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Perception of Emotional Valence Projected by Prosody in Prefaces to Announcements of News

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Abstract

Prefaces (“I’m calling about your medical examination”) to news announcements (“They’re better than previously”) can serve important interactional functions such as preparing listeners for the emotional content of the upcoming news. We address whether, in French, listeners associate the valence of the upcoming news with a matching affective reaction depending on the prosody conveyed solely in the preface. For this, we used prefaces extracted from recordings of read voicemail-like announcements, presented in isolation (i.e., without the news). Prefaces varied in the emotional valence of the upcoming news: positive, negative, neutral. 110 participants (66 women, 42 men, 2 non-binary) were assigned to three experimental groups which varied in the pairing of two of three possible valences. They were instructed to choose among two-alternative forced-choices depending on their affective reaction. Results showed that only positive and neutral news elicited matching responses, and solely when they were contrasted with negative news. Additionally, women chose matching responses more often than men when positive and negative news were paired. No effects were found on reaction times. These findings suggest that prosodic variation within the preface leads listeners to associate the emotional valence of upcoming news with matching affective reaction.

Index Terms: prosody, anticipatory cues, emotional valence, gender, news announcement

1. Introduction

Listeners infer basic emotions from acoustic/prosodic cues [1-11]. Higher values of fundamental frequency, faster speech rate, and more energy in the high frequencies are usually associated to positive emotions like happiness. In contrast, lower f0 values, slower speech rate, and less energy in high frequencies are usually found when expressing negative emotions like sadness. It has been shown that prosodic cues to emotion in news announcements are very similar for happiness and sadness in other types of productions [12].

In news announcements, the part preceding the announcement itself is generally called “preface” [13] in Conversation Analysis and Interactional Linguistics. It is used to prepare the listener interactionally and affectively for the following sequence (the announcement), by “projecting” cues [14]. For listeners to be able to prepare, it is necessary for them to recognize the affective valence carried in the preface. In doing so, they can anticipate and produce a response that “affiliated” [15], and is appropriate and coherent with the conversational trajectory [16]. Affiliation is realized by adopting the same affective stance as the speaker, which can participate in giving an appropriate answer, thus indicating a certain preparation to

the valence of the news. This is important for both the speaker and the listener, as it facilitates the success of the interaction, a common goal to any conversation. We hypothesize that prosody in the preface can help the listener for anticipating the affective valence of the news to give an affiliative response later, which could play a role in preparation. Indeed, prosody plays a central role in carrying affect [1-11]. To explore this prosodic projection of affect, we studied prefaces that contain no lexical cues to valence, only prosodic cues. So far, few studies have tested whether prosody has a projective value, i.e., that it cues the affective valence of a following utterance.

[17] conducted a study on prosodic projection of affective speech in news announcements in Dutch. They used a production experiment to test whether prosody projects an affective valence, and a perception experiment to test whether this valence is indeed recognized by listeners. They recorded the announcements of the results of job interviews as if they were given on voicemail. The news could be positive (getting the job) or negative (not getting the job). Pitch-related data (f0 average, standard-deviation, maximum and minimum), energy-related values (average, standard-deviation, maximum and minimum of rms), and temporal measures (overall duration and speaking rate) in prefaces were analyzed according to valence of the news. The prefaces were then used in a rating task, where participants had to listen to those and decide whether they expected a positive or a negative news announcement after. Valence was recognized correctly above chance level in both cases. However, this does not consider what a more interactional setting could have done on participants’ responses, especially regarding anticipation, affiliation, and interactional preparation.

Gender differences in the perception of prosody have been shown in previous studies [18-21]. Particularly, [18] and [19] studied the perception of emotional speech depending on gender in German. The first study analyzed how written positive or negative words were cognitively treated depending on the affective prosody heard in a preceding utterance. When the valences of the preceding utterance and of the target word were aligned, women displayed faster recognition of the word than men. This supports the idea that women rely more on affective prosody than men, making faster use of its cues. In this paper, we investigated the role of affective prosody for cueing listeners to anticipate the valence of news and associate it with a corresponding affective reaction. Participants had to choose an affective reaction in a two-alternative forced-choice task after hearing a preface containing affective prosody. We measured reaction times in order to better understand the mechanisms underlying the associated preparation. We also considered the gender of listeners.

