Factors Correlated with Communication Confidence in Persons with Aphasia: A Synthetic Cohort Analysis

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Aphasia is an acquired language disorder that affects a person's communication abilities. Consequently, aphasia can have a profound impact on how persons with aphasia (PWA) experience their personal life. Recently, approaches to aphasia management have taken a turn from the medical model of deficit to the functional and social model of deficit, which places emphasis on functional communication, social participation, and communication efficacy. In line with this approach, the construct of communication confidence was introduced. Communication confidence is a psychosocial construct related to the constructs of life participation, autonomy and self-determination, and self-efficacy. Communication confidence in PWA has received little attention, although confidence levels have been shown to be related to lifestyle changes in PWA. The purpose of this study was to determine the factors that correlate with communication confidence in PWA and contribute to broadening the general understanding of this construct.

Fifteen participants with with aphasia as the result of a left hemisphere cerebrovascular accident (CVA) participated in the investigation. In a single session at East Carolina University in the Communication Equity and Outcomes Laboratory, the participants provided their medical and demographic information and were administered an objective impairment-level language

measure as well as subjective measures. The former was the Western Aphasia Battery – Revised (WAB-R) to assess their language performance and the latter were the American Speech-Language-Hearing Association (ASHA) Quality of Communication Life Scale (ASHA-QCL) and the Communication Confidence Rating Scale for Aphasia (CCRSA) to capture their perception of their communication impairment from the quality of communication life standpoint and a communication confidence point of view, respectively. Synthetic data analysis utilized the distributional properties of the original data to interpolate statistically robust estimates of the relationship between communication confidence and demographic, objective measure, and subjective measure variables.

The synthetic cohort analyses simulated results using a probabilistically constructed simulation of 5000 participants. This synthesized data were closely similar to that collected across all included variables. Regression analyses indicated that a statistically significant positive correlation of ASHA-QCL ($p = 0.03$) and ASHA-Q18 ($p = 0.04$) with the CCRSA existed. Demographic variables and objective measures were not correlated with the CCRSA. The constructs of quality of life, quality of communication life, and communication of confidence, therefore, seem strongly interrelated and are important factors that may contribute to better adaptation and living successfully with aphasia.

FACTORS CORRELATED WITH COMMUNICATION CONFIDENCE IN PERSONS WITH APHASIA: A SYNTHETIC COHORT ANALYSIS

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CHAPTER I: INTRODUCTION

Aphasia: An Acquired Language Disorder

Aphasia is an acquired language disorder that affects a person's communication abilities; compromising one's auditory comprehension, oral expression, reading, and/or writing skills (Goodglass, 1993; McNeil & Pratt, 2001). It is a multi-modal impairment of the complex process responsible for understanding and constructing language symbols caused by damage to the brain's language-dominant hemisphere (McNeil & Pratt, 2001). While its most common etiology is cerebrovascular accident, particularly thromboembolic stroke in the middle cerebral artery region, aphasia can also be caused by traumatic brain injury or brain tumor (Clark & Cummings, 2003; Miceli, Capasso, Monti, Santini, & Talacchi, 2012). Typically, the site of lesion leading to aphasia is the primary language cortex in the left hemisphere of the brain (Potagas, Kasselimis, & Evdokimidis, 2013).

Aphasia occurs in about 18% to 38% of all stroke patients (Ellis, Hardy, Lindrooth, & Peach, 2018; Kauhanen et al., 2000; Pedersen, Stig Jørgensen, Nakayama, Raaschou, & Olsen, 1995). It is estimated that about 2 million people are currently living with aphasia in the United States, with approximately 180,000 Americans acquiring aphasia each year (National Aphasia Association, 2020). Each individual with aphasia presents with their unique aphasia characteristics, differing in their linguistic and cognitive abilities as well as severity.

Multiple factors, including the size and site of the lesion, determine the severity and type and form of aphasia. Aphasia can be considered either fluent or non-fluent in form, depending on whether and how affected verbal output is (Parr, Byng, & Gilpin, 1997). For example, non-fluent aphasia impairs one's ability to verbally communicate, affecting one's expressive abilities, even though language comprehension can be relatively unimpaired.

Conversely, in fluent aphasia, one is relatively expressive, but can be incoherent, with one's ability to comprehend language usually impaired in varying degrees. Regardless of the modality affected, communication difficulties in PWA arise and can hinder the individual's ability to participate in their environment (Howe, Worrall, & Hickson, 2008). Fundamentally, aphasia can affect any or all aspects of communication and can thus potentially have a profound impact on how PWA experience their personal life as well as interaction within the wider network.

Aphasia impacts PWA and their families in different aspects of their lives. In addition to the considerable communication challenges, the language disorder is also associated with increased mortality in both the short-term and long-term, higher costs related to management, greater persistent functional impairments, increased use of health services, and lower chances of returning back to work compared to other stroke-related impairments (Ellis, Simpson, Bonilha, Mauldin, & Simpson, 2012; Laska, Hellblom, Murray, Kahan, & Von Arbin, 2001; Paolucci et al., 1998; Pedersen, Vinter, & Olsen, 2004).

Moreover, due to the marked life changes aphasia imposes, PWA are prone to experiencing anxiety and depression, reduced friendships and social networks, and social isolation (Code & Herrmann, 2003; Kauhanen et al., 2000; Le Dorze & Signori, 2010; Parr, 2007). Consequently, aphasia significantly affects the daily lives of PWA, compromising their social relationships, their engagement in social activities, thereby disrupting their psychosocial well-being.

Psychosocial Sequalae of Aphasia

Stroke, in general, and stroke-related complications can negatively impact a person's psychological well-being and social functioning, affecting their confidence and participation in daily life activities (Horne, Lincoln, Preston, & Logan, 2014). More specifically, individuals

with left hemisphere damage, the site where the damage leading to aphasia most commonly occurs, may be more likely to retain emotional awareness and demonstrate extreme emotional reactions than individuals with right hemisphere damage (Spalletta et al., 2001). Consequently, PWA may be, in their essence, more prone to exhibit emotional distress.

In addition to the disposition the site of lesion imposes, the consequences of aphasia can be extremely significant; affecting all aspects of an individual's life. Therefore, PWA are likely to experience negative social consequences (Dalemans, De Witte, Wade, & Van Den Heuvel, 2010; Vickers, 2010). These changes in PWA's psychosocial integrity create negative repercussions often leading to exclusion; PWA report having reduced social networks and experiencing decreased support, loss of independence, role changes, and depression (Le Dorze & Brassard, 1995; Parr et al., 1997; Vickers, 2010).

Depression is common in stroke survivors, affecting their well-being, recovery, progress, and survival (Herrmann, Black, Lawrence, Szekely, & Szalai, 1998). In the chronic post-stroke period, depression may arise due to the psychological responses of the stroke-related impairments (Robinson, 2003). Specifically, depression has been reported to be common in PWA with 62% of all individuals with aphasia experiencing depression at 12 months post-onset (Kauhanen, 2001). Further, the severity of post-stroke depression was found to be associated with the severity of impairment in activities of daily living, which is generally found to be more impaired in PWA than post-stroke survivors without aphasia (Gialanella, Prometti, Vanoglio, Comini, & Santoro, 2016).

Because each individual with aphasia presents with their unique deficits and experiences aphasia differently, speech-language pathologists (SLPs) are encouraged to focus on adjusting and personalizing treatment to the specific needs of each individual due to their unique problems,

lifestyle, and expectations. Afterall, communication is of fundamental importance to psychosocial adjustment (Bose, McHugh, Schollenberger, & Buchanan, 2009). Losing the ability to effectively communicate can affect the quality of life (QoL) of individuals with communication disorders, specifically PWA (Cruice, Worrall, Hickson, & Murison, 2003).

Quality of Life in Aphasia

QoL is based on a multidimensional and holistic construct that incorporates all aspects of an individual's life (Bowling & Windsor, 2001). It should include the significant areas necessary for an individual to achieve their goals and satisfy their basic needs (Cummins, 2005; Sorin-Peters, 2003). QoL should therefore incorporate areas such as health, environment, work, culture, communication, and family. The assessment of QoL is a measure of one's perception of their position in life and satisfaction with their physical, emotional, familial, and social functioning. Perception of QoL is highly individual-specific. Accordingly, the individual is the sole person capable of judging their own QoL.

The consequences of aphasia may result in social exclusion, challenges with interpersonal relationships, mood and emotional changes, difficulty or inability to return to work, and consequently lack of autonomy (Ross & Wertz, 2003). Secondary to these consequences, decreased QoL is a prominent repercussion often experienced in PWA (Townend, Brady, & McLaughlan, 2007). Even when physical abilities, social support, and general well-being are indistinguishable, PWA report overall lower QoL compared to stroke survivors without aphasia (Hilari, 2011). Assessing and gaining insight of PWA's QoL is therefore essential in order to plan an individualized treatment that targets the psychosocial aspects relevant to each patient.

In response to the need for measures that provide comprehensive assessments of the subjective components known to contribute to QoL while also being sensitive to cognitive-

communicative impairments, two QoL measures have been designed to be accessible to PWA: the Stroke and Aphasia Quality of Life Scale-39 (SAQOL-39; Hilari, Byng, Lamping, & Smith, 2003) and the American Speech-Language-Hearing Association (ASHA) Quality of Communication Life Scale (ASHA-QCL; Paul et al., 2004). The SAQOL-39 is a valid and reliable 39-question scale usually administered by an interviewer to measure the stroke survivor's perceptions in the domains identified to be most affected by stroke. The ASHA-QCL, on the other hand, is a self-rating scale consisting of 17 statements concerning the communicative aspects of QoL as well as one statement related to one's overall QoL.

The ASHA-QCL was designed to allow PWA with significant language and communication impairments to rate their quality of communication life in three critical domains: socialization/activities, confidence/self-concept, and roles/responsibilities. The scale uses short and grammatically simple statements, thereby minimizing the linguistic load on reading comprehension. Additionally, the ASHA-QCL minimizes the effects of cognitive-communicative impairments that could potentially influence the rating validity by utilizing visual analogue scales for PWA to mark on, as a way of responding to the statements. Paul et al. (2004) indicated that the ASHA-QCL is a valid tool for use with adults with neurogenic communication disorders, including PWA, regardless of their age, educational level, race/ethnicity, severity, or time post-onset. This scale is also considered useful, providing important information about the impairment's effects on social relationships, communication interactions, work, education, leisure, and overall QoL.

Aphasia Management: The Social Approach

SLPs are typically driven to manage their patients using traditional approaches, implementing impairment-targeted therapies due to traditional therapy models and

reimbursement constraints (Duchan, 2001). In traditional impairment-based interventions, attention is mostly given to deficits in language function whereas little direct attention is given to issues of identity, social role, and life participation. These approaches frequently examine and focus on the existing language disorders, working towards improving areas of language deficits, providing no information about the impact of the communication disability and the implemented treatment on PWA's lives (Ross & Wertz, 2003).

While SLPs previously focused more on improving linguistic and/or cognitive impairments associated with aphasia and less on facilitating life adjustments and participation, current approaches are shifting (Simmons-Mackie, 2001). Over the past few decades, approaches to aphasia management have taken a turn from the medical model of deficit intervention, which focuses on impairment-based treatment, to the functional model of deficit treatment, which places emphasis on functional communication, social participation, and communication efficacy (Chapey et al., 2000; Simmons-Mackie, 2001). Whereas the significance of gaining detailed knowledge of the person's neurological status and language skills is acknowledged, the effects aphasia imposes on social participation are what shape the lived experience of aphasia for the person, their family, and wider network.

Understanding social participation and life satisfaction among PWA is important as it reflects the individual's perception to their language impairment and its consequences on their everyday life (Ellis & Peach, 2017). Therefore, measuring outcomes of aphasia treatment must include subjective measures such as the PWA's own opinion on whether and how therapy has been of benefit to their everyday life, rather than just capturing results using objective standardized tests of performance on specific language and/or cognitive tasks related to therapy. Further, SLPs have expressed their interest in learning about PWA's wants and needs, stating

that this knowledge may guide service adjustments to meet these wants and needs. Therefore, satisfying PWA's psychosocial needs is deemed as a valid goal, aside from improving language and communication impairments. This alternative approach is seen as a way to empower PWA (Jordan & Kaiser, 1996).

According to social approaches in aphasia rehabilitation, the aim of any intervention is to facilitate adaptation to disability, promote social and community integration, maximize social inclusion, encourage communication within natural contexts, and ultimately enhance QoL (Simmons-Mackie, 1998). Healthcare interventions should ultimately seek not only improving physical and behavioral function, but also emotional and social well-being (Department of Health, 2007). Being integrated back into the community, by improving life participation in social settings and facilitating their involvement in meaningful activities, maximizing their autonomy and self-determination, and increase their self-efficacy, despite their challenges, is the final and utmost long-term goal for stroke survivors, particularly PWA (Cavanaugh & Haley, 2020). Hence, it is our ethical duty, as healthcare professionals, to consider the psychosocial difficulties PWA face, in order to better facilitate their adaptation and encourage their community re-entry.

Life Participation in Aphasia

Life participation, by definition, is engaging in activities of daily living at home and in the community, thereby requiring the use of language, communication, and social interaction (Shadden & Agan, 2004). Aphasia-related communication disability and other impacts of stroke, such as physical, cognitive, and psychological repercussions, are therefore associated with decreased activity participation and social engagement (Dalemans, De Witte, Beurskens, Van

Den Heuvel, & Wade, 2010; Hilari, 2011; Manning, MacFarlane, Hickey, & Franklin, 2019; Spaccavento et al., 2013).

Life participation and community involvement can affect one's sense of identity, perception of QoL and psychological well-being, and social inclusion, in either direction (Le Dorze, Salois-Bellerose, Alepins, Croteau, & Hallé, 2014). PWA have participation restrictions in different aspects of life related to their communication difficulties (Wallace, 2010). These restrictions hinder them from participating in activities related to their domestic life, social life, personal interactions and relationships, education and employment, and community (Dalemans, De Witte, Wade, & Van den Heuvel, 2008). Moreover, they were found to have limited involvement in community activities of leisure and sports compared to older healthy adults (Davidson, Howe, Worrall, Hickson, & Togher, 2008).

Maintaining healthy social relationships, with family, friends, and the wider network, is negatively affected by aphasia (Davidson et al., 2008; Fotiadou, Northcott, Chatzidaki, & Hilari, 2014). For example, Hilari and Northcott (2006) explored the social experiences and friendships of 83 people with chronic aphasia and found that 64% reported that they saw their friends less than they did prior to acquiring aphasia and 30% reported having no close friends at all. In turn, PWA's roles as partners, family members, parents, friends, and citizens shift, impacting their social interactions and life experience (Dalemans et al., 2008). Additionally, individuals with aphasia experience decreased feelings of life participation as they face changes in their social relationships, characterized by restrictions in the quantity as well as quality of communication (Davidson, Worrall, & Hickson, 2003). These feelings may be further exacerbated as PWA lose their jobs and frequently find themselves unable to return to work (Le Dorze et al., 2014).

To address the negative consequences of aphasia, health professionals have been encouraged to focus on life participation and social access for PWA (Chapey et al., 2014; Simmons-Mackie & Damico, 2007; Simmons-Mackie, Raymer, Armstrong, Holland, & Cherney, 2010). Accordingly, a community of health professionals joined forces to provide PWA and their families with patient-centered practices, creating a platform, AphasiaAccess, that advocates for PWA and their individualized needs. AphasiaAccess encourages the implementation of a holistic service model that pertains to the individual's environment, life situation, personhood, perceptions, and feelings, in addition to their language impairment (AphasiaAccess, 2020).

