The Relationship between Attention and Rapport in Conversation with AAC Users

by
Duy M. Nguyen

A THESIS

submitted to

Oregon State University

Honors College

in partial fulfillment of
the requirements for the
degree of

Honors Baccalaureate of Science in Computer Science
(Honors Scholar)

Presented August 22, 2016
Commencement June 2017

AN ABSTRACT OF THE THESIS OF

Duy M. Nguyen for the degree of Honors Baccalaureate of Science in Computer Science presented on August 22, 2016. Title: The Relationship between Attention and Rapport in Conversation with AAC Users.

Abstract approved:_____

Frank J. Bernieri

Augmentative and Alternative Communication (AAC) devices enable people who cannot speak to communicate with others. Unfortunately, they are tedious to use and are believed to lower the satisfaction of interacting with others. This thesis attempted to document the impact that AAC devices have on social interactions, in the hope of developing ways to improve the AAC user experience through innovative engineering and/or user training. Twenty-five female-female pairs of participants were video recorded having two five-minute conversations. One was asked to communicate through an AAC device. Partners of AAC users reported less rapport the more time they spent looking around the room suggesting that the gaze behavior of individuals was critical to the interaction experience. Participants also spent less time looking at the AAC users face during the second interaction in which the AAC input device was an Xbox controller, which simulated the tedious and challenging interfaces that are commonly used. Not surprisingly, all participants reported much less rapport during this second, more communicatively challenging interaction. This pattern of results suggested that, as the AAC interface requires more time to compose each statement

the attention of conversational partner will decline, which will lead to less rapport and less satisfying social interactions.

Key Words: AAC, attention, conversation, gaze, rapport

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I understand that my project will become part of the permanent collection of Oregon State University, Honors College. My signature below authorizes release of my project to any reader upon request.

_____

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Chapter I: Introduction

Amyotrophic Lateral Sclerosis (ALS), also known as Lou Gehrig's disease, is a progressive neurodegenerative disease that currently affects more than 12,000 American, with around 6,000 people diagnosed each year. As the most common motor neuron disease around the world, ALS causes the brain nerve cell (upper motor neuron) or the spinal cord (lower motor neuron) to degenerate and weakens the links that transport signal from the brain to voluntary muscles across the body. As the result, the patients will gradually lose the ability to perform day-to-day activities such as waking, coordinating hand movement, swallowing, speaking, etc. According to reports from the *National Institute of Neurological Disorders and Stroke*, the life expectancy of ALS patients is around three to five years after diagnosis, and only 10% of them can live more than ten years. At this moment, there is still no definitively known cause for the disease. Additionally, there are no effective cures available either ("Amyotrophic Lateral Sclerosis (ALS) Fact Sheet", 2016; "NINDS Amyotrophic Lateral Sclerosis (ALS) Information Page", 2016; "Motor Neuron Diseases Fact Sheet", 2016).

As the disease progresses, around 80% of the patients will develop dysarthria and eventually lose their ability to communicate. The condition tends to cause a large amount of stress and discomfort to the patients as they cannot have meaningful conversations nor verbally express feelings toward their loved ones during their final moments (Ray, 2015). To help those patients, researchers around the world have created a speech synthesizer device called the Augmentative and Alternative Communication (AAC) device. These machines allow people with speech

impairments to convey their thoughts and intentions to others by inputting them to a computer, which will synthesize the message into a spoken response. There are multiple versions of AAC devices, with the oldest and simplest version of the devices including only pictures that represented basic needs of the patients, such as needing an assistant, feeling cold, wanting to eat, or expressing happiness etc. ("Assistive Devices for People", 2014). Recent versions of the device incorporate a text to speech function, which can greatly improve the patients' communicative attempts. The input mechanisms of those devices range from typing with keyboard to using facial recognition or eye gaze detection to select characters from a screen (Kaplan, 2014, "Tobii Dynavox", n.d.). As a result of the increase in variety and usability of the devices, almost 96% of ALS patients who are recommended an AAC intervention accept the device and use it to the end of their life (Ball, Beukelman, & Pattee, 2004).

Assistive devices allow ALS patients to reconnect with their family members and continue to communicate with others. It is a small step in the right direction, but many improvements are still needed for developing a better and more comfortable social experience for AAC users. Multiple AAC users report that AAC device invokes boredom, loss of interest, and lower perception of trustworthiness from their communicative partners. The root of those uncomforted feeling can be contributed to the mechanical and impersonal tone of computerized voice of the device. (Mullennixa, Sterna, Wilsonc, & Dysonb, 2003; Stern, 2008; Stern, Dumont, Mullennix, & Winters, 2007). This problem has plagued the AAC since its development. Fortunately, various potential solutions have slowly emerged over the

years, such as better speakers with a wider range of pitch and customized voices (Patel, 2013).

Unfortunately, there exists another major drawback of AAC devices that has not yet been remedied. When a patient uses an AAC device, she or he needs to type her or his response out, which is an extremely slow process that can greatly extend the duration of typical pauses in normal conversations **(**Kendon, 1967; Heldner, & Edlund, 2010**).** Only a few seconds of those atypical pauses are enough to cause confusion and discomfort to the communication partner **(**Sellen, 1992; Wennerstrom & Siegel, 2003**)**.

This prolonged response time impacts other aspects of the conversation as well. Multiple studies in conversation with AAC users showed that their exchanges are dominated by a) closed end, yes-no questions from the AAC users' communication partners, b) a lack of initiation from AAC users, and c) a lack of interpersonal coordination in turn-taking between AAC users and their partner (Basil, 1992; Light, Collier, & Parnes, 1985; Lund, & Light, 2007). Many AAC users report being aggravated by the fact that they are unable to properly convey their ideas (Basil, 1992). As a result, AAC users suffer from low quality of face-to-face conversations, especially with strangers. This, in turn, limits the amount of rapport they can achieve with others.

The ultimate goal of this research program, where the current report is its first step, is to improve the quality of life for ALS patients by creating a better AAC device that allowing them to have a more coordinated and natural conversation with others. Prior approaches to this problem mainly involve training the communication

partners' new communication techniques tailored to AAC users (Mathis, Sutherland, & McAuliffe, 2011; Basil, 1992) or creating a better interface for the software (Drager, Light, Carlson, D'Silva, Larsson, Pitkin, & Stopper, 2004). Unfortunately, there is little to no research on how to eliminate the awkward pauses created by the process of typing. These unwanted and extended pauses can be detrimental for building the rapport in a conversation by potentially causing the communication partners to lose attention. Despite all these problems however, no formal research has been conducted to address the issue. The objective of this project is to assess people's attention while interacting with an AAC user. Furthermore, I am looking for signs (i.e., duration of pause) that can signal the moment when people start to wander and lose attention in the conversation. With the information, we hope to develop an AAC device that can eliminate those inattentive moments.

In this section, I will talk about 1) the background information in a natural conversation and how attention plays a role in each, 2) a little more information about what exactly is attention, 3) how attention is measure in the conversational setting, and 4) the hypothesis of this thesis.

1. The role of attention in a natural conversation:

It is not uncommon for people to interact with strangers as though they have known each other their whole life. In contrast, however, there are cases where long-time acquaintances behave as if they are complete strangers. The first case is an example of high rapport interaction when people just click with each other and become a harmony and unified group. On the other hand, the second case would be described as an interaction devoid of rapport; one that feels disconnected and

awkward. In social psychology, rapport is a construct that is associated with the quality of the relation or connection between individual at a group level (Bernieri, 2005). Linda Tickle-Degnen and Robert Rosenthal (1990) have identified three different components to rapport within face-to-face interactions: emotional positivity, coordination, and attention.

Emotional positivity represents the good feelings toward people that an individual is interacting with. It is an individual's first impression of his or her communication partners that can set an initial tone for the interaction. For example, people tend to enjoy conversation with attractive individuals more than their counterpart (Langlois, Kalakanis, Rubenstein, Larson, Hallam, & Smoot, 2000).

After the first impression period, the outcome of the interaction relies more heavily on the coordination between the participants. Coordination can be understood in terms of the "chemistry" between people; how well they understand the conversation and regulate the turn-taking exchanges and smooth flow of verbal and nonverbal behaviors (Bernieri & Rosenthal, 1991).

Last but not least is attention. Attention plays a major role throughout the interaction by acting as the bridge connecting emotional positivity and coordination. At the beginning of the interaction, the attention is focused on identifying the positive cues from the interactants based on their biological appearance. As the conversation begins, the attention slowly shifts to the topic of the conversation and nonverbal cues such as eye gaze, hand moment, body position, etc. to create a more cohesive interaction. Hence, in the conversational setting, attention is the most important role

in the development of rapports between people (Tickle-Degnen & Robert Rosenthal, 1990).

2. What is attention?

Attention is a common and important cognitive process in daily social interaction, but although it is an intuitive construct, its precise nature remains elusive. E. Bruce Goldstein (2011, p.82), a cognitive psychologist at University of Pittsburgh who has published multiple textbooks on the topic, defines it vaguely as, "the ability to focus on specific stimuli or location". Alternatively, Daniel Kahneman (1973, p.2), a harbinger in studying attention, whose book, *Attention and Effort*, is cited by thousands of researchers around the world, views attention as, "a label for some of the internal mechanisms that determine the significance of stimuli." In other words, attention is more of a label we ascribe to an inferred causal agent than it is a reference to an objectively describable neural event. It's not always clear, for example, whether scientists operationalize attention by measuring what is interesting to us, or operationalizing what is interesting to us by measuring what we appear to be attending to.

Arousal is one reason why we pay attention to certain things and ignore others (Kahneman, 1973; Sui & Liu, 2009). For example, Kahneman, Peavler, and Onuska (1968) created an experiment to determine whether people's attention was driven by incentive or arousal. In their experiment, they operationalized arousal as the difficulty of the task. The results showed that attentiveness depended on the level of arousal more than the incentive of the tasks. Kahneman (1973) suggested that our brain has a limited resource for attention at any given moment and arousal is treated as currency.

Each event around us can potentially raise our arousal and get attention from us. If all the events exert a small amount of arousal, we will be able to pay attention to all of them. However, as the arousal level of the events increase, the demands for attention increase accordingly. At a certain point, we will run out of attention resource. Hence, only events that give out the most arousal has our priority for attention (Wilbiks & Dyson, 2013). Therefore, it is expected that during conversations with others, the amount of attention people pay to their partners can decline to the extent they lose their interest and become bored (experience a decline in autonomic arousal).

3. Measuring attention in the conversational setting

For capturing signs of attention, psychologists have applied multiple methods, from measuring brain signals, detecting reaction delay, to coding eye gaze behaviors (Bernieri, 2005; Colby, Duhamel, & Goldberg, 1995; McAdams, & Reid, 2005; Kahneman et. al., 1968; Kleinke, 1986; Sui & Liu, 2009). Brain signals are analyzed through a recording device implanted into the primary visual cortex, which in turn measures the firing rate of the neuron in order to evaluate the attention level (Colby, Duhmenl, & Goldberg, 1995; McAdams, & Reid, 2005). Due to the intrusive nature of the technique, it is used mostly on animals to gain understandings of the physiological reaction in our brain. The second popular technique to identify attention is the detection of reaction delay. This method is mainly used for task-oriented experiments in which participants perform certain cognitive activities while under the influences of different stimuli. The times for finishing each activity are recorded and analyzed to show whether participants are distracted by the stimuli or not (Sui & Liu,

2009). Therefore, eye gaze is the most appropriate methods to measure the attention in a setting meant to simulate social conversations (Bernieri, 2005; Kleinke, 1986).

Adam Kendon (1967) used gaze to study attention in typical conversations. He recorded multiple films of people having conversations and annotated their eye movement in each frame. His study showed that people looked at the communicative partners around 41% of the time while talking and 58% of the time while listening. These numbers are similar to a later study conducted by Argyle and Ingham (1972) in which the participants gazed at their partners is 37% of the time while talking and 68% of the time while listening. It means that in a typical conversation, people spend around 50% of all their time looking at their partners. Specifically, they have a tendency to look at their partners less while speaking than while listening to the other person. These important studies demonstrate how an investigation studying the impact of attention people pay to one another during a conversation can be compared to baseline normal conversations.

4. The hypothesis

This thesis is the initial step of a larger program of research attempting to understand the processes impacting rapport in conversations using speech-assisted devices. The purpose of this study is to grasp a broad understanding of the correlation between attention and rapport in a conversation in which one person used a speech assistant device. We predicted that the longer it took for a person to compose a message using an AAC device, the more their conversational partner's engagement and attention level would decrease. As such, we decided to operationalized engagement level as eye gaze at the communication partner's face. A conversational

experiment was created to test out the prediction, where participants came in pairs and were asked to converse with each other for five minutes. One of the participants had to use an AAC device throughout the conversation while the other did not have any restriction imposed on her or him. Every pair of participants engaged in two conversations that required a different text input device. The first interaction required participants to type their resposes with a keyboard. As most people in our current generation utilize some sort of communication technology such as texting, Skype, Facebook Messenger, etc., in their daily activities, we expected that the first interaction would come as second nature to them, which would lead to shorter typing times. For the second interaction, we introduced an Xbox controller and asked one of the participants (Participant A) to compose her responses by selecting characters from an on-screen keyboard. Due to the novelty and tediousness of the task, we expected long composing times from the device users in the second interaction.

We hypothesized that 1) the rapport reported by participants in the first interaction would be greater than the rapport achieved in the second interaction; 2a) there would be a decrease in percentage of eye gaze from interaction 1 to interaction 2; 2b) there would be an increase in random looks around the room, which would be a sign of a loss of interest and attention being paid to Participant A; finally, 3a) as participants spent less time looking at their partner's face, the rapport of the conversation would decrease; 3b) Likewise, as the person spent *less* time looking around, the rapport of the conversation should increase. If this happened, it would demonstrate that usage of AAC devices could lower attention level and interactional engagement.

