Revealing the Secret to Successful Virtual Meetings: How Personality, Social Skills, and More Impact Conversational Involvement

Do people that are assessed as better conversational partners have a higher level of involvement?

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Abstract

The importance of understanding how to maximize involvement in virtual meetings has been greatly increased due to the rapid rise of video conferencing tools during the COVID-19 pandemic. This research builds upon the data collected by the MEMO Corpus [39], specifically interview footage and annotated data, and will aim to explore the various factors that influence group involvement in virtual meetings. The research will be conducted in three steps; data annotation, data exploration, and data analysis. The goal of this paper is to investigate the influence of factors such as likeability, listening, and audience engagement in how conversational ability is perceived, given that the scales provided by the MEMO Corpus are valid and the three measures are independent, and how conversational ability influences group involvement, by exploring the existence of correlations. The results of the analysis will provide insight into the dynamics of conversational involvement in virtual meetings and improve virtual communication practices.

KEYWORDS: involvement, conversational ability, likeability, listening, annotation

1 Introduction

Due to the COVID-19 [6] pandemic, video conferencing tools have rapidly gained popularity, mainly due to the need to keep contact while social distancing. This newfound popularity raised the need to understand how to maximize involvement in virtual meetings [28] since it is much easier to avoid a virtual meeting or to not pay attention than in an in-person meeting. In order to answer this question the various factors that influence conversational involvement in the context of virtual meetings will be explored. This research will buildup on the data collected in the MEMO corpus [39], mainly the interview footage and annotated data.

The structure of this report is the following. Firstly, a background on the research that has been done and the subquestions that will help answer the main research question will be presented in Section 2. Secondly, the sub-questions will be summarized in Section 3, and a hypothesis will be deduced from past research. Then, the research methodology will be explained in Section 4, where the approach to this research will be described, including how the data will be collected, extracted, and analyzed. Following, the results of the research will be shown in Section 5. The consequences and observations drawn from these results will be presented here. Next, the responsible research will be in Section 6. This section will reflect on the ethical aspects of this research and discuss the reproducibility of the methods used. Finally, the conclusion will be described in Section 8, here the research question and the answer drawn from this research will be briefly summarized, as well as other vital aspects of the report. This section will also present new questions that might arise from this work or possible improvements to the methods used.

2 Background

In this section past research on the research question presented in Section 1 will be utilized to reason why this research question should be answered.

2.1 Understanding Involvement

Group Involvement and Involvement have been previously defined as:

- Group Involvement:
  - ”The perceived degree of interest or involvement of the majority of the group” [11]
- Involvement:
  - “The process by which interactions start, maintain, and end their perceived connections to each other during an interaction.” [36]

The degrees of involvement and how to detect and label them have been explored. During virtual meetings, hot spots will exist [42], these hot spots can be utilized to determine moments of a higher involvement, be it through visual cues which have a high correlation to involvement [29], such as gaze [39] [28] or audio cues which can also be utilized to determine the emotions being expressed in these moments of higher involvement in spontaneous speech [45].

2.2 Understanding factors that influence involvement

Group involvement can be influenced by various factors, such as the domination of a single or a group of participants, the existence of conflicts amongst the participants, lack of interest in the subject being discussed, or some of the participants being reluctant communicators either by being shy or not very talkative [12]. The type of group involvement also depends greatly on the type of action that was performed to create the hotspot, with moments of amusement generally originating from jokes and moments of disagreement stemming from rejections and negative statements [43]. However, regarding the influence of good conversational partners there is only information regarding the treatment of patients with conditions such as Aphasia [19], and loneliness [2] none regarding how it can influence group involvement in virtual meetings. Due to the lack of information and research on the influence of good conversational partners in group involvement during a virtual meeting, the research question **”Do groups with a higher conversational ability have a higher level of involvement?”** was created.

2.3 Understanding Conversational Ability

In order to correctly answer the question posed above it is essential to understand conversational ability. A speaker with high conversational ability is ”a speaker capable of catching the attention of an audience through their way of speaking” [37].

Likeability and Listening

A conversation is an exchange of information initiated when a participant communicates this information and another participant listens [9]. The conversation is maintained when this process is completed back and forth among participants.