The Living with Aphasia: Framework for Outcome Measurement (A-FROM; Kagan, 2011) and the Life Participation Approach to Aphasia (LPAA; Chapey et al., 2000) are two social approaches that follow the same holistic service model. These approaches emphasize the goals of PWA and encourage their reengagement in their preferred activities. Additionally, A-FROM and LPAA address the importance of individuals' life experience, goals, and values, and therefore aim to facilitate PWA's life participation. Both approaches are consistent with the patient-centered practice, placing a primary focus on PWA, valuing their autonomy, participation, and physical and emotional well-being.

The framework from which the LPAA operates calls for an emphasis on life reengagement following aphasia onset. Clinicians are accordingly required to help PWA establish real life goals and encourage their full participation. The LPAA aims to provide support for PWA as well as their families and caregivers as they are considered affected by aphasia. For PWA, the approach suggests that the established goals should ultimately focus on PWA's engagements in activities of choice, in the face of language and communication deficits. Additionally, PWA are solely in

charge of setting their own goals, with a focus on improvement of their QoL (Chapey et al., 2000). Further, the LPAA recommends providing caregivers with resources, training, and facilitating social connections with other caregivers.

Similarly, A-FROM was developed, based off and extending on the mission of the LPAA, as a universal guide for clinicians working with PWA to incorporate domains of QoL when developing a plan of care (Kagan et al., 2008). The four domains are comprised of aspects related to the communication impairment, personal factors such as identity and self-efficacy issues, relationships and social participation, and communication environment. This framework helps PWA pinpoint what aspects of their life are the most meaningful or relevant to them, so that these domains can be targeted and prioritized in therapy.

Personal Identity in Aphasia: Autonomy and Self-Determination

Language is the primary means of self-expression. Creating and maintaining an identity is accomplished through language; establishing an identity is contingent upon the roles, values, and beliefs one acquires and sustains through social interaction and communication (Shadden & Agan, 2004). It is thus no surprise that aphasia, an impairment that fundamentally affects language, may decrease one's sense of self. In fact, some individuals with aphasia view their inability to communicate and express themselves as devastatingly equivalent as to losing their personhood (Albert, 1998). PWA report feeling unsociable, avoiding friends and social acquaintances, as well as inclining to avoid crowds; these changes in social interaction caused primarily by the aphasia make PWA feel they had lost a part of their former selves (Fotiadou et al., 2014).

Living with stroke and aphasia can cause an initial negative impact on identity as well as a later subsequent struggle to adapt to their poststroke identity (Salter, Hellings, Foley, & Teasell,

2008). Successfully living with aphasia requires readjustment of one's self-concept, adaptation to one's new perception of self, and identification of new goals (Hinckley, 2006). Aphasia rehabilitation success may be reliant on the adjustment of therapeutic strategies with the individual's identity and their need for autonomy support and self-determination (Le Dorze et al., 2014). Having the power to independently lead a fulfilling life is key to achieving a sense of independence, one of our most basic needs as adults. One's sense of autonomy and independence lies in one's self-determination; their ability to make decisions for themselves and be in control of their own lives.

Aphasia, with its associated language impairments, can considerably impact one's autonomy and consequently affect their self-determination (Manning et al., 2019). For example, PWA may not be actively involved in making decisions, limiting their self-determination, because others might feel that they lack the capacity to understand issues or express their stands. Further, their decrease in autonomy often stems from their associated health conditions, inability to independently get around the environment, reduced ability to manage and contribute to finances, and avoidance of engaging in social situations (Manning et al., 2019). Fotiadou et al. (2014) reported that PWA felt they were losing their independence as they relied on others for daily life activities and for compensation of lost skills. Unsurprisingly, the change in roles and the consequent extreme dependence on family members have been associated with increased distress in PWA (Ch'ng, French, & McLean, 2008).

The implementation of a patient-centered approach in which PWA participate in setting their own treatment goals, although necessary, presented more barriers than facilitators, as such PWA tended to be less involved in making decisions concerning their treatment goals (Leach, Cornwell, Fleming, & Haines, 2010). Additionally, SLPs have identified challenges, due to

communication barriers, hindering them from actively involving PWA in clinical decisions, acknowledging that this devolvement decreases PWA's sense of autonomy (Berg, Rise, Balandin, Armstrong, & Askim, 2016).

In their qualitative meta-analysis, Brown, Worrall, Davidson, and Howe (2012) identified autonomy as one of the important themes PWA, their family members, and SLPs found crucial for living successfully with aphasia. For example, for PWA, their sense of autonomy is achieved by their ability to execute everyday activities by themselves, including both activities reliant on the use of language (e.g. ordering in restaurants) and those that do not rely on the use of language (e.g. doing their hair). Moreover, PWA expressed their want to be seen as useful and contributing members that actively participate in society, conveying that this participation provides the opportunity to regain their autonomy (Manning et al., 2019). SLPs, on the other hand, viewed that autonomy in decision-making and control in their relationship, financial, legal, and health-related matters as the most important aspects of independence for PWA.

Self-Efficacy in Aphasia

Self-efficacy is a construct relating to one's belief about their capabilities to complete a given task and to influence events that affect their lives (van der Bijl & Shortridge-Baggett, 2001). This core belief is the foundation of human functioning, affecting goals, aspirations, and expectations. Consequently, it drives motivation, performance accomplishments, and emotional well-being (Bandura, 2006). Self-efficacy is believed to contribute to the quality of psychosocial functioning (van der Bijl & Shortridge-Baggett, 2001). In general, perceived self-efficacy has been found to be an accurate predictor of performance (Zimmerman, 2000). Four sources of information influence self-efficacy beliefs: performance accomplishments, indirect experience, verbal urging, and physiological knowledge (Bandura, 1977). It is thus unsurprising that

experiences of success increase self-efficacy while regular failure decreases it (Zimmerman, 2000).

In stroke survivors, including PWA, self-efficacy beliefs may be associated with their ability to motivate themselves to execute certain tasks and activities (Lev & Owen, 1996). Self-efficacy affects one's motivation, risk for depression, and readiness to set and accomplish goals (Blazer, 2002; Phillips & Gully, 1997; Resnick, 2002). As such, stroke and aphasia treatment outcomes are largely influenced by self-efficacy beliefs (Jones & Riazi, 2011; Korpershoek, van der Bijl, & Hafsteinsdóttir, 2011; Robinson-Smith, Johnston, & Allen, 2000). Moreover, Tatsumi et al. (2016) found that higher self-efficacy levels in persons with communication disorders were associated with their caregivers' decreased feelings of burden and increased emotional well-being.

Communication Confidence in Aphasia

Communication confidence is a psychosocial element related to the constructs of life participation, autonomy and self-determination, and self-efficacy (Babbitt & Cherney, 2010). The three aforementioned constructs interact to drive one's confidence in executing communicative acts, participating in language-demanding activities, and being an active independent communicator. When these constructs are compromised due to aphasia, the person may participate less in activities of daily life, rely on others to make decisions about situations in their life, and have decreased self-efficacy. This can lead to decreased confidence in the ability to communicate wants and needs, which can induce feelings of helplessness (Babbitt & Cherney, 2010).

Communication confidence can be defined as the perception of one's own capacity to participate in communicative situations and the attitude of one's capability to comprehend the

communication of others and to express one's thoughts (Babbitt, Heinemann, Semik, & Cherney, 2011). It is of fundamental importance that PWA themselves feel confident in their communication skills to be able to participate in different settings. The construct of communication confidence in PWA has received little attention in the literature, both when being evaluated and addressed (Babbitt & Cherney, 2010; Babbitt et al., 2011), although confidence levels have been shown to be related to lifestyle changes in PWA (Cherney, Halper, Holland, & Cole, 2008).

SLPs have reported that increasing communication confidence in PWA is an important intervention outcome, considering it a key to living successfully with aphasia and enhancing PWA's QoL (Brown, Worrall, Davidson, & Howe, 2011; Cruice, Isaksen, Randrup-Jensen, Viberg, & Kate, 2015; Rose & Attard, 2015; S. J. Wallace, Worrall, Rose, & Dorze, 2016). SLPs identify themselves as responsible for addressing PWA's communication confidence and psychosocial well-being by helping them improve their language and communication abilities (Northcott, Simpson, Moss, Ahmed, & Hilari, 2017). Feeling more confident in their communication skills, PWA are more likely to communicate in different settings, increasing their participation in their daily life activities, leading to their immediate involvement in their personal, financial, or legal matters, which will consecutively increase their autonomy, independence, and self-determination (Babbitt & Cherney, 2010). Therefore, with increased confidence in communication abilities, PWA's perception of QoL is expected to consequently improve (Babbitt et al., 2011).

From their perspective, on the other hand, PWA, among other stroke survivors, have considered confidence an important construct, deeming it an area that should be a research priority (Pollock, St George, Fenton, & Firkins, 2014). This stems from their feeling of

decreased confidence in social situations (Horne, 2016), which arises from their communication disability that compromises their personal identity (Babbitt & Cherney, 2010), impacting their participation in life activities. PWA describe simple, everyday communication as a struggle, stating that at times they felt unconfident in taking part or communicating in their community due to their aphasia (Fotiadou et al., 2014). Further, stroke survivors and PWA see communication confidence as an important treatment outcome, explaining that the treatment of their physical and communication impairments will have little to no value if they are not confident to go out and utilize those skills in social settings (Pollock et al., 2014). Additionally, the QoL of PWA is impacted by their communication skills and their confidence to utilize these skills, making them prone to social isolation and community exclusion (Le Dorze & Brassard, 1995).

Changes in communication confidence are not necessarily related to changes in language skills as measured by tests of language performance. In fact, Babbitt and Cherney (2010) found that PWA reported significant increases in communication confidence after a computer-based treatment. although their language scores did not significantly change. These findings are unsurprising, as SLPs reported believing that PWA's communication confidence can be influenced, and ergo driven, by their environment, relationships, experiences, and self-efficacy beliefs (Tonello, Howe, Colozzo, & Small, 2018), rather than merely their performance on standardized language tests. Accordingly, it is believed that PWA's experiences of successful participation is crucial for building and reinforcing their communication confidence (Tonello et al., 2018). Communication confidence has, therefore, been found to be in line with the principles of the LPAA (Chapey et al., 2000).

Communication confidence is a construct that can be assessed by a subjective self-rating scale; the Communication Confidence Rating Scale for Aphasia (CCRSA; Babbitt & Cherney, 2010). The scale was developed to evaluate the perspectives, attitudes, and feelings of PWA in relation to their communication. Its design was motivated as PWA and their families repeatedly mentioned the notion of communication confidence and its significance as a meaningful outcome of treatment. Changes in communication confidence were hence seen as important enough to be addressed. The CCRSA's development was accomplished by adapting the ASHA-QCL and was inspired by the Self-Efficacy Scaling for Adult Stutterers (SESAS; Ornstein & Manning, 1985); with both scales being the foundations of its development.

Other researchers have previously noted that confidence levels resulted in lifestyle changes for PWA (van der Gaag et al., 2005); however, prior to Babbitt and Cherney (2010)'s construction of CCRSA, there was no validated way to evaluate changes in communication confidence in PWA following any treatment. The CCRSA adapted questions from the ASHA-QCL to measure communication confidence in different situations and with different people. The scale does not include pictorial, graphic, or visual analogue support, and therefore may be limited in application to only individuals with mild to moderate severity, with basic comprehension skills. Using the Western Aphasia Battery (WAB) Aphasia Quotient (AQ) as a refenrece, an AQ below 25 is considered indicative of very severe aphasia, with 26 to 50 considered severe, 51 to 75 considered moderate, and 76 till the cut-off score of 93.8 considered mild (Kertesz, 2007). In addition to its initial purpose of serving as a measure of progress, the CCRSA may be administered at the start of treatment to give insight into the personal goals PWA would like to target.

The CCRSA is a 10-point rating scale, comprised of 10 questions addressing one's confidence to communicate with people, understand others, talking in different situations, and self-perceptions. Ratings are indicated by pointing or circling a vertical mark on a horizontal scale from 0 (not confident) to 100 (very confident), with marks to designate each set of 10 points. An average of the responses is then calculated. The psychometric properties of CCRSA show that its use as a self-rating tool for communication confidence in aphasia is considered suitable, with the tool being psychometrically sound and adequately assessing communication confidence in PWA (Babbitt et al., 2011; Cherney, Babbitt, Semik, & Heinemann, 2011) Additionally, the scale has proven to have high person and item reliability using rating scale analysis. However, the authors explain that further research is needed to examine CCRSA's sensitivity to change as well as its inter- and intra-rater reliability.

Since so many human activities involve some form of language, and communication is the essence of human interaction, aphasia is an extremely pervasive disorder. PWA are thus likely to experience decreased communication confidence after acquiring aphasia. This change in communication confidence significantly affects their everyday life, hindering them from expressing themselves, engaging in social events, and being active participants in their respective communities. It is imperative to determine the factors that drive communication confidence to provide best management, in line with the social approach in aphasia rehabilitation. Although growing, communication confidence is still understudied in PWA. The purpose of this study was to determine the factors that correlate with communication confidence in PWA and contribute to broadening the general understanding of this construct. Therefore, we aim to answer the following question: What are the general perceptions of PWA concerning their communication confidence?

It is hypothesized that PWA would generally demonstrate low communication confidence scores, reflecting their self-perception regarding their ability to get their messages well-delievered. Additionally, it is hypothesized that different variables would correlate with communication confidence in PWA. Concerning patient-related variables, it is hypothesized that these would not correlate with CCRSA, since we speculate that PWA across different demographic variables and in all stages post aphasia onset are likely to report low communication confidence due to their language and communication impairments. Therefore, we do not hypothesize communication confidence scores to be driven by patient-related demographic variables. As for the measures to be administered, we hypothesize that objective measures such as the WAB-R AQ would not correlate with CCRSA as a large body of evidence has shown that PWA who score above the WAB-R AQ cutoff score still report communication difficulties that interfere with their everyday life (Cavanaugh & Haley, 2020). On the other hand, we hypothesize that subjective measures, specifically those examining PWA's perspectives on their quality of communication life and quality of life in general, would highly correlate with CCRSA, for these constructs are all a reflection of one's self-perception and personal attitudes. Furthermore, by definition, communication confidence is related to the constructs of life participation, autonomy and self-determination, and self-efficacy (Babbitt & Cherney, 2010), all of which are integral parts of quality of life (Lachapelle et al., 2005; Van Der Slot et al., 2010).

CHAPTER II: METHODS

Participants

This study included participants with a current or a previous diagnosis of post-stroke aphasia. Inclusion criteria for the participants were: a) have acquired aphasia as a result of a cerebrovascular accident to the brain's language-dominant hemisphere, b) have achieved an Aphasia Quotient (AQ) of at least 30 on Western Aphasia Battery-Revised (WAB-R; Kertesz, 2007), c) able to answer no less than 70% of yes/no questions on WAB-R, thereby accounting for the significant weight expressive language has on the WAB-R AQ (Ellis, Peach, & Rothermich, 2020), and d) have aided or unaided hearing and visual acuity. Informed consent was taken from all participants prior to administering any test.

