-speech samples, such as conversational samples, which will provide the SLP with a detailed understanding of the client's morphological, phonological, syntactic, and lexical systems. Comparing this information across languages used by the client can be helpful. In spite of this, numerous elements, such as phonological acquisition and syntactic complexity, will greatly vary across languages, rendering comparison between the client's languages challenging ("Language in Brief", n.d.).

Not only should the assessment of bilingual post-stroke aphasia patients include an analysis of expressive language samples, but it should also include a speech perception evaluation, which analyzes a patient's ability to understand speech and to predict their success in common day-to-day contexts. This evaluation of speech reception thresholds and word recognition ability should utilize test materials that are consistent with the client's cultural and linguistic background. For instance, accent, dialect, and linguistic background must be considered when selecting pre-recorded or live voice testing. Information collected from the client's language history, such as the age of second language acquisition, should be taken into account during this evaluation as well. Previous research has indicated that age of acquisition directly impacts performance in speech perception evaluations. For example, individuals who acquired a second language after ten years of age performed better in their dominant language. Additionally, early bilinguals who acquired a second language before six years of age were able

to more effectively process speech in the presence of noise than late bilinguals who acquired a second language after fourteen years of age. However, monolinguals have demonstrated better speech recognition ability in noise than fluent early bilinguals ("Language in Brief", n.d.). Lastly, if the professional is using a questionnaire to assist in evaluating the client's speech perception skills, the questionnaire must be translated into the client's first language. This translation must account for the vast cultural and linguistic variation among bilingual clients ("Language in Brief", n.d.).

Because the term "bilingualism" is utilized to describe an immensely diverse range of linguistic capabilities and language usage, particularly in the United States, clinicians must understand the implications of each individual's bilingual status to more effectively meet their needs ("Bilingual Service Delivery: Overview", n.d.). To determine the language(s) in which the assessment should be conducted, and the treatment options provided to the post-stroke aphasia patient, it is necessary to consider all languages spoken, the age at which each language was acquired, and if the languages were acquired simultaneously or sequentially. Also, dialect of the language(s) used, premorbid use of each language, language(s) used at home and at school or work, and language(s) used when communicating with family should be considered. Other necessary considerations include length of exposure to each language, language typically utilized with friends or in casual contexts, and the language(s) needed by the individual to return to daily activities ("Aphasia: Assessment & Language in Brief", n.d.). Clinicians must also take into account if a client is an English language learner or if they belong to a language minority in the United States and are learning English for the purpose of education or social integration, as well as their contact with native speakers of their primary language. Their progress in receiving English as a second language (ESL) services or adult English language learning classes,

language of academic instruction, academic performance in each language, and age of immigration are also important considerations ("Aphasia: Assessment & Language in Brief", n.d.). This information is key in determining the context in which each language is used and in setting therapy goals that will be more effective in assisting the patient in returning to daily activities ("Bilingual Service Delivery: Key Issues", n.d.).

To accurately compare deficits present in the languages spoken by the client and to generate a treatment plan that will target these impairments, it is ideal to assess all languages spoken by post-stroke aphasia patients (Penn, Barber, & Fridjhon, 2017). Occasionally, bilingual aphasia patients will sustain severe impairment in one language, but minimal impairment in the other language. If only one language spoken by the individual is assessed, the clinician will be unable to assess the extent of impairment in both languages and the overall impact of the brain injury. The assessment of only one language could also result in the patient or SLP misinterpreting the extent of the patient's impairment in each language (Lorenzen & Murray, 2008). Scores gained from an assessment may result in a formal diagnosis of a language disorder, describe the severity and resulting limitations of the language disorder, provide a prognosis for change, or recommend therapy, other services, or other resources. In bilinguals, understanding the deficits present in all languages will allow the SLP or other professional to determine which language(s) should be targeted in therapy and to set goals for each language (Lorenzen & Murray, 2008). To better understand the implications of a language disorder in bilinguals, it is important to recognize existing forms of language usage and the distinction between a language difference and a language disorder.

Language is defined by ASHA as the "comprehension and/or use of a spoken, written, and/or other communication system" and can vary across regional, social, ethnic, or cultural

groups (“Language in Brief”, n.d.). Tasks such as listening and reading are regarded as receptive uses of language, whereas speaking and writing are considered expressive uses of language. Language is comprised of various domains, including phonology, morphology, syntax, semantics, and pragmatics, which present themselves through the ability to complete various spoken or written language tasks. If an individual possesses a language disorder, their comprehension and/or use of a spoken or written language or other communication system is impaired. Impairment can occur in the form/phonology, morphology/syntax, the content/semantics, and/or the function/pragmatics of the language. Individuals with language disorders may experience difficulties with social communication, which requires the use of pragmatics, language processing, and social cognition (“Language in Brief”, n.d.).