Listening is an important factor in conversation, it allows for sharing or exchanging information within a conversation among partners or small groups [41]. Listening has many benefits; it reduces depression [34], balances extreme attitudes [17], and provides clarity on a person's attitude [18]. It can greatly improve one's knowledge, performance [16; 22] and the relationship with the conversational partner [24; 21]. When learning a new language, however, it has been shown to be very little correlation between one's listening and conversational ability [44]. In order to fully understand the impact of listening and conversational ability in a virtual meeting the sub-question **"How does listening correlate to conversational ability in a virtual meeting?"** will be posed.

Conversational ability is a perceived measure. There is no objective way of determining how good of a speaker a participant is. Likeability of an individual is defined by how pleasant, friendly, and polite others perceive them to be [38; 31; 10; 7]. People tend to judge people they like more highly than people they don't like [31]. It is normal to underestimate how liked they are after a conversation [3], however, how does likeability contribute to being assessed as a better conversational partner? In order to answer this the sub-question **"How does likeability correlate to conversational ability?"** was created.

It is important to mention that the Likeability, Listening, and Conversational ability scores are taken from a scale created by the MEMO Corpus as explained in Section 4.2, as such it is necessary to ensure that they are independent, and are not components of the same construct before answering these questions.

Audience Engagement

A good speaker should be able to sway their audience, they should be able to convince the audience that what they are saying is true and meaningful [1]. A situation where the audience has different perceptions of the conversational ability of the speaker shows the incapacity of the speaker of convincing their audience. By utilizing the standard deviation of the conversational ability scores received from the audience to understand if they were convinced of the speaker's ability I aim to understand its impact on the received conversational ability score. This is presented as the question **"How does the standard deviation of a participant's received conversational ability score correlate to the participant's conversational ability score?"**.

3 Research Questions and Hypothesis

Finally, the research questions will be summarized and a hypothesis will be posed. Sub-questions 1 and 2 can only be answered once the scales created by the MEMO Corpus to describe listening, likeability and conversational ability have been validated in order to ensure that they are independent and not elements of the same construct.

3.1 Sub-question 1: "How does listening correlate to conversational ability in a virtual meeting?"

This sub-question originates from the importance of listening in conversation [41], its benefits [21] and the interest in understanding the weight listening has when rating someone's conversational ability.

Due to the critical role of listening in conversation and its capacity of making the conversational partner feel like we are paying attention, it is expected that there is a positive correlation. However, listening can be faked [4] and participants might be aware of that fact which could result in a weak positive correlation.

3.2 Sub-question 2: "How does likeability correlate to conversational ability?"

Since conversational ability is a perceived measure it is important to understand how factors that affect interpersonal interactions such as likeability correlates to conversational ability.

The positive influence of likeability on outcomes of interpersonal interactions [31] leads me to believe that a positive correlation exists.

3.3 Sub-question 3: "How does the standard deviation of a participant's received conversational ability score correlate to the participant's conversational ability score?"

Due to the nature of the interviews recorded in the MEMO Corpus, which can be found in Section 4.1, being that of a free-flowing conversation between more than two people, the impact of the audience's understanding of the speaker should also be taken into account. More specifically, how a speaker's ability to convince the audience of their conversational ability should result in similar scores from the audience [1] since an unconvinced audience will naturally be in disagreement [27]. The disagreement of the audience can be measured through the standard deviation of the conversational ability scores received by each participant.

From the literature explained above it is expected that there will be a negative correlation between the standard deviation and the mean of the conversational ability scores

3.4 "Do groups with a higher conversational ability have a higher level of involvement?"

The influence of good conversational partners has been greatly studied in the cure of certain medical conditions [19; 2]. It is however an important factor in meetings, in particular virtual meetings. In order to maximize the involvement of a group in a virtual meeting various factors have to be taken into account by past research, such as shyness or lack of interest [12]. This question was created due to this gap in knowledge regarding the influence of conversational ability on the level of involvement of a group.

People's nature to do what they excel at [33] propels me to suggest that there exists a positive correlation between a higher conversational ability and a higher level of involvement.

4 Methodology

In order to answer the research questions posed in Section 2, the process was divided into three parts Data Annotation, Data Exploration, and Data Analysis.