Individuals with a history of post-stroke aphasia, who still report communication difficulties due to persisting word finding issues regardless of scoring at or above the WAB-R AQ cutoff score for aphasia presence (≥ 93.8), were included. We elected to include those individuals as recent evidence suggests that individuals who score at or above the WAB-R AQ cutoff score cannot be considered unimpaired or non-aphasic as they frequently present with significant language deficits, and these difficulties have adverse effects on multiple domains of living successfully with aphasia, when compared to non-aphasic controls, and they still consider themselves to be aphasic (Cavanaugh & Haley, 2020; Fromm et al., 2017; MacWhinney, Fromm, Holland, Forbes, & Wright, 2010).

Our sample comprised of participants who participated in a feasibility of telerehabilitation study. These participants had been recruited from eastern North Carolina, specifically from inpatient and outpatient clinics at local hospitals, Veterans Administration health care clinic, and community senior centers. Participants were provided with information about the study, as

outlined in the East Carolina University's Institutional Review Board (IRB) guidelines (UMCIRB 17-001246). IRB approval letter is presented in Appendix A.

Procedure and Measures

After collecting their medical and demographic information, participants were administered an objective impairment-level language measure (WAB-R) to assess their language performance and subjective measures to capture their perception of their communication impairment from a QoL and a communication confidence point of view, using the ASHA-QCL and the CCRSA, respectively. Both objective and subjective measures were administered in a single session. The session took place at East Carolina University in the Communication Equity and Outcomes Laboratory.

Western Aphasia Battery – Revised (WAB-R)

WAB-R AQ subtests were administered to all participants to assess their linguistic skills affected by their acquired language disorder. This valid, reliable, and standardized assessment was used to identify and classify the aphasia types our participants present with as well as measure their performance in general and in the two oral language comprehension and expression subtests (i.e. Spontaneous Speech, and Auditory Verbal Comprehension) that are part of their AQ.

ASHA Quality of Communication Life (ASHA-QCL)

ASHA-QCL was given to all participants for them to rate their communicative aspects of QoL as well as their perception of their QoL in general. This subjective measure was used to interpret the participants' satisfaction with the quality of their communicative life. ASHA-Q18 is the final question of the ASHA-QCL. This question was interpreted separately as it measures one's satisfaction with their overall QoL.

Communication Confidence Rating Scale for Aphasia (CCRSA)

All participants were given the CCRSA to self-rate their confidence in communication. This measure gave insight concerning participants' self-perception of their abilities to socialize, participate, and communicate in their respective communities.

Statistical Analyses

In order to find the factors that are significantly correlated with communication confidence in PWA, a machine learning algorithm was implemented to leverage the distributional properties of covariates of interest and fully utilize the information matrix. This approach is capable of producing statistically robust estimates even with a statistically "small" sample sizes. It assigns the contribution and weight of every independent variable, therefore offering detailed decomposition of the factors that might be in play (Barr & Lin, 2015).

The data generation process (DGP) was executed alongside the learning algorithm in RStudio. This approach allowed the learning algorithm to be "trained" on the data, while it is iteratively optimized on the sample population. This enabled us to identify the level of significance for each of our independent variables relative to one another through the optimization process without extraneous computing power. We elected to incorporate the aforementioned variables in the DGP to explore a range of demographic variables, objective measures that capture comprehension and expression skills, as well as subjective measures that capture self-perceptions. The approach was completed in an iterative process, using successive optimization, until a convergence was reached. Probability (significance) values (*p* values) less than .05 were considered statistically significant.

Synthetic cohort analyses can offer information concerning the maximum likelihood of a factor correlating to communication confidence in PWA, with minimal margins of error, which

we found critical to the results of this study. As the gathered sample comprised of only 15 participants, the suggested approach furthered our sample with synthesized data, increasing the sample size to give statistically significant and valid results, minimizing biases related to sample size. The sample, therefore, helped the derivation of accurate conclusions.

Our chosen approach presents several advantages. First, it has high statistical power, yielding statistically significant results despite a relatively small sample size, without overinflating standard errors. Importantly, variables' distributional properties and sample properties are preserved throughout the process. Second, it provides results that are easily interpretable, which helps maximizing the study's overall accessibility. Also, the generated synthesized data increase the sample size, making the information provided by the participants unidentifiable and untraceable, thereby ensuring their privacy is maintained. The approach's disadvantages are discussed below (Chapter IV).

CHAPTER III: RESULTS

Research in the area of psychosocial aspects of aphasia is fundamental as it contributes to our understanding of the magnitude of effects aphasia exerts on the well-being of PWA, beyond the language impairments captured through subjective measures. This understanding is necessary for speech-language pathologists whom, we hope, will use this knowledge to enhance PWA's QoL through the intervention methods that account for these psychosocial aspects. The current and most prominent body of research in aphasia management primarily focuses on language and communication, with little focus on functional outcomes as related to participation, inclusion, self-determination, and confidence and self-efficacy. The current research study sought to examine communication confidence, an important construct of psychosocial well-being, in PWA. Specifically, we intended to explore the variables that correlate with communication confidence in this population, with the hope of shedding light on their importance as critical aspects of aphasia outcomes.

Descriptive Analyses Results

The participants for this study included 15 persons with post-stroke aphasia (*mean age = 62.27 years*). They had a range of aphasia forms, including fluent aphasia (*n = 13)* and non-fluent aphasia *(n = 2)*. Participants' years of education ranged from 9 to 20 years *(mean years of education = 13.93)*. Additionally, their time post aphasia onset at the time of the examination ranged from 2 to 288 months *(mean time post aphasia onset = 53.20 months)*. The demographic variables with their corresponding means and standard deviations are presented in Table 1. Individual demographic characteristic for each participant are presented in Appendix B.

Table 1: Means and Standard Deviations of Participants' Demographic Variables

Demographic Variable	Mean (M)	Standard Deviation (SD)
Age (years)	66.27	12.35
Time Post Aphasia Onset (months)	53.20	80.51
Education (years)	13.93	2.81

Using the the subtests of Spontaneous Speech, Auditory Comprehension, Repetition, and Naming, participants' WAB AQs were calculated. The distribution of scores across all participants for the WAB-R and its Spontaneous Speech and Auditory Comprehension subtests are presented in Figures 1 and 2, respectively. Furthermore, the distribution of scores for the ASHA-QCL and ASHA-Q18 are presented in Figure 3. For the CCRSA, participants rated themselves on 10 questions that investigated their perception of their own communication abilities and their CCRSA score was calculated by averaging their rating scores that correspond to each of the 10 questions. Distribution of participants' scores for the CCRSA are presented in Figure 4. Figures 1-4 are presented in Appendix C. Individual scores for the WAB-R AQ, WAB-R Spontaneous Speech subtest, WAB-R Auditory Comprehension subtest, ASHA-QCL, and ASHA-Q18 are presented in Appendix D.

Statistical Analyses Results

The synthetic cohort analysis was used to test the statistical correlation between CCRSA and age, aphasia form, education, time post aphasia onset, WAB-R, WAB-R Spontaneous Speech subtest, WAB-R Auditory Comprehension subtest, ASHA-QCL, and ASHA-Q18. The data generation process (DGP) generated a synthesized sample of 5000 participants that was closely similar to that collected across all included variables. Graphic comparisons of collected and synthetic data are presented in Appendix D.

Given the discrete nature of the dependent variable, the model employed maximum likelihood estimation. The algorithm was "trained" on the synthetic cohort then tested on the actual data to ensure construct validity and reduce the likelihood that statistical pertubations would bias results. Results showed a statistically significant, positive correlation between ASHA-QCL ($p = 0.03$) and ASHA-Q18 ($p = 0.04$) with the CCRSA (see Table 2). No additional

independent factors reached statistical significane. These estimates suggest that PWA who report higher quality of communication life and higher general quality of life also report greater communication confidence.

Table 2: Estimates of Regression Analyses of Variables Correlated with CCRSA

Variable	Coefficient Estimate	Standard Error	z-score	*p*
Intercept	-10.62	15.67	-0.68	0.50
Age	0.05	0.14	0.38	0.71
Aphasia Form (Fluent)	0.10	3.69	0.03	0.98
Time Post Aphasia Onset	0.01	0.02	0.15	0.88
Education	-0.05	0.51	-0.09	0.93
WAB-R AQ	0.03	0.09	0.30	0.77
WAB-R Spontaneous Speech	0.07	0.48	0.15	0.88
WAB-R Auditory Comprehension	0.25	0.91	0.27	0.78
ASHA-QCL	4.63	2.43	1.90	0.03*
ASHA-Q18	3.08	1.69	1.83	0.04*

*$p < .05$

CHAPTER IV: DISCUSSION

The ultimate goal of health care and service delivery in speech-language pathology is to maximize patients' functional abilities and associated outcomes. More specifically, in treating PWA, it is of paramount importance that their QoL and psychosocial well-being are prioritized. Communication confidence is an important construct that falls under these domains. In fact, confidence is believed to be a prerequisite for participation in social situations and can be perceived as specifically crititcal to PWA (Niemi & Johansson, 2013). PWA's confidence levels can result in significant lifestyle changes, in either direction (Cherney et al., 2008; van der Gaag et al., 2005). For example, Le Dorze and Brassard (1995) explained that PWA were more prone to social isolation and community exclusion due to their low confidence in utilizing their communication skills, which ultimately decreased their QoL. Further, PWA with low communication confidence report to refrain from engaging in their respective communities (Fotiadou et al., 2014).

Importantly, PWA have expressed that feeling confident in their communication skills is a meaningful intervention outcome that facilitates their engagement in activities of daily living (Babbitt & Cherney, 2010). They have also considered this construct an area deserving research priority (Pollock et al., 2014) as it exerts important effects on one's overall QoL and is a key construct that facilitates living successfully with aphasia (Brown et al., 2011; Wallace et al., 2016). Therefore, it is extremely important that PWA feel confident in their communication skills, a feeling that will enable them to participate in different settings, engage in activities of daily life, and maintain their social identities.

In order to appropriately address communication confidence in aphasia management, we sought to identify the variables that correlate with this construct. Knowledge of these variables

can help advance our understanding of the psychosocial aspects of aphasia and can provide critical information concerning the elements that should be accounted for and targeted in therapy. In the current study, we applied a synthetic cohort analysis that generated a synthesized sample size. Simultaneously, a learning algorithm was performed to find the variables that correlate with communication confidence. This method allowed for accurate analyses and consequently the deduction of appropriate conclusions, with minimal margins of biases. Regression results indicated that among all variables, only the subjective measures ASHA-QCL (coefficient estimate = 4.63; $p = 0.03$) and ASHA-Q18 (coefficient estimate = 3.08; $p = 0.04$) significantly correlate with CCRSA.

Communication Confidence in Persons with Aphasia, Quality of Communication Life, and Quality of Life

Living successfully with aphasia goes beyond being able to communicate through language. In fact, one's psychosocial well-being is an important aspect of living successfully with aphasia (Brown et al., 2012). More importantly, having confidence in one's communication abilities; an increased self-perception of the capability to communicate effectively, is key to ensure living successfully with aphasia (Brown et al., 2011) and ultimately enhances one's QoL (Cruice et al., 2015). The constructs of QoL, quality of communication life, and communication of confidence therefore seem strongly interrelated, and are important driving forces that contribute to better adaptation and living successfully with aphasia. As such, the findings of the current study are unsurprising, yet they offer critical and novel information regarding the construct of communication confidence.

Specifically, the findings of the current study indicate that a positive correlation exists between ASHA-QCL and CCRSA, with the former measuring quality of communication life and

the latter measuring communication confidence. Therefore, as PWA increase their perception that their communication allows for meaningful social participation, their confidence in their communication skills increases. Importantly, this relationship might exist as both measures are self-reported, demonstrating the reflection of one's perception in constructs that are related to life participation (Babbitt & Cherney, 2010; Paul et al., 2004). Further, these constructs could all be dependent on or related to an external unobserved factor. There might be statistical endogeneity that we cannot identify.

Communication confidence, by definition, is related to the constructs of life participation, autonomy, and self-efficacy (Babbitt & Cherney, 2010). Similarly, the quality of communication life is driven by relationships and interactions, participation in social, leisure, and work activities, and self-perception (Paul et al., 2004). Further, both constructs capture aspects of functional communication and its effects on one's psychosocial well-being, and are therefore in line with the LPAA patient-centered practice approach (Babbitt et al., 2011; Carozza & Shafi, 2013). The development of the CCRSA was accomplished by adapting specific features of ASHA-QCL (Babbitt & Cherney, 2010). In fact, the CCRSA used eight of the ASHA-QCL's measured aspects but addressed them from the confidence point of view. The CCRSA modified questions and the original ASHA-QCL questions are presented in Table 3. This table was modified from Babbitt, Cherney, & Halper (2008).

Table 3: CCRSA Modified Questions and their Corresponding ASHA-QCL Original Questions (Adapted from Babbitt, Cherney, & Halper (2008))

CCRSA Modified Questions	ASHA-QCL Original Questions
How confident are you about your ability to talk with people?	I like to talk with people.
How confident are you about your ability to stay in touch with family and friends?	I stay in touch with family and friends.
How confident are you that people include you in conversations?	People include me in conversations.
How confident are you about your ability to follow news, sports, and stories on TV/movies?	I follow news, sports, and stories on TV/movies.
How confident are you about your ability to speak on the telephone?	I use the telephone.
How confident are you that people understand you when you talk?	People understand me when I talk.
How confident are you that you can make your own decisions?	I make my own decisions.
How confident are you about your ability to speak for yourself?	I speak for myself.

Another important finding in the current study is that the overall QoL of PWA is significantly and positively correlated with communication confidence. This finding verifies the hypothesis of Babbitt et al. (2011), which speculated that there exists a positive relationship between the two constructs. Babbitt et al. (2011) further hypothesized that communication confidence is a driving factor of QoL, which was not confirmed in the current study. It it noteworthy that Le Dorze and Brassard (1995) concluded that QoL of PWA is influenced by their confidence in utilizing their communication skills. Additionally, van der Gaag et al. (2005) noted that PWA's confidence levels gave rise to lifestyle changes. However, both these conclusions were not supported by the use of a psychometrically sound tool that measured communication confidence. Therefore, the specificity of the influence that communication confidence may exert on QoL is an important notion that is yet to be explored.

In conclusion, with the high interrelation in the domains that make up the constructs of communication confidence, quality of communication life, and overall QoL, and with these constructs placing a primary focus on PWA, valuing their autonomy, participation, and emotional well-being, the findings of our study seem reasonable. Additionally, these findings further support the importance of focusing on PWA's psychosocial aspects, including domains that are related to the quality of communication life such as community inclusion, participation, self-determination, and emotional support as well as overall QoL.

Communication Confidence in Persons with Aphasia and Their Language Outcomes

The results of the current study suggest that PWA's performances on language tests are not correlated with communication confidence. Although unconventional, these findings are unsurprising and align well with the findings of the study that first examined communication confidence using the CCRSA (Babbitt & Cherney, 2010). In their study, Babbitt and Cherney

(2010) found that PWA significantly increased their communication confidence while their language scores did not significantly change. Additionally, our findings align with a recent study that concluded that aphasia severity, as measured by WAB-R AQ, does not appear to impact PWA's perceived communication confidence, as measured by the CCRSA (Lee, Finch, & Rose, 2020).

Although it is acknowledged that PWA's performance in language tasks is an important indicator of their language utilization skills, this performance, no matter how accurate, may not always reflect their psychosocial status and confidence beliefs. In fact, a recent study suggested that PWA who demonstrate high performance on standardized objective language measures still experience functional language difficulties, and these difficulties have adverse effects on living successfully with aphasia (Cavanaugh & Haley, 2020). Importantly, PWA who perform well on standardized language measures (e.g. at or above the WAB-R AQ cutoff) can still present significant deficits at the discourse level (Fromm et al., 2017; MacWhinney et al., 2010). These deficits can manifest themselves in situations of daily living, such as the situations that the CCRSA investigates (e.g. using the telephone, initiating and maintaining conversations). Unfortunately, the objective language measures fail to detect these deficits. Accordingly, it is possible that the skills not captured by the objective language measures (e.g. functional language) affect communication confidence. Future research should investigate this potential relationship.