Chapter II: Method

1. Design

The study consisted of three interactions each lasting five minutes. In the first interaction, the AAC users used the keyboard to write their responses on a computer which, then, synthesized the responses when the participants hit the Enter key. In the second interaction, the same setting was employed except the AAC users worked with an Xbox controller instead of a keyboard. The purpose of always having the Xbox controller interaction after the keyboard interaction was that we wanted the participants to familiarize themselves with the experimental setting and communication system. In order to increase the external validity of this study as a simulation of normal AAC usage, we could not throw naïve participants immediately into a situation where the technological constraints were so novel and challenging that it would overwhelm any other psychological phenomenon we were interested in assessing. Between each interaction, participants received a packet of survey to measure how they felt about the rapport between them and their partners. The independent variable of our study was the composing time of the AAC users in each interaction and the dependent variables were the eye gaze behaviors of their partners and the perceived rapport from both participants.

Finally, a third conversation was held where participants could freely talk to each other. The purpose of this interaction was not to examine any particular hypothesis, nor was it relevant to this thesis. It served as a mean for participants to destress or to fully express themselves without any handicap.

2. Materials

a. Survey

In this experiment, we employed nine different surveys. Some were designed as self-reports of the interaction. Others were personality scales that were included to examine other research hypotheses not relevant to this thesis. The surveys include: 1) a demographic questionnaire, 2) self-assessment, 3) ratings of partner, 4) interaction assessment, 5) Hogan Empathy Scale (Hogan, 1969), 6) Boredom Scale, 7) Marlowe-Crowne Social Desirability Scale (Crowne & Marlowe, 1964), 8) Davis Interpersonal Reactivity Index (Davis, 1983), and 9) Post-Study Measures. The implementation of multiples different scales would give us a holistic idea of participants' feelings. However, for this thesis, I have focused solely on the interaction assessment survey, which assesses the rapport between two participants

b. Hardware and software

The study involved three cameras: two of them recording each participant's face and the third one recording the both participants from the side. We had one set of computer system, which included a NUC computer, a monitor, a speaker, a keyboard, a mouse, and an Xbox controller. The monitor was the only equipment visible on the table. All other parts of the computer were hidden under the table to prevent any unnecessary distraction. The monitor was pushed a little to the side and turned toward the AAC users to prevent it from turning into an unintentional wall between the pair of participants, which could disrupt their ability to perceive their partner's nonverbal cues (*Figure 2.1*). Additionally, this setting was more aligned with how most AAC system is set up in the real world.

Figure 2.1: The setting for an Xbox controller interaction

For the text-to-speech program, we modified the Festival software from Black Alan (2016) and used voices from the CMU Database (Alan, n.d.) with the voice named RMS for male participants and SLT for female participants. Another open-source software named Xboxdrv was utilized to allow us to operate the Xbox controller as a mouse and type by clicking on a virtual keyboard (*Figure 2.1*) All of the software were on an Ubuntu operate system.

We used Adobe Premiere Pro software to created split-screen videos by combining videos from the two cameras recording the participants' face (*Figure 2.2*). According to a meta-analysis from Chris Kleinke (1986), the assessment of gaze can be improved if it is done on split-screen videos and has slow motion option. Additionally, we used a built-in subtitle function from Adobe Premiere Pro software

as our coding tool for this project. A customized program was written to convert all those subtitle files, which were exported as XML files, into Excel files.

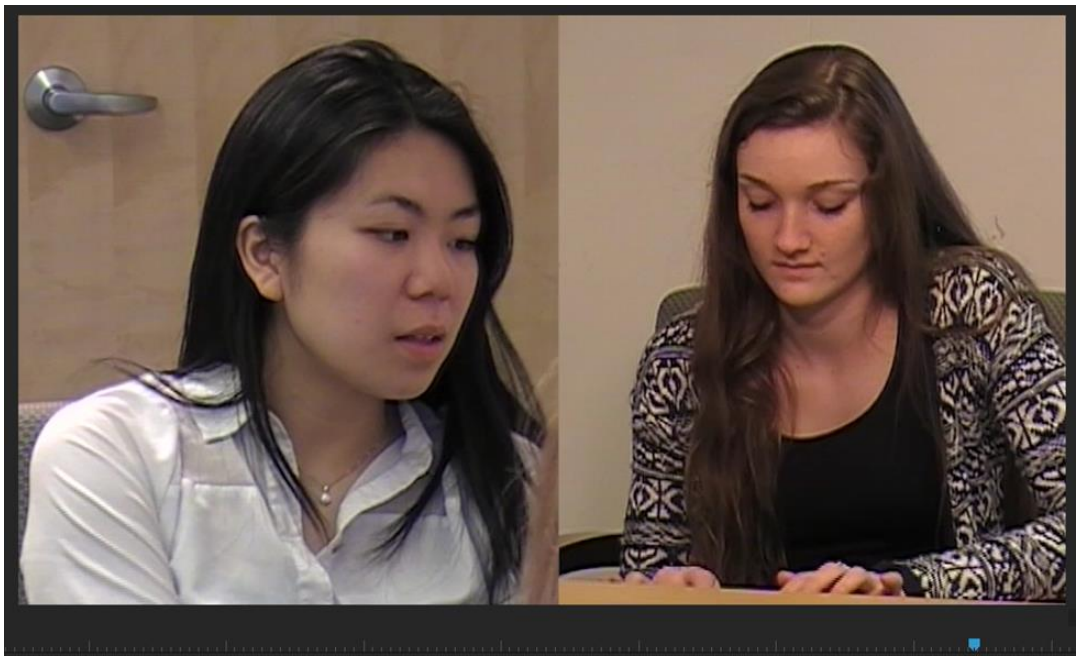

Figure 2.2: Split-screen videos created from 2 cameras recording participants in interaction 1

3. Participants

The experiment recruited 160 participants (33 males and 127 females, M_{age} = 19.7) from Oregon State University. Participants were from introduction psychological courses open to students in any major. They received extra credit for their participation.

Due to how laborious it is to annotate the data (around fifteen hours to process videos from one single session), there was only enough time to analyze videos from twenty-five sessions out of the eighty session run. We decided to limit our analysis to the female-female dyads for two reasons: a) Opposite sex dyads increased the

possible confounds of sexual attraction which could severely impact the attitudes and behaviors of individuals, and b) there were an insufficient number of male-male dyads to generate a reliable set of results. We had forty-nine pairs of female-female interactions, eight of which had technical errors, and one session experienced blurriness. Of the remaining forty-two experimental sessions recorded, this thesis reports a subset of twenty-five sessions (fifty participants) for which the video analysis was completed. [1]

4. Procedure

When the participants arrived at the lab the first participant was always assigned to be the AAC users, called Participant A, and the second participant was the normal speaker, called Participant B. This was done because more time was needed to teach the participant on how to use an AAC device. There were two experimenters for each session, and each of them was assigned to one of the participants throughout the entry study.

Each participant was lead into a different room and was advised not to talk to each other outside of the interaction to prevent any unaccounted influence on their rating. Participants were given a brief introduction of the study and a *Consent Form* (*Appendix A*). After the participants fully understood and signed the consent form, both participants would be given the *Pre Conversation Survey* to complete (*Appendix B*). By the time both participants finished their survey, Participant B was lead to the computer room where Participant A was sitting. The experimenters began the first

[1] Four pairs of participants had known each other before participating in this study

interaction and asked the participants to remove their hat or glasses, because those could obstruct or reflect light toward the camera.

Next, the experimenters started the calibration process and asked each participant to follow a moving finger to several specific locations with their eyes while keeping their head still in order to help calibrate the video images of their gaze to standard fixed locations (e.g., right eye of partner, left eye of partner, chest of partner, middle of the table, monitor, empty area to the right of his or her partner, and empty area to the left of his or her partner). After the calibration, the experimenters went to the room next door and signaled the start of the interaction by turning on the headlight in the computer room. Throughout all interaction, if the AAC user faced any technical difficulty, she or he could raise her or his hand and an experimenter would come to her or his aids. After five minutes, the experiments turned the light off, and waited five seconds before coming back into the room. This procedure ensured that each conversation across all experimental sessions was constant in duration.

After each conversation, the experimenter in charge of Participant B led him or her to the room next door while Participant A (the AAC user) remained in the same spot. The experimenters gave them a set of *Post Conversation Survey* (*Appendix C*) to complete. After the pair was done with their survey, participant B was guided back to the computer room and began the same process as the first interaction: calibrating eye gaze, interacting for five minutes, separating to a different room, and working on a set of *Post Conversation Survey*. The same process was repeated for a third time, but both participants, at that moment, could talk normally. Additionally, instead of the

Post Conversation Survey, the participants were given a set of *Post Experiment Survey* (*Appendix D*). Participant B was then led back to the computer room one last time and an experimenter would start the debriefing process. After making sure both participants did not have any concerns or questions about the study, the experimenters lead the participants outside and thanked them for their time.

5. Coding process

The study implemented two different coding processes: talking code and eye gaze code.

a. Talking code

For the talking code, there were five different categories: speaking, typing, self-simultaneous speech (SSS), hovering, and no speaking (NS). Speaking was coded the moment the Participant B speak or the computer started to synthesize Participant A's response; typing was coded when participants hit the keyboard or clicked on the Xbox controller; SSS was coded when Participant A was typing while the computer was speaking at the same time; hovering was coded when Participant A had his or her hand on top of the keyboard or the controller but had yet to actually hit or type anything; and NS was coded for the actions that did not belong to any of the four previous categories. The experimenters annotated the talking behaviors for both participants in the first and second interaction.

b. Eye gaze code

In this paper, we adopted some terminology from Von Cranach (as cited by Harper, Wiens, and Matarazzo, 1978, p.173), which are 1) face-gaze: gaze at another's face, 2) mutual gaze: two people gazing at each other's face, 3) eye contact:

two people gazing into each other's eyes and are aware of that, and 4) gaze avoidance: intentional avoidance of eye contact.

For eye gaze location coding, there were four different locations coded: partner's face, monitor, keyboard, and other (e.g., looking around): face was coded when Participant B was looking at the upper half of their partner face (the red region in *Figure 2.3*); keyboard included the body of the Participant A toward the middle of the table (the yellow region in *Figure 2.3*); monitor was coded when Participant B looked at the monitor direction including from the top of the screen to the base on the table (the blue region in *Figure 2.3*); and around was Participant B looked around the room or to places that did not belong to the other three categories (the green region in *Figure 2.3*). The coders pinpointed the precise frame when the gaze location change and marked it with the name of the new gaze location.

Figure 2.3: Coding schema for eye gaze location

c. Coder agreement

Several different coders are needed because it takes over fifteen hours to measure each interaction. In order to assess coder reliability, all coders coded the same two interactions generating a very large sample of 18,000 (30 frames/sec * 60 sec/min * 5 min/conversation * 2 conversations/pair of participants) measurements per pair of participants in which their agreement could be assessed. We computed the reliability of each of the four gaze categories and each of the five taking categories individually by dummy coding the nine-category nominal scale into nine separate binary (present/absent) scales. For example, a "*Face gaze*" variable was created where a frame was coded as 1 if the target was looking at their partner's face and coded as 0 if the target was looking at the monitor, the keyboard, or anything else. When two or more coders coded the 36,000th frames from two pairs of participants, intercoder reliability can be estimated by a simple correlation coefficient calculated down the number of measurements made by the two coders (Rosenthal & Rosnow, 2008, p.104).

i. Gaze coding

For the gaze categories, we were mainly interested in the coders' agreement of face and around gaze. The reason was that face gaze could be a sign for when attention was directed to the AAC users (Participant A) and around gaze could be an indicator of distraction. Gazing at the monitor and keyboard was an interesting behavior as it could be interpreted as either inattention or mutual attention. In *Table 2.1*, the average correlation of coder agreement was greater than .70. Thus, we believed that it was acceptable to use the data from the coders for our analysis.

Additionally, *Figure 2.4* and *Figure 2.5* showed us that face gaze (red) and around gaze (green) were the two dominant gaze actions in the 300 seconds (5 minutes) conversation while monitor (orange) and keyboard (gray) only contributed small portions of the total gaze time. Therefore, monitor and keyboard gaze were more prone to small coding errors, such as when the participants made a quick glance lasting only a couple of hundred milliseconds.

Table 2.1

Correlations between Coders Coding Gaze Location.

