**Outline of the result plan of action:**

1. Compare the different (paired t-test) and look at the relationship (correlation) between gazes in conversation 1 and conversation 2 using total gaze duration and mean gaze duration. Expectation: Around gaze decrease and face gaze increase in conversation 2

1. Compare the different (paired t-test) and look at the relationship (correlation) between the around and face gaze in first 100 second of the last 100 second in both conversation: Expectation: There is an increase in around gaze in the last 100 second comparing to the first 100 second and there is a decrease in face gaze in the last.
2. Compare the five emotional ratings (Effort, Irritated, Patient + responsible, Interested, Responsive) of Shakespeare self-rating and Hawking partner rating between two conversation and with each other.
3. Do the correlation between around and face gaze with the five emotional rating, in 3 condition, full conversation, 1st 100 second, 3rd 100 second. Expectation: the 3rd 100 second will have the strongest correlation
4. Do multilinear regression with input is either around, face or the 4 gazes with each of the five emotional rating in 3 condition full conversation, 1st 100 second, 3rd 100 second. Expectation: the gaze behavior in the last 100 second in the 2nd conversation will be the most predictive for the emotional trait
5. (Optional) Correlation and paired t-test for the speaking behaviors between the two interaction and using the gaze behavior in typing and do from 1 to 5.

**The Code for Result below is in the file:**

**Analysis for 5 minute data.sas**

**Overall of the data:**





The boxplot shows that the conversation partners of the AAC users, overall, spend less time focusing on the AAC users and more time wandering around the room in the second conversation comparing to the first conversation



The boxplot shows that the average time for each gaze action in the second conversation varies more in the second interaction comparing to the first interaction. There seems to be a significantly increase in around gaze in conversation 2 comparing to conversation 1 while the other gazes stay the same.





We can see that there is a large decrease in the frequency of face gaze and small decrease in the other gazes. That means that people tend to gaze longer in the second interaction.

**Around gaze**



Pair t-test for total around gaze duration between conversation 1 and conversation 2 (Con1 - Con2)

| **N** | | **Mean** | | | **Std Dev** | | | **Std Err** | | **Minimum** | | **Maximum** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 68 | | -26.8559 | | | 43.7653 | | | 5.3073 | | -175.0 | | 70.2333 | | |
| **Mean** | | | | **95% CL Mean** | | | | | | **Std Dev** | | **95% CL Std Dev** | | |
| -26.8559 | | | | -37.4493 | | | -16.2624 | | | 43.7653 | | 37.4465 | | 52.6696 |
| **DF** | | | **t Value** | | | **Pr > |t|** | | |
| 67 | | | -5.06 | | | <.0001 | | |

Correlation test for total around gaze duration between conversation 1 and conversation 2

| **Simple Statistics** | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | | **N** | **Mean** | **Std Dev** | **Sum** | | **Minimum** | **Maximum** |
| **TotalDurationAround2** | | 68 | 89.13775 | 60.24321 | 6061 | | 5.63333 | 237.00000 |
| **TotalDurationAround1** | | 68 | 62.28186 | 37.08656 | 4235 | | 7.06667 | 177.83333 |
| **Pearson Correlation Coefficients, N = 68 Prob > |r| under H0: Rho=0** | | | | | | |
|  | | **TotalDurationAround1** | | | | |
| **TotalDurationAround2** | | 0.69135 <.0001 | | | | |

Overall, most of the conversational partner spend around 26.86 seconds (SD = 43.77) more wandering around the room in the second conversation comparing to the first conversation (t(67) = -5.06, p < .0001). The time a conversational partner spends wandering around in the first interaction (M = 62.14, SD = 37.09) is significantly correlated to their wandering behavior in the second interaction (M = 89.14, SD = 60.24) (r(66) = 0.69, p < .0001).