If a bilingual or multilingual individual possesses a communication disorder, deficits of varying degrees will be present in all languages utilized by the individual. To determine if the client possesses a disorder or a difference, the clinician must consider language development, language loss, language dominance fluctuation over the individual’s lifespan, and the influence of acquiring and using two or more languages. The clinician must also consider linguistic elements for each of the client’s languages. For instance, phonetic patterns can differ between monolinguals and bilinguals, potentially due to interference between languages in bilinguals. Moreover, communication disorders must be distinguished from accents, or an individual’s pronunciation, and dialect, or one’s systematic variation of a language. Accents and dialects can affect syntax and semantics and can result in interference across languages. Therefore, clinicians must be able to determine whether any notable differences are consistent with other second language learners, or if symptoms are the result of a communication disorder. To demonstrate,

regional, social, cultural, or ethnic variations in speech are deemed communicative differences, not disorders (“Bilingual Service Delivery: Key Issues”, n.d.).

In the area of morphology, it is imperative to recognize that the multiple languages spoken by an individual are likely to possess varying grammatical structures. As a result, when assessing a bilingual individual, analyzing the frequency and types of morphological patterns or errors made by the client is crucial in distinguishing between a difference and a disorder. Additionally, syntactic structures vary across languages, often resulting in an individual transferring grammatical structures from one language to another. This transfer of grammatical structures is regarded as a difference as opposed to a disorder. Finally, the specific vocabulary utilized in each language by the individual may differ depending on the environment in which each language is typically used by the individual. To illustrate, an individual in the United States may use their native language more frequently in everyday conversation but use English in an academic setting (“Bilingual Service Delivery: Key Issues”, n.d.). For this reason, it is important to consider the environments in which the individual typically uses each language to assess their linguistic abilities (“Language in Brief”, n.d.).

Although the process of acquiring a second language varies by individual, several patterns are consistent among second language learners and can be targeted by healthcare professionals in the rehabilitation process. These patterns include interference or transfer, in which errors occur when the structure of one’s primary language influences their usage of their second language. If an individual is a simultaneous bilingual, interference may occur in both languages. If a sequential bilingual is learning English as a secondary language, such as a Hispanic immigrant to the United States, the individual may exhibit differences in language usage from that of native English speakers. The clinician must determine if these differences are

the result of interference from the primary language and are typical for other members of this population, or if they illustrate a deviation from the individual's baseline. Another commonality among second language learners is the presence of a silent period, in which a new second language learner strengthens their understanding of a language solely through listening skills, as opposed to production of the language ("Bilingual Service Delivery: Key Issues", n.d.).

Fluent bilinguals also frequently exhibit systematic codeswitching, particularly those who are simultaneous bilinguals. If an individual begins acquiring a second language in adulthood, they are likely to exhibit increased codeswitching errors due to a lack of linguistic competence; however, these errors are not explained by the presence of a language disorder. If typical codeswitching limitations in fluent bilingual adults are violated, this can be indicative of a cognitive and/or communication disorder due to impairment in executive function, aphasia, dementia, or other language disorders. Another pattern seen in second language learners is known as subtractive bilingualism. In cases of subtractive bilingualism, an individual becomes less fluent in their primary language and experiences deficits in lexicon and grammatical systems while immersed in their second language, potentially causing a negative impact on their overall language performance. Because of these patterns, when treating an individual who demonstrates language loss, clinicians must consider the client's language history, education, motivation, societal influences, primary language proficiency, and consistency in learning their primary language ("Bilingual Service Delivery: Key Issues", n.d.).

To provide equal healthcare access and linguistically and culturally appropriate services to the growing United States bilingual population, it is essential for SLPs and other healthcare professionals to exercise cultural competence. This includes providing bilingual staff or collaborating with healthcare interpreters to screen, assess, and treat the patient. To properly

assess a bilingual post-stroke aphasia patient's language deficits, a comprehensive assessment should be conducted. This should include a case history, caretaker questionnaire, oral motor exam, assessment of expressive and receptive language skills, and the consideration of other limitations or impairments. Additionally, the patient should be assessed in all languages spoken utilizing a culturally and linguistically adapted assessment tool, which is selected based on information received from the prior questionnaires and observations. When analyzing the results obtained from this assessment, the professional must take into account the various language domains, the patient's language history, accents and dialects, and patterns consistent among second language learners to determine whether the results are indicative of a language difference or disorder. This information is important when selecting an effective treatment plan that will maximize the patient's recovery.