4.1 Data Annotation

Firstly, it was necessary to obtain the involvement values to allow us to answer the research questions from the 36 hours of virtual meetings recorded in the MEMO Corpus. These virtual meetings contain one moderator and two to five members of British origin. The conversation is guided by the moderator, but the intent is to simulate a free-flowing conversation regarding how each participant felt about the COVID-19 pandemic [39].

Definition of Involvement

In order to ensure that all group members had a similar understanding of what involvement is, a definition had to be agreed on by the group. These definitions can be found in Section 2.

Afterward, a scale had to be devised to allow the members of the group to label the moments of involvement. Initially, the scale was very focused on physical aspects, such as speech, however, involvement can be demonstrated through other means, such as thinking or simply paying attention. The group decided on broader descriptions to allow the annotator to have some more input on the level of involvement such as the Leuven Scale [15] which is mainly utilized when describing the involvement levels of children who have reduced capability of speech. This will help reduce certain biases regarding speech described in Section 6.3. The scale is the following:

1. Very Low Involvement
2. Low Involvement
3. Moderate Involvement
4. High Involvement
5. Very High Involvement

Involvement Annotation

Once the scale and definitions of involvement were agreed on the group could proceed with the annotation of the involvement levels of a random subset of 5s intervals, since more than 5s would allow the level of involvement to change and less than 5s would not be enough time to understand the level of involvement. From each of the 3 sessions of the 14 groups that were not previously annotated using a simple Python [32] script which randomly created four subsets 300 5s intervals for each of the 14 groups. Each of the four members of the group annotated on average 5 minutes per session which equates to about 14 hours of annotation.

Inter-rater Reliability

Since the data was annotated by four different annotators it was necessary to ensure that the data was consistent. When dividing the random subsets of 5s the Python script ensured that there was at least a 10 % overlap in order to calculate the percentage of intervals that were labeled the same by two different annotators, giving us a better understanding of the consistency of the data amongst the four annotators.

4.2 Data Exploration

Secondly, gaps in the data collected had to be filled and missing data had to be extracted and cleaned.

Extracting the remaining data

From the Data Annotation, only the group involvement was extracted. In order to answer the research questions provided it was necessary to extract the Likeability, Conversational Ability, and Listening score of each participant. In the MEMO Corpus study, participants were asked to fill out a questionnaire after three sessions with a group, where they were asked to describe on a score of 1 to 7 how much they liked the other participants, how good of a listener they perceived other participants to be as well as the conversational ability of other participants.

The questionnaire [39] questions were the following:

1. "To what extent is [participant] a good listener? Insert numbers on a scale from 1 to 7" $\rightarrow$ Listener Score.
2. "To what extent do you like [participant]? Insert numbers on a scale from 1 to 7" $\rightarrow$ Likeabilty.
3. "How would you rate [participant]'s ability to keep the conversation flowing? Insert numbers on a scale from 1 to 7" $\rightarrow$ Conversational Ability.

Cleaning the data

Firstly, the four different sets of involvement annotations were combined. Then, using Pandas [30] a DataFrame for the Involvement scores and a separate one for the Likeability, Conversational Ability, and Listening score were created since they were extracted from a separate data source as mentioned above.

Since the scores for each of the three categories were given by each participant it was necessary to combine them in order to retrieve the final score of each participant for Likeability, Conversational Ability, and Listening score, for this the Mean was utilized.

4.3 Data Analysis

Finally, once the data had all been collected and cleaned, it could be used to plot the correlations that would answer the sub-questions mentioned in Section 2.

It was also necessary to ensure that the Likeability and Listener Scores extracted in Section 4.2 were not describing that same construct and could be utilized separately. In order to check this Principal Component Analysis (PCA) [23] will be utilized in combination with a Scree plot [25] to determine the principal components and the Cronbach's Alpha [5] between the Likeability and Listening Score will be calculated.

These correlations were plotted using Matplotlib [14] and the results are shown in Section 5.

5 Results

The results reached from this research will be shown in this section and a possible explanation will be presented in Section 7.

5.1 Data Distribution

Firstly, the distribution of the annotations from Section 4.1 is presented in Figure 1.

The standard deviation is 0.8076 and the mean is 3.0686. The data follows a normal distribution with a slight skew towards the higher levels of involvement.