		Coder ID				
		A	D	L	R	S
Face	A	--				
	D	.87	--			
	L	.90	.79	--		
	R	.76	.81	.72	--	
	S	.95	.80	.90	.64	--
Around	A	--				
	D	.84	--			
	L	.93	.90	--		
	R	.73	.91	.72	--	
	S	.96	.95	.94	.59	--
Monitor	A	--				
	D	.86	--			
	L	.85	.67	--		
	R	.44	.71	.39	--	
	S	.86	.85	.80	.41	--
Keyboard	A	--				
	D	.49	--			
	L	.82	.59	--		
	R	.60	.53	.52	--	
	S	.84	.54	.79	.61	--

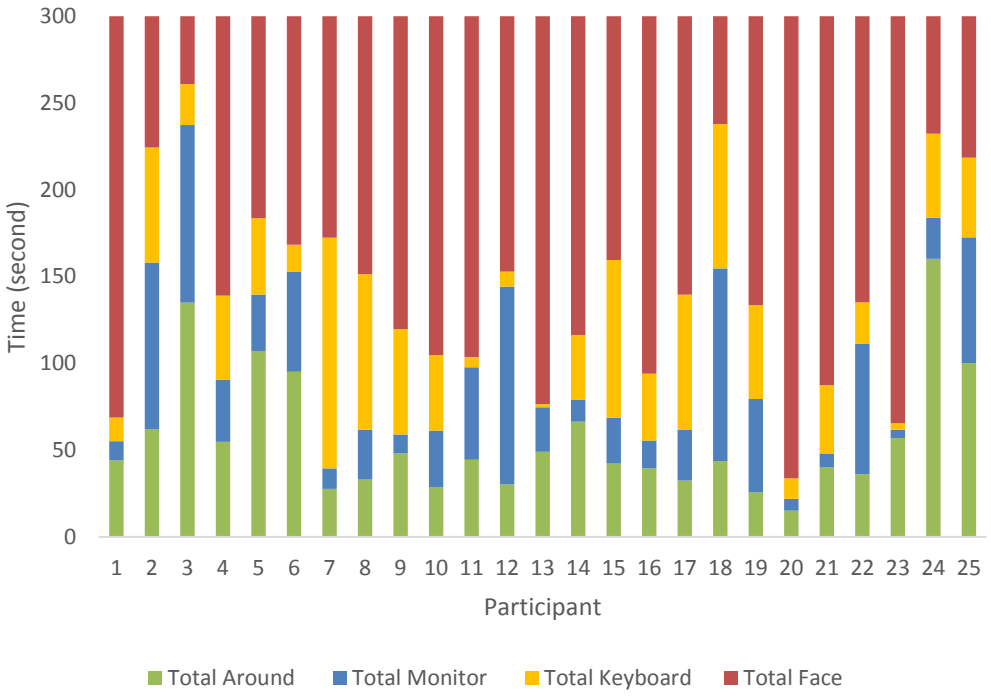

Figure 2.4: Time spent in each gaze location for all 25 Participant Bs in conversation 1

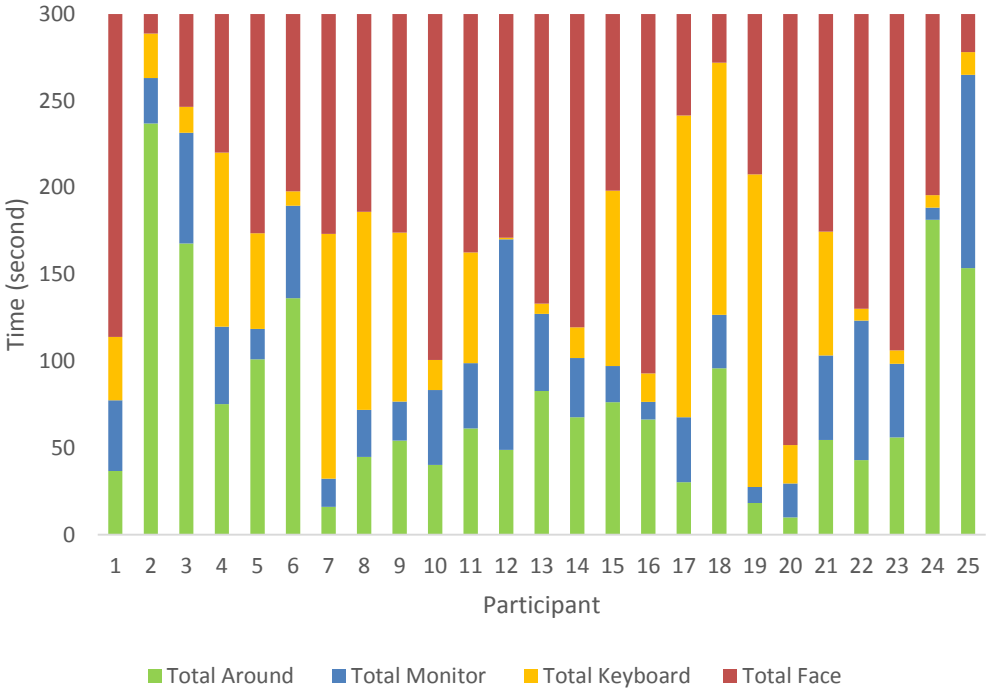

Figure 2.5: Time spent in each gaze location for all 25 Participant Bs in conversation 2

ii. Talking coding

In this talking annotation, we focused on the non-speaking (NS), speaking, and typing correlations between coders, the three most important characteristics of the conversation. Self-simultaneous speech (SSS) or hovering tag were created for certain specific occasions and appeared only for a short amount of time (*Figure 2.6* and *Figure 2.7*). From *Table 2.2*, it was showed that correlations between coders at ns, speaking, and typing were relatively high, as most of them were above .65. For this reason, we believed it was acceptable to use their data for the analysis.

Table 2.2

Correlations between Coders Coding Talking

			Coder ID			
			H	M	R	A
Participant A	NS	H	--			
		M	.91	--		
		R	.66	.65	--	
		A	.82	.82	.67	--
	Speaking	H	--			
		M	.94	--		
		R	.92	.92	--	
		A	.88	.87	.87	--
	Typing	H	--			
		M	.93	--		
		R	.86	.85	--	
		A	.82	.83	.80	--
	Hovering	H	--			
		M	Null	--		
		R	Null	.56	--	
		A	Null	.24	.29	--
	SSS	H	--			
		M	Null	--		
		R	Null	.56	--	
		A	Null	.24	.29	--
Participant B	NS	H	--			
		M	.82	--		
		R	.69	.73	--	
		A	.78	.82	.72	--

Note. NS: no speaking; SSS: self-simultaneous speech; Null: we cannot calculate the result as coders do not code them

Note. Participant B, the normal speaker, only has two type of speaking categories: no-speaking and speaking. Hence, the *binary* correlations of them will be the same

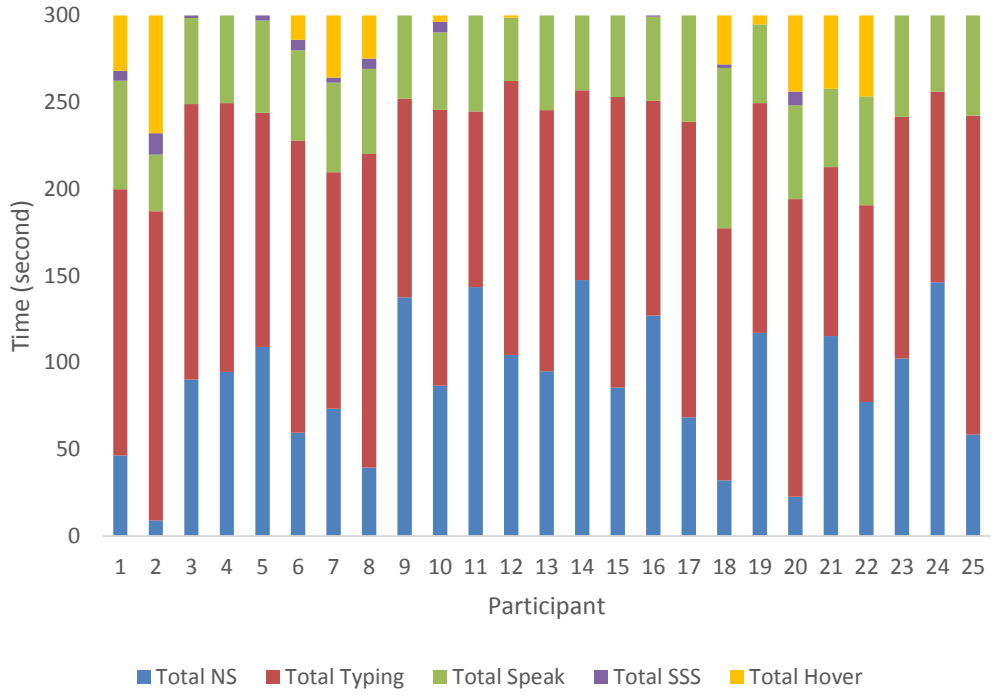

Figure 2.6: The time spent by the 25 AAC users (Participant A) within the five different coded talking categories during conversation 1.

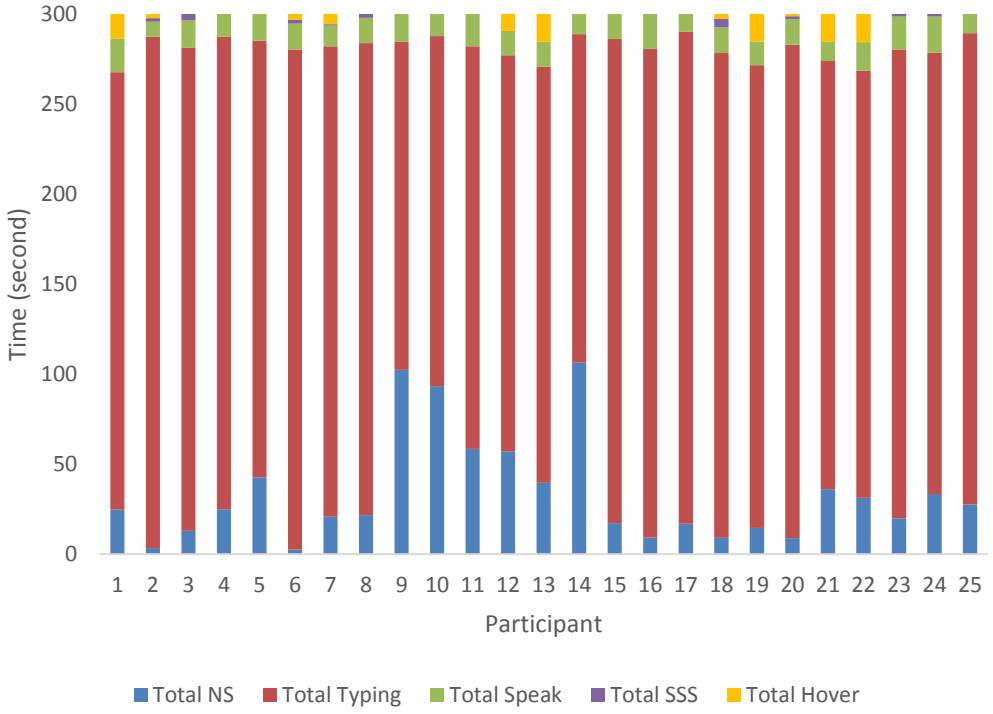

Figure 2.7: The time spent by the 25 AAC users (Participant A) within the five different coded talking categories during conversation 2.

6. Calculating Rapport

An overall rapport variable was created from two pages of the administered survey ("Interaction Assessment" and "Rapport" in *Appendix C*). The questionnaires were divided into five subsets: awkward, bad, harmonious, rapports, and active.[2] We averaged the score of the questions in each subset. The overall rapport equals the sum of harmonious, rapport, and active sets (good rapport sets) minus the sum of awkward and bad sets (bad rapport sets).

7. Analysis tests

The results section reports data from twenty-five female-female sessions. We employed the paired *t*-test to analyze the differences between keyboard conversation and joystick section and computed the *Pearson* correlation to assess how the differences in gaze location and talking categories influenced the rapport felt during each conversation.

[2] See Bernieri (2005) for a review

Chapter III: Results

1. Time for composing sentences:

Table 3.1 presents a paired *t*-test comparison for Participant B's talking behaviors between the first and second interaction. The "total time" is the amount of time each behavior appeared and the "frequency" is how often Participant B performs a talking behavior in the conversation.

In this study, we made an assumption that using an Xbox controller would increase the composing time comparing to using a keyboard due to its novelty. Participant B did indeed spend an extra 103.28 seconds on average when typing their messages with the controller ($t\ (24) = -19.26$, $p < .001$). Additionally, the Xbox controller not only increased the time for typing but also reduced the total responses and number of spoken words in each response of Participant B. The total number of responses in the second conversation ($M = 10.04$, $SD = 3.27$) was reduced by half from the first interaction ($M = 23.40$, $SD = 5.52$) ($t\ (24) = 15.43$, $p < .001$). For each response attempt, the total amount of spoken time of Participant B while she was using the Xbox controller ($M = 14.16$, $SD = 3.06$) was decreased to a third of when she was using the keyboard ($M = 52.00$, $SD = 11.18$) ($t\ (24) = 17.31$, $p < .001$). For the last row in *Table 3.1*, we calculated the ratio between the typing time and the sum of speaking and self-simultaneous speech (SSS). For each second of speaking time for Participant B, she would need 17.34 seconds ($SD = 4.57$) to compose their response with the controller and only 2.74 seconds ($SD = 0.64$) using the keyboard ($t\ (24) = -16.69$, $p < .001$). The analytic test strongly supported the differences in typing time, speaking time, typing frequency, and the ratio between first conversation

and the second conversation. In the end, the results confirmed our assumption for the independent variable that participant B would struggle at using the Xbox controller to perform her task.

Table 3.1

T-*test results on the differences in time that Participant A spent communicating within conversations 1 and 2.*

			N	*M*	*SD*	*T*	*p<*
NS	Total Time	1st Interaction	25	87.56	39.07	8.30	**.0001**
		2nd Interaction	25	33.41	29.31		
	Frequency	1st Interaction	25	18.56	5.03	13.34	**.0001**
		2nd Interaction	25	6.48	2.71		
Typing	Total Time	1st Interaction	25	144.41	26.18	-19.26	**.0001**
		2nd Interaction	25	247.69	28.74		
	Frequency	1st Interaction	25	23.40	5.52	13.32	**.0001**
		2nd Interaction	25	10.04	3.27		
Speaking	Total Time	1st Interaction	25	52.01	11.18	17.31	**.0001**
		2nd Interaction	25	14.16	3.06		
	Frequency	1st Interaction	25	20.12	4.60	16.70	**.0001**
		2nd Interaction	25	8.04	2.79		
SSS	Total Time	1st Interaction	25	2.17	3.30	2.29	**.03**
		2nd Interaction	25	.76	1.25		
	Frequency	1st Interaction	25	1.04	1.34	1.70	.10
		2nd Interaction	25	.60	1.12		
Hovering	Total Time	1st Interaction	25	13.85	20.09	2.63	**.02**
		2nd Interaction	25	3.98	6.07		
	Frequency	1st Interaction	25	6.64	9.30	3.36	**.003**
		2nd Interaction	25	1.36	2.08		
Ratio		1st Interaction	25	2.74	.64	-16.96	**.0001**
		2nd Interaction	25	17.43	4.57		

Note. NS: no speaking; SSS: self-simultaneous speech; Ratio: the ratio between typing and the sum of speaking and SSS

2. Hypothesis 1: Rapport in conversation

In the first hypothesis, we predicted that rapport reported by participants in the first interaction would be greater than the rapport achieved in the second interaction. *Table 3.2* is the *t*-test analysis on the rapport measurement from both participants in the first and second interactions.