Treatment

Throughout the treatment process, it is the goal of the SLP to improve the client's success in communicating, thereby assisting the client in gaining independence in completing daily activities and enhancing their overall quality of life. Based on an analysis of the patient's communicative strengths and weaknesses, individualized treatment goals will be established to maximize the patient's recovery. When generating therapy goals, it is essential to consider the patient's language proficiency and patterns of language usage prior to and after suffering a stroke. The presence of differing syntactic impairments across languages also requires SLPs to take into account characteristics unique to each language when setting goals (Lorenzen & Murray, n.d.). After treatment goals have been set for the patient, the SLP must create a treatment plan that assists the patient in achieving these goals. When generating a treatment plan for a bilingual patient, the SLP must take into account the patient's linguistic and cognitive

abilities, their executive function skills, and if the cognitive or linguistic elements of language processing deficits need to be targeted. Determining whether to begin by targeting linguistic or cognitive skills can be aided by knowledge of the relationship between language and executive function and the patient's linguistic and non-verbal profiles (Penn, Barber, & Fridjhon, 2017). If these factors are observed and the selected language of intervention is not the primary language spoken by the SLP, the provider may need to collaborate with another individual to provide the most effective treatment. This collaborator could be a bilingual SLP, certified healthcare interpreter, or a language broker, who specializes in helping others understand the client's cultural and linguistic background ("Aphasia: Treatment", n.d.).

When deciding whether to conduct treatment in one or both of the patient's languages, the SLP must be concerned with the above factors, as well as the patient's premorbid language usage. The client must receive services in the language used in the home in order to return to daily activities, but whether they receive treatment in additional languages depends on the patient's capacity to restore their communicative abilities to premorbid levels. The individual may be unable to fully restore their communicative abilities to previous levels due to their language usage before developing aphasia. For example, a bilingual post-stroke aphasia patient who speaks Spanish at home and English at work may be unable to return to work due to their physical condition. As a result, restoring the individual's ability to participate in daily activities would require treatment primarily in Spanish ("Aphasia: Treatment", n.d.).

Depending on the language of intervention selected by the SLP, the SLP will also need to understand the impact of the selected treatment language on cross-linguistic generalization, or incidental improvement in the language not being treated. Through designing treatment plans that target deficits in only one language but maximize cross-linguistic generalization, treatment

methods become more efficient (Lorenzen & Murray, 2008). This can be seen in a study conducted by Kang, Chung, and Kim (2016). This study found that treating a patient in their dominant language was ineffective, whereas treating the patient's non-dominant language also enhanced their dominant language due to the phonological connection between the patient's languages. Treatment strategies that have maximized cross-linguistic generalization in various studies include the cognate therapy approach, cognitive treatment, and reading and naming treatments focusing on aspects shared across languages. Other treatment strategies include the use of one language to cue the other, the usage of dual language abilities in creating compensatory strategies, and the increase of communication through the use of language mixing or cognates (Lorenzen & Murray, n.d.). A study conducted by Penn, Barber, & Fridjhon (2017) found that cognitive therapy, which focuses on nonlinguistic information processing instead of language therapy, improved the patient's cognition and usage of all languages spoken.

Treatment approaches that are selected to maximize the patient's language recovery should also be influenced by the patient's language history. If the post-stroke aphasia patient is bilingual or multilingual, the SLP must consider the patient's proficiency in understanding and producing each language, the frequency at which they use each language, and the environmental and social context in which each language is used. The SLP must also consider the demands for use of each language, if the patient acquired languages sequentially or simultaneously, the type of aphasia they have developed, their prognosis, and the potential impact of their prognosis on their ability to communicate ("Aphasia: Treatment", n.d.). For example, age of acquisition of one's second language has been found to influence second language syntactic impairment post-stroke. This is illustrated in a study conducted by Tschirren et al. (2011), which shows that the acquisition of a second language after the critical period may affect syntactical impairments in