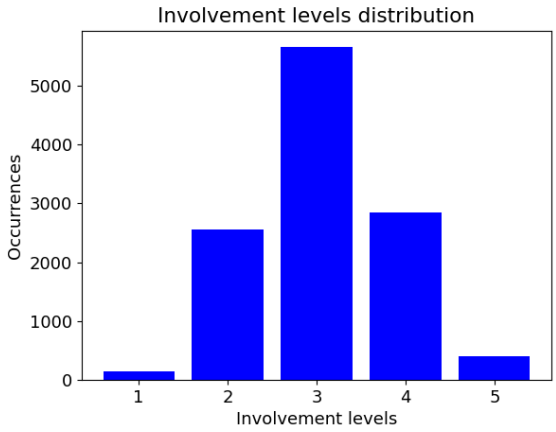

Figure 1: Involvement Levels Distribution

5.2 Validating the Likeability, Listening, and Conversational Ability Scales

In order to ensure that the scales created by the MEMO Corpus were describing different constructs a PCA was performed. The following results were obtained:

	PC1	PC2	PC3
Likeability	-0.6018	-0.1026	-0.7920
Listening	-0.5717	-0.6371	0.5169
Conversational Ability	-0.5577	0.7639	0.3247

Table 1: PCA of Likeability, Listening, and Conversational Ability Scales

Since the PCA results are inconclusive because all three components are heavily explained by at least two of Likeability, Listening, and Conversational Ability. As such a Scree plot was created and is shown in Figure 2.

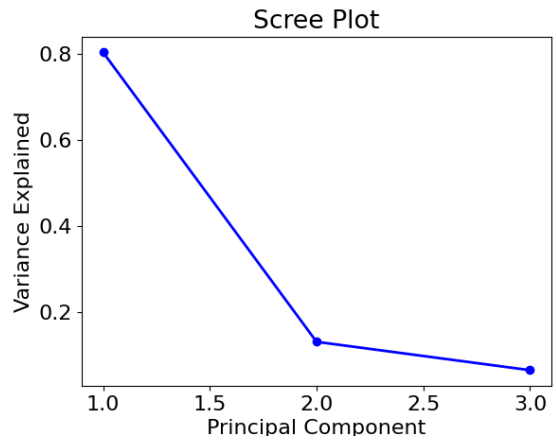

Figure 2: Scree Plot

From Figure 2 we can see that all three components are part of the same construct and are not independent. This is backed by Cronbach's Alpha which is 0.8708 for these three components. From these results, we can determine that the sub-questions 1 and 2 cannot be answered.

5.3 Sub-Question 3: How does the standard deviation of a participant's received conversational ability score correlate to the participant's conversational ability score?

The result shown in Figure 3 shows a negative correlation, where a larger standard deviation of the participant's received conversational ability score will result in a smaller mean conversational ability score. The correlation score is $R^2 = 0.209399$ with a p-value of $7.5574 * 10^{-12}$.

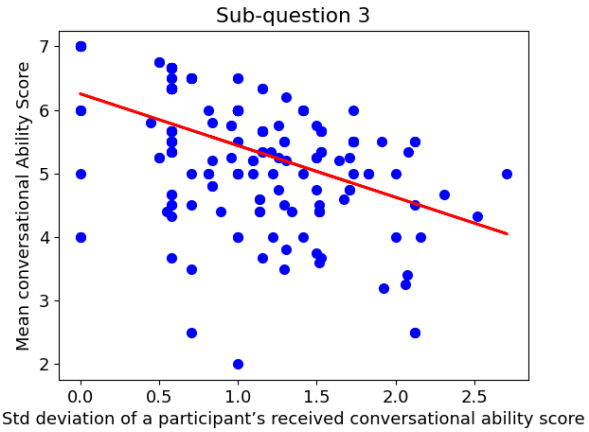

Figure 3: Standard deviation of a participant's received conversational ability score to determine a participant's conversational ability score