Pair t-test for mean duration of around gaze between conversation 1 and conversation 2 (Con1 - Con2)

| **N** | | **Mean** | | | **Std Dev** | | | **Std Err** | | **Minimum** | | | **Maximum** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 68 | | -1.3196 | | | 1.9531 | | | 0.2368 | | -9.5196 | | | 0.5212 | |
| **Mean** | | | | **95% CL Mean** | | | | | | **Std Dev** | | **95% CL Std Dev** | | |
| -1.3196 | | | | -1.7924 | | | -0.8469 | | | 1.9531 | | 1.6711 | 2.3504 | |
| **DF** | | | **t Value** | | | **Pr > |t|** | | |
| 67 | | | -5.57 | | | <.0001 | | |

Correlation test for mean duration of around gaze between conversation 1 and conversation 2

| **Simple Statistics** | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | | **N** | **Mean** | **Std Dev** | **Sum** | | **Minimum** | **Maximum** |
| **MeanDurationAround2** | | 68 | 3.09699 | 2.49647 | 210.59554 | | 0.65067 | 13.16667 |
| **MeanDurationAround1** | | 68 | 1.77737 | 0.91733 | 120.86136 | | 0.61528 | 5.38889 |
| **Pearson Correlation Coefficients, N = 68 Prob > |r| under H0: Rho=0** | | | | | | |
|  | | **MeanDurationAround1** | | | | |
| **MeanDurationAround2** | | 0.71164 <.0001 | | | | |

In the second conversation, the conversational partner spend around 1.32 second (SD = 1.95) more in each time they wandering around than the first conversation (t(67) = -5.57, p < .0001). On average, the duration of each time the conversation partner looking around in the second interaction (M = 3.10, SD = 2.50) is significantly correlated to the time they spend wandering around in the first interaction (M = 1.78, SD = 0.92) (r(66) = 0.71, p > .0001).



Pair t-test for the frequency of around gaze between conversation 1 and conversation 2 (Con1 - Con2)

| **N** | | **Mean** | | **Std Dev** | | | | **Std Err** | | **Minimum** | | | **Maximum** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 68 | | 4.8235 | | 10.5207 | | | | 1.2758 | | -34.0000 | | | 37.0000 | |
| **Mean** | | | | **95% CL Mean** | | | | | | **Std Dev** | | **95% CL Std Dev** | | |
| 4.8235 | | | | 2.2770 | | | 7.3701 | | | 10.5207 | | 9.0017 | 12.6612 | |
| **DF** | | | **t Value** | | | | **Pr > |t|** | |
| 67 | | | 3.78 | | | | 0.0003 | |

Correlation test for frequency of around gaze between conversation 1 and conversation 2

| **Simple Statistics** | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | | **N** | **Mean** | **Std Dev** | | **Sum** | **Minimum** | **Maximum** |
| **FrequencyAround2** | | 68 | 30.19118 | 13.97146 | | 2053 | 5.00000 | 69.00000 |
| **FrequencyAround1** | | 68 | 35.01471 | 12.54900 | | 2381 | 7.00000 | 65.00000 |
| **Pearson Correlation Coefficients, N = 68 Prob > |r| under H0: Rho=0** | | | | | |
|  | | **FrequencyAround1** | | | |
| **FrequencyAround2** | | 0.69012 <.0001 | | | |

The frequency of the communicational partner looking around in the second interaction is significantly less than the frequency of looking around in the first interaction (M = 4.82, SD = 10.52) (t(67) = 3.78, p < 0.0001). There is a significant correlation between the frequency of around gaze in the first interaction (M = 35.01, SD = 13.97) and in the second interaction (M = 30.19, SD = 12.55) (r(67) = 0.69, p < .0001).