the second language. A patient's language recovery is typically superior in their native language or the language with which they were most familiar prior to suffering a stroke, illustrating the importance of the patient's language history in recovery from aphasia (Kang, H. G., Chung, J. Y., & Kim, B. J., 2016). Lastly, it is imperative to understand the significance of the ability to control the interference between two languages in bilinguals. If this ability is impaired due to damage in areas of the brain that permit the cognitive control of language, the patient may experience selective recovery, mixing, or pathological switching (Penn, Barber, & Fridjhon, 2017), and this damage may limit their degree of recovery (Hope et al., 2015). In societies such as the United States where bilinguals may utilize different languages at home, at work, or in educational contexts, recognizing difficulties that may arise as the result of the inability to control the interference between languages is important. This inability to control interference may affect the rate and pattern of improvement in spoken and written languages (Penn, Barber, & Fridjhon, 2017). Controlling the interference between languages, along with a patient's language history, are important to consider when selecting an appropriate and effective treatment approach.

To assist a bilingual post-stroke aphasia patient in achieving their goals, numerous treatment plans and approaches exist to allow for an individualized and effective recovery process. If it is believed that rehabilitation will allow the patient's impaired functions to return to premorbid levels, a restorative treatment plan will be selected to help the patient achieve their goals. However, if a patient appears unable to reach a premorbid communicative status, a compensatory treatment plan will be utilized to provide the patient with accommodations or compensatory strategies that will assist them in participating in daily activities ("Aphasia: Treatment", n.d.). Additionally, to most effectively meet the needs of each patient, numerous

treatment approaches are available, such as computer-based, reading, multimodal, word-finding, and syntax treatments. Community support and integration or a collaborative approach to treatment in which multiple individuals are equally important in contributing to the rehabilitation of the patient are also valuable treatment approaches. When recommending treatment options and providing potential treatment outcomes, the professional should respect the patient and their family's cultural views due to differing values among cultures regarding treatment procedures ("Aphasia: Treatment", n.d.).

Treatment approaches that are specific to bilingual post-stroke aphasia patients include the bilingual approach and the cross-linguistic approach. In the bilingual approach, the focus is primarily on treatment goals, not the chosen language of intervention. The SLP will establish goals that address errors committed frequently in both languages, as well as constructs shared by both languages in order to enhance language skills common to all languages utilized by the patient ("Language in Brief", n.d.). In contrast, the cross-linguistic approach considers the differences in structures and unique linguistic skills across languages by addressing the patient's deficits in one specific language. Often, these approaches are used together to create a more efficient and effective treatment plan. With certain patients, the SLP may begin by targeting deficits common in both languages, then addressing aspects that are unique to each language after shared structures and features are mastered ("Language in Brief", n.d.). In bilinguals with severe non-fluent aphasia, it has been suggested that language deficits will improve as the result of therapy targeting basic information processing skills (Penn, Barber, & Fridjhon, 2017). Finally, other approaches that have been effective in the treatment of bilingual aphasia patients include the general stimulation approach and phonemic cueing (Lorenzen & Murray, n.d.).

In addition to considering the treatment approach that will be most effective for bilingual post-stroke aphasia patients, healthcare professionals should consider the format or structure of the treatment session, the individual who will be providing the treatment, and the frequency, intensity, and duration of treatment. The location of or environment in which the treatment will be administered and the timing of beginning treatment following the stroke or development of aphasia are also necessary considerations. In regard to the format or structure of treatment sessions, the format of group therapy is often used in conjunction with individual therapy to provide the patient with a natural conversational environment to apply the strategies learned in their individual sessions. The frequency, intensity, and duration of treatment, as well as the timing of beginning treatment are typically determined by the patient's environment and insurance. As a result, external factors should be taken into consideration when establishing treatment plans, such as the availability of services in the patient's region, the patient's insurance, pattern of recovery, and the method in which services can be offered. Frequently, treatment begins in the acute phase after an individual is admitted to an inpatient rehabilitation center and may or may not continue after the patient is discharged. Even though a patient has been discharged, research indicates that there are not definitive limits to an individual's ability to improve as a result of intervention, illustrating the benefit of continuing treatment in an outpatient setting if insurance permits ("Aphasia: Treatment", n.d.).

