Smiling, gaze, and humor in conversation

A pilot study

Elisa Gironzetti, Salvatore Attardo and Lucy Pickering
Texas A&M University – Commerce, Applied Linguistics Laboratory

This paper presents a pilot study, which is part of a larger research project intended to shed light on the role of smiling as a marker of humor in naturalistic conversation. Building on previous research (Attardo, Pickering, and Baker 2011; Calvo, Fernández-Martín, and Nummenmaa 2013; Calvo, Gutiérrez-García, Avero, and Lundqvist 2013; Heerey and Crossley 2013), a mixed methods approach was adopted to collect qualitative and quantitative data in order to determine if there is a relationship between gaze patterns, humorous events, and the smiling behavior of native English speakers taking part in a dyadic face-to-face conversation. Preliminary results show that occurrence of humor and increased participants' attention to the mouth and eyes areas of the interlocutor's face tend to co-occur.

Keywords: smiling, humor markers, eye-tracking, gaze, discourse analysis

1. Introduction

The pilot study presented here is part of a larger research project on humor in conversation carried out at the Applied Linguistics Laboratory at Texas A&M University – Commerce. As part of this project, we are creating and analyzing a multimodal corpus consisting of video and audio-recorded interactions among dyads of native speakers of English, Spanish, and Chinese. Moreover, eye-tracking data are also being collected for each participant using two portable, non-intrusive eye-trackers. This unique setting takes advantage of the possibilities offered by social eye-tracking combined with discourse analysis in order to shed light on the relationship between gaze patterns, humorous events, and smiling behavior in dyads of conversational partners.

The goal of this pilot study is to begin to explore the complexities of a social and interactional paradigm for eye-tracking studies involving dyadic face-to-face

DOI 10.1075/ivitra.14.12gir

interaction, and the relationship between humor, gaze patterns, and smiling among participants in dyadic humorous conversations, which will allow for further research on the role of smiling as a humor marker (Attardo, Pickering, Lomotey, and Menjo 2013).

Previous studies have shown that an increase in smiling intensity in relation to the baseline of the conversation co-occurs with the presence of humor; conversational partners display very different smiling gestures, reciprocating each other smiles (Wild, Erb, Eyb, Barthels, and Grodd 2003; Hess and Bourgeois 2010), and matching each other smiling intensity (Heerey and Crossley 2013; Gironzetti and Menjo 2014). We hypothesized that, in order for these behaviors to occur, participants were paying greater attention to the facial areas involved in this behavior, namely the mouth and the eyes area (Ekman and Friesen 1978). This hypothesis has been tested in the present study by implementing a social eye-tracking study of humor in conversation and analyzing the length and number of eye fixations on the facial regions of the mouth and eyes.

2. Humor in interaction

The field of humor in interaction has been widely researched from several different approaches, primarily discourse analysis and psychology. However, the current study is situated in neither properly speaking. Researchers have focused mostly on the functions of humor in conversation (see, Attardo, in press, for a review of the literature on the discourse analysis of humor), and on the responses to humor in conversation (see, for example, Kotthoff 2003; Eisterhold, Attardo, and Boxer 2006). The research focus on conversations derived from the seminal work of Sacks (1974), in which the author analyzed the telling of a canned joke among a group of young friends, and recognized three kinds of responses to humor: silence, laughter, and delayed laughter. Many scholars followed the work of Sacks and focused their research on laughter as a behavior co-occurring with humor (see Schegloff 1977, on multi-party laughter; Jefferson 1979, and O'Donnell-Trujillo and Adams 1983, on laughter as a cue on the humorous intention of the speaker). Norrick (1993) even claimed that humor and laughter form an adjacency pair. De facto, and usually without theoretical discussion, (but see Attardo 2015, for some exceptions) the assumption that most researches make in conversation and discourse analysis of humor is that laughter can be used as a marker indicating the presence of humor in conversation.

However, using laughter as a marker for humor in conversation is problematic because laughter can occur with and without humor, and humor in conversation can occur with and without laughter. Therefore, the presence or absence of laughter potentially tells us nothing about the presence or absence of humor (Attardo 1994).

Recently, the research on humor markers has been broadened to multimodality and particularly prosody. Various theories of the prosody of humor predicted that speakers would mark humor with high pitch and volume, extensive pauses, and marked speech rate. Research on prosodic markers of humor (Pickering, Corduas, Eisterhold, Seifried, Eggleston, and Attardo 2009; Attardo and Pickering 2011; Attardo, Pickering, and Baker 2011; Attardo, Wagner and Urios-Aparisi, 2011), found that, contrary to expectations, speakers do not mark humor in conversation or in experimental situations by means of volume, pitch, pauses, or speech rate. The only markers that occurred in non-insignificant numbers were smiling and laughter. However, as mentioned above, neither is a reliable marker of humor. Moreover, whereas laughter has been the subject of significant study within linguistics (see Chafe 2007), smiling has been largely ignored. It is not even clear whether smiling is an attenuated form of laughter or a different phenomenon. Therefore, a research program was developed to investigate the hypothesis that smiling may be a good candidate to mark the presence of humor in conversation (Attardo et al. 2013).