5.4 Do groups with a higher conversational ability have a higher level of involvement?

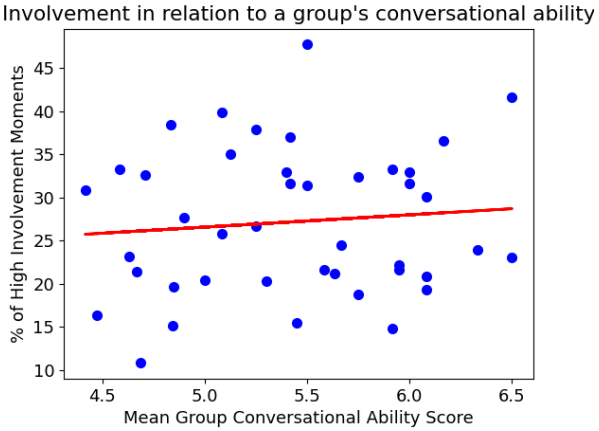

Figure 4: % of high involvement moments in relation to a group's conversational ability

In Figure 4 it is visible that there is no correlation between conversational ability and the level of involvement, contrary

to the hypothesis presented in Section 2.3. The correlation score is $R^2 = 0.009590$ with a p-value of 0.5372.

6 Responsible Research

During this research the following biases were encountered:

6.1 Selection Bias

The groups that participated in the MEMO Corpus consisted mainly of British origin. As such the results obtained cannot be generalized to other groups.

Repeating this research with a different group may result in different observations.

6.2 Group Bias

The annotator might adapt the involvement scale to each group. A group with a higher average level of involvement might receive lower involvement levels than they should and vice-versa. This could lead to situations where two different timestamps with the same level of involvement might end up being labeled differently due to the group.

This could happen due to the Central Tendency Bias [8], where the most common occurring level of involvement will, in most situations, be associated with the central value of a Likert scale, which in this case is 3.

6.3 Speech Bias

Involvement is very often related to speech. As such the annotator might ignore other kinds of involvement such as body language.

In a moment where no participant is speaking, even if they are thinking, waiting for someone else to speak, paying attention or other possible types of involvement, the moment will, more likely than not, be labeled as a low level of involvement.

6.4 Time Bias

Since the time intervals were randomly distributed as mentioned in Section 4.1, it is possible that the time intervals that were selected do not accurately depict the level of involvement of the session, creating the idea that a certain group might have a high-level involvement when in actuality only the moments of high involvement were selected in this random distribution.

6.5 Personal Bias

The involvement scale is very vague so the involvement value given to the same 5s interval could be different if annotated by a different person. Resulting in a very different set of values for the same time intervals.

7 Discussion

In this section, the results shown in Section 5 will be discussed and compared to previous work and the hypothesis stated in Section 2. A possible explanation of these results will also be presented.

7.1 Data Distribution

The distribution shown in 5.1 is slightly skewed towards the higher levels of involvement. This skew can be explained by the time and personal bias explained in Section 6.

The annotated time intervals could be moments of high involvement due to the randomness of the selection of the time intervals. In addition, the annotators due to the broad definition of group involvement [36] reached and the positivity bias of the English language [20] might tend to lean towards a higher level of involvement when the annotator believes a higher involvement to be the more beneficial choice [35].

7.2 Validating the Likeability, Listening, and Conversational Ability Scales

After validating the scales for likeability, listening, and conversational ability created by the MEMO corpus, we can see that all three components are not independent and are part of the same construct.

These results can stem from the overlapping and complementary nature of the three components. Listening is a crucial factor in a conversation [41] and can be a determining factor of one's conversational ability. A good listener will tend to be more liked by their conversational partner [24] which will increase their likeability. Finally, a more likable person will tend to be positively influenced [31] which can lead to a more engaged audience [26].

Another reason could be the subjective nature of these qualities which can result in each participant having a different understanding of each of the qualities as mentioned in Section 6.5.

7.3 Sub-Question 3: How does the standard deviation of a participant's received conversational ability score correlate to the participant's conversational ability score?

The results shown in Section 5.3 show that the hypothesis presented in Section 2 that a smaller standard deviation of received conversational ability scores will result in a higher conversational ability is correct. Meaning that a speaker's ability to convince the audience of their conversational ability should result in similar scores from the audience [1] since an unconvinced audience will naturally be in disagreement [27].