The recovery process of bilingual post-stroke aphasia patients, often as the result of intervention or treatment strategies, can vary. While bilinguals exhibit varying impairment and recovery patterns, the majority of bilinguals demonstrate a parallel recovery rate (Tschirren et al., 2011). In this recovery pattern, the recovery of each language parallels the patient's abilities pre-stroke. For example, if an individual was more proficient in Spanish than English prior to

suffering a stroke, their Spanish proficiency would return to the same higher proficiency level in the recovery process. Another common recovery pattern is the differential pattern, in which the recovery of one language is much greater than the other when compared to pre-stroke abilities. Following this pattern in frequency is blending, in which the patient uncontrollably mixes their two languages when speaking, even if they are only intending to speak a single language. Lastly, a patient may demonstrate a selective recovery pattern, in which language abilities are lost in only one language, while the other language remains virtually intact. Patients who do not exhibit any of the previously mentioned recovery patterns may demonstrate antagonistic, alternating antagonism, or successive recovery patterns. In the case of an antagonistic recovery, a patient may initially possess abilities in one language, but they gradually lose these abilities as their other language recovers. Similarly, a patient exhibiting an alternating antagonism pattern loses their initial language abilities as their other language improves, but this occurs in a continuous cycle in which languages alternate in availability. Finally, the uncommon successive pattern indicates the recovery of one language before the other (Lorenzen & Murray, n.d.).

These recovery patterns could be influenced by numerous factors, including the patient's language history, language status or proficiency in each language, lesion type and/or site, aphasia type, manner of acquisition, and the context in which each language is used. Additionally, recovery patterns can be affected by differences across languages, such as in the areas where breakdown can occur, which structures can be avoided, and cue validity (Lorenzen & Murray, n.d.). Recovery patterns can also be affected by the severity of the patient's language and cognitive deficits. For example, a lack of inhibition is often present in patients that possess impaired cognitive control, affecting the recovery pattern demonstrated by the patient. Lastly, because of the interaction between language and executive function skills in the recovery phase,

executive functions may impact recovery from aphasia and suggest potential responses to intervention. However, few studies currently exist detailing the role of executive functions in bilingual aphasia patients. Because of their impact on recovery patterns, the severity of language and executive function deficits are important in predicting treatment outcomes (Penn, Barber, & Fridjhon, 2017).

Treatment of a bilingual post-stroke aphasia patient requires careful consideration on behalf of the SLP of numerous factors that affect the patient's communicative success and their ability to gain independence in participating in daily activities. Setting goals for the patient and establishing a treatment plan that will allow them to attain this communicative success through maximizing their recovery requires an understanding of the patient's linguistic and cognitive abilities, as well as their language history. Setting goals also requires an understanding of the significance of language control in bilinguals, along with other factors, including the format of treatment sessions. The SLP must use this information to select the appropriate language(s) of intervention, recognize the impact of cross-linguistic generalization, and pursue effective treatment approaches that encourage cross-linguistic generalization. Numerous treatment plans exist to assist aphasia patients in achieving their goals, such as restorative and compensatory treatment plans, as well as approaches specific to treating bilingual aphasia patients, such as the bilingual and cross-linguistic approaches. Finally, the recovery pattern of a bilingual aphasia patient varies and can be influenced by numerous factors, including the patient's language history and type of aphasia.

Conclusions and Suggestions for Future Research

The recent growth of the bilingual population and older age demographic in the United States have contributed to the need to evaluate the effectiveness of current assessment and treatment protocols for bilingual post-stroke aphasia patients. Due to the correlation between age and stroke incidence, the aging bilingual population in the United States is likely to experience a growth in stroke patients, and by extension an increase in bilinguals who have developed aphasia. In the study of Alladi et al. (2016), bilingualism was found not to have an impact on the frequency of developing aphasia, indicating that the development of appropriate assessment tools and treatment protocols is equally as essential for monolingual and bilingual residents of the United States. However, minimal research currently exists concerning intervention in bilingual aphasic adults (ASHA, Language in Brief). Consequently, there is currently a critical need for empirical studies to be conducted that examine the assessment and treatment of bilingual aphasia patients.

Future empirical studies of bilingual aphasia must account for several variables for which little evidence currently exists. Additional information is needed regarding the quantification and qualification of bilingualism and other linguistic concepts specific to bilinguals, as well as the influence of linguistic and cognitive factors on recovery patterns in bilingual aphasia patients, such as inhibition (Lorenzen & Murray, 2008). Furthermore, consistent assessment and treatment protocols have yet to be developed that consider the cultural and linguistic diversity present in a bilingual population. With the development of consistent and validated assessments and treatment plans, it will be easier to compare assessment scores and recovery processes among bilingual aphasia patients. Though various studies of bilingual post-stroke aphasia patients have been conducted in the United States, these studies have typically been small-scale and have not

accounted for numerous variables, such as language usage and capabilities prior to stroke. By conducting more large-scale studies that account for all confounding variables, more reliable information can be compiled concerning providing effective healthcare to bilingual post-stroke aphasia patients (Lorenzen & Murray, 2008).