The central questions addressed by our study are the following: Are cues projected by affective prosody used by listeners to

make an association with an affective reaction? Does this anticipation differ based on gender? Building on [17]’s findings, we are expecting that listeners will again be able to infer the valence of the news from prosodic cues. Our novel hypothesis is that this capacity to anticipate the valence of the news could also help the listeners prepare themselves affectively and answer in an appropriate and affiliated manner. Thus, our expectation for this study is that listeners will choose the positive response “Ah oui” (Ah yes) more often when hearing prefaces produced before positive news, the negative response “Oh non” (Oh no) often when hearing prefaces produced before negative news, and the neutral response “J’écoute” (I’m listening) often when hearing prefaces produced before neutral news. We expect participants to be able to recognize the valence of the upcoming news, and thus to be able to associate prefaces to corresponding response type. Based on previous studies [18-21], we hypothesized that women may recognize valence more readily, both in terms of accuracy and reaction times.

2. Method

2.1. Corpus

The stimuli for our study consisted of 864 prefaces produced by 24 native French speakers. We only recorded women to reduce potential gender perception variability. Prefaces were extracted from a previously recorded corpus of news announcements read as if they were voicemails. We extracted only the preface (eg. “Je vous appelle au sujet de vos examens médicaux”, in English, “I’m calling about your medical exams”). The corpus included 12 scenarios which varied in social context (doctor calling about exams, teacher calling about a school trip). Each scenario was produced before news announcements whose content corresponded to three valences: positive (e.g. the test results are better), negative (e.g. they are worse), neutral (e.g. the room for the meeting has been moved). A previous study [22, 23] demonstrated that a range of prosodic measures in the prefaces varied systematically according to valence. These recordings were conducted at the Laboratoire Parole et Langage, in Aix-en-Provence.

2.2. Pre-experiment: Validation of affective responses

Three types of textual feedback responses were selected for the study, each matching a different affective valence: “Ah oui” (ah yes) as a positive response, “Oh non” (oh no) as a negative response, and “J’écoute” (I’m listening) as a neutral response. The association of these responses with their corresponding valences was validated prior to the experiment using an online task. 136 participants (77 women, 42 men, 3 non-binary individuals, mean age 25.8 years, SD = 4.2 years) were presented with written stimuli involving explicit textual cues to emotional valence (eg. “I have good news about your medical exams”). Participants rated the responses for appropriateness as an answer to the stimuli. “Ah oui” (94%) was significantly more used than “Oh non” (6%) when the preface was positive compared to negative [$\beta = 4.6$, SE = 0.002, $z = 1946$, $p < 0.0001$]. “J’écoute” (88%) was significantly more used than “Oh non” (18%) when the preface was negative compared to neutral [$\beta = 2.5$, SE = 0.1, $z = 6.32$, $p < 0.0001$]. “J’écoute” (69%) was significantly more used than “Ah oui” (31%) when the preface was neutral compared to positive [$\beta = 0.8$, SE = 0.1, $z = 13.24$, $p < 0.0001$]. These responses were presented as

feedback response choices for the participants in the main study.

2.3. Materials and procedure

The main study used a two-alternative forced-choice task, wherein participants listened to prefaces and then choose between two response options. They were asked to choose a response based on their own affective reaction, specifically, they were instructed choose a response according to their “emotional reaction” to the preface, ignoring how they might actually answer out loud. Response choices always included two of the three responses assessed in the validation study. Participants in Group 1 were presented prefaces to positive and negative news, with the response options “Ah oui” and “J’écoute”. Participants in Group 2 were presented with negative and neutral prefaces, with response options “Oh non” and “J’écoute”. Participants in Group 3 were presented with positive and neutral prefaces, with response options “Ah oui” and “Oh non”. Figure 1 shows the progression of each trial with the response options for Group 1.