Both participants felt more positive in the first interaction than the second interaction. In both conversation, the AAC user, Participant A, (1st interaction: M = 4.04, SD = 6.21; 2nd interaction: M = -3.22, SD = 5.12) did not enjoy the interaction as much as her partner (1st interaction: M = 5.66, SD = 6.81; 2nd interaction: M = -.11, SD = 6.84). Furthermore, not only did both participants lose chemistry because of the switch from keyboard to the controller, Participant A was more affected by the change comparing to Participant B. The *t*-test analysis strongly supported our hypothesis that the rapport of both participants in the Xbox controller conversation was less than the rapport reported in the keyboard interaction (Participant A: $t\ (24)$ = 6.88, $p < .001$; Participant B: $t\ (24)$ = 6.18, $p < .001$).

Table 3.2

T-*test results on the differences in rapports of Participant A and Participant B within conversations 1 and 2*

		N	*M*	*SD*	*t*	*p*<
Participant A	1st interaction	25	4.04	6.21	6.88	**.0001**
	2nd interaction	25	-3.22	5.12		
Participant B	1st interaction	25	5.66	6.81	6.18	**.0001**
	2nd interaction	25	-.11	6.84		

3. Hypothesis 2: Face gaze and inattentive gaze in conversation

In the second hypothesis, we predicted that there would be a) a decrease in the percentage of eye gaze and b) an increase in the percentage of eye gaze from first interaction to second interaction.

a. Face gaze:

In the first interaction, Participant B spent around 52% of her time looking at Participant A, whereas she only spent 41.21% of her time looking at Participant A in the second interaction. Our hypothesis about the difference between the percentage of face gaze in the first interaction and the percentage face gaze in the second interaction was strongly supported by the analytic test ($t\ (24) = 4.65$, $p < .001$).

Table 3.3 includes the *t*-test analytic of face gaze in each individual talking activity between the first and second interaction. For all five talking categories: typing, speaking, in silent (NS), self-simultaneous speech (SSS), and hovering, Participant B had a tendency to focus her attention toward Participant A's face more often in the first conversation compared to the second conversation. However, the differences in face gaze of Participant B between the two conversations were the most noticeable while the AAC device was synthesizing the message ($t\ (24) = 3.75$, $p = .001$) and only moderately discernible while Participant A was silent ($t\ (24) = 2.27$, $p = .03$).

Table 3.3

T-*test results on the differences in the percentage of face gaze from Participant B within conversations 1 and 2.*

		N	*M*	*SD*	*t*	*p* <
Total	1st interaction	25	52.27	19.79	4.65	**.0001**
	2nd interaction	25	41.21	20.41		
NS	1st interaction	25	61.15	16.21	2.27	**.03**
	2nd interaction	25	53.57	19.88		
Typing	1st interaction	25	45.08	22.99	1.79	.09
	2nd interaction	25	39.99	21.39		
Speaking	1st interaction	25	57.52	25.36	3.75	**.001**
	2nd interaction	25	46.07	26.59		
SSS	1st interaction	25	27.86	38.41	2.06	.13
	2nd interaction	25	16.15	33.31		
Hovering	1st interaction	25	30.908	35.18	2.06	.26
	2nd interaction	25	23.08	31.16		

Note. NS: no speaking; SSS: self-simultaneous speech

b. Inattentive gaze:

Our hypothesis on the increase in the percentage of wandering or inattentive gaze from the first interaction (M = 18.92, SD = 11.95) to the second interaction (M = 26.08, SD = 18.84) was strongly supported by the analysis test ($t\ (24)$ = -2.91, p = .008).

Table 3.4 reports the tests comparing the differences in conversations 1 and 2 of inattentive gaze during each of the five talking categories. During all five talking categories defined by the AAC user, her partner (Participant B) spent more time looking around the room in the second conversation than in the first interaction. However, the differences in inattentive gaze of Participant B between two interactions was only significant while Participant A was composing the messages ($t\ (24)$ = -2.94, p = .007).

Table 3.4

T-*test results on the differences in the percentage of inattentive gaze from Participant B within conversations 1 and 2.*

		N	*M*	*SD*	*t*	*p*<
Total	1st interaction	25	18.92	11.95	-2.91	**.008**
	2nd interaction	25	26.08	18.84		
NS	1st interaction	25	21.91	11.47	-1.87	.07
	2nd interaction	25	28.35	17.02		
Typing	1st interaction	25	18.87	15.69	-2.94	**.007**
	2nd interaction	25	25.21	20.45		
Speaking	1st interaction	25	13.57	11.83	-1.40	.18
	2nd interaction	25	18.22	19.97		
SSS	1st interaction	25	5.87	14.50	-.64	.53
	2nd interaction	25	9.93	27.96		
Hovering	1st interaction	25	5.90	9.37	-1.57	.13
	2nd interaction	25	10.89	18.88		

Note. NS: no speaking; SSS: self-simultaneous speech

4. Hypothesis 3: Relationship between gaze and rapport

Our last hypothesizes were: 3a) as the person spends less time looking at their partner's face, the rapport of the conversation would decrease; 3b) as the person spends less time looking around, the rapport of the conversation would increase.

a. Face gaze and rapport:

Table 3.5 shows the correlational test between the total percentage of face gaze of Participant B in each interaction and rapport reported from Participant A and Participant B. The table also reports the correlation between the percentage of face gaze in each talking categories (non-speaking (NS), typing, speaking, self-simultaneous speech (SSS), and hovering) and rapport reported from each participant. *Figure 3.1* and *Figure 3.2* present the scatter plot between face gaze of Participant B

and rapport from Participant A in conversation 1 and conversation 2, respectively. *Figure 3.3* and *Figure 3.4* displays the scatter plot between face gaze of Participant B and her rapport in first and second interaction, respectively.

For the keyboard (first) conversation, there was strong evidence suggesting that when Participant B focused on Participant A's face, Participant A (r = .48, p = .02) and Participant B (r =.50, p = .01) would feel more connected to each other. Contrary to what was hypothesized, there was no correlation between both participants' rapport and face gaze of Participant B in the controller (second) conversation. It showed that rapport between two participants was not very dependent on face gaze, as Participant A spent more time composing responses.

Looking at the correlation between the percentage of face gaze from Participant B in each talking categories and the rapport reported from both participants in the first interaction, the *t*-test analysis test shows a significantly positive correlation between face gaze and rapport of Participant B while A was *typing* (r = .54, p = .005). Additionally, *Table 3.5* presents a moderately positive correlation between face gaze of Participant B and rapport of Participant A while she was *speaking* (r = .44, p = .03) and in *silent* (r = .44, p = .03). Therefore, on the occasion when the AAC user, Participant A, needed more time to compose her message, she would feel more positive about the conversation if her communication partner looked at her when she was speaking or in silent. As for her partner, Participant B would feel better about the interaction if she looked at the AAC user while she was taking times to compose the response.

In the end, the hypothesis about relationship between rapport and gaze is only partially supported in that while true in the first conversation, the pattern did not replicate while using the Xbox controller in second interaction.

Table 3.5

Correlation table between self-reported rapport and percentage of total face gaze within each talking behavior category in conversation 1 and 2

		Self-reports of rapport	
		Participant A	Participant B
1st interaction	Total	.48*	.50*
	NS	.44*	.13
	Typing	.38	.54**
	Speaking	.44*	.35
	SSS	.04	-.11
	Hovering	.01	.17
2nd interaction	Total	-.07	.12
	NS	.21	.24
	Typing	-.12	.09
	Speaking	-.00	.19
	SSS	-.00	.03
	Hovering	-.17	.02

**$p < .01$ two-tailed.
*$p < .05$ two-tailed.
Note. NS: no speaking; SSS: self-simultaneous speech

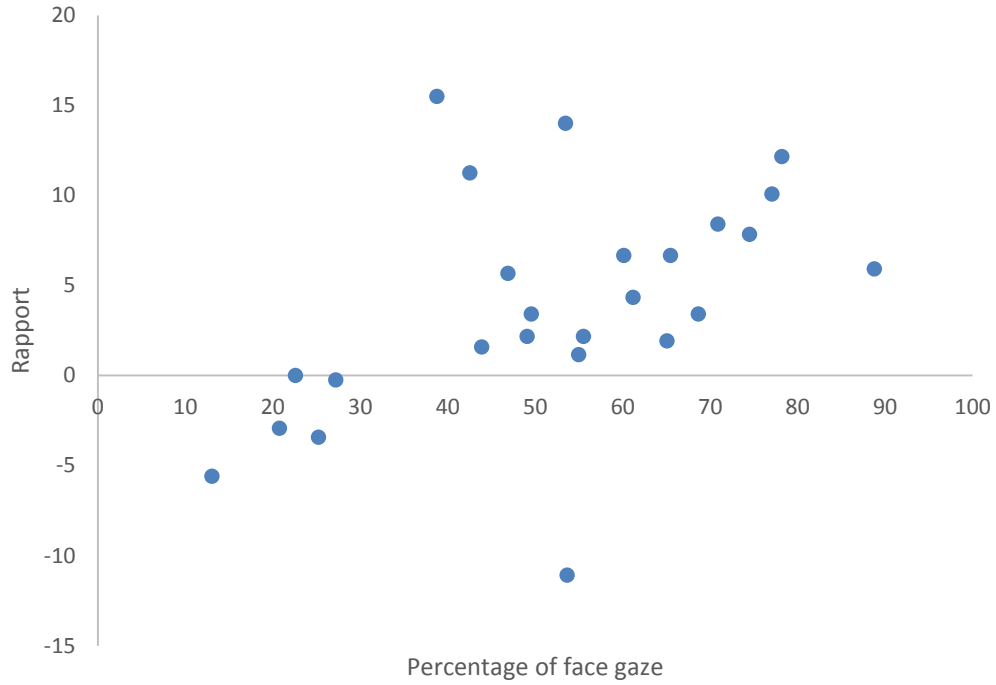

Figure 3.1: Scatter plot between percentage of face gaze from Participant B and rapport reported from Participant A in conversation 1

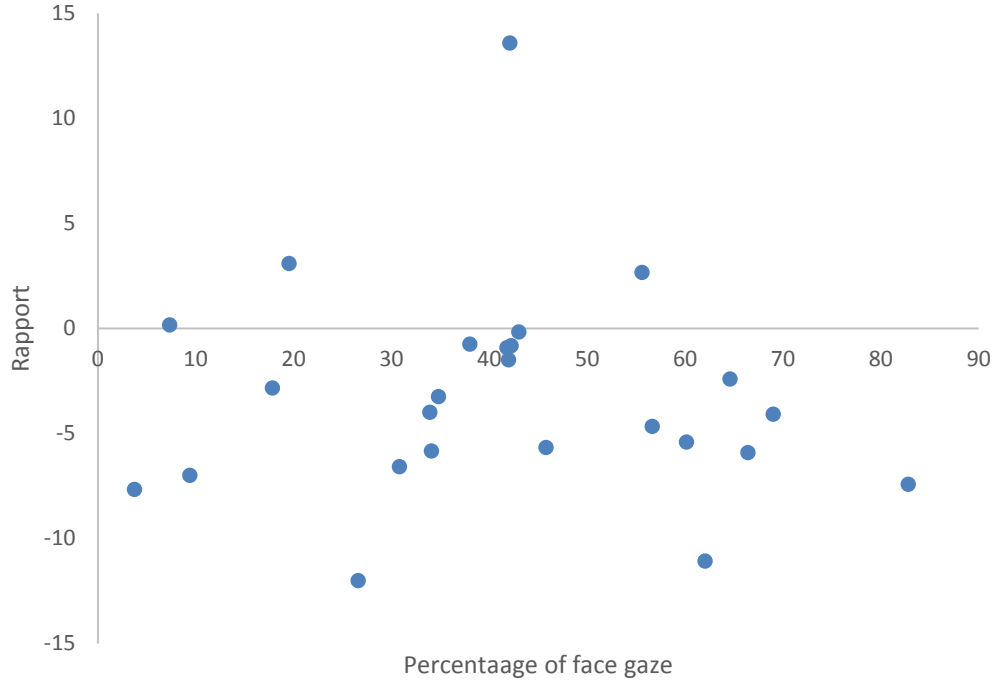

Figure 3.2: Scatter plot between percentage of face gaze from Participant B and rapport reported from Participant A in conversation 2

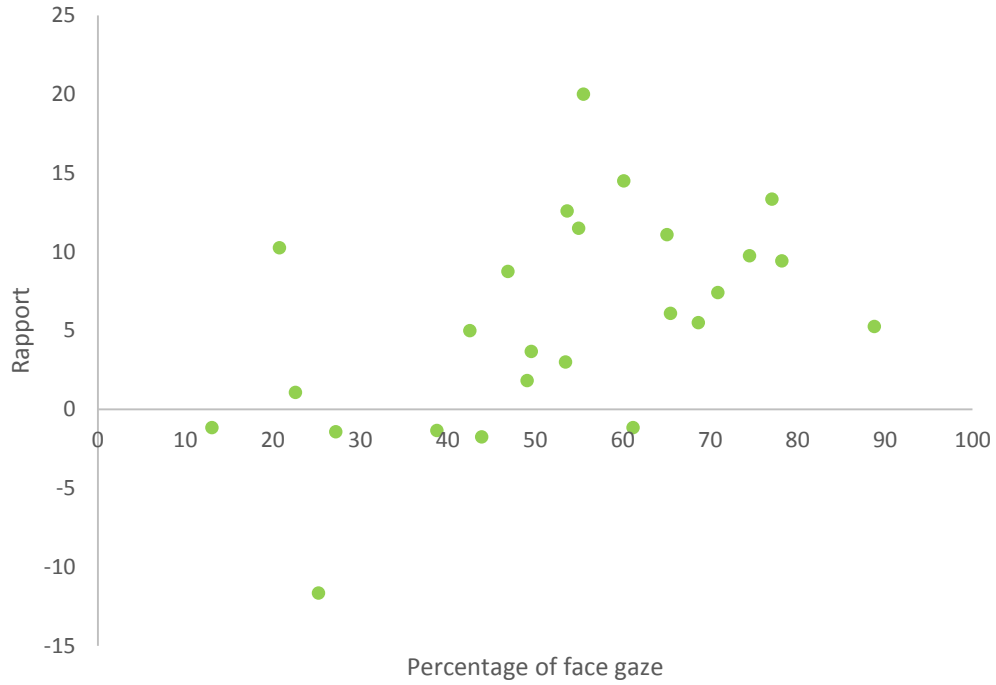

Figure 3.3: Scatter plot between percentage of face gaze from Participant B and rapport reported from Participant B in conversation 1

