versatile channel

employing non-verbal language in design practice to reshape communication precedence.

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content

abstract

A majority of our lives are spent in conversation with others, however few identify or explore the complexity of this interaction. Communication is an inclusive behavior that determines an individual's degree of influence or control over the things that matter within a group. Conversation is a powerful interaction in which existing knowledge is transmitted and new knowledge can be generated. Aphasia reveals the crucial necessity for communication.

Those with aphasia have communication difficulties arising from their cognitive impairment, which in turn is exacerbated by the primacy and reliance on written and spoken language. This condition leads to social exclusion, problems comprehending the use of alternative communication channels and a disruption of inner thought and language. It is vital to realize the exclusivity of the current framework for communication and seek modification of the process with design. Through visualizations of non-verbal and verbal communication design can enabling comprehension and use of proximity and gesture in the hopes of reducing interference for those with communication impairments. This research also studies the capacity for design to take on untraditional and challenging problems by means of visual thinking, form making and research methods to define specificity.

problem statement

How might visualizations of embodied gesture, proximity and verbal language benefit and inform the communication process?

subproblems

How does proximity affect particular modes and addresses of communication: individual-to-individual, individual to group, individual to public space.

What is the role and effect of gesture and proximity in communication?

How can notational systems be conceived of and designed for particular users to use consciously in mediating their communication?

understanding the conditions of aphasia

Aphasia creates a condition where communication difficulties arise from a cognitive impairment, which in turn is exacerbated by the primacy and reliance on written and spoken language. Aphasia is a result of lesions to the language areas of the brain, which interrupt neural pathways in the left hemisphere, the brain's language center. Common developments of lesions are an outcome of stroke, head trauma, brain tumors, infection or Alzheimer's and Parkinson's disease. Each person's symptoms vary, and can affect the ability to put ideas and intentions into spoken and or written language, the ability to put words together in grammatical sentences and or the ability to understand what is being said and or written. Most common types of this impairment are Wernicke's, Global, Nominal, Jargon and Broca's aphasia. Those with Wernicke's aphasia may speak in meaningless long sentences, create neologisms or add unnecessary words. Those with global aphasia have limited communication abilities in writing, speaking or language comprehension. Nominal aphasia is characterized by the difficulty in recalling words or names. With Broca's aphasia, patients can speak short meaningful phrases but they are produced with great effort. Jargon aphasia is characterized by the capacity to speak fluently and without effort; however, speech is incomprehensible to the listener.

Aphasia is acknowledged as an impairment within an individual. In contemporary social organization, spoken and written language is the primary way that we understand on another. The predominance of verbal and written language tends to discriminate against other modes of communication, which are seen as peripheral.

justification

Adapting to or recovering from aphasia occurs with time and therapy; however communication with others is essential for meaningful and beneficial social interaction. At the core of each communicative interaction is a motivation to fulfill primary physical, social, and self-actualization needs. These demands can't be met when language capacities are diminished and the use of traditional communication modalities is impossible. When alternative behaviors or interactions are required by those with impairments the structure is uncompromising. "A person with communication impairments is not disabled because they cannot keep pace with conversations, but because the framework of social interactions fails to accommodate their temporal style of communication." (Parr, Paterson, Pound 2003, 128) Communication interactions and environments can be redesigned to reflect the differentiation among speakers instead of forcing compliance to a normative communication style.

To reducing interference within the communication process alternative methods are available to designers who possess a desire to challenge the current framework and explore language boundaries. The technique of visualization can provide new ways of seeing and illuminate the complexity of communication. Through visualizations non-verbal communication can be made tangible, enabling comprehension and use of proximity and gesture in the hopes of reducing interference for those with communication impairments.

Few people think about their language use, so by damaging discourse, aphasia reveals the complexity, skill and necessity of communication. It is vital for design to comprehend research and practice that it has not yet concerned itself with. Design interventions can modify situations of social exclusion and aid the communication process for those with aphasia.

verum ipsum factum *truth through making*

preliminary studies

Research began with a literature review comprised of case studies, concerning aphasia, that were then adapted as design scenarios. The design strategies for this research project were iterative, valuing the process of thinking through making in a nonlinear manner. Articulation of this method can be difficult because intuition is not rationalized linear reasoning but thinking beyond conscious understanding. Research is carried out primarily is a systematic investigation to prove a hypothesis. Traditionally, intuition is considered less justifiable than the rational process because it relies not on reason but acquires knowledge without inference. This approach and thinking has been validated through research methods such as the use of empirical data, gathered through the readings, heightened observation of communication and the ability to focus work on altering moments in the communication process. Each investigation will be placed adjacent to the areas of research they initiated from. Short descriptions will accompany each artifact and in depth images can be found in *appendix a*.
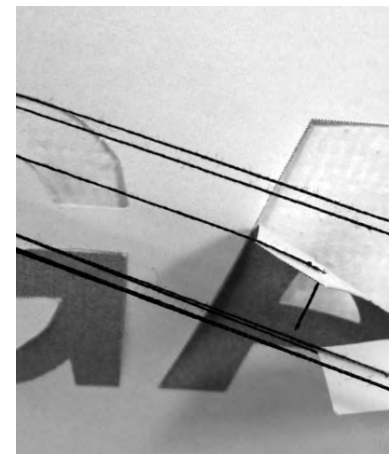
conversational making

Students were presented with several dozen abstracted letterforms and asked to create during the conversation. (*fig. 1-3*) What was of interest in this experiment was whether a toolkit, which mediates communication, could alleviate awkward pauses, which occur during communication with aphasics. An aphasic is given time to collect and vocalize their thoughts through the creation of subsidiary feedback. *see appendix a*

case studies

Three case studies emerged that typified three particular situations that those with aphasia are frequently faced with, social exclusion, developing a personal notational system between an aphasic and their caregiver, and alternative ways of facilitating inner thoughts and mental connections. The design artifacts addressed the context specific issues identified in each selected studies and responded to each individual's motivations to communicate.

At the core of each communicative interaction is a motivation to satisfy a need. These needs could be physiological, physical, social, or esteem. (Emmert and Donaghy 1981, 56) Maintaining a friendship is difficult for aphasics; interpersonal communication is painful, rather than pleasurable. For those who are motivated to write, aphasia can affect linking thoughts to words. Techniques have been developed to help with this process through seeing words by means of writing or speaking. "There is a meaning in my head, I want it but I don't know what it is. So the only way I can handle that one is by writing it down to check it out. The only way is translating it through the pen. Then I think 'that looks fine' and sometimes 'that looks funny' but I don't know what the meaning was exactly or how to spell its I might sound it out and then I know I had another word in my head, although I don't know what it is, how to say it, spell it or write it down. It's trapped there. I can get thoughts in my head that only makes sense if I write it down, I don't contain in my head. When I write down, I let it allow. Time, ripple, enjoy that phrase, soothe me, soft." (Black and Ireland 2003, 26)

social exclusion

Time plays a central role structuring communication. Conversation can consist of small talk, in depth discussion, gossip yet each has an individual time scale for participation. Those with communication impairments struggle with timing demands of everyday interactions because of slower speech requirements and so can cut people off from work and social contact. The impacts of temporal rules can be profoundly limiting and excluding.

When the fluent ability to communicate is lost, relationships with coworkers, family and friends can be compromised. "Christopher, who speaks very slowly and takes a long time to formulate his thoughts, finds that his friends is unwilling to wait for him to contribute to the conversation. The whole dynamic of their interaction has changed. Christopher finds their time together uncomfortable." (Parr, Paterson, Pound 2003, 135) Design can alter these social interactions through modifying the time scale for conversation.

developing personal notational systems

For aphasics in long-term relationships difficulty is often experiences in developing new modes of communication. John, after a stroke acquired global aphasia, meaning a total impairment of communication. Monica is his partner and has become his long-term caretaker and together they have developed a communication system using paper, pencils, map, images, gestures and non-verbal language. Motivated to communicate in a meaningful way, his daily needs, wishes and fears, John has, "a self created drawing -, gesture-vocabulary of about 20 or more art words which he has taught us: family, friends, care workers, all of us. They have helped us to understand him so much better, because we have learned to use back to him his own gestures and drawings, mirroring them, repeating them, which has made understanding between us so much easier." (Clark and Clark 2003, 120)

Non-impaired partners often act as a translator in private and public spaces, reconnecting an aphasic's non-verbal language with verbal language. Notational systems can be designed to help optimize the conversational process and enable interactions between the caregiver and the aphasics. Through crafting appropriate tools design can help unite non-verbal visual language with written language to aid in communicate.

thought & language

In the third case study, the authors discuss and examine the affect aphasia has on inner language and the changes in cognitive patterns that affect recall, and association in building communication. "Although not the same as thought, our inner language allows us to pay attention to our thoughts, to "keep hold of them, compare and link them together to form more complex thoughts, arguments and plans." (Black and Ireland 2003, 23) Inner speech has multiple functions, many unknown and unconscious to us yet, we do know that internal language mediates and makes conscious our thinking. The affects of aphasia on inner language can make it hard to pin down and grasp thoughts, emotions and meanings. Anecdotally, aphasics have revealed that how they may construct this "inner language" is structured differently. This inner language is comprised of the manner in which our thoughts are coded into words, held and then combined. Time and notations are needed for the thoughts and words of aphasics and so designing tools to explore and hold onto inner language will help with writing and conversation.

applied communication models

To reduce interference for those with aphasia requires adjusting and augmenting components of the communication process. Particular contexts change the way that a model is useful in formulating a design intervention. Standard models generalize interchanges, while aphasia introduces unique social and cognitive issues into the situation.
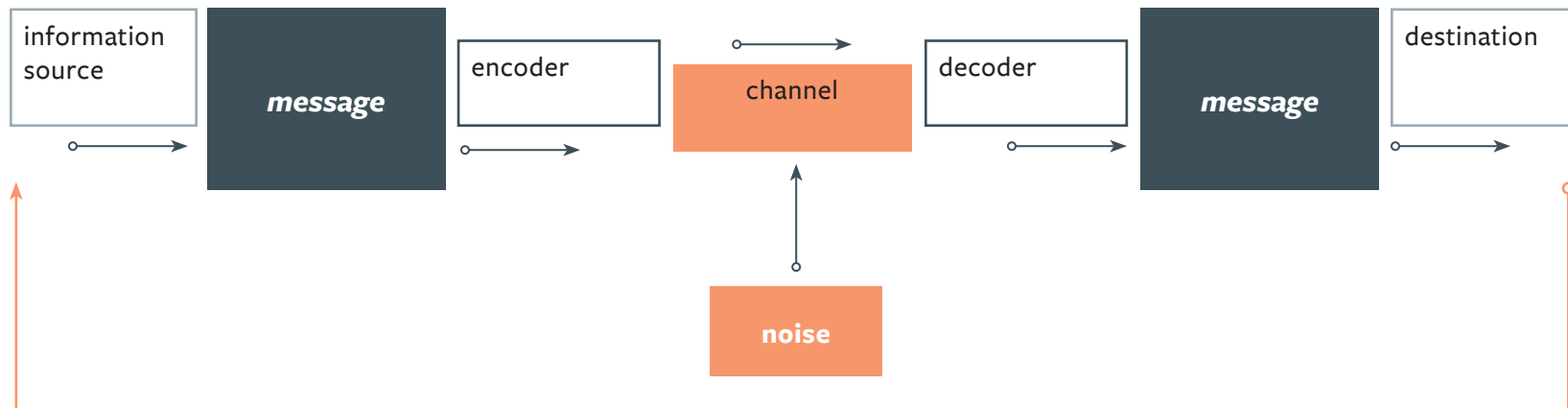
Aphasia causes interference in inner language and thinking. Inner language helps individuals pay attention to and compare, and link thoughts together. The cognitive research of Lev Vygotsky, was concerned with the inter-relationship of language and thought. According to Vygotsky, the predominance of word sense over meaning, of sentence over word, and of context over sentence are the rules of inner speech. (Vygotsky 1962 244) The sense of a word is the sum of all the psychological events aroused in a person's consciousness by the word. It is a dynamic, complex, fluid whole, which has several zones of sense, the most stable and precise zone. A word acquires its sense from the context in which it appears; in different contexts, it changes its sense. "Our investigation established three main semantic peculiarities of inner speech. The first, and basic one is the preponderance of sense of a word over it's meaning-a-distinction we owe to Frederic Paulhan. The sense of a word, according to him, is the sum of all the psychological events aroused in our consciousness by the word. It is a dynamic, fluid, complex whole, which has several zones of unequal stability. Meanin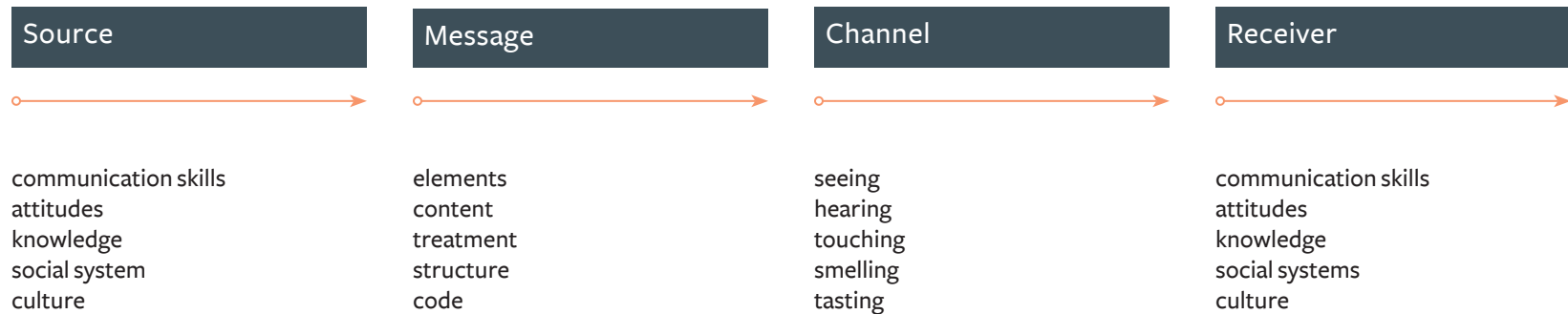g is only one of the zones of sense, the most stable and precise zone. A word acquires its sense from the context in which it appears; in different contexts, it changes its sense. Meaning remains stable throughout the changes of sense." (Vygotsky 1962, 224)

Similar to Vygotsky, cognitive linguistics argue that language is both embodied and situated in a specific environment. Everyday language and cognition mutually influence one another, and are both embedded in the experiences and environments of its users. Producing and understanding language involves cognitive processes, such as categorization. There are different phenomena, organism and objects, people, animals, plants, and artifacts in the world. Identification and classification, of these phenomena help to construct language in which meaning is expressed. Cognitive categories are mental concepts in which different phenomena are organized. They contain a prototypical member, are selective, interrelated, open-ended and shared by those belonging to a social group. Interactions between concepts is the context in our cognitive representations. "The prototypes of cognitive categories are not fixed, but may change when a particular context is introduced, and the same is true for category boundaries. The whole internal structure of a category seems to depend on the context and in a wider sense on our social and cultural knowledge, which is thought to be organized in cognitive and cultural models." (Ungerer, and Schmid 1996)

Claude Shannon's theory, originally intended to describe communication through technology, was applied by Warren Weaver to explain interpersonal communication. According to Shannon and Weaver's model, a message flows from an information source in a linear fashion, through a transmitter that encodes a signal, and is then sent via the signal towards the receiver. The transmission, however, is subjected to noise or interference from outside sources. On reception of the message the receiver attempts to clarify, extracting the interference to eventually convey the message to it's final destination. (*fig. 4*) Researchers found the Shannon-Weaver model useful for it's clarity, and application to a wide range of conversational processes, but also limited, for a number of reasons, in describing human communication. All messages have meaning, however, the semantic aspects of communication were irrelevant to Shannon. "In Shannon's model an information source selects a message from a known set of possible messages, for example, a dot or a dash, a letter of the alphabet, or a word or phrase from a list." (Dubberly and Pangaro, 2009) Reliance on an expected set of messages facilitates the ease and speed of conversation however it is also restrictive. If communication were confined to a predetermined set of messages new knowledge would never be generated or shared. "Only in conversation can we learn new concepts, share and evolve knowledge, and confirm agreement." (Dubberly and Pangaro, 2009) Design for communication also relies on a set of predetermined contexts for simplification of the process. The Shannon and Weaver model, reductive in nature, fails to take into account the cognitive capabilities of people involved in interpersonal communication.

| Source	Message	Channel	Receiver
communication skills attitudes knowledge social system culture	elements content treatment structure code	seeing hearing touching smelling tasting	communication skills attitudes knowledge social systems culture

The work of David Berlo, Philip Emmert and William Donaghy, modify and supplement Shannon and Weaver's theory. These models attempt to fix the limitations by taking into account all the components of communication.