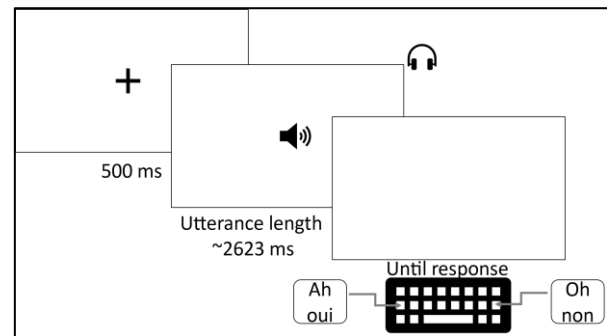


Figure 1: Experiment design with response, Group 1.

E-Prime 3.0 [24] was used for stimulus presentation as well as to capture responses and reaction times. Participants heard a total 24 stimuli: 12 scenarios proposed once in each of 2 valences. Each experimental group was divided into two lists, and each list was composed of two blocks. In block 1, the 12 first stimuli are presented in random order, six in one valence, and six in the other. In Block 2, each scenario was presented in a valence different from that of Block 1. The blocks’ order of presentation varies depending on the list.

2.4. Participants

110 French listeners (mean age = 20.8 y.o., SD = 2.5) were recruited for the main study: 66 women, 42 men, 2 non-binary individuals. Non-binary participants were excluded due to a lack of sufficient group size. 38 participants were assigned to Group 1, 36 to Group 2 and 36 to Group 3. Each group included 22 women and 14 men. Participants provided written consent and were compensated with 10 euros. The local ethics committee at Aix-Marseille University approved the study (reference: 2021-01-07-02).

3. Results

Following the recommendations of [25], a total of 6% (54/912 obs.) of the observations in Group 1, 1% (9/864 obs.) in Group 2, and 1% (5/864 obs.) in Group 3 were trimmed. We realized

two sets of analyses, one for accuracy, the other for reaction times.

3.1. Categorical measures

The first set of analyses assessed whether valence and gender influenced response choice (Figure 2). We ran logit models based on binomial distributions. The models tested the effect of valence and gender on responses. Valence by listener was included as random slope after backward elimination based on likelihood-ratio tests and AIC values [26]. After a *relevel* to observe the condition positive vs. neutral, only p-values smaller than 0.025 were treated as significant ($p = 0.05/2$).

In Group 1, women choose "Ah oui" significantly more often for prefaces where the valence of the news is positive (59%) compared to when it is negative (42%) [$\beta = 0.71$, $SE = 0.2$, $z = 3.55$, $p < 0.01$]. On the other hand, men do not choose "Ah oui" significantly more often whether the preface precedes positive (67%) or negative news (62%) [$\beta = 0.21$, $SE = 0.26$, $z = 3.81$, $p = 0.8$]. Men seem to be less inclined to select a matching response when they hear prefaces to negative news and match their response more often for prefaces to positive news. Consequently, when the preface preceded negative news, women (59%) answered "Ah oui" significantly less than men (67%) [$\beta = -0.9$, $SE = 0.33$, $z = -2.74$, $p < 0.05$]. On the other hand, when it preceded positive news, we find no difference between the two genders [$\beta = -0.39$, $SE = 0.28$, $z = -1.42$, $p = 0.4$].

In Group 2, the proportion of "J'écoute" choices does not vary significantly between prefaces to negative and neutral news, whether the listeners are women [$\beta = 0.27$, $SE = 0.19$, $z = 1.4$, $p = 0.4$] or men [$\beta = 0.08$, $SE = 0.25$, $z = 0.33$, $p = 0.9$]. We also did not find significant differences within the same valence between women and men, for prefaces to negative news [$\beta = -0.36$, $SE = 0.29$, $z = -1.22$, $p = 0.6$], and to neutral news [$\beta = -0.17$, $SE = 0.26$, $z = -0.66$, $p = 0.9$].