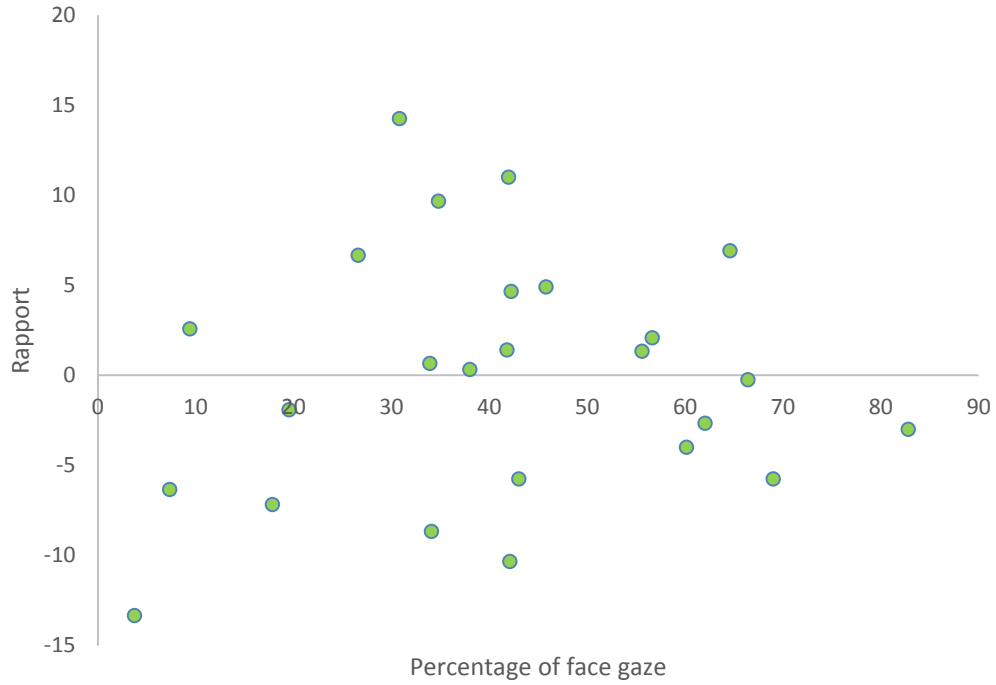

Figure 3.4: Scatter plot between percentage of face gaze from Participant B and rapport reported from Participant B in conversation 2

b. Inattentive gaze and rapport:

Table 3.6 shows the correlational test between the total percentage of inattentive gaze in each interaction and rapport reported from Participant A and Participant B. Similar to *Table 3.5*, it also reports the correlation between the percentage of inattentive gaze in each talking categories (non-speaking (NS), typing, speaking, self-simultaneous speech (SSS), and hovering) and rapport from each participant. *Figure 3.5* and *Figure 3.6* display the scatter plot between the inattentive gaze of Participant B and rapport from Participant A in conversation 1 and conversation 2, respectively. *Figure 3.7* and *Figure 3.8* present the scatter plot between face gaze of Participant B and her rapport in first and second interaction, respectively.

For Participant B who was interacting with the AAC user (Participant A), the more time they spent looking around the room, the less rapport they reported having with the AAC user in both interaction (Conversation 1: r = -.50, p = .01; Conversation 2: r = -.43, p = .03). Thus, the gaze behavior of Participant B was highly predictive of the interaction quality they experienced. In contrast to what was hypothesized, the amount of time Participant B spent looking around did *not* have any significant impact on the rapport reported by Participant A, who was using the AAC. Additionally, *Figure 3.4, Figure 3.5, Figure 3.6, and Figure 3.7* shows that both participants only spent an average of less than 60% of their time to looking around in both conversations.

In each talking action (non-speaking (NS), typing, speaking, self-simultaneous speech (SSS), and hovering) from Participant A, the amount of time Participant B

spent looking around inattentively while Participant A was *typing* turned out to be a very strong predictor of Participant B's rapport in the first interaction (r = -.54, p = .005) and remained significant in the second interaction (r = -.45, p = .02). Interestingly, the AAC user was not affected by their partner's inattentive gaze during interaction 2.

To sum it up, the hypothesis was partially supported, since the more time Participant B spent looking around the room, the more negative she felt toward both interactions. However, the amount of time Participant B spent wandering did not have any strong effects on how Participant A (the user of the AAC) felt about the interaction.

Table 3.6

Correlation table between self-reported rapport and percentage of inattentive gaze within each talking behavior category in conversation 1 and 2

		Self-reports of rapport	
		Participant A	Participant B
1st interaction	Total	-.25	-.50*
	NS	.01	-.12
	Typing	-.31	-.54**
	Speaking	-.02	-.36
	SSS	.02	-.22
	Hovering	-.05	.08
2nd interaction	Total	.02	-.43*
	NS	-.13	-.12
	Typing	.06	-.45*
	Speaking	-.08	-.04
	SSS	-.18	-.09
	Hovering	-.31	-.12

**p< .01 two-tailed.
*p< .05 two-tailed.
Note. NS: no speaking; SSS: self-simultaneous speech

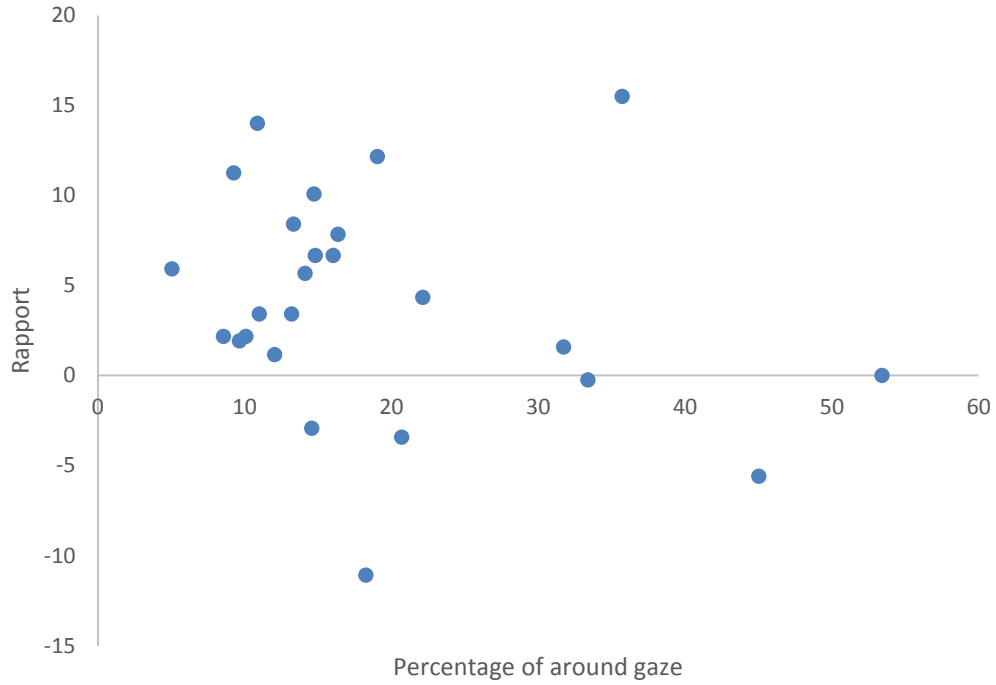

Figure 3.5: Scatter plot between percentage of inattentive gaze from Participant B and rapport reported from Participant A in conversation 1

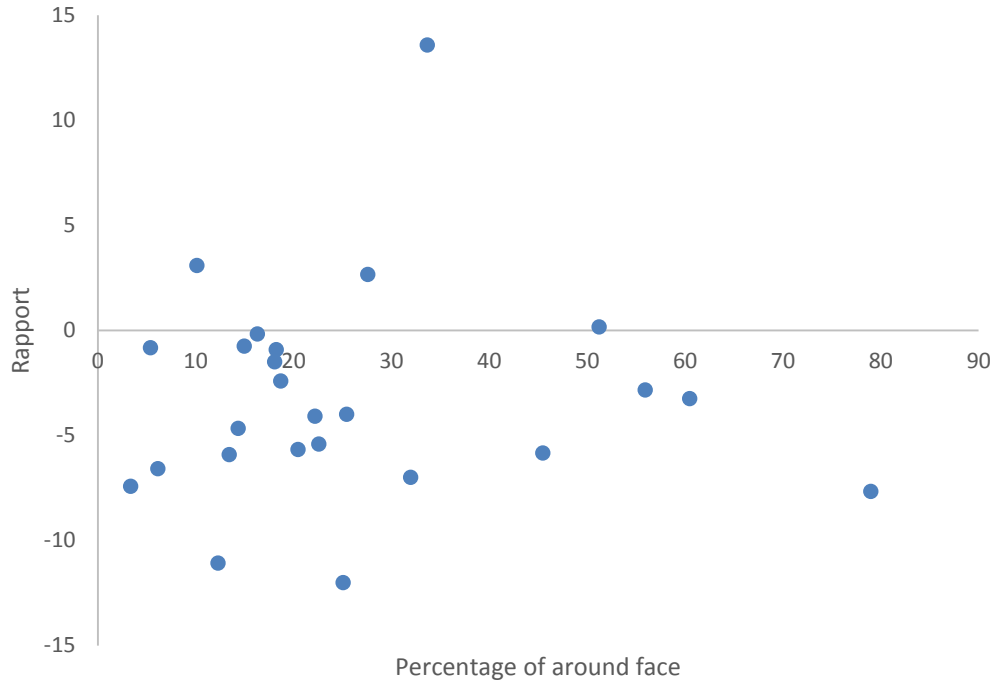

Figure 3.6: Scatter plot between percentage of inattentive gaze from Participant B and rapport reported from Participant A in conversation 2

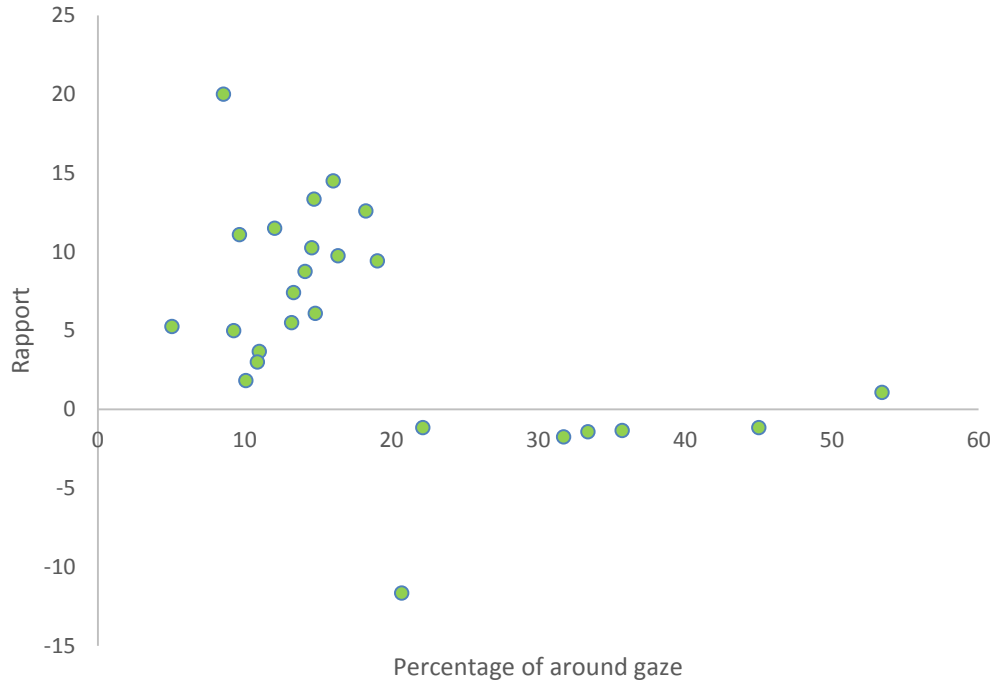

Figure 3.7: Scatter plot between percentage of inattentive gaze from Participant B and rapport reported from Participant B in conversation 1

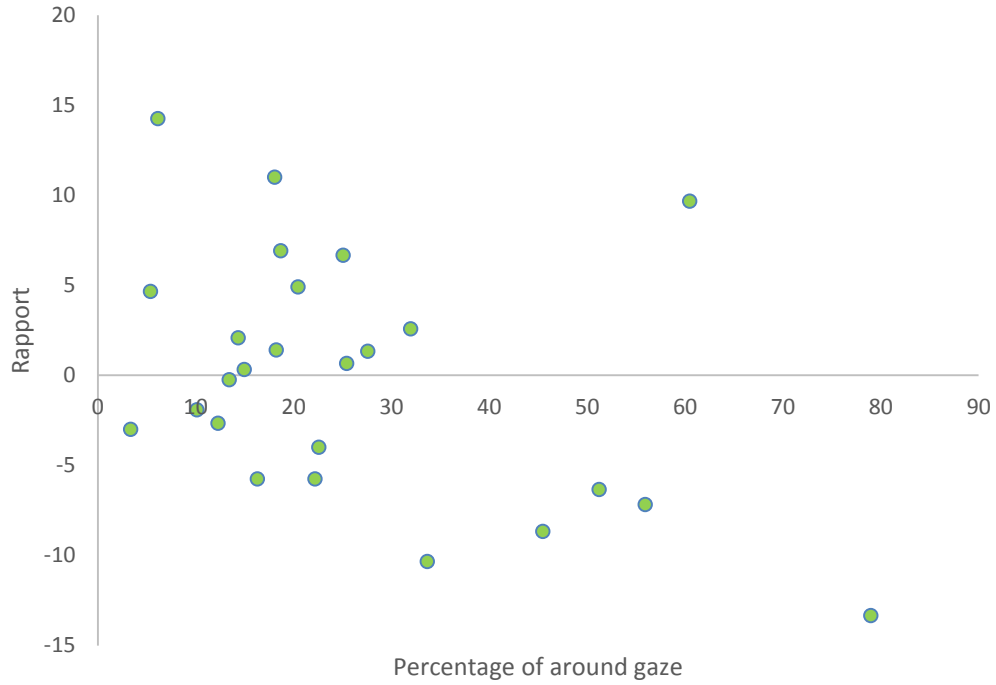

Figure 3.8: Scatter plot between percentage of inattentive gaze from Participant B and rapport reported from Participant B in conversation 2

Chapter IV: Discussion

The purpose of this thesis is to grasp a broad understanding about the correlation between attention and rapport in a conversation in which one person uses a speech assistant device. This study examined gaze behaviors, such as face gaze and wandering gaze, during two conversational settings as a measure for how much an individual paid attention to the AAC user, and compared them to the reported rapport from both interactants.