Communication Confidence in Persons with Aphasia and Their Demographic Variables

The results of the current study indicate that PWA's demographic variables are not correlated with communication confidence. In specific, PWA's age, aphasia form (fluent vs. non-fluent), time post aphasia onset, and education were not correlated to their perception of their

capability in communicating. Although previous studies have not explored these variables' relationship to communication confidence, the literature does suggest that changes in QoL in PWA, a construct related to communication confidence, do not seem to be age-dependent (Bullier et al., 2020; Hilari, Needle, & Harrison, 2012; Taylor-Sarno, 1992) or education-dependent (Bose et al., 2009; Bullier et al., 2020). Concerning time post onset, it is believed that the severity of functional communication deficits as well as the presence of comorbidities are the factors that drive QoL, rather than being in the acute, subacute, or chronic stage (Hilari, Wiggins, Roy, Byng, & Smith, 2003). On the other hand, one study found that fluent PWA have better QoL than non-fluent PWA (Bahia & Chun, 2014), with the specific domains of "language" and "self-care" presenting the significant differences. Future studies are encouraged to explore these domains and their effects on QoL as well as communication confidence in PWA.

Limitations and Suggestions for Future Research

The current study presents several limitations. Concerning the collected sample, it did not include all classic types of aphasia. Additionally, 12 (80%) of our participants were diagnosed with mild aphasia; anomic aphasia. Therefore, we cannot generalize the results of the current study to all individuals with aphasia, as our sample may not be representative of their distribution (Pedersen et al., 2004). Although having severe aphasia might hinder us from truly capturing PWA's perspectives due to the concurrent communication deficits, PWA with moderate aphasia, like 20% of our sample, are capable of participating. Second, information concerning participants' speech-language therapy history (previous or concurrent) were not taken into account. This information is important as therapy might influence perceptions and adaptation strategies. For example, studies that examined the effects of speech-language therapy interventions that focus on enhancing communication, coping strategies, and leadership skills

found that these interventions significantly affect communication confidence and QoL in PWA (Plourde et al., 2019; Ryan et al., 2017). Third, functional language outcomes were not considered in the analysis. Based on the literature, functional language abilities are important variables that may be correlated with communication confidence (Volkmer, Spector, Meitanis, Warren, & Beeke, 2020).

Concerning our statistical analysis method, it cannot be used for forecasting or predicting. Other methods, such as Bayesian methods, can provide precise estimates and thus be used for prediction purposes. However, these methods require informative priors which were not available for the construct of communication confidence. Moreover, although synthetic data can mimic many properties of the collected data, it does not copy the original content exactly. In fact, models look for common trends in the collected data when simulating synthetic data and in turn, may not cover the corner cases that were originally present. In some instances, this may not be a critical issue. However, in most system training scenarios, this will seriously limit their capabilities and negatively impact the output accuracy. Also, the quality of synthetic data is highly dependent on that of the model that created it. These generative models can be excellent at recognizing statistical regularities in datasets but can also be susceptible to statistical noise, such as adversarial perturbations that can cause the model to misclassify data and create highly inaccurate outputs. While outputs from the current study were tested for accuracy on the collected data and we ensured statistical validity, we feel that it is important to acknowledge these shortcomings.

Although the current study offered critical information concerning the variables that are correlated to communication confidence in PWA, there is a need to further investigate the specific relationship among these variables, and whether they drive communication confidence.

This information is critical as little is known about communication confidence in PWA. Further, it is essential that these variables are considered in the aphasia management process, with special focus on PWA's psychosocial well-being and functional outcomes. The findings of this study should be considered the building blocks that future studies build on for the ultimate goal of enhancing PWA's overall functionality.

Conclusion

Aphasia is a chronic condition that can be damaging to a person's psychosocial well-being, affecting their social engagement, life participation, and importantly communication confidence and self-esteem. These are core elements that help PWA successfully adapt to their aphasia. The current research offers critical information concerning the variables that are correlated with communication confidence in PWA. It is our belief that these variables, along with communication confidence should be considered integral parts in aphasia management. Exploring PWA's perspectives concerning their participation in everyday communication prioritizes their well-being and gives PWA a chance to be finally heard.

REFERENCES

Albert, M. L. (1998). Treatment of aphasia. *Archives of Neurology*. https://doi.org/10.1001/archneur.55.11.1417

AphasiaAccess, A. (2020). Home - Aphasia Access. Retrieved October 4, 2020, from https://www.aphasiaaccess.org/

Babbitt, E., & Cherney, L. (2010). Communication confidence in persons with aphasia. *Topics in Stroke Rehabilitation*, *17*(3), 214–223. https://doi.org/10.1310/tsr1703-214

Babbitt, E M, Cherney, L. R., & Halper, A. S. (2008). Measuring changes in quality of life in persons with aphasia: Is communication confidence a good measure. *Poster Presentation at the Clinical Aphasiology Conference*.

Babbitt, Edna M., Heinemann, A. W., Semik, P., & Cherney, L. R. (2011). Psychometric properties of the communication confidence Rating scale for Aphasia (CCRSA): Phase 2. *Aphasiology*. https://doi.org/10.1080/02687038.2010.537347

Bahia, M. M., & Chun, R. Y. S. (2014). Quality of life in aphasia: differences between fluent and non-fluent aphasic Augmentative and Alternative Communication users. *Audiology - Communication Research*, *19*(4), 352–359. https://doi.org/10.1590/s2317-64312014000300001353

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*. https://doi.org/10.1037/0033-295X.84.2.191

Bandura, A. (2006). Toward a Psychology of Human Agency. *Perspectives on Psychological Science*. https://doi.org/10.1111/j.1745-6916.2006.00011.x

Barr, T., & Lin, C. (2015). A detailed decomposition of synthetic cohort analysis. *Economics Letters*. https://doi.org/10.1016/j.econlet.2014.12.032

Berg, K., Rise, M. B., Balandin, S., Armstrong, E., & Askim, T. (2016). Speech pathologists' experience of involving people with stroke-induced aphasia in clinical decision making during rehabilitation. *Disability and Rehabilitation*. https://doi.org/10.3109/09638288.2015.1066453

Blazer, D. G. (2002). Self-efficacy and depression in late life: A primary prevention proposal. *Aging and Mental Health*. https://doi.org/10.1080/1360786021000006938

Bose, A., McHugh, T., Schollenberger, H., & Buchanan, L. (2009). Measuring quality of life in aphasia: Results from two scales. *Aphasiology*. https://doi.org/10.1080/02687030802593189

Bowling, A., & Windsor, J. (2001). Towards the Good Life: A Population Survey of Dimensions of Quality of Life. *Journal of Happiness Studies*. https://doi.org/10.1023/A:1011564713657

Brown, K., Worrall, L., Davidson, B., & Howe, T. (2011). Exploring speech-language pathologists' perspectives about living successfully with aphasia. *International Journal of Language and Communication Disorders*. https://doi.org/10.3109/13682822.2010.496762

Brown, K., Worrall, L. E., Davidson, B., & Howe, T. (2012). Living successfully with aphasia: A qualitative meta-analysis of the perspectives of individuals with aphasia, family members, and speech-language pathologists. *International Journal of Speech-Language Pathology*. https://doi.org/10.3109/17549507.2011.632026

Bullier, B., Cassoudesalle, H., Villain, M., Cogné, M., Mollo, C., De Gabory, I., … Glize, B. (2020). New factors that affect quality of life in patients with aphasia. *Annals of Physical and Rehabilitation Medicine*. https://doi.org/10.1016/j.rehab.2019.06.015

Carozza, L., & Shafi, N. (2013). Quality of life in aphasia community group members: A social model of clinical treatment. *Acta Neuropsychologica*.

Cavanaugh, R., & Haley, K. L. (2020). Subjective communication difficulties in very mild aphasia. *American Journal of Speech-Language Pathology*. https://doi.org/10.1044/2019_AJSLP-CAC48-18-0222

Ch'ng, A. M., French, D., & McLean, N. (2008). Coping with the challenges of recovery from stroke: Long term perspectives of stroke support group members. *Journal of Health Psychology*. https://doi.org/10.1177/1359105308095967

Chapey, R., Duchan, J. F., Elman, J., Garcia, L. J., Kagan, A., Lyon, J. G., & Simmons-mackie, N. (2014). Life Participation Approach to Aphasia: A Statement of Values for the Future by LPAA Project Group. *American Speech-Language-Hearing Association (ASHA)*.

Chapey, R., Duchan, J. F., Elman, R. J., Garcia, L. J., Kagan, A., Lyon, J. G., & Simmons Mackie, N. (2000). Life Participation Approach to Aphasia: A Statement of Values for the Future. *The ASHA Leader*, *5*(3), 4–6. https://doi.org/10.1044/leader.FTR.05032000.4

Cherney, L., Babbitt, E., Semik, P., & Heinemann, A. (2011). Psychometric properties of the communication confidence rating scale for aphasia (CCRSA): Phase 1. *Topics in Stroke Rehabilitation*. https://doi.org/10.1310/tsr1804-352

Cherney, L. R., Halper, A. S., Holland, A. L., & Cole, R. (2008). Computerized script training for aphasia: Preliminary results. *American Journal of Speech-Language Pathology*. https://doi.org/10.1044/1058-0360(2008/003)

Clark, D. G., & Cummings, J. L. (2003). Aphasia. In T. Brandt, L. R. Caplan, J. Dichgans,

H. C. Diener, & C. Kennard (Eds.), *Neurological Disorders: Course and Treatment* (2nd ed., pp. 265–275). Academic Press.

Code, C., & Herrmann, M. (2003). The relevance of emotional and psychosocial factors in aphasia to rehabilitation. *Neuropsychological Rehabilitation*. https://doi.org/10.1080/09602010244000291

Cruice, M., Isaksen, J., Randrup-Jensen, L., Viberg, M. E., & Kate, O. Ten. (2015). Practitioners' Perspectives on Quality of Life in Aphasia Rehabilitation in Denmark. *Folia Phoniatrica et Logopaedica*. https://doi.org/10.1159/000437384

Cruice, M., Worrall, L., Hickson, L., & Murison, R. (2003). Finding a focus for quality of life with aphasia: Social and emotional health, and psychological well-being. *Aphasiology*. https://doi.org/10.1080/02687030244000707

Cummins, R. A. (2005). Moving from the quality of life concept to a theory. *Journal of Intellectual Disability Research*. https://doi.org/10.1111/j.1365-2788.2005.00738.x

Dalemans, R. J. P., De Witte, L. P., Beurskens, A. J. H. M., Van Den Heuvel, W. J. A., & Wade, D. T. (2010). An investigation into the social participation of stroke survivors with aphasia. *Disability and Rehabilitation*. https://doi.org/10.3109/09638281003649938

Dalemans, R. J. P., De Witte, L. P., Wade, D. T., & Van den Heuvel, W. J. A. (2008). A description of social participation in working-age persons with aphasia: A review of the literature. *Aphasiology*, *22*(10), 1071–1091. https://doi.org/10.1080/02687030701632179

Dalemans, R. J. P., De Witte, L., Wade, D., & Van Den Heuvel, W. (2010). Social participation through the eyes of people with aphasia. *International Journal of*

Language and Communication Disorders. https://doi.org/10.3109/13682820903223633

Davidson, B., Howe, T., Worrall, L., Hickson, L., & Togher, L. (2008). Social participation for older people with aphasia: The impact of communication disability on friendships. *Topics in Stroke Rehabilitation*. https://doi.org/10.1310/tsr1504-325

Davidson, B., Worrall, L., & Hickson, L. (2003). Identifying the communication activities of older people with aphasia: Evidence from naturalistic observation. *Aphasiology*. https://doi.org/10.1080/729255457

Duchan, J. F. (2001). Impairment and social views of speech-language pathology: Clinical practices re-examined. *International Journal of Speech-Language Pathology*. https://doi.org/10.3109/14417040109003707

Ellis, C., Hardy, R. Y., Lindrooth, R. C., & Peach, R. K. (2018). Rate of aphasia among stroke patients discharged from hospitals in the United States. *Aphasiology*, *32*(9), 1075–1086. https://doi.org/10.1080/02687038.2017.1385052

Ellis, C., & Peach, R. K. (2017). Life satisfaction and aphasia: an integrative review with recommendations for future research. *Aphasiology*. https://doi.org/10.1080/02687038.2016.1154500

Ellis, C., Peach, R. K., & Rothermich, K. (2020). Relative Weight Analysis of the Western Aphasia Battery. *Aphasiology*, *00*(00), 1–12. https://doi.org/10.1080/02687038.2020.1787947

Ellis, C., Simpson, A. N., Bonilha, H., Mauldin, P. D., & Simpson, K. N. (2012). The one-year attributable cost of poststroke aphasia. *Stroke*. https://doi.org/10.1161/STROKEAHA.111.647339

Fotiadou, D., Northcott, S., Chatzidaki, A., & Hilari, K. (2014). Aphasia blog talk: How does stroke and aphasia affect a person's social relationships? *Aphasiology*. https://doi.org/10.1080/02687038.2014.928664

Fromm, D., Forbes, M., Holland, A., Dalton, S. G., Richardson, J., & MacWhinney, B. (2017). Discourse characteristics in aphasia beyond the Western Aphasia battery cutoff. *American Journal of Speech-Language Pathology*. https://doi.org/10.1044/2016_AJSLP-16-0071

Gialanella, B., Prometti, P., Vanoglio, F., Comini, L., & Santoro, R. (2016). Aphasia and activities of daily living in stroke patients. *European Journal of Physical and Rehabilitation Medicine*.

Goodglass, H. (1993). *Understanding Aphasia*. Academic Press.

Health, D. of. (2007). National stroke strategy. *Department of Health Website*.

