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The Impact of Background Noise on the Communicative Experience of People With Mild to Moderate Aphasia: A Qualitative Study

Riley Robertson Hegewald
Brigham Young University

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Master of Science

Tyson G. Harmon, Chair
Christopher Dromey
Connie Summers

Department of Communication Disorders

Brigham Young University

ABSTRACT

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Riley Robertson Hegewald
Department of Communication Disorders, BYU
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This study examined how retelling stories with a variety different background noise conditions affected the communicative experiences of people with aphasia (PWA). Participants included 11 adults with mild to moderate aphasia and 11 age- and gender-matched controls. Participants participated in a semi-structured interview immediately following the experimental measure where they were asked open-ended questions regarding their experience retelling stories and how those experiences related to their everyday lives. Results revealed three themes related to how participants responded to communicating in noise: (a) cognitive reactions, (b) emotional reactions, and (c) social reactions. The findings suggest that PWA exert more effort when speaking in noise and benefit from supportive communication partners more than control participants. Findings also suggest that PWA who reported a lack of strategies were more likely to adopt maladaptive strategies. Explicit training for communication partners and PWA may help PWA more effectively cope with the challenges of difficult noise situations which may lead to increased confidence and social participation.

Keywords: aphasia, attention, language, distraction

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I am honored for the opportunity I've had to complete a thesis but even more honored to know each of these individuals.

TABLE OF CONTENTS

LIST OF TABLES

DESCRIPTION OF THESIS STRUCTURE AND CONTENT

This thesis, *The Impact of Background Noise on the Communicative Experience of People With Mild to Moderate Aphasia: A Qualitative Study,* is written in a format that combines is written in a format that combines traditional thesis requirements with the format of a journal article. The preliminary pages of this thesis reflect requirements for submission to the university. The remainder of this thesis is structured like a journal article; it conforms to the style requirements for submitting research reports to relevant journals. The annotated bibliography is included in Appendix A. Appendix B contains the research consent form for people with aphasia, Appendix C contains the research consent form for control participants, Appendix D contains the final code book in which the data were thematized and categorized, Appendix E contains the semi-structured interview guide or PWA, and Appendix F contains the interview guide for the control participants.

Introduction

Aphasia is a neurogenic language disorder that affects more than two million Americans nationwide (Simmons-Mackie & Cherney, 2018). Most often acquired through stroke or traumatic brain injury, aphasia affects one's expression and reception of language across the four modalities of auditory comprehension, verbal expression, reading, and writing (Nance & Ochsner, 1981). In conjunction with language deficits, aphasia impacts one's social participation in everyday activities. This decreased participation may be exacerbated by attentional and social demands common to everyday communication environments (Harmon, 2020). These demands include environmental distractions such as background noise that can greatly disrupt the ability of people with aphasia (PWA) to participate in communication activities and ultimately hinder their inter- and intra-personal relationships (Baylor et al., 2011; Dalemans, De Witte, Wade, & Van Den Heuvel, 2010; Harmon, 2020). Most communicative experiences take place in distracting environments such as restaurants, grocery stores, or at family gatherings, whereas therapeutic intervention often takes place in quiet rooms with limited distractions. Based on previous findings, researchers have speculated that incorporating practice that simulates real world distractions for PWA may facilitate improved generalization (Harmon et al., 2019). As the first step towards the long-term goal of addressing everyday communication demands in aphasia therapy, the present study sought to explore the subjective experiences of PWA while retelling stories in the presence of a variety of distracting background noises.

Attention and Language in Aphasia

Different types of attention can influence language processing and communication for PWA. These include sustained attention (i.e., the ability to focus on a stimulus for a prolonged period), selective attention (i.e., the ability to reject irrelevant stimuli, thus testing resistance to

distraction), and divided attention (i.e., the ability to focus on two or more stimuli at the same time; Murray, 2012; Murray et al., 1998). Compared with sustained attention, selective and divided attention place greater demands on the attentional system, requiring greater attentional capacity and/or resource allocation. These increased attentional demands have generally been found to lead to greater difficulty performing language tasks for PWA when compared with their neurotypical peers (Murray et al., 1998; Villard & Kidd, 2019). While previous studies have mostly focused on the effects of divided attention on language processing and communication for PWA, relatively few studies have investigated the effects of selective attention. Selective attention, however, may be particularly pertinent to PWA because of its ecological validity. For example, talking in the presence of background noise, when there are visual distractions, or when there is time pressure, all draw upon selective attention (Harmon et al., 2020). The current study qualitatively explored the impact of selective attention (i.e., speaking in noise) on perceived communication experiences. Because they are among the most attentionally demanding, we will focus our review of the literature on how both selective and divided attention have been shown to impact and interact with receptive and expressive language for PWA.

How Attentional Demands Affect Receptive Language in Aphasia

Some degree of receptive language deficit is common in aphasia, which makes it difficult for PWA to understand what others are saying. These difficulties may be exacerbated in attentionally demanding environments that require selective attention. One example of this is background noise, which can include environmental noises that may or may not carry linguistic information. Energetic noise does not carry linguistic information and therefore draws upon relatively fewer attentional resources, since the distracting noises need not be processed linguistically. An example of energetic noise is a noisy restaurant in which the speech of

individuals is not discerned, but the overall noise level is high as speakers throughout the room talk at the same time. Informational noise, on the other hand, has discernable linguistic meaning and, therefore, requires more attentional resources because the brain involuntarily processes and interprets those linguistic elements (Brungart et al., 2001). An example of informational noise would be having a conversation with a friend while sitting close to a TV reporting recent news. This situation would make it difficult to listen to the friend because the auditory system is trying to process both the friend's speech as well as the news coming from the TV that is carrying important information.

Whether or not it carries linguistic information, background noise has been shown to interfere with speech recognition, listening and recall, and speech processing for people with aphasia more than their neurotypical peers, despite similar hearing status. Interference does seem to be more robust, however, with informational than energetic noise. Rankin et al. (2014) asked participants with and without aphasia to complete three tasks, one at the word level and two at the sentence level. The first task, words in noise, consisted of 42 common monosyllabic words. Each target word was accompanied by recordings of three human faces speaking in turn over simultaneously presented steady-state speech noise. One face spoke the accurate target word while the others spoke non-word foils, which differed from the target word by only one feature (i.e., place, manner, or voicing). Participants were then asked to identify which face accurately produced the target word. In the second task, participants were asked to follow a string of instructions with two forms of masking: male speech and continuous speech noise with the same long term average spectrum as speech. The last task was the Bamford-Kowal-Bamford Sentence Test where participants were asked to repeat sixteen phonetically balanced sentences containing three target words (e.g., “The clown had a funny face”). Despite similar performance in quiet

conditions, PWA experienced greater interference with all three tasks in noise (regardless of the type of noise stimuli) than their neurotypical peers (Rankin et al., 2014).

In addition to noise interfering with receptive language generally for PWA, the effects of informational noise might be especially detrimental. Villard and Kidd (2019) examined the effects of energetic (e.g., noise absent of linguistic information) and informational (e.g., noise carrying linguistic information) masking on performance in PWA, specifically receptive speech processing. The researchers simulated real world listening environments by spatially separating the target and maskers so that participants could make use of binaural cues for source segregation. The target and masker speech materials were taken from a closed-set matrix-style corpus, and a forced-choice word identification task was used. Results indicated that although both groups showed similar susceptibility to the effects of energetic masking, PWA were more susceptible than their neurotypical peers to the effects of informational masking. Decreased comprehension with informational masking was, therefore, suggested to be a consequence of acquired cognitive-linguistic impairments associated with aphasia (Villard & Kidd, 2019). Taken together, the aforementioned studies suggest that PWA present with more difficulty in receptive language tasks when completing these tasks in noisy environments–particularly when the background noise carries linguistic information.

How Attentional Demands Affect Expressive Language in Aphasia

Like receptive language, heightened attentional demands seem to have the potential to interfere more with the expressive language of PWA than their neurotypical peers. Certainly, all individuals, despite diagnosis, will exhibit increased effort when completing tasks that are cognitively demanding, and most adults naturally adjust their spoken language by pausing more frequently and slowing their speech rate (see e.g., Kemper et al., 2003; Harmon et al., 2019).

Although PWA present with similar speech patterns, their delayed response time and expressive errors are exacerbated. Klingman and Sussman (1983) provided some indirect evidence that shows the negative implications of attention variations on PWA's spoken language. In this study, both PWA and controls were asked to participate in a dual task where they were to manually tap their hands while simultaneously verbalizing (e.g., describing pictures or reciting the days of the week). PWA demonstrated greater difficulty than the control group when completing the concurrent task of tapping while verbalizing. These disruptions ranged from morphosyntactic errors to deficits in pragmatics. In a similar study, Harmon et al. (2019) had participants retell short stories in isolation while simultaneously distinguishing between high and low tones. The results of both studies showed that the dual task interfered more with spoken language of people with aphasia than controls and suggests that PWA are more sensitive to variations in attention and the influence it has on language performance (Murray et al., 1998, Petry et al., 1994; Harmon et al., 2019).

Harmon et al. (2019) also gathered qualitative data from the dual task experiment and found that PWA viewed their performance poorly and described their experience as negative and emotional. These emotional reactions may be related to the increased anxiety and stress associated with participating in challenging communication tasks. Communicative situations that neurotypical adults find challenging may likely feel threatening to PWA and lead to heightened neurovisceral responses that influence their language accuracy which can lead to low self-efficacy and low self-confidence. These feelings of inadequacy may result in complete withdrawal from certain environments and social isolation. (Davidson et al., 2008; Harmon et al., 2019; Parr, 2007).

While most literature focused on the effects of attentional demands on expressive language has used a divided attention paradigm, attentional disruptions that result from competing stimuli such as background noise (i.e., selective attention) may also be particularly difficult for PWA. Scadden (2020) specifically investigated the impact of background noise on the spoken language of PWA. In this study, 11 PWA and 11 control participants were asked to retell a story in the presence of different noise conditions. Spoken language was analyzed to identify changes in speech fluency and language production. Results revealed that PWA scored significantly lower than their peers in terms of communication efficiency using dependent measures such as correct information units, lexical errors, lexical diversity, and cohesive utterances. The commonality in all of these quantitative studies is that when PWA are multitasking or having to ignore background stimuli, they are jeopardizing their expressive communication.

Potential Effects of Attentional Demands on Participation

The role of attention in aphasia is important not only because of how it affects language per se, but also because of its potential influence on quality of life and communicative participation. The Aphasia-Framework for Outcome Measurement (A-FROM) suggests that life with aphasia influences four major domains which include, (a) language related impairments; (b) participation in life situations; (c) communication and language environment; and (d) personal identity, attitudes, and feelings (Kagan et al., 2008). Similarly, the International Classification of Functioning, Disability and Health (ICF) addresses the domains that influence the participation of PWA. According to the ICF, participation is defined as “involvement in life situations” (World Health Organization (WHO), 2001) and communicative participation has been further defined as “taking part in life situations where knowledge, information, ideas, and feelings are

exchanged" (Eadie et al., 2006). PWA have expressed in qualitative interviews that communicating in cognitively demanding environments poses extreme restrictions on their participation. Harmon et al. (2020) interviewed 21 PWA and found that participants commonly shared their frustration by saying, "I can't just ignore the music and focus on whatever it is that I'm studying… I have to focus so much more than I used to," and "[background noise makes me] discouraged from saying anything." Selective attention environments affect PWA's ability to effectively express their thoughts, feelings, and desires, which often results in feelings of extreme stress, frustration, and challenge (Baylor et al., 2011; Dalemans, De Witte, Wade, & Van Den Heuvel, 2010; Harmon, 2020).