When developing an effective standardized assessment to be used in the evaluation of bilingual post-stroke aphasia patients, the assessment should include all tasks that are typically included in monolingual aphasia assessments, such as reading or lexical components, and that these tasks are equally as challenging in bilingual assessments. Additionally, an effective bilingual aphasia assessment must account for cultural and linguistic differences and should not be a direct translation of an English assessment. Within the United States, it is also necessary for this assessment to distinguish between inherently multilingual and immigrant societies because of the impact of society on an individual's communicative patterns and habits. Large-scale studies conducted in other countries, such as India and South Africa, have contributed beneficial information towards our understanding of bilingual aphasia. However, the general type of bilingualism found in these multilingual societies greatly differs from that of the English-dominant United States, which may affect the results gathered from large-scale studies. For example, the study conducted by Hope et al. (2015) found that non-native English-speaking bilinguals with aphasia performed poorer than native English-speaking monolinguals on language tests; however, results gathered from the study of Paplikar et al. (2018) contradict the results of Hope et al. (2015).

These conflicting results could be the result of several variables. In the study by Hope et al. (2015), bilingual participants were mostly immigrants, whereas those in Paplikar et al. (2018) were not immigrants and resided in an inherently multilingual society. Because participants in

the study by Paplikar et al. (2018) resided in a multilingual society, they utilized different languages frequently in daily interactions. This is significant due to the impact of language use and exposure on linguistic and nonlinguistic tasks, as well as the difference in brain activation patterns in monolinguals versus bilinguals. Additionally, the participants in the study by Paplikar et al. (2018) belonged to a homogenous group due to their languages spoken. The majority of participants were native speakers of Telugu or Dakkhini and acquired English and/or Hindi as a secondary language. In contrast, the bilingual participants in the Hope et al. study (2015) belonged to a heterogenous group due to their usage of more than 20 different native languages and English as a secondary language, a quality more common to that of the United States. This distinction is relevant due to the influence of differing language combinations, sociocultural factors, and linguistic factors on language and cognitive performance. If studies are conducted in different populations, such as the United States or India, results may differ as a result of the impact of language proficiency, use, combination, and language of assessment on cognitive and linguistic consequences of bilingualism (Paplikar et al., 2018). Although these studies, among others, have contributed towards understanding the implications of bilingualism in establishing effective communicative rehabilitative strategies post-stroke, there is still a lack of large-scale studies in the United States that test previously suggested approaches.

In addition to considering cultural and linguistic factors when developing a standardized bilingual aphasia assessment, the assessment must be simple due to the lack of endurance typically exhibited in the acute phase post-stroke. The assessment should also be able to differentiate between normal and deficient receptive and expressive language (Penn, Barber, & Fridjhon, 2017). If nonstandardized adaptations are utilized in a clinical setting, providers will be unable to compare the language abilities of their client to individuals with normal language

functions or other bilingual aphasia patients. For instance, the BAT is an adaptable assessment that possesses versions in over 50 languages, all of which consider linguistic and cultural factors. However, these adaptations were created by individuals based on provided suggestions of adaptation techniques that the adapter must "scrupulously adhere to" (McGill University, 2019). Because few large-scale studies exist to validate the cultural and linguistic considerations within these adaptations, it is expected that other clinicians utilizing these adaptations report any errors found in the assessment. Consequently, the validity of these adaptations is currently dependent on clinicians discovering and reporting any issues, as opposed to empirical studies (Portland State University, n.d.)

In conclusion, the demographic shift towards an aging bilingual population in the United States has made evident the need for large-scale studies addressing effective assessment and treatment protocols for bilingual post-stroke aphasia patients. Without the development of effective assessment tools and validated research suggesting treatment approaches, SLPs in the United States are forced to provide services without the knowledge necessary to provide efficacious healthcare to this population. Providing services without validated research can result in utilizing directly translated assessments or ineffective treatment plans, which violates the ASHA Code of Ethics (Lorenzen & Murray, 2008). The consistent growth in the bilingual population in the United States has increased the probability that medical SLPs will encounter a bilingual aphasia patient. Furthermore, it is important for SLPs to be prepared to treat this population. While creating bilingual SLP training programs and ASHA-regulated qualifications to be registered as a bilingual SLP would greatly assist in providing appropriate care to this population, providing these clinicians with the research needed to guide their clinical decisions is a necessity.

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