Smiling has been researched primarily within psychology, by applying the standard method for analyzing facial expressions, Ekman and Friesen's Facial Action Coding System (FACS, 1978). Ekman's FACS was developed based on facial muscular activity, categorized in 44 different Action Units (AUs), which are described as anatomically separated and visually distinguishable muscle movements that combine to produce different facial expressions. Furthermore, each action unit is given a laterality score (bilateral, unilateral, and asymmetrical), and an intensity score on a five-point scale (1–5).

Studies that apply FACS to investigate smiling focus mostly on identifying the type of smile being displayed in pictures and videos (sincere or non-sincere, also known as Duchenne or non-Duchenne smile), and using FACS-derived smiling scales (see Harker and Keltner 2001) to predict certain aspects of the life of the subjects based on their smiling in previous pictures and videos. For example, Hertenstein, Hansel, Butts, and Hile (2009) analyze whether smiling intensity in photographs can predict divorce; Oveis, Gruber, Keltner, Stamper, and Boyce (2009) study smiling intensity in photographs as an indicator of affective style in children and their families; and Seder and Oishi (2012) explore the relation between smiling intensity on a Facebook picture and future life satisfaction.

Harker and Keltner's FACS-derived scale, however, due to its additive nature, fails to integrate in a meaningful way the intensity scores of two different AUs (AU12 and AU6) and does not provide an overall smiling intensity score. Given these limitations, we opted for developing a new holistic five-point Likert-like scale based on FACS by modifying and enhancing existing five-point scales in use in the research literature (Harker and Keltner 2001; Seder and Oishi 2012). The new Smiling Intensity Scale (see Appendix A) integrates the muscular movement of different AUs that may be involved in smiling without aiming at differentiating between Duchenne and non-Duchenne smiles, and allows researchers to score the overall smiling intensity of a person based on video recording or static images. The five levels of this Smiling Intensity Scale are descriptive of different smiling behaviors that go from Level 0 (neutral, non-smiling facial expression), to Level 4 (laughing smile). This scale is externally valid since it is based on the FACS standard for coding facial expressions, and was tested for internal validity with three raters that reached good inter-rater reliability (Cohen Kappa = 0.89). The SIS is currently being used to code for smiling intensity for each participant in the dyadic conversations of our corpus.

Despite the numerous studies on smiling, its role in relation to the presence of humor has been neglected until very recently (Attardo et al. 2013; Gironzetti and Menjo 2014). Our study situates itself at the interaction of the fields of research on humor markers and smiling behavior. In line with previous work on humor in conversation, we assume that conversational humor may be marked and, given that smiling tends to co-occur with humor (Attardo et al. 2013), we applied eye-tracking technology to explore whether conversational partners attend more to the smiling behavior of their interlocutor during humorous segments of conversation than non-humorous ones.

More generally speaking, the focus on the pragmatic markers of humorous intention (metapragmatic markers, see Ajmer and Simon-Vandenbergen 2011 for discussion) is part of a trend of work looking at applying the General Theory of Verbal Humor (Attardo and Raskin 1991) in discursive contexts. There have been proposals (Canestrari 2010; Tsakona 2013) that seek to expand the General Theory by introducing other knowledge resources that account for various contextual aspects of the text. In this context and elsewhere (Attardo forth.), we have preferred an approach that treats the GTVH as a theory of competence and we develop a separate (but not entirely independent) theory of performance, on the basis of corpus data.

3. Eye-tracking in interaction

The application of eye-tracking methodology to social settings is a novel (Clark and Gergle 2011; Rosegrant, Hearrington, Alvarado, and Keeble 2012; Broz, Lehmann, Nehaniv, and Dautenhahn 2012; Ye, Li, Fathi, Han, Rozga, Abowd, and Rehg 2012) extension of eye-tracking research allowed by the availability of wearable and portable eye-trackers, in contrast with the traditional eye-tracking equipment that required participants to have their head strapped in the machine (Duchowski 2007). New head-free eye-trackers have enabled the broadening of eye-tracking methodology to social situations, allowing researchers to study multiple participants' interactions as they occur naturally (Hayhoe and Ballard 2005).

In the last few years, social eye-tracking studies have begun to attract a lot of interest within the field of interactional discourse studies (see, for example, Brône and Oben 2015) and ecological psychology (see, for example, Paxton and Dale 2013). Two significant studies in this field, that implemented a social eye-tracking paradigm, are Rosegrant et al. (2012) and Broz et al. (2012). In the first study, Rosegrant et al. (2012) used wearable eye-tracking glasses to investigate students' attention during a lecture, while in the second Broz et al. (2012) focused on mutual gaze during face to face conversations.

With the exception of the few recent studies such as Rosegrant et al. (2012) and Broz et al. (2012), there is a lack of research within a truly social eye-tracking paradigm. The majority of research has focused on human-computer interactions, with subjects watching a video where social interactions occur, or with subjects directly interacting with a robot (Yu, Scheutz, and Schermerhorn 2010). Interactions among people have received limited attention, and have been studied mostly by recording the participants' gaze using a video camera (Kendon 1967; Williams, Burns, and Harmon 2009), eye-tracking just one participant in a face-to-face conversation (Vertegaal, Slagter, van der Veer, and Nijholt 2001; Gullberg and Holmqvist 2006), or having participants interact through a computer-mediated device, such as video-conferencing (Barisic, Timmermans, Pfeiffer, Gary, Vogeley, and Schilbach 2013; Raidt, Bailly, and Elisei 2007).