Herrmann, N., Black, S. E., Lawrence, J., Szekely, C., & Szalai, J. P. (1998). The Sunnybrook stroke study a prospective study of depressive symptoms and functional outcome. *Stroke*. https://doi.org/10.1161/01.STR.29.3.618

Hilari, K. (2011). The impact of stroke: Are people with aphasia different to those without? *Disability and Rehabilitation*, *33*(3), 211–218. https://doi.org/10.3109/09638288.2010.508829

Hilari, K., Byng, S., Lamping, D. L., & Smith, S. C. (2003). Stroke and aphasia quality of life scale-39 (SAQOL-39): Evaluation of acceptability, reliability, and validity. *Stroke*, *34*(8), 1944–1950. https://doi.org/10.1161/01.STR.0000081987.46660.ED

Hilari, K., Needle, J. J., & Harrison, K. L. (2012). What are the important factors in health-related quality of life for people with aphasia? A systematic review. *Archives of*

Physical Medicine and Rehabilitation. https://doi.org/10.1016/j.apmr.2011.05.028

Hilari, K., & Northcott, S. (2006). Social support in people with chronic aphasia. *Aphasiology*, *20*(1), 17–36. https://doi.org/10.1080/02687030500279982

Hilari, K., Wiggins, R. D., Roy, P., Byng, S., & Smith, S. C. (2003). Predictors of health-related quality of life (HRQL) in people with chronic aphasia. *Aphasiology*, *17*(4), 365–381. https://doi.org/10.1080/02687030244000725

Hinckley, J. J. (2006). Finding messages in bottles: Living successfully with stroke and aphasia. *Topics in Stroke Rehabilitation*, *13*(1), 25–36. https://doi.org/10.1310/FLJ3-04DQ-MG8W-89EU

Horne, J., Lincoln, N. B., Preston, J., & Logan, P. (2014). What does confidence mean to people who have had a stroke? - A qualitative interview study. *Clinical Rehabilitation*, *28*(11), 1125–1135. https://doi.org/10.1177/0269215514534086

Howe, T. J., Worrall, L. E., & Hickson, L. M. H. (2008). Observing people with aphasia: Environmental factors that influence their community participation. *Aphasiology*. https://doi.org/10.1080/02687030701536024

Jones, F., & Riazi, A. (2011). Self-efficacy and self-management after stroke: A systematic review. *Disability and Rehabilitation*. https://doi.org/10.3109/09638288.2010.511415

Jordan, L., & Kaiser, W. (1996). Aphasia — A Social Approach. In *Aphasia — A Social Approach*. https://doi.org/10.1007/978-1-4899-3434-5

Kagan, A. (2011). A-from in action at the Aphasia institute. *Seminars in Speech and Language*. https://doi.org/10.1055/s-0031-1286176

Kauhanen, M. L., Korpelainen, J. T., Hiltunen, P., Määttä, R., Mononen, H., Brusin, E., … Myllylä, V. V. (2000). Aphasia, depression, and non-verbal cognitive impairment in

ischaemic stroke. *Cerebrovascular Diseases*. https://doi.org/10.1159/000016107

Kauhanen, Marja Liisa. (2001). *Quality of life after stroke: clinical, functional, psychosocial and cognitive correlates*. University of Oulu.

Kertesz, A. (2007). *Western Aphasia Battery–Revised*. San Antonio, TX: The Psychological Corporation.

Korpershoek, C., van der Bijl, J., & Hafsteinsdóttir, T. B. (2011). Self-efficacy and its influence on recovery of patients with stroke: A systematic review. *Journal of Advanced Nursing*. https://doi.org/10.1111/j.1365-2648.2011.05659.x

Lachapelle, Y., Wehmeyer, M. L., Haelewyck, M. C., Courbois, Y., Keith, K. D., Schalock, R., … Walsh, P. N. (2005). The relationship between quality of life and self-determination: An international study. *Journal of Intellectual Disability Research*. https://doi.org/10.1111/j.1365-2788.2005.00743.x

Laska, A. C., Hellblom, A., Murray, V., Kahan, T., & Von Arbin, M. (2001). Aphasia in acute stroke and relation to outcome. *Journal of Internal Medicine*. https://doi.org/10.1046/j.1365-2796.2001.00812.x

Le Dorze, G., & Brassard, C. (1995). A description of the consequences of aphasia on aphasic persons and their relatives and friends, based on the WHO model of chronic diseases. *Aphasiology*. https://doi.org/10.1080/02687039508248198

Le Dorze, G., Salois-Bellerose, É., Alepins, M., Croteau, C., & Hallé, M. C. (2014). A description of the personal and environmental determinants of participation several years post-stroke according to the views of people who have aphasia. *Aphasiology*. https://doi.org/10.1080/02687038.2013.869305

Le Dorze, G., & Signori, F. H. (2010). Needs, barriers and facilitators experienced by

spouses of people with aphasia. *Disability and Rehabilitation*. https://doi.org/10.3109/09638280903374121

Leach, E., Cornwell, P., Fleming, J., & Haines, T. (2010). Patient centered goal-setting in a subacute rehabilitation setting. *Disability and Rehabilitation*. https://doi.org/10.3109/09638280903036605

Lee, J. J., Finch, E., & Rose, T. (2020). Exploring the outcomes and perceptions of people with aphasia who conversed with speech pathology students via telepractice: a pilot study. *Speech, Language and Hearing*. https://doi.org/10.1080/2050571X.2019.1702241

Lev, E. L., & Owen, S. V. (1996). *A Measure of self-care self-efficacy*. 421–429.

MacWhinney, B., Fromm, D., Holland, A., Forbes, M., & Wright, H. (2010). Automated analysis of the Cinderella story. *Aphasiology*. https://doi.org/10.1080/02687030903452632

Manning, M., MacFarlane, A., Hickey, A., & Franklin, S. (2019). Perspectives of people with aphasia post-stroke towards personal recovery and living successfully: A systematic review and thematic synthesis. *PLoS ONE*, *14*(3). https://doi.org/10.1371/journal.pone.0214200

McNeil, M. R., & Pratt, S. R. (2001). Defining aphasia: Some theoretical and clinical implications of operating from a formal definition. *Aphasiology*. https://doi.org/10.1080/02687040143000276

Miceli, G., Capasso, R., Monti, A., Santini, B., & Talacchi, A. (2012). Language testing in brain tumor patients. *Journal of Neuro-Oncology*. https://doi.org/10.1007/s11060-012-0810-y

National Aphasia Association, N. (2020). Aphasia FAQs. Retrieved April 10, 2020, from https://www.aphasia.org/aphasia-faqs/

Niemi, T., & Johansson, U. (2013). The lived experience of engaging in everyday occupations in persons with mild to moderate aphasia. *Disability and Rehabilitation*. https://doi.org/10.3109/09638288.2012.759628

Northcott, S., Simpson, A., Moss, B., Ahmed, N., & Hilari, K. (2017). How do speech-and-language therapists address the psychosocial well-being of people with aphasia? Results of a UK online survey. *International Journal of Language and Communication Disorders*. https://doi.org/10.1111/1460-6984.12278

Ornstein, A. F., & Manning, W. H. (1985). Self-efficacy scaling by adult stutterers. *Journal of Communication Disorders*. https://doi.org/10.1016/0021-9924(85)90008-5

Paolucci, S., Antonucci, G., Pratesi, L., Traballesi, M., Lubich, S., & Grosso, M. G. (1998). Functional outcome in stroke inpatient rehabilitation: Predicting no, low and high response patients. *Cerebrovascular Diseases*. https://doi.org/10.1159/000015856

Parr, S. (2007). Living with severe aphasia: Tracking social exclusion. *Aphasiology*, *21*(1), 98–123. https://doi.org/10.1080/02687030600798337

Parr, S., Byng, S., & Gilpin, S. (1997). *Talking about Aphasia - Living With Loss of Language after Stroke*. https://doi.org/10.1046/j.1365-2648.1999.0918e.x

Paul, D., Frattali, C., Holland, A., Thompson, C., Caperton, C., & SC, S. (2004). *Quality of Communication Life Scale*. American Speech-Language Hearing Association.

Pedersen, P. M., Stig Jørgensen, H., Nakayama, H., Raaschou, H. O., & Olsen, T. S. (1995). Aphasia in acute stroke: Incidence, determinants, and recovery. *Annals of Neurology*, *38*(4), 659–666. https://doi.org/10.1002/ana.410380416

Pedersen, P. M., Vinter, K., & Olsen, T. S. (2004). Aphasia after stroke: Type, severity and prognosis: The Copenhagen aphasia study. *Cerebrovascular Diseases*. https://doi.org/10.1159/000073896

Phillips, J. M., & Gully, S. M. (1997). Role of goal orientation, ability, need for achievement, and locus of control in the self-efficacy and goal-setting process. *Journal of Applied Psychology*, *82*(5), 792–802. https://doi.org/10.1037/0021-9010.82.5.792

Plourde, J. M. H., Purdy, S. C., Moore, C., Friary, P., Brown, R., & McCann, C. M. (2019). Gavel Club for people with aphasia: communication confidence and quality of communication life. *Aphasiology*. https://doi.org/10.1080/02687038.2018.1453043

Pollock, A., St George, B., Fenton, M., & Firkins, L. (2014). Top 10 research priorities relating to life after stroke - consensus from stroke survivors, caregivers, and health professionals. *International Journal of Stroke*. https://doi.org/10.1111/j.1747-4949.2012.00942.x

Potagas, C., Kasselimis, D. S., & Evdokimidis, I. (2013). Elements of Neurology Essential for Understanding Aphasia. In I. Papathanasiou & P. Coppens (Eds.), *Aphasia and related neurogenic communication disorders*. Burlington, MA: Jones & Bartlett Learning.

Resnick, B. (2002). The impact of self-efficacy and outcome expectations on functional status in older adults. *Topics in Geriatric Rehabilitation*. https://doi.org/10.1097/00013614-200206000-00003

Robinson-Smith, G., Johnston, M. V., & Allen, J. (2000). Self-care self-efficacy, quality of life, and depression after stroke. *Archives of Physical Medicine and Rehabilitation*. https://doi.org/10.1053/mr.2000.3863

Robinson, R. G. (2003). The controversy over post-stroke depression and lesion location. *Psychiatric Times*, *20*(7), 39–41.

Rose, M. L., & Attard, M. C. (2015). Practices and challenges in community aphasia groups in Australia: Results of a national survey. *International Journal of Speech-Language Pathology*. https://doi.org/10.3109/17549507.2015.1010582

Ross, K. B., & Wertz, R. T. (2003). Quality of life with and without aphasia. *Aphasiology*, *17*(4), 355–364. https://doi.org/10.1080/02687030244000716

Ryan, B., Hudson, K., Worrall, L., Simmons-Mackie, N., Thomas, E., Finch, E., … Lethlean, J. (2017). The Aphasia Action, Success, and Knowledge Programme: Results from an Australian Phase i Trial of a Speech-Pathology-Led Intervention for People with Aphasia Early Post Stroke. *Brain Impairment*. https://doi.org/10.1017/BrImp.2017.5

Salter, K., Hellings, C., Foley, N., & Teasell, R. (2008). The experience of living with stroke: A qualitative meta-synthesis. *Journal of Rehabilitation Medicine*. https://doi.org/10.2340/16501977-0238

Shadden, B. B., & Agan, J. P. (2004). Renegotiation of identity: The social context of aphasia support groups. *Topics in Language Disorders*. https://doi.org/10.1097/00011363-200407000-00005

Simmons-Mackie, N. (1998). In support of supported conversation for adults with aphasia. *Aphasiology*. https://doi.org/10.1080/02687039808249576

Simmons-Mackie, N. (2001). Social approaches to aphasia intervention. In R. Chapey (Ed.), *Language intervention strategies in aphasia and related neurogenic communication disorders* (pp. 246–268). Wiliams & Wilkins.

Simmons-Mackie, N. N., & Damico, J. S. (2007). Access and social inclusion in aphasia: Interactional principles and applications. *Aphasiology*. https://doi.org/10.1080/02687030600798311

Simmons-Mackie, N., Raymer, A., Armstrong, E., Holland, A., & Cherney, L. R. (2010). Communication partner training in Aphasia: A systematic review. *Archives of Physical Medicine and Rehabilitation*. https://doi.org/10.1016/j.apmr.2010.08.026

Sorin-Peters, R. (2003). Viewing couples living with aphasia as adult learners: Implications for promoting quality of life. *Aphasiology*. https://doi.org/10.1080/02687030244000752

Spaccavento, S., Craca, A., Del Prete, M., Falcone, R., Colucci, A., Di Palma, A., & Loverre, A. (2013). Quality of life measurement and outcome in aphasia. *Neuropsychiatric Disease and Treatment*. https://doi.org/10.2147/NDT.S52357

Spalletta, G., Pasini, A., Costa, A., De Angelis, D., Ramundo, N., Paolucci, S., & Caltagirone, C. (2001). Alexithymic features in stroke: Effects of laterality and gender. *Psychosomatic Medicine*. https://doi.org/10.1097/00006842-200111000-00013

Tatsumi, H., Nakaaki, S., Satoh, M., Yamamoto, M., Chino, N., & Hadano, K. (2016). Relationships among Communication Self-Efficacy, Communication Burden, and the Mental Health of the Families of Persons with Aphasia. *Journal of Stroke and Cerebrovascular Diseases*. https://doi.org/10.1016/j.jstrokecerebrovasdis.2015.09.018

Taylor-Sarno, M. (1992). Preliminary findings in a study of age, linguistic evolution and quality of life in recovery from aphasia. *Scandinavian Journal of Rehabilitation Medicine, Supplement*.

Tonello, A., Howe, T., Colozzo, P., & Small, J. (2018). “Well if he can do it, I can do it”:

speech–language pathologist's perspectives on what helps with and what detracts from confidence in communication for people with post-stroke aphasia. *Aphasiology*, *32*(sup1), 231–232. https://doi.org/10.1080/02687038.2018.1487921

Townend, E., Brady, M., & McLaughlan, K. (2007). A systematic evaluation of the adaptation of depression diagnostic methods for stroke survivors who have aphasia. *Stroke*, *38*(11), 3076–3083. https://doi.org/10.1161/STROKEAHA.107.484238

van der Bijl, J. J., & Shortridge-Baggett, L. M. (2001). The theory and measurement of the self-efficacy construct. *Scholarly Inquiry for Nursing Practice*.

van der Gaag, A., Smith, L., Davis, S., Moss, B., Cornelius, V., Laing, S., & Mowles, C. (2005). Therapy and support services for people with long-term stroke and aphasia and their relatives: A six-month follow-up study. *Clinical Rehabilitation*. https://doi.org/10.1191/0269215505cr785oa

Van Der Slot, W. M. A., Nieuwenhuijsen, C., Van Den Berg-Emons, R. J. G., Wensink-Boonstra, A. E., Stam, H. J., & Roebroeck, M. E. (2010). Participation and health-related quality of life in adults with spastic bilateral cerebral palsyand the role of self-efficacy. *Journal of Rehabilitation Medicine*, *42*(6), 528–535. https://doi.org/10.2340/16501977-0555

Vickers, C. P. (2010). Social networks after the onset of aphasia: The impact of aphasia group attendance. *Aphasiology*, *24*(6–8), 902–913. https://doi.org/10.1080/02687030903438532

Volkmer, A., Spector, A., Meitanis, V., Warren, J. D., & Beeke, S. (2020). Effects of functional communication interventions for people with primary progressive aphasia and their caregivers: a systematic review. *Aging and Mental Health*.

https://doi.org/10.1080/13607863.2019.1617246

Wallace, G. (2010). Profile of life participation after stroke and aphasia. *Topics in Stroke Rehabilitation, 17*(6), 432–450. https://doi.org/10.1310/tsr1706-432

Wallace, S. J., Worrall, L., Rose, T., & Dorze, G. Le. (2016). Core outcomes in aphasia treatment research: An e-Delphi consensus study of international aphasia researchers. *American Journal of Speech-Language Pathology*. https://doi.org/10.1044/2016_AJSLP-15-0150

Zimmerman, B. J. (2000). Self-Efficacy: An Essential Motive to Learn. *Contemporary Educational Psychology*. https://doi.org/10.1006/ceps.1999.1016

APPENDIX A: UMCIRB Approval

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board
4N-64 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office **252-744-2914** · Fax **252-744-2284** ·
rede.ecu.edu/umcirb/

Notification of Amendment Approval

From: Biomedical IRB
To: Charles Ellis
CC:

Date: 2/17/2021
Re: Ame1_UMCIRB 17-001246
UMCIRB 17-001246
Speech Telerehab

Your Amendment has been reviewed and approved using expedited review for the period of 2/15/2021 to 4/19/2021. It was the determination of the UMCIRB Chairperson (or designee) that this revision does not impact the overall risk/benefit ratio of the study and is appropriate for the population and procedures proposed.

Please note that any further changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. A continuing or final review must be submitted to the UMCIRB prior to the date of study expiration.The investigator must adhere to all reporting requirements for this study.

Approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Document	Description
add a student (Fatima Jebahi) to the project.	

For research studies where a waiver or alteration of HIPAA Authorization has been approved, the IRB states that each of the waiver criteria in 45 CFR 164.512(i)(1)(i)(A) and (2)(i) through (v) have been met. Additionally, the elements of PHI to be collected as described in items 1 and 2 of the Application for Waiver of Authorization have been determined to be the minimal necessary for the specified research.

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

APPENDIX B: Participants and Their Corresponding Demographic Characteristics

Participant ID	Age (years)	Time Post Aphasia Onset (months)	Education (years)	Aphasia Form
1	47	6	16	Fluent
2	72	288	14	Non-Fluent
3	72	31	20	Fluent
4	59	50	16	Fluent
5	96	15	12	Fluent
6	68	12	18	Fluent
7	62	63	13	Fluent
8	65	49	12	Fluent
9	75	52	12	Fluent
10	51	2	14	Non-Fluent
11	59	14	16	Fluent
12	53	4	12	Fluent
13	64	14	12	Fluent
14	72	6	9	Fluent
15	79	192	13	Fluent

APPENDIX C: Scatter Plots Presenting Participants' Perfomances on Objective and Subjective Measures

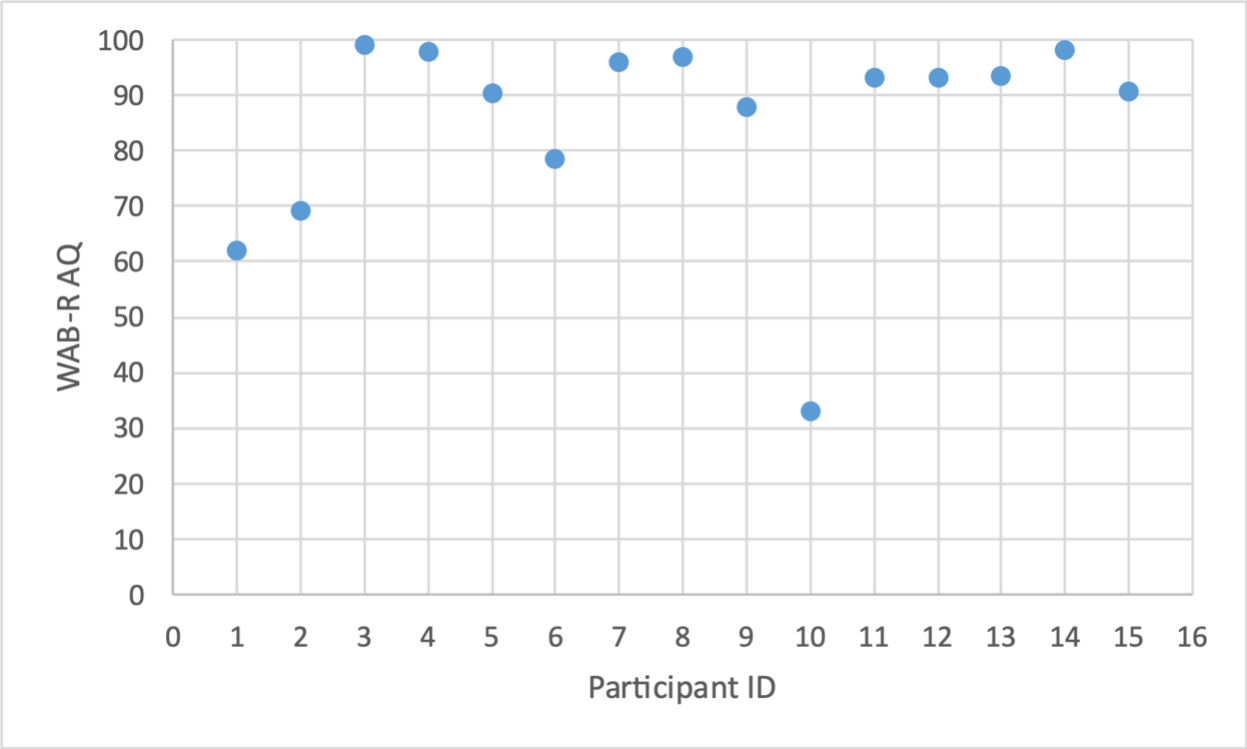

Figure 1: Scatter Plot of Participants' WAB-R AQ. WAB-R AQ has a score range of 0 – 100.

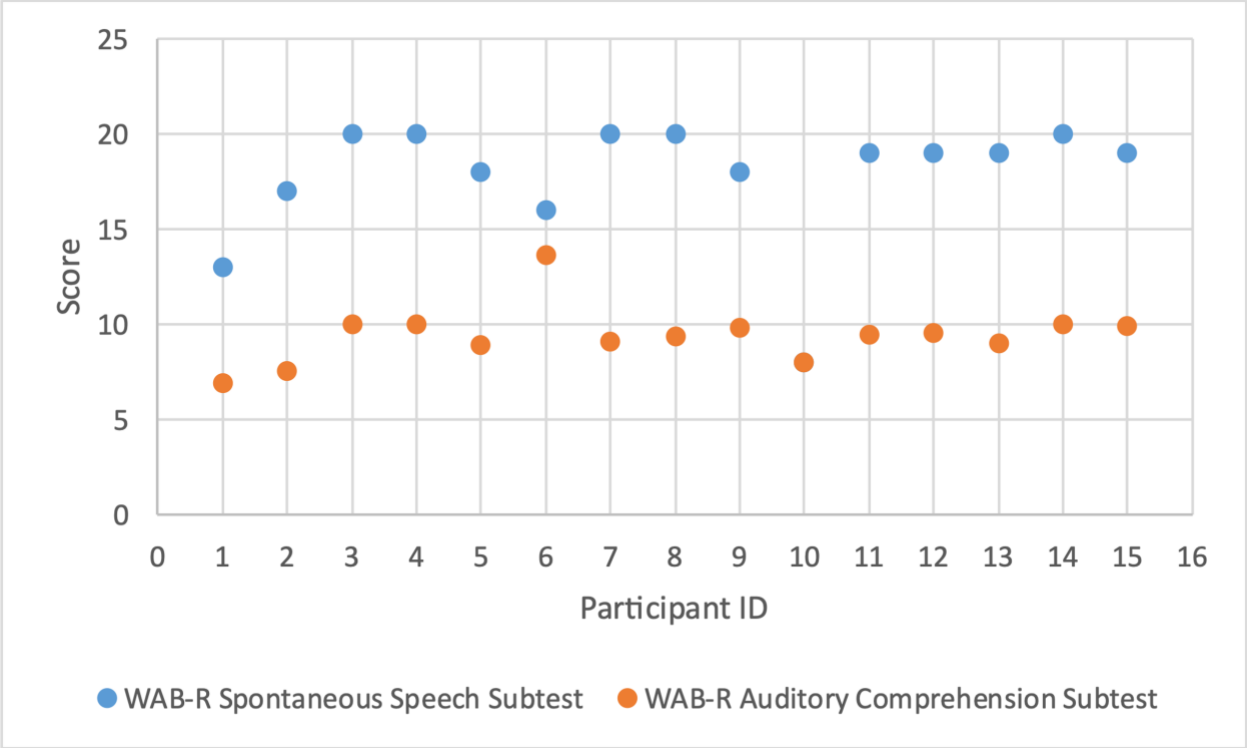

Figure 2: Scatter Plot of Participants' WAB-R Spontaneous Speech Subtest and WAB-R Auditory Comprehension Subtest Scores. WAB-R Spontaneous Speech Subtest and WAB-R Auditory Comprehension Subtest have a score range of 0 – 20.

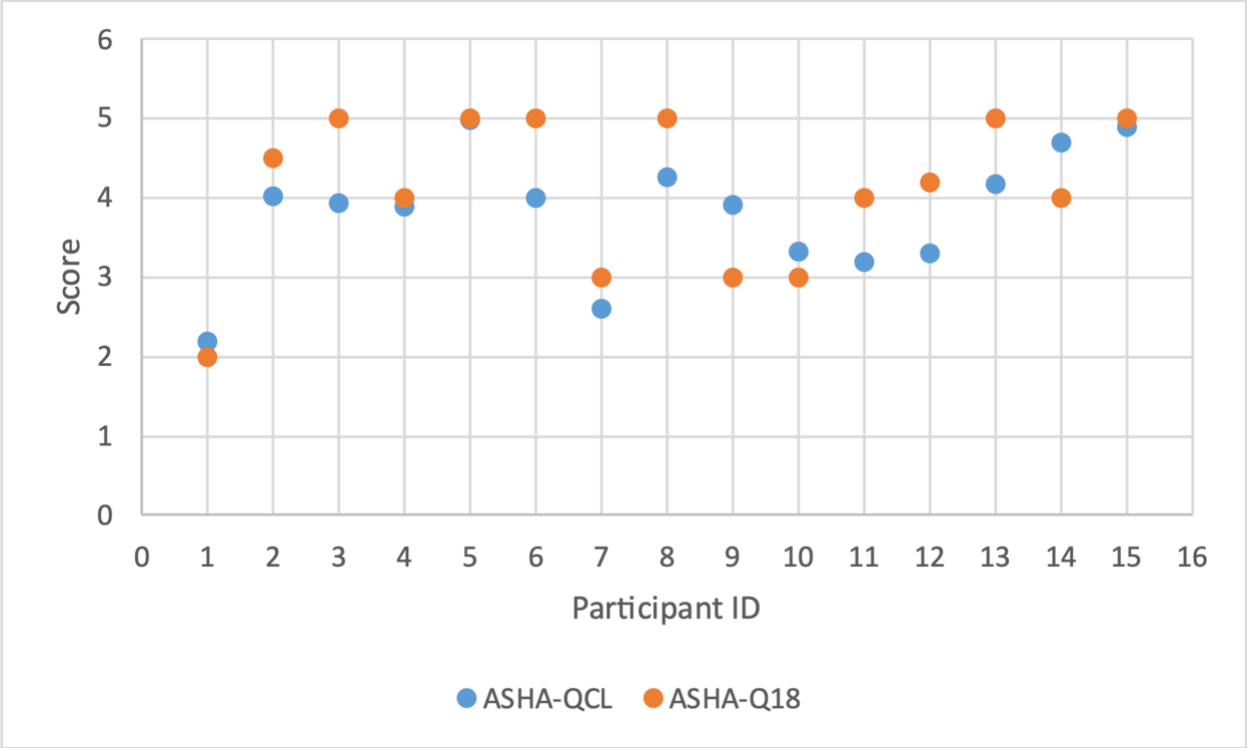

Figure 3: Scatter Plot of Participants' ASHA-QCL and ASHA-Q18 Scores. ASHA-QCL and ASHA-18 have a score range of 0 – 5.

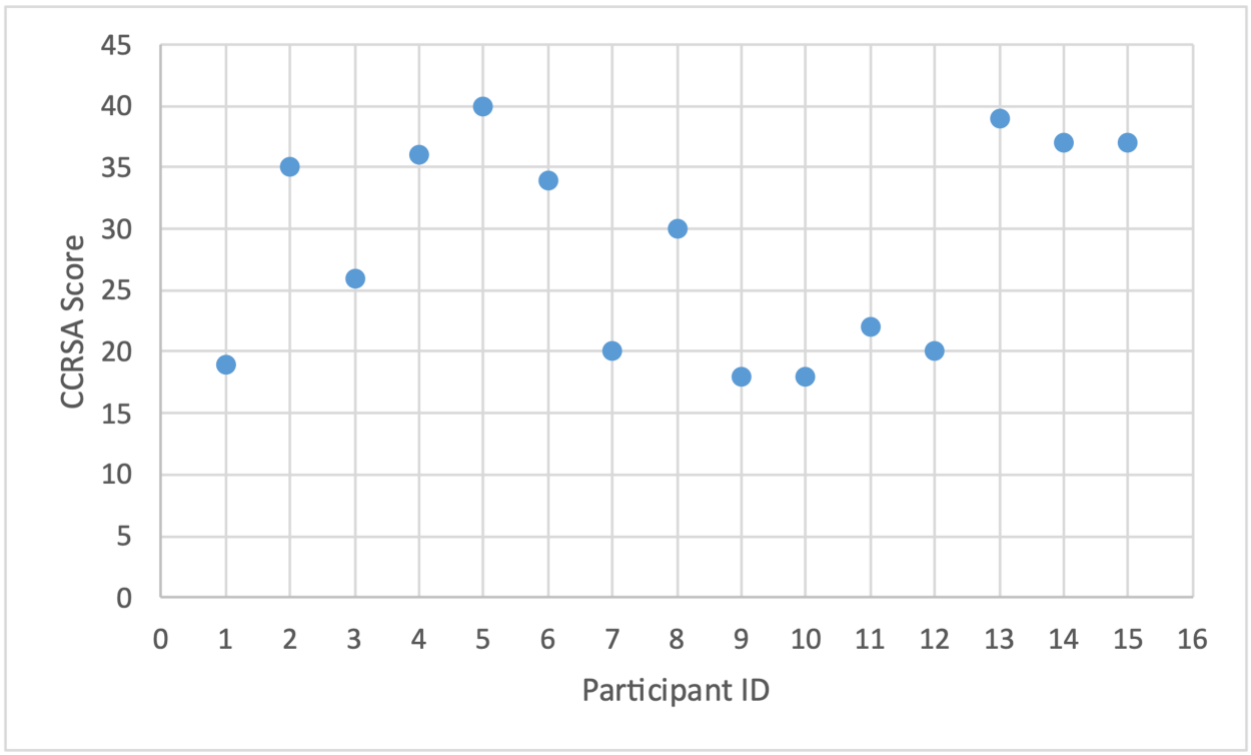

Figure 4: Scatter Plot of Participants' CCRSA Scores. CCRSA has a score range of 0 – 100.