Berlo's model describes four factors within the source and receiver, which can increase what he calls fidelity or message clarity. (*fig. 5*) First, communication skills determine message clarity in affecting the capacity to analyze purposes and intentions and in the wherewithal to encode: writing and speaking and decode: reading and listening. Second, the attitude towards the subject matter, the self and others of a source and a receiver affects how messages are constructed, transmitted and interpreted. Third, communication is affected by the knowledge of the subject matter being transmitted or received by individuals. Communication in affected numerous ways by the culture and social system, the role and prestige of an individual, cultural beliefs and values, accepted forms of behavior and expectations. (Berlo 1960, 72)

The next component that modified communication is content, code and treatment of a message. "When we speak, the speech is a message. When we write,

the writing is the message. When we paint, the picture is the message. When we gesture, the movements of our arms, the expressions on our faces are the message." (Berlo 1960, 54) Communication is structured with elements that make up messages. Basic elements of a language are sounds that are grouped to form phonemes, and then into higher-level groups morphemes. Letter form notations of the sound groups. The premise of having better elements or structure is debatable. "Which is more important in communication, having good ideas (elements) or having good organization (structure)." (Berlo 1960, 55) However, neither can exist without the other. Messages in interpersonal communication are then encoded and decoded through the senses, decisions are determined by the content, code, and treatment as well as knowledge of the receiver and how they best decode a message. An individuals particular skill also direct channel selection.

Emmert and Donaghy structured their model as a complex system configured with subsystems that are affected by the surrounding environment. (Emmert and Donaghy, fig 2.3, 1981, 40) This model comes closest to illustrating how and where interference occurs caused by the conditions of aphasia. (*fig. 6*) Each communicator
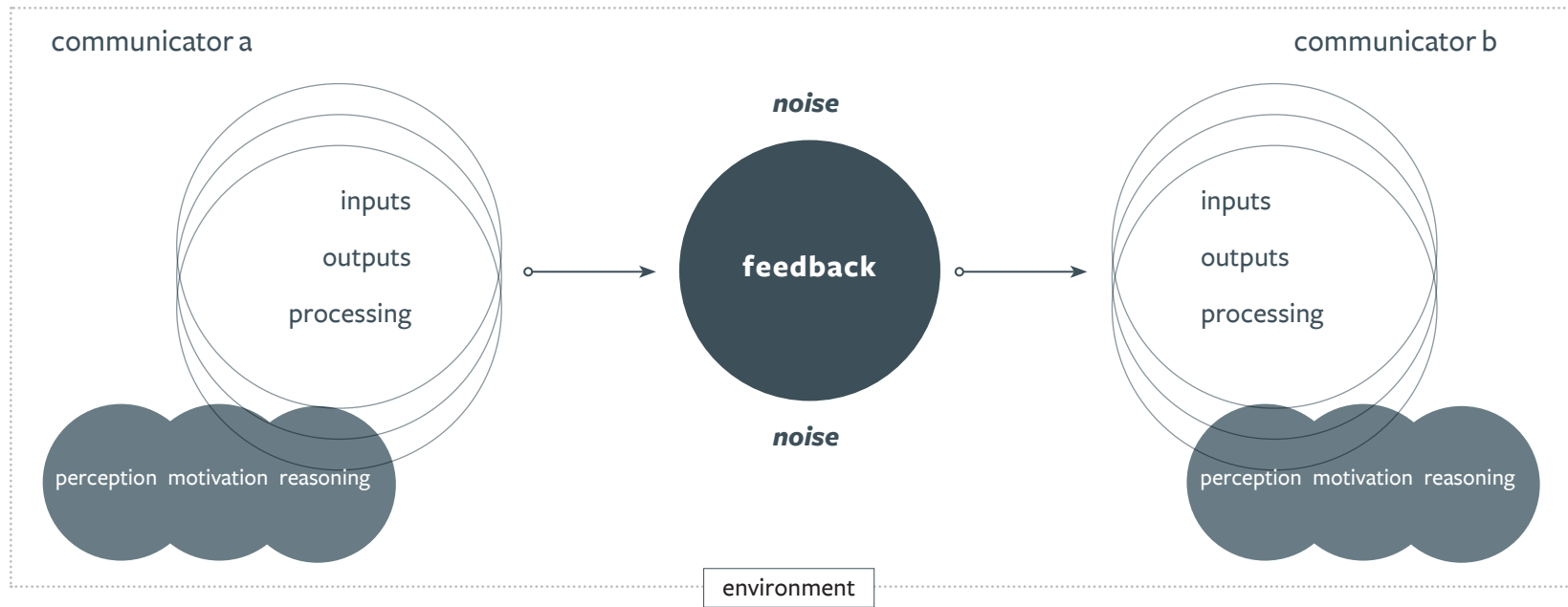
is composed of subsystems; these include input, output, and processing, motivation perception and reasoning. Output subsystems include the verbal and non-verbal messages as well as the physical behaviors produced by a communicators, that then become input for the receiver. The input subsystem allows the communicator to receive messages and stimuli from outside and includes the reception of light, temperature touch, sound and smells. The process includes more than just physical stimulus, but all the stimuli received in past experiences, education, health, physical capabilities and other environmental factors.

All three models discuss interference either as an external, internal or simultaneous issue in the communication process. Interference, defined by Emmert and Donaghy is "anything present within the system or within the environment that can alter or distort inputs and outputs is interference." (Emmert and Donaghy 1981, 43) External factors such as a noisy coffee shop would distort the spoken messages between people. Internal factors such as emotional states or

aphasia can cause another kind of interference.

Shannon and Weaver suggest encoders are pure until their message comes in contact with the environment and then are degraded. Aphasics however are compromised encoders as a result of brain damage and so demonstrate the imperfections of that model. Berlo's model did not discuss interference as an external factor, however, as a result of conditions within the communicators, such as knowledge, attitudes, skill levels, the particular treatment of a message and the channel used. Emmert and Donaghy are a combination of Shannon and Weaver's theory as well as Berlo's. Interference was found both as an internal cause within the sender and receiver and was a result of external factors in the environment.

The origin of interference for aphasics is located in the inputs, outputs and processing of the encoding source. Though interference is also found in the decoding receiver; those who fail to understand the conversational qualities and behaviors needed by those with aphasia.
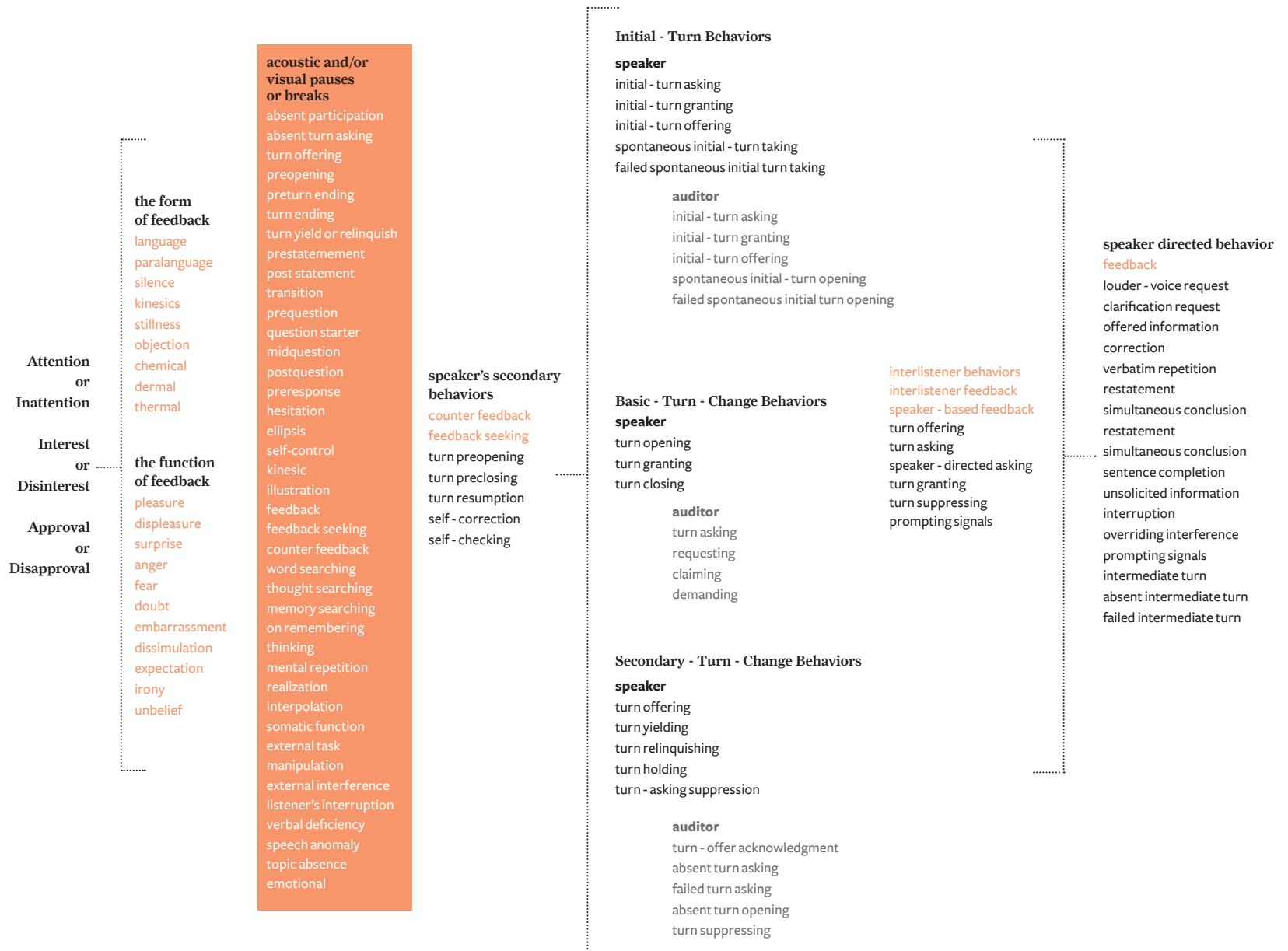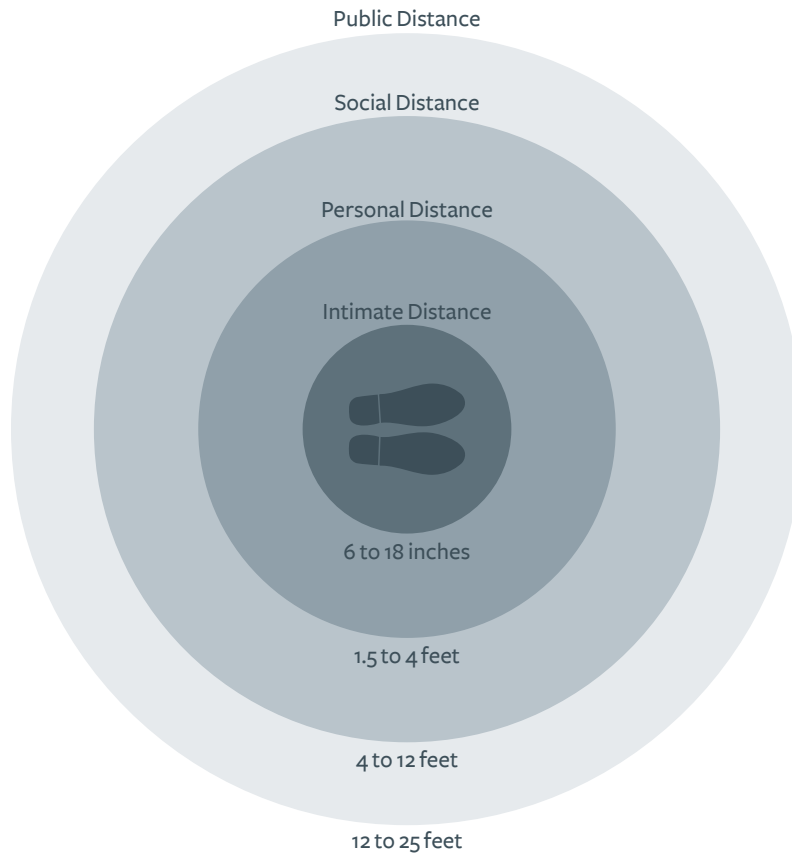
non-verbal components of communication

If written and verbal communication is compromised, then additional channels of communication such as proximity and gesture may help augment awareness in a conversation. Kinesthetic communication, non-verbal behaviors related to movement of the whole body, are elements that can be feasibly altered and augmented. Edward Hall and Fernando Poyatos's work provided, on one hand, a generalized map of conversational components and a more specific observational model for non-verbal actions.

Poyatos work makes obvious that language is greater than spoken words alone. Communication consists of verbal language, paralanguage, and the non-verbal components. An aspect of inquiry focused on the role of adjusting feedback in direct communication. Feedback is defined as a series of activities traveling over verbal and non-verbal channels from speaker to listener. This action acts as a running commentary and serves to prove that the listeners are actually listening, that they agree or disagree, like it or dislike the messages being transmitted. For those with aphasia time is needed to reflect on what is being said and to then formulate their own thoughts into external forms. Utter silence is disruptive to a normal conversation. Another aspect of inquiry could focus on adjusting listening behaviors during a conversation. Examining actions such as turn change behaviors might lead to reducing interference in the communication process.

