"Is it ok if I laugh now?”: Laughter and gaze coordination in interaction

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Keywords: laughter, gaze, pragmatic function, alignment.

Through analysis of a multimodal corpus of dyadic taste-testing interactions, we show that laughs performing distinct pragmatic functions are accompanied by different patterns of gaze at one's dialogue partner. We also demonstrate that gaze contributes to the synchronisation and alignment of laughter production, analogously to turn-taking in speech. Furthermore, our study provides empirical evidence to the debate about gaze aversion, opposing the view that social stress is the main explanatory factor.

Introduction

Our work is rooted in the view that communication in interaction involves multiple modes and channels outside of speech, capable of conveying meaning (Bavelas & Chovil, 2000; Streeck et al., 2011). Laughter and gaze are two of these embodied meaning-making elements that are pervasive in our interactions, and a deeper understanding of these can provide opportunities for new theoretical, empirical, and methodological insights (Bell & Davison, 2013). Both laughter and gaze have been subject to in-depth independent analyses and their role in managing and coordinating interaction is not in doubt. While there is some work on the interaction of smiles, laughter, and gaze in relation to humour (Gironzetti, 2016, 2017; Brône, 2020), less is known about laughter and gaze when related to social incongruity rather than humour. In the current work we address the following questions:

1. Do laughs with different pragmatic functions relate to different patterns of gaze?
2. Does gaze towards a partner play a significant role in laughter coordination and alignment?

Methods

Our data consist of 23 min taken from three dyadic interactions from the Good Housekeeping Institute Corpus (Somashekarappa et al., 2020). The corpus contains video and audio-recordings of participants discussing and rating different kinds of hummus on a questionnaire. We annotated laughter and gaze using the software ELAN.

- Laughter Annotation

Laughter was annotated following Mazzocconi et al.'s (2020) framework. Here we focus on two of the annotated features: (1) type of incongruity of the laughable, (2) laughter positioning in relation to partner's laughter.

- Laughable classification

By laughable we mean the argument the laughter predicates about, which can be constituted by an utterance or an event. Here we consider the two most frequent classes of laughables across contexts and languages (Mazzocconi et al., 2020):

1. *Pleasant incongruity* is a clash between the laughable and certain background information perceived as witty, rewarding and/or somehow pleasant. Common examples are jokes, goofy behaviour and conversational humour.
2. *Social incongruity* is a clash between social norms and/or comfort and the laughable. Examples include social discomfort (e.g. embarrassment or awkwardness), violation of social norms (e.g., invasion of another's space, asking a favour), or an utterance that clashes with the interlocutor's expectations concerning one's behaviour (e.g., criticism).

We analysed 74 laughs (40--pleasant incongruity, 34--social incongruity). Inter-annotator agreement between two coders over 60% of the data was 82% (Krippendorff's α=0.69).

- Laughter positioning in relation to other's laughter

We distinguish 3 classes:

1. *Isolated laughter*: Laugh not preceded by and not having the same onset as another laughter;
2. *Antiphonal laughter*: Laugh starting during a laugh from the partner or within one second after its offset;
3. *Coactive laughter*: Laugh with the same onset-time as a laughter from the interlocutor.

- Gaze Annotation

We followed the gaze annotation protocol presented in Somashekarappa et al. (2020). Here we explore only gaze at the partner, leaving a more fine-grained analysis of gaze reciprocity and joint attention on objects for future work.

- Data extraction

We made use of the ELAN Analysis Companion (EAC) software (Andersson & Sandgren, 2016) to conduct event-related analysis. Our dependent variable is gaze at the partner. As predictors we used i) laughable type (pleasant/social incongruity), or ii) laughter position (isolated/antiphonal/coactive). We considered a time window of 3000ms centred on the laughter onset (i.e. 1500ms before/after the laughter onset). We selected 10ms resolution, using a "first come first served" overlap handling and binned the data at intervals of 100ms, rounding up any fractions to 1. For each model reported below, we ran a mixed-effect logistic regression in R, using the *glmer* function from the *lme4* package, with subjects as random factor. Gaze at the partner was treated as a dichotomous variable (present/not

present) for each bin of the time window of interest. We considered laughable type or laughter position as categorical predictors, as well as time, contrasting the time-window following the laugh onset to the time-window preceding it.

Results

- Laughable Type

Fig. 1 shows the probability of the laugher gazing at their partner around the onset of their own laugh depending on whether the laughter is related to a pleasant or a social incongruity. We observe main effects of both incongruity type (CE=−0.81, SE=0.22, z=−3.56, p<.001) and time (CE=−0.70, SE=0.20, z=−3.51, p<.001), and a significant interaction between the two factors (CE=1.60, SE=0.30, z=5.31, p<.001). The laugher is more likely to gaze at their partner before the laughter onset when laughter is related to a pleasant incongruity. The opposite is true after the laughter onset, when they are more likely to gaze at their partner if the laughter is related to a social incongruity.
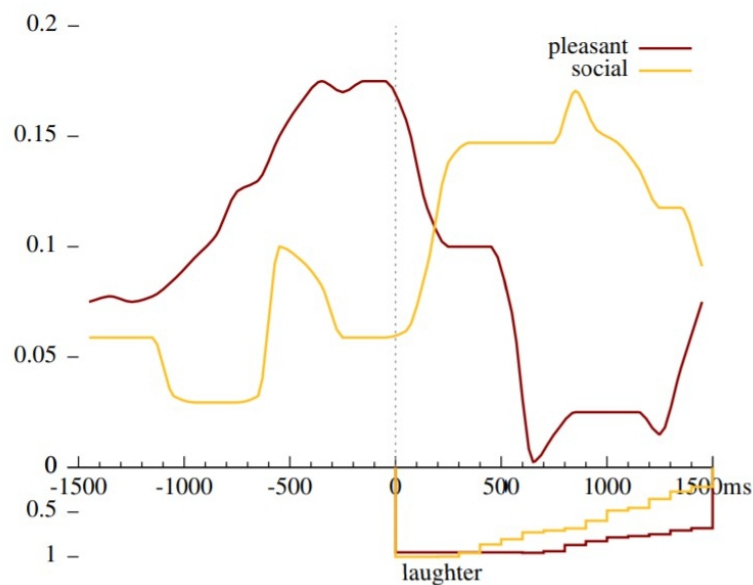

Figure 1. Probability of laugher's gaze at partner around laughter onset according to incongruity type. The probability of laughter duration is shown at the bottom of the figure.

- Laughter positioning

Fig. 2 shows the probability of the partner looking at the laugher at the laughter onset depending on whether the laugh produced was an isolated, an antiphonal, or a coactive one. We observed significant main effects for all the predictors included in the model (time: CE=−0.69, SE=0.31, z=−2.28, p=.02), but no significant interactions. Gaze from the partner is significantly more likely to occur around the onset of an antiphonal laughter than an isolated one (CE=1.06, SE=0.26, z=3.81, p<.001), and even more likely around the onset of a coactive laughter (CE=2.22, SE=0.29, z=7.53, p<.001).
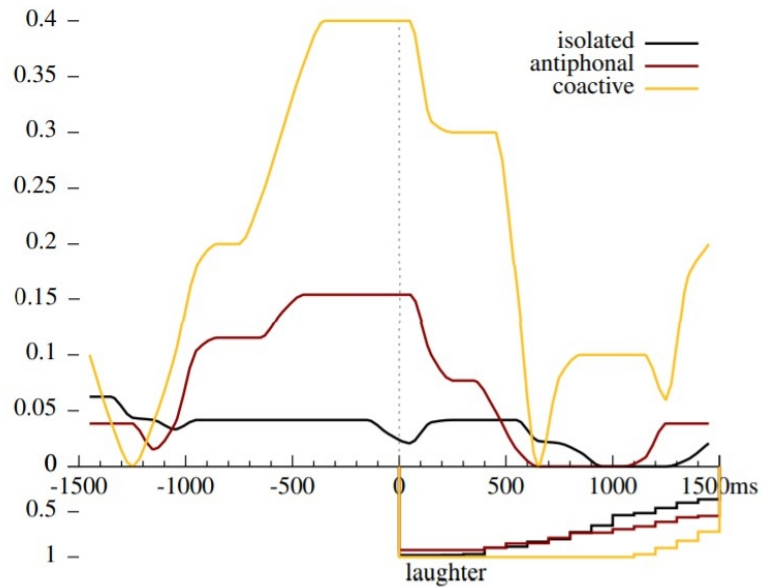
Figure 2. Probability of partner's gaze at laugher around laughter onset according to laughter positioning. The probability of laughter duration is shown at the bottom of the figure.

Discussion

We showed that laughter performing different pragmatic functions is characterised by different accompanying patterns of gaze. These observations confirm that both laughter and gaze play a crucial pragmatic role in the unfolding of the dialogue, and also validate the laughter taxonomy proposed in Mazzocconi et al. (2020) showing that the different laughter classes are produced and perceived as performing distinct pragmatic functions, eliciting different multimodal behaviours from interactants. The laugher is more likely to gaze at their partner while producing a laughter related to social rather than pleasant incongruity. We believe that this can be explained on the basis of the pragmatic function performed by the laughter. It seems reasonable that the need to check one's partner's reaction is more compelling when the laugher is facing a potentially uncomfortable situation rather than a pleasant/amusing one.

Our data do not support the hypothesis that gaze aversion is more related to social stress (Schneier et al., 2011), in which case we would have expected the opposite pattern to the observed one. Gaze is also known to be a cue for turn-taking and backchanneling (Bavelas et al., 2002). We observed at the onset of antiphonal and coactive laughter the partner is more likely to be already looking at the laugher. This highlights the important role of gaze in the fine synchronisation of non-verbal emotional vocalisation production, as for speech. Our results have to be taken cautiously given our limited sample size. We intend to extend our analysis and to explore gaze patterns related to other aspects of the laughs produced (e.g. arousal, positioning in relation to the laughable etc.) in more detail.

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