**Face gaze**



Pair t-test for total face gaze duration between conversation 1 and conversation 2 (Con1 - Con2)

| **N** | | **Mean** | | | **Std Dev** | | | **Std Err** | | **Minimum** | | **Maximum** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 68 | | 38.8426 | | | 38.9716 | | | 4.7260 | | -54.6333 | | 132.5 | | |
| **Mean** | | | | **95% CL Mean** | | | | | | **Std Dev** | | **95% CL Std Dev** | | |
| 38.8426 | | | | 29.4095 | | | 48.2758 | | | 38.9716 | | 33.3449 | | 46.9006 |
| **DF** | | | **t Value** | | | **Pr > |t|** | | |
| 67 | | | 8.22 | | | <.0001 | | |

Correlation test for total face gaze duration between conversation 1 and conversation 2

| **Simple Statistics** | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | | **N** | **Mean** | **Std Dev** | | **Sum** | **Minimum** | **Maximum** |
| **TotalDurationFace2** | | 68 | 110.95735 | 58.13652 | | 7545 | 11.23333 | 259.60000 |
| **TotalDurationFace1** | | 68 | 149.80000 | 57.02827 | | 10186 | 31.43333 | 264.23333 |
| **Pearson Correlation Coefficients, N = 68 Prob > |r| under H0: Rho=0** | | | | | |
|  | | **TotalDurationFace1** | | | |
| **TotalDurationFace2** | | 0.77114 <.0001 | | | |

The conversation partner, overall, spend less time (M = 38.84, SD = 38.97) focus on the AAC users in the second interaction than the first interaction (t(67) = 8.22, p < .0001). Additionally, if the conversation partner spend more time than the average participants in the study focusing on the AAC users in the first interaction (M = 149.80 , SD = 57.03), they will likely spend more time than the average participants looking at the AAC users in the second interaction (M = 110.96, SD = 58.14) (r(66) = 0.77, p <.0001)



Pair t-test for mean duration of around gaze between conversation 1 and conversation 2 (Con1 - Con2)

| **N** | | **Mean** | | | **Std Dev** | | | **Std Err** | | **Minimum** | | | **Maximum** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 68 | | -0.0343 | | | 0.9299 | | | 0.1128 | | -4.0213 | | | 1.7922 | |
| **Mean** | | | | **95% CL Mean** | | | | | | **Std Dev** | | **95% CL Std Dev** | | |
| -0.0343 | | | | -0.2594 | | | 0.1908 | | | 0.9299 | | 0.7956 | 1.1191 | |
| **DF** | | | **t Value** | | | **Pr > |t|** | | |
| 67 | | | -0.30 | | | 0.7620 | | |

Correlation test for mean duration of around gaze between conversation 1 and conversation 2

| **Simple Statistics** | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | | **N** | **Mean** | **Std Dev** | **Sum** | | **Minimum** | **Maximum** |
| **MeanDurationFace2** | | 68 | 2.33137 | 1.64514 | 158.53282 | | 0.59583 | 10.76389 |
| **MeanDurationFace1** | | 68 | 2.29708 | 1.12546 | 156.20129 | | 0.68947 | 6.90926 |
| **Pearson Correlation Coefficients, N = 68 Prob > |r| under H0: Rho=0** | | | | | | |
|  | | **MeanDurationFace1** | | | | |
| **MeanDurationFace2** | | 0.83943 <.0001 | | | | |

The paired t-test shows that there are not any differences in the duration for each time the communication partner looking at the AAC users (M = -0.03, SD = 0.93) between the two conditions (t(67) = -0.30, p = 0.76). On average, the face gaze actions of the communication partners are really consistent between the two interaction (Interaction 1: M = 2.29, SD = 1.13; Interaction 2: M = 2.33, SD = 1.65) (r(66) = 0.84, p < .0001)



**Monitor Gaze**



Pair t-test for total monitor gaze duration between conversation 1 and conversation 2 (Con1 - Con2)

| **N** | | **Mean** | | | **Std Dev** | | | **Std Err** | | **Minimum** | | **Maximum** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 68 | | -9.6495 | | | 38.1382 | | | 4.6249 | | -157.1 | | 80.1000 | | |
| **Mean** | | | | **95% CL Mean** | | | | | | **Std Dev** | | **95% CL Std Dev** | | |
| -9.6495 | | | | -18.8809 | | | -0.4181 | | | 38.1382 | | 32.6318 | | 45.8975 |
| **DF** | | | **t Value** | | | **Pr > |t|** | | |
| 67 | | | -2.09 | | | 0.0408 | | |