In Group 3, the proportion of "Ah oui" choices does not vary significantly between prefaces to positive and neutral news, whether the listeners are women [$\beta = -0.23$, $SE = 0.18$, $z = -$

1.32 , $p = 0.5$] or men [$\beta = -0.02$, $SE = 0.22$, $z = -0.11$, $p = 0.9$]. We did not find significant differences within the same valence between women and men, for prefaces to positive news [$\beta = 0.01$, $SE = 0.23$, $z = 0.08$, $p = 0.9$], and for prefaces to neutral news [$\beta = 0.23$, $SE = 0.24$, $z = 0.94$, $p = 0.7$].

3.2. Reaction times

The second row of analysis was done to analyze the effects of congruence, valence, and gender on reaction time. We ran LMER models. The models tested the effect on reaction time of valence, congruence (ie., when the response chosen matches the valence of the news) and gender. Listener, item, and voice were included as random intercepts after backward elimination. We used the *emmeans* function of R [27] to do pairwise comparisons instead of a simple *relevel* due to the quantity of contrasts to account for. In group 1, 2 and 3, the analyses revealed no significant differences between conditions: The p-value is always above the significance threshold [$p > 0.05$]. This means that reaction time is not affected by any of the above-mentioned factors.

4. Discussion

The goal of this study was to investigate whether listeners are able to detect prosodic cues to valence in prefaces, and then associate that valence with a matching response, thus displaying a tendency towards affiliation with the valence of the upcoming news.

The principal result concerns the effect of valence and gender on the choice of response. We found in Group 1 that women answered more often the positive matching answer when hearing prefaces to positive news than when it was prefaces to negative news. This result was not found for men as they did not choose "Ah oui" significantly more often for prefaces to positive news than for prefaces to negative news. Rather, they seem to have generally preferred "Ah oui" to the point that they used it significantly more often for prefaces to negative news than women. It could be that men tend to prefer more neutral responses that let the speaker continue without having to

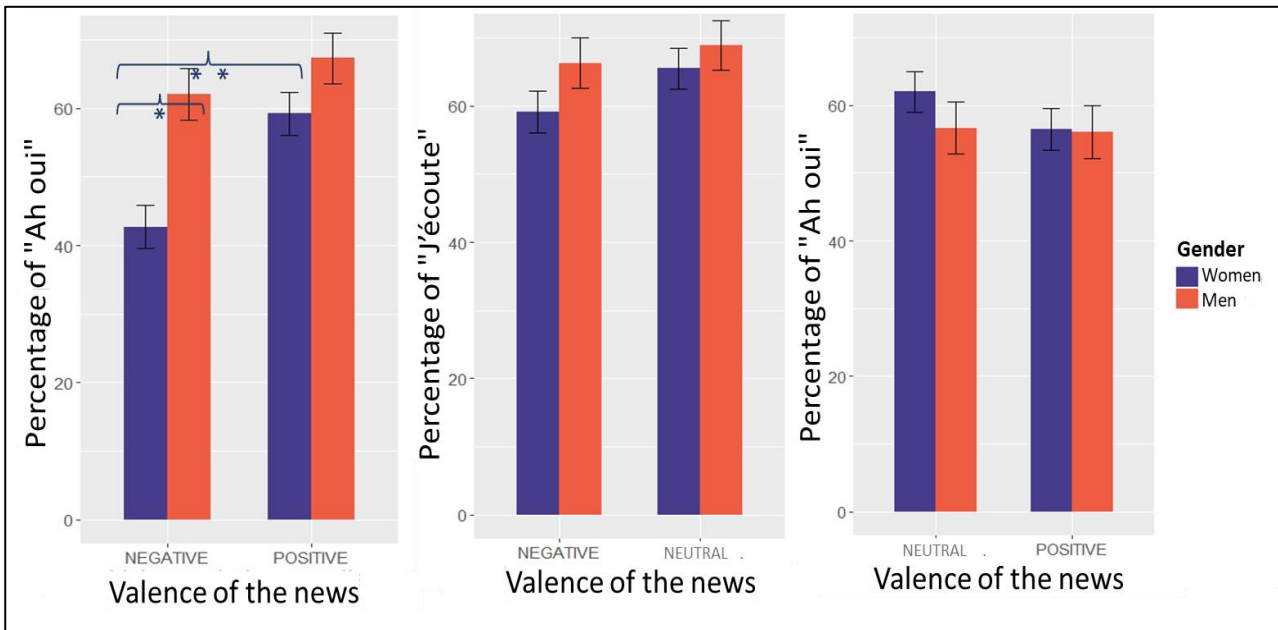


Figure 2: Response percentage depending on valence and gender

respond in terms of affect: i.e., without affiliation. These results are consistent with our hypotheses and with literature on gender and affective prosody perception [18, 19]. Our results thus corroborate the finding that women are more prone to using cues of affective valence shared through prosody than men are. We might also interpret these results as women being more likely to affiliate with the valence of news.

