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The Use of Gesture in Self-Initiated Self-Repair Sequences by Persons with Non-Fluent Aphasia

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THE USE OF GESTURE IN SELF-INITITATED SELF-REPAIR SEQUENCES BY PERSONS WITH NON-FLUENT APHASIA

THESIS

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Arts in the College of Arts and Sciences at the University of Kentucky

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This study examines the relationship between types of gestures and instances of self-initiated self-repair (SISR) used by persons with non-fluent aphasia (NFA), which is a type of aphasia characterized by stilted speech or signing (Papathanasiou et al., 2013), in interactions with clinicians. Conversation repairs in this study are assessed using the framework of Conversation Analysis (CA), which is an approach for describing, analyzing, and understanding social interaction (Sidnell, 2010). Previous linguistic studies have demonstrated a distinct preference for the use of gesture during a repair by persons with aphasia (Goodwin, 1995; Klippi, 2015; Wilkinson, 2013). This study draws more conclusive generalizations than previous studies about the types of gesture used in successful and unsuccessful SISR by persons with NFA through the use of the AphasiaBank corpus. Results show that there does not appear to be a connection between the overall frequencies of gesture used by persons with NFA during a phase of the repair mechanism as compared to other phases in the repair mechanism. Additionally, there is a slight tendency in this dataset for persons with NFA to have more successful repairs when they use gesture during the initiation and reparable portions of the repair mechanism.

KEYWORDS: Aphasia, Repair, Gesture, Conversation Analysis, Communication Disorders

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Section 1: Introduction

Conversations rarely ever go as perfectly as the conversation partners intend them to go. They are often riddled with dis-fluencies that may result in an opportunity for a conversation partner to fix, or repair this outlying segment of conversation. The field of Conversation analysis (CA) has frequently studied these conversation repairs and has offered insight as far as what these repairs look like and how they function (Levelt, 1989; Schegloff, 1979, 1987, 1992, 1997a, 1997b, 2000; Schegloff et al., 1977). As common as repairs are, however, they are even more common when there is a communication disorder that interferes with the timeliness and seamlessness of this repair.

Non-Fluent Aphasia (NFA) is a communication disorder that affects these repair sequences. People affected by this disorder therefore have to find ways to compensate for these prolonged and sometimes messy conversation repairs. One way that people with NFA repair conversations is with the aid of gestures, such as pointing, tapping, or acting out the sequence of conversation being repaired. This phenomenon has been studied extensively, normally at a case-study level (Goodwin, 1995; Kim et al., 2014; Klippi, 2014; Wilkinson, 2013).

For this thesis, I focused on the interplay between self-initiated self-repair (SISR) and the use of gesture by persons with non-fluent aphasia. Specifically, the goals of this research project are:

1) To describe the relationship between gesture type and phase of repair in SISR sequences for persons with aphasia (PWA);
2) To determine if there is a difference between the use of gesture in successful vs. unsuccessful SISR sequences for PWAs and describe these patterns.

To explore these lines of inquiry, transcripts and videos of conversations from the AphasiaBank database were tagged for segments of each SISR and for types of gesture. In contrast with previous studies, 20 separate persons with NFA from the AphasiaBank corpus were included in this study.

The goals for this thesis focused on conversation repair and gestures for several reasons. Persons with NFA encounter many opportunities for repair in their conversations due to the great number of dis-fluencies in their speech as a symptom of NFA (Papathanasiou et al., 2013). Therefore, it is important that persons with NFA are trained in ways to better execute these repairs. This project will add to the body of knowledge available on an understudied aspect of conversation repair (SISR) in persons with aphasia. Additionally, this study contributes a detailed analysis of the types of gestures used by persons with NFA during SISR sequences. This information could be useful for clinicians who use Conversation Analysis (CA) in their treatment sessions with PWAs, where the use of gesture by persons with NFA during SISR sequences could be promoted or constrained by the clinician. Overall, this study seeks to apply linguistic methods to clinical data for the purpose of informing future clinical practice.

Section 2: Literature Review

Section 2.1: Conversation Repair

An aspect of the field of Conversation Analysis (CA) focuses on conversation repair (Levelt, 1989; Schegloff, 1979, 1987, 1992, 1997a, 1997b, 2000; Schegloff et al., 1977). The specific phenomenon of conversation repair is described by Sidnell as an "organized set of practices through which participants are able to address and potentially resolve problems of speaking, hearing, or understanding" (2010:110). Repairable items, or trouble sources, occur often in everyday conversation (Sidnell, 2010). Conversational breakdowns can originate from the listener or the speaker. When the listener in a conversation has trouble locating and processing the auditory signal of what was said, a problem of comprehension occurs (Sidnell, 2010). Difficulty with comprehending the message takes a number of forms, including when the listener doesn't recognize the word or words used, doesn't have enough context to know what the conversation is about, or the utterance is too syntactically ambiguous for the listener to correctly parse (Sidnell, 2010). When a speaker has difficulty finding or using a speech segment, this is an expressive breakdown (Sidnell, 2010). In all of these cases, in order to "fix" what was said, a repair must be made. Repairs occur in a specific sequence, which is referred to as the "repair mechanism." Sakes et al. define the repair mechanism as a method for negotiating turn-taking errors and violations (1974). A repair is generally considered successful if it is accepted by either participant in the conversation within the same turn-at-talk or a subsequent return close to the turn in which the repair occurred (Ferguson, 1994, 1998).

There are three main parts to a repair mechanism, or more simply put, a *repair*: the *initiation*, which occurs at a possible disjunction, the *repairable*, which is a portion of talk that should be repaired, and the *outcome*, which is a solution to the disjunction (Schegloff, 2000). The types of repair are also identified based on the positioning of the interlocutors, or members of a conversation, in conversation. These terms are the *self* (speaker of the repairable segment) and the *other* (any other participant) (Sidnell, 2010). Based on these types of repair, repair can be self-initiated/ self-repair, other-initiated/ self-repair, self-initiated/ other repair, other-initiated/ other-repair, etc. (Sidnell, 2010).

Table 2.1.1 below shows which participant in the conversation is responsible for each phase of the repair based on the type of repair. All examples of these repairs are from AphasiaBank unless otherwise noted.

Table 2.1.1: Types of Repair

	Repair Mechanism Initiation	Repair Mechanism Repairable	Repair Mechanism Outcome	Examples
Self-initiated self-repair	self	self	self	PAR: "I was there for about &fingers:two &t &uh &fingers:one one week."
Other-initiated self-repair	other	self	self	PAR: "because I got into &g the &uh &traces:circle cen(t)er. So I was there. INV: "A rehab center you mean?" PAR: Yeah. A rehab center.
Self-initiated other-repair	self	self	other	INV: "Do you remember when you had your stroke? PAR: nineteen &uh (…) &um (…) INV: It was a while ago. Do you remember anything about that day?
Other-initiated other-repair	other	self	other	(Schegloff et al. 1977:378) Ben: Lissena pigeons. Ellen: Coo-coo::: coo::: Bill: Quail, I think. Ben: Oh yeh? Ben: No that's not quail, that's a pigeon.