In summary, previous research has explored the subjective experiences of PWA during divided attention tasks, but there is still little known about the experiences of PWA when communicating in situations that require selective attention. Despite the paucity of research in this area, these situations may be even more common in everyday communication environments and have implications for quality of life and participation.

Purpose of the Study

Research indicates that PWA experience greater interference to their expressive and receptive language in attentionally demanding conditions that require divided attention. Qualitative research has investigated the general communicative experiences of PWA, including their subjective experiences communicating in divided attention conditions. Although a small number of qualitative studies include reports from PWA who complain of their difficulty communicating in background noise (a task that requires selective attention), no previous study has qualitatively explored their subjective experiences communicating in noise specifically. Therefore, the primary aim of this study is to explore the subjective experiences of PWA when

communicating in the presence of background noise. We suspect that PWA will present with greater perceived effort during tasks and present with more negative emotional reactions. The secondary aim of this study, in connection with the former, is to analyze these experiences and document strategies that may facilitate or improve the communication experience of PWA.

Methods

This is a follow up study to Scadden (2020), who evaluated the quantitative effects of various types of background noise on narrative production for people with aphasia compared with a control group. Data for the present study were derived from semi-structured interviews that were completed with participants immediately after their participation in the experimental arm of the Scadden (2020) study.

Participants

Twenty-two people participated in the study (11 with aphasia, 11 controls), all of whom were recruited from Brigham Young University's Speech and Language Clinic, the Stroke and Brain Injury Registry, and by word of mouth. Study procedures were approved by the university's Institutional Review Board in March 2020, and an addendum concerning necessary precautions secondary to the COVID-19 pandemic was approved by the university's Institutional Review Board in June 2020.

Participants with aphasia included 11 adults (3 females and 8 males). Prior to testing, all participants with aphasia participated in the Quick Aphasia Battery (QAB) to assess the severity of their language impairment (Wilson et al., 2018). Results of the QAB indicated that participants had mild to moderate language impairments and represented a spectrum of fluent and non-fluent aphasia. Only participants with mild to moderate aphasia were included because participation in a story retell task was required for the experiment. Five participants scored as

having “very mild” aphasia on the QAB; however, all had been previously diagnosed by a speech-language pathologist as having aphasia and displayed characteristics of aphasia such as word-finding difficulties, circumlocution, and paraphasias. The QAB also includes an apraxia and dysarthria screening (Speech Motor Programming subtest; Wilson et al., 2018), which all participants with aphasia completed. Based on these results, the faculty advisor and two graduate-student clinicians’ consensus-rated three participants (A02, A04, and A08) as presenting with motor speech behaviors consistent with apraxia of speech and two participants (A03 and A05) as presenting with motor speech behaviors consistent with dysarthria. In all cases, motor speech deficits were judged to be mild with one exception (A08 was judged to have moderate apraxia of speech). Table 1 provides participant demographic information and test scores for the aphasia group.

Control participants included 11 adults who were age- and gender-matched with the aphasia group. All control participants confirmed that they had no history of neurological damage due to stroke, transient ischemic attack, or other neurological condition by completing the Questionnaire for Verifying Stroke-Free Status (QVSFS; Jones et al., 2001). Table 2 provides demographic information and questionnaire scores for the control group.

Table 1

Aphasia Subject Characteristics

Ppt ID	Sex	Age (years)	Educ. (years)	MPO	LHT (dB)	RHT (dB)	QAB Scores	
							O	Severity
A01	F	46	16	94	1.25	-1.25	9.77	Very Mild
A02	M	53	19	85	10.00	5.00	8.05	Mild
A03	M	69	18	60	35.00	22.50	6.40	Moderate
A04	F	49	12	206	3.75	3.75	5.84	Moderate
A05	M	44	14	56	7.50	8.75	9.34	Very Mild
A06	M	35	15	131	11.25	8.75	7.52	Mild
A07	M	55	16	5	7.50	1.25	7.34	Moderate
A08	F	62	13	105	17.50	17.50	5.20	Moderate
A09	M	47	18	252	6.25	3.75	8.90	Very Mild
A10	M	52	18	3	13.75	12.50	9.79	Very Mild
A11	M	60	16	52	30.00	26.25	9.18	Very Mild

Note. Ppt = participant; Educ. = education; LHT = Left Average Hearing Threshold; RHT = Right Average Hearing Threshold; MPO = Months Post Onset; QAB = Quick Aphasia Battery; O = Overall.

Table 2

Control Subject Characteristics

Ppt ID	Sex	Age	Educ. (years)	Matched PWA	LHT (dB)	RHT (dB)	QVSFS
C01	M	48	18	A02	23.75	8.75	0
C02	F	53	15	A04	18.75	20.00	0
C03	M	74	16	A03	43.75	31.25	0
C04	M	45	20	A05	8.75	8.75	0
C05	F	44	17	A01	7.50	3.75	0
C06	M	32	16	A06	5.00	7.5	0
C07	M	48	20	A10	6.25	6.25	0
C08	M	56	18	A07	17.5	8.75	0
C09	M	55	17	A12	0.00	5.00	0
C10	M	49	14	A11	33.75	30.00	0
C11	F	57	18	A08	2.50	7.50	0

Note. Ppt = participant; Educ. = Education; LHT = Left Average Hearing Threshold; RHT = Right Average Hearing Threshold; QVSFS = Questionnaire for Verifying Stroke-Free Status Scores.

Procedures

Each participant completed one session lasting no more than two hours. At the beginning of the session, each participant reviewed the consent form with a trained research assistant and completed either the QAB (if they were a participant with aphasia) or the QVSFS (if they were a control participant). Participants were told short stories and then asked to retell those stories with as much detail as they could remember in a baseline silent condition and five different background noise conditions: cocktail speech, lively conversation, pink noise, phone call, and a monologue (Doyle et al., 2000. All participants completed all experimental noise conditions, except for one (06) who discontinued after four conditions but still participated in the interview.

For the purposes of this follow-up qualitative study, each individual participated in a semi-structured interview where they were asked questions about their experience retelling stories in the presence of background noise.

Semi-Structured Interview

Semi-structured interviews took place in a quiet room where the participant, a graduate student clinician, and a research assistant were present. We designed the project in such a way that the interviews would happen immediately after the experimental tasks as a means to prime participants to think more in depth about how background noise affects their communication; however, participants were given a short break prior to the interview as needed. A graduate student clinician interviewed each participant individually. Interviews lasted approximately 20–30 minutes and were recorded using a Canon Vixia HF R80 camera with a Sony ECM-AW4 microphone. Participants engaged willingly throughout the interview and appeared to share their thoughts openly. First, PWA were asked about their experiences related to speech therapy and whether they are currently receiving services or have in the past. If participants answered yes, the interviewer asked a follow up question about whether or not background noise was addressed in therapy and which, if any, strategies were taught to cope with background noise. All participants (i.e., both PWA and controls) were then asked what impressions they had regarding the experiment (i.e., retelling stories in the different noise conditions) followed by questions such as, “What was easy/difficult for you?” and “What strategies did you use to cope with the different noise conditions?” To conclude the interview, all participants were asked to describe in detail what day-to-day experiences the communication situations reminded them of and to give specific examples. Consistent with the methodology of semi-structured interviews, the order and wording of questions were not identical during each interview, which allowed questions to be adapted to

the individual needs of each participant (Britten, 1995). The interviewer also provided discussion probes when necessary to elicit more detailed and meaningful responses. Along with probing, the interviewer used methods to facilitate communication for PWA such as referencing diagrams/pictures (yes/no boxes, number boxes, etc.), providing the participant with pen and paper, and using simple sentences/gestures.

Analysis

Interview recordings were initially transcribed orthographically by two undergraduate research assistants and then checked again by a third research assistant to ensure all the data were transcribed accurately. Transcripts included verbal and nonverbal communication that occurred during the interview from both the interviewer and the participant. Interview transcripts were coded qualitatively using codebook thematic analysis (Gale et al., 2013). Thematic analysis is a widely used, theoretically flexible method to analyze interview data (Braun & Clarke, 2006; Gale et al., 2013). Coding was an iterative process. First, the author and an undergraduate research assistant read through all the transcripts separately to familiarize themselves with the data. While doing so, they both took notes on what stood out to them and recurring themes. Second, the author and research assistant, along with a supervising professor, drafted an initial codebook with descriptive codes that captured important and/or recurring information from the dataset. Third, the author and research assistant met several times, making three iterations to the codebook. The iterative process began by the coders using the initial codebook to independently analyze the data while writing down concepts, codes, and/or themes that they felt were not adequately represented in the codebook from the data. The coders then met together to collaborate on their notes, review the coding, and make decisions about how to refine the codebook to improve its reliability. This process was completed two more times until both the

author and the research assistant agreed that the revised codebook was well defined and represented the dataset adequately. Fourth, the author and research assistant coded all of the interview transcripts using atlas.ti (Smit & Scherman, 2021). After completing their independent coding, the author and research assistant met together to check their coding and resolve discrepancies. This was done by comparing the codes to the codebook definitions and discussing discrepancies until consensus was reached. The final codes were collaboratively organized into themes and categories. The themes and categories consisted of participant coded statements that were labeled according to the aims of the present study.

Results

We used descriptive codes to understand previous therapy experiences and which conditions participants found most difficult or easy. The information regarding previous therapy is reported in Table 3. The information regarding participants' reports about difficult and easy conditions is documented in Table 4.

Table 3

Experiences That PWA Reported Having Previously With Speech Therapy

Ppt ID	Currently receiving Speech Therapy	Time since last receiving speech therapy*	Length of time in therapy**	Sessions per week**	Duration of session**	Previously addressed background noise in speech therapy
A01	No	3-4 yrs.	-	-	-	No
A02	Yes	-	5+ yrs.	2x/week	1 hour	No
A03	No	2 yrs.	-	-	-	No
A04	No	1-2 yrs.	-	-	-	No
A05	No	6 months	-	-	-	No
A06	Yes	-	5+ yrs.	2x/week	1 hour	No
A07	Yes	-	5 months	1x/week	1 hour	No
A08	Yes	-	5+ yrs.	1x/week	1 hour	No
A10	No	19 yrs.	-	-	-	No
A11	No	1 month	-	-	-	No
A12	No	4 yrs.	-	-	-	No

Note. Ppt = Participant; *This information was only obtained from participants who were not currently in speech therapy; **This information was only obtained from participants who were currently in speech therapy. Information was based on participant report.

Table 4

Participants' Perceptions of Difficult and Easy Noise Conditions

Code	Summary	Example Quotes
Difficult Conditions	Almost all PWA and controls specifically mentioned informational noise conditions being especially difficult although cocktail speech was also mentioned.	"When I had, you know… a conversation at the same time, that was really hard for me." (A07) "I found myself wanting to listen to conversations and 'Oh what's going on over there?'" (C09)
Easy Conditions	All participants (PWA and controls) reported that the easiest conditions were either no noise or pink noise. Pink noise was considered easiest to ignore or block out.	"[Pink noise] yeah that, that was fine, I felt really confident, like, uh, there wasn't anything that was a serious distraction." (A09) "Um quiet has always been nice, it's a lot easier." (A11) "[Pink] noise… wasn't hard to block out and tune out and focus on retelling the stories." (C01)

Qualitative coding and analysis of the interview data revealed three themes related to how participants responded to communicating in noise during the experimental paradigm and in similar everyday communication experiences: (a) cognitive reactions, (b) emotional reactions, and (c) social reactions. The categories of *challenges* and *strategies* were nested within each major theme, which captured the communication challenges the participants described when attempting to communicate in the presence of background noise and the strategies they described using to facilitate communication in noise and restore communication breakdowns. Although both groups were asked the same questions, PWA were found to share more detailed experiences concerning the challenges associated with communicating in everyday life.

