Trying to Be Heard: Gender and Group Dynamics

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Abstract. We use nonlinguistic audio analysis to investigate differences in speaking style of men and women in study groups discussions. Our results show that women took shorter turns than men and that women interrupted men more than men interrupted women. We found no significant differences in other turn taking characteristics.

Keywords: Gender · Group dynamics · Wearable sensors · Nonlinguistic audio analysis.

1 Introduction

Group gender composition plays an essential role in social interaction and group dynamics [15, 7], making it one of the foundations of research on gender inequality [1] and gender difference [18]. Many sociology studies have reported explicit relationships between gender and conversational behaviors, including turn-taking behaviors and interruption patterns [8, 19, 2, 5]. For example, studies found that women take shorter speaking turns [9], and that men are more likely to interrupt women than the opposite [17]. Onnela et al. showed that women were more talkative in natural collaborative context, but found no difference in gender in team project context [6].

In this study, we investigate differences in gender speaking styles using nonlinguistic audio collected using Rhythm Badges [3, 4] from study groups meetings in an executive MBA program. In part, this study was motivated by concerns raised by women students who generally had the impression that they did not get to speak as much as men.

The differences we find in turn-taking characteristics only partially confirm previous laboratory experiments, and the differences in interruption patterns contradict existing research. These results contribute to a limited, but growing, body of literature that investigates gender differences in natural settings. In particular, to the best of our knowledge, it is the first time differences in interruption patterns have been validated outside the laboratory.

2 Background

The occurrence of overlap and interruption have been found to be closely related to gender in many sociology studies [19, 17]. The classic study by Zimmerman and West found that in same-sex conversations, interruptions were rare and appeared to be evenly distributed between speakers, whereas in cross-sex conversations, almost all the interruptions were initiated by male speakers [19]. A well-adopted explanation is that men tend to show dominance by interrupting women. Many other works have found similarly that men interrupt more than women.

However, a few studies have different findings. For example, Hannah et al. found no significant difference between interruption and gender [2]. Murray and Covelli even had a contrary discovery that women interrupt more than men [5]. One potential reason for the diverse findings is that multiple conceptual and operational definitions of interruptions are used in the literature [17]. Interruption is a complex interactional phenomenon with rich meanings, diverse functions, and various structural features [17]. The literature suggests two different types of interruption—cooperative and disruptive [14, 17]. Cooperative interruption describes words of agreement and support or anticipation of how other peoples' sentences and thoughts would end. This type of interruption is reported to be characteristic of women's style of speech [8], and to have a potentially positive influence on the interpersonal relationship between speakers. Disruptive interruption, on the other hand, is described as the tendency to switch the topic or take the floor. This type of interruption is typically attributed to men, and may negatively affect interpersonal relationship between speakers.

The motivation of using nonlinguistic audio originates from privacy concerns in various real-life scenarios. Collecting truly spontaneous conversation requires recording people in unconstrained and unpredictable situations, both public and private, where there is little control over who or what might be recorded [16]. Literature indicates personal information could be leaked from our daily generated digital trace like WiFi signals [12, 11, 10]. Nonlinguistic audio hides the content of user speech, which cannot be reconstructed either and thus protect privacy to a great extent [4].

3 Data

The data we used were collected in 2016 from the first four weeks of a full-time executive MBA program for mid-career professionals. With a rigorous admission criteria, only professionals with work experience of at least eight years are considered for this program. The program pre-assigned students into teams of four or five, with each team working on multiple group assignments over the course of the term. Students typically attended classes during the day, and later joined their assigned teams for group work during afternoons, evenings, and weekends. The assignments had significant group problem-solving and discussion components. Team meetings were primarily in person and mostly conducted in English.

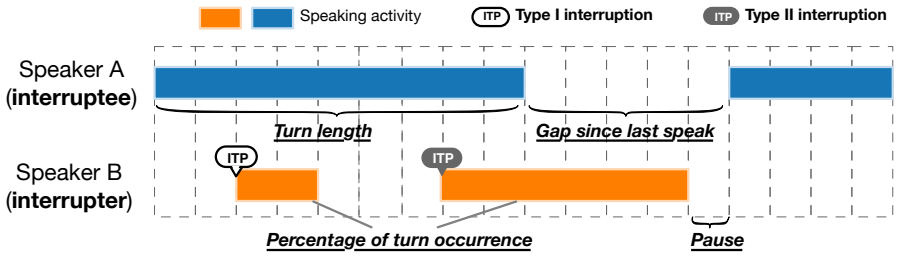


Fig. 1. Illustration of conversational features. Underlined bold text represents turn-taking features, the other bold text represents interruption features.

Each team was given a kit that included a Rhythm Badge [4] for each team member, and an Android phone loaded with the Rhythm mobile hub application. The participants were asked to use the badges in every team meeting for the duration of the study.

A total of 22 teams comprising 105 students chose to participate in the study, out of a total of 112 students in the cohort. This included 33 females and 72 males. All participants gave written consent to participate. The participants were from 35 different countries and had an average age of 37.41 $\pm$ 4.45 years (mean $\pm$ standard deviation), as well as an average work experience of 13.78 $\pm$ 4.24 years. A total of 363 meetings with a total duration of over 500 hours were recorded during the experiment.

4 Results

We apply a voice activity detection algorithm to the raw data to identify periods of speech [13]. Then, we define and extract two kinds of conversational features—turn-taking features and interruption features, as shown in Figure 1.

4.1 Turn-taking features

Turn-taking features include turn length (how long a person's turn lasts), the percentage of turn occurrence (how frequently a person speaks), pause between consecutive turns, and gap since last turn to speak, as indicated in the literature [8].

Figure 2(a) $\sim$ (d) depict the probability density functions (PDFs) of four different features. As shown in Figure 2(a), females have shorter turn length than males. According to Figure 2(b), females have larger turn-taking variations. There seem to be no significant gender difference in gap since last turn to speak and turn pauses as indicated by Figure 2(c) and (d).

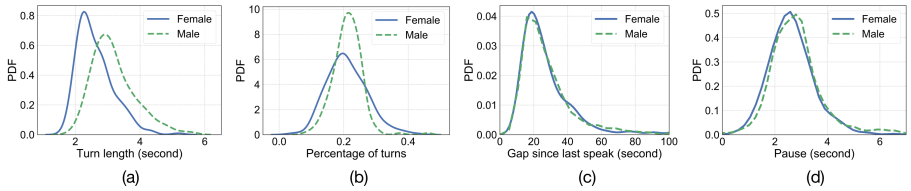


Fig. 2. Analysis of turn-taking features. (a) ∼ (d) show PDFs of different features.

4.2 Interruption features

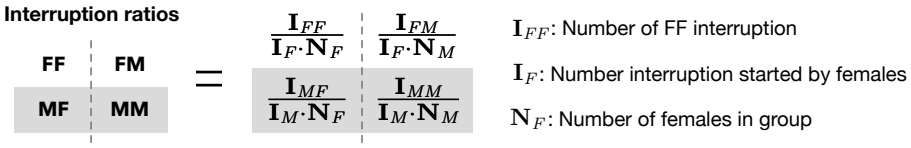
According to the literature, interruption consists of cooperative and disruptive interruption, which could reflect gender difference [14, 17]. Cooperative interruption is usually words of agreement and support or anticipation of how other peoples' sentences and thoughts would end. Disruptive interruption, on the other hand, is described as having a tendency to switch the topic or take the floor.

However, cooperative and disruptive interruption might be too complex and difficult to detect without context information. In Figure 1, we define two roles in interruption. An interrupter is a person who starts his turn before others' turns finish, while an interruptee is a person who is interrupted. We also define two types of interruption. Type I interruption is more likely to be a mixture of unsuccessful interruption and cooperative interruption, while Type II interruption is mostly successful interruption.

After analyzing the collected data, we find that generally, women interrupt men more frequently, which is contrary to most existing findings in sociology studies [19, 17].