1. Rapport in conversation with an AAC user

Results indicated that when the AAC user spent more time composing messages, the quality of the conversation would decrease accordingly. The finding was similar to studies from Sellen (1992), Wennerstrom, and Siegel (2003) where participants in those studies feeling worse toward interactions that had prolonged pauses. As people are not accustomed to pauses that last more than a few seconds in their day-to-day conversation, they can easily feel lost and uncomfortable interacting with AAC users, who need a lot of time to response to them **(**Kendon, 1967; Heldner, & Edlund, 2010). However, it was interesting to discover that between the two conversants, the AAC user often expressed lower rapport than their partner. This could be explained by the tediousness of using the devices or the unfamiliarly computerized voice that caused AAC users to feel frustrated (Mullennixa, Sterna, Wilsonc, & Dysonb, 2003; Basil, 1992). Additionally, our video records showed that several normal speaking participants (Participant Bs) expressed happiness and relieved feelings because they did not have to use the device, therefore, rated rapport

from them could be higher than others. In the end, these results further support the notion that AAC devices can greatly hinder conversation flow.

2. Face gaze and inattentive gaze in conversation with an AAC user

a. Face gaze

Our initial assumption that the gaze behaviors of Participant B when the AAC users communicated through a typing keyboard would be close to a natural conversation was supported. The results from the keyboard conversation were in agreement with studies from Kendon (1967), and Argyle and Ingham (1972) in which people spend around 50% of their total time in a conversation looking at their partner' face, and around 60% while they are listening to their communicative partner. As communicative technology takes a more major role in our daily routine through the increasing importance of communicative applications, such as Facebook Messengers, Snapchat, Skype, etc., it is expected for the AAC users to feel natural speaking with others by typing their messages with a keyboard.

However, as the message production times increased from 2.7 seconds for every second of speech using the keyboard to 17.3 seconds for every second of speech using the Xbox controller, it was not obvious to Participant B what the appropriate gaze behavior should be during that extra 15 seconds. Thus, some avoided looking at Participant As' face, perhaps because they felt it would make them look rude or impatient to stare at the AAC users while they were composing their responses.

b. Inattentive gaze:

The time Participant B spent looking around in the first interaction was different from what Kendon (1967), and Argyle and Ingham (1972)' had reported. It could potentially be due to our decision of having two additional gaze categories: monitor and keyboard gaze, as they were unique features in this specific study and might give some insight to the interaction. In general, when the AAC users, Participant A, took more time to compose her message, Participant B spent more time looking around the room. This action could be signs of inattentiveness toward the conversation from Participant B.

3. Relationship between gaze behaviors and rapport:

a. Face gaze and rapport:

We hypothesized that both participants would feel a stronger connection with their conversational partners when Participant B spent more time focusing on Participant A. The result partially confirmed our hypothesis by showing a strong and positive correlation between face gaze from Participant B and the chemistry experienced between partners in the first interaction. Contrary to our prediction, there was no evidence supporting the relationship between how often Participant B looked at the AAC user and the reported rapport from both of them in the second interaction. It was argued earlier that typing with a keyboard is more similar to normal conversations than using an Xbox controller. As such, the findings from the first interaction were expected to have a similar result to prior experiments with normal conversation in which there exist a positive correlation between face gaze and reported rapport from both conversants (Ellsworth & Carlsmith, 1968; Wennerstrom

& Siegel, 2003). The reason is that looking at your conversational partner' face, especially while they are speaking, is one of the signs that show they are being listened attentively. Ergo, it can make the speaker feel better about themselves and the whole conversation.

The impact of face gaze on conversation differed in interaction 2, where there existed long and atypical pauses before each response. Both participants expressed no influences on their reported rapport from how much time Participant B spent looking at her partner. For Participant A, it could be because she was too occupied with typing through a controller, a task that is fairly challenging. Additionally, many AAC users indicated that they had never use an Xbox controller before, which meant, they could be fully engaged in the typing process and did not have many opportunities to notice whether Participant B was looking at them or not. Furthermore, the struggle and possibly frustration from using the controller could negatively affect the AAC users' rating on the interaction.

For Participant B, the lack of influences between face gaze and her feeling toward the second conversation could be explained by her confusion from first time exposure to prolonged pauses before receiving any responses. Gazing at one person without saying anything nor, at the same time, receiving any communitive signals from *that individual* can be considered rude and inappropriate in a natural interaction. In our study, *that individual* was the AAC user and she might had been completely focus on composing the messages and did not have time to give any communitive signals to her partner. This shortage of communicative feedback from the AAC user did not appeared in the first interaction because the majority of Participant As showed

that they could type with a keyboard while maintaining a constant flow of nonverbal signals toward Participant Bs. This kind of multi-tasking was nearly impossible to do in the second interaction where Participant A needed to select characters one by one in an onscreen keyboard with an Xbox controller.

Furthermore, composing a message with the Xbox controller is a laborious task and required a lot of focus from the users. Thus, Participant A would need to look at the monitor or controller in most of the typing process. When Participant B wanted to express that she was still paying attention but could not keep staring at Participant A's face due to it being a social taboo, she would look at the monitor or controller as a sign of mutual attention, a phenomenon where two persons looking at the same object. As a result, the time Participant B spent looking at the monitor or controller (keyboard) would became more important in predicting the bond between two participants in the second interaction than the firs conversation.

b. Inattentive gaze and rapport:

The data showed that Participant B felt more out of tune with her partner when she spent more time looking around the room in both interactions. However, the direction of gaze from Participant B did not have a same predictive power on the rapport reported by the AAC user (Participant A). This lack of influence from inattentive gaze was possibly explained as similar to the relationship between face gaze and rapport in which the AAC users needed to focus exclusively on using the devices and neglect their partners' communicative signals. The difference between these two gazes could be seen in the first interaction, where face gazes from Participant B showed strong influence on perceived interaction quality of Participant

A while inattentive gazes did not. Though it was possible for the AAC user to compose responses while keeping some connections with her partner, who was possibly looking at them and waiting for a response, it was still a challenging task and was primarily done due to social rule of politeness. Consequently, when Participant B did not look at the AAC user nor demand any more attention from her, the relief of not having to perform two cognitive tasks simultaneously could equalize the supposed negative feelings toward the conversation for Participant A.

As suggested by Kahneman (1973), people pay less attention to tasks that have low arousal or uninteresting events around them. Whenever participant B spent more time looking around the room, it was possibly because she was not interested in Participant A, the AAC system, and ultimately the conversation itself. As the result, her feeling toward the conversation drastically decreased.

c. Eye gaze behaviors in typing

We conducted further analysis on the relationship between the five talking behaviors (non-speaking (NS), typing, speaking, self-simultaneous speech (SSS), and hovering) from the AAC users, when Participant B was looking at the user or around the room, and the reported rapport from Participant B (*Table 3.5* and *Table 3.6*). It turned out that the amount of time Participant B spent looking around or at the AAC user while Participant A was typing was a very strong indicator of Participant B's rapport. It could be because Participant A spent a majority of her time typing the response in both interactions (*Table 3.1*). Consequently, it had the most weight in most of our statistical calculation.

Chapter V: Limitations

Due to the enormous amount of data and limited resources, this thesis focused only on twenty-five out of eighty ran dyads. The small sample size can diminish the accuracy of our statistical calculation, which in turn decreases the validity of our results. However, this problem will be solved when all eighty dyads are coded. Additionally, that will give us a holistic view of the population instead of only female-female interactions used in this study.

Our second limitation involves the diverse training and experience level of coders. Even though our coder reliability was high, some of those data were corrected multiple times while others were only coded one time by new coders. With that said, this should not be a major problem due to two reasons. First this limitation will be addressed as coders become more proficient with their task. Second, the level of coding reliability achieved in this early report is more than enough that is required in coding studies of this type (Rosenthal, 2005).

Another limitation is that the participants in this study were not typical AAC users and, thus, were not familiar with this mode of communication. This limitation might be responsible for our failure to find a significant influence of Participant B's gaze Participant A's rapport in the second interaction. Perhaps, due to the novelty and cognitively demanding nature of composing message with the Xbox controller, Participant A was less impacted by Participant Bs' behaviors. On the other hand, typical AAC users are possibly more accustomed with the system, which enables them to multi task and monitor their communicative partners better than our participants were able to do.

Finally, the lack of counter balancing the order of interactions should be considered as a possible limitation. However, judging from all of the dyads and witnessing multiple participants struggle with the Xbox, we strongly believe that putting the Xbox controller interaction first will further expand the differences between our participants and typical AAC users.

Chapter VI: Future Work

The next step for this study is to rerun the statistical test for all eighty pairs of participants. This should provide a more representative description of how both male and female individuals converse with AAC users. Additionally, our results showed an interesting connection between Participant B's gaze and her feelings toward the conversation while the AAC user was composing her messages. Further analyses should be conducted on those typing events in order to discover any other unknown factors. Those analyses will focus on the duration and each gaze behavior in individual typing events and compare them with each other. Finally, we will annotate gaze behaviors of the AAC users, participant A, and incorporate the data of gaze and speaking behaviors from both participants to our analysis to measure special behaviors such as mutual gaze, or when there is no one speaking in the room.

Generally, this thesis is a first step towards building a foundation of knowledge about the impact that AAC devices have on face-to-face interactions. With the acquired information from the study, we hope to develop and incorporate computer science techniques to create a better AAC device that can continuously keep people interested in the conversation and allow the users to have a more coordinated and natural conversation with others.

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Chapter VIII: Appendix

(Due to the extra margin, all the surveys were reformatted)

APPENDIX A

CONSENT FORM

Project Title:	Conversations using speech-assisted devices
Principal Investigator:	Frank Bernieri
Student Researcher:	Duy Nguyen
Co-Investigator(s):	William Smart
Sponsor:	None
Version Date:	10/28/2015

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1. WHAT IS THE PURPOSE OF THIS FORM?

This form contains information you will need to help you decide whether to be in this research study or not. Please read the form carefully and ask the study team member(s) questions about anything that is not clear.

2. WHY IS THIS RESEARCH STUDY BEING DONE?

The purpose of this research is to assess the impact of mechanical speech synthesizers in typical face-to-face conversations. Individuals who use such devices have to endure very long pauses that disrupt the normal flow and cadence of conversational turn-taking. In this research project, we will ask you or your partner to use a speech synthesizer while interacting with someone for the very first time. We will assess the psychological impact of this devise and interpersonal behavior (via an analysis of video) of these devices.

This study is intended to be used as part of an Honors Thesis for Duy Nguyen. However, other researchers within Psychology and Engineering plan to expand this research program in the years ahead to explore related issues.

We are targeting an enrollment of 500.

3. WHY AM I BEING INVITED TO TAKE PART IN THIS STUDY?

You are being invited to take part in this study because we would like to observe a representative sample of the Oregon State University student population. To be eligible, you must be over the age of 18 and be able to converse in English.

4. WHAT WILL HAPPEN IF I TAKE PART IN THIS RESEARCH STUDY?

The study activities include:

(a) a couple of brief personality surveys

(b) a short tutorial on the use of mechanical speech devices

(c) three conversations with a partner who, like you, was recruited to participate in this study

(d) some brief questionnaires that will ask you to describe your conversational experiences

(e) a post study discussion about the experience with the experimenter and your partner.

Study duration: Today's session is designed to last about ninety minutes

Recordings and photographs: It is important to know that video recordings of all three interactions will be made. We will measure and quantify the verbal and nonverbal behavior that takes place. **If you do not wish to be recorded then you should not enroll in this project.**

How will we use your data?

We are not planning to release, or make available, any of the data collected here today. However, sometimes this is requested by other researchers or becomes necessary for technical reasons. To be clear, we will never release your name. However, it is sometimes the case that video recordings are analyzed at other institutions. For this reason, we need to know whether you grant us permission to provide other researchers access to the data and video generated by you today.

_____You may store my data and video for use in future studies.

Initials [initial this to give your permission to allow us or other research teams to use your data and/or video to explore other research questions beyond those mentioned in this document]

_____You may store my data and video for presentation purposes.

Initials [initial this to give your permission to allow us to use a video clip or image of you in any lecture, publication, or news story about this research. *Do not initial* this if you do not want a picture of you taken in this study to be seen by anyone outside of this research lab.]

_____ You may <u>not</u> store my data and video for use in future studies.

Initials [initial this if *do not want* the data or video you've generated to be used for any other research purposes other than the one disclosed in this informed consent document]

Future contact: We may contact you in the future for another similar study. You may ask us to stop contacting you at any time.