Note: PAR = Participant; INV = Investigator; & = Dis-fluency or Gesture; (...) = Pause; ::: = Extended Sound

Overwhelmingly, there seems to be a preference for self-repair because opportunities for self-repair occur earlier on in the organization of the turns than opportunities for other repair (Schegloff et al., 1977). Self-repairs occur at the word, phrase, turn-at-talk, and stress placement and intonation levels. The specific types of dis-fluencies that occur to initiate a repair sequence can occur in positions that are before (pre framing) or after (post framing) the repairable item. The exact positioning of certain types of dis-fluencies acting as repair initiators has been extensively studied. For example, Schegloff (2004) found that repeated words have been found to occur in both pre and post framing positions (as cited in Sidnell, 2010). Schegloff (2004) also examined how self-repair is framed in terms of deletions, insertions, replacements and reorderings. Intonation and stress were not examined in this thesis; however, Stivers' (2005) prior work on the modified repeat through changes in intonation contours suggests restructuring intonation and stress placement could act as a form of self-initiated self-repair (SISR). SISR as a specific type of self-repair, is usually directly preceded by a disruption in the turn at talk because of a dis-fluency like a repetition, hitch in speech, or cut-off sound (Sidnell, 2010). Repairs for SISR generally occur in the same turn that the repairable item occurs or in; more specifically they are usually initiated within the first syllable of the repairable. If the repair does not occur in the first turn, it generally occurs in the third-turn of a conversation turn-taking sequence (Schegloff, 1997b). This type of self-repair is not the only kind of self-repair used in conversation.

Other-initiated self-repair, which is a type of self-repair, is also common in conversation and takes a variety of forms. In contrast to SISR, other-initiated self-repair generally occurs in the turn immediately following the repairable, and is brought on by next-turn repair-initiators (Schegloff, 1992). This type of repair is initiated by the listener at that point in the conversation of the breakdown and contains wh-word, repeat, and understanding check repair initiator types (Sidnell, 2010). The least specific of the repair initiator types are the open-class repair initiators, while the most specific are the understanding checks (Sidnell, 2010). Table 2.1.2 shows the different repair initiator types and examples of each type (adapted from Sidnell, 2010).

Table 2.1.2: Types of Repair Initiators

Type of Repair Initiator	**Examples**
Open-class	"Huh?", "Pardon?", "What?"
Wh-Word	"Where?", "When?", "Who?"
Understanding check	"you mean (paraphrased prior segment)?"

The main conundrum of other-initiated repair is that it's not always clear what kind of repair is needed after the repair is initiated, especially if an open-class repair initiator is used (Jefferson, 1972). This is one of the reasons why other initiated repair is dis-preferred by interlocutors compared to self-initiated self-repair (Wilkinson, 1999). Self-initiated self-repair is interesting to study because of its "extremely sophisticated ability to parse the emerging structure of an utterance and to attend to multiple, simultaneous courses of conduct in interaction" (Sidnell, 2010).

Section 2.2: Gesture Theory

The act of gesture can also function as a type of repair and can assist repair sequences. Gesture and language are not the same thing, but they are linked, and the exact nature of this link is debated (Dipper et al., 2015). The four current schools of thought on this link are the *interface hypothesis* (Kita & Ozyurek, 2003), *growth point theory* (McNeill, 2000), *lexical hypothesis* (Butterworth & Hadar, 1989), and the *theory of gesture as a simulated action* (Hostetter & Alibali, 2008) (as cited in Dipper et al., 2015, Kim et al., 2014). The first of the theories, the interface hypothesis operates under the assumption that gesture is formulated pre-linguistically and therefore not subject to linguistic ideas (Dipper et al., 2015). Therefore, the link between gesture and language occurs cognitively (Dipper et al., 2015). The growth point theory, developed by David McNeill, puts gesture at the semantic level by asserting that all speech-gesture actively constructs meaning by filling the role of a psychological predicate. McNeill also categorized types of gestures as deictic, metaphoric, iconic, and beats (Dipper et al., 2015). Another theory, the lexical hypothesis, suggests gestures come into play during lexical retrieval and are part of lexical semantics (Dipper et al., 2015). The lexical hypothesis states that gestures function as providers of important semantic information that support the linguistic information during a repair by enhancing it or reflecting it (Dipper et al., 2015). The next theory of gesture looks at it as a simulated action. Speakers naturally simulate perceptual state and action during speech production and gestures are a by-product of simulated actions (Kim et al., 2014). There is much debate surrounding these theories and their effectiveness (Dipper et al., 2015). New theories on the gesture-language connection as well as variations on the current theories are also being developed.

For the purposes of this study David McNeill's growth point theory will be used to examine the use of gesture during conversation repair sequences. There are a number of reasons for the selection of this theory. First, McNeill developed a tagset that can be easily implemented to categorize types of gestures (McNeill, 2005). Second, this tagset has been used in previous studies investigating gesture use by persons with aphasia (Dipper et al., 2015). Third, most other gesture theories now reference the growth point theory and its importance in the study of gesture in some way (Dipper et al., 2015). Finally, this theory provides a consistent and research-supported method for categorizing gestures at a level that is fine-grained enough for this analysis.

The basic types of gesture described in the growth point theory are beats, deictic gestures, metaphoric gestures, and iconic gestures. McNeill makes a distinction that I do not make by calling these types of gestures "gesticulations" instead of gestures. The term "gesture" in growth point theory is broader than deictic, metaphoric, iconic, and beat movements. It actually encompasses emblems, pantomimes, adaptors, and sign language as well (McNeill, 2000). A full description of David McNeill's gestures and what characterizes each gesture is in Table 2.2.1 below (adapted from McNeill, 2000). As a reminder, this study will focus on the participant's use of what McNeill calls "gesticulations", which I will refer to as "gestures". I have also coded for pantomimes, emblems, sign language and adaptors present in repair sequences for the sake of completion.

Table 2.2.1: Growth Point Theory

Defining Characteristics	**Gesture Type**				
	Gesticulation	**Pantomime**	**Emblem**	**Sign Language**	**Adaptor**
Sub-types	Beat, iconic, deictic, metaphoric	N/A	N/A	ASL, BSL, NZSL, etc.	N/A
Relationship to speech	Obligatory presence of speech	Obligatory absence of speech	Optional presence of speech	Obligatory absence of speech	Optional presence of speech
Relationship to linguistic properties	Linguistic properties absent	Linguistic properties absent	Some linguistic properties present	Linguistic properties present	Linguistic properties absent
Relationship to conventions	Not conventionalized	Not conventionalized	Partly conventionalized	Fully conventionalized	Not conventionalized
Character of semiosis	Global and synthetic	Global and analytic	Segmented and synthetic	Segmented and analytic	N/A
General definition	A movement involving any part of the arm(s) from the shoulder to the finger tips that has the above defining characteristics	A movement involving any part of the arm(s) from the shoulder to the finger tips that has the above defining characteristics	A movement involving any part of the arm(s) from the shoulder to the finger tips that has the above defining characteristics	A movement involving any part of the arm(s) from the shoulder to the finger tips that has the above defining characteristics	A movement involving any part of the arm(s) from the shoulder to the finger tips that has the above defining characteristics and is used to attend to a bodily need (e.g. scratching nose, brushing hair out of face, etc.).