Within this semi-social eye-tracking paradigm, researchers have focused on the different functions of mutual gaze (when two people look at each other's face) and eye contact (when two people look at each other's eyes) among conversational partners. Results indicate that these two gaze behaviors are used for signaling the intention or willingness to start an interaction (Cary 1978), turn-taking regulation (Beattie 1978), as well as indicating higher levels of attraction, attention and familiarity (Kleinke 1986). In addition, factors such as age, gender, familiarity, conversational role (speaker or listener), type of utterances, and cultural background have been proved to have a strong influence on visual behavior of participants in a conversation (Anolli and Lambiase 1990; Kendon 1967; Knackstedt and Kleinke 1991; Levine and Sutton-Smith 1973). While all these studies provide useful insight into human gaze patterns, they failed to represent gaze behavior in naturalistic social situations where people interact with each other face to face.

Finally, eye-tracking studies of facial expressions, although providing useful insight into how people perceive other people's faces and expressions, investigate visual attention patterns for faces in general, thus focusing only marginally on smiling (see, for example, Calvo et al. 2013; Fernández-Martín et al. 2013; Fernández-Martín and Calvo 2012). Moreover, these studies prefer to use static images of faces, often manipulated by the researchers to combine parts of the face expressing different emotions. No such study has been carried out investigating dynamic visual patterns for faces in real-time face-to-face interaction between participants.

The pilot study that we are presenting here combines the recent technology advances in portable eye-tracking within the recent field of social eye-tracking to explore the role of smiling in face to face conversations involving humorous events. In particular, we will investigate whether participants pay more attention to smiling facial areas (the mouth and the eyes) when humor is present than when there is no humor. We also intend to explore if and how mutual gaze and eye contact behavior are influenced by the presence of humor in conversation, thus contributing to the development of this growing research field.

4. Eye-tracking and humor in conversation

As part of the aforementioned larger study on humor and smiling in interaction, video, audio, and eye-tracking data were collected from pairs of conversational partners whose native language was American English, Mexican Spanish, and Mandarin Chinese. The description of the research method, instrument, participants, and data collection presented in the following sections applies to the research project at large. However, in the Data analysis and Results section we will be referring specifically to the interaction of two native English participants in a dyadic face-to-face conversation, which is the object of this pilot study. The data from this conversation have been analyzed to establish a baseline of gaze synchronicity and begin to investigate the relationship between gaze patterns and the presence of humor. Further analysis of the remaining conversations and cross-cultural comparisons will follow at a later stage in the research project.

4.1 Method

The study followed a mixed method approach and a concurrent triangulation design (Creswell and Plano Clark 2011). Quantitative and qualitative data were collected, analyzed and coded separately, and finally combined in order to answer the research question: is there a relationship between gaze patterns, humorous events, and the smiling behavior of participants in a dyadic face-to-face conversation?

Qualitative data comprise a transcription of the whole interaction, humor identification and coding (Attardo 2001, 2012), and a seven-item closed-response demographic questionnaire addressing the participants' age, education background, nationality, mother tongue, foreign languages, and level of familiarity with each other. Quantitative data used include eye-tracking data relative to fixations on two Areas of Interest, mouth and eyes, involved in the smiling behavior. Because only one conversation of the corpus has been analyzed so far, no statistical inferences are presented.

4.1.1 *Eye-tracking set-up*

Given the novelty of the research method adopted for this study, we describe in some detail the set-up of the eye-tracking lab. A picture of the instrument is included below.

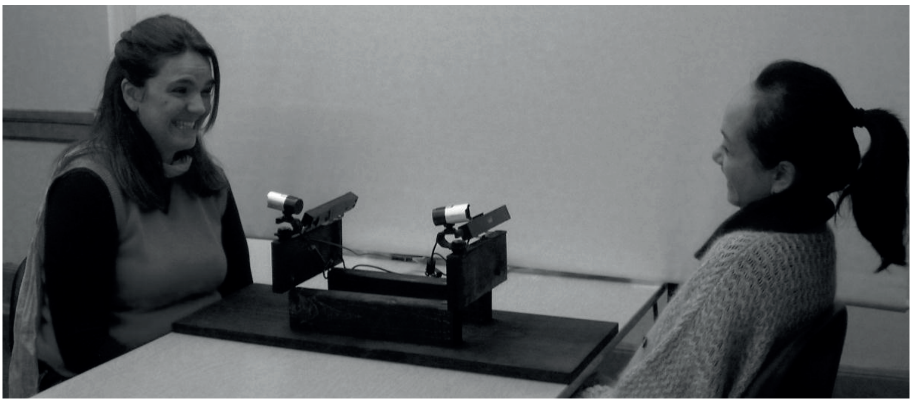


Figure 1. The social eye-tracking lab set-up at Texas A&M University – Commerce

As shown in Figure 1, a custom-made support was built to host the two eye-trackers and cameras. The support was designed to integrate the eye-trackers and cameras and make them as non-intrusive as possible for the participants, so as not to disrupt the natural flow of the conversation or interfere with participant's natural eye movements.