Theme 1: Cognitive Reactions

The *cognitive reactions* theme captured statements from PWA about the perceived cognitive demands involved when participating in communicative situations where there is background noise present. PWA and controls also shared various strategies that provided assistance during the story retelling task and that facilitate communication in everyday life. Categories and codes related to this theme are summarized in Table 5.

Cognitive Challenges

The *cognitive challenges* category included statements from participants relating to the disadvantages and complexities associated with communicating with background noise. Comments made by PWA, and controls captured the following codes: *attention*, *memory*, *multitasking*, and *sensory distractors*. Codes which relate specifically to the experiences of PWA included *decreased processing speed* and *fatigue*.

Table 5

Categories, Codes, and Descriptions Associated With the Cognitive Reactions Theme

Categories	Codes	Descriptions
Challenges	Attention (both)	**PWA** described difficulty blocking out background noise; **controls** described attending to background noise out of curiosity and interest.
	Memory (both)	**PWA** and **controls** described how background noise interacted with their ability to remember and recount specific story details.
	Multitasking (both)	**PWA** felt that multitasking interfered with their communicative interactions and overall task performance; **controls** described dividing their attention more of a minor distraction.
	Sensory Distractors (both)	**PWA** and **controls** expressed awareness that sensory stimuli affected their ability to communicate but **PWA** seemed more sensitive to overstimulation.
	Decreased Processing Speed (PWA)	**PWA** described difficulty processing what was either said or heard due to background noise.
	Fatigue (PWA)	**PWA** described feeling cognitively and physically fatigued because of attempting to communicate with background noise.
Strategies	Focus (both)	**PWA** talked mostly about deliberate focusing on the task whereas **controls** mentioned adjustments to their focus that occurred spontaneously.
	Internal Memory Aid (both)	Both **PWA** and **controls** described using internal memory aids to facilitate communication in the presence of background noise.
	Reducing Sensory Input (both)	**PWA** and **controls** mentioned eliminating sensory stimuli (visual, olfactory, auditory) to improve their communication experience.
	Taking Breaks (PWA)	**PWA** commented on the advantages of taking breaks during cognitively demanding tasks/situations.

Categories	Codes	Descriptions
	Slowing Down (PWA)	**PWA** commented about decreasing the rate of communication of either themselves or their communication partner to allow more time for thought formulation and comprehension.
	Lack of Strategies (PWA)	Several **PWA** were unable to identify strategies used to cope with background noise.
	Negative Strategies (PWA)	**PWA** doubted their ability to communicate successfully with background noise and described withdrawing from communication instead.

Note. (Both) implies that PWA and controls made comments pertaining to the corresponding code and (PWA) implies that only people with aphasia made comments pertaining to the corresponding code.

Attention. Every participant, both PWA and controls, mentioned difficulties and distraction associated with attending to, focusing, or concentrating on a stimulus or task in the presence of background noise. There were various examples where PWA struggled to attend to the task due to the noise condition being perceived as personally relevant. A01 mentioned how it was difficult to focus on the story when the background noise was either interesting or held meaning because "I actually wanted to listen." Similarly, A10 expressed multiple times how it was much harder to concentrate on the task when it felt like the background noise was directed toward him: "It was definitely harder… when the conversation was more upfront and like they were talking right to me." A majority of PWA also specified the challenge of attending to multiple speakers in a group and referred to them as "competing noises" which posed a significant distraction in both the experiment and everyday life. During the story retelling task, A07 said that he would find himself listening to what the people in the background were saying rather than the story, which made it more difficult for him to tell the story back successfully because he was unable to maintain his attention on the story itself. A08 related similar challenges, which affected his day-to-day activities such as eating at a restaurant or watching cartoons with his grandchildren. Control participants also made numerous comments about attention challenges in the presence of background noise. The key difference between their comments and those expressed by PWA was that PWA indicated decreased ability to block out background noise whereas controls mentioned attending to it more out of curiosity and interest. C01 exemplified this by saying, "Should I be listening to that conversation, are they saying anything interesting?"

Memory. Both PWA and controls described how background noise interacted with their ability to remember and recount specific details in the stories they were asked to retell. Five

PWA repeatedly described difficulty retrieving information when background noise was present. A06 mentioned that it wasn't just the presence of background noise that made the experiment hard, but it was trying to remember the story details with the background noise present. He stated, "It's just like [the information] runs away." Like PWA, eight control participants attributed difficulty remembering parts of the story to the background noise being "too detailed" or "too much." Specifically, they mentioned how background noise with a lot of information, such as the audiobook, made it harder to recall and/or concentrate on the story.

Multitasking. Four PWA and two controls mentioned that doing something else while background noise was present interfered with their communication. Examples from participants with aphasia included not being able to talk while music was playing in the background or not being able to focus on a task while background noise was present. All participants explained that it is difficult to do two things at once; however, PWA explained the need to focus on one thing: either their communication or the background noise. A06 exemplified this sentiment by stating, "that was hard for me, you know, to do two things at the same time." Another participant, A01, shared how she was once line dancing at a work meeting and her coworkers asked her to teach them the steps. Her response was as follows, "I can't, there's music going, I can't figure out how to say heel or toe or anything else, I just can't do it." The control participants (C06, C08) mentioned how multitasking taxed their attention by explaining that they felt as if they were in a "juggling act" or "splitting attention and losing it in one place or the other." Although both PWA and controls made mention of the difficulties associated with multitasking in both the experiment and in their daily lives, participants with aphasia felt that it greatly interfered with their communication, social interactions, and performance on the story retell task, whereas the two control participants suggested that this was more of a minor distraction.

Sensory Distractors. Eight PWA and six controls mentioned how the presence of a variety of sensory stimuli can affect their ability to complete a task. Types of sensory stimuli mentioned included auditory, visual, somatosensory, and olfactory. Specifically, PWA shared challenges associated with the volume on the TV being too loud, the mildew smell of clothes, or the sun setting while driving in the car. A01 explained that her communicative abilities in noise were especially affected when additional sensory input was received. Additionally, she reported that any additional sensory stimulation could affect her communication or ability to attend to a task. For example, she explained, "...if the sun is coming down, then I'm driving, I've got the sight stuff, I can't listen to music, especially if the kids are in the car because it's just one extra sense." When asked what made the experiment the most difficult, A02 exclaimed, "No, I just, there was a, it was just noise, noise, noise." Five control participants also made comments about how having excess sensory input can lead to overstimulation, which can hinder their ability to communicate and attend to a stimulus. Examples of this included having the TV on during a group conversation or listening to a favorite song while trying to study. Despite both PWA and controls expressing awareness of sensory stimuli affecting their ability to communicate, being overstimulated by the background noise in the experiment seemed more prevalent for PWA as they often complained of the background noise being "too loud" while the controls made no mention of this.

Decreased Processing Speed. Four PWA (no controls) mentioned difficulty processing what was either being said or heard due to background noise. When asked what would make the experiment easier, A04 stated, "Slow down the, you know, the, the story, slow." She then elaborated on her comment by saying, "Slow down (gestures slowly) is is bru-, bru- better." A09 shared how because of background noise inhibiting his ability to process speech and respond

effectively, he will often avoid social situations where there are a lot of people. He, along with other PWA, explained how if the story could hypothetically slow down it would be beneficial.

Fatigue. Four PWA (no controls) mentioned feeling a decrease in their performance over time either during the experiment or while communicating in everyday situations when background noise was present. For example, A10 said he felt the experiment got harder with each condition while most controls felt that "over time it got easier" with each condition because they knew what to expect. PWA also expressed the increased effort and stamina it took to complete the tasks. When asked about his experience, A09 said, "It took a lot of extra work and made me tired." Other PWA made statements like, "it uses up all the concentration in your brain," "I feel a bit tired now" and "it drains me a lot more… because you have to focus a lot more on, you know, what's happening presently, and I feel like I'm not very good at it." The PWA described not only feeling cognitively but also physically fatigued as a result of attempting to communicate with background noise.

Cognitive Strategies

The *cognitive strategies* category captured specific comments from each participant relating to the individualized methods used to facilitate communication. The codes that encapsulated strategies from both PWA and controls included *deliberate focus*, use of *internal memory aids*, and *reducing sensory input*. Codes specific to the experiences of PWA included *taking breaks* and *slowing down* (i.e., slowing their own speech or asking others to slow down). Codes that captured comments from participants with aphasia only included *lack of strategies* and *negative strategies*.

Focus. Nine PWA made comments about how they used a variety of methods to deliberately focus during the story retell. For example, three PWA said that they would

encourage themselves to keep going when they had a hard time focusing during the experiment. A01 said she told herself, “Okay just focus, this is what I have to do, keep doing it” as a strategy to get through the task. Two PWA mentioned focusing on the main topics of the stories or specific details in the stories as a strategy to stay focused on the content amidst the background noise. Only one PWA mentioned a spontaneous focus strategy when completing the task. When referencing the cocktail speech condition, A09 would tell himself, “Oh that’s not going to be as big of a deal,” whereas the other PWA expressed having to make a deliberate effort to block out the background noise and focus on the task. In contrast, despite also using deliberate strategies to focus, all eleven control participants described moments where they responded spontaneously with increased focus. For example, most comments started with, “my brain would just…,” followed by “block out the noise,” “ignore it [background noise],” “tune it [background noise] out,” “pretend it [background noise] wasn’t there,” etc. This result indicates that although people without aphasia also use strategies to help them focus in the presence of background noise, a lot of their strategies happen spontaneously, whereas for PWA, only one PWA mentioned a spontaneous strategy.

Internal Memory Aid. Five PWA and six controls mentioned patterns of thinking that helped them remember details from the experiment or improve their communicative experiences with background noise. The patterns mentioned in the interviews included associations (i.e., any mention of making connections between stories and their past experiences), repetition (i.e., saying information over and over to themselves or asking others to repeat), rehearsal (i.e., verbally, or mentally reviewing information to assist in retrieval or understanding), visualization (i.e., creating a mental image of information in one’s mind to help remember specific details). When asked if there was anything that facilitated the story retelling task, A08 mentioned how she

was able to remember the character in the story's name because her cousin shares that same name. A09 shared that when he is in a group setting with a lot of conversations going on, he likes to ask the person that he is conversing with to “repeat things” so that it is “clearer” which helps him better attend to his communication partner amidst background noise. A09 also said that he looked for specific patterns in the story so that he could know which details were most pertinent for when he needed to tell it back. Similarly, A11 would replay details about the story in his mind in an attempt to tune out the background noise, he said, “Um, just thinking through, you know, replaying it in my mind.” Both PWA and controls benefitted from the use of internal memory aids while completing the story retell task and shared experiences of using these resources in everyday life. Despite both groups having similar representation of using these aids (5 PWA, 6 controls), the control group shared more instances per participant where these resources were utilized to facilitate communication in the presence of background noise.

Reducing Sensory Input. Seven PWA and eight controls used sensory strategies (e.g., auditory, visual, and olfactory) to create an environment that was conducive to better communication. A01 spoke of how she needs to remove strong smells in the house to participate successfully in Zoom meetings. A04 said that when her husband plays music, she often has to ask him to turn it down so she can better communicate with him while A11 will mute the TV or pause the movie when he needs to engage in conversation. Some PWA (A07 and A09) mentioned preferring no noise in the background when trying to focus while others (A01, A03, A09) said they actually benefit from music in the background to focus, with the caveat that music playing in the background was described as not helpful when communicating in group settings (A09). When A05 was asked about how he attempted to ignore the background noise conditions during the experiment, he said, “closed my eyes…and concentrated on what I was

saying," thus removing visual stimuli. The controls reported similar strategies to eliminate sensory distractions such as turning down the volume on the TV or shutting the door while in a meeting. Interestingly, three control participants referenced that familiar background noise was easier to tune out. When elaborating on her experience, C05 said, "the cocktail noise, like the sounds in the restaurant, that wasn't too bad I think, just cuz it sounded so familiar and, so that was pretty easy to tune out." Other comments were made about how familiar music in the background while working on a task was much less distracting than an unfamiliar noise. Overall, despite the type of noise, both PWA and controls found that by eliminating sensory stimuli (visual, olfactory, auditory), their communication experience improved.