The sub-types of gesticulations, or “gesture types” as I am calling them are deictic, iconic, metaphoric, and beat. Deictic gestures are pointing motions used to identify an entity under discussion or refer to a location in space where the entity has been placed or occurred (McNeill et al., 1993). An example from an AphasiaBank participant using a deictic gesture is shown in Figure 2.1.1 below. This figure continues onto the following page.[1] Transcription conventions for figures in this section are the same as those described in Table 2.1.1.

Figure 2.1.1: Deictic Gesture

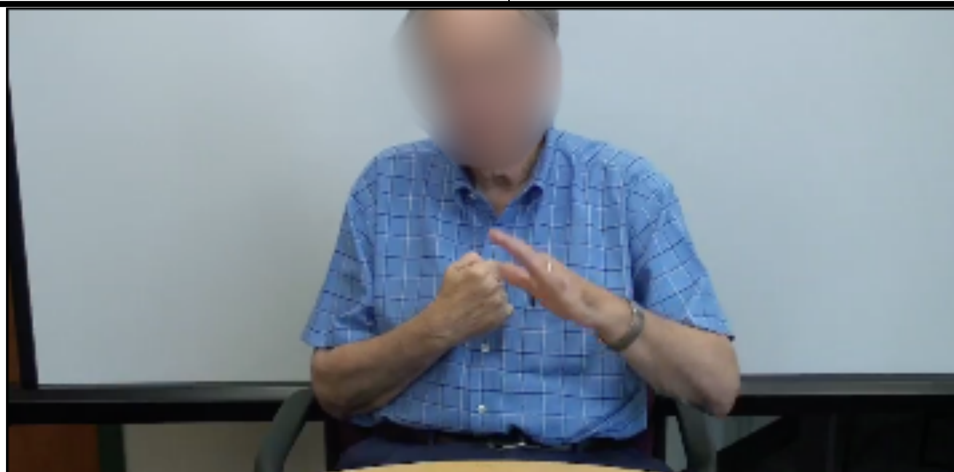
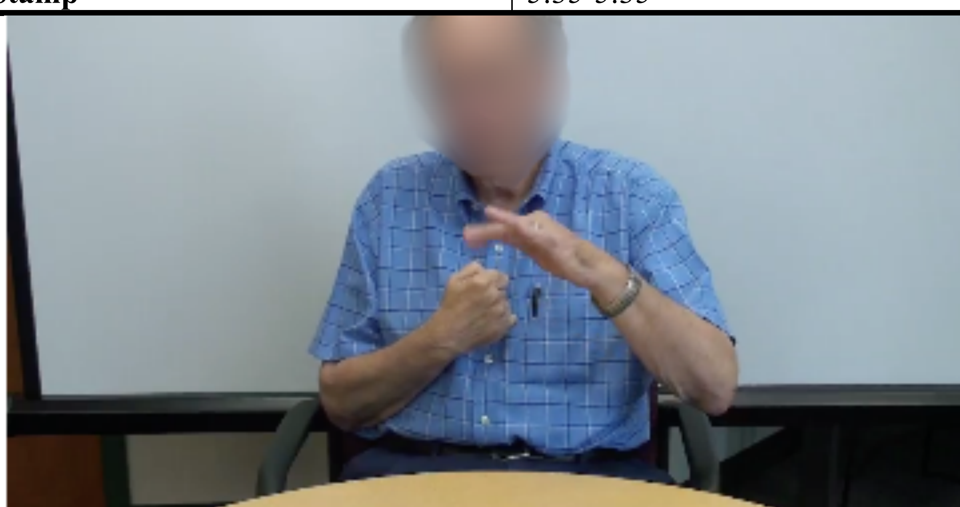
Deictic Gesture	
	
Description of Gesture Phase	Prestroke hold: The participant waits to initiate the stroke phase of the gesture with the left hand raised to chest level and palm facing up.
Co-occurring Speech	“An:d”
Time Stamp	1:06-1:08

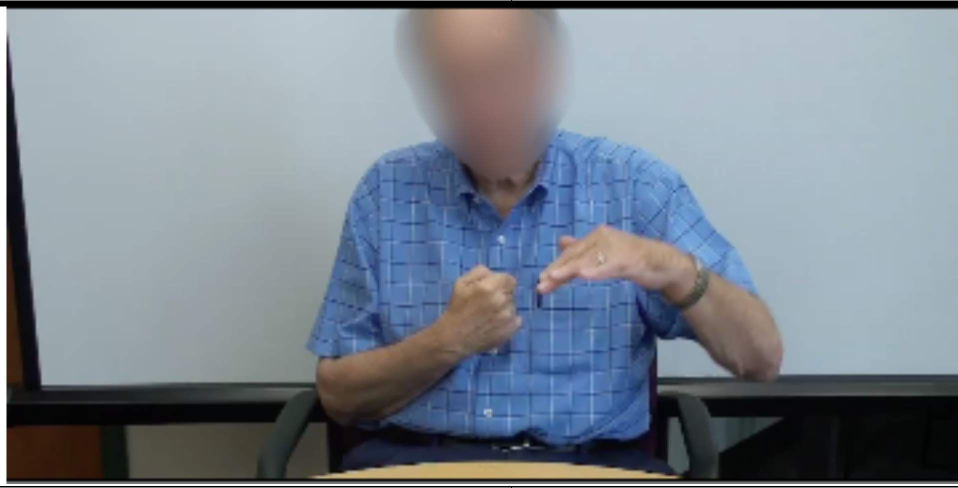
[1] The use of these screenshots of participants for this thesis and the method for concealing participants’ identity was cleared with Brain MacWhinney from AphasiaBank (Personal Communication, March 30th, 2016).

	
Description of Gesture Phase	Stroke: The participant moves the hand from the starting position to her head while maintaining the palm facing up position.
Co-occurring Speech	“&uh”
Time Stamp	1:08-1:09
	
Description of Gesture Phase	Stroke hold: The palm of the hand flips over when it reaches the participant’s head. This phase of the gesture is held static for the remainder of the utterance.
Co-occurring Speech	“my brain stand” [scanned]
Time Stamp	1:09-1:11

Iconic gestures are movements used to represent concrete ideas (Loehr, 2004). The gesture itself usually paints a very clear picture of the idea under discussion. For example, if you wanted to represent the idea that you were on a boat, you might move your arm in the motion of a wave as you are talking about riding on your boat. Figure 2.1.2 shows an AphasiaBank participant’s use of an iconic gesture to represent this idea.

Figure 2.1.2: Iconic Gesture

Iconic Gesture	
Speech Occurring Before Gesture	“And &uh &wa one &um &um maybe &uh &uh &uh the boat the boat &uh…”
	
Description of Gesture Phase	Stroke: The participant’s left hand flattens out with palm facing down. It then moves from the resting position upward toward the right shoulder. The participant’s right hand is held as a fist throughout the gesture.
Co-occurring Speech	“cruising” (first syllable of word)
Time Stamp	5:35-5:35
	
Description of Gesture Phase	Stroke: The participant’s left hand starts to curl and move downward.
Co-occurring Speech	“cruising” (second syllable of word)

Time Stamp	5:35-5:36
	
Description of Gesture Phase	Stroke: The participant’s left hand curls further and is moved down and back.
Co-occurring Speech	“the”
Time Stamp	5:36-5:37
	
Description of Gesture Phase	Stroke: The Participant’s left hand moves horizontally, flattens out, and opens up to complete the gesture.
Co-occurring Speech	“cruising”
Time Stamp	5:37-5:38
Speech Occurring After Gesture	“&uh &uh [name withheld] and me and big crowd”

Like iconic gestures, metaphoric gestures are also used to represent an idea. Unlike iconic gestures, metaphoric gestures represent abstract ideas (Loehr, 2004). These movements are generally used to simulate the structure of a conversation (Loehr, 2004).