Correlation test for total monitor gaze duration between conversation 1 and conversation 2

| **Simple Statistics** | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | | **N** | **Mean** | **Std Dev** | **Sum** | | **Minimum** | **Maximum** |
| **TotalDurationMonitor2** | | 68 | 56.24706 | 44.93460 | 3825 | | 0.53333 | 224.16667 |
| **TotalDurationMonitor1** | | 68 | 46.59755 | 34.00720 | 3169 | | 1.23333 | 118.40000 |
| **Pearson Correlation Coefficients, N = 68 Prob > |r| under H0: Rho=0** | | | | | | |
|  | | **TotalDurationMonitor1** | | | | |
| **TotalDurationMonitor2** | | 0.56315 <.0001 | | | | |

There is a slight affect differences between the total monitor gazing duration between two interactions in which people look at the monitor more in the second interaction comparing to the first interaction (M = -9.65, SD = 38.14) (t(67) = -2.09, p = 0.04). The amount of time people look at the monitor is significantly correlated between the two interaction (Interaction 1: M = 46.60, SD = 34.01, Interaction 2: M = 56.25, SD = 44.93) (r(66) = 0.56, p < .0001)



Pair t-test for mean monitor gaze duration between conversation 1 and conversation 2 (Con1 - Con2)

| **N** | | **Mean** | | | **Std Dev** | | | **Std Err** | | **Minimum** | | | **Maximum** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 68 | | -0.6436 | | | 1.0754 | | | 0.1304 | | -5.6846 | | | 1.8542 | |
| **Mean** | | | | **95% CL Mean** | | | | | | **Std Dev** | | **95% CL Std Dev** | | |
| -0.6436 | | | | -0.9040 | | | -0.3833 | | | 1.0754 | | 0.9202 | 1.2942 | |
| **DF** | | | **t Value** | | | **Pr > |t|** | | |
| 67 | | | -4.94 | | | <.0001 | | |

Correlation test for mean monitor gaze duration between conversation 1 and conversation 2

| **Simple Statistics** | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | | **N** | **Mean** | **Std Dev** | **Sum** | | **Minimum** | **Maximum** |
| **MeanDurationMonitor2** | | 68 | 2.03959 | 1.26756 | 138.69210 | | 0.47778 | 8.55641 |
| **MeanDurationMonitor1** | | 68 | 1.39595 | 0.65020 | 94.92452 | | 0.41111 | 3.30000 |
| **Pearson Correlation Coefficients, N = 68 Prob > |r| under H0: Rho=0** | | | | | | |
|  | | **MeanDurationMonitor1** | | | | |
| **MeanDurationMonitor2** | | 0.52957 <.0001 | | | | |

For each time the communication partner looking at the monitor of the AAC users, they are likely to look half a second (M = -0.64, SD = 1.08) longer in the second interaction comparing to the first interaction (t(67) = -4.94, p < .0001). There is also a significant correlation between each monitor gaze of the conversational partner in the first interaction (M = 1.40, SD = 0.65) and the monitor gaze in the second interaction (M = 2.04, SD = 1.27) (r(66) = 0.53, p < .0001)

**Typing device**



Pair t-test for total keyboard/typing device gaze duration between conversation 1 and conversation 2 (Con1 - Con2)

| **N** | | **Mean** | | | **Std Dev** | | | **Std Err** | | **Minimum** | | **Maximum** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 68 | | -2.3373 | | | 34.5066 | | | 4.1845 | | -125.4 | | 71.3000 | | |
| **Mean** | | | | **95% CL Mean** | | | | | | **Std Dev** | | **95% CL Std Dev** | | |
| -2.3373 | | | | -10.6896 | | | 6.0151 | | | 34.5066 | | 29.5245 | | 41.5271 |
| **DF** | | | **t Value** | | | **Pr > |t|** | | |
| 67 | | | -0.56 | | | 0.5783 | | |