The fact that the positive response “Ah oui” was often matched with the preface to positive news is coherent with our expectations and with literature showing that affects such as happiness, which we link to positive valence of news here, are usually well recognized by listeners. However, it is surprising that the negative valence response “Oh non”, which we link to sadness, was not often associated with prefates to negative news, and this was even more so for men. Indeed, sadness is usually not confused with happiness [11]. Moreover, we see that when opposed with prefates to neutral news, listeners do not show significant differences between prefates to negative or neutral news, or to positive or neutral news. This shows that prefates to negative and positive news are more readily recognized when opposed against each other. This is consistent with findings from our own production study [22, 23], where prefates to positive news and to negative news displayed very contrasted acoustic cues between each other. A possible explanation for the fact that prefates to negative news elicit fewer matching responses than prefates to positive news could be that prosodic cues to valence of prefates to negative news are simply less easily recognized. However, this explanation would be surprising considering the distinctive prosodic cues in prefates to positive vs. negative news.

An alternative explanation is that participants might have misunderstood the instructions and answered depending not only on their emotional reaction but also on what they would answer out loud as feedback. If they did so, additional rules of interaction might have come into play: preference [28, 29] and facework [30-32]. Preference is the fact that a speaker has answers that they would prefer to hear on the part of their interlocutor, who will generally try to answer the closer they can to a preferred response. A preferred response will always be to at least, have a response rather than none, and the even more preferred response would be a positive one (here, “Ah oui” rather than “Oh non”). Facework, and specifically the protection of face, is the idea that interactants in a conversation both try to protect their own face, meaning the way they are viewed by society, and the other person's face. In our context, answering the negative response “Oh non” could be considered as non-preferred even for a preface to negative news, despite being an affiliative response. Indeed, it could render even more difficult the task of announcing, making it seem as if the listener does not want to be told the negative news. In consequence, using this response could also be considered face threatening for interactants, thus avoided. This reasoning could then explain the observable greater use of “J'écoute”, the neutral answer, for prefates to negative news in Group 2. If preference and face need to be considered, it is possible that those two are treated differently depending on the gender of the listener. This could also have influenced the differences that we found. Indeed, literature has shown that when using feedbacks in conversation, men tend to stay more neutral or show disaffiliation [33] more often than women who stay more affiliative [34], which is coherent with our findings.

Lastly, the results of the reaction time analysis revealed no significant differences. It seems that neither valence, nor gender, nor congruence, had an influence on reaction time. This

goes against our expectations, as we hypothesized that women would be faster than men, and that congruent answers would be made faster than incongruent ones. It also goes against the results of [18, 19] where women not only made more use of prosodic cues to affect than men, but they also used them faster. A potential explanation for this finding could be that we are overlooking important factors which we should consider, such as the empathy level of participants.

5. Conclusions

Our study focused on the capacity of a listener to associate a preface carrying a certain affective valence in its prosody, with a response whose affective valence matches the news's. Our aim was to verify that participants associated “Ah oui” with a preface to positive news, “Oh non” with a preface to negative news, and “J'écoute” with a preface to neutral news, thus displaying affiliation with the valence of the news just using prosodic cues to this valence. We found that the valence carried by prosody in prefates did make a difference in the responses. The clearer results were found when opposing negative and positive valences, and negative with neutral. Gender had an impact on responses but not on reaction times. In the future, it would be interesting to complement this study with psychophysiological measures. This could help to have a better idea of the online affective reaction of listeners, and thus assess how they emotionally prepare to the affective valence of the news.

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