An example of this would be moving a hand slowly outward while talking. In this way, the metaphoric gesture is acting as a channel for the presentation of the narrative. Figure 2.1.3 shows this metaphoric gesture in action.

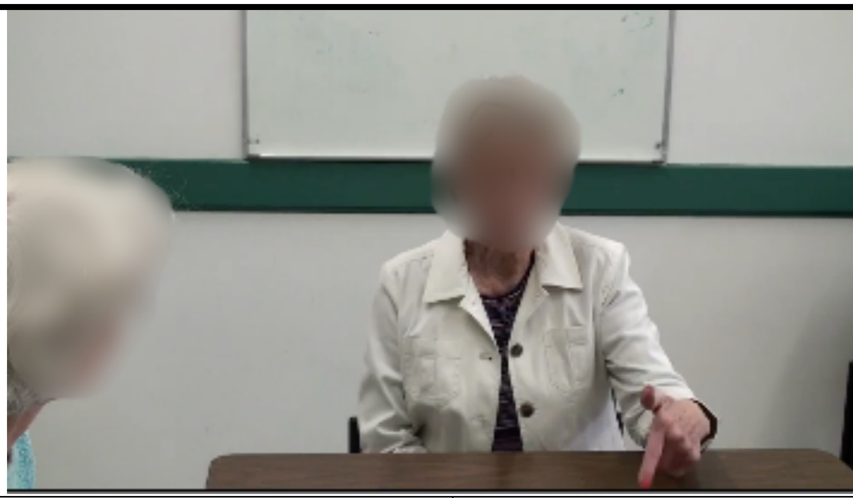
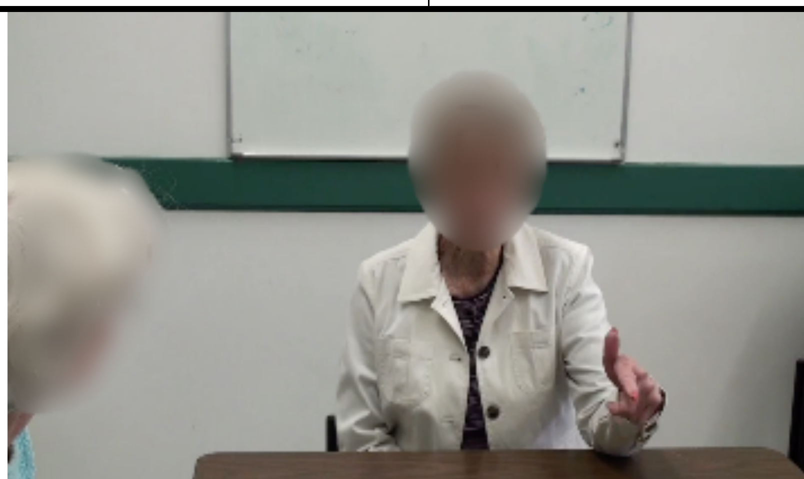
Figure 2.1.3: Metaphoric Gesture

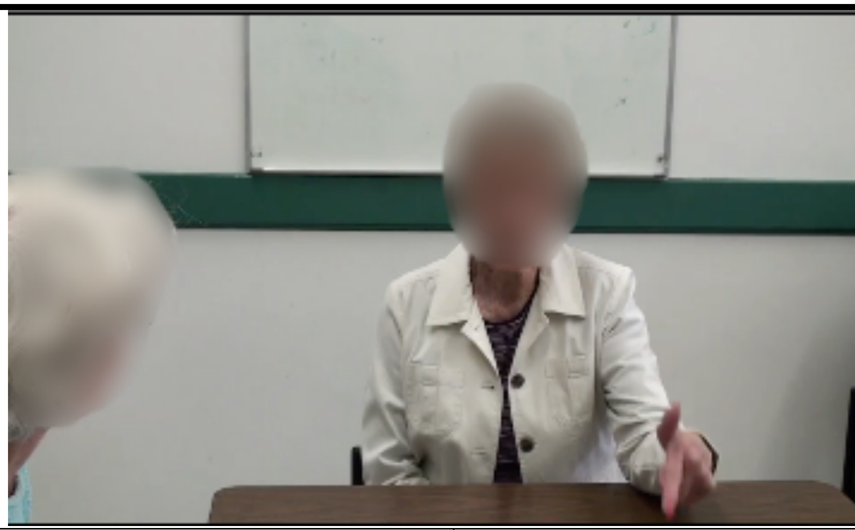
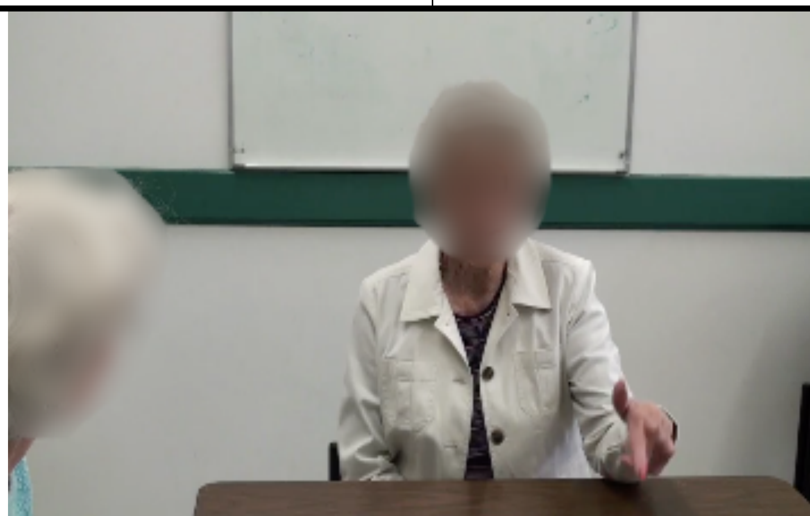
Metaphoric Gesture	
	
Description of Gesture Phase	Prestroke hold: The participant starts with his left hand on top of his right, resting on the table.
Co-occurring Speech	“I”
Time Stamp	3:37-3:37

Description of Gesture Phase	Stroke: The participant's left hand opens up then rotates so his palm is facing up and to the side. This hand then continues outward toward the camera for the duration of the utterance.
Co-occurring Speech	"don't I can't think"
Time Stamp	3:38-3:40

Finally, beat gestures are timed with the "rhythm" of the speech by occurring on some stressed syllables (Loehr). The gestures themselves can be very small in scale, like tapping a finger, or very large, like waving an arm up and down. Figure 2.1.4, which continues over the next two pages, shows an example of a larger beat gesture.