APPENDIX D: Comparison of Collected Data and Synthetic Data Across the Different Variables

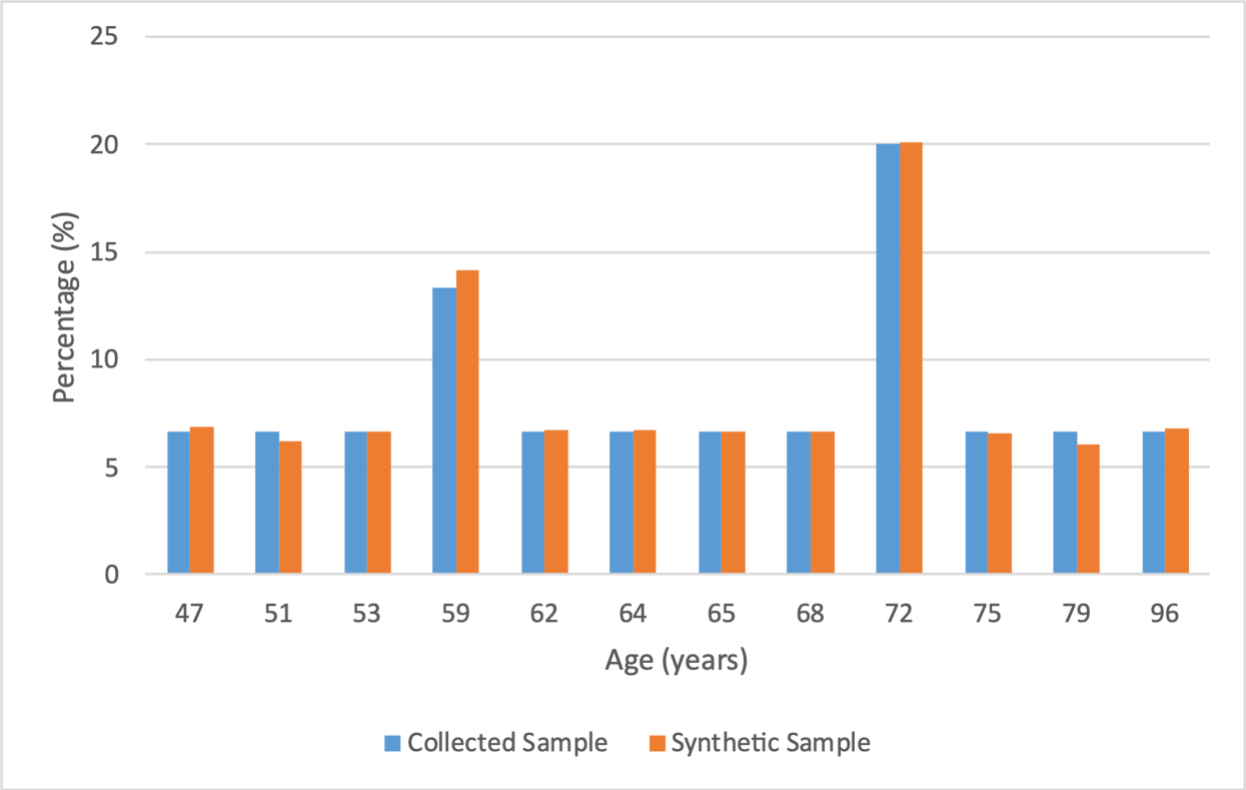

Figure 5: Bar Graph Comparing Distribution of Age Between Collected Sample and Synthetic Sample. Age is presented as a discrete value.

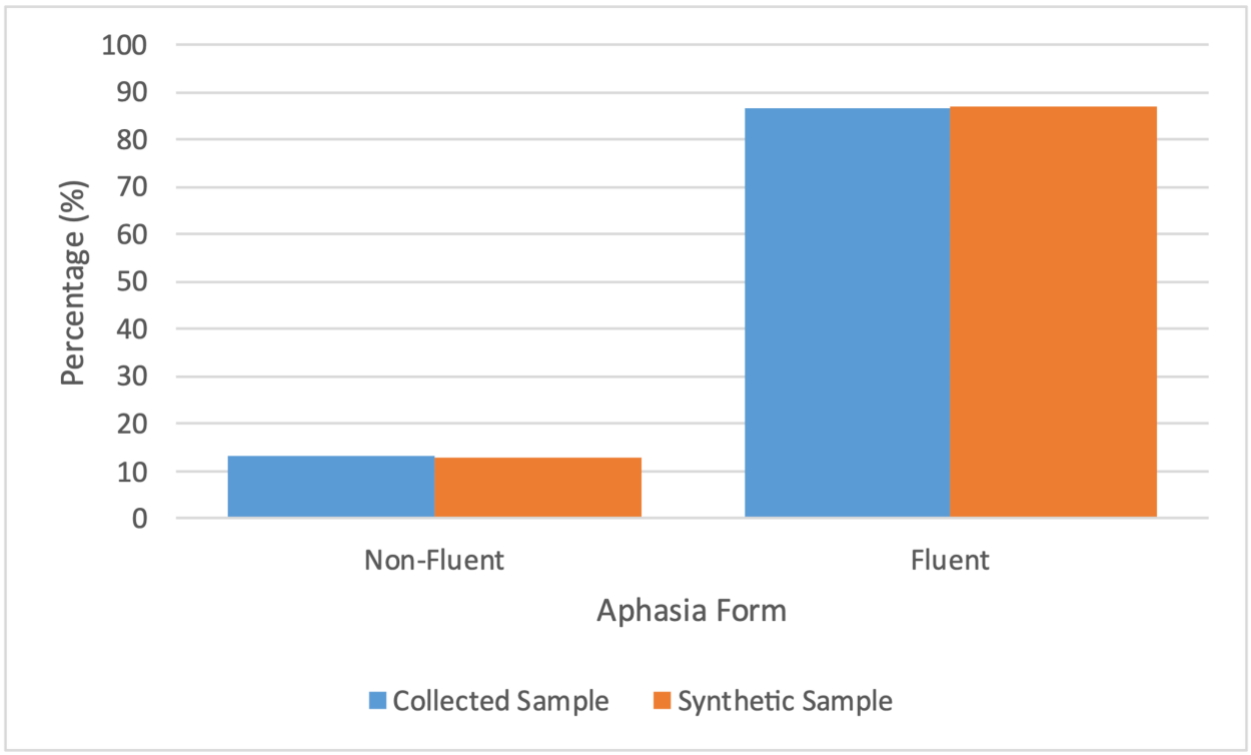

Figure 6: Bar Graph Comparing Distribution of Aphasia Form Between Collected Sample and Synthetic Sample

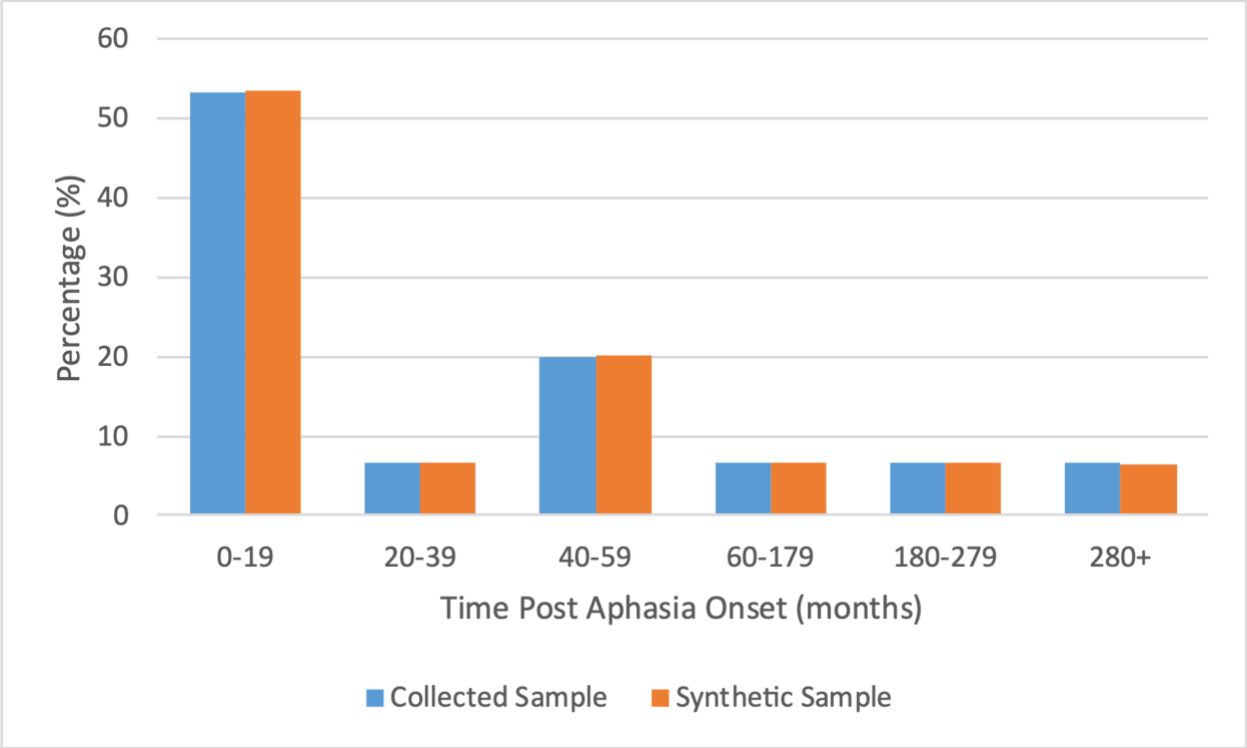

Figure 7: Bar Graph Comparing Distribution of Time Post Aphasia Onset Between Collected Sample and Synthetic Sample. Times Post Aphasia Onset are presented in ranges.

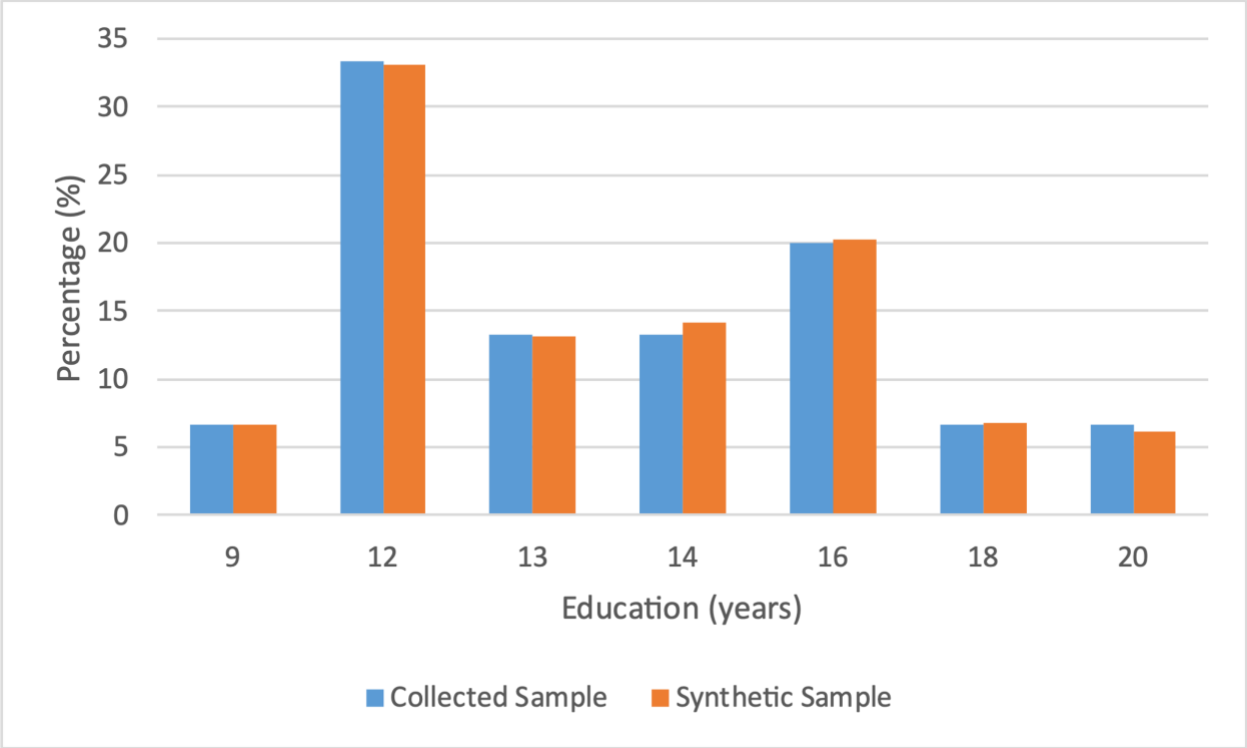

Figure 8: Bar Graph Comparing Distribution of Education Between Collected Sample and Synthetic Sample. Educational years are presented as discrete values.

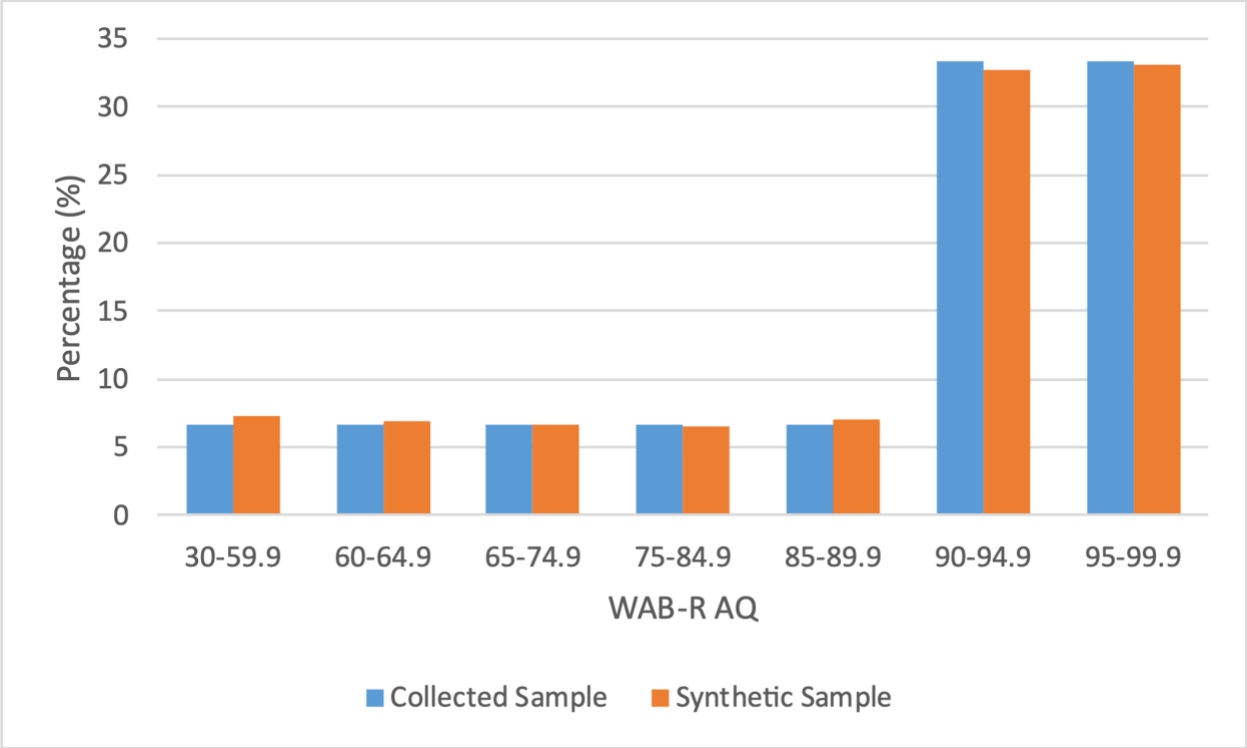

Figure 9: Bar Graph Comparing Distribution of WAB-R AQ scores Between Collected Sample and Synthetic Sample. Participants' WAB-R AQ are presented as range values.