Taking Breaks. Four PWA expressed the need to remove themselves from demanding noise environments in order to cope. During the experiment, one PWA (A08) took a brief bathroom break and claimed that the background noise was less bothersome upon returning to the task. A09, although he did not take a break during the session, mentioned the possible advantages that may have resulted. Two participants (A04, A08) mentioned removing themselves from noisy environments in their everyday life by going to their room. No control participant mentioned the need for or possible benefits of taking breaks.

Slowing Down. To combat the aforementioned processing speed challenges, two PWA made comments about decreasing the rate of communication of either themselves or the communication partner to allow more time for thought formulation and comprehension. A04 stated, "I tell…, uh uh… my husband, 'slow down, ease off, allow sounds.'" Conversely, A07 mentioned how when he goes to talk when there is background noise it is more difficult, and he has to think more about what he is going to say. He uses this strategy, "I, I, I have to slow it really down and, and I have to think of what I'm going to say and what I, and make sure that I'm

gonna, that it makes sense you know." The two PWA explained that this strategy took conscious effort on either their part or the part of their communication partner.

Lack of Strategies. When asked if a therapist had ever talked to them about background noise, each participant with aphasia said "no" (see Table 3). In fact, a majority of PWA had been discharged from therapy despite the ongoing, daily challenges attributed to aphasia. When asked if they used specific strategies during the experiment or in everyday situations, four PWA expressed not having adequate knowledge or use of compensatory strategies to facilitate communication with background noise. When asked this question, all four of the PWA reported, "I don't know." Half of the participants who reported lack of strategies also commented on feelings of stress and fear associated with communicating in noise.

Negative Strategies. Four PWA described negative strategies when attempting to communicate with background noise. These behaviors included withdrawing or avoiding a communicative encounter in the attempt to eliminate possible communication breakdowns. When asked how they cope with background noise, three participants shared experiences where they would just stop talking. A01 answered this question by saying, "so, I just, yeah, I just, I know I won't be able to communicate, so I just stop" and A08 responded, "shut the no speech (motions no speaking around mouth)." While explaining his experience with communicating in background noise, A09 began to speak about how the consistent challenge has affected his relationship with his wife. He expressed, "I don't think I'm an absent husband, but I do feel like I, I move away from a lot of people and, and noise, so." Many PWA doubted their ability to communicate successfully with background noise and instead of using strategies to combat the interference, several described withdrawing from the conversations altogether.

Theme 2: Emotional Reactions

The *emotional reactions* theme captured statements from participants with aphasia about feelings that were experienced while participating in the experiment and during everyday life. Some PWA expressed feelings of stress, fear, and frustration which left them feeling insecure and incapable. PWA also shared strategies of positive affirmations, emotional regulation, and acceptance to cope with these emotional reactions related to communicating with background noise. Categories and codes related to this theme are summarized in Table 6.

Emotional Challenges

The *emotional challenges* category captures the feelings and emotions of PWA and controls during the story retelling task and while communicating in everyday life. The *stress* code captured comments from both PWA and controls while the *overwhelm* and *frustration* codes were specific to PWA.

Table 6

Categories, Codes, and Descriptions Associated With the Emotional Reactions Theme

Categories	Codes	Descriptions
Challenges	Stress (both)	**PWA** described feelings of stress due to the presence of background noise and possibility of performing poorly on the task; **controls** described feelings of stress associated primarily with concern about their performance.
	Overwhelm (PWA)	**PWA** mentioned feeling overwhelmed because of their aphasia.
	Frustration (PWA)	**PWA** expressed disappointment with their performance on the story retell task and described feeling upset or annoyed by their perceived inability to communicate effectively.
Strategies	Positive Affirmations (both)	**PWA** and one **control** used positive affirmations to maintain an optimistic perspective of their ability to communicate in different background noise conditions despite other challenges.
	Emotional Regulation (both)	**PWA** had to consciously control their emotions during the background noise conditions while the **controls** appeared to naturally remain calm.
	Gratitude (PWA)	**PWA** made comments about their appreciation for their ability to be alive and communicate.

Note. (Both) implies that both PWA and controls made comments pertaining to the corresponding code and (PWA) implies that only people with aphasia made comments pertaining to the corresponding code.

Stress. Five PWA and four controls explained feelings of stress due to communicating in noise. When asked about other everyday experiences in which they feel a similar degree of stress to that which they felt during the experiment, A04 replied, “um everything” and A08 said, “[my] brain is stressed…[my] brain is stuck.” A05 shared his feelings of stress when asked about his overall performance by responding, “It was a little stressful because I didn't feel like I was doing a very good job.” Many of the controls shared the same sentiment as A05 with being more

stressed about their overall performance and doing well on the task rather than communicating in background noise itself. C01 expressed, “the ones with lots of details were more stressful ’cause you, you want to get them right” and C06 said, “sometimes I was a little bit stressed about trying to retain as much of the details as I could.” Stress was felt at various moments during the story retelling task by both PWA and controls. The main distinction here was that PWA expressed stress due to communicating in background noise itself, whereas controls were more concerned with their ability to perform well, regardless of the noise condition**.**

Overwhelm. Two PWA mentioned feeling overwhelmed because of their aphasia. A01, a mother, spoke about how she can no longer multitask, especially with background noise present. When asked about how this affects her, she said, “I can’t do two things at once now, which is scary as a mom.” A09 also shared an example of the newfound difficulties associated with attempting to communicate with a lot of conversation in the background. She explained that after her stroke she felt overwhelmed by a lot of people “going at it [in conversation]” which she compared to feeling like “everything was underwater.”

Frustration. All 11 PWA expressed significant disappointment with their performance on the story retelling task and described feeling upset or annoyed by their inability to communicate effectively. One PWA (A05) explained, “I know like even people without brain injuries are not going to recite back the whole story, but I wanted to do it as best I could and I just felt like I couldn't do as well as I used to be able to do before my brain injury, so that kind of made me frustrated about that.”

Emotional Strategies

The *emotional strategies* category sought to capture the intimate and personal methods used by the participants to combat the emotional challenges of communicating with background

noise. The *positive affirmations* and *emotional regulation* codes included strategies mentioned by both PWA and controls. Comments from only PWA contributed to the *gratitude* code.

Positive Affirmations. Six PWA and one control were observed to maintain a positive perspective of their ability to communicate in different background noise conditions despite other challenges. Two of the six would remind themselves using positive affirmations during the story retelling task that "I can do this" or "I can do better." Other PWA had grace with themselves and would say "I've gotten better" or "it will get better." A05 explained that what helped him most was coming to the realization that "no one is going to be able to tell back perfectly and I just got to do my best."

Emotional Regulation. Three PWA described being able to calm themselves when having to communicate in background noise environments. For example, A04 described regulating her stress by going into her room alone, locking it, and taking time for herself. She explained that once she's in the room she says to herself, "calm down, easy." Similarly, A03 mentioned trying to ignore as much background noise as possible to decrease stress and stay calm. Four controls also mentioned feeling calm during the experiment but unlike PWA they appeared to naturally remain calm without requiring any emotional regulation.

Gratitude. Two PWA made comments about their appreciation for their ability to be alive and communicate to some degree since having their stroke. A01 shared how sometimes she can only get about three words out. When asked how she feels about this she replied, "...the fact that I can talk is, like, pretty incredible. The fact that I'm not dead. I, I like that I'm not dead…" A07 shared a similar sentiment when he expressed gratitude for being able to converse using more words than he could right after his stroke.

Theme 3: Social Reactions

The *social reactions* theme captured statements from participants regarding both the challenges and strategies used in social situations. Challenges included lack of support from communication partners in social situations and comments relating to the difficulties and challenges associated with participation in group settings. Participants also expressed the importance of supported relationships and speaker communication modifications. Categories and codes related to this theme are summarized in Table 7.

Social Challenges

The *social challenges* category includes comments from PWA relating to *unsupportive relationships* and *social withdrawal* (i.e., withdrawal from social situations because of background noise). PWA were the only participants to report on social challenges.

Unsupported Relationships. PWA frequently mentioned a lack of support from friends, family, and/or other professionals. This was manifested by an unwillingness from the communication partner to provide adequate resources or modify their speech behavior to facilitate communication. Specifically, three PWA expressed feeling unsupported when it came to their communication success. One PWA (A09) made mention of how he felt unsupported by his speech therapist: “He, he had decided that, um, I, I I was pretty damaged, and I would never go any further, which is unfortunate ‘cuz he’s a speech therapist.” This same participant shared how when he is at a party or family gathering, he thinks to himself that he would be more effective if he was doing something at his computer instead of engaging in the conversations.

Two other PWA made mention of how they routinely feel a lack of communication modification from their communication partners, especially in noisy environments. A04 said that her husband talks softly when at restaurants, and she is constantly having to ask “what? what?”

She also said that her daughter talks to her very fast, and it is hard for her to keep up. A08 expressed similar frustration and said that she actually stops talking because her husband will often keep talking "talk talk talk" without giving her a chance to contribute.

Table 7

Categories, Codes, and Descriptions Associated With the Social Reactions Theme

Categories	Codes	Descriptions
Challenges	Unsupported Relationships (PWA)	**PWA** want to communicate effectively, which often requires the support and patience of someone else.
	Social Withdrawal (PWA)	**PWA** mentioned withdrawing from social situations or feeling discouraged from social participation due to the presence of background noise.
Strategies	Self-Modified Communication (both)	**PWA** and **controls** described making modifications to be better understood by their communication partner.
	Relying on Supportive Partners (PWA)	**PWA** mentioned ways that communication partners can adjust their speech to better support communication.

Note. (Both) implies that both PWA and controls made comments pertaining to the corresponding code and (PWA) implies that only people with aphasia made comments pertaining to the corresponding code.

Social Withdrawal. Two PWA mentioned withdrawing from social situations or feeling discouraged from social participation due to the presence of background noise. A08 shared how she enjoys watching football but can't watch with her family and friends because it gets too loud. When asked what she does in this situation, she replied, "sit, go to the bedroom and watch the um, TV." A09 spoke specifically to the challenges of participation while in a group setting with other conversations going on. After expressing how difficult group settings are for her, she said. "...in group, when I'm talking with other people, I need, I need, quiet except for them."

Social Strategies

The *social strategies* category identifies codes that encapsulate the methods that both the communicator and communication partner described using to enhance successful communication. PWA and controls made comments about how modifying one's own speech facilitates conversation amidst background noise (*Self-modified Communication*). Comments specific to PWA included the positive impact on being able to rely on a supportive communication partner (*Relying on Supportive Partners*).

Self-Modified Communication. In addition to asking communication partners to adjust their communication, PWA described making modifications to be better understood. A02 said, " I love, I listen, (points to ear) then I respond and if they don't understand, then I will say it again." One control gave insight into what he does to better understand the people he is talking to in a noisy environment. He said that he will often get closer to them so that he can focus and better understand. Creating an environment that promotes successful communication while background noise is present takes effort on both the sender and receiver.