Figure 2.1.4: Beat Gesture

<table>
<tr><th colspan="2">Beat Gesture</th></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Description of Gesture Phase</td><td>Stroke: Participant uses left hand to point downward. This hand is resting on the table.</td></tr>
<tr><td>Co-occurring Speech</td><td>“twenty”</td></tr>
<tr><td>Time Stamp</td><td>4:57-4:57</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Description of Gesture Phase</td><td>Stroke: Participant raises left hand off the table. This hand is pointing outward.</td></tr>
<tr><td>Co-occurring Speech</td><td>“five”</td></tr>
<tr><td>Time Stamp</td><td>4:57-4:58</td></tr>
</table>

	
Description of Gesture Phase	Stroke: The participant moves her pointing hand back down to the table.
Co-occurring Speech	“forty”
Time Stamp	4:58-4:58
	
Description of Gesture Phase	Stroke: The participant moves her pointing hand upward again from the table.
Co-occurring Speech	“five”
Time Stamp	4:58-4:59
Speech Occurring After Gesture	“sixty seventy five &ei (a)bout eighty five we forty eighth to to tow or three”

Section 2.3: Overview of Aphasia

In most individuals, the left hemisphere of the brain maintains primary responsibility for language functioning. Broca's and Wernicke's areas, which are located in this hemisphere, function as gateways for a greater neural network of language, providing the connection between iconic sensory representations and their more arbitrary word forms (Papathanasiou et al., 2013). When a lesion occurs in the language-dominant areas of the brain from trauma, usually in the form of a stroke, aphasia is the result. Papathanasiou et al. (2013:xx) combines neurological, neurolingusitic, cognitive, and functional perspectives to provide the following basic operating definition of aphasia as "an acquired selective impairment of language modalities and functions resulting from a focal brain lesion in the language-dominant hemisphere that affects the person's communicative and social functioning, quality of life, and the quality of his or her relatives and caregivers."

This broader definition of aphasia can be broken down into specific types, which fall into the categories of fluent (FA) or nonfluent aphasia (NFA) (Papathanasiou et al., 2013). Both types of aphasia differ from each other neurologically in terms of the area of the brain affected and the nature of the impairment experienced. NFA is characterized by intact comprehension and stilted speech (or signing) fraught with long, frequent pauses. In contrast, persons with FA have fluent speech but struggle with comprehension (Papathanasiou et al., 2013). One of the most classic types of aphasia, Broca's aphasia, involves difficulty with language production and not difficulty with comprehension (Papathanasiou et al., 2013). In contrast, Wernicke's aphasia is classified by fluent and mostly nonsensical speech production with a lack of language comprehension

(Papathanasiou et al., 2013). Types of aphasia can be divided further from the FA and NFA labels into even more specific sub-types, which are categorized by fluency, comprehension, repetition, and naming abilities. For a comprehensive breakdown of the types of aphasia, see Table 2.3.1 (adapted from Papathanasiou et al., 2013).

Table 2.3.1: Typical Characteristics of Types of Aphasia

Type of Aphasia	**Fluency**	**Comprehension**	**Repetition**	**Naming**
Global	Nonfluent	-	-	-
Broca	Nonfluent	+	+	+
Motor transcortical	Nonfluent	+	+	-
Mixed transcortical	Nonfluent	-	+	-
Wernicke	Fluent	-	-	-
Sensory transcortical	Fluent	-	+	-
Conduction	Fluent	+	-	-
Anomic aphasia	Fluent	+	+	-

Note: - = mostly impaired; + = mostly preserved.

Aphasia is diagnosed by speech-language pathologists in conjunction with other medical professionals through both formal and informal means (Papathanasiou et al., 2013). Formal assessments include tests for specific language functions like The Boston Diagnostic Aphasia Exam (BDAE-3) (Goodglass et al., 2000), Western Aphasia Battery (WAB) (Paradis & Libben, 1987), and testing cognition through exams like the Aphasia Check List (Kalbe et al., 2005). Informal diagnostics involve the clinician developing and carrying out tasks that assess the gaps from formal diagnostics (Papathanasiou et al., 2013). These tasks usually involve collecting and analyzing connected speech samples (Papathanasiou et al., 2013). Once a diagnosis is obtained, a treatment plan is developed and carried out.

Section 2.4: Aphasia and Conversation Repair

Since persons with aphasia (PWA) struggle with language, the need for conversation repair is a necessary part of communicating. Repairables result from the PWA's difficulty with language production or comprehension (Wilkinson, 1999). PWAs engage in three types of repair. Other-initiated/ self-repair, part of collaborative repair, which is discussed later, is involved in a word search or correcting a linguistic error in the speech of the PWA (Laakso, 1999). Initiation of self-repair in persons with FA has been found to be context dependent and not indicative of the ability to self-monitor and produce a repair (Laakso, 1999). Ferguson (1994) also supports context dependency of repair for persons with FA.

Section 2.5: Aphasia and Gesture

Numerous studies have found that persons with aphasia (PWA) use gesture during conversation significantly more often than people without aphasia (Goodwin, 1995; Klippi, 2014; Wilkinson, 2013). Similar studies have also found that speakers without aphasia use gesture to resolve verbal ambiguity, and gestures are used as context in narratives (Hollar & Beattie, 2003). Additionally, gesture and language collaborate their timing and meaning (Dipper et al., 2015). Some of these ideas carry over into the use of gesture with language by persons with aphasia.

PWAs tend to rely heavily on gestures to repair their conversation turns (Goodwin, 1995; Klippi, 2014). Some of the reasoning behind using gesture to repair conversation over other types of repair is partially connected with using gesture in speech therapy sessions and with other-initiated repair (Goodwin, 1995). Gesture has a place in conversation repair by PWAs, even though it is not the preferred mode of repair by interlocutors, since it is likely not initially considered to be relevant to the conversation and requires repetition to draw attention to its relevant status (Wilkinson, 2013). Many repairs by PWAs are therefore prolonged and co-constructed through gesture and other-initiated repair (Goodwin, 1995).

A common type of gesture used by PWAs is pointing, or deictic gestures (Klippi, 2014). In Klippi's analysis, pointing is an embodied practice, which also includes other gestures and facial expressions (2014). PWAs rely on embodied practices to supplement their speech (Klippi, 2014). Pointing itself can refer to physical items in the immediate vicinity, to a person involved in the conversation, or to an abstract entity (though this last usage is less common in PWAs) (Klippi, 2014). Deictic gesture is used in a wide variety of conversation functions such as expressing difficulty and in the repair mechanism (Klippi, 2014). In fact, Klippi (2014) even found that pointing is so central to PWA conversation that it can function in place of a word without creating a repairable.

Gestures for persons with NFA can be vital to conversations for aiding in answering questions and repairing utterances (Wilkinson, 2013). An adapted version of McNeill's classification of gestures was used by Wilkinson in a case study that found that iconic gestures of acting, pantomiming, body modeling, and bounding were relied on by a person with NFA in conversation. Kim et al. (2014) found that it's debatable whether persons with FA or persons with NFA produce more iconic gestures. Loehr (2004) confirmed the prevalence of iconic gestures in conversations with persons affected by NFA by stating that the telegraphic nature of NFA-characterized speech meant that many iconic gestures were used but few beats were used. Loehr (2004) goes on to mention that this is because a higher level of fluency is needed to use beats.