Though detailed in its components, (*fig. 7*) The Behavioral Structure of Conversation is a generalized step-by-step procedure of conversation. The downfall of his work comes from it's failure to take into account the duration of conversation, environment in which the conversation is taking place, number of people involved, topics discussed, specific intonation of voice and the skills and cognitive abilities of the speakers and the listeners. (Poyatos, fig 7.1, 2002, 231)

The research of Edward Hall elaborates on these concepts presented by Poyatos to include the senses, space and time. During fieldwork in Europe, Asia, Middle Ease, and several Native America reservations, Hall observed and

**Attention
or
Inattention**

**Interest
or
Disinterest**

**Approval
or
Disapproval**

**the form
of feedback**

language
paralanguage
silence
kinesics
stillness
objection
chemical
dermal
thermal

**the function
of feedback**

pleasure
displeasure
surprise
anger
fear
doubt
embarrassment
dissimulation
expectation
irony
unbelief

**acoustic and/or
visual pauses
or breaks**

absent participation
absent turn asking
turn offering
preopening
preturn ending
turn ending
turn yield or relinquish
prestatemement
post statement
transition
prequestion
question starter
midquestion
postquestion
preresponse
hesitation
ellipsis
self-control
kinesic
illustration
feedback
feedback seeking
counter feedback
word searching
thought searching
memory searching
on remembering
thinking
mental repetition
realization
interpolation
somatic function
external task
manipulation
external interference
listener's interruption
verbal deficiency
speech anomaly
topic absence
emotional

**speaker's secondary
behaviors**

counter feedback
feedback seeking
turn preopening
turn preclosing
turn resumption
self - correction
self - checking

Initial - Turn Behaviors

speaker
initial - turn asking
initial - turn granting
initial - turn offering
spontaneous initial - turn taking
failed spontaneous initial turn taking

   auditor
   initial - turn asking
   initial - turn granting
   initial - turn offering
   spontaneous initial - turn opening
   failed spontaneous initial turn opening

Basic - Turn - Change Behaviors

speaker
turn opening
turn granting
turn closing

   auditor
   turn asking
   requesting
   claiming
   demanding

Secondary - Turn - Change Behaviors

speaker
turn offering
turn yielding
turn relinquishing
turn holding
turn - asking suppression

   auditor
   turn - offer acknowledgment
   absent turn asking
   failed turn asking
   absent turn opening
   turn suppressing

interlistener behaviors
interlistener feedback
speaker - based feedback

turn offering
turn asking
speaker - directed asking
turn granting
turn suppressing
prompting signals

speaker directed behavior

feedback
louder - voice request
clarification request
offered information
correction
verbatim repetition
restatement
simultaneous conclusion
restatement
simultaneous conclusion
sentence completion
unsolicited information
interruption
overriding interference
prompting signals
intermediate turn
absent intermediate turn
failed intermediate turn

Public Distance

Social Distance

Personal Distance

Intimate Distance

6 to 18 inches

1.5 to 4 feet

4 to 12 feet

12 to 25 feet

experienced difficulties communicating with cultures. "People from different cultures not only speak different languages but what is possibly more important, inhabit different sensory worlds." (Hall, 1982, 2) Hall noted different cultures maintain varying distances between each other during communication but are within the definitions he established of the informal, or personal spaces that surround individuals. "If we can think of man as surrounded by a series of expanding and contracting fields which provide information of many kinds, we shall begin to learn about human behavior." (Hall, 1982, 115) Intimate distance is reserved for our closest friends and family. In this space people take part in embracing, touching or whispering. Personal distance space is set aside for interactions among good friends or family members. Social distance space is saved for interactions among acquaintances and public distance space is used for lectures. The number of individuals addressed, from a single individual to a group as well as the environment are factors in the construction and transmission of messages. (*fig. 8*)

Complications from differences in spatial treatment in cross-cultural communication can be compared to the communication experiences had by those with aphasia. The identification of particular distances that provide channels of communication for those with aphasia can aid in reducing interference as well as granting a means to send and receive clear, complete messages. Considering very specific elements such as proximity, feedback and gesture can change personal perception of communication for the benefit of aphasics. Generalization of the communication process is beneficial when thinking about changing structural elements, though specifics such as the environment, the individual and his or her abilities need to be taken into account to insure specificity in design for communication.

visualizing intonation in speech

Inserting a subsidiary level of feedback such as intonation in notation form might cause reflection in communication. Informed by technology, extracting data from the frequencies of spoken language can then be translated into typographic form. (*fig. 9*) Typographic qualities were additive, as the frequency increases the number of elements multiplies. Practical applications for this research include closed captions for the hearing impaired, online chat interfaces, and notational software on the Apple iPad. *see appendix a*

design strategies

Standard communication models do not accommodate those that are impaired. Design based on these models excludes rather than expands the possibilities of communication. Yet, communication is the foundation for strong relationships, creative endeavors, discoveries, and inclusion. Compensatory strategies for communication by, for and with aphasics encourages the use of any means of dialogue including drawing, writing, pointing to key words or images, using body language and gestures. Designers have the unique capacity to look at complex issues through the concepts and models they construct. Examining the specific challenges faced by aphasic was necessary to understand current communication limits and the potential for employing addition channels. This context provides designers with a manageable scope, and concepts that are contingent on the specific challenges. Investigations were then carried out through visualizations of underused communication channels of gesture and proximity. Building on the previous studies, a communication aid was constructed. This prototype granted affordance for making notations, which facilitates inner thoughts and mental connections to satisfy motivations to communicate.

The abundance of information that is now available requires visualization. Visualizing data, processes, and experiences makes them tangible, and engaging. Recording and depicting movement has been a concerned both in the aesthetic and scientific areas. Empirical knowledge is essential to science. For example James D. Watson, Francis Crick and their team had difficulty discerning the structure of the DNA molecule they turned to a method of visualization using a large three-dimensional model. (Watson 1980) The pioneering research of Edward Muybridge, iconic studies of animal and human locomotion, represented the stages of movement in individual frames. Etienne-Jules Marey's work captured movement on a single photographic plate, informing all subsequent analytical representations of movement. Harold Edgerton was responsible for transforming the stroboscope from a laboratory device into the strobe flash for stop-action photography. These individuals, all used technology to record phenomena, and developed notational systems to focus on particular traits. For example, Marey ask his subjects to wear black suits, which he previously had applied white lines on particular points of the body. The black suit made the subject invisible except for the white lines, which helped only record the movements. (Marey 1895, 61) Today similar research, informed by technology, is being executed.

crafting messages through proximity

Proximity is a component of the kinesthetic channel of communication and greatly affects how a message is understood. Language can be altered by proximity through the changing perception of image schema. Mark Johnson and George Lakoff's theory of embodied cognition rejects the notion that the mind and the body are two ontologically distinct kinds. They reject the view that cognition and language are based on symbolic representations in our minds that refer to some physical thing out in the world. Embodiment theory seeks to understand the dynamic nature of humans as an organism operating in conjunction with its environment. (Johnson and Lakoff 1987, 10)

An image schema is a cognitive structure for understanding all aspects of perception and motor activities. Image schemas are structures which link bodily experience to conceptualization and language, and afford pattern completions and help server a basis for inferring what type of conversational interaction will occur. Though image schemas typically operate without our conscious awareness of how they structure our experience, it is possible to become reflectively aware of the structure of a certain experience, such feeling your body off balance or cupping your hands to form a container, or the feeling of being uncomfortable when someone enters intimate space uninvited. (Johnson and Lakoff 1987, 18-28) To some degree individuals are aware of the effects of non-verbal communication on message transmission. It is imperative, however to draw forth a deeper comprehension of non-verbal expression, building the skill sets of both those with aphasia and the non-impaired to reduce interference and generate more effective communication.

By means of observing and recording space that separates individual-to-individual, individual to group, individual to public space designers can understand proximities affect on cognition and language use. In the context of aphasia, proximity can be a way to structures messages that clarify information, and enhance personal and social connections. These are qualities of conversation that benefit those with communication impairments. Proximity, in the communication process affects the construction and transmission of messages. "Spatial changes give a tone to communication, accent it and at time even override the spoke word." (Hall, 1980, 204) Changes in message transmission can be achieved by physical distance alterations by both speakers and listeners, happens in degrees and modifies both verbal and physical messages. The number of individuals addressed, from a single individual to a group as well as the environment are factors in the construction and transmission of messages. "Concepts such as these are not always easy to grasp, because most of the distance-sensing process occurs outside awareness." (Hall 1982, 115)
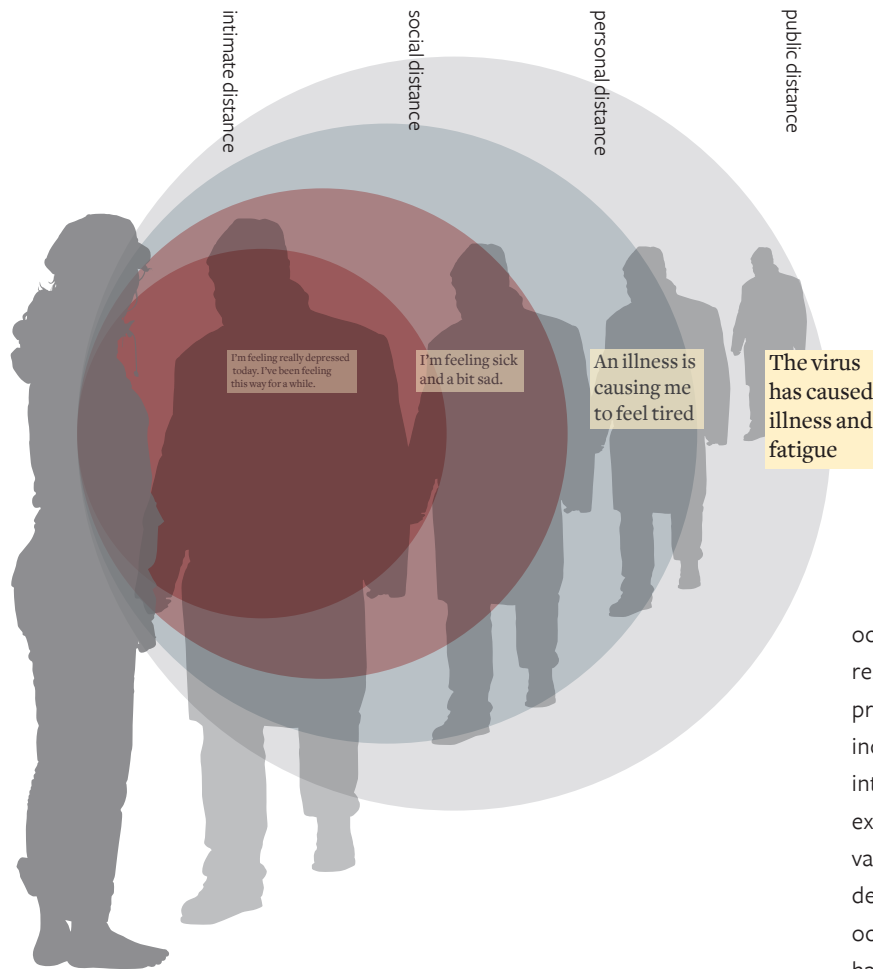
In this study thoughts and messages recorded by the designer, revealed language modification as distances changed. (*fig. 10, 11*) The messages were compiled during various observations in the public realm, individual-to-individual and individual-to-group. Messages were noted using Hall's proximity zones as the determining factor for distance range.

The intimate distance mode of communication is thorough and restricted, addresses are specifically about the other person or space and not about the self. Silence or lack of verbal communication is accepted. The personal distance mode of communication is localized and familiar, addresses are in relation to the self operating within a collective, community or pair. The social distances mode of communication allows a general transmission. The individual is concerned with the self in comparison to the other individual or group but not as an organism operating within the group or with the other individual. The public distance mode of communication grants a complete, complex image, yet mainstream or universal it its address. An individual is concerned with the self only in his or her address to others or spaces.

public distance

social distance

personal distance

intimate distance

"don't forget to make eye contact when you are speaking"

"my hands are shaking"

"my palms are sweating"

"remember to feed the cats when you get home"

"did I turn off the lights before I left the house"

"he's cute"

"wow what a strange guy, stop looking..."

"I'm not interested in speaking to you."

"watching people at this distance is enjoyable"

"stand up straight"

"it feels good to have close friends like this"

"I need to throw these shoes out"

"don't stare at your shoes too much"

"why is she so skinny why can't I be that way?"

"hilarious"

"I was thinking about the same thing"

"I'm not interested in speaking to you."

"I love her bag"

"I don't standing this close but I will tolerate you."

"I feel really safe around her"

"back up back up"

"she's beautiful"

"I don't like it but I will tolerate you."

"bad breath"

"great sense of style"

"bad breath"

"Don't stand so close to me."

"I love her jacket"

"back up back up"

"great sense of style"

"You are standing way too close to."

"looking him in the eyes is hard"

"looking him in the eyes is hard"

"I don't like it but I will tolerate you."

"I feel really safe around her"

intimate distance

social distance

personal distance

public distance

I'm feeling really depressed today. I've been feeling this way for a while.

I'm feeling sick and a bit sad.

An illness is causing me to feel tired

The virus has caused illness and fatigue

Word choice and phrasing of sentences, grammatical and syntactic shifts occur as distances between people changes. Messages were crafted, in this study in response and relevance to the question, "how are you feeling today?" and the proximity of a single individual to another individual. (*fig. 12*) As the distance increases the message becomes generic, and as distance decreases the message is intimate and personal. Distance between individuals revises several sensory experiences. Vocalization can range from a soft whisper to a loud boom. Vision at varying distances may be blurred and limited to clear and precise, textures and details can be noticed as distances decreases. An awareness of various smells occurs due to distance changes. "Not only is a vocal message qualified by the handling of distance, but the substance of a conversation can often demand special handling of space. There are certain things which are difficult to talk about unless one is within the proper conversational zone." (Hall 1980, 206)

Using the affects of proximity on modes and address of communication for slower face-to-face conversations that afford differences in communication skills can generate more effective, tailored, context specific dialogue in both physical and virtual space. Enabling users to influence and shape these changes creates a more dynamic, participatory, open environment.

gesture & verbal language

Gesture allows individuals with aphasia to communicate a variety of feelings and thoughts, from contempt and hostility to approval and affection. The following research visualizes the interconnections between non-verbal gesture and verbal language. Gesture supports spoken language and serves to convey information to others. It also aids in speech production and the reduction of cognitive load through creating a link from spoken language to visual images. After an individual acquires aphasia an increase in gesture production is seen. These individuals have greatly impaired language abilities and so speaking is difficult. (Goldin-Meadow 2003, 146) Gesture is integral to the speaking process. All gestures, except for emblematic, must be tied with spoken language for universal understanding. Through gesture, a visual route is formed from the phonological lexicon to the brain. The process of word finding may become easier as a result, alleviating some conditions of aphasia.