From the low correlation coefficient, we can deduce that while convincing the audience is an important factor that leads to higher conversational ability in a virtual meeting, there are other factors that have a greater impact on how one's conversational ability is perceived. These factors can be how articulate and clear the speaker is, a clearer speech will be remembered better by the audience [40], how much knowledge the speaker has regarding the subject in conversation, a person that demonstrates to be very knowledgeable may be unconsciously rated as a better speaker as "the audience sizes you up quickly, from several factors; your depth of knowledge, the experiences you speak from, the love you have for the area of expertise" [46], and finally, their contribution to the overall conversation can also impact the perception of the audience since someone can speak a lot in a meeting without adding any relevant information [46], this can happen when

the speaker is not aware of the topic or not fully interested [13].

7.4 Do groups with a higher conversational ability have a higher level of involvement?

The results obtained and shown in Section 5.4 contradict the hypothesis presented in Section 2.3 that a higher conversational ability will result in a higher level of involvement due to people's nature to do what they excel at [33]. However, since the p-value is larger than 0.05 the results are not significant.

These results can be due to multiple reasons; those being the involvement annotations being inconsistent, and the fact that there may be other factors that are more important when predicting conversational involvement.

The inconsistency of the involvement annotations can be explained by the biases explained in Section 6. More specifically Personal bias could lead to different ratings for the same exact moment depending on the annotator, their values, and perception, and Group bias could lead to moments of similar involvement but from different groups being rated differently. These biases are explained more in-depth in Sections 6.5 and 6.2 respectively. It could be very interesting to understand how to avoid such biases in future renditions of the involvement annotation.

Other factors that may have a greater impact on conversational involvement other than conversational ability are mentioned in Section 2.2. These are the domination of a single or a group of participants, the existence of conflicts amongst the participants, lack of interest in the subject being discussed, or some of the participants being reluctant communicators either by being shy or not very talkative [12]. In addition to these factors, personality or individual background may have a greater impact on conversational involvement than conversational ability. The impact of these factors on conversational involvement is currently being studied by my colleagues Andy Li and Ana Hobai, respectively.

8 Conclusions and Future Work

In conclusion, this article explores how the conversational ability of a group influences their conversational involvement, with a focus on the factors that lead to being perceived as a good speaker such as likeability, listening, and audience engagement. The study utilized data from the MEMO corpus, which included interview footage and annotated data. In addition, the scales created to measure likeability, listening, and conversational ability were validated.

The methodology of the article followed data annotation where involvement was defined and labeled from the virtual meetings collected by the MEMO Corpus, data exploration where data related to likeability, listening, and conversational ability was extracted and cleaned and data analysis which involved the validation of the scales for likeability, listening and conversational ability and the investigation of the correlations obtained in order to answer the research questions posed.

In order to answer the first 2 sub-questions **"How does likeability correlate to conversational ability?"** and **"How does listening correlate to conversational ability?"**, the scales created by the MEMO Corpus had to be validated. The results obtained show that the scales for likeability, listening, and conversational ability are describing the same construct and are not independent, which means the sub-questions could not be answered.

Further research on how to ensure that the scales are describing different constructs should be conducted before attempting to investigate this relationship.

Regarding the influence of audience engagement in being perceived as a good speaker the sub-question **"How does the standard deviation of a participant's received conversational ability score correlate to the participant's conversational ability score?"** was asked. The standard deviation is utilized to measure the agreement of the audience about the capability of the speaker. I concluded that there is indeed a negative correlation. This implies that when the audience has varying perceptions of a speaker's ability, it reflects a lack of convincing power in the speaker.

Finally, I found that while a higher group conversational ability indicates a higher group involvement no significant results were obtained. This could be due to the way involvement was annotated. Future research on this topic would benefit from investigating how to annotate involvement while minimizing human error.

Future work on this topic could investigate how the results change when utilizing a different platform to hold virtual meetings and when interviewing people of different cultures and ethnicity. In addition, it could also prove interesting to hold these meetings with people of different mother tongues in order to investigate the impact of language on involvement.

To summarize, the research conducted aims to understand the factors that influence conversational involvement in virtual meetings. However, potential limitations due to the MEMO corpus's specific context and the subjective nature of conversational ability, listening, and likeability exist. Future research on this topic would benefit from a more diverse set of participants in the meetings as well as the investigation of additional factors that help maximize involvement in a virtual meeting.

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