Section 2.6: Aphasia and Conversation Analysis-Based Treatments

Conversation Analysis-based treatments, which are treatments that promote collaborative repair, are one way of helping persons with aphasia repair their utterances. Conversation Analysis (CA) is a linguistic approach used to describe, analyze and understand talking as a central feature to the social life of humans (Sidnell, 2010). Therefore, CA-based therapies use the knowledge gained from CA to teach conversation partners how to communicate more successfully with each other. One type of CA-based therapy method is to teach the use of collaborative repair. This type of repair is characterized by self or other initiation of repair that carries on over more than the usual two turns-at-talk and involves multiple other initiations of repair after the first initiation, which culminates ideally in the PWA self repairing the original trouble source (Milroy & Perkins, 1992). The key portion of this style of repair is that it is collaborative in that the neurotypical conversation partner needs to contribute to the repair in order for the repair to happen at all (Milroy & Perkins, 1992). Speech-language pathologists encourage this style of repair for conversations with PWAs because of its proven success rate at reducing the number of turns spent on repairs by the PWA and the average length of a single repair (Booth & Perkins, 1999). To achieve this improvement in the flow of conversation by using collaborative repair, speech-language pathologists focus on teaching the neurotypical conversation partner to use more precise repair initiators (Booth & Perkins, 1999).

This style of treatment relies on the familiarity between the neurotypical conversation partner and PWA conversation partner. A strong relationship between the PWA and neurotypical conversation partner has shown to be one of the contextual elements that influences the repair mechanism. Lindsay and Wilkinson (1999) found that neurotypical spouses of PWAs tended to engage in collaborative repair more often than speech-language pathologists. Additionally, PWAs tend to formulate their own set of gestures to use with familiar conversation partners that are vast in scope and often more creative than what is usually found in the therapy setting (Wilkinson, 2013). In fact, the person with aphasia's repairable was more often glossed over by the speech-language pathologist (Lindsay & Wilkinson, 1999). The proposed reason for this is that with more shared information or context between speakers, there is more opportunity for collaborative repair (Lindsay & Wilkinson, 1999). Collaborative repair involves some dis-preferred action because of its use of other-initiated repair. Therefore, conversation partners with a better rapport through greater shared contextual information engage in collaborative repair more successfully than those who do not have as strong of a rapport (Lindsay & Wilkinson, 1999). Conway (1990) also found that PWAs preferred self-repair over other-initiated repair in conversations with neurotypical family members, but this was often not possible due to the fact that self repair may require accessing linguistic areas that may be beyond the level that the PWA can access.

In addition to being used in therapy, Conversation Analysis is also used in assessment of conversations by PWAs. The CAPPA, or Conversation Analysis Profile for People with Aphasia, is a formalized assessment that requires the collection of discourse samples that are then compared to the CAPPA scales to determine the type and degree of impairment in the PWA (Perkins et al., 1999). Some of the specific questions asked by the CAPPA are how much collaborative repair is needed and whether it is effective (Perkins et al., 1999).

Section 3: Methods

Section 3.1: AphasiaBank Overview

The AphasiaBank corpus served as the source of data for this thesis. This corpus is composed of video-linked transcripts of conversations between clinicians and persons with aphasia (MacWhinney, 2016). The creators of AphasiaBank intended for this corpus to be used for the purpose of the study of communication in aphasia (MacWhinney, 2016). AphasiaBank is one facet of the TalkBank project, which is run by Dr. Brian MacWhinney of Carnegie Mellon University and is currently supported by an NIH-NIDCD grant R01-DC008524 for the years 2007-2017.

The clinicians and researchers that contribute to AphasiaBank follow a specific protocol in order to ensure consistency across samples as far as the participant selection and the topics for discussion during the recorded conversations (MacWhinney, 2016). Participants for AphasiaBank interactions must be individuals whose aphasia resulted from a stroke and can be verified through neuroimaging or a clear medial diagnosis (MacWhinney, 2016). Part of the reasoning for this is because one of the conversation topics for eliciting a narrative from all participants is the "Stroke Story" where the clinician asks the participant to "Tell me about when you had your stroke." (MacWhinney, 2016). Other topics the clinician introduces to the participant in order to collect narrative samples are "How do you think your speech is these days?", "Tell me about your recovery from your stroke.", and "Tell me about an important event that happened in your life." (MacWhinney, 2016). Clinicians bring up all of these prompts in the same sequence, with the first listed item occurring first in the sequence:

1) "How do you think your speech is these days?"

2) "Tell me about when you had your stroke."
3) "Tell me about your recovery from your stroke."
4) "Tell me about an important event that happened in your life."

They also keep the wording of each prompt similar to the suggested wording outlined in the AphasiaBank procedural guide (MacWhinney, 2016). Overall, AphasiaBank is set up for large-scale discourse studies because of its 200+ video-linked transcripts of conversations on similar topics between persons with aphasia and clinicians. For this thesis, repair mechanisms and gestures were examined during each of these questions for each participant. The overall time sampled for each question for each participant was not controlled. The participants' entire answer to each of the four questions was used in this study.

Section 3.2: Participant Selection

In addition to the inclusion criteria outlined for participation in AphasiaBank, I used the participant demographics sheet provided by AphasiaBank administrators to select which participants to use for this thesis. I decided to look at participants with NFA rather than FA because the participants with NFA had enough pragmatic awareness to recognize when a SISR needed to be made. This selection was narrowed further by only including participants with Broca's or motor transcortical aphasia because other types of NFA (global and mixed transcortical) result in diminished comprehension abilities for those affected (see Section 2.3). Comprehension abilities needed to be mostly intact in order for the participants in the project to have the level of pragmatic awareness required to initiate SISR sequences. From this point in the participant selection process, I excluded participants that had any other co-occurring conditions, such as depression or dementia, in order to keep the focus of the study on participants with only NFA. All participants had some form of hemiplegia and/or hemiparesis due to the area of the brain affected by the stroke. Even with these conditions, these participants showed sufficient motor abilities for gesture engagement. Participants known to have no motor involvement (as indicated by the demographics sheet) were excluded because of the physical nature of this study. Finally, multi-linguals were also left out of this study if they indicated their primary language was not English. After this initial sifting, 20 participants met the criteria for this study because they had a type of NFA that does not affect comprehension, they had no co-occurring medical conditions besides hemiplegia or hemiparesis, and they used English as their primary language. See Table 3.2.1 for a further breakdown of participant demographics for this study as reported by the participants. The demographics sheet did not include a column for the region of the United States where the participants lived.

Table 3.2.1: Participant Demographics

	Gender	Race	Age	Years of Education	Years Post-Stroke
Male	14	12 Caucasian 1 African American 1 Hispanic	Range = 52.2 – 78.3 Median = 64.9 Mean = 64.4	Range = 12-18 Median = 14 Mean = 14.38	Range = 0.75-25.75 Median = 4.9 Mean = 4.18
Female	6	5 Caucasian 1 African American	Range = 39.5 - 81.9 Median = 68.1 Mean = 65.11	Range = 12-18 Median = 17 Mean = 15.67	Range = 1.0-7.9 Median = 1.55 Mean = 2.75
Total	20	17 Caucasian 2 African American 1 Hispanic	Range = 39.5 – 81.9 Median = 65.5 Mean = 64.74	Range = 12-18 Median = 16 Mean = 14.78	Range = 0.75-25.75 Median = 4.2 Mean = 5.15

Section 3.3: Tagging Conversation Repair

In the first pass through the transcripts, self-initiated self-repair (SISR) sequences used by the participants during the portions of the conversation meant to elicit narratives (see Section 3.1) were tagged. Segments of repair were tagged on the same tier as the transcribed speech. Repairs were not tagged on separate tiers because the computer program through which the transcripts were accessible, CHAT, did not allow for tiers to be linked through a time alignment. Since segments of conversation repair have a temporal element, all tagging was done on the same level as what the participant said rather than on a separate tier in order to express this feature of repair segments. See Figure 3.3.1 for an example of the level at which repair was tagged.