The first attempts to visualize gesture focused on diagramming proximity to the self and others, emphasis of movement, and iconography. Any visualization of non-verbal language should take that into account extracting information from observable events in communication. The black and white stop frame video was sketched to record the motion of hands through space. (*fig. 13*)

time
mapping zones / color codes
distance
person
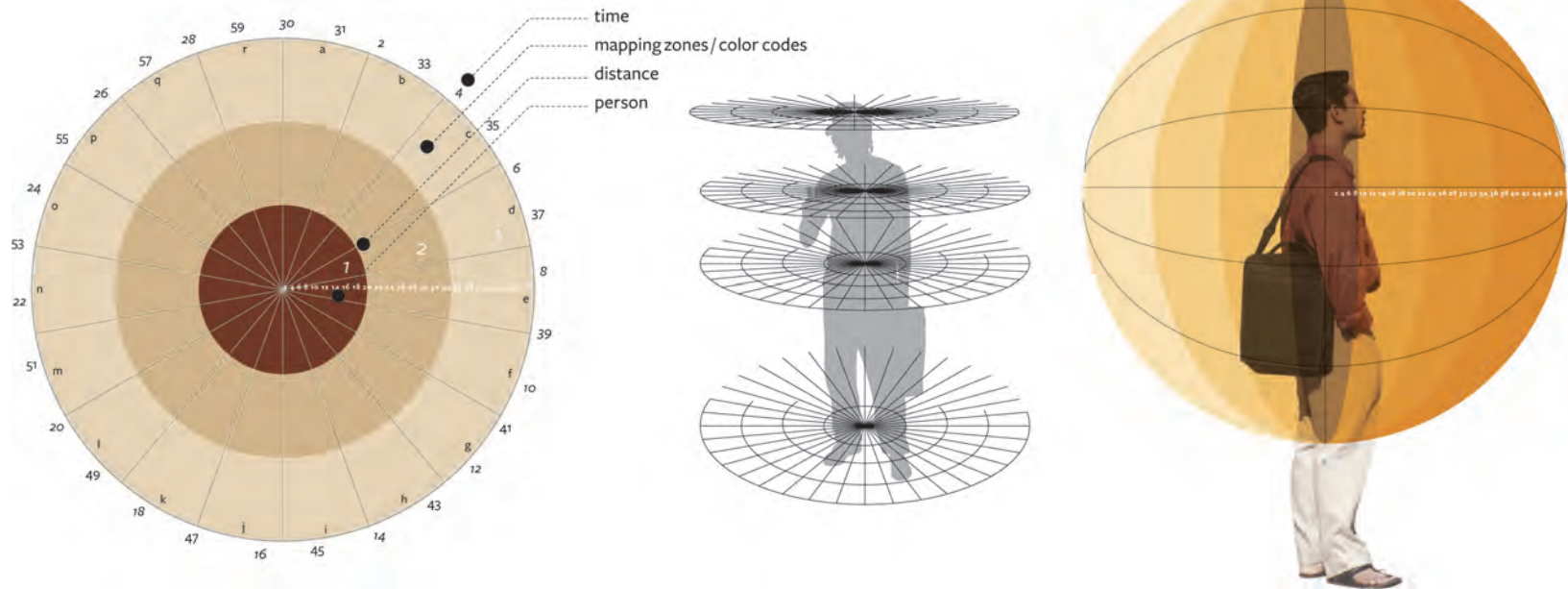
The second stages dealt with the translation of information from gesture, such as duration, emphasis and proximity to the self and others into visual form. A rationalized, objective approach was used for the formal qualities of this study. (*fig. 14 - 18*) This method emerged from constructing a hypothetical relationship between a digital device that sensed body movements and simultaneously made notations.

.05 SECONDS
ZONE O/3 - I/3
ZONE F/3 - D/3

"ok I have to
get my **bag at studio**
before we go"

.05 SECONDS
ZONE O/3 - I/3
ZONE F/3 - D/3

HEY JOE
WERE GOING
DOWN THE STREET
TO GRAB A DRINK

.05 SECONDS
ZONE O/3 - I/3
ZONE F/3 - D/3

"i climbed
up the stairs"

.05 SECONDS
ZONE O/3 - I/3
ZONE F/3 - D/3

"THERE WAS A LONG PAUSE, IF I SAID
SOMETHING AND THEN THERE
WAS ABOUT TWO MINUTES"
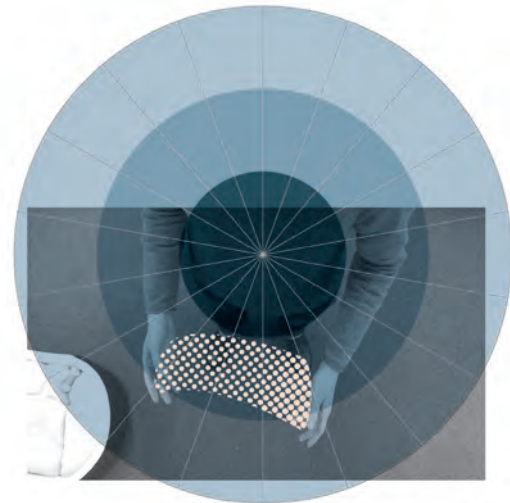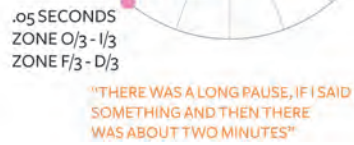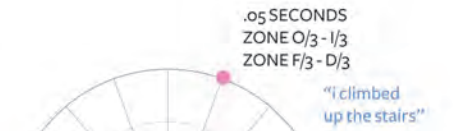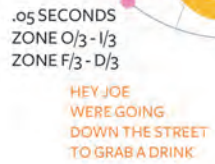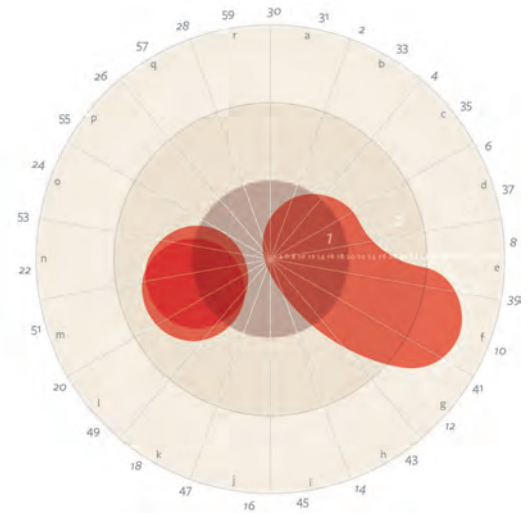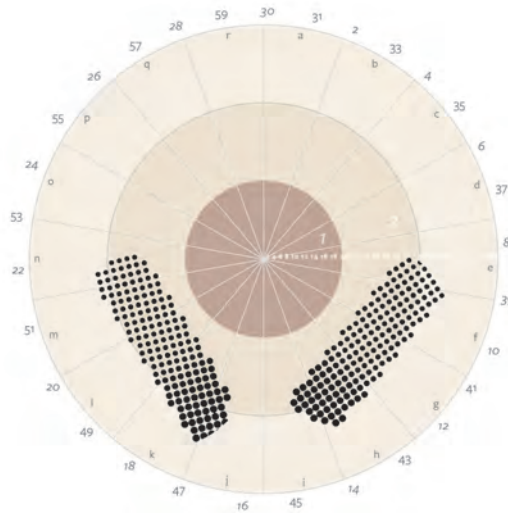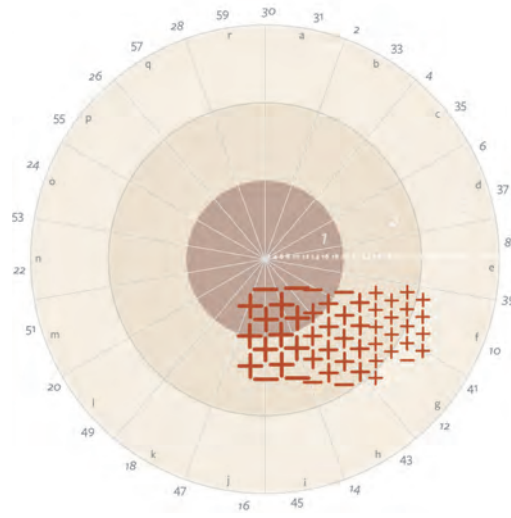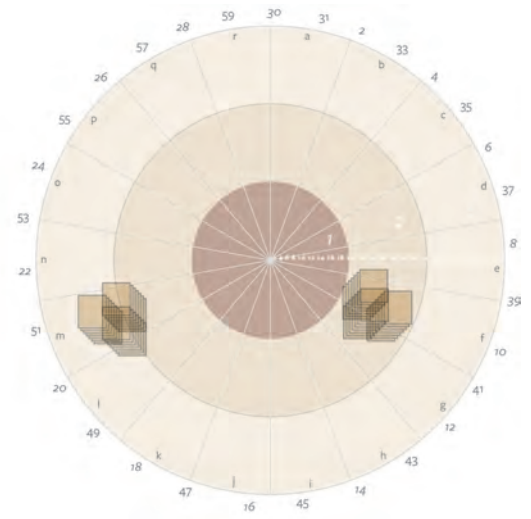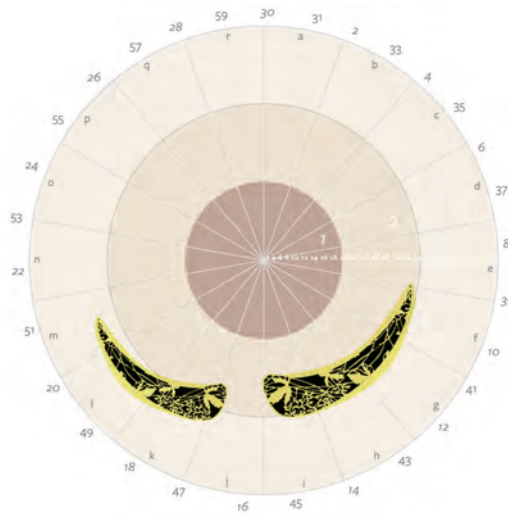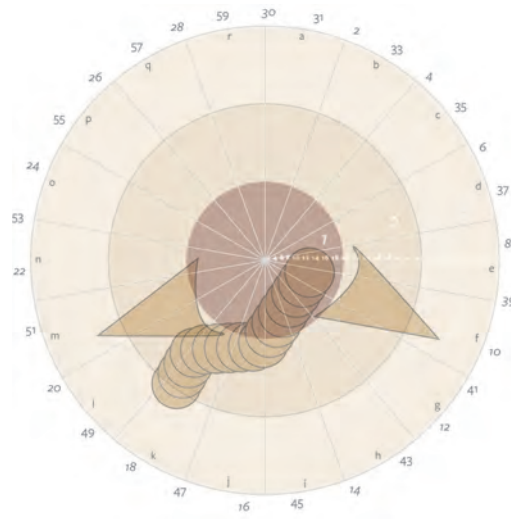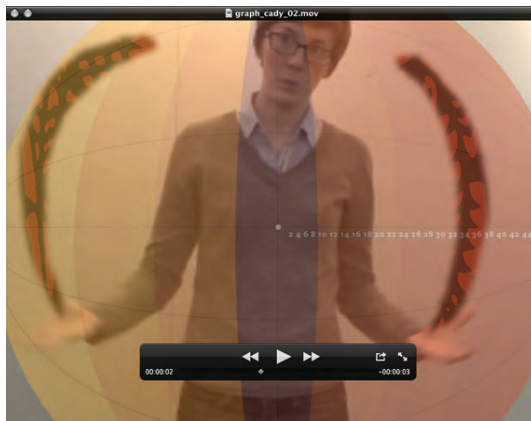
Connecting speech with the previous graphic notations in video was researched. (*fig. 19 - 24*) Several recordings were made from two axes, the "top down" map like view and an "elevation" view, straight at the body. Diagrams, which measured distance and time, were then applied to the appropriate video. Graphic lines, recording the point of origin and ending, which was configured to show a progress of gesture over time was added.

From this observational approach, the following studies shifted to capture only those qualities that describe the body's sequential movement through space during a gesture. (*fig. 25 - 26*) They focused on capturing a more general perception of the body in space. What they failed to accomplish was the correlation between the sequence of images and the progression through the verbal language. If visualizations are to function as pertinent information to viewers they must be able to communicate through a specific phrase.
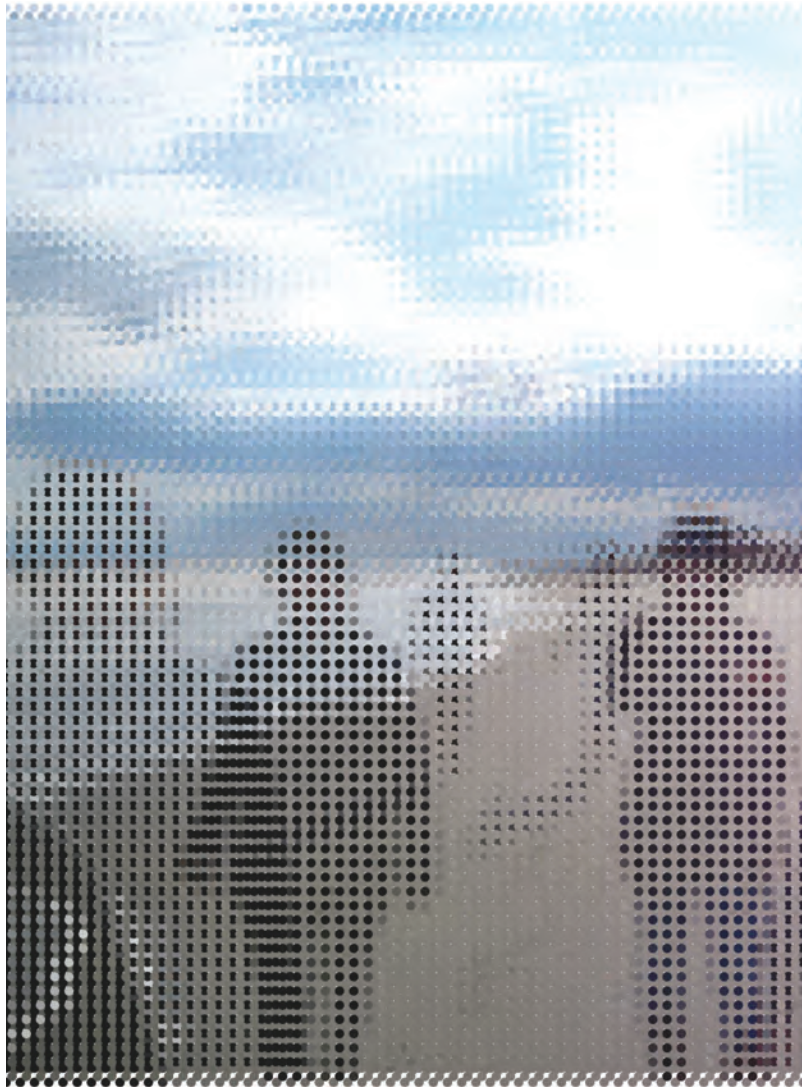
Subsequent visualizations considered ways to represent the correlation between speech and phrasing with the more subjective visual information of gesture. (*fig. 27*) "Nonverbal messages cannot be studied in isolations. In order to understand their importance, we must look at them holistically relative to the other aspects of communication, especially verbal language. The nonverbal channel most often complements the verbal channel." (Emmert and Donaghy 1981, 166) This series of images were designed to trace the sequence of hand and body movement and then tie the motion to the words being spoken, building on and clarifying the previous investigation. (*fig. 28-30*)