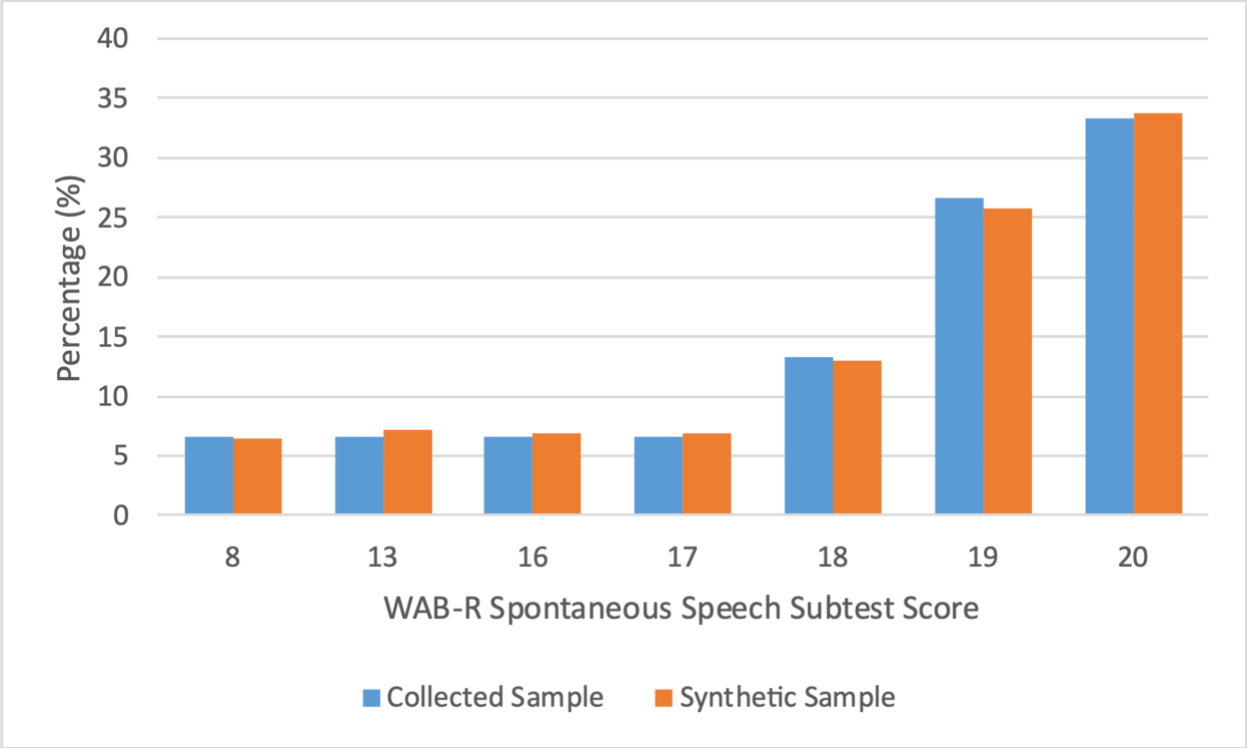

Figure 10: Bar Graph Comparing Distribution of WAB-R Spontaneous Speech Subtest Scores Between Collected Sample and Synthetic Sample. WAB-R Spontaneous Speech Subtest Scores are presented as discrete values.

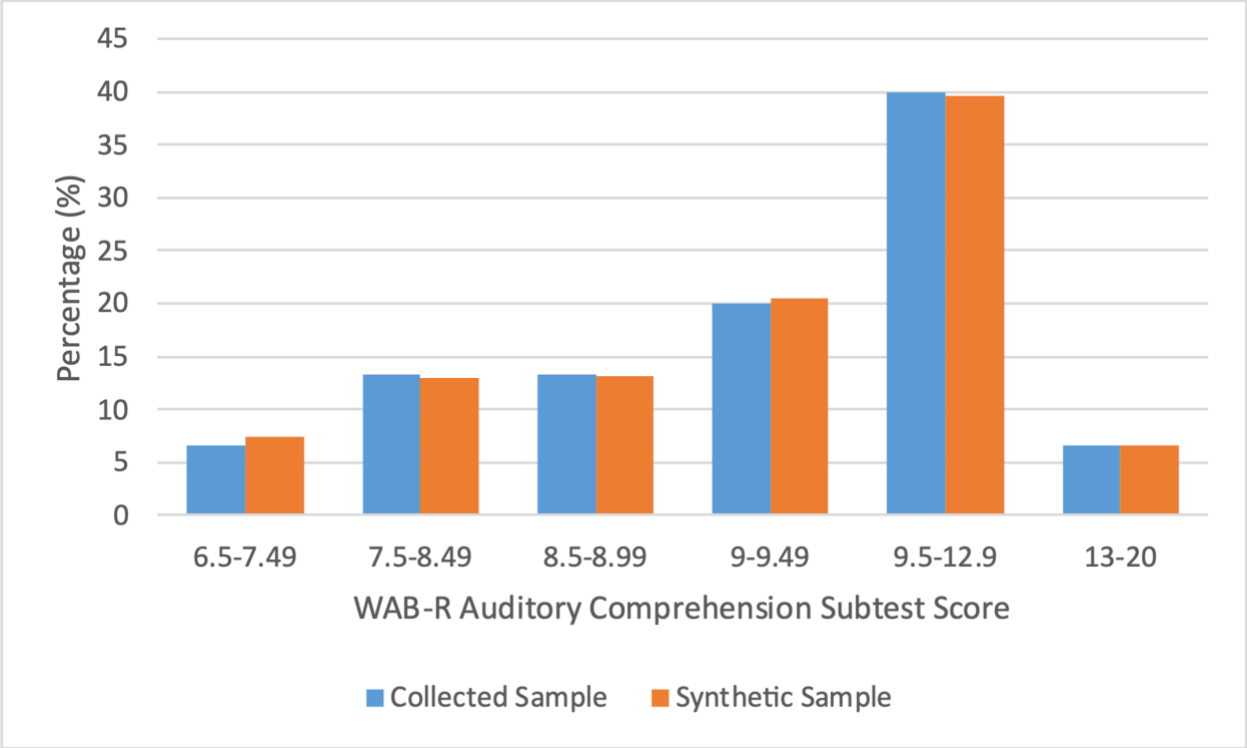

Figure 11: Bar Graph Comparing Distribution of WAB-R Auditory Comprehension Subtest Scores Between Collected Sample and Synthetic Sample. WAB-R Auditory Comprehension Subtest Scores are presented in ranges.

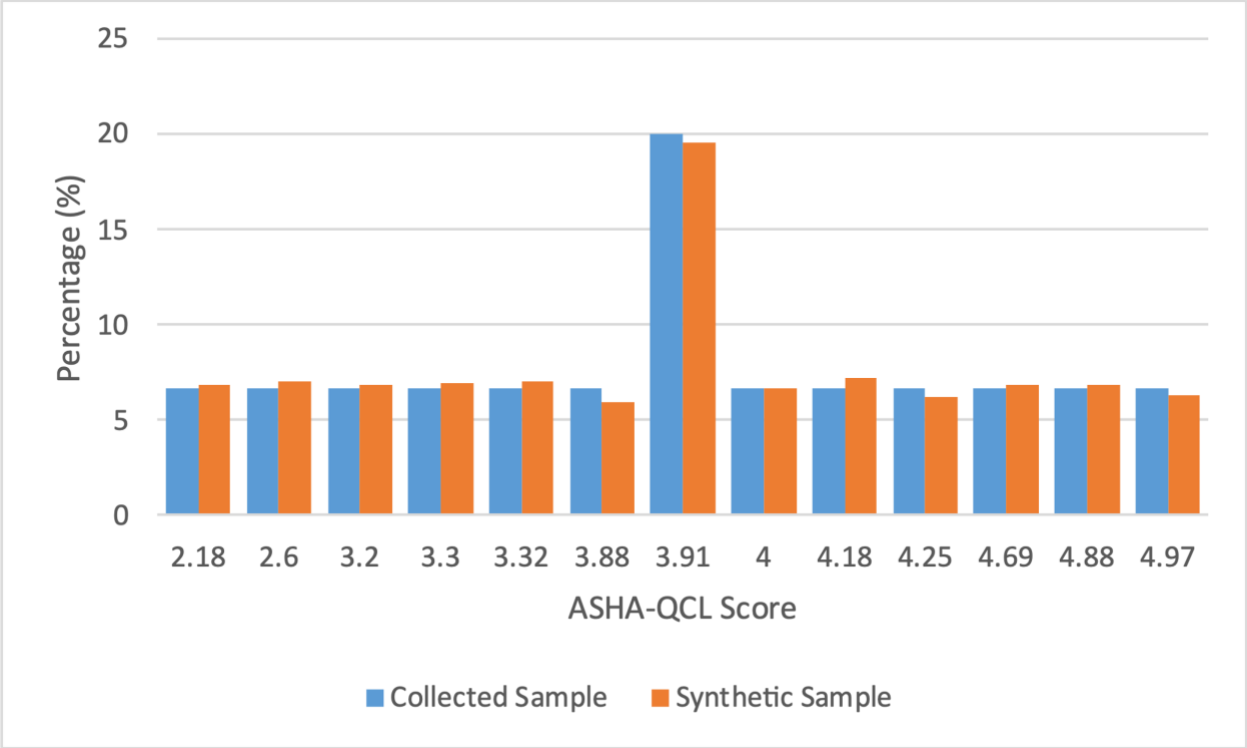

Figure 12: Bar Graph Comparing Distribution of ASHA-QCL Scores Between Collected Sample and Synthetic Sample. ASHA-QCL Scores are presented in discrete values.

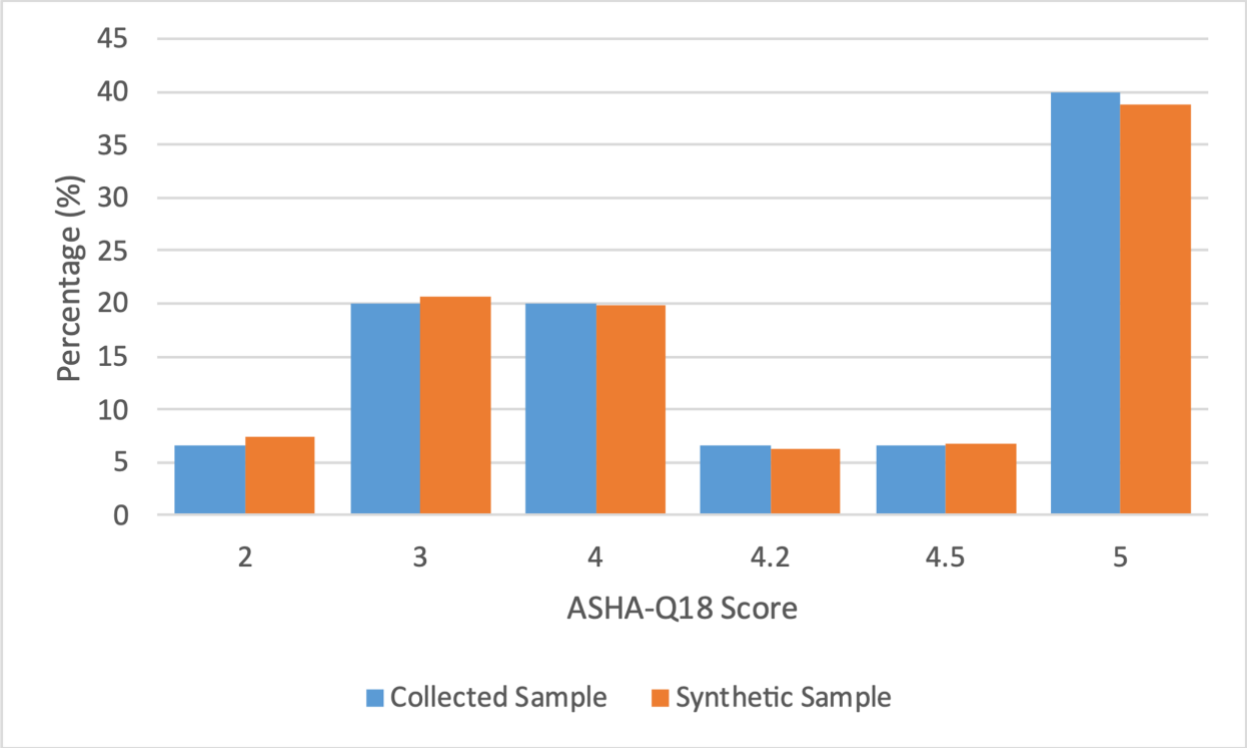

Figure 13: Bar Graph Comparing Distribution of ASHA-Q18 Scores Between Collected Sample and Synthetic Sample. ASHA-Q18 are presented as discrete values.

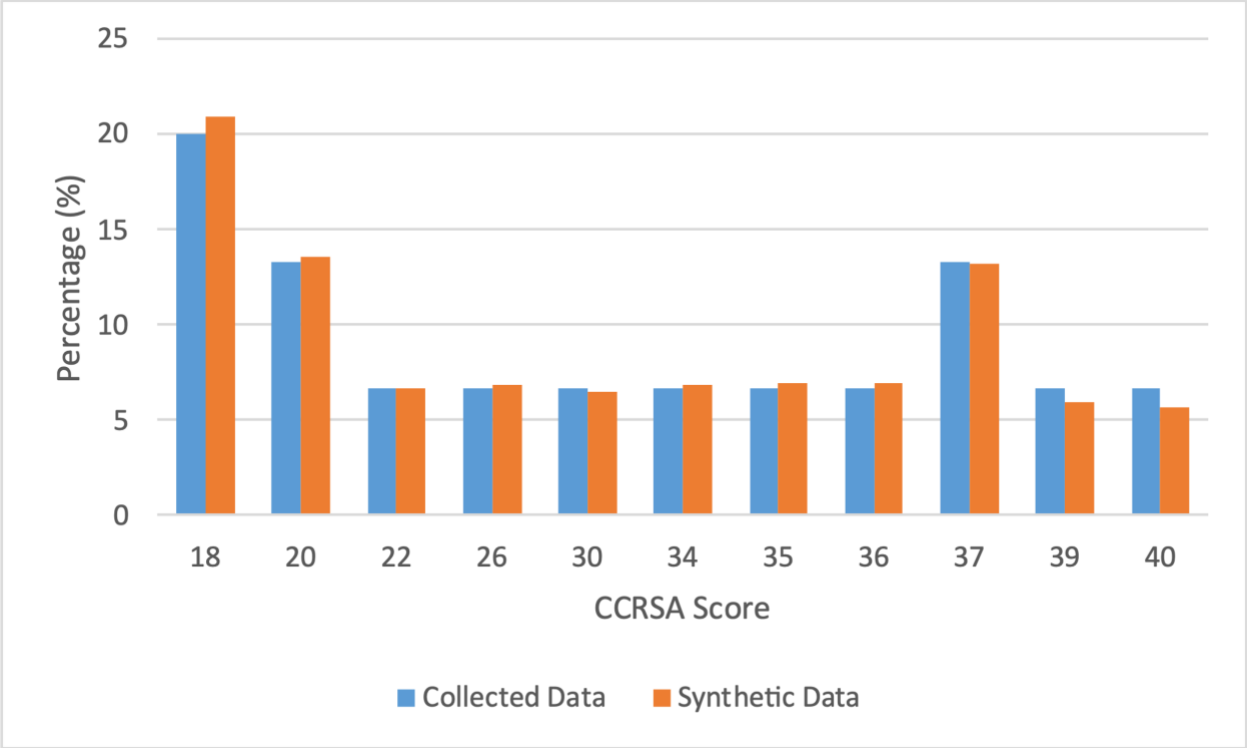

Figure 14: Bar Graph Comparing Distribution of CCRSA Scores Between Collected Sample and Synthetic Sample. CCRSA scores are presented as discrete values.

APPENDIX E: Participants and Their Corresponding Objective and Subjective Scores

Participant ID	WAB-R AQ	WAB-R Spontaneous Speech Subtest	WAB-R Auditory Comprehension Subtest	ASHA-QCL	ASHA-Q18	CCRSA
1	61.9	13	6.95	2.18	2	19
2	69.2	17	7.6	4.01	4.5	35
3	99	20	10	3.94	5	26
4	97.8	20	10	3.88	4	36
5	90.2	18	8.95	4.97	5	40
6	78.4	16	13.7	4	5	34
7	96	20	9.1	2.6	3	20
8	97	20	9.35	4.25	5	30
9	88	18	9.8	3.91	3	18
10	33	8	8	3.32	3	18
11	93.3	19	9.45	3.2	4	22
12	93.1	19	9.55	3.3	4.2	20
13	93.4	19	9	4.18	5	39
14	98	20	10	4.69	4	37
15	90.7	19	9.95	4.88	5	37