The analysis of interruption consists of three parts: who interrupts whom, interrupter, and interruptee.

Who interrupts whom In a mixed-gender group meeting, there are four classes of interruption, namely FM (female interrupts male), MF, MM, and FF. Given the fact that the numbers of both genders are different, we calculate interruption ratios as shown in the matrix below.



The normalized interruption ratio is a normalization of each ratio over their total sum. As shown in Figure 3, we plot PDFs of four classes of interruption in three different situations. To show the relation of pairwise classes of interruption,

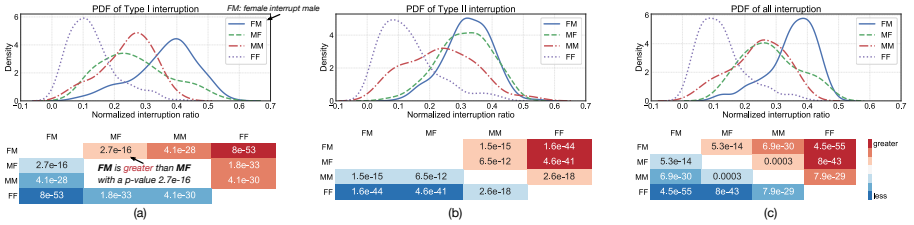


Fig. 3. Analysis of who interrupts whom with PDFs of four-class interruption and results of Mann-Whitney U test for different types of interruption. (a) Type I interruption; (b) Type II interruption; (c) Type I and Type II interruption.

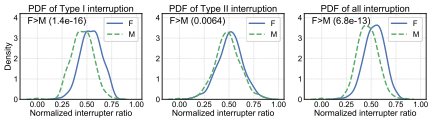


Fig. 4. Analysis of interrupter under three types of interruption.

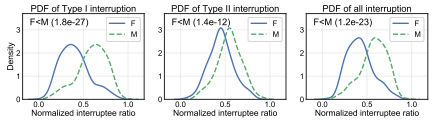


Fig. 5. Analysis of interuptee under three types of interruption.

we resort to the Mann-Whitney U test, which is a nonparametric test. The null hypothesis of the test is that it is equally likely that a randomly selected value from one sample will be less than or greater than a randomly selected value from a second sample. We derive interesting results that in different situations, the relationships between four-class interruption are also different. For all interruptions, the relationship of four-class interruption is FM > MF > MM > FF. For Type I interruptions, the relationship mostly holds, except that there is no significant difference between MF and MM. The PDFs of Type II interruption indicate that there is no significant difference in Type II interruption between females interrupting males and males interrupting females.

Interrupter The role of gender to interrupters is analyzed in Figure 4. We show PDFs of male and female interrupters under three different types of interruption. The normalized interrupter ratio is simply calculated using the percentage of male or female interrupter over all interrupters. We find that females are more likely to initiate interruptions, especially Type I interruption. This is reasonable, since a significant part of Type I interruption is cooperative interruption, which is favored by women.

Interruptee Similar to the analysis of interrupters, we also analyze interruptees. The results in Figure 5 indicate males are far more likely to be interrupted.

5 Conclusion

We analyzed the conversation patterns of same- and mixed-gender study groups from an executive MBA program and found differences in speaking styles of men and women. The results show differences in speaking styles of men and women, but do not support the concerns over participation of women in study groups discussions. The differences we found in turn-taking only partially confirm previous laboratory experiments, and differences in interruption patterns contradicted existing research.

We found that the average turn length of women is shorter than that of men (2.6 versus 3.2 seconds, respectively), as expected. However, no significant difference was found in the other turn-taking features—percentage of turn occurrence, pause between consecutive turns, and gap since last turn to speak.

Contrary to most existing findings on interruption, we found that women interrupt men more often than vice versa. One possible explanation is that a significant part of Type I interruption is cooperative interruption, which is favored by women. Alternatively, it is possible that women in this cohort may be more aggressive in this high pressure class context.

6 Acknowledgement

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