Study Results: Most of the data you and your partner will be generating is confidential. You will not be given any description, analysis, or evaluation of your participation today. However, it is likely that a report of this project along with its results will be drafted and submitted to the OSU Scholars Archive in about a year from now. At any time, however, you may email the Principal Investigator (Dr. Frank Bernieri) to inquire about the results from this study.

5. WHAT ARE THE RISKS AND POSSIBLE DISCOMFORTS OF THIS STUDY?

The possible risks and/or discomforts associated with the being in the study includes all of those risks and discomforts that might arise when meeting a person for the very first time. Under these conditions people vary in the extent to which they are susceptible to feeling anxious, self-conscious, and awkward, especially when they know they are being recorded.

These feelings may be more intense than usual because in this study you'll be using a speech synthesizer for the first time which greatly impedes the timing and flow of face-to-face conversation. In fact, the primary purpose of this research project is to better understand what users of these devices experience in their day-to-day lives with them.

6. WHAT ARE THE BENEFITS OF THIS STUDY?

We do not know if you will benefit from being in this study. However, if you have never used or interacted with a person who uses a speech assisted device before then your participation in this study should provide you with some first-hand knowledge and experience that should facilitate future interactions with others who use such devices.

7. WILL I BE PAID FOR BEING IN THIS STUDY?

You will not be paid for being in this research study. If you have signed up for this study through the SONA system used in the School of Psychological Sciences then you will receive extra credit for your participation in accordance to the policy dictated in your instructor's syllabus.

8. WHO WILL SEE THE INFORMATION I GIVE?

The information you provide during this research study will be kept confidential to the extent permitted by law. The PI will store all research materials for at least 3 years post study termination. Research records will be stored securely and only researchers will have access to the records. Federal regulatory agencies and the Oregon State University Institutional Review Board (a committee that reviews and approves research studies) may inspect and copy records pertaining to this research. Some of these records could contain information that personally identifies you (e.g., a video recording).

If the results of this project are published your name and identity will not be made public. However, if you give us permission to use video recordings or photographs of you for presentation purposes, then this becomes a possibility.

Video recordings will be archived and kept within the research lab. Only those members associated with the team and certified to conduct research with human participants will have access to them. Your name or any other identifying information will not be associated with, or tied to these recordings.

To help ensure confidentiality, we will not ask you for your name at any time other than to receive your consent to participate and to report to your instructor that you are entitled to receive extra credit for your participation today. All of the data you provide to us will be given a code and de-identified so that your responses will not be tied back to you, personally. All of the information you will provide us will be stored and analyzed in computers and rooms that are accessible only by lab personnel with the proper keys and access codes.

The data collected from any individual in this study will not be made available to the public. All reports, publications, and presentations will only include group level statistics. Data from individuals will not appear in any publicly released reports of this project. All reports, publications, and presentations generated from this project will be stored in the University Archive or Scholars Archive.

9. WHAT OTHER CHOICES DO I HAVE IF I DO NOT TAKE PART IN THIS STUDY?

Participation in this study is voluntary. If you decide to participate, you are free to withdraw at any time without penalty. You will not be treated differently if you decide to stop taking part in the study. If you choose to withdraw from this project before it ends, the researchers may keep information collected about you and this information may be included in study reports.

If you are currently enrolled in a Psychology class that is offering extra credit for research participants, please be aware that instructors are required to offer alternative means to earn such points. Your decision to take part or not take part in this study will not affect your grades, your relationship with your professors, or your standing in the University.

10. WHO DO I CONTACT IF I HAVE QUESTIONS?

If you have any questions about this research project, please contact: Frank Bernieri at (541) 737-1373 or Frank.Bernieri@oregonstate.edu.

If you have questions about your rights or welfare as a participant, please contact the Oregon State University Institutional Review Board (IRB) Office, at (541) 737-8008 or by email at IRB@oregonstate.edu

11. WHAT DOES MY SIGNATURE ON THIS CONSENT FORM MEAN?

Your signature indicates that this study has been explained to you, that your questions have been answered, and that you agree to take part in this study. You will receive a copy of this form.

Do not sign after the expiration date:

Participant's Name (printed):

_____

_____

(Signature of Participant) (Date)

Experimenter's Name (printed):

_____

_____

(Signature of Experimenter certifying the consent process (Date)

APPENDIX B

THE H-E PERSONALITY QUESTIONNAIRE

Some of the following questions may seem puzzling or strange to you. They were designed to be used with a wide variety of people. If you are unsure about the meaning of any question try to answer it as best you can. Do not ask for help since the important thing is how YOU feel and how YOU answer the questions.

Be sure to answer the questions rapidly but carefully.
Do not spend too much time on one question – your first impression is best.
Remember, answer the questions to the best of your ability and answer each question.

Indicate whether you believe each statement is **True** or **False** by circling the appropriate letter.

T F 1. A person needs to show off a little now and then.
T F 2. I usually take an active part in the entertainment at parties.
T F 3. I like to have a place for everything and everything in its place.
T F 4. I feel sure there is only one true religion.
T F 5. I am afraid of deep water.
T F 6. I have at one time or another tried my hand at writing poetry.
T F 7. I prefer a shower to a bath.
T F 8. It bothers me when something unexpected interrupts my daily routine.
T F 9. It is hard for me to just sit still and relax.
T F 10. I always try to consider the other person's feelings before I do something.
T F 11. I don't like to work on a problem unless there is the possibility of coming out with a clear-cut and unambiguous answer.
T F 12. I can remember "playing sick" to get out of something.
T F 13. I like to keep people guessing what I'm going to do next.
T F 14. Before I do something I try to consider how my friends will react to it.
T F 15. I like to talk before groups of people.
T F 16. My parents were very strict and stern with me.
T F 17. Sometimes I rather enjoy going against the rules and doing things I'm not supposed to.
T F 18. I think I would like to belong to a singing club.
T F 19. I usually don't like to talk much unless I'm with people I know well.
T F 20. I think I am usually a leader in my group.
T F 21. I must admit I often try to get my own way regardless of what others may want.
T F 22. I liked "Alice in Wonderland" by Lewis Carroll.
T F 23. I don't really care whether people like me or dislike me.
T F 24. Clever, sarcastic people make me feel very uncomfortable.
T F 25. I have natural talent for influencing people.
T F 26. The trouble with many people is that they don't take things seriously enough.
T F 27. Only a fool would try to change the American way of life.
T F 28. Most arguments or quarrels I get into are over matters of principle.
T F 29. I would like the job of a foreign correspondent.

T F 30. People today have forgotten how to feel properly ashamed of themselves.
T F 31. When a man is with a woman he is usually thinking about things related to her sex.
T F 32. Sometimes I think of things too bad to talk about.
T F 33. I would like to be with a crowd who plays jokes on one another.
T F 34. Sometimes without any good reason or even when things are going wrong I feel excitedly happy, “on top of the world”.
T F 35. My way of doing things is apt to be misunderstood by others.
T F 36. I like poetry.
T F 37. I am sometimes cross and grouchy without any good reason.
T F 38. I would like to be a journalist.
T F 39. I am a good mixer.
T F 40. I feel it is certainly best to keep my mouth shut when I am in trouble.
T F 41. I am an important person.
T F 42. My feelings are easily hurt.
T F 43. I have met problems so full of possibilities that I have been unable to make up my mind about them.
T F 44. What others think of me does not bother me.
T F 45. My mother or father often made me obey even when I thought it was unreasonable.
T F 46. I easily become impatient with people.
T F 47. Sometimes I enjoy hurting the person I love.
T F 48. I tend to be interested in several different hobbies rather than stick to one of them for a long time.
T F 49. I am not easily angered.
T F 50. People have often misunderstood my intentions when I was trying to put them right and be helpful.
T F 51. I am usually calm and not easily upset.
T F 52. I would certainly enjoy beating a crook at his own game.
T F 53. I am often so annoyed when someone tries to get ahead of me in a line of people that I speak to him about it.
T F 54. I am often sorry because I am so cross and grouchy.
T F 55. I have never been especially nervous over trouble that any member of my family has gotten into.
T F 56. I like to talk about sex.
T F 57. I frequently undertake more than I can accomplish.
T F 58. I enjoy the company of strong willed people.
T F 59. Disobedience to the government is never justified.
T F 60. I have a pretty clear idea of what I would try to impart to my students if I were a teacher.
T F 61. I am usually rather short-tempered with people who come around and bother me with foolish questions.
T F 62. It is the duty of a citizen to support his or her country, right or wrong.
T F 63. I have seen some things so sad that I almost felt like crying.
T F 64. As a rule, I have little difficulty in “putting myself into other people’s shoes”.

EXPERIENCE OF ACTIVITIES

Instructions: Circle the "T" (True) or "F" (False) according to how you would usually describe yourself.

T F 1. It is easy for me to concentrate on my activities.
T F 2. Frequently when I am working I find myself thinking about other things.
T F 3. Time always seems to be passing slowly.
T F 4. I often find myself at "loose ends," not knowing what to do.
T F 5. I am often trapped in situations where I have to do meaningless things.
T F 6. Having to look at someone's home movies or travel slides bores me tremendously.
T F 7. I have projects in mind all the time, things to do.
T F 8. I find it easy to entertain myself.
T F 9. Many things I have to do are repetitive and monotonous.
T F 10. It takes more stimulation to get me going than most people.
T F 11. I get a kick out of most things I do.
T F 12. I am seldom excited about my work.
T F 13. In any situation, I can usually find something to do or see to keep me interested.
T F 14. Much of the time I just sit around doing nothing.
T F 15. I am good at waiting patiently.
T F 16. I often find myself with nothing to do – with time on my hands.
T F 17. In situations where I have to wait, such as a line or a queue, I get very restless.
T F 18. I often wake up with a new idea.
T F 19. It would be very hard for me to find a job that is exciting enough.
T F 20. I would like more challenging things to do in life.
T F 21. I feel that I am working below my abilities most of the time.
T F 22. Many people would say that I am a creative or imaginative person.
T F 23. I have so many interests, I don't have time to do everything.
T F 24. Among my friends, I am the one who keeps doing something the longest.
T F 25. Unless I am doing something exciting, even dangerous, I feel half dead and dull.
T F 26. It takes a lot of change and variety to keep me really happy.
T F 27. It seems that the same things are on television and the movies all the time; it is getting old.
T F 28. When I was young, I was often in monotonous or tiresome situations.

Attitudes Scale

True or False?

T	F	1	Before voting I thoroughly investigate the qualifications of all the candidates.
T	F	2	I never hesitate to go out of my way to help someone in trouble
T	F	3	It is sometimes hard for me to go on with my work if I am not encouraged.
T	F	4	I have never intensely disliked someone
T	F	5	On occasion I have had doubts about my ability to succeed in life.
T	F	6	I sometimes feel resentful when I don't get my way.
T	F	7	I am always careful about my manner of dress.
T	F	8	My table manners at home are as good as when I eat out in a restaurant.
T	F	9	If I could get into a movie without paying and be sure I was not seen, I would probably do it.
T	F	10	On a few occasions, I have given up doing something because I thought too little of my ability.
T	F	11	I like to gossip at times.
T	F	12	There have been times when I felt like rebelling against people in authority even though I knew they were right.
T	F	13	No matter who I'm talking to, I'm always a good listener.
T	F	14	I can remember "playing sick" to get out of something.
T	F	15	There have been occasions when I took advantage of someone.
T	F	16	I'm always willing to admit it when I make a mistake.
T	F	17	I always try to practice what I preach.
T	F	18	I don't find it particularly difficult to get along with loud-mouthed, obnoxious people.
T	F	19	I sometimes try to get even, rather than forgive and forget.
T	F	20	When I don't know something I don't at all mind admitting it.
T	F	21	I am always courteous, even to people who are disagreeable.
T	F	22	At times I have really insisted on having things my own way.
T	F	23	There have been occasions when I felt like smashing things.
T	F	24	I would never think of letting someone else be punished for my wrongdoings.
T	F	25	I never resent being asked to return a favor.
T	F	26	I have never been irked when people expressed ideas very different from my own.
T	F	27	I can never make a long trip without checking the safety of my car.
T	F	28	There have been times when I was quite jealous of the good fortune of others.
T	F	29	I have almost never felt the urge to tell someone off.
T	F	30	I am sometimes irritated by people who ask favors of me.
T	F	31	I have never felt that I was punished without cause
T	F	32	I sometimes think when people have a misfortune they only got what they deserved.
T	F	33	I have never deliberately said something that hurt someone's feelings.

DEMOGRAPHIC INFORMATION

1. How old are you? _____years_____months

2. Sex (please circle one) FEMALE MALE OTHER

3. Is English your first language? Yes No

4. Please indicate which of the following race and ethnicity groups best describes you.

   American Indian or Alaskan Native — Asian or Pacific Islander

   African American — Hispanic

   Caucasian/White — Other

5. What is your class standing? (Circle one)
   1. Freshman
   2. Sophomore
   3. Junior
   4. Senior
   5. Other

6. How many years have you lived in the United States? _____years

7. How much experience do you have with a computer keyboard?
   a. I've never used one before.
   b. I've used one a few times in my life.
   c. I use one every couple of months.
   d. I use one weekly.
   e. I use one daily.

8. How much experience do you have with X-Box type controllers?
   a. I've never used one before.
   b. I've used one a few times.
   c. I use one once every couple of months.
   d. I use one weekly.
   e. I use one daily

APPENDIX C

Self-Assessment

Your answers on the items below are completely confidential and will remain anonymous. Please be as open and honest.