The height of the support and the relative vertical position of the video camera and eye tracker were kept as low as possible in order not to obstruct the view of the interlocutor's face, but high enough for the eye-trackers and cameras to be able to capture the participants' faces and eye movements. Moreover, the height of the support is adjustable, allowing for further modifications of the set-up. The horizontal position of the central support was determined to guarantee the correct positioning of participants in relation to the eye-trackers (about 60cm), a comfortable and natural distance between interlocutors, and also a comfortable seating position for each participant. The base of the support was positioned and fixed to the table in order to allow for comfortable seating of participants and the use of adjustable chairs. The chairs are adjustable in height to guarantee the correct positioning of different participants in relation to the eye-tracker, but with fixed wheels in order to limit the participants' movements.

4.1.2 *Participants*

Participants with good or corrected to normal vision were recruited from university students using posters on campus. Participants who agreed to participate in the study received no course credits or any other compensation, but were offered water and cookies before the actual experiment took place. All participants provided written informed consent and the institution's IRB approved the study.

4.1.3 *Data collection*

Naturalistic dyadic interaction between native speakers were recorded using two portable eye-trackers (Tobii X60), two high-definition scene cameras (Microsoft HD LifeCam Studio), two dedicated laptops (Dell Precision M4800), and one PZM microphone. The recording procedure is non-invasive and all the instruments were chosen in order not to disrupt the normal course of the conversation and allow participants to interact as freely as possible. Each conversation lasted approximately between 15 and 20 minutes. Before starting the conversation, participants were given one joke each (in their native language) to memorize and use as an ice-breaker. This allowed the researcher to collect a sample of canned humor for each conversation. Participants were instructed to start the conversation by telling their jokes and then talk to each other in their native language for about 15 minutes about whatever topic they liked. This ensured that the tone of the conversation and the interaction between the participants were as natural as possible.

Before the experiment started, participants filled in consent forms and a demographic survey. Afterwards, calibration was completed manually using a five-point calibration grid. If calibration was successful, the two participants sat facing each other at a table where two Tobii X2-60 eye-trackers, two scene cameras and

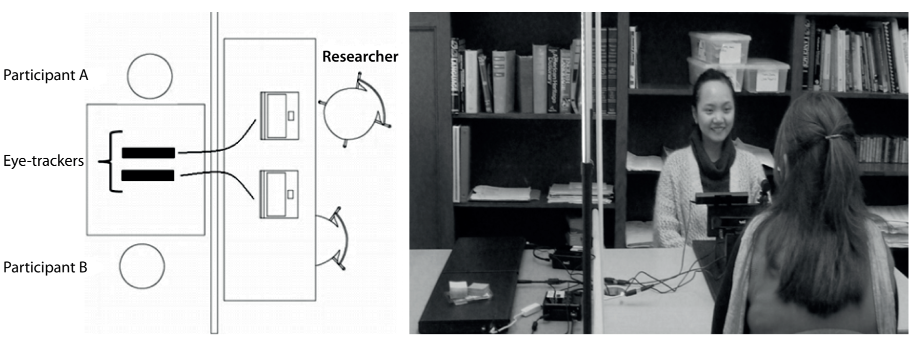


Figure 2. The eye-tracking lab at Texas A&M University – Commerce

one microphone were placed, as shown in Figure 3, and the recording started. In order to allow for data synchronization, at the beginning of the study, after the recording had started, the researcher took a picture of the participants using a camera with a flash. The flash was recorded by all the eye-trackers and scene cameras and is used as a signal to synchronize the data collected by these devices. As an additional synchronization instrument, key pressing was also recorded at the same time for both computers. After taking the picture, the researcher moved to a different area of the laboratory hidden from participants by a screen, in order not to interfere in the conversation.

Participants' number and duration of eye fixations, and pupil dilation measurements were recorded at a 60Hz sampling rate for each area of interest for the length of the conversation. Fixations, conceptualized as the pause of the eye movement on a specific area of the visual field, were filtered using an algorithm implemented in the Tobii I-VT Fixation Filter of the analysis software Tobii Studio (for more information on the algorithm, see Olsen 2012). Two Areas Of Interest were determined based on the two action units involved in producing a genuine smiling facial expression according to FACS (Ekman and Friesen 1978), AU6, which involves a contraction of the orbicularis muscle and visually results in the squinting of the eyes, and AU12, which involves the zygomaticus mayor muscle and visually results in the raising of the corner of the mouth. Two dynamic Areas of Interest were created per participant (see Figure 3), and manually adjusted for size and position in order to follow and accommodate the participants' movements and facial expressions.

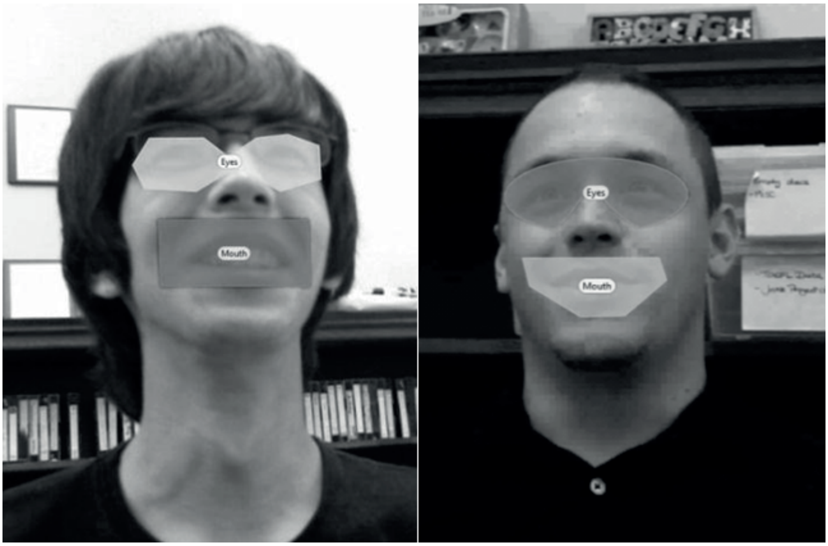


Figure 3. Mouth and eyes Areas of Interest

4.2 Pilot study

As previously mentioned, while the Method section referred to the research project at large, the Data Analysis that follows focuses on one single conversation, which was the object of the pilot study.

The conversation was transcribed according to standard American English conventions. An example of humor coding can be seen in Table 1, where the punch line is marked in bold.

Table 1. Example of transcription (punch line)

John	and the engineer takes it out and says look I'm an engineer I don't have time for a girlfriend but a talking frog **is really cool**
	long pause (< 4 seconds)
Tony	okay (laughs)
	yours is just a lot longer than mine

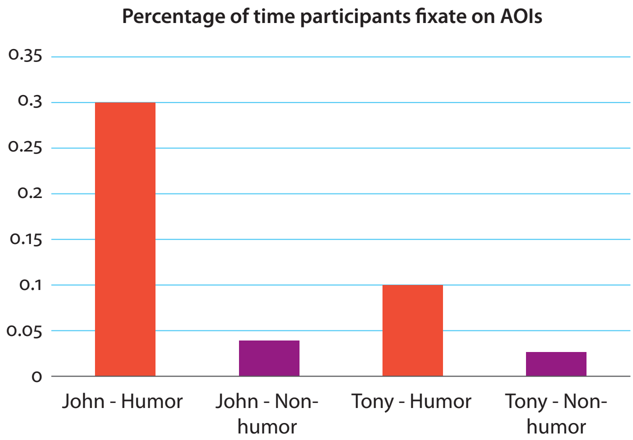
The coding of humor was performed by two independent raters following the triangulation method outlined in Attardo (2012), and relied on cues, including laughter, metalinguistic comments (*that was funny*), speaker's explicit claims (*let me tell you a joke*), and the semantic-pragmatic analysis of the text in order to determine if a humorous Script Overlap/Opposition (Raskin 1985) was present. The researcher also had also access to the participants, and asked them to comment on the conversation (using either the audio file or the transcription of the interaction) to help identify what was intended as humorous and thus include in the analysis also cases of failed humor, when present. Participants' claims were used as one clue in the triangulation process, not as the "final say" on the presence/absence of humor.

In order to allow for comparisons between humorous instances and non-humorous instances in this particular conversation, all humorous events were identified and marked for a total of sixteen humorous events including punch lines, jab lines, and irony. However, due to some missing data from one of the two participants, only six humorous events could be analyzed. For each humorous event, a five-second segment was created, starting two seconds before the event and lasting three more seconds after the event. This gave us a set of six humorous segments containing information about each participant's fixations (presence and length), for a total of approximately thirty seconds of recordings. The same procedure was used to sample six non-humorous segments of the same length. These non-humorous segments were selected randomly. The data from the two sets were then extracted and compared across participants and Areas of Interest.

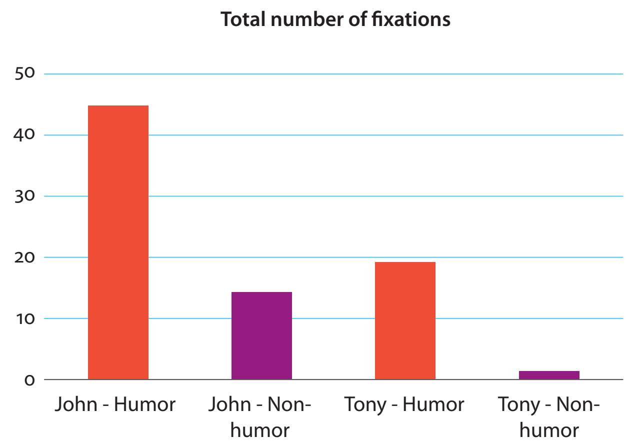
4.2.1 *Results*

The eye-tracking results obtained show: (a) the percentage of time participants fixated on the two Areas of Interest combined across humorous and non-humorous events; (b) the total number of fixations per participant on both Areas of Interest across humorous and non-humorous events; (c) the total fixations' duration per participant on both Areas of Interest across humorous and non-humorous events; and (d) the total fixations' number of both participants combined per Areas of Interest across humorous and non-humorous events.

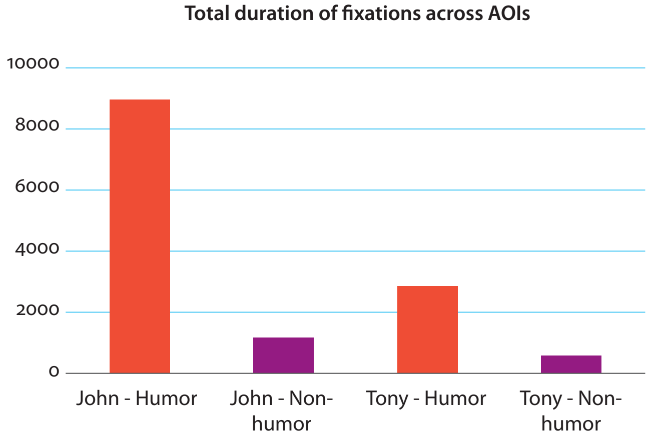
The graphs in Figure 4 summarize these results. The red columns represent the data for the humorous events, while the purple columns represent the data for the non-humorous events. Even at first glance it is noticeable that the red columns are always higher than the purple ones, indicating that fixations on the two Areas



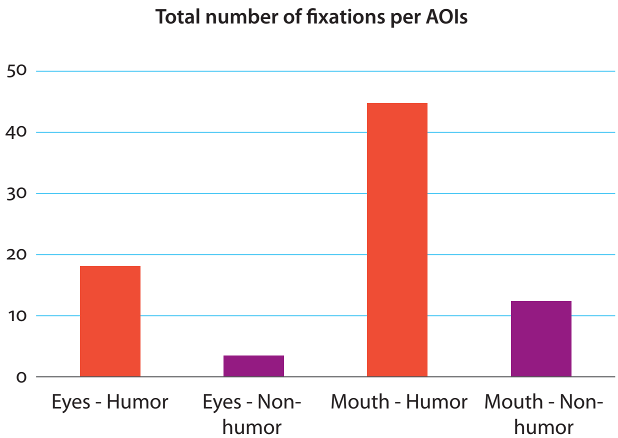
a.



b.



c.



d.

Figure 4. Fixations across humorous and non-humorous events

of Interest during humorous events tends to be overall more numerous and longer than fixations on the same Areas of Interest during non-humorous events.

The first graph in the top-left part of Figure 4 offers an overview of the percentage of time that participants spent fixating on the two Areas of Interest during humorous and non-humorous segments of conversation. The total time of humorous and non-humorous segments was approximately 30 seconds per each category, for an overall value of 1 minute. For example, John spent 3% of the total humorous time fixating on the two Areas of Interest, against 0.3% of the total non-humorous time spent fixating on the same Areas of Interest. The second participant, Tony, shows less variation across humorous and non-humorous segments, but nonetheless spent slightly more time fixating on Areas of Interest during humorous (0.3%) than non-humorous segments of conversation (0.2%).

The second graph in the top-right part of Figure 4 shows the total number of fixations produced by each participant. Again, John is the participant that generated the highest number of fixations overall, with the majority of them during humorous segments ($N = 45$). Tony generated an inferior number of fixations overall, but similarly to John, the majority of them were during humorous segments ($N = 14$).

The third graph in the bottom-left part of Figure 4 summarizes the total fixations length in milliseconds across participants and humorous or non-humorous segments. Both participants fixated longer on the two Areas of Interest during humorous segments (John = 8999 ms; Tony = 2750 ms) than during non-humorous ones (John = 1040 ms; Tony = 830 ms).

Finally, the last graph in the bottom-right part of Figure 4 summarizes the total number of fixations produced by both participants across Areas of Interest and humorous or non-humorous segments. The mouth is the area that gets the highest number of fixations in general, for a total of 58 fixations, with the majority of fixations happening during humorous segments ($N = 45$). The eyes get less attention, but show a similar pattern in that the number of fixations on this area is much higher during humorous segments ($N = 13$) than non-humorous ones ($N = 3$).

5. Discussion of results

The goal of the pilot study presented here is twofold: first, we contribute to the field of humor research by exploring the relationship between humor, gaze, and smiling; second, we propose a new social paradigm for eye-tracking research involving two participants interacting face-to-face.

Regarding our first goal within the field of humor research, this study contributes to the area of investigation on humor markers by adopting the multimodal approach advocated for in Attardo et al. (2013) and examining the role of smiling and the attention participants pay to it during conversation. The data collected point to the fact that the presence of humor may tend to correlate with a greater attention being paid to facial areas involved in smiling. Different measures were collected to estimate the attention paid by participants to selected facial areas, and all these measures consistently point to the fact that the mouth and eyes regions of the participants face receive more attention when humor is present than when humor is absent. Overall, the percentage of time participants fixated on these areas was higher when humor was present; the absolute total time participants fixated on these areas when humor was present was higher; and the total number of fixations per participant and per Area of Interest was higher when humor was present.

Previous findings showed that participants tend to display a higher smiling intensity when humor is present (see Gironzetti and Menjo 2014), thus suggesting that smiling may be used as a marker of humor in conversation. We hypothesized that, in order to be capable of using each other smiling behavior as a marker indicating the presence of humor in conversation, participants should pay attention to the facial areas involved in this gesture, namely the mouth and the eyes area. This hypothesis was confirmed by the present eye-tracking analysis of participants' fixations on the mouth and eyes facial regions. Both participants involved in the conversation fixated more and longer on the mouth and the eyes when humor was present relative to the baseline of the conversation. These data confirm our initial hypothesis, namely that there is a relationship between gaze patterns, humorous events, and the smiling behavior of participants in a dyadic face-to-face conversation; however, this pilot study is just one more step towards finding the answer to a much more complex question regarding the role smiling as a marker of the presence of humor in face to face conversation.

As per our second goal, recent eye-tracking technology developments make it possible for researchers to implement new research paradigms and explore how humans use gaze in real-life during face-to-face interactions. This pilot study outlined a methodology for social eye-tracking that allows researchers to investigate eye movements not limited to participants looking at videos or static images, but involving real-life changing and moving facial expressions. The application of this methodology is not limited to humor studies, of course, since any research area concerned with face to face interactions could benefit from it. While the possibilities offered by this novel setting are numerous, there is also one main disadvantage with respect to more traditional, video-based eye-tracking studies, namely, the loss of data. This problem is inherent in the very nature of social eye-tracking: in a natural setting, participants will move, gesture, cover their faces, look away, etcetera, and these behaviors, while perfectly acceptable in natural interactions, cause the loss of eye-tracking data. Moreover, if the research involves cross-analyzing data from two participants, the loss of data for one of them will cause the corresponding data from the other participant to be of no use. Researchers willing to pursue social eye-tracking studies should always take into account the possibility of losing data due to these circumstances and oversample.

The next step in the project will consist in expanding the analysis of the corpus in order to confirm or discard this initial hypothesis with a larger set of participants and conversations, and obtain some significance values. The analysis of the corpus will also be necessary to account for cultural differences and familiarity level (these data have been collected in the initial questionnaire), and conversational roles of participants, since previous studies demonstrated that these factors may affect participants' eye movements. In the interaction analyzed here, for example, one participant (John) had almost exclusively the role of speaker throughout the whole interaction, while Tony was the listener. We noticed that John's attention was mostly on the mouth area of Tony's face, while Tony's attention was concentrated mostly on the eyes' area of John's face (see the top and bottom right graphs in Figure 4). We hypothesized that this difference may be due to their different conversational roles, and will be able to test this hypothesis with a larger set of data. This hypothesis is consistent with recent studies on eye-contact and mutual gaze according to which these behaviors are used by people to indicate willingness to listen and participate in a conversation (Beattie 1978; Cary 1978). Moreover, cultural differences – Tony has an Asian-American cultural background, while John's cultural background is American – may be partially responsible for the difference (Hall and Hall 1990; Jandt 2010) between the number of fixations and the overall fixation time (percentage and absolute time) across participants (see top and bottom left graphs in Figure 4). In this respect, since our corpus includes interactions among native speakers of Spanish, English, and Chinese, we will be able to test this hypothesis by contrasting participants' behavior across cultures. However, it should also be noted that participants with a Mexican cultural background showed a similar behavior, displaying differences in the fixation area – the mouth was preferred – and among participants – one participant consistently displayed higher fixation values than the other –. Future analysis and a larger set of data will allow for a fine-grained analysis of these differences.

Finally, since smiling seems to play a role in conversation, especially when humor is present, and given the possibilities offered by the social eye-tracking setting, we intend to look at participants' coordination of gaze patterns (mutual gaze and eye-contact, as well as shared attention on the mouth and eyes regions) and smiling behavior. Research in interpersonal alignment showed that speakers tend to "change their affect, behavior, and cognition as a direct result of their interaction with another individual" (Paxton and Dale 2013). Higher behavioral coordination and synchronicity were found to correlate with affiliative types of interactions (Richardson, Dale, and Kirkham 2007), while disaffiliative interactions, such as arguments, were found to have lower levels of behavioral coordination and synchronicity (Paxton and Dale 2013). Therefore, we expect to find higher levels of behavioral synchronicity and alignment for humor used with affiliative purposes as opposed to humor used for disaffiliative purposes.

Acknowledgements

This research was supported by the Spanish Ministry of Economy and Competitiveness through Grant FFI2015-64540-C2-1-P "Género, humor e identidad: desarrollo, consolidación y aplicabilidad de mecanismos lingüísticos en español" [Gender, humor and identity: Development, consolidation and applicability of linguistic mechanisms in Spanish] (2016–19).

Corresponding author: Elisa Gironzetti, Elisa.Gironzetti@tamuc.edu, Texas A&M University – Commerce, P.O. Box 3011, Commerce, Texas 75429.

References

Ajmer, Karin and Anne-Marie, Simon-Vandenbergen. 2011. Pragmatic markers. In Jan Zienkowski, Jan-Ola Östman, and Jef Verschueren (Eds.), Discursive Pragmatics. Amsterdam: Benjamins. 223–247. doi: 10.1075/hoph.8.13aij

Annoli, Luigi, and Lambiase, Laura. 1990. ""Giochi di sguardo" nella conversazione." *Giornale Italiano di psicologia* XVII(1): 27–58.

Attardo, Salvatore. 1994. Linguistic Theories of Humor. Berlin: Mouton de Gruyter.

Attardo, Salvatore. 2001. Humorous Texts. Berlin: Mouton de Gruyter. doi: 10.1515/9783110887969

Attardo, Salvatore. 2012. "Smiling, Laughter, and Humor." In Paolo Santangelo (Ed.), *Laughing in Chinese*. Rome: Aracne. 421–436.

Attardo, Salvatore. 2015. "Humor and Laughter." In Deborah Tannen, Heidi E. Hamilton, and Deborah Schiffrin (Eds.), *The Handbook of Discourse Analysis, Second edition*. Chichester, UK: John Wiley and Sons. 168–188.

Attardo, Salvatore. (Forthcoming). The GTVH and Humorous Discourse.

Attardo, Salvatore, and Pickering, Lucy. 2011. "Timing in the performance of jokes." *Humor: International Journal of Humor Research* 24(2): 233–250 doi: 10.1515/HUMR.2011.015

Attardo, Salvatore, Pickering, Lucy, and Baker, Amanda. 2011. "Prosodic and Multimodal Markers of Humor in Conversation." *Pragmatics and Cognition*, 19(2): 224–247. doi: 10.1075/pc.19.2.03att

Attardo, Salvatore, Pickering, Lucy, Lomotey, Fofo, Menjo, Shigehito. 2013. "Multimodality in Conversational Humor." *Review of Cognitive Linguistics*, 11(2): 400–414. doi: 10.1075/rcl.11.2.12att

Attardo, Salvatore and Raskin, Victor. 1991. "Script theory revis(it)ed: joke similarity and joke representation model." *HUMOR*, 4(3): 293–347.

Attardo, Salvatore, Wagner, Manuela, and Urios-Aparisi, Eduardo. 2011. "Prosody and Humor." *Prosody and Humor. Special issue of Pragmatics and Cognition*, 19(2): 189–201. doi: 10.1075/pc.19.2.01att

Barisic, Iva, Timmermans, Bert, Pfeiffer, Bente, Gary, Ulrich J., Vogeley, Kay, and Schilbach, Leonhard. 2013. "Using dual eye-tracking to investigate real-time social interactions." Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems.

Beattie, Geoffrey W. 1978. "Floor apportionment and gaze in conversational dyads." *British Journal of Social and Clinical Psychology*, 17(1): 7–15. doi: 10.1111/j.2044-8260.1978.tb00889.x

Brône, Geert and Oben, Bert. 2015. "InSight Interaction: a multimodal and multifocal dialogue corpus." *Language Resources and Evaluation*, 49(1): 195–214. doi: 10.1007/s10579-014-9283-2

Broz, Frank, Lehmann, Hagen, Nehaniv, Chrystopher L., and Dautenhahn, Kerstin. 2012. "Mutual Gaze, Personality, and Familiarity: Dual Eye-Tracking During Conversation." *IEEE RO-MAN: The 21st IEEE International Symposium on Robot and Human Interactive Communication*, 858–864.

Calvo, Manuel G., Fernández-Martín, Andrés, and Nummenmaa, Lauri. 2013. "A smile biases the recognition of eye expressions: Configural projection from a salient mouth." *The Quarterly Journal of Experimental Psychology*, 66(6): 1159–1181. doi: 10.1080/17470218.2012.732586

Calvo, Manuel G., Gutiérrez-García, Aida, Avero, Pedro, and Lundqvist, Daniel. 2013. "Attentional Mechanisms in Judging Genuine and Fake Smiles: Eye-Movement Patterns." *Emotion*, 13(4): 792–802. doi: 10.1037/a0032317

Canestrari, Carla. 2010. "Meta-communicative signals and humorous verbal Interchanges: A case study." *Humor. International Journal of Humor Research*, 23 (3): 327–349. doi: 10.1515/humr.2010.015

Cary, Mark S. 1978. "The role of gaze in the initiation of conversation." *Social Psychology*, 41: 269–271. doi: 10.2307/3033565

Chafe, Walace L. 2007. The Importance of Not Being Earnest: The Feeling Behind Laughter and Humor. John Benjamins. doi: 10.1075/ceb.3

Clark, Alan T., and Gergle, Darren. 2011. "Mobile Dual Eye-Tracking Methods: Challenges and Opportunities." Paper presented at DUET 2011: Dual Eye-tracking Workshop at ECSCW 2011 (Aarhus, Denmark. September 25, 2011.)

Creswell, John W. and Plano Clark, Vicky L. 2011. Designing and conducting mixed methods research (2nd ed.). Thousand Oaks, CA: Sage.

Duchowsky, Andrew. 2007. Eye-tracking Methodology: Theory and Practice. