

CS6795 Fall 2024 Final Report

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Abstract—This paper explores common communication errors in articulation and comprehension and ways to mitigate them. Research on drivers of interpersonal communication, language disorders, external aids like note-taking, and nonverbal cues like gestures reveal how these factors enhance or impair communication. The role of cognitive limitations, bounded rationality, and distributed cognition also highlights how errors arise and how tools can be used to help mitigate them.

I. INTRODUCTION

Effective communication is vital for success in academics, personal life, and professional growth. Individuals who struggle with communication often miss out on much of the information presented to them. Those unable to express their knowledge clearly risk being unfairly perceived as uninformed or lacking education [1]. Addressing sources of communication errors can lead to significant improvements in interpersonal interactions.

Cognitive biases, such as the availability heuristic and confirmation bias, influence how we process and convey information, often leading to misunderstanding. Disorders of speech, language, and hearing further complicate articulation and comprehension. For individuals with these challenges, effective communication requires specialized tools and strategies.

There are multiple approaches we can take to mitigating these errors. Understanding the drivers of interpersonal communication, employing external aids like note-taking or visual aids, and utilizing nonverbal cues such as gestures and disfluencies can all enhance clarity. Furthermore, for individuals with temporary or permanent communicative impairments, Augmentative and Alternative Communication (AAC) methods provide essential tools for overcoming barriers. Finally, integrating communication skills into educational curricula ensures that individuals are equipped to both convey and understand information effectively in diverse settings.

II. LITERATURE REVIEW DESIGN

A. Search Methodology

The literature review was conducted by searching Google Scholar for a range of terms including (but not limited to) *communication, articulation, comprehension, nonverbal communication, disorders of communication, communicative biases, errors in communication, and communication therapy*.

B. Selection Criteria

Preferential focus was placed on recent scholarship by filtering out papers older than fifteen years and reviewing

abstracts to manually select studies that best aligned with the research question. Selected papers were analyzed by taking markdown notes on each one in the note-taking software Obsidian, adding reflections which included common patterns, important findings, connections to cognitive science, and relation to my research question. References from the course (CS6795 Introduction to Cognitive Science) were also included, such as lecture material [2] and essential readings such as Paul Thagard's Mind [3] and a paper by Nersessian [4]. Certain websites were also used as additional references for supplementary information (the full list of which can be found in the references section at the end of the paper).

C. Adjustments in Research Focus

My research question was refined to be more specific, becoming **what are common errors adult humans make in communicative articulation and comprehension, and what are some tools used to mitigate these errors?** This allowed me to target the research literature more effectively. For instance, several research papers which I analyzed were discarded from consideration, as they were tangential and did not have direct relevance to my research question. These included:

- *Effective communication skills among married couples: An overview* [5]
- *Mental Simulation as Substitute for Experience* [6]
- *Ineffability: the Very Concept* [7]
- *Analysis of Articulation Errors in Dysarthric Speech* [8]

III. RESULTS

A. What Drives Interpersonal Communication

According to Berger [9], interpersonal communication is goal driven and self-serving, with five key functions:

- **Impression Management** (i.e., positively shaping the impressions other people have of the speaker)
- **Emotional Regulation** (i.e., providing comfort and consolation)
- **Information Acquisition**
- **Social Bonding**
- **Persuasion**

What gets discussed is influenced by both the mode of communication (synchronous vs. asynchronous) and the audience (i.e., friends vs. acquaintances, large vs. small audiences, and higher status vs. lower status individuals). For example, asynchronous (written) communication can lead to more polished

	Communication Audience			Communication Channel		
	Stronger Ties	Larger Audience	Higher Status	Written vs. Oral	Identifiability	Audience Salience
Impression Management	+/-	+	+	+	+	+
Emotion Regulation	+	+/-	-	-	0	+
Information Acquisition	+/-	+/-	0	+/-	0	+
Social Bonding	+	-	+	-	+	+
Persuade Others	+	+/-	-	+	+	+/-

Fig. 1. Important moderators and their impact on word of mouth motivations. + means increase, - means decrease, 0 means no change, and +/- means both directions. Image source: [9]

persuasive messaging, while synchronous (oral) communication can facilitate social bonding. **Fig. 1** on the previous page shows how these moderators impact motivations.

Echterhoff and Schmalbach found that communication is a key platform for creating a **shared reality**, which they define as “the experienced commonality of inner states with others about an object” [10]. Their findings suggest that low time pressure, positive mood, and encouraging the discussion of unique information can all aid in mitigating **shared information bias**, which is the tendency for group members to prioritize information that is already commonly known, while neglecting unique information possessed by individual members.

B. Cognitive Biases

Cognitive shortcuts and biases influence judgment and decision-making [11], which in turn can affect interpersonal communication. Many biases shape how individuals process, interpret, and convey information, often leading to misunderstandings or miscommunications. In addition to the aforementioned shared information bias, other common biases which affect communication include:

- **Availability Bias:** Where individuals rely on readily available information to make judgments. This can cause errors in communication by leading to egocentric judgments or assumptions.
- **Confirmation Bias:** Confirmation bias affects how individuals seek, interpret, and recall information, which can lead to reinforcing preexisting beliefs rather than considering alternative viewpoints.
- **Framing:** The framing effect shows how the presentation of information can shape perception and decision-making. In communication, how a message is framed (positive vs. negative) can dramatically change how it is received.
- **Overconfidence:** Overconfidence in one’s ability to understand or convey information can lead to poor articulation or assumptions that others share the same understanding.

C. Insights from Language Disorders

TABLE I
TYPES OF COMMUNICATION DISORDERS (ASHA, 1993)

Type of Disorder	Definition
Speech	Impairment in articulation (production of speech sounds), fluency (flow of speaking), or voice (vocal quality, pitch, loudness, etc.).
Language	Impairment in comprehension and/or use of spoken, written, or other symbol systems. Affects the form (phonology, morphology, syntax), content (semantics), or function (pragmatics) of language.
Hearing	Impaired auditory sensitivity that limits speech and/or language development. Includes classifications such as deaf or hard of hearing.
Central Auditory Processing	Deficits in processing auditory signals that affect perceptual, cognitive, and linguistic functions.

The American Speech-Language-Hearing Association (ASHA) provides definitions and guidelines on communication disorders. ASHA defines a **communication disorder** as “an impairment in the ability to receive, send, process, and comprehend concepts or symbol systems, including verbal, nonverbal, and graphic symbols” [12]. **Table I** lists the different types of disorders identified by ASHA.

Research by Bishop et al. [13] shows how looking at language disorders, whether they are caused by injuries or develop over time, helps us understand how we communicate. When someone has a language disorder due to a brain injury, it can lead to specific communication problems. For instance, a person with semantic dementia might have trouble understanding words, even though they can repeat complicated ones. This shows that while they can still say words, their ability to understand their meanings is affected. In other words, different language processing systems (e.g., phonology, semantics) can be impaired independently of one another, which relates to the notion of modularity in the brain’s language functions.

Studying how children develop language also reveals important insights about how we learn to communicate. Kids with language difficulties might actually know grammar rules but have a hard time using them correctly in the moment. This suggests that their struggle isn’t due to a lack of knowledge but rather an issue with processing information as they speak.

D. External Aids for Comprehension

Jansen et al. [14] show that note-taking can benefit comprehension depending on how information is presented, how the notes are taken, and differences in cognitive ability among individuals. In addition to creating notes which serve as **external storage** for future reference, the processing of note-taking appears to exhibit an immediate **encoding effect** whereby people who take notes engage with material more effortfully, thereby increasing retention of that material. However, care must be taken as to avoid **verbatim overlap** where notes end up being rote copies of lecture material, which has consistently been shown to have a negative relationship with factual-recall.

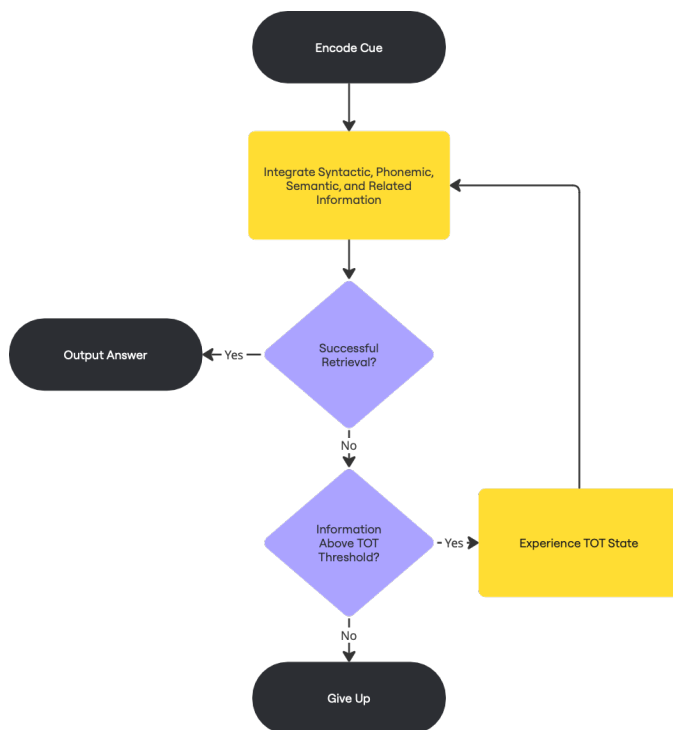


Fig. 2. A model of the cognitive process associated with tip-of-the-tongue (TOT) states. Image is a modified version of a figure found in [18]

Russ et al. [15] show that team checklists are not only essential for minimizing adverse outcomes in high risk environments (such as operating rooms) but also valuable in more mundane settings by serving as a way for people to familiarize themselves with each other, promoting individuals' sense of participation and responsibility, and aiding in the alignment of shared mental models.

Oatley proposed that "works of fiction are simulations that run on minds" [16] which research shows can be used to improve social skills. The author cited papers which found that reading fiction is shown to aid in developing empathy and theory of mind by providing readers with a simulation of human experiences and emotions. Works of fiction let readers explore challenging social interactions in a safe, reflective way, encourage self-reflection, and strengthen narrative skills, letting people better structure their own stories.

E. Paralinguistic Features that Aid Communication

Dargue et al. [17] used a four category classification system for nonverbal gestures:

- **Iconic:** Gestures semantically related with their accompanying verbal content (e.g., raising one's arms while talking about picking something up).
- **Metaphoric:** Gestures that represent an abstract metaphor (e.g., talking about a stock while pointing up to indicate that its value is rising).
- **Deictic:** Using pointing gestures to draw attention (e.g., pointing at a cat while saying "cat").

- **Beat:** Rhythmic movements of the hand that accompany speech (e.g., politicians flicking their hand to emphasize particular parts of their speech)

Their meta-analysis showed that gestures are beneficial to comprehension when they are observed but even more so when they are produced. No gesture was found to be more beneficial than another and gestures were equally beneficial across all age groups.

Schwartz and Metcalfe define a **tip-of-the-tongue state** (TOT) as "the feeling that accompanies temporary inaccessibility of an item that a person is trying to retrieve" [18]. For example, when someone speaks and can't remember a word they want to use but know it exists. Counterintuitively, according to the research, TOTs actually serve as memory aids by alerting our higher-order executive functions that retrieval failures are potentially resolvable. **Fig. 2** shows a simplified flowchart for how TOTs are believed to be triggered.

Diacheck and Brown-Schmidt [19] show that **disfluencies**, which are interruptions in fluent speech, can both help listeners recognize forthcoming information and aid in information recall. This is consistent with the **attentional orienting hypothesis**, which is the notion that disfluencies focus listeners' attention on upcoming context, thereby enhancing memory for words that follow directly afterward. They identified three types of disfluencies:

- **Pauses:** Used while planning a new message before the actual articulation of that message begins (e.g., "she walks towards the door ... and then ... stops abruptly")
- **Fillers:** Also used while planning a new message before the actual articulation of that message begins (e.g., "he reaches for the book and um... realizes it's the wrong one")
- **Repetitions:** Typically used when the planned material is already available and articulated, allowing it to be repeated (e.g., "I think that the the key is on the table")

Their research found that disfluencies, rather than being a nuisance, are used as meaningful cues to guide immediate understanding and reinforce memory of discussions.

F. The Importance of Communication in Education

Morreale et al. performed a literature review on papers which highlight the significance of studying communication in today's society [1]. Noting that while humans are born with the ability to vocalize, the ability to communicate effectively is acquired through learning and must be taught. Thus, they emphasize the need for communication as a central focus in education, listing the following key themes:

- Communication education is vital to individual development.
- Communication education improves whole educational systems.
- Communication education enhances our social and cross-cultural understanding.
- Communication education is essential to career success.
- Communication education should be taught by specialists.

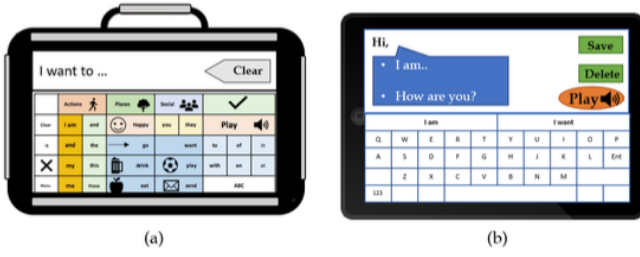


Fig. 3. Examples of a dedicated (a) and a non-dedicated (b) device running an AAC application with predictive language and speech generation. Image source: [20]

Notably, communicative skill has broad applicability and crosses disciplinary and professional boundaries. People with ineffective listening skills have difficulty comprehending new material, while people who can't articulate information clearly may be incorrectly perceived as uneducated or misinformed.

G. Augmentative and Alternative Communication

"Up to 1% of the global population experiences speech, language, or communication needs (SLCN), with paralysis and medical conditions posing communication barriers" [20]. Augmentative and Alternative Communication (AAC) can help these individuals who have significant challenges communicating.

Elsahar et al. [20] classify AAC into three categories:

- **No-tech AAC:** Facial expressions and voluntary movements (e.g., sign language).
- **Low-tech AAC:** Tools like books and display boards with images and phrases.
- **High-tech AAC:** Electronic devices, such as speech-generating devices (SGDs), to convert user intent into speech.

Elsahar et al. also classify AAC users into one of three categories:

- **Alternative-language users:** Difficulty conversing but with intact cognitive understanding.
- **Augmentative-language users:** Difficulty with both understanding and conversing.
- **Temporary AAC users:** Short-term difficulties such as after surgery.

AAC systems utilize various human signals, including body movements, breathing, vocalization, and brain activity, often combining these inputs to enhance accessibility for users with differing abilities. Imaging methods, like eye-tracking and head-pointing systems, employ video-oculography, electro-oculography, and infrared technologies to follow eye movements, aiding communication for individuals with limited motor skills. Mechanical tools, such as keyboards and switches, support both direct and indirect selection methods, with scanning options available for users with restricted mobility. Touch-activated systems commonly feature resistive or capacitive touchscreens, allowing message selection through taps or swipes, often enhanced by predictive language models. Breath-activated systems encode messages via distinct breath patterns,

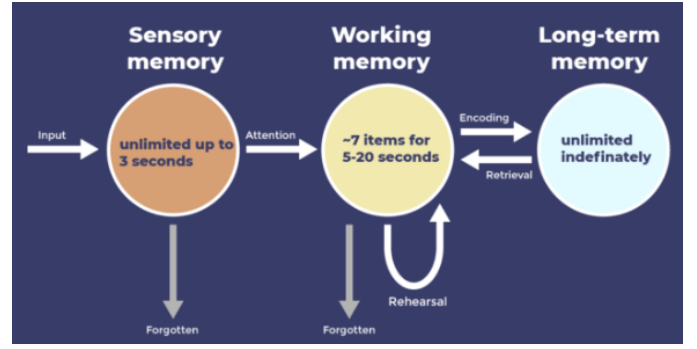


Fig. 4. Atkinson and Shiffrin's memory processing model describes memory as a flow through three stages: sensory memory, short-term memory, and long-term memory storage. Cognitive load theory is used to reduce effort in this process. Image source: [21]

facilitating communication for those with severe mobility limitations using breath-to-text and sniff-based interfaces. Brain-Computer Interface (BCI) systems detect brain activity through invasive or non-invasive methods, such as EEG, to allow individuals with significant motor impairments to communicate or control devices without physical movement [20]. See Fig. 3 for examples of devices running AAC applications.

IV. DISCUSSION

A. Implications

There are a number of principles of cognitive science which are implicated in this research. For one, the theory of **Bounded Rationality**, first proposed by Herbert Simon, states that the rationality of human behavior is constrained by incomplete information and limited cognitive resources (e.g., time, memory, and attention) [22]. Accordingly, our ability to comprehend information communicated to us is limited by what information is presented (and how it is presented) as well as how much of our cognitive resources we can allocate to that information. This can help explain why humans are susceptible to certain biases or make particular errors in communication.

"**Cognitive load** refers to the amount of information our working memory can process at any given time" [22]. Using the findings in Section III as an example, cognitive load is induced by note-taking, meaning that people who take notes must divide their attention between the process of note-taking and the process of listening to a speaker. This can explain why note-taking may actually be detrimental for individuals with lower cognitive abilities, and why asynchronous communication methods can be a benefit for students, allowing them to pause material being presented while they take the time to process that information. Cognitive load is additionally believed to be reduced by the use of gesturing [17]. Research on using gestures in tandem with verbal communication suggests that they enable speakers to organize and communicate their ideas more efficiently. For an illustration of a memory processing model, see Fig. 4.

Distributed cognition is a theory that describes how information processing is distributed among intelligent agents

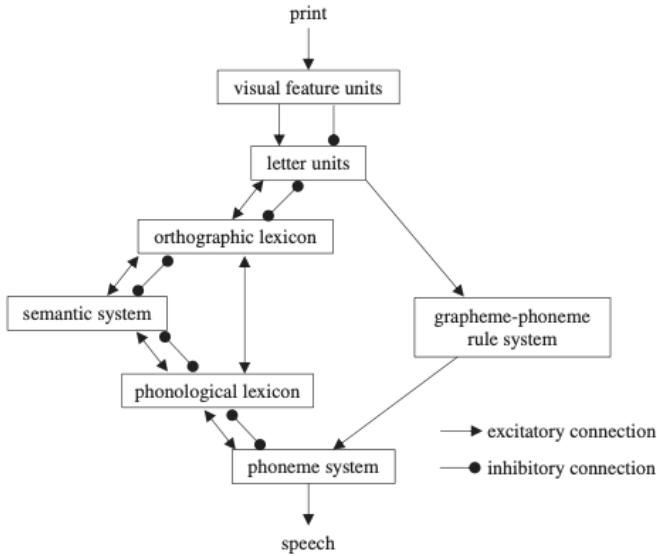


Fig. 5. The Dual Route Cascaded model used to explain how we read words aloud, emphasizing two main routes that operate in parallel to convert written words into spoken language. Image source: [13]

and their environment [23]. Research applicable to distributed cognition and communication in Section III includes the use of team checklists and note-taking, where those external aids can be used to help structure information in a cogent manner to increase comprehension.

Connections in cognitive science refer to connectionist networks that consist of units and links. They are one of the main theories of mental representation currently advocated by cognitive scientists [3]. Bishop et. al state that “a key feature of connectionist models simulating acquired disorders is the interaction of components of language processing with each other and with other cognitive domains” [13]. They discuss a number of different models for explaining language processing (such as box-and-arrow models and triangle models), with an emphasis on how different components (like phonology, semantics, and orthography) interact. One such model can be seen in **Fig. 5**.