MOODS. Below is a list of words describing different kinds of moods and psychological states. Please indicate how you feel **right now.**

1.	Cheerful	Not at all	0	1	2	3	4	5	very much
2.	Irritated	Not at all	0	1	2	3	4	5	very much
3.	Tense	Not at all	0	1	2	3	4	5	very much
4.	Amused	Not at all	0	1	2	3	4	5	very much
5.	Guilty	Not at all	0	1	2	3	4	5	very much
6.	Insecure	Not at all	0	1	2	3	4	5	very much
7.	Confused	Not at all	0	1	2	3	4	5	very much
8.	Anxious	Not at all	0	1	2	3	4	5	very much
9.	Satisfied	Not at all	0	1	2	3	4	5	very much
10.	Self-conscious	Not at all	0	1	2	3	4	5	very much

BEHAVIOR. During the last conversation to what extent were **you:**

1.	Not all	0	1	2	3	4	5	6	open and disclosing
2.	Not all	0	1	2	3	4	5	6	patient
3.	Not all	0	1	2	3	4	5	6	responsive to your partner's needs
4.	Not all	0	1	2	3	4	5	6	frustrated
5.	Not all	0	1	2	3	4	5	6	distant and self-absorbed
6.	Not all	0	1	2	3	4	5	6	making an effort to be liked
7.	Not all	0	1	2	3	4	5	6	talkative
8.	Not all	0	1	2	3	4	5	6	interested in your partner
9.	Not all	0	1	2	3	4	5	6	friendly
10.	Not all	0	1	2	3	4	5	6	polite

THOUGHTS. Please indicate how strongly you agree with each of the following:
Strongly DISAGREE = 0 1 2 3 4 = Strongly AGREE

0 1 2 3 4	1. Time seemed to pass quickly
0 1 2 3 4	2. I was concerned with what my partner was thinking about me
0 1 2 3 4	3. When not speaking, I spent a lot of time planning what I was going to say next
0 1 2 3 4	4. Much effort was required to keep this conversation going for the allotted time
0 1 2 3 4	5. I was very much aware of the sounds outside of this room (e.g., people talking, doors closing, wind blowing outside)

0 1 2 3 4	6. I was primarily responsible for what transpired during the conversation
0 1 2 3 4	7. I had a feeling of togetherness with my partner
0 1 2 3 4	8. During the conversation I was attentive to many details in my partner'sappearance (eye color, jewelry) and can provide a detailed description if asked.

Rating of Partner

Your answers on the items below are completely confidential and will remain anonymous. Please be as open and honest as possible.

MOODS. Please rate the extent to which you believe your partner felt.

11.	Cheerful	Not at all	0	1	2	3	4	5	very much
12.	Irritated	Not at all	0	1	2	3	4	5	very much
13.	Tense	Not at all	0	1	2	3	4	5	very much
14.	Amused	Not at all	0	1	2	3	4	5	very much
15.	Guilty	Not at all	0	1	2	3	4	5	very much
16.	Insecure	Not at all	0	1	2	3	4	5	very much
17.	Confused	Not at all	0	1	2	3	4	5	very much
18.	Anxious	Not at all	0	1	2	3	4	5	very much
19.	Satisfied	Not at all	0	1	2	3	4	5	very much
20.	Self-conscious	Not at all	0	1	2	3	4	5	very much

BEHAVIOR. To what extent was **your partner:**

11.	Not all	0	1	2	3	4	5	6	open and disclosing
12.	Not all	0	1	2	3	4	5	6	patient
13.	Not all	0	1	2	3	4	5	6	responsive to your needs
14.	Not all	0	1	2	3	4	5	6	frustrated
15.	Not all	0	1	2	3	4	5	6	distant and self-absorbed
16.	Not all	0	1	2	3	4	5	6	making an effort to be liked
17.	Not all	0	1	2	3	4	5	6	talkative
18.	Not all	0	1	2	3	4	5	6	interested in you
19.	Not all	0	1	2	3	4	5	6	friendly
20.	Not all	0	1	2	3	4	5	6	polite

THOUGHTS.

Strongly DISAGREE = 0 1 2 3 4 = Strongly AGREE

0 1 2 3 4 1. My partner thought time passed quickly
0 1 2 3 4 2. My partner was concerned with what I was thinking about him
0 1 2 3 4 3. When not speaking, my partner spent a lot of time planning what they would say next
0 1 2 3 4 4. My partner thought much effort was required to keep this conversation going
0 1 2 3 4 5. My partner was very much aware of the sounds outside of this room (e.g., people talking, doors closing, wind blowing outside)
0 1 2 3 4 6. My partner felt responsible for what transpired during the conversation
0 1 2 3 4 7. My partner had a feeling of togetherness with me

0 1 2 3 4 8. My partner was very attentive to many details of my appearance (eye color, jewelry) and can probably provide a detailed description if asked.

Interaction Assessment

This next section does not apply to you or your partner as individuals. Instead, we'd like to get your assessment of the *conversational event.* Please rate the **interaction** between you and your partner on the following characteristics. Circle the number that you think best describes the quality of the interaction.

NOT AT ALL							EXTREMELY		
0	1	2	3	4	5	6	7	8	WELL-COORDINATED
0	1	2	3	4	5	6	7	8	BORING
0	1	2	3	4	5	6	7	8	COOPERATIVE
0	1	2	3	4	5	6	7	8	HARMONIOUS
0	1	2	3	4	5	6	7	8	UNSATISFYING
0	1	2	3	4	5	6	7	8	UNCOMFORTABLY PACED
0	1	2	3	4	5	6	7	8	COLD
0	1	2	3	4	5	6	7	8	AWKWARD
0	1	2	3	4	5	6	7	8	ENGROSSING
0	1	2	3	4	5	6	7	8	UNFOCUSED
0	1	2	3	4	5	6	7	8	INVOLVING
0	1	2	3	4	5	6	7	8	INTENSE
0	1	2	3	4	5	6	7	8	UNFRIENDLY
0	1	2	3	4	5	6	7	8	ACTIVE
0	1	2	3	4	5	6	7	8	POSITIVE
0	1	2	3	4	5	6	7	8	DULL
0	1	2	3	4	5	6	7	8	WORTHWHILE
0	1	2	3	4	5	6	7	8	SLOW

Rapport is a term used to describe the combination of qualities that emerge from an interaction. These interactions are characterized by such statements as "we really clicked" or "we experienced real chemistry."

Please rate the **level of rapport you felt** between you and your partner.

NO RAPPORT 0 1 2 3 4 5 6 7 8 HIGH RAPPORT

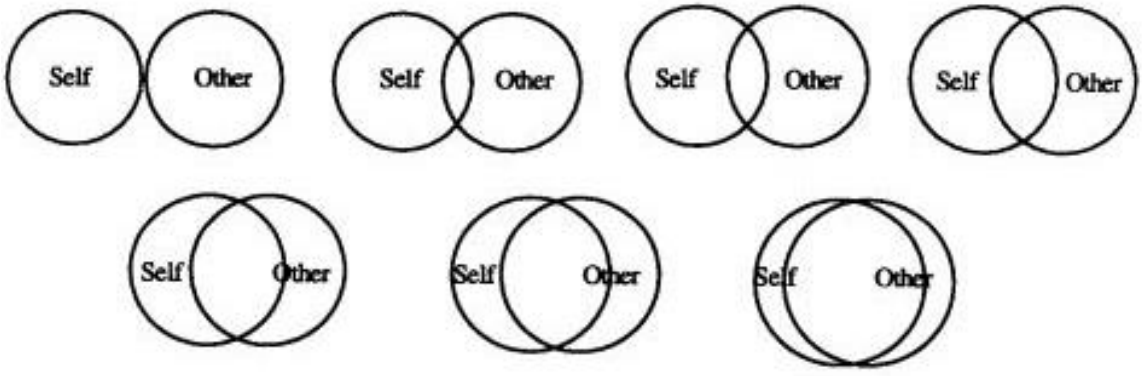
Please rate the **level of rapport you think your partner gave** this interaction.

NO RAPPORT 0 1 2 3 4 5 6 7 8 HIGH RAPPORT

How did the interaction with your partner **compare to interactions you have with close others** in your daily life (with friends, family, etc?)

WORSE				BETTER
1	2	3	4	5
DIFFERENT				TYPICAL
1	2	3	4	5

Please **circle the picture below** that best describes your interaction with your partner, where "self" indicates you and "other" indicates your partner.



APENDIX D

FINAL QUESTIONS

1. How well did you know the person you interacted with today ***before*** showing up for today's study? (Circle 1)
    1. Never met them before today.
    2. I've seen them but we've never talked.
    3. We've talked but I don't know them well
    4. We are well acquainted
    5. We are friends and know each other well

Here are a number of personality traits that may or may not apply to **your partner**. You should rate the extent to which the pair of traits applies to your partner, even if one characteristic applies more strongly than the other.

Generally, I would guess that my partner is usually:

1.	Not all	0	1	2	3	4	5	6	7 Extraverted, enthusiastic
2.	Not all	0	1	2	3	4	5	6	7 Critical, quarrelsome
3.	Not all	0	1	2	3	4	5	6	7 Dependable, self-disciplined
4.	Not all	0	1	2	3	4	5	6	7 Anxious, easily upset
5.	Not all	0	1	2	3	4	5	6	7 Open to new experiences
6.	Not all	0	1	2	3	4	5	6	7 Reserved, quiet
7.	Not all	0	1	2	3	4	5	6	7 Sympathetic, warm
8.	Not all	0	1	2	3	4	5	6	7 Disorganized, careless
9.	Not all	0	1	2	3	4	5	6	7 Calm, emotionally stable
10.	Not all	0	1	2	3	4	5	6	7 Conventional, uncreative
11.	Not all	0	1	2	3	4	5	6	7 Optimistic and positive
12.	Not all	0	1	2	3	4	5	6	7 Selfish, self-absorbed
13.	Not all	0	1	2	3	4	5	6	7 Stubborn, inflexible
14.	Not all	0	1	2	3	4	5	6	7 Socially skilled
15.	Not all	0	1	2	3	4	5	6	7 polite, respectful

DAVIS IRI: THOUGHTS AND FEELINGS QUESTIONNAIRE

The following statements inquire about your thoughts and feelings in a variety of situations. For each item, indicate how well it describes you by choosing the appropriate letter according to the scale provided at the top of the page: **A, B, C, D,** or **E,** and filling in the blanks next to the item.

READ EACH ITEM CAREFULLY BEFORE RESPONDING.

Answer as honestly and accurately as possible.

ANSWER SCALE:

A	B	C	D	E
DOES NOT DESCRIBE ME WELL				DESCRIBES ME VERY WELL

_____ 1. I daydream and fantasize, with some regularity, about things that might happen to me.

_____ 2. I often have tender, concerned feelings for people less fortunate than me.

_____ 3. I sometimes find it difficult to see things from the "other guy's" point of view.

_____ 4. Sometimes I don't feel very sorry for other people when they are having problems.

_____ 5. I really get involved with the feeling of the characters in a novel.

_____ 6. In emergency situations, I feel apprehensive and ill-at-ease.

_____ 7. I am usually objective when I watch a movie or play, and I don't often get completely caught up in it.

_____ 8. I try to look at everybody's side of a disagreement before I make a decision.

_____ 9. When I see someone being taken advantage of, I feel kind of protective towards them.

_____ 10. I sometimes feel helpless when I am in the middle of a very emotional situation.

_____ 11. I sometimes try to understand my friends better by imagining how things would look from their perspective.

_____ 12. Becoming extremely involved in a good book or movie is somewhat rare for me.

_____ 13. When I see someone get hurt, I tend to remain calm.

Post-Study Measures: *Natural Speaker*

How did you feel over the entire experimental session?

STRONGLY DISAGREE= 0 1 2 3 4 5 6 7 = STRONGLY AGREE

0 1 2 3 4 5 6 7 1. I was relieved I did not have to use the speech synthesizer.

0 1 2 3 4 5 6 7 2. I sympathized with my partner because they had to use the speech synthesizer.

0 1 2 3 4 5 6 7 3. I had to concentrate (work hard) to understand the synthesized voice.

0 1 2 3 4 5 6 7 4. I wanted to try to use the speech synthesizer.

Please pick **three** locations for each of the questions below. Rank the three locations by labeling them with a 1, 2, and 3. Place a 1 by the location you looked at the most, a 2 by the location you looked at the second most, and a 3 by the location you looked at the third most.

	5. When my partner was using the keyboard and joystick to input what they wanted to say, I **tended to** look at:	6. When my partner was using the keyboard and joystick to input what they wanted to say, I **avoided** looking at:	7. I was usually looking at ___ while the speech was coming out of the speaker:
The audio speaker			
The monitor			
The floor			
Around the room			
My hands			
The table			
My partner's face			
My partner's hands			
The cameras			

Please give us your feedback about the experiment itself.

STRONGLY DISAGREE= 0 1 2 3 4 5 6 7 = STRONGLY AGREE

0 1 2 3 4 5 6 7	8. I was thinking about the cameras a lot.
0 1 2 3 4 5 6 7	9. I was nervous about being in an experiment.
0 1 2 3 4 5 6 7	10. I was concerned about doing the right thing. I didn't want to mess up the study or appear rude.
0 1 2 3 4 5 6 7	11. The experimenters helped me feel comfortable (e.g., warm, friendly, respectful, etc.).
0 1 2 3 4 5 6 7	12. I thought the whole experience was extremely interesting.

13. How many experiments do you think the experimenter has administered?
    1. 0
    2. 10
    3. 25
    4. 50
    5. 100

Post-Study Measures: *Speech Synthesizer User*

Please give us your feedback about the experiment itself.

STRONGLY DISAGREE= 0 1 2 3 4 5 6 7 = STRONGLY AGREE

0 1 2 3 4 5 6 7	1. I was thinking about the cameras a lot.
0 1 2 3 4 5 6 7	2. I was nervous about being in an experiment.
0 1 2 3 4 5 6 7	3. I was concerned about doing the right thing. I didn't want to mess up the study or appear rude.
0 1 2 3 4 5 6 7	4. The experimenters helped me feel comfortable (e.g., warm, friendly, respectful, etc.).
0 1 2 3 4 5 6 7	5. I thought the whole experience was extremely interesting.

6. How many experiments do you think the experimenter has administered?
    1. 0
    2. 10
    3. 25
    4. 50
    5. 100