Figure 3.3.1: Repair Tagset Example

PAR: RMRa &=fingers:three RMRb RMIa &uh &=raises:hand RMIb RMOa three years ago RMOb

For each SISR sequence, the repair initiation, repairable, and repair outcome were tagged. The complete tagset is outlined in Table 3.3.1. To mark the start and finish of each part of the repair mechanism, the tags "bookended" the segment of speech in question with the part "a" of the tagset occurring at the beginning of the sequence and the part "b" of the tagset occurring at the end of that section of the repair mechanism (see Figure 3.3.1).

Table 3.3.1: Repair Tag Set

Segment of Repair Mechanism	Repair Initiation	Repairable	Successful Repair Outcome	Unsuccessful Repair Outcome
Corresponding Tags	RMIa, RMIb	RMRa, RMRb	RMOa, RMOb	NO-RMOa, RMOb

The identification and tagging of each SISR was based on the principles described in Section 2.1 and on the surrounding context. Repairs tagged as RMO were successful, which means the segment of talk that was in question was fixed in a way that was fluent, intelligible, made sense in the context of the conversation, and was not questioned by the clinician. In contrast, repairs that ended in an unsuccessful way were tagged as NO-RMO. An unsuccessful repair outcome meant the repair itself was unintelligible, completely out of context for the conversation, or the participant gave up on repairing the segment and simply moved on to a new topic without completing the repair. Overall, there were 300 total repairs. Thirty-five of the total repairs were unsuccessful, while 265 of the repairs were successful.

Section 3.4: Tagging Gesture

After repair itself was tagged, the type and duration of gesture was marked for each repair. The creators of AphasiaBank have a gesture tagset already. An example of a typical gesture tag is, "&=ges:points" where the "ges" part of the tag indicates a gesture has taken place and the portion after the colon indicates what type of gesture occurred. This preexisting tagset was unfortunately insufficient for my analysis for a number of reasons. First, whether gestures were tagged or not both within and across transcripts was inconsistent. This made it difficult to find where gestures were occurring in the transcripts. Second, there were no set "types" for gestures. Clinicians made up their own gesture types, if they included them at all. Finally, the manner in which the existing tagset was applied did not capture the duration of the gesture.

Since the original tagset provided by AphasiaBank was insufficient for this study, David McNeill's gesture tagset outlined in *Gesture and Thought* (2005) and described in detail in Section 2.2 of this thesis was adopted. This tagset was developed for gestures involving movement from the shoulders through the tips of the fingers and not for gestures using the face, head, or other body parts. The tags used for each gesture type were as follows: beat, deictic, iconic, and metaphoric. Also, while not technically gesture types, the tags "Emblem" and "Adaptor" were also used because all arm movement by the participants was noted in the tagging performed by this study. Finally "No Gesture", as in no movement at all, was considered a gesture type but was not tagged. Segments could be identified as no gesture based on if they did not have a tag. The duration of a gesture was marked by bracketing the segment of speech over which the gesture occurred (see Figure 3.4.1). Curly brackets were used instead of parentheses or regular brackets since curly brackets did not have any preexisting functions in CLAN, a transcription computer program. Like the repair tagset, gestures were also tagged at the same level as what the participants were saying and not on a separate tier.

Figure 3.4.1: Gesture Tagset Example

PAR: {{RMRa &=fingers:three &=type:emblem RMRb RMIa &uh}

{&=raises:hand RMIb RMOa &=type:beat three years ago RMOb}}

Section 3.5: Data Processing

Once the transcripts were tagged, the information from these transcripts was transferred to a Microsoft Excel workbook. Every repair that occurred and the type of gesture that occurred during each phase of that repair was recorded and grouped by participant. Figure 3.5.1 shows what one repair would look like in this spreadsheet.

Figure 3.5.1: Repair Spreadsheet Example

File Name	Line Number	Gesture	RMI	RMR	RMO	NO-RMO	Total
Sample	25	B	0	0	0	0	**0**
		D	0	0	0	0	**0**
		I	0	0	0	0	**0**
		M	0	0	0	0	**0**
		E	0	0	0	0	**0**
		A	0	0	0	0	**0**
		N	1	1	1	0	**3**

Every repair was grouped by file name, which corresponded to a specific participant. Then the line number or range of line numbers over which the repair occurred. Gesture type was represented by using the first letter of each type of gesture tagged for (B = Beat, D = Deictic, I = Iconic, M = Metaphoric, E = Emblem, A = Adaptor, N = No Gesture). For each phase of repair, the number of instances of each type of gesture used by the participant during that phase was recorded. A value of 0 was used if that gesture type did not occur or if a phase did not occur. The phases RMI and RMR are mandatory for every repair. The repair can then end in either RMO (a successful repair) or NO-RMO (an unsuccessful repair). The setup shown in Figure 3.5.1 was repeated for every occurrence of self-initiated, self-repair. This representation of the data was then duplicated into another Microsoft Excel worksheet that displayed only the successful repairs and another worksheet that showed only the unsuccessful repair sequences. These three worksheets were used to analyze the data as discussed in the results for this study.

Section 4: Results

Section 4.1: Gesture Type and Repair Mechanism Phase

Since this study explored the types of gesture used in each phase of repair, the first set of results show the raw counts of the types of gesture used at each phase of repair for all instances of SISR across all 20 participants. Table 4.1.1 is a visual representation of this information.

Table 4.1.1: Instances of Gesture Type During Repair Mechanism Phase

	RMI	**RMR**	**RMO**	**NO-RMO**	**Total**
Beat	49	51	70	5	175
Deictic	26	28	47	3	104
Iconic	18	18	37	0	73
Metaphoric	57	54	90	10	211
Emblem	7	7	17	2	33
Adaptor	2	3	2	0	7
No Gesture	169	166	133	30	498
Total	328	327	396	50	1101

The above table shows that the most common "type" of gesture is actually no gesture at all. This holds true across all phases of repair. The second most common gesture type across all phases is metaphoric. From there, beat is the next most common, then deictic. Iconic is the fourth most common for RMI, RMR, and RMO but not for NO-RMO. Emblem is next for RMI, RMR, and RMO. The order of Emblem and Iconic switches for NO-RMO. Finally, adaptors are the least used. The ordering of which types of gestures occur across each phase of repair remains the same for all phases of repair with the exception of the switch between iconic and emblem in the NO-RMO phase. From these raw frequencies, it appears as though there is no relationship between the type of gesture used and a specific phase of repair.

Section 4.2: Gesture in Successful and Unsuccessful Repair

While there appears to be no relationship between gesture type and phase of conversation repair, there is a relationship between the use of gesture in a successful repair as compared to an unsuccessful one. In Table 4.2.1 below, all instances of gesture were combined for each phase of repair and were compared to instances with no gesture during each phase of repair.