Gesture servers a communicative function and are produced to aid comprehension by the listener. Gesturing in conjunction with speech benefits the listener as a visual support of what is being said and as a reflection of the speaker's thoughts. "It is only recently that communication specialists have begun to look at the nonverbal channels carefully, and we are just beginning to understand their potentialities and interrelationships with verbal communication. Many of the early investigators of nonverbal communication were surprised to discover that people tend to believe messages that flow through the nonverbal channels more than messages that flow through the verbal channels when the two are in conflict." (Emmert, et all. 1981, 167)
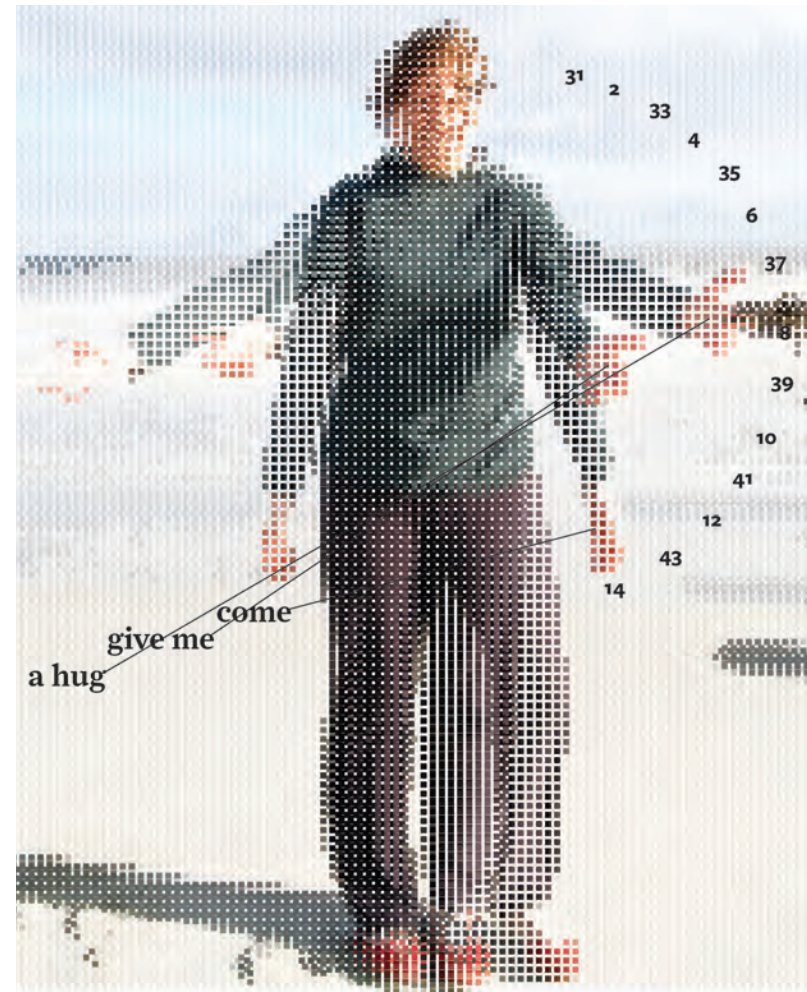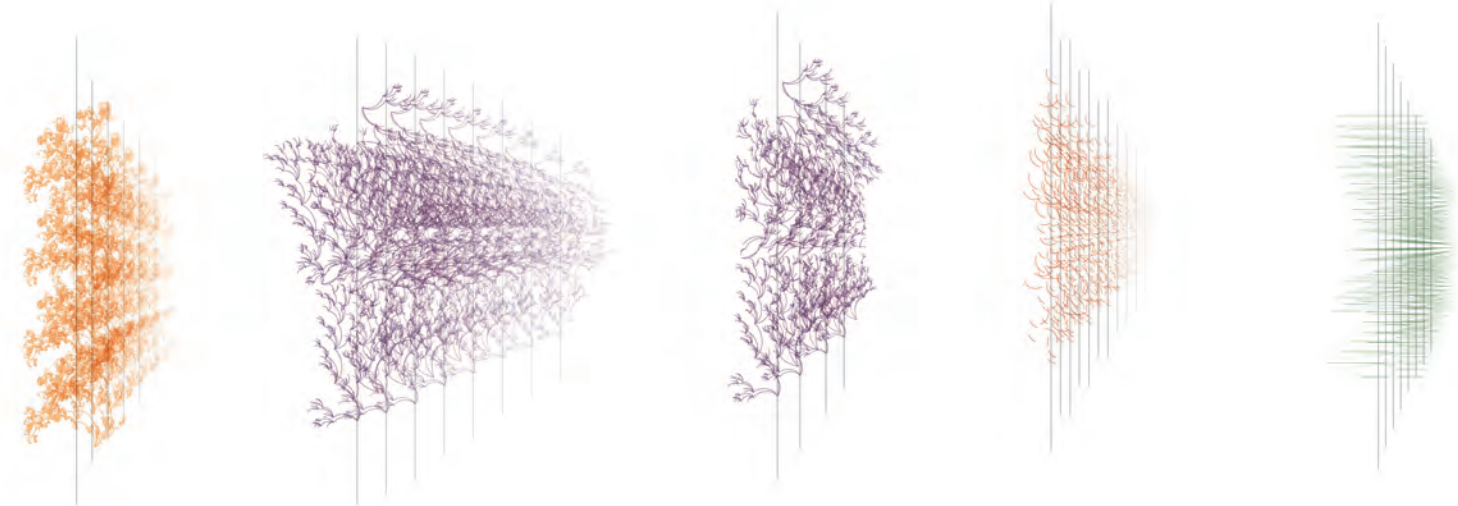
HEY

IT'S NICE TO

SEE YOU AGAIN

COME

GIVE ME A HUG

1/2 sec

1/2 sec

1/2 sec

1/2 sec

a hug

give me

1/2 sec

1/2 sec

time

typography & gesture

This experiment began with a concern for capturing the dimensional beauty of gesture. (*fig. 31 - 33*) The act established a foundation for further visualizations. The intention behind the work was to investigate the effects on letterforms controlled by the motion of the hand. Letters were cut from paper and sewn to pushpins on the wall that represented the endpoint of a gesture.

see appendix a
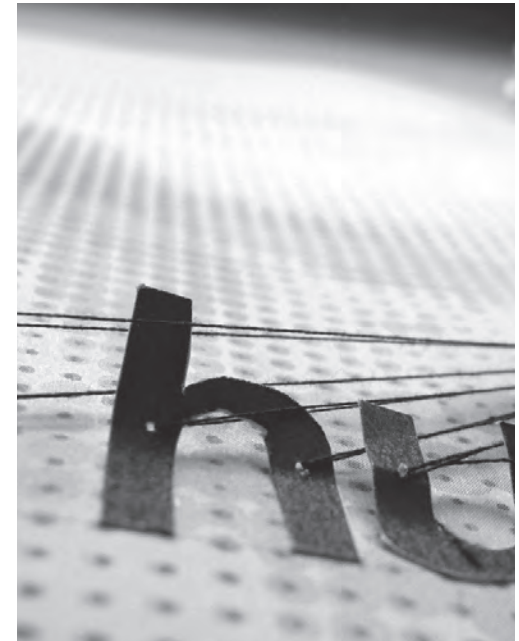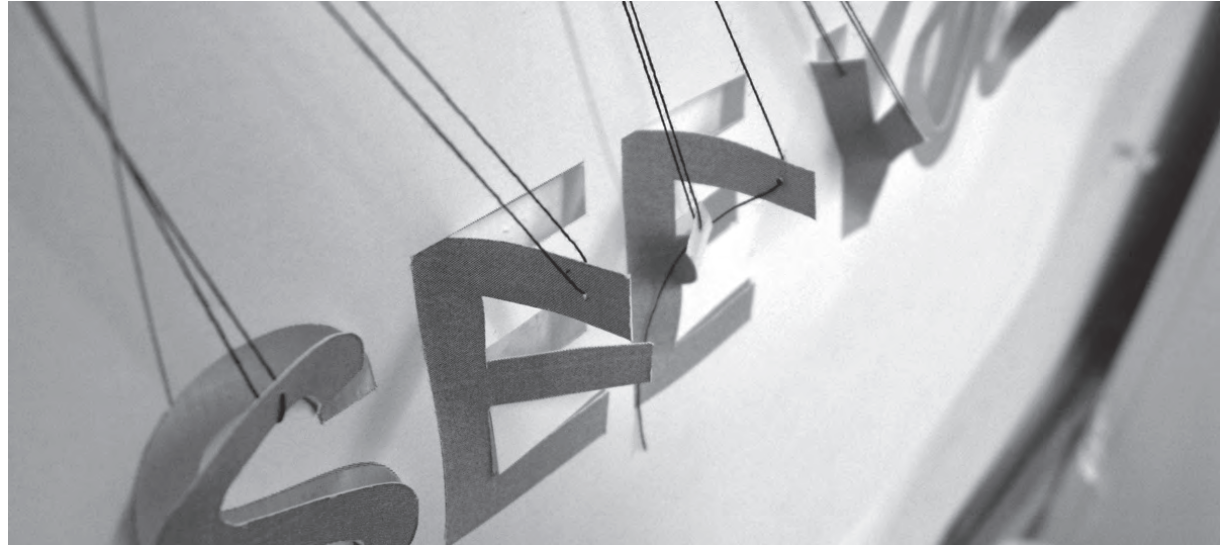
Gesture can enable speech as stated by Susan Goldin-Meadow or it can contradict spoken language. When the body movement by a speaker conveys a meaning that is different from the meaning conveyed in speech, it can confuse the listener. In this instance, there are two messages that the speaker is conveying - one in speech and another in gesture. The meaning conveyed in gesture may compete with the meaning conveyed in speech.

This visualization examined a series of gestures based on the phrase, "you go left". Seven seconds were recorded, a second for each image. Selections were made of significant movements at each stage during the gesture and then layered, labeling the point of beginning and point of end. Notations were added correlating with the phrase and the motion of the gesture. The readability of the spoken message is determined by the gesture. (*fig. 34*)

The process was replicated to visualize a gesture that contradicts speech. Yet, the gesture now indicates to the right. This change in direction greatly influences the understanding of the messages. In the previous study the hand motion supported language, the movement here distorts the typography. (*fig. 35*)
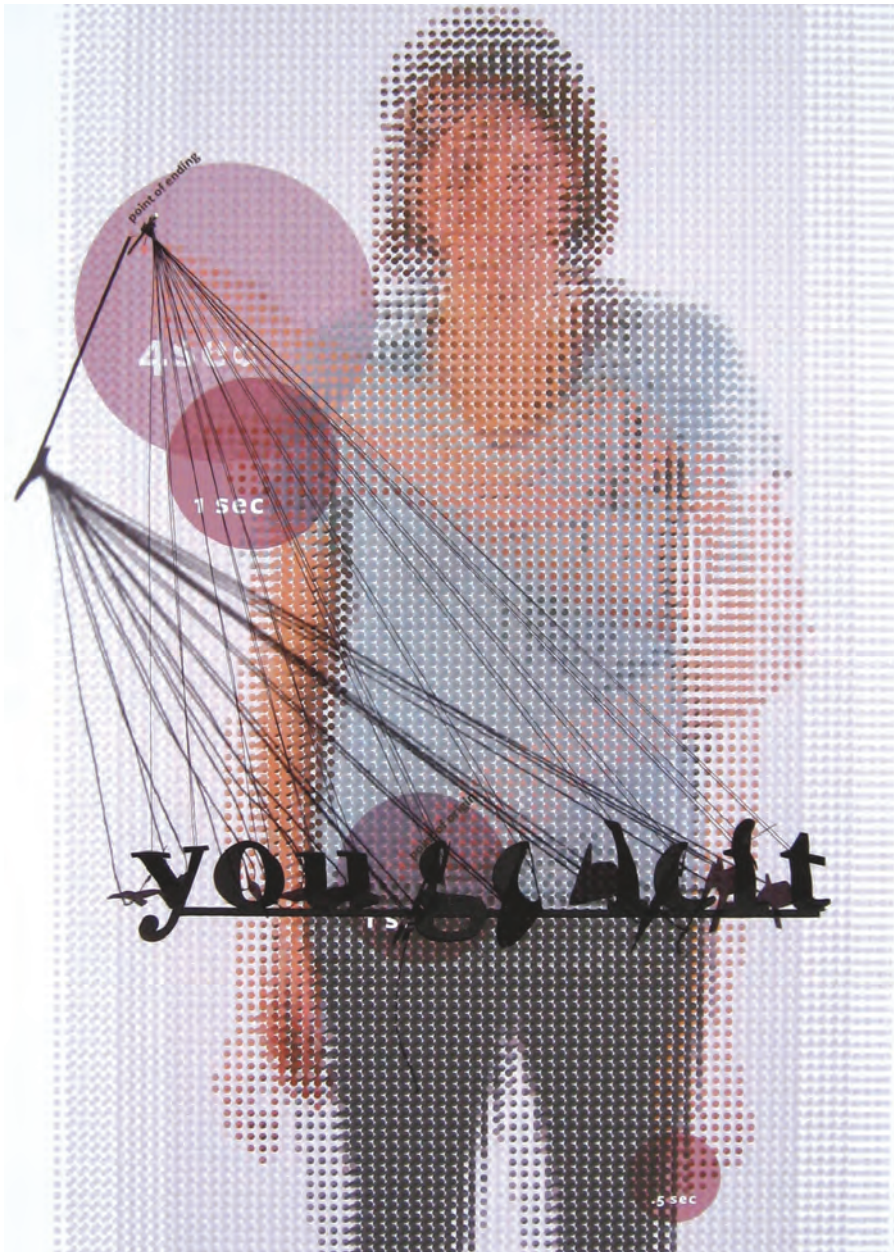
Further investigations were executed of the impact on readability in typographic notations involving a gesture with two hands. The verbal message though not distorted acquires qualities of the gesture, twisting slightly and moving forward with the motion of the body. Observing the gesture from varying heights changes the message's readability. (*fig. 36 - 37*)

Gesture, during conversation aids in memory and comprehension of the speaker. In conjunction with speech, gesturing supports speakers who are problem solving and may provide them with a channel for expressing thoughts that are difficult to articulate in speech. Often, phone users can be seen gesturing even when there is no obvious communicative gains for the listener.
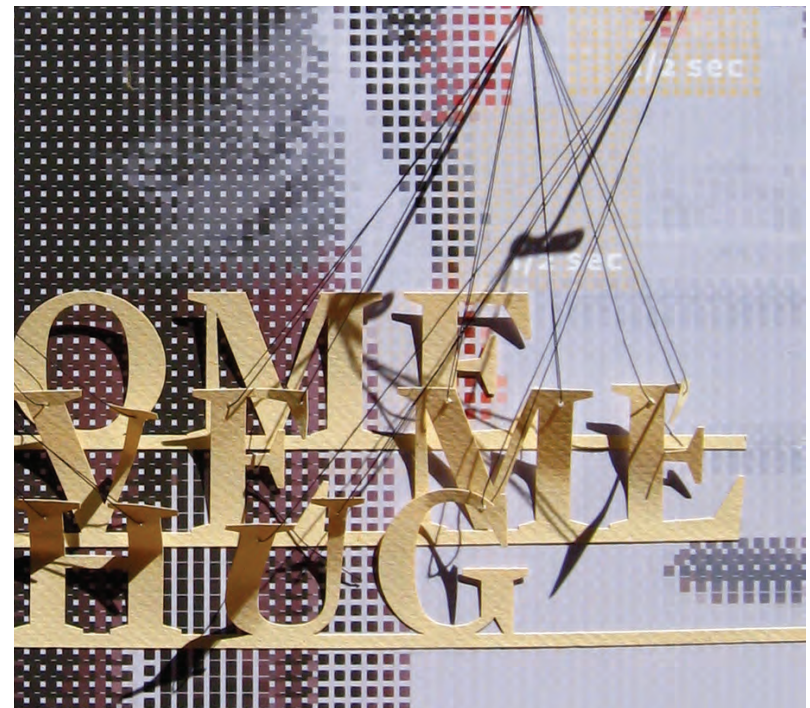
Gesture might assist those with aphasia by adding a visual element to aid in memory. Information that is jointly expressed in speech and in gesture allows for the possibility to encode that information in a visual-spatial store. Shifting from speech alone to gesture and speech is stated "to remove some of the load from the verbal store, thus leaving more "room" and making it possible to remember more verbal material. (Goldin-Meadow 2003, 158)

Gesture can assist the cognitive capacities of an aphasic through activating a visual route from the right hemisphere of the brain. The visual processing augments the left hemisphere where the phonological and word retrieval is active. Gesturing also supports linking a speaker's words to real-world objects and helps speakers organize information, particularly spatial information, for the act of speaking.