Relying on Supportive Partners. Six PWA made comments about how they feel supported by their communication partner in their efforts to communicate. A04 mentioned two family members that help her calm down. A07 expressed gratitude for his children and coworkers that try to be quiet and facilitate conversation when background noise is present. A09 said one of his strategies was having other people repeat themselves and described the people that do this as "very nice." Many PWA mentioned the communication modifications of their peers and the significant effect this can have on their confidence to express themselves. A09 said his wife knows not to give him big chunks of information because he needs time to "process through the conversation." PWA also indicated that they ask their family members to talk louder,

quieter, slower, etc. and describe how beneficial it is to them when these adjustments are made. A07 gave an example of what this looks like in her home, “guys, you need to just, let me, let me talk first, you know and then put it, put it, you know, make it very quiet, let me finish, just my, I only have a few sentences so I don’t have to do, uh, but if, but I, you know, hold off and let me do that until, and then then we can talk, you know.”

Discussion

The purpose of this study was to explore the subjective experiences of PWA while retelling stories in the presence of a variety of distracting background noises and compare those findings to age- and gender-matched controls. The task elicited cognitive, emotional, and social reactions which encapsulated both challenges and strategies employed to facilitate communication. Findings suggest some differences in how people with aphasia and neurologically healthy adults respond to speaking in noise. Specifically, participants' comments suggested that speaking in noise may require more effort for participants with aphasia than healthy older adults. Findings also highlight the importance of supportive communication partners as well as training focused on strategies and coping mechanisms to prepare PWA to communicate in noise.

People With Aphasia Described Exerting More Effort When Speaking in Noise Than Controls

Due to common distracting stimuli, everyday communication situations present greater demands on attention than quiet clinic environments wherein therapy is most often administered (Harmon et al., 2019). In this study, comments from PWA suggested that increased cognitive effort was required to communicate in the presence of background noise. Findings support that selective attention, which was required in the experimental task, is more challenging and requires

more deliberate effort than sustained attention (Murray et al., 1997). Selective attention has also been shown to interfere more with performance on language tasks for PWA than their neurologically healthy peers (Murray et al., 1998, Villard & Kidd, 2019). Our findings align with the notion that, compared with neurologically healthy adults, PWA have decreased attentional capacity and/or resource allocation, which may lead to increased cognitive effort when speaking in noise. Previous research also provides evidence that both expressive and receptive language, on the word and sentence level, are interrupted when attention is divided (Rankin et al, 2014). Interruptions increase when the background noise becomes more distracting. More distracting background noise includes informational noise which contains linguistic content (Brungart et al., 2001). Findings from the present study supported this idea in that participants made comments about how the lively conversation, monologue, and the phone call conditions (all which included linguistic content) required increased attentional effort and processing time. These noise conditions were referred to as the most *difficult* as shown in Table 4 and often led to cognitive, emotional, and social challenges such as stress and negative strategies.

It appears that when attentional demands are increased and capacity is limited or allocation of attentional resources is strained, PWA exert more effort, which is manifested by use of deliberate strategies to help them focus. Deliberate strategies observed in this study included telling themselves to keep going and focusing on main topics. This was contrasted with controls who reported strategies to focus, which appeared to happen spontaneously. In fact, rather than explaining how they were able to focus, many control participants said that it just happened. It may be that due to lesioned brain tissue and subsequent deficits in neurophysiological and behavioral processes, PWA were unable to ignore the background noise spontaneously and

allocate their attention appropriately. This potentially led to the use of deliberate strategies to compensate, which required increased cognitive effort during the task.

Another possibility for why PWA reported increased effort and difficulty speaking in noise was that they were potentially overstimulated by the addition of sensory input. The most obvious of these sensory inputs was the background noise itself. Previous research supports that PWA appear to do worse on comprehension and production tasks when there is additional auditory input coming into the system (Rankin et al., 2014, Villard & Kidd, 2019); however, what has not been previously researched is how additional sensory input might contribute to this worsening in linguistic performance. Beyond the background noise, participants in the present study described being distracted by additional sensory input including visual and olfactory. An example of this includes having the visual distraction of the TV when attempting to communicate with a communication partner. This finding expands on the idea that visual distractions may combine with background noise to increase attentional demands for PWA during communication (Harmon, 2020) to suggest that any form of sensory input may contribute to taxing the attentional system. The fact that participants mentioned reducing other sensory inputs that were separate from auditory suggests that PWA were potentially attempting to harness all available cognitive resources on the speaking task by reducing sensory stimulation generally. It is still unclear how overstimulation through multiple sensory inputs affects PWA in general, but our findings indicate that PWA may need to allocate more effort on a task when other senses are being stimulated. This finding implies that a multitude of inputs could lead to more communicative breakdowns and negative feelings. Future research should focus on investigating sensory processing in aphasia across different types of input.

Another manifestation of increased effort while communicating in noise for PWA was their reports of feeling fatigued and overwhelmed. These findings support the previously discussed notion that increased perceived effort for PWA is often met with a decrease in performance and negative emotional reactions (Harmon et al., 2019). All PWA in this study commented on their perception that they decreased in their performance over time while controls perceived that they acclimated to speaking in noise and that the task ultimately got easier. We propose there are three possible reasons why the task became harder for PWA and not for controls: (a) PWA may have become tired, which resulted in decreased performance over time; (b) PWA may have become more emotionally aroused over time due to their perceived performance leading to negative emotional reactions as mentioned in the results; (c) PWA may have perceived speaking in noise as a threat whereas control participants, on the other hand, may have perceived it as a challenge.

Importance of Supportive Communication Partners

This study confirms that PWA often feel a lack of support from familiar and unfamiliar communication partners (Dalemans, De Witte, Beurskens, et al. 2010; Harmon et al., 2020) but expands these findings to address the specific context of background noise. With background noise present, it is crucial that PWA have not only family and friends to support them, but also professionals that are willing to provide them with adequate resources to improve their quality of life. When attentional demands are high, PWA struggle to effectively express their thoughts, feelings, and desires, which can lead to negative feelings and withdrawal from social situations (Baylor et al., 2011; Dalemans, De Witte, Wade, & Van Den Heuvel, 2010; Harmon, 2020). Data from both previous research and this current study suggest that PWA may benefit from

therapy that addresses complex communication environments and training for communication partners on how to modify/adjust their speech and eliminate distracting stimuli.

In the present study, PWA provided specific ways in which they requested that others adjust their speech including repeating themselves when asked, speaking slower, standing face to face during conversations, and being patient when a response is being formulated. Participants have expressed that when they feel supported, they are better able to communicate their thoughts and feelings successfully, increasing self-confidence and participation (Harmon et al., 2020).

Possible practices for ensuring PWA have a strong support system include (a) providing training to communication partners about supportive strategies, (b) educating PWA on disclosure statements, and (c) encouraging PWA to ask for speech modifications and adjustments from their communication partners. A large body of previous research has demonstrated the value of communication partner training, suggesting that a variety of training programs can lead to more supportive strategies from close family members, friends, and healthcare providers (e.g., see Simmons-Mackie et al., 2010 for a review).

It is important to acknowledge that not all individuals will have an adequate understanding of aphasia and its implications; therefore, it is important that PWA are capable and confident when using disclosure techniques. Disclosing often includes explaining what aphasia is, explaining common difficulties, and asking for modifications and adjustments when necessary. While we cannot determine from this study whether disclosure statements were trained or acquired spontaneously, it appears that communication partners were willing to make adjustments when asked. This suggests that proper training for PWA and communication partners can lead to more successful communication for both parties.

In addition to the value of communication partner adjustments, PWA in the current study commented about gratitude for those that were willing to support and have patience with them. This feeling of gratitude seemed to instill a degree of optimism in an unfortunate situation and provide motivation to continue improving their lives and communication. Research from social psychology provides strong evidence for the practice of gratitude (Gran & Gino, 2010); however, to our knowledge, the benefits of gratitude for PWA specifically have not previously been explored. Future research may consider investigating the potential role of gratitude in aphasia rehabilitation.

Lack of Strategies and the Potential for Maladaptive Strategies

Previous qualitative studies discovered that PWA face negative attitudes regarding their communicative abilities and fear how their speech may be perceived by others. The aforementioned negative attitudes included comments about avoiding conversations or social settings to spare feeling excluded or unwanted (Harmon et al., 2020; Harmon et al., 2019). These previous qualitative findings provide insight into the negative strategies mentioned in the present study. It is important to note that the severity of language impairment for all PWA in the present study was mild to moderate. Although all participants had received speech therapy at some point following the onset of aphasia, only four of the participants were receiving speech therapy services at the time of the study. One of these was less than six months post-onset, whereas the other three were over five years post-onset. All four were receiving services through a pro bono university clinic which accepts only a limited number of clients with aphasia. Unfortunately, inconsistent speech therapy sessions that lack intense training for both PWA and caregivers rarely lead to sustainable results (Meinzer et al., 2005). Interestingly, not one participant said that they had addressed background noise as part of their therapeutic practice and/or training. These

discoveries are particularly poignant given the perceived challenges these participants described while speaking in noise. Given that no participants with aphasia had addressed background noise in therapy, it is not surprising that several described having no available strategies for dealing with the situation. In fact, three PWA who mentioned a lack of strategies also mentioned or were observed to use maladaptive strategies. Inadequate knowledge of coping strategies seems to have led some participants to engage in maladaptive behaviors like negative self-talk, not talking, or complete withdrawal.

PWA are often trained on practical behavioral strategies such as self-advocacy techniques in therapy, but cognitive and social strategies are rarely trained explicitly and if they are, they are not practiced in everyday situations (Kneebone, 2016; Kneebone & Jeffries, 2013; Thomas et al., 2013). Results from the present study suggest that some people with mild to moderate aphasia do have cognitive and social strategies to cope with communication challenges (especially background noise) but they appear to have been developed through their experiences over time and not explicitly trained. Many participants with aphasia described using strategies but were unaware that these were evidence-based methods for improving cognitive-linguistic performance (e.g., making word associations, taking cognitive breaks, and mentally rehearsing story details) (Thumbeck et al., 2021).

Ours and other qualitative studies have found PWA to have significant restrictions regarding engagement in conversation when there are environmental distractions. With a lack of cognitive, emotional, and social strategies, disengaging can affect their relationships with themselves and others (Baylor et al., 2011; Dalemans, De Witte, Wade, & Van Den Heuvel, 2010; Harmon, 2020). To enhance the quality of life for PWA, it may be helpful for training to include instruction and practice focused on how to cope with background noise. For example,

therapy might first seek to train PWA on how to accurately perceive noisy communication situations; they could then either modify the environment, change their thought patterns related to the situation, or implement explicit cognitive strategies that were trained in therapy. In relation to modifying their environment, PWA could find ways to achieve a more ideal communication situation such as moving to a quieter table in a restaurant, turning down the music in the car, or asking a friend to come closer during conversation. In relation to changing their thought patterns, PWA could learn cognitive restructuring techniques that help them see noisy communication situations as opportunities for growth, which could mitigate feelings of stress, overwhelm, and frustration (Laures-Gore & Buchanan, 2015). If cognitive strategies were explicitly trained in therapy, PWA would also have an arsenal of potential tools for coping with the demands of background noise. In the present study, strategies mentioned included taking breaks, reducing sensory input, and being educated on internal memory aids. This list represents a potential starting point for strategies that may be appropriate to train explicitly.

Limitations

Findings from the present study should be interpreted in light of several limitations. First, unlike previous qualitative studies, the present study was done in the first nine months of a pandemic where most noisy environments such as restaurants were closed, and social gatherings were discouraged. When asked about everyday experiences with background noise, some participants had difficulty remembering examples due to an increased period of isolation. However, patients were interviewed immediately following the experimental task, which equipped them with a recent experience of attempting to communicate in noise. Although participants struggled at times to come up with strategies, a majority easily shared the challenges and barriers associated with communicating in background noise. The open-ended approach

focusing on challenging everyday situations could have likely led participants to focus more on the challenges associated with their communication rather than the strategies and facilitators. Participants were also unsure whether the strategies they were using were actually helpful, which could lead them to be more reticent when sharing. Although the interview was appropriate for the purpose of the study which was to better understand the challenges associated with communicating in noise so that therapy can better simulate real life situations, the interview could have been structured differently in order to glean more information regarding strategies and facilitators.

Conclusion

Everyday communication situations most often occur in the presence of background noise which increases attentional demands. The distractions associated with background noise might divide the speaker's attention from being able to successfully communicate or attend to a task (Baylor et al., 2011; Dalemans, De Witte, Wade, & Van Den Heuvel, 2010; Parr, 2007). The purpose of this study was to explore the subjective experiences of PWA while completing a task in the presence of distracting background noises. Findings suggest that background noise poses increased cognitive, social, and emotional challenges for PWA. The need for supportive communication partners and resources to facilitate communication in difficult environments was reported by participants with aphasia. Explicit training for communication partners and PWA may help PWA more effectively cope with the challenges of difficult noise situations, which may lead to increased confidence and social participation. Future research should continue investigating the effect of background noise on the communicative experiences of PWA and how therapy might be modified to generalize to real world situations.

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APPENDIX A

Annotated Bibliography

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Objective: The purpose of this study was to better assess the similarities and differences in communication participation across a variety of communication disorders. The study also sought to better understand how participation is restricted in individuals with communication disorders.

Methods: The study included 44 adults who presented with 7 different medical conditions associated with communication disorders. This article was a secondary analysis of qualitative data which was collected during cognitive interviews to develop the Communicative Participation Item Bank. The data were analyzed using Atlas.ti to develop themes and codes related to communication participation.

Results: It is important to note that the terms for the themes and codes were not chosen beforehand but instead emerged as different topics were raised in the notes. The data showed that many participants shared experiences in which they experienced interference in communicative participation. Two major themes emerged from the data. The first theme was *Interference is both "functional" and "emotional"* and *it depends.* The first theme was described by the participants as interference limiting their ability to accomplish tasks and having emotional consequences. The second of *it depends* was described as variables that contribute to interference such as environmental factors and personal decisions.

Conclusions: Despite having different disorders, the participants all described similar communicative participation restrictions. The article concluded that these findings may lead to better assessments and treatment of communication restrictions in these disorders.

Relevance to current work: This article had many points of relevance to my thesis. The part that most directly related was the data analysis section which brought up the use of Atlas.ti in the coding of the face-to-face interviews. In this process a handful of authors were included to insure interrater reliability. The term "triangulation" was also used in this study which ensures trustworthiness and rigor. My thesis incorporated this in a sense by having 3 trained interviewers, 2 transcribers, and 3 coders.

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, 14*(2), 141–155. https://doi.org/10.3109/17549507.2011.632026

Objective: This study was a meta-analysis that sought to integrate the findings from a variety of qualitative studies to explore the perspectives of three participant groups (individuals with aphasia, speech-language pathologists, and family members) about living successfully with aphasia.

Methods: The method of this study was an iterative process of systematically re-interpreting and transforming concepts from an individual study into another as a means to reformulate multiple study findings at a more detailed level. A "seven step" process was used to create themes, subthemes, and categories. The process had a lot of back and forth (iterative process) until the reviewers came to a consensus. Overarching themes

arising from the meta-analysis process were described through a narrative account that highlighted the similarities and differences of data across the participant groups. Venn diagrams were constructed as a means to visually display the relationships between the three participant groups for each overarching theme.

Results: The qualitative meta-analysis process identified seven overarching themes that represented the data across the three participant groups. The themes included participation, meaningful relationships, support, communication, positivity, independence, and living successfully with aphasia as a journey over time.

Conclusions: The results concluded people with aphasia's need for a holistic, client-centered approach that considers communication in the broader context of an individual's daily life, a call for greater involvement of family members in the rehabilitation process and services that cater for family members' needs, the need for positivity and hope in rehabilitation services, and services that acknowledge the chronicity of aphasia by addressing individuals' changing needs over time.

Relevance: This article is very similar and relevant to my study. It includes created themes, subthemes, codes, similarities, etc. from qualitative data. It gave me insight into how I might present my findings in my thesis.

Cavanaugh, R., & Haley, K. L. (2020). Subjective communication difficulties in very mild aphasia. *American Journal of Speech-Language Pathology, 29*(1 Special Issue), 437–448. https://doi.org/10.1044/2019_AJSLP-CAC48-18-0222

Objective: This study was conducted to glean better insight into the communicative difficulties of those who have mild to recovered aphasia.

Methods: Five people with mild/recovered aphasia who scored above the Western Aphasia Battery-Aphasia Quotient, were interviewed to discuss the difficulties in everyday communication situations within the framework of living with aphasia.

Results: The participants reported notable communication difficulties, decreased social participation, difficulties returning to work and daily activities, a continual need to concentrate when engaging in language tasks, and an awareness of persisting impairments.

Conclusions: Even people with very mild aphasia experience significant daily language difficulties that affect their ability to live successfully with aphasia. More research and investigation are needed to better assess the provide intervention.

Relevance to current work: This article is relevant to my thesis in many different aspects but most specifically in that of the methods. Like this article, my thesis will include interviewing PWA and analyzing those interviews in a hope to better understand how background noise affects their everyday lives.

Cruice, M., Hill, R., Worrall, L., & Hickson, L. (2010). Conceptualizing quality of life for older people with aphasia. *Aphasiology, 24*(3), 327–347. https://doi.org/10.1080/02687030802565849

Objective: This was a descriptive study that investigated factors that influence the quality of life of those living with aphasia.

Methods: The study consisted of 30 older participants (16 women, 14 men) with mild to moderate aphasia. All participants demonstrated adequate communication skills to participate. Participants participated in a structured interview while in their own homes using six brief, unprompted, open questions about their quality of life. The first five

questions were drawn from previous gerontological research and the last question specifically targeted communication. Content analysis was used, identifying discrete units of data and then coding these into concepts and factors. Additional demographic information was collected, and participants' mood on day of interviewing was assessed using the Geriatric Depression Scale.

Results: The results indicated that the factors that most impacted their quality of life, for better or for worse, were activities, verbal communication, people, and body functioning. Other factors including stroke, mobility, positive personal outlook, in/dependence, home, and health were also noted to influence their quality of life.

Conclusions: The findings of this study suggest that many of the factors that influence quality of life are shared with their peers. The article concluded that activities are fundamental for people living with aphasia. Activities were the most influential data in that they most influenced the PWA's quality of life when they were no longer able to participate in the activities they used to be able to.

Relevance: This article/study is relevant to my study in its in-depth analysis of the qualitative findings that influence PWA's QoL. A question in my thesis was how their experience with retelling a story with background noise is similar to their everyday experience. Similar comments were made in my study about how specific activities have been made harder now that they have aphasia.

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, 32*(20), 1678–1685. https://doi.org/10.3109/09638281003649938

Objective: The purpose of this study was to better understand how people with aphasia participate socially and to investigate the factors that help or adversely influence it.

Methods: A cross-sectional study was conducted in 150 people with aphasia using a structured interview format, adjusted to the communicative abilities of the participants. SPSS 16.0, a research software, was used to summarize the data using descriptive statistics.

Results: The results were reported in 4 different tables. The first table shared the outcomes of the socio-demographic, injury severity, rehabilitation, and personal and social variables. The second table shows the actual level of social participation recorded for each item. Table 3 presents the correlations that involve two variables between the possible predicting factors and social participation measured with the CIQ. Lastly, table 4 showed how functional performance, age, gender and severity of aphasia affected communication.

Conclusions: From this article, I learned that stroke severity in terms of functional dependence and aphasia, greatly influences social participation. The article concluded that by reducing limitations in functional performance as well as by promoting communication, people with aphasia could gain greater social participation.

Relevance: This article is relevant to my thesis in that it categorized and reported on qualitative data. It gave me insight into how I can transfer my data into tables and numerical values that are easier to understand.

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, 45*(5), 537–550. https://doi.org/10.3109/13682820903223633

Objective: The purpose of this study was to better understand how people with Aphasia view their participation in society and to see what factors most influence them and if and how they choose to participate.

Methods: This was a qualitative study where 13 people with aphasia and 12 caregivers kept a diary over the course of two weeks where they recorded about their individual experiences and perspectives.

Results: The results of this study showed that people with aphasia are not necessarily concerned with the number or activities that they participate in but more the social quality of those activities. This study better analyzed the feelings of isolation that PWA experience and how they yearn for feelings of engagement, involvement, and belonging.

Conclusions: This article talked about how people with aphasia place more weight on the amount of engagement they get out of social events rather than the number of social events they attend.

Relevance to current work: From this article, I was able to glean the most insight from the methods section. This study, similar to mine, is qualitative and focuses and uses a semi-structured interview that was analyzed after using codes, categories, and central themes. I was able to gain insight into how I might code the interviews I have conducted in order to get the most out of them.

Harmon, T. G., Jacks, A., Haley, K. L., & Bailliard, A. (2020). How responsiveness from a communication partner affects story retell in aphasia: Quantitative and qualitative findings. *American Journal of Speech-Language Pathology, 29*(1), 142–156. https://doi.org/10.1044/2019_AJSLP-19-0091

Objective: Since PWA often interact with partners who are not responsive to their attempts to communicate, this study sought to investigate how communication partner responsiveness affects quantitative measures of speech and subjective reactions during a story retell.

Methods: A mixed study was conducted. In the first study, participants with aphasia and controls retold stories to a responsive and unresponsive partner. The accuracy of the story retell, delivery speed and ratings of psychological stress were measured and compared. In the second study, participants completed a semi-structured interview about their experience participating in the story retell which were recorded and then transcribed and coded.

Results: The quantitative results revealed that PWA experienced increased stress and decreased delivery speed with unresponsive communication partners. Qualitative results revealed that participants with aphasia were more sensitive to unresponsive communication partners and reported more emotional reactions. The responsiveness of the communication partner also affected how PWA perceived and coped with the overall communication experience.

Conclusions: Qualitative and quantitative findings suggested that unresponsive communication partners elicit strong emotional reactions from people with aphasia, which, in turn, affect their communication experience.

Relevance to current work: This study relates to my current work because it is a mixed-method study that involves a semi structured interview to better understand the challenges that PWA face every day.

Harmon, T. G. (2020). Everyday communication challenges in aphasia: descriptions of experiences and coping strategies. *Aphasiology, 34*(10), 1270–1290. https://doi.org/10.1080/02687038.2020.1752906

Objective: This study sought to explore everyday communication challenges for PWA and how they cope with these challenges.

Methods: Twenty-one participants with mild or moderate aphasia completed a semi-structured interview that followed their participation in a larger experiment. These interviews focused on everyday experiences of PWA and how those experiences relate to situations they experienced during the experiment (retelling stories to a responsive and unresponsive communication partner and while completing a concurrent task). The interviews were recorded, transcribed verbatim, and then coded.

Results: This study found relationships, environmental distractions, and coping strategies to be common themes from the interviews. PWA said they were greatly influenced by their communication partners and the environment in which these conversations take place. Two thirds of participants reported implementing behavioral and/or cognitive strategies to cope with everyday challenges of living with aphasia.

Conclusions: This study concluded that PWA face communicative challenges every day. These challenges stem from a lack of support from their communication partners, exposure to background noise, and having to perform a concurrent task. PWA reported using coping mechanisms involving their thoughts, attitudes, and beliefs. The author concluded that future research is needed to better understand how to focus on cognitive strategies in aphasia therapy and to improve generalization and social participation.

Relevance to current work: This study adds insight to behavioral and cognitive strategies used by PWA.

Harmon, T. G., Jacks, A., Haley, K. L., & Bailliard, A. (2019). Dual-Task effects on story retell for participants with moderate, mild, or no aphasia: Quantitative and qualitative findings. *Journal of Speech, Language, and Hearing Research, 62*(6), 1890–1905. https://doi.org/10.1044/2019_JSLHR-L-18-0399

Objective: The purpose of this study was to explore qualitative data from people with mild, moderate, and no aphasia and see how they perceived their completion of retelling a story with a concurrent task.

Methods: This study consisted of both qualitative and quantitative data collection. The quantitative data collection had people with aphasia retell stories in isolation and while differentiating between high and low tones. The retells were then analyzed in terms of retell accuracy, speed, and perceived effort. After completion of the task, participants completed a semi-structured interview where they were asked about their retell experience.

Results: The results showed that PWA exhibited more difficulties in spoken language than the controls. All people with aphasia reported more negative emotional and behavioral reactions to the dual task and opposed to the controls as well. Interestingly, only people with mild aphasia reported during the interview that they used cognitive strategies to cope with the cognitive demands associated with the task.

Conclusions: Overall, the study concluded that dual tasks are more difficult for PWA as opposed to people without aphasia; however, a big take away was that the results

showed people with mild aphasia better coping with high demands communicative situations than those with moderate aphasia.

Relevance to current work: The method of collecting data is very similar to my thesis in that there is a quantitative and qualitative side to it. Like my study, the qualitative semi-structured interview included getting feedback from the participants about what coping strategies they used in order to complete the dual task.

Harmon, T. G., Hardy, L., & Haley, K. L. (2018). Proactive social validation of methods and procedures used for training speech production in aphasia. *Aphasiology, 32*(8), 922–943. https://doi.org/10.1080/02687038.2017.1385051

Objective: The objective or goal of this study was to better understand the social validity of goals in treatment and to see if offering choice making in this process would prove advantageous.

Methods: Seven people with aphasia and eight speech-language pathologists were interviewed about previous treatment that targeted speech production. Detailed field notes were obtained and analyzed.

Results: The results concluded with four overlapping themes including experience with treatment, experience with practice, procedural choice making and therapeutic engagement. Common codes were also created and defined.

Conclusions: This study showed that people with aphasia value treatment goals and procedures that are most likely to increase their personal motivation such as offering them a choice and help them see their progress.

Relevance to current work: This study talked about how the interviews were modified depending on the needs of the person with aphasia through supported communication.

Howe, T. J., Worrall, L. E., & Hickson, L. M. H. (2008). Observing people with aphasia: Environmental factors that influence their community participation. *Aphasiology, 22*(6), 618–643. https://doi.org/10.1080/02687030701536024

Objective: This study sought to explore the environmental factors that hinder or support the community participation of adults with aphasia.

Methods: Ten participants with aphasia were observed participating in several community environments. The participants, aged 35 to 72, were purposefully selected using maximum variation sampling for a variety of variables such as gender, aphasia severity, and living situation. Qualitative content analysis was used to analyze the field notes.

Results: The study revealed six major themes: referents, interaction, familiarity, communication complexity, time available for communication, and availability of extra support for communication.

Conclusions: The results contribute to the development of an audit tool to identify barriers and facilitators in the community for people with aphasia.

Relevance: This study observed and listened to people in their natural settings while the researchers took field notes. The data was reported using those notes and an interview conducted after the observations. The data is similar to the data I collected in my interviews. The data was read and reread and then put into themes.

Kemper, S., Herman, R. E., & Lian, C. H. T. (2003). The costs of doing two things at once for young and older adults: Talking while walking, finger tapping, and ignoring speech or noise. *Psychology and Aging, 18*(2), 181–192. https://doi.org/10.1037/0882-7974.18.2.181

Objective: Young and older adults provided language samples in response to questions while walking, finger tapping, and ignoring speech or noise. The language samples were scored on 3 dimensions: fluency, complexity, and content. The hypothesis that working memory limitations affect speech production by older adults was tested by comparing baseline samples with those produced while the participants were performing the concurrent tasks.

Methods: Seventy-five young adults and 75 older adults completed all of the tasks. There were nine tasks: talking alone, walking alone and while talking, complex finger tapping alone and while talking, and simple finger tapping alone and while talking, talking while ignoring concurrent speech, and talking while ignoring concurrent noise. All tasks were administered in a fixed order and cognitive tests were administered here and there. Many other tests were administered after the nine tasks were completed.

Results: The results of this study were more numerical but because my study is not, I am going to focus on the take-away results without going into the data side of things. This study was designed to assess whether concurrent task demands differentially affect young and older adults' speech. In general, both groups of participants were able to meet the demands of doing two things at once, simultaneously talking while walking, finger tapping, or ignoring speech or noise. The exception appears to be complex finger

tapping where both groups adopted a task- alternation strategy, as indicated by the increased DTCs for the time-on-task.

Conclusions: Young adults respond to dual task demands differently than do older adults.

Relevance: This article is relevant to my study by the fact that it was further investigating the effects of dual tasks on speech. Though the methods section was not as relevant, the results and conclusions gave me a lot to think about in how I will formulate those sections of my thesis.

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, 28*(4), 421–439. https://doi.org/10.1080/02687038.2013.869305

Objective: The research seeks to explore factors that help or hinder participation according to people who live with aphasia.

Methods: Seventeen people with aphasia participated in a semi structured small group interview. The interviews were transcribed and analyzed qualitatively by breaking them into excerpts and regrouping excerpts with similar meaning.

Results: PWA mentioned more factors helping their participation rather than hindering. Helpful or facilitating factors included: helpful family members, community organization and aphasia support groups, and self-determination. Hindrances included poorly adjusted speakers and limited services post stroke.

Conclusions: This article concluded that rehabilitation professionals should refocus the services that they provide to PWA and their families to better help them

maintain a positive identity, optimal communication, and strong relationships. PWA should be encouraged to ask for specific services in their community. Using participation-based models of therapy would be a better approach to helping PWA experience a better quality of life.

Relevance to current work: This is relevant to my current work in that it involves a semi-structured interview that asked PWA about their experiences post stroke. The transcription and coding of the interviews gave insight into how I can better organize and code the interviews in my study.

Murray, L. L., Holland, A. L., & Beeson, P. M. (1998). Spoken language of individuals with mild fluent aphasia under focused and divided-attention conditions. *Journal of Speech, Language, and Hearing Research, 41*(1), 213–227. https://doi.org/10.1044/jslhr.4101.213

Objective: The aim of this study was to evaluate the spoken language of individuals with mild fluent aphasia under focused and divided-attention conditions.

Methods: The spoken language of individuals with mild aphasia and age-matched control subjects was studied under conditions of isolation, focused attention, and divided attention. A picture-description task was completed alone and in competition with a tone-discrimination task.

Results: Regardless of condition, individuals with aphasia performed more poorly on most morphosyntactic, lexical, and pragmatic measures of spoken language than control subjects. When the condition complexity was increased there was little quantitative or qualitative change in the spoken language of the control group. On the contrary, individuals with aphasia showed dual-task interference; as they shifted from isolation to divided-attention conditions, they produced fewer syntactically complete and

complex utterances, fewer words, and poorer word-finding accuracy. In pragmatic terms, their communication was considered less successful and less efficient.

Conclusions: The results suggest that decreased attentional capacity may negatively affect the quantity and quality of the spoken language of individuals with mild aphasia.

Relevance: This study is relevant to my study in that I conducted interviews following a divided attention/dual task similar to this study. Though my thesis will not address the effect these tasks have on spoken language, it is important for me to understand how those findings may correlate with the results I gleaned from my qualitative data.

Sherratt, S., & Worrall, L. (2020). Posttraumatic growth following aphasia: A prospective cohort study of the first-year post-stroke. *Aphasiology, 35*(3), 1–23. https://doi.org/10.1080/02687038.2020.1787945

Objective: This article reported on a quantitative and qualitative study to determine whether people with aphasia can experience post traumatic growth throughout their first year after a stroke.

Methods: 13 people with aphasia were assessed at four different points throughout the year using a longitudinal cohort study. The quantitative study used a post traumatic growth inventory based on five domains and the qualitative study consisted of open-ended interviews.

Results: There were no significant differences in the mean total post traumatic growth inventory scores at each stage. There was, however; a greater growth noted as time progressed. In regard to domains, new possibilities and spiritual domains scored

relatively low at all stages, whereas relationship to others, appreciation of life and personal growth consistently showed the most growth at each time period.

Conclusions: This study concluded that there are some individuals with aphasia that can move beyond simply living successfully with aphasia and actually experience post traumatic growth in that they are not merely managing their aphasia but gaining personal and social awards because of it.

Relevance to current work: This study applies to my thesis in that it consists of both qualitative and quantitative aspects. The qualitative study includes a semi-structured interview that seeks to gain insights into the lives of PWA.

Villard, S., & Kidd, G. (2019). Effects of acquired aphasia on the recognition of speech under energetic and informational masking conditions. *Trends in Hearing, 23*. https://doi.org/10.1177/2331216519884480

Objective: This study compared the performance of PWA and age-matched healthy controls on a masked speech identification task and examined the consequences of different types of masking on performance.

Methods: This study modified a speech identification task that required good visual perception as well as the ability to semantically map a spoken word to a picture (within a consistent four-item closed set); however, it removed many of the other demands often present in standard speech identification tasks. This task was used for both PWA and HC participants. Participants were required to demonstrate ceiling-level performance on the task in quiet before beginning the full set of conditions.

Results: For the speech masking condition, a significant difference was observed between PWA. For the noise masking condition and the glimpsed speech condition, the difference between PWA and HC was not significant.

Conclusions: Results suggest that aphasia—even, in some cases, mild aphasia—may result in difficulties separating target speech from masker speech that cannot be accounted for by age, HL, or pure comprehension deficits. Although further work is needed to identify at precisely what point PWA abilities falter, as well as which cognitive-linguistic abilities may be predictive of the degree of this impaired processing in individual PWA, these findings demonstrate that this is an important issue in PWA.

Relevance to current work: The goal of this study was to assess the effect of acquired aphasia on ones to selectively attend to target speech in complex acoustic environments. This is relevant to my thesis because the objectives are similar as we as well are seeking to determine how different noise conditions affect PWAs ability to communicate.

APPENDIX B

Consent Form for People With Aphasia

Consent to be a Research Subject

Introduction

This longitudinal research study is being conducted by Tyson Harmon, Ph.D., CCC-SLP and Dr. Christopher Dromey, Ph.D., CCC-SLP at Brigham Young University. The purposes of this study are to (1) determine the impact of background noise conditions on spoken language and (2) learn about the communication experiences of people recovering language after a stroke or brain injury from their own perspective. You were invited to participate because you had a stroke or other brain injury that affected your communication.

Procedures

Your participation in this study will involve a **single evaluation session** lasting **1.5 to 2 hours**. During this session, you will be asked to complete a number of tests, retell stories in background noise conditions, and respond to some questionnaire and interview questions.

The tests, questionnaires, and interview will involve:

	**Speech, Language, and Attention Tests**	Naming pictures and objects Repeating words and phrases Answering questions Following directions Describing pictures Looking for symbols and listening for tones
	**Story Retell Tasks**	Listening to and retelling short stories

	**Questions about communication experiences**	Participation in communication activities Supports and barriers to communication

Several of these tests, questionnaires, and a brief interview will be **audio or video recorded** to check scores and complete more detailed analysis after the session. The session will be held on BYU campus (John Taylor Building room 110).

As noted above, **audio and video recordings** will be obtained throughout the evaluation session. Please indicate what uses of these recordings you are willing to permit, by initialing next to the uses you agree to and signing at the end. This choice is completely up to you.

___Yes ___No Audio and/or video recordings can be studied by the research team for use in the **research project**.

___Yes ___No Short excerpts of audio and/or video recordings can be used for **scientific publications, conferences, or meetings**.

___Yes ___No Short excerpts of audio and/or video recordings can be shown in **university classes**.

Risks/Discomforts

Risks associated with this study are minimal. Because some of the test items may be difficult, you may become anxious or embarrassed. You might also become tired or frustrated. We will make every effort to be sure you are as comfortable as possible during the testing. **You can take a break or discontinue your participation at any time.** If the session is too long, the length and number of sessions can be changed according to your needs.

Benefits

Since this is not a treatment study, there is likely no direct benefit to you. However, your participation in this study will provide us with information that might generally improve

assessment and treatment of people with communication impairments following stroke or brain injury.

Confidentiality

All **data** collected for the purposes of this study will be **kept confidential** and will only be reported without personally identifiable information.

You will be given a number that will identify you for this study. All data obtained from you will be associated with this number instead of your personally identifiable information. Any paper forms or test protocols will be kept in locked cabinets in a locked research lab at BYU. Any electronic forms or files (e.g., audio files) will be kept on a secured, password protected server. Only those directly involved with the research will have access to these data.

Compensation

You will receive $15.00 cash after completing the session.

Participation

Participation in this research study is **voluntary**. You have the right to withdraw at any time or refuse to participate entirely. You do not have to be in this study to receive clinical services through the BYU Speech and Language Clinic. Choosing to not participate will not jeopardize your services at BYU or any other healthcare service you receive.

Questions about the Research

If you have questions regarding this study, you may contact Tyson Harmon, Ph.D., CCC-SLP by phone at 801-422-1251 or email at tyson_harmon@byu.edu.

Questions about Your Rights as Research Participants

If you have questions regarding your rights as a research participant contact IRB Administrator at (801) 422-1461; A-285 ASB, Brigham Young University, Provo, UT 84602; irb@byu.edu.

Statement of Consent

I have read, understood, and received a copy of the above consent and desire of my own free will to participate in this study.

Name (Printed):	Signature:	Date:
_____	_____	_____

APPENDIX C

Consent Form for Control Participants

Consent to be a Research Subject

Introduction

This research study is being conducted by Tyson Harmon, Ph.D., CCC-SLP and Dr. Christopher Dromey, Ph.D., CCC-SLP at Brigham Young University. The purposes of this study are to (1) determine the impact of background noise conditions on spoken language and (2) learn about the communication experiences of people recovering language after a stroke or brain injury from their own perspective. You were invited to participate in this study as a pilot or control participant.

Procedures

Your participation in this study will involve a single session lasting 1.5 to 2 hours. During the session, you will be asked to complete an attention test. You will also complete a questionnaire intended to verify that you have not experienced a stroke or other neurological damage.

During the experimental task, you will listen to a variety of short stories and retell them in background noise conditions. You will also answer questionnaire and interview questions about your experiences retelling these stories. This session will be held on BYU campus (John Taylor Building room 110).

Audio/video Recordings

During the session audio and video recordings will be obtained so that we can complete more detailed analysis after the session. Please indicate what uses of these recordings you are willing to permit, by initialing next to the uses you agree to and signing at the end. This choice is completely up to you. We will only use the recordings in the ways that you agree to. In any use of the audio/video, you will not be identified by name.

> Audio and video recordings can be studied by the research team for use in the research project.
>
> Short excerpts of audio and/or video recordings can be used for scientific publications, conferences, or meetings.
>
> Short excerpts of audio and/or video recordings can be used in university classes.

Risks/Discomforts

Risks associated with this study are minimal. Because some of the tasks may be difficult, you may become anxious or embarrassed. You might also become tired or frustrated. We will make every effort to be sure you are as comfortable as possible during the testing. You can take a break or discontinue your participation at any time. If the session is too long, the length and number of sessions can be changed according to your needs.

Benefits

Although there will likely be no direct benefit to you for participating in this study, your

participation will provide us with information that might generally improve assessment and treatment of people with aphasia.

Confidentiality
All data collected for the purposes of this study will be kept confidential and will only be reported without personally identifiable information. Any personally identifiable information will be stored separate from research data in a locked cabinet in the researcher's office.

You will be given a number that will identify you for this study. All data obtained from you will be associated with this number instead of your personally identifiable information. Any paper forms or test protocols will be kept in locked cabinets in a locked research lab at BYU. Any electronic forms or files (e.g., audio files) will be kept on a secured, password protected server. Only those directly involved with the research will have access to these data.

Compensation
You will receive $15.00 cash after completing the session.

Participation
Participation in this research study is voluntary. You have the right to withdraw at any time or refuse to participate entirely.

Questions about the Research
If you have questions regarding this study, you may contact Tyson Harmon, Ph.D., CCC-SLP by phone at 801-422-1251 or email at tyson_harmon@byu.edu.

Questions about Your Rights as Research Participants
If you have questions regarding your rights as a research participant contact IRB Administrator at (801) 422-1461; A-285 ASB, Brigham Young University, Provo, UT 84602; irb@byu.edu.

Statement of Consent
I have read, understood, and received a copy of the above consent and desire of my own free will to participate in this study.

Name (Printed):	Signature:	Date:
_____	_____	_____

APPENDIX D

Aphasia Noise Code Book

Purpose: Explore how different types of background noise affect people with aphasia compared with people who don't have aphasia and understand their everyday experiences with communicating in noise.

Cognitive

Challenges

- *Attention:* any mention about difficulties attending to stimuli or tasks and/or distractions.
    - Use code when referencing real life experiences.
    - Any specific mention of "focus," "concentration"
- *Memory*: any comment about informational retrieval.
- *Multitasking*: comments about doing more than one task at once.
    - *"*…I can't do two things at once, which is scary as a mom."
- *Sensory Distractors:* any mention of a stimulus affecting their ability to complete a task.
- *Decreased Processing Speed*: any mention of not being able to process what is being said/heard due to background noise.
- *Fatigue*: any mention of decreased mental capacity with increased noise exposure.

Strategies

- *Focus*: any mention of intentionally attending to specific stimuli to improve task completion.
    - Deliberate vs. Spontaneous
- *Internal Memory Aid:* any mention of patterns of thinking that help remember details from experiment or facilitate communication with background noise.
    - *Associations:* mention of making connections between stories and their past experiences.
    - *Repetition:* mention of repeating something to themselves in order to remember.
    - *Rehearsal:* mention of verbal or mental rehearsal to assist in retrieval and understanding.
    - *Visualization:* mention of creating a mental image to help remember details.
- *Reducing Sensory:* any mention of creating a sensory environment that is conducive to better communication.
- *Taking Breaks*: any mention about removing oneself from demanding noise environments to improve their communication experience.
- *Slowing Down:* any comment about decreasing rate of communication either for the PWA or the communication partner.
- *Lack of Strategies:* any mention of not having adequate knowledge and or usage of compensatory strategies to facilitate communication with background noise.
- *Negative Compensatory Strategies:* Any mention of withdrawing or avoiding a communicative encounter to avoid a possible communication breakdown.

Emotional

Challenges

- *Stress:* feeling of emotional or mental tension due to participating in a demanding noise condition.
- *Overwhelm:* any mention of feeling overwhelmed because of their aphasia.
- *Frustration:* any mention of feeling upset or annoyed, especially because of inability to communicate effectively.

Strategies

- *Positive Affirmations:* any mention of maintaining a positive perspective of one's ability to communicate in different noise environments.
- *Emotional Regulation:* comments about one's ability to calm themselves in highly stimulating environments.
- *Gratitude:* any mention of appreciation for the ability to communicate to some degree.

Social

Challenges

- *Unsupported Relationships:* comments about lack of support from communication partners in a demanding noise environment.
- *Social Withdrawal:* any mention of withdrawing from social situations due to presence of background noise.
    - *Groups:* any mention of groups being more difficult to participate with due to increased noise.

Strategies

- *Self-Modified Communication:* any mention of the person speaking modifying their communication with background noise to be better understood by others.
- *Relying on Supportive Partners:* any mention of how their communication partner supported them in their communication efforts.

Miscellaneous

- *Condition: Easy*: mention of experimental conditions that were easy/tolerable.
- *Condition: Difficult:* mention of experimental conditions that were difficult.
- *Negative Self Evaluation:* negative comments about oneself and their abilities in challenging noise conditions.
- *Positive Self Evaluation:* positive comments about oneself and their abilities in challenging noise conditions
- *Rehabilitation Services:* any mention of not receiving adequate therapy regarding background noise.

APPENDIX E

Semi-Structured Interview Guide for People With Aphasia

"Thank you for agreeing to participate. We are very interested to receive your feedback about the experience you just had telling stories in different noise conditions. We want to learn about your perceptions of how these different conditions affected your communication and relate to your day-to-day life."

[Make sure to give people time to think before answering the questions and don't move too quickly. Use the probes to make sure that all issues are addressed but move on when you feel you are starting to hear repetitive information.]

Questions:

1. Let's start by talking about some of your experiences related to speech therapy.
    a. Are you currently receiving speech therapy? *Circle their response:* YES / NO
        i. If yes:
            1. how long have you been receiving services?
            2. How many days per week do you attend therapy sessions?
            3. How long does each speech therapy session last?
        ii. If no:
            1. when was the last time you received speech therapy services?
    b. Has a therapist ever talked to you about background noise? How was this addressed in therapy? What training tasks have you completed?
    c. What strategies do you use in your life to cope with background noise?

2. Next, I would like to hear about some of your impressions regarding the experiment (i.e., retelling stories in the different noise conditions).

a. What was easy for you?

b. What was difficult for you?

c. What strategies did you use to cope with the different noise conditions?

3. What day-to-day experiences did these communication situations remind you of? Please describe and give specific examples.

Probes for Discussion:

· *Stress response and any link to speech behavior*

· *Perceived differences between telling the story across different conditions*

· *Self-evaluation of story retell performance*

· *Factors that contributed to ease/challenge of story retell task*

· *How and why these situations relate to everyday communication*

"That concludes our interview. Thank you so much for coming and sharing your thoughts and opinions. If you have additional information that you did not get to share, please feel free to contact Dr. Tyson Harmon" [provide business card].

APPENDIX F

Semi-Structured Interview Guide for Control Participants

"Thank you for agreeing to participate. We are very interested to receive your feedback about the experience you just had telling stories in different noise conditions. We want to learn about your perceptions of how these different conditions affected your communication and relate to your day-to-day life."

[Make sure to give people time to think before answering the questions and don't move too quickly. Use the probes to make sure that all issues are addressed but move on when you feel you are starting to hear repetitive information.]

Questions:

1. First, I would like to hear about some of your impressions regarding the experiment (i.e., retelling stories in the different noise conditions).

   a. What was easy for you?

   b. What was difficult for you?

   c. What strategies did you use to cope with the different noise conditions?

2. What day-to-day experiences did these communication situations remind you of? Please describe and give specific examples.

Probes for Discussion:

· Stress *response and any link to speech behavior*

· Perceived *differences between telling the story across different conditions*

· Self-*evaluation of story retell performance*

· *Factors that contributed to ease/challenge of story retell task*

· *How and why these situations relate to everyday communication*

"That concludes our interview. Thank you so much for coming and sharing your thoughts and opinions. If you have additional information that you did not get to share, please feel free to contact Dr. Tyson Harmon" [provide business card].