Table 4.2.1: % of Occurrences of Gesture Vs. No Gesture Used During Repair Phases

	RMI	**RMR**	**RMO**	**NO-RMO**
% of Occurrences of Gesture	48.48%	49.23%	66.41%	40.00%
% of Occurrences of No Gesture	51.52%	50.77%	33.59%	60.00%

This table demonstrates an even split between whether participants are using gesture or not during the RMI and RMR phases. The use of gesture during the outcome of these first two phases, however, is very different. Successful repairs resorted to gesture as an aid 66.41% of the time and no gestures 33.59%. In contrast, unsuccessful repairs used gesture 40% of the time and used no gesture the remaining 60%.

Based on this finding, a third exploration of the data was conducted to discover whether there was a set sequence of gesture types over the RMI and RMR phases that would predict an unsuccessful repair outcome. To do this, the sequences for each repair ending in RMO were compared. Table 4.2.2 shows this comparison using the tagset outlined in Section 3.3 of Methods. Each line in Table 4.2.2 represents one repair sequence, and the ordering of the lines is based on the order in which they appeared in each file.

Table 4.2.2: NO-RMO Repair Sequences

RMI	RMR	NO-RMO
N	N	N
I,M	I,M	N
N	N	B, M, N
N	N	N
N	N	N
M, N	M, N	N
M	M	M
N	N	N
N	N	N
N	N	N
N	N	N
N	N	N
N	N	N
D	D	D
N	N	N
N	N	N
N	B	B, N
M	M	M
N	N	N
N	N	N
N	N	N
N	N	N
B	B	B
M	M	M
D	D	D
N	N	N
B	B	B
M	M	M
N	N	N
D	D	N
M	M	M
N	N	N
N	N	N
M, N	M,N	M, N
B	B	D, E

The most common sequence for an unsuccessful repair was NNN, meaning there was no gesture at each phase of the repair. Results leading up to NO-RMO, the RMI, and RMR phases usually both display no use of gesture. In fact, the sequence NNX, with "X" representing any gesture or no gesture in the outcome phase, occurs 57% of the time for a NO-RMO repair as compared to any other sequence leading up to a NO-RMO occurring 43% of the time. This split between 57% and 43% was then compared to how often the sequence NNX occurred in successful repairs. The sequence NNX occurred 40% of the time in RMO-type repairs. This means that 60% of the time, some gesture was used leading up to a successful repair. Overall, the sequence NNX is more likely to occur in an unsuccessful repair as compared to a successful repair.

Section 5: Discussion

The goals of this thesis were twofold:

1) To describe the relationship between gesture type and phase of repair in SISR sequences for PWAs;
2) To determine if there is a difference between the use of gesture in successful vs. unsuccessful SISR sequences for PWAs and describe these patterns.

In reference to the first goal, Table 4.1.1 showed that there does not appear to be a connection between the overall frequencies of the type of gesture used during a phase of the repair mechanism as compared to other phases in the repair mechanism. It was interesting to see that, with the exception of the "no gesture" type, metaphoric and beat types were most commonly used by persons with NFA across all SISRs. This contrasts with most of the findings reported in Section 2.5, which indicated a preference for persons with NFA to use iconic and deictic gestures over beat and metaphoric gestures in conversation and during a repair. The reason for this contradictory finding may have to do with the genre of discourse considered in this study, which is different from the genre of discourse used in the research presented in Section 2.5. This project used transcripts from the AphasiaBank corpus, which included strict guidelines that emphasize the need for the participant to talk as much as possible and for the clinician to talk as little as possible. In this way, interaction between the clinician and the participant was explicitly and openly discouraged beyond the agreed upon conversation topic openers (these guidelines, however, were not as strictly followed by some clinicians). Thus the genre of the free speech samples collected were much closer to narratives rather than conversations. In narratives, a level of pragmatic competence is needed to successfully carry the story. This may be why gestures like metaphoric and beats, both of which are used as "channeling" and "timing" devices for units of talk appeared more frequently than iconic or deictic gestures, which are more "collaborative" gesture types.

Additionally, the formality of the setting may have influenced the use of metaphoric and beat gestures over iconic and deictic gestures. While participants did have an established relationship with their respective clinicians in the AphasiaBank corpus, this relationship and the context in which the conversation occurred are much more formal than the settings for the studies on gesture and collaborative repair therapies discussed in Sections 2.5 and 2.6. This could have again influenced the extent to which the participants used the more or less collaborative gesture types.

Finally, this finding is important because it shows that persons with NFA can and do use gestures that require increased prosodic abilities (beat and metaphoric). While other studies downplay the ability to use gestures by an individual with NFA, in the context of this study, those with NFA demonstrated that they used beat and metaphoric gestures during repairs and much more frequently than other gesture types.

To address the second goal of this thesis, the results in section 4.2 showed more generally that the lack of gesture during the RMI and RMR phases of the repair had a slightly higher tendency to result in an unsuccessful repair. Additionally, the use of gesture occurred more frequently overall in both the RMI and RMR phases of successful repair sequences and in the RMO portion of the repair than in unsuccessful repair sequences (see Section 4.2). Given this information, while there is a slight tendency for a repair without gesture in the RMI and RMR phases to result in NO-RMO, the strength of this correlation seems too weak to be an accurate predictor of whether the repair outcome will be successful. Nevertheless, it appears that the use of gesture in all phases of the repair mechanism does help facilitate a successful repair outcome for SISR.

Section 6: Conclusion

The findings of this thesis demonstrate the utility of gesture in SISR sequences for persons with NFA. While there appeared to be no connection between the type of gesture used during each phase of repair, there was a greater use of both metaphoric and beat gestures over iconic and deictic gestures. This challenges previous studies, which found iconic and deictic gestures were used more frequently by persons with NFA during repair sequences than the gesture types that require greater pragmatic skill (metaphoric and beat gestures). These findings might differ from earlier literature because of the different genre examined, the focus was on SISR rather than a collaborative repair, and the formality of the environment. Still, these findings show that persons with NFA do have a command of gestures that are connected to pragmatic skills in this context. These findings also reveal that gesture is correlated with the success of a repair. The successful repair outcomes examined had a higher percentage of gesture usage than the unsuccessful repairs. The results related to goals one and two of this thesis show the importance of gesture in connection with SISR for persons with NFA.

This study is not without its limitations. First and foremost, this study lacked inter-rater reliability due mostly to logistical constraints. In addition to lacking inter-rater reliability, this study relied on a smaller dataset than originally planned. While the project started with a potential pool of over 200 transcripts with potentially thousands of instances of SISR, by the time the participants were selected, only 20 of them met the criteria for this study, yielding a total of only 300 instances of SISR. Another limitation was not being able to see the clinician in some of the videos. This meant I could not tell if the clinician was influencing the responses of the participant through anything other than their words.

Future work with this data could include, reviewing how the participants pattern overall in the sequence of gesture types they use across each phase of the repair mechanism to see if there is a certain pattern that emerges. Future work for this dataset could also include refining and enhancing the annotation of the data, which would mean the use of another person tagging the transcripts and tagging the entire transcript for every transcript for gesture types to establish baselines of gesture use outside of SISR for each participant. Finally, beyond this dataset, clinicians could look more into the use of metaphoric and beat gestures by persons with NFA in different contexts and they could look at ways of encouraging gesture use to repair conversation breakdowns.

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