Additional research on gesture and their aid in organizing information for the act of speaking revealed the tie between hand movements and event sequences conveyed in speech. The speaker is discussing the tasks and projects of a junior level design class for the semester. Abstract objects and information are organized with the movements of the hands. (*fig. 39*) Typography was placed at the point of the gesture's origin and size was determined by the emphasis of the gesture. The sequences were combined to view the distance, range and emphasis of this individual's gestural behavior. (*fig. 38*)

These studies, however revealing and fruitful, lead to a more comprehensive project that would support and help aid in the retrieval of words for an aphasic.

THEY
ARE
JUNIORS

SO THE SECOND HALF

SO THEY CAN
DO WHATEVER
THEY WANT

OF THE SEMESTER...

SO THEY CAN DO...

BUT I KINDA MEAN

BUT YOU COULD SAY
I'M INTERESTED IN
BOOK DESIGN
SO I'M GOING
TO DO A CATALOGUE,

SO WITH IN

THE REALM
OF LIKE
EXHIBITION MEDIUM

CONCEIVE A SHOW
AROUND THIS BOOK

AND THEN
DO A CATALOGUE
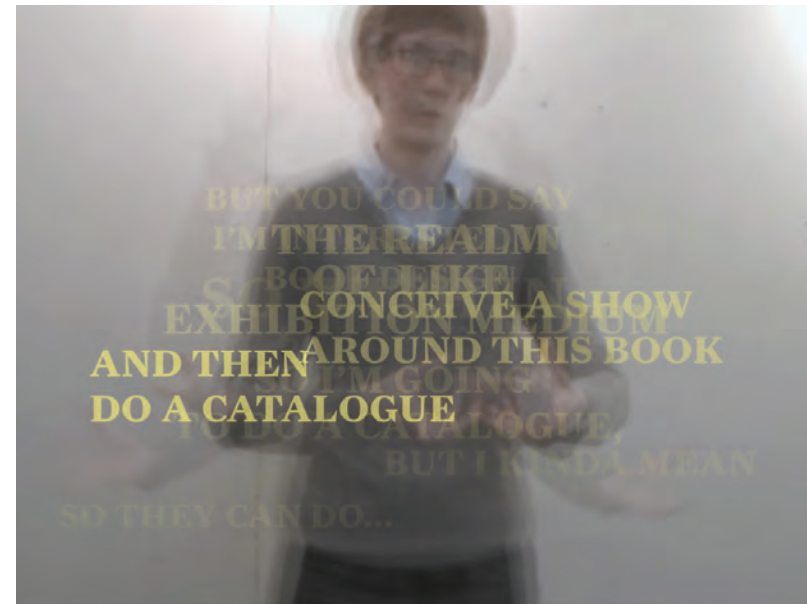
PROTOTYPING A COMMUNICATION AID

Inner speech has multiple functions, some unknown but we do know that internal language mediates and makes conscious our thinking. The affects of aphasia on inner language can make it hard to pin down and grasp thoughts, emotions and meanings. Vygotsky said that we should not treat thought and language as a static thing but "a continual movement back and forth from thought to word and from word to thought", an "inner movement through a series of planes" (Vygotsky 1962, 125) Designing notational systems to prompt and help organize an individual's personal recall can aid certain individuals with aphasia to compensate for their diminished capacity to express themselves using written language conventions.

To define the attributes of the tool to accommodate and guide behaviors motivations to communicate and language competence were identified in each subject. At the core of each communicative interaction is a motivation to satisfy a need. From the case studies, Christopher is motivated to maintain his friendships through dialogues on shared interests. John is motivated, from a dream, to visit his childhood house in Slough, outside of London England. For Chris, a poet motivation arrives from the design to write. Each individual, with aphasia, has varying difficulties communicating. John cannot read, write, or speak and so it was necessary to incorporate images connected with written language for his wife Monica. Christopher and Chris both can read and write but struggle to encode their thoughts into language, link ideas and maintain the conversational route once located. Tools were identified in speech therapy to help Chris with the process through seeing words or saying words aloud. "There is meaning in my head, I want it but I don't know what it is. So the only way I can handle that one is by writing it down to check it out. The only way is translating it through the pen. Then I think 'that looks find' and sometimes 'that looks funny' but I don't know what the meaning was exactly or how to spell it." (Parr, Paterson, Pound 2003, 26)

word associations

The final project concerned with language and thought began with examining ten personal emails to reveal patterns of language use. Words were organized into categories, such as frequency, number of letters in the word, family and friends names, adjectives, nouns and verbs.
see appendix a
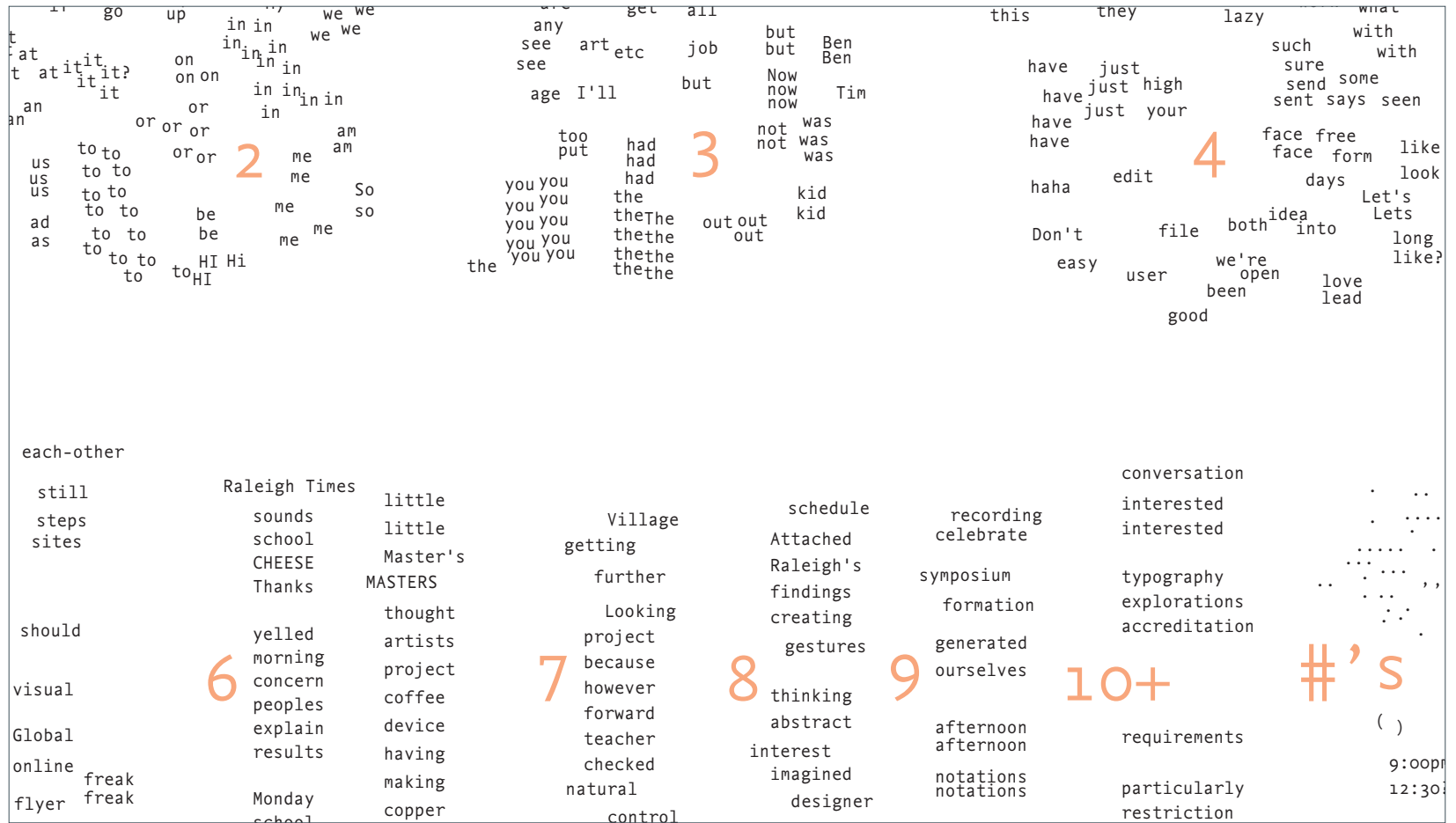
"I have forgotten the word I intended to say,
and my thoughts, unembodied, returns
to the realm of shadows." — O. Mandelstam

This conversational system is designed with knowledge based on learned written language and conventions such as the dictionary and it's alphabetical structure for organization; capitalizing on the use of particular language schemas and cognitive ordering based on associations and experiences to customize and enrich communication. Cognitive ordering is an approach based on the work of Vygotsky and a theory defined by cognitive linguists. Everyday language and cognition mutually influence one another, and are both embedded in the experiences and environments of its user. Significant to this study is the knowledge that each cognitive category consists of members belonging to the category and the attributes or essential features each member possesses. These categories change as contexts are chosen. To aid in recall and association building in communication the system designed relies on the use of an individual's cognitive containers, built over time through the use of software constructed to aggregate and recognize patterns from an individual's digital imagery and language records.

Planed with the affordances of a touch screen device in mind this system enables individuals to interact naturally through gesture without the use of any mechanical devices. Several communication aids, such as Lingraphica and Touchspeak take advantage of touch screen devices such as the Apple iPhone. This technology affords, portability, simplicity and adaptation to an elderly audience that may have limited dexterity to control a mouse.

visualizing word sense

Inspired by Lev Vygotsky's work on the function and description of inner speech a visualization of a word sense was made. The sense of a word is the sum of all associated psychological events present in our thoughts. Inner speech is the conversion of speech into inward thought and it contains only predicates and words are used economically. A single word in inner speech may be so replete with sense to the individual that it would take many words to express it in external speech. Using the dictionary as a language container a single word was chosen and it's personal word sense traced using a needle and thread. (*fig. 41 - 42*) Using a physical dictionary verses a digital exploration arose from an intuitive understanding that the tangible object replicated aspects of the thinking process. *see appendix a*

The guidebook, a communication aid, functions with knowledge based on learned written language and conventions of the dictionary. Upon entrance to the system individuals will have the option of using their individually configured database or the general arrangement. (fig. 43) The metaphor of a map to route an individual in a conversational or language journey was employed, however, the design retained the chapters or alphabetized sections of a traditional dictionary. Each letter of the alphabet are represented as continually changing containers, words gently fade in as if rising to the surface of a lake. Within the general arrangement, individuals can expect adjacent words next the chosen word. (fig. 44)
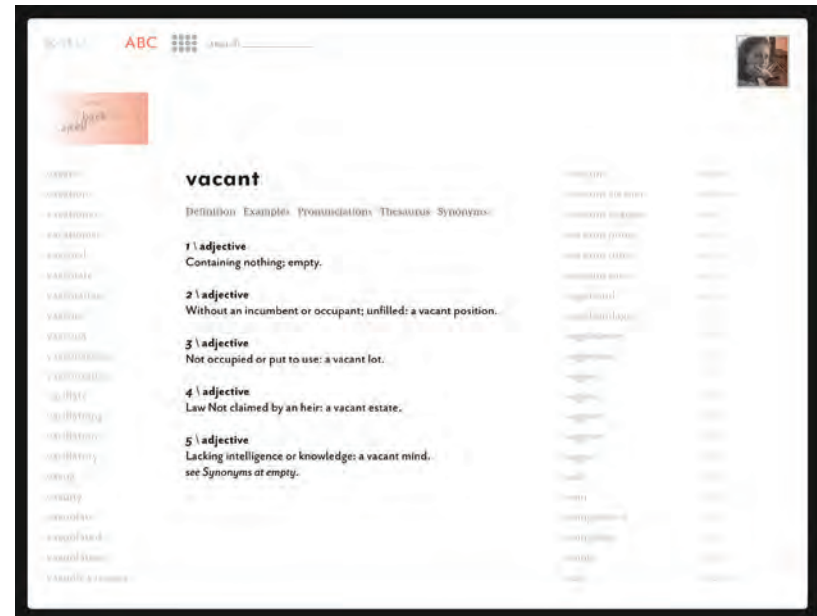
Parallel to the language dictionary each image and corresponding word is present and divided into the same alphabetical ordering. (fig. 45) To access the letter Q division an individual can select the image, upon touch, the picture increases in size and transforms from black and white into color. A definition can be viewed, along with examples, pronunciations, and etymologies. Adjacent words are seen in the background. (fig. 46) At this point in the system the individual can scroll right to access other words in proximity, as they would in a traditional physical dictionary by turning the pages. A search function accommodates a more direct route to an image and word.

ABC search _____
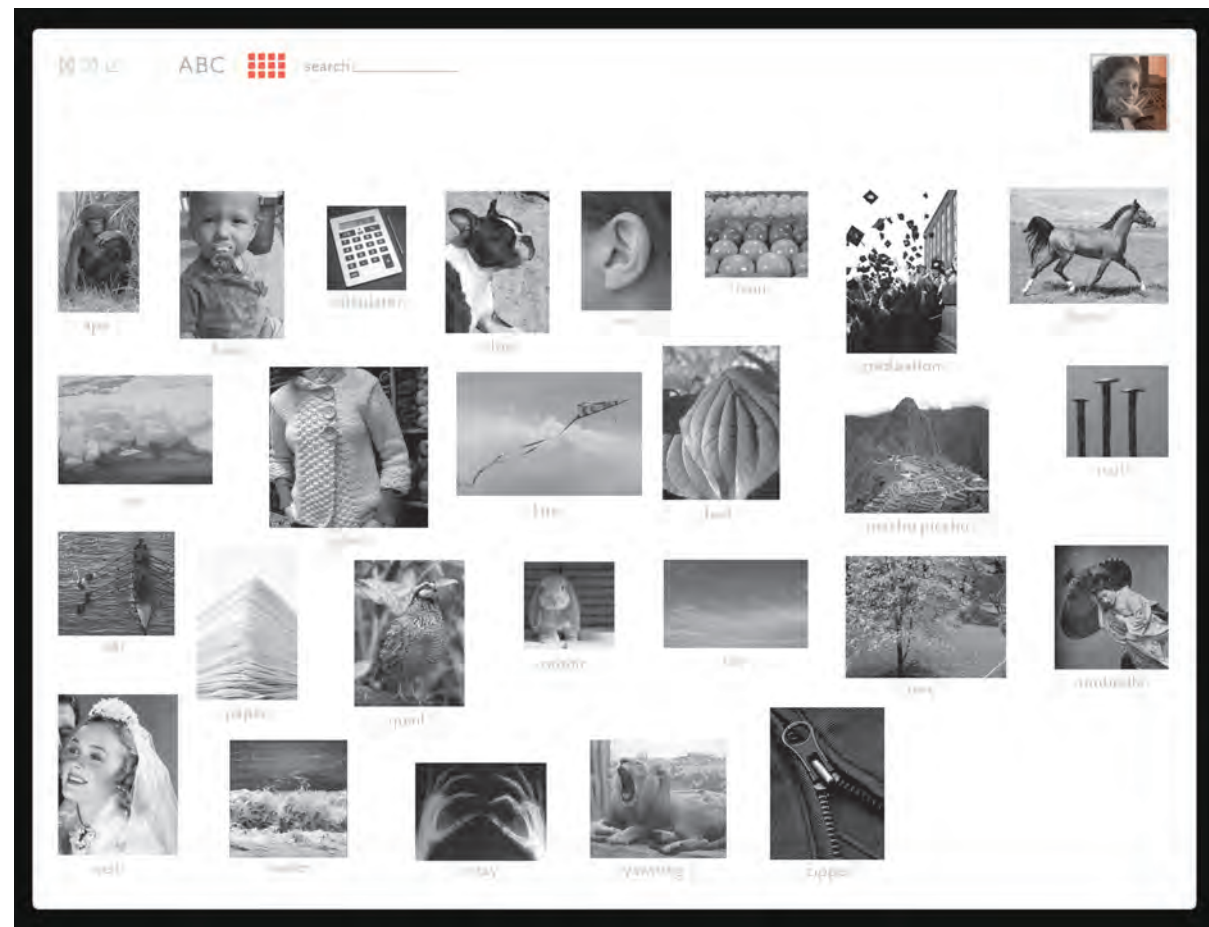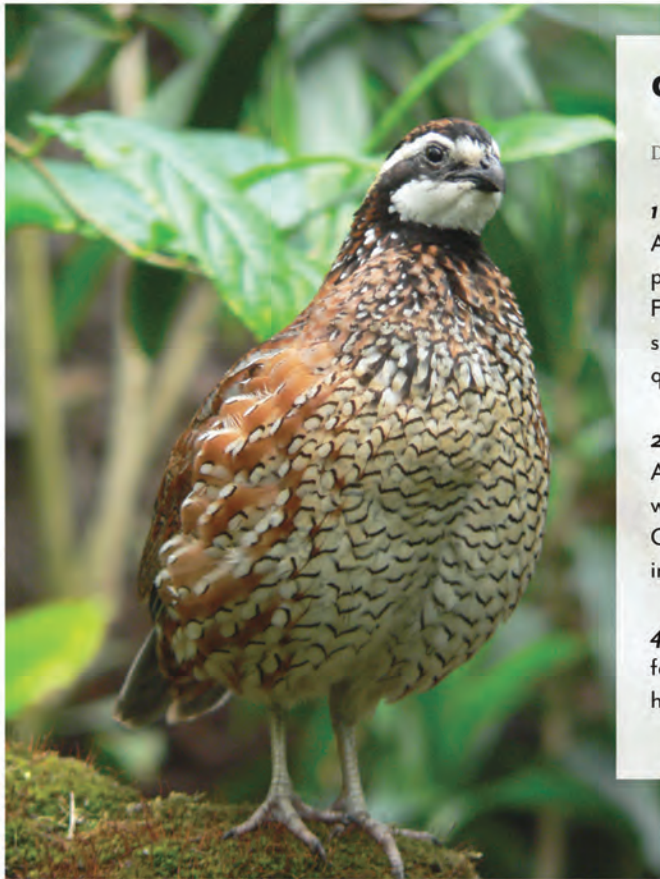
quail

Definition Examples Pronunciations Thesaurus Synonyms

dove

1 \ **noun**
A small, short-tailed Old World game bird resembling a tiny partridge, typically having brown camouflaged plumage. • Family Phasianidae: three genera, in particular Coturnix, and several species, e.g., the widespread migratory common quail.

2 \ **noun**
A small or medium-sized New World game bird, the male of which has distinctive facial markings. • Family Phasianidae (or Odontophoridae): several genera and many species, including the bobwhite.

quake grass

4 \ **verb**
feel or show fear or apprehension : she quailed at his heartless words.

quaker

The individual's configured system can be accessed through the icon located in the right hand corner. Upon touching the icon the system will shift and present the user with his or her recent language paths. In the alphabetical containers, those words frequently searched for appear large and prominent. (fig. 47) Language paths can be revisited upon sliding the bronze red bar open, the alphabetical containers cluster and drop to the bottom of the screen. Changes in size, font and color organize the path into cognitive categories, contexts, members of the categories and attributes. (fig. 48)

As the individual combs through words, culturally associative contexts are brought forth. These contexts are directly attributed to the word; the prototypes of cognitive categories are not fixed, and may change when a particular context is introduced. A threaded path forms simultaneously, constructing thoughts into conversational notations allowing individuals to anchor thinking and retrace mental steps more directly.
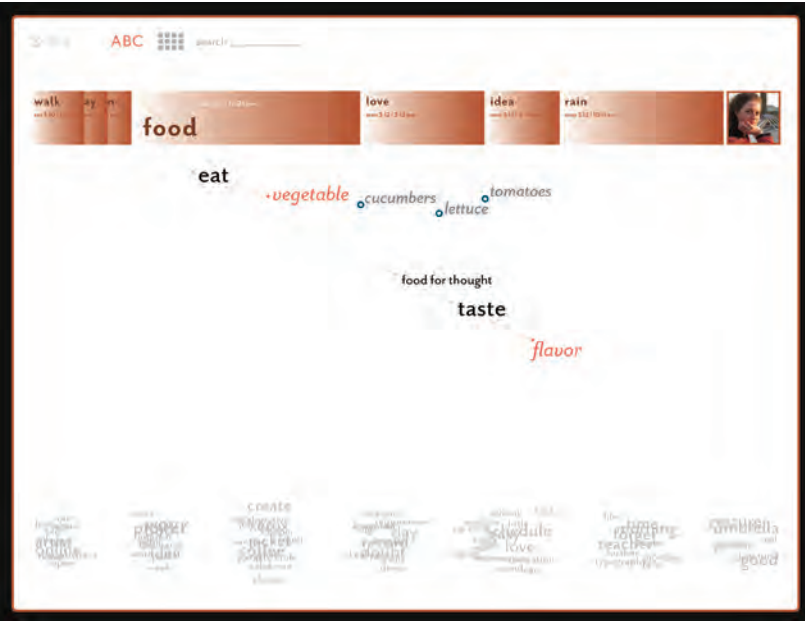
To begin a new path to sift through words to spark connections and solidify thinking the individual, if there is a particular word she wishes to search for, can be typed into the search function located at the top left hand corner of the screen. The definition of food surfaces and her particular cognitive contexts are attached to the word. An individual on selecting a word is given the appropriate contexts attributed to the word. (fig. 49) The prototypes of cognitive categories are not fixed, but may change when a particular context is introduced. Selecting for example, "eat" through touch, results in contexts and members of the container appearing. In the next screen choosing vegetable specifies the associations to just members belonging to that container. If the individual went further in their search, attributes of the selected word would appear, for example, tomato would call forth, red, juicy, round and so forth. (fig. 50)

ABC search _____

spinach
eggplant broccoli
pepper cucumber
leek zucchini
lettuce squash
pumpkin carrot
asparagus

vegetable   taste
meat   eat
fish   cook
dairy
fruit   grow
bread   shop

tomato
red
clusters
juicy
seeds

fontinal
fontinalis
font name
food chow

food

Definition Examples Pronunciations Thesaurus Synonyms

1 \ noun
Material, usually of plant or animal origin, that contains
or consists of essential body nutrients, such as
carbohydrates, fats, proteins, vitamins, or minerals, and is
ingested and assimilated by an organism to produce energy,
stimulate growth, and maintain life.

2 \ noun
A specified kind of nourishment: breakfast food;
plant food.

3 \ noun
Nourishment eaten in solid form: food and drink.

food ball
food canal

This individual has formated his guidebook to operate primarily through images. Upon touching the icon, his recent language paths are given. Alphabetical categories are seen as personal as well as the database's images. (fig. 51 - 52) As with the word only section, frequently searched for images will be prominently placed to access with greater ease. (fig. 53)

ABC

search _____
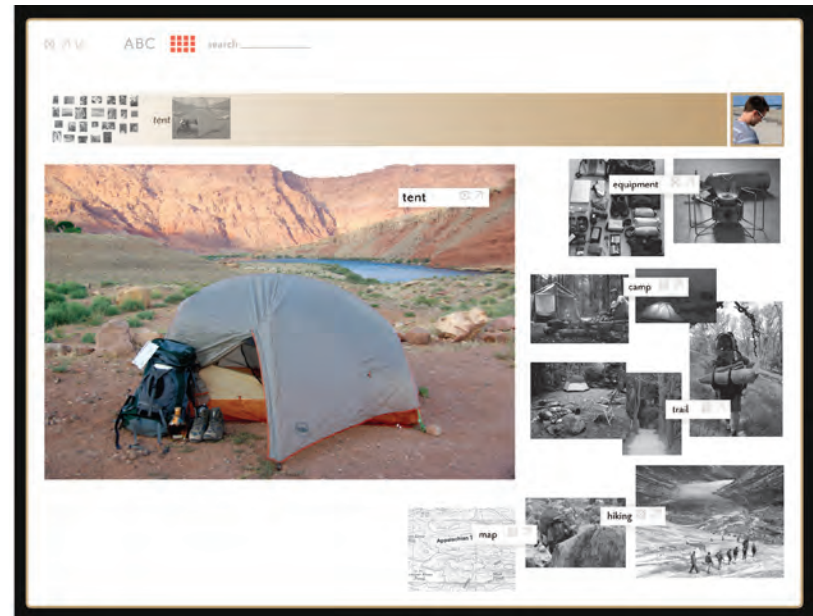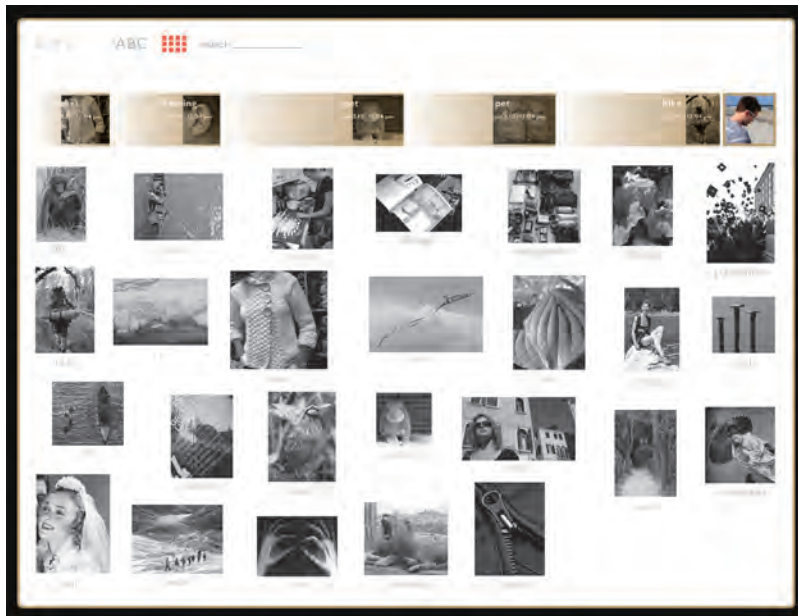
camp · hike · trail · forest softwood tree
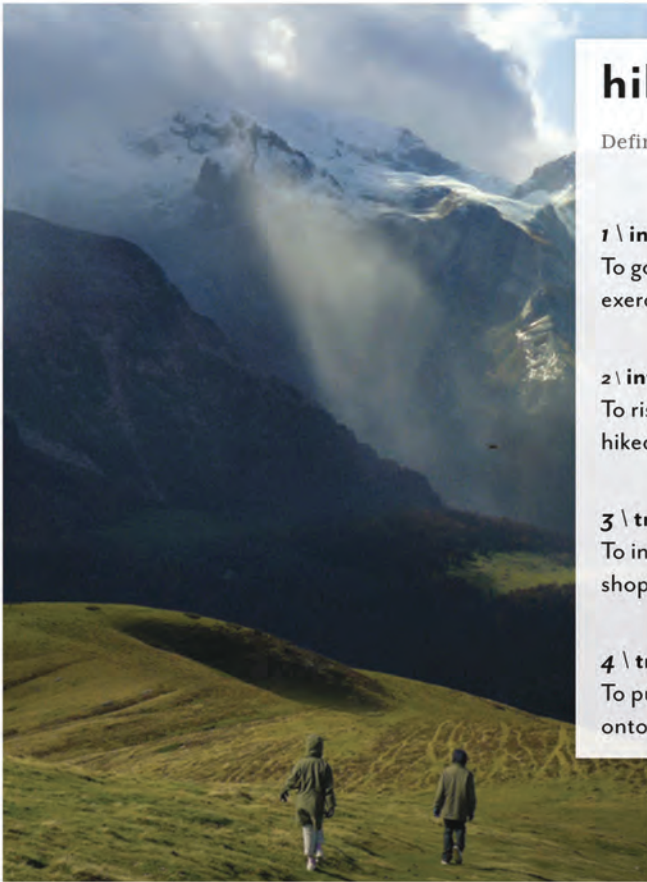
hike

Definition Examples Pronunciations Thesaurus Synonyms

1 \ intransitive verb
To go on an extended walk for pleasure or exercise.

2 \ intransitive verb
To rise, especially to rise upward out of place: My coat had hiked up in the back.

3 \ transitive verb
To increase or raise in amount, especially abruptly: shopkeepers who hiked their prices for the tourist trade.

4 \ transitive verb
To pull or raise with a sudden motion; hitch: hiked myself onto the stone wall; hiked up her knee socks.

equipment

trail

Multiple users can access the guidebook simulations in physical proximity or remotely. Images don't have to remain in alphabetical order but can be sorted in categories determined by the individuals. (fig. 54 - 55) This organizational structure is particularly important for those with global aphasia, who lack the ability to read and write. If the person with aphasia is using images as a means to communicate words associated with the images are given to aid the non-impaired partner who often acts as a translator in private and public spaces.
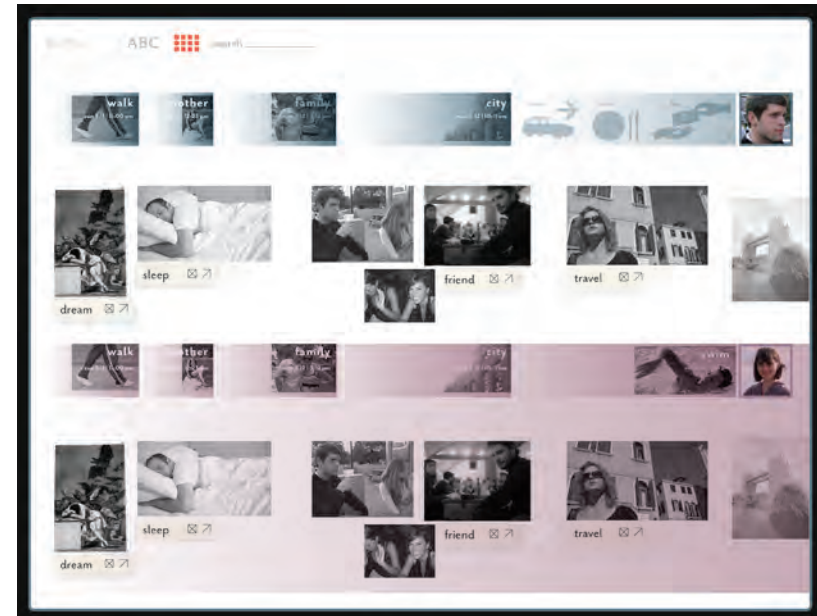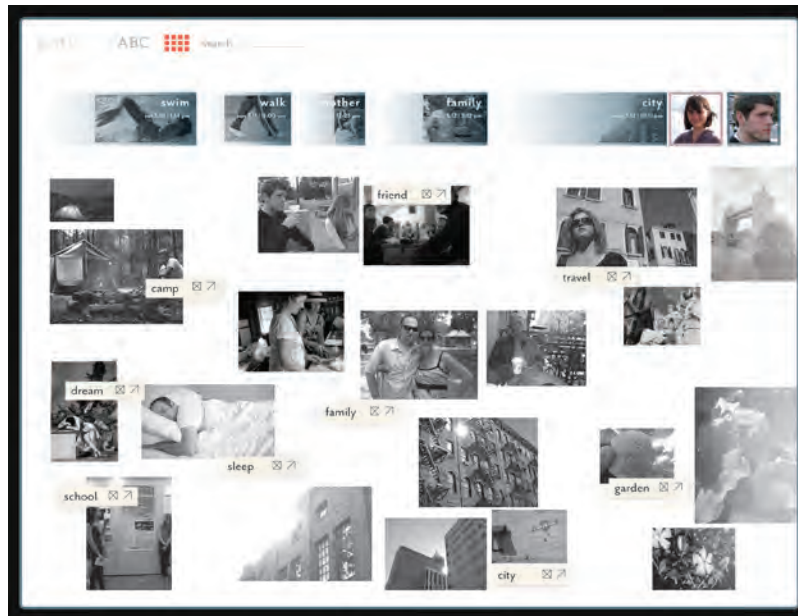
An option to use a script or scenario to aid in creating a conversational path is given. (fig. 56) The script is the loose lexical containment of the interaction or scenario. Applied to an individual's conversational path expedites the message construction. Theses scripts provide a structure for recurring events and a way to make inferences about a communication path that are based on world knowledge. (fig. 57)
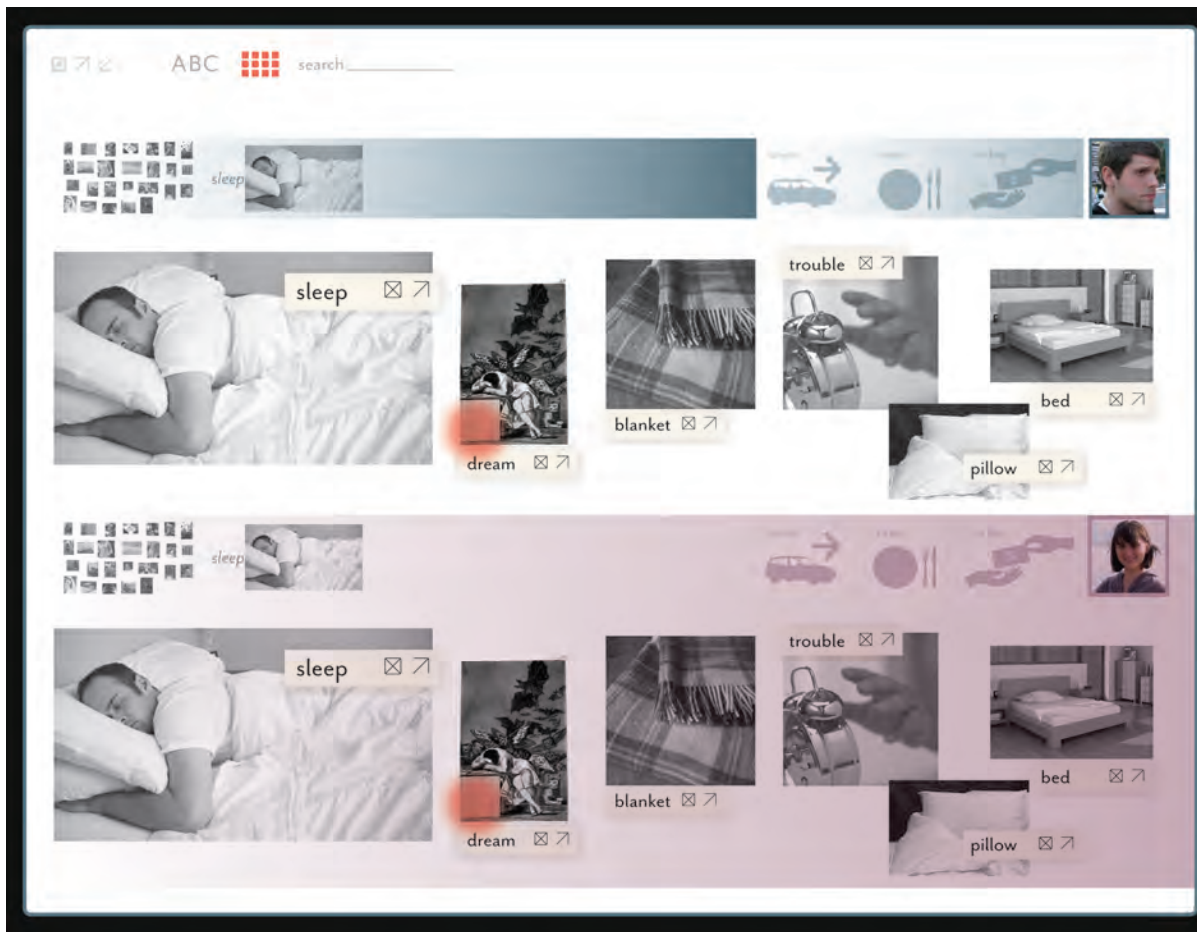
sleep
childhood
mother
home
to visit
to eat
to buy

home ⊠ ↗

102 ocean view

98 farm lane

233 singel st.

2 institute dr.

24 winter st.

sleep
childhood
mother
home
to visit
to eat
to buy

home ⊠ ↗

102 ocean view

98 farm lane

233 singel st.

2 institute dr.

24 winter st.

conclusion & future trajectory

Visualizations are powerful tools, which capture and illuminate the intricacies of communication. Investigations from this research can inform the design of experiences, place, and technology to reduce interference found within communication process. Non-verbal language such as proximity and gesture are closely tied and greatly influence messages. Designing notational systems that use images and language to prompt and help organize an individual's personal recall can aid those with aphasia to compensate for their diminished capacity to express themselves using written language conventions. These systems act as translators reconnecting non-verbal intentions and with verbal language.

The capacity for designers to take on untraditional problems by means of more intuitive methods of form making was validated in the final project. Research often starts with a hunch and intuitive reaction to a problem. Only through the act of creation can a more clear understanding emerge that can finally be stated. The act of designing can stimulate ideas and concepts and help frame questions to realize the final outcome. The complexity of our world needs practitioners that have the skills and methodologies to insert themselves into various disciplines working in collaboration with other professionals and offering a visible path through research.

Further research on visualizations of non-verbal communication for two dimensional print and screen media is of interest in continuing my research. The possibility for crafting typography informed by the complexities of non-verbal language is compelling. Typography is the notational form of language, however in its current configuration it insufficiently conveys verbal and non-verbal language such as pitch, accent, volume, rhythm or geographical location of one speaker to another.

Clear, successful communication is a powerful asset, that grants agency to an individual. Designing systems, which allow for more effective and transformative conversations individuals will regain agency and connection within their community. This can be enabled, and supported through a design approach that results in the creation of open-ended tools, allowing for the audience to become designers and stakeholders.

Our philosophies and methods for creating shared understanding will remain limited and stagnant if we do not challenge them through design explorations and research. Advancing comprehension and use of both verbal and non-verbal language will be ongoing, for communication is elaborate and expansive.
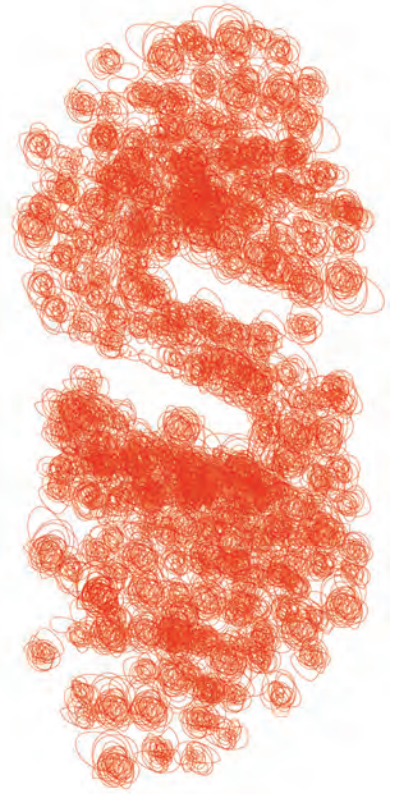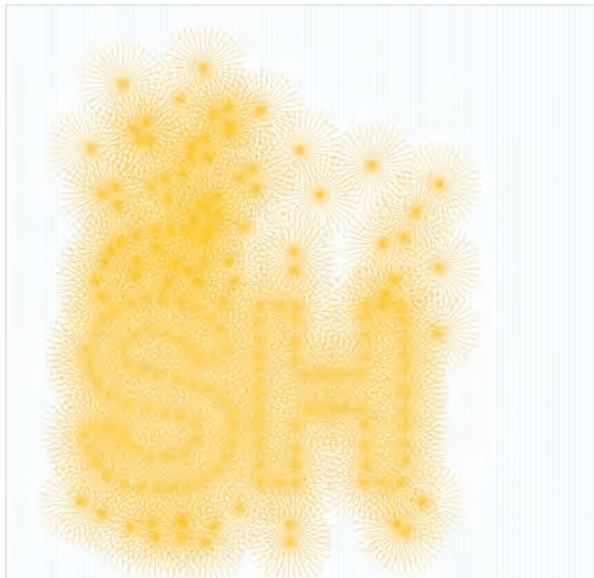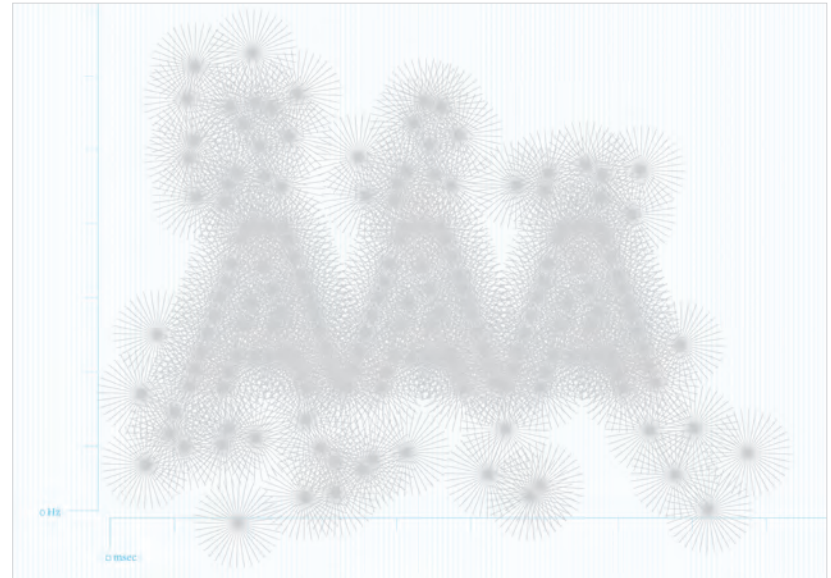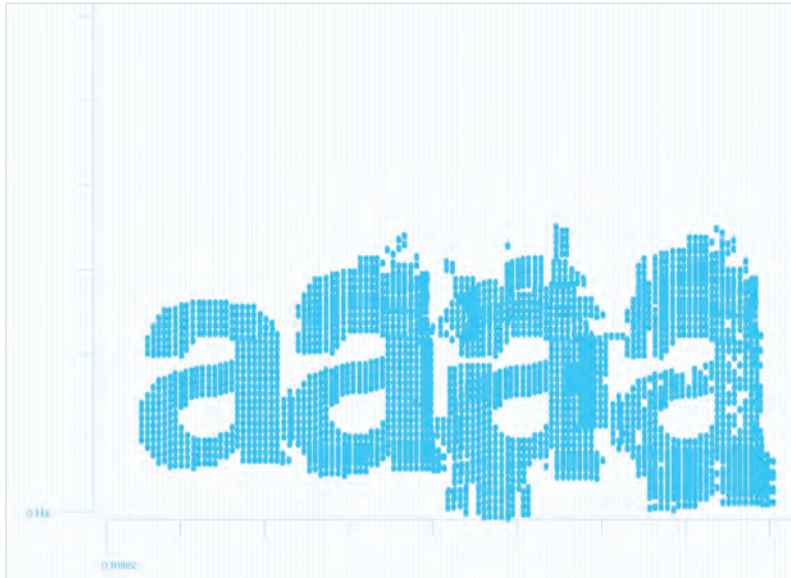
appendix content

hey sidney at
eight we're play
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have a party

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literature review

Hearing Gesture: How Our Hands Help Us Think by Susan Goldin-Meadow

This book explains the active role that gesture pays in conversation and thinking. A through resource used to comprehend and guide two-dimensional visualizations of gesture and it's link and influence on verbal language.

In Aphasia inside Out: Reflections on Communication Disability by Susie Parr, Judith F. Duchan and Carole Pound

A collection of essays, grants readers a perspective on aphasia that includes a range of issues including social challenges, communication ramps, adaptations and personal triumphs. Contributors include individuals with aphasia writing in tandem with therapists, counselors, social scientists and linguists. As a reference, these essays were invaluable to this project because they allowed for understanding the context of aphasia. Tangible direction was found through knowledge about specific issues and challenges faced by those who experience communication interference.

Nonverbal Communication Across Disciplines by Fernado Poyatos

Poyatos's anthropological work on culture, sensory interaction, speech, and conversation gives foundation for investigating and mapping particular aspects of communication such as paralanguage, kinesics, verbal language, personal and environmental interaction. Poyatos work makes obvious that language is greater than spoken words alone.

Thought and Language by Lev Vygotsky

Primarily an exploration of human mental development this book analyzes the relationship between words and consciousness, arguing that speech is social in its origins and that only as children develop does it become internalized verbal thought. Lev S. Vygotsky's writing, poetic in nature was particular useful to develop an understanding of how thought is coded into language.