The age old philosophical debate about the innateness of knowledge is well-exemplified by the juxtaposition of **Rationalist** and **Empirical** views. Rationalists argue that “logic and rules are used to build new knowledge out of our innate knowledge [while] Empiricists [argue] that a lot of our knowledge is generated from experiences” [24]. Morreale et al. point out that even though humans are born with the ability to vocalize (innate knowledge), they must develop the knowledge, attitudes, and skills necessary for effective communication [1]. In particular, written text is a much more recent phenomenon in human history and “reading is likely to depend on more general systems that have evolved to support primary functions such as vision and language” [13].

According to the Computational-Representational Understanding of Mind (CRUM), people produce intelligent behavior because they have **mental representations** and algorithmic

processes that operate on those representations [3]. A similar (and perhaps synonymous) term used is that of **mental models**. According to Nersessian, “creating models as systems of inquiry...is central in... problem solving” [4]. The construction of mental models can be aided by tuning communication to attenuate shared information bias [10] and even by reading fiction, which has been shown to aid in the development of empathy and theory of mind [16]. Worth noting is that cognitive biases may arise when our mental models are distorted, incomplete, or overly simplified. To prevent this and other errors, strategies like using team checklists can help ensure common understanding and align mental models of key concepts between team members [15].

B. Importance

This research is significant because communication is an essential aspect of human interaction that directly influences personal, academic, and professional success. Miscommunications or difficulties in articulation and comprehension can create barriers that affect relationships, hinder knowledge sharing, and cause individuals to be perceived as less competent. By examining common errors and understanding their underpinnings, we can identify more effective strategies for communication. This approach ensures a multifaceted understanding of communication challenges and supports the development of tools and interventions that make communication more efficient and inclusive.

C. Real-World Applications

TABLE II
HEURISTICS, ASSOCIATED BIASES, AND MITIGATION STRATEGIES

Heuristic	Associated Bias	Mitigation Strategies
Mental shortcuts based on prior knowledge	Egocentric Bias	Perspective-taking exercises, feedback loops, rephrasing
Using initial information as a reference point	Anchoring Bias	Presenting balanced information, reframing, avoiding premature judgments
Judging based on easily recalled examples	Availability Bias	Using data and structured frameworks, avoiding reliance on personal anecdotes
Favoring information that confirms existing beliefs	Confirmation Bias	Open-ended questions, fact-based discussion, promoting curiosity
Choosing familiar or clear options	Ambiguity Effect	Providing clarity, examples, and encouraging questions
Overestimating one's own knowledge or abilities	Overconfidence Bias	Double-checking assumptions, peer reviews, feedback mechanisms
Interpreting information based on how it is presented	Framing Effect	Reframing information, considering multiple perspectives

TABLE III
SUGGESTED COMMUNICATION METHODS FOR DIFFERENT TYPES OF
COMMUNICATION DRIVERS

Driver	Suggested Methods
Impression Management	<ul style="list-style-type: none"> - Use engaging, self-relevant, and positive content. - Avoid exaggeration; focus on authenticity.
Emotion Regulation	<ul style="list-style-type: none"> - Share emotional experiences carefully, using language that encourages cognitive reappraisal. - Choose contexts where social support is likely.
Information Acquisition	<ul style="list-style-type: none"> - Clearly articulate the problem or question. - Seek diverse perspectives for complex decisions.
Social Bonding	<ul style="list-style-type: none"> - Emphasize shared experiences and common ground. - Use emotionally resonant language to strengthen connections.
Persuasion	<ul style="list-style-type: none"> - Present balanced arguments; use emotion judiciously. - Tailor the message to the audience's values and interests.