Correlation test for total keyboard/typing device gaze duration between conversation 1 and conversation 2

| **Simple Statistics** | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | | **N** | **Mean** | **Std Dev** | **Sum** | | **Minimum** | **Maximum** |
| **TotalDurationKeyboard2** | | 68 | 43.65784 | 42.79898 | 2969 | | 0.90000 | 179.36667 |
| **TotalDurationKeyboard1** | | 68 | 41.32059 | 29.29494 | 2810 | | 0 | 126.96667 |
| **Pearson Correlation Coefficients, N = 68 Prob > |r| under H0: Rho=0** | | | | | | |
|  | | **TotalDurationKeyboard1** | | | | |
| **TotalDurationKeyboard2** | | 0.59788 <.0001 | | | | |

Overall, there is no differences between when the communicational partner gaze at the keyboard in the first interaction and gaze at the remote control in the second interaction. However, there is a significantly correlation between the gaze behavior of the communication partner in the first and second interaction (Interaction 1: M = 41.32, SD = 29.29; Interaction 2: M = 43.66, SD = 42.80) (r(66) = 0.60, p < .0001).



Pair t-test for mean keyboard/typing device gaze duration between conversation 1 and conversation 2 (Con1 - Con2)

| **N** | | **Mean** | | | **Std Dev** | | | **Std Err** | | **Minimum** | | | **Maximum** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 68 | | -0.4029 | | | 0.8053 | | | 0.0977 | | -3.5849 | | | 1.9596 | |
| **Mean** | | | | **95% CL Mean** | | | | | | **Std Dev** | | **95% CL Std Dev** | | |
| -0.4029 | | | | -0.5978 | | | -0.2080 | | | 0.8053 | | 0.6890 | 0.9691 | |
| **DF** | | | **t Value** | | | **Pr > |t|** | | |
| 67 | | | -4.13 | | | 0.0001 | | |

Correlation test for mean keyboard/typing device gaze duration between conversation 1 and conversation 2

| **Simple Statistics** | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | | **N** | **Mean** | **Std Dev** | **Sum** | | **Minimum** | **Maximum** |
| **MeanDurationKeyboard2** | | 68 | 1.60034 | 0.93086 | 108.82343 | | 0.45000 | 5.27193 |
| **MeanDurationKeyboard1** | | 68 | 1.19746 | 0.62894 | 81.42720 | | 0 | 4.43043 |
| **Pearson Correlation Coefficients, N = 68 Prob > |r| under H0: Rho=0** | | | | | | |
|  | | **MeanDurationKeyboard1** | | | | |
| **MeanDurationKeyboard2** | | 0.52403 <.0001 | | | | |

For each time the communicational partners looking at the typing device of the AAC users, they look at the remote control (conversation 2) more often than they look at the keyboard (conversation 1) (M = -0.40, SD = 0.81) (t(67) = -4.13, p < .0001). There is also a high correlation between the amount of time the communicational partner look at the keyboard in the first interaction (M = 1.20, SD = 0.63) and the time the communication partner look at the remote control in the second interaction (M = 1.60, SD = 0.93) (r(66) = 0.52, p < .0001).

**Summary for all the gaze:**

Overall, each of the gaze behaviors is significantly correlated between the first and second interaction. That means people gaze tendency doesn’t change when the waiting time is longer. People spend more time looking around the room and less time focus on their partner in the second interaction comparing to the first interaction. There is also a small influence from the waiting time to the total time people gaze at the monitor. There is no differences in the time people gazing at the typing device between the two interaction.

When looking at each gaze actions in the whole conversation, we see that there is a strong correlation between each gaze actions in the first interaction and the second interaction. Overall, majority of people spend more than 1 second looking around the room in the second interaction action than the first interaction. The majority of people also spend around 1 second more looking at the monitor and keyboard in the second interaction than the first interaction. However, there is no differences in the average face gaze duration between the first and second interaction.

**The Code for Result below is in the file:**

**Analysis for 100s Segment data.sas**



The plot box shows the decrease in the total face gaze of the