TABLE IV
STRENGTHS AND LIMITATIONS OF DIFFERENT AAC METHODS

AAC Method	Strengths	Limitations
Eye-gazing	<ul style="list-style-type: none"> - Non-invasive - Minimal voluntary control of muscles - Can be used with patients requiring mechanical ventilation 	<ul style="list-style-type: none"> - Data processing is complex - IR signals not reliable outdoors - High cost
Head-pointing	<ul style="list-style-type: none"> - Less expensive compared to typical eye-gaze systems 	<ul style="list-style-type: none"> - Needs fine precision - In direct contact with user's head
Typing/icon selection	<ul style="list-style-type: none"> - Instant feedback to user when key is pressed 	<ul style="list-style-type: none"> - Voluntary muscle control required
Touch-activated	<ul style="list-style-type: none"> - Minimal activation pressure 	<ul style="list-style-type: none"> - No direct feedback upon activation - Requires appended feedback mechanisms (auditory/sensory)
Breath-activated	<ul style="list-style-type: none"> - Integration with a predictive language model 	<ul style="list-style-type: none"> - Requires physical control of movements - Portability constraints - Slow conversational rate
Brain-Computer Interface	<ul style="list-style-type: none"> - Communication without need for body movements 	<ul style="list-style-type: none"> - Prone to classification errors - Difficult for everyday use - Requires assistance from caregivers

Being aware of our cognitive biases and the drivers of interpersonal communication is critical for improving clarity in both interpersonal and professional settings. This has practical applications in a multitude of areas such as teaching, learning,

and conflict resolution as awareness of biases and drivers can lead to more effective communication strategies.

Table II presents several mental heuristics that humans use to make quick and efficient daily decisions. However, these heuristics often lead to biases due to their tendency to generalize and overlook potentially important information. The table also includes research-based mitigation strategies from Ehrlinger et al. [11] to counteract these biases. Similarly, **Table III** presents methods of effective communication tailored to different types of communication drivers. Note how each driver requires distinct approaches to maximize understanding and impact [9].

The study of language disorders suggests that interventions should be tailored to the specific aspects of language that are impaired rather than taking a one-size-fits-all approach. For instance, people with disordered cognitive understanding can benefit from augmentative communication tools such as picture-based communication systems or speech-generating devices, whereas people who have intact cognitive understanding but difficulty conversing would benefit from alternative communication tools such as text-to-speech software or speech-training programs. See **Table IV** for a comparison of different AAC methods based on research by Elsahar et al. [20].

External aids like note-taking and team checklists have applications in education and organizational communication in workplaces. Jansen et al. [14] identified five processes which effective note-takers must perform:

- 1) Comprehend the material
- 2) Identify key points
- 3) Link to prior material
- 4) Summarize
- 5) Write it down

These processes introduce greater cognitive load, so people should be aware of the trade-offs and make decisions accordingly. For instance, individuals with faster handwriting or typing speeds can dedicate more time to focusing on the material presented synchronously, making note-taking likely to benefit their recall more often than it does for slower note-takers. In contrast, slower note-takers or those with lower working memory capacity should preferentially utilize asynchronous material whenever possible to allow for pauses and reflection.

Incorporating checklists into workplaces and educational settings can similarly enhance communication and decision-making by reducing cognitive load and providing structured support for essential tasks. Safety checklists improve teamwork and communication by fostering open dialogue, promoting the sharing of critical information, and helping to align mental models among team members [15]. These mechanisms reduce observable errors associated with poor team coordination and mitigate differences in authority, creating an environment where all participants feel empowered to voice concerns. Just as note-taking demands efficient information processing, effective checklist use depends on user engagement and thoughtful implementation to avoid turning into mere

formalities, as disengagement can undermine the checklist's intended benefits.

The research on the effects of gesture on comprehension [17] has significant real-world applications. Here are a few examples:

- **Education:** Teachers can use gestures to enhance students' understanding. For example, using iconic or metaphoric gestures to illustrate abstract ideas can help students form stronger mental associations with the material.
- **Public speaking and presentations:** Incorporating gestures strategically can reduce cognitive load for speakers, making their delivery smoother and more engaging.
- **Clinical settings:** Therapists and communication specialists can apply these insights to support individuals with language or cognitive impairments to improve outcomes.
- **User interface design:** Gestures could be integrated into virtual or augmented reality systems to facilitate more intuitive interactions.

Finally, this research calls for more focused education on communication, especially in professional training programs where clarity and articulation are critical. For example, incorporating training on the purpose and use of paralinguistic features may lead to better communication outcomes. Elements like tone, pitch, rhythm, and pauses subtly but powerfully shape the meaning of our words, infusing them with emotional nuance and directing attention where it is needed most. When professionals develop an awareness of these features, they can tailor their communication to suit different contexts, making their interactions more engaging and effective.

V. CONCLUSION

Effective communication is fundamental for fostering understanding and connection across various aspects of life, including academia, personal relationships, and professional environments. This paper explored the common errors adults make in communicative articulation and comprehension with an emphasis on the role of cognitive biases and communication disorders. By recognizing how cognitive shortcuts influence our interactions, we can better appreciate the complexities of effective communication.

The findings suggest that employing external aids, leveraging nonverbal cues, and integrating communication education into curricula can significantly enhance our ability to articulate thoughts and comprehend information. Moreover, Augmentative and Alternative Communication (AAC) methods are vital tools for individuals with communication barriers.

The research emphasizes the importance of a multipronged approach to improving communication. By understanding and addressing the many factors that contribute to communication errors, we create a more empathetic and effective society. As communication continues to evolve with technological advancements and cultural shifts, ongoing research and application of these insights will be critical to shaping a future where everyone can engage meaningfully and confidently.

VI. LIMITATIONS AND FUTURE RESEARCH

There are a number of limitations and challenges related to this research. First and foremost, the scope of the research question is quite broad. While it does cover a wide breadth of subjects, the trade-off is that none of them are given the depth needed to do them justice. Related to this is that the wide diversity of mitigation strategies presented in this paper makes it difficult to present a unified approach to addressing communication errors. Different contexts require different approaches, so just laying out everything that we know appears to aid articulation and comprehension is like laying out pieces of a very large jigsaw puzzle.

Secondly, there is no mention of cultural factors in this research. While I tried to only include topics which could be applied universally, many would benefit from an exploration of how specific social/cultural factors influence communication.

Finally, there is no mention of cost in this paper. For example, certain forms of AAC can be cost-prohibitive for people looking for solutions to problems caused by medical issues. Affordable and practical solutions could be just as or more important than optimal ones.

Future research can address these limitations by:

- Narrowing research focus to investigate specific types of communication errors.
- Investigating the impact cultural factors have on communication errors, perhaps by exploring common errors experienced when being exposed to unfamiliar cultures.
- Determining the practicality of different solutions to communication problems by comparing their cost-effectiveness.

VII. DISTRIBUTION OF RESPONSIBILITIES

The semester project plan can be found in Appendix A. All report-related tasks have now been completed, with the exception of revising and submitting the final presentation, which is due a week after this report. A total of twenty hours were subtracted from the initial estimate as the Week 6, Week 7, Week 10, and Week 11 tasks each took 5 hours less than expected to complete.

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APPENDIX A SEMESTER PROJECT PLAN

Week	Task	Description	Hours	Done
3	1	Brainstorm research topics	5	Y
3	2	Collect research papers	5	Y
4	3	Draft Project Pitch	10	Y
5	4	Revise Project Pitch	10	Y
5	5	Submit Project Pitch	.25	Y
PROJECT PITCH DUE SEP 23				
6	6	Start reading research papers	10	Y
7	7	Finish reading research papers	10	Y
8	8	Draft Midpoint Check-In	10	Y
9	9	Revise Midpoint Check-In	10	Y
9	10	Submit Midpoint Check-In	.25	Y
OPTIONAL MIDPOINT CHECK-IN DUE OCT 21				
10	11	Additional research	5	Y
11	12	Additional research	5	Y
11	13	Draft Final Report	10	Y
12	14	Revise Final Report	10	Y
13	15	Draft Final Presentation	10	Y
14	16	Submit Final Report	.25	Y
FINAL REPORT DUE NOV 25				
15	17	Revise Final Presentation	10	N
15	18	Submit Final Presentation	.25	N
FINAL PRESENTATION DUE DEC 2				
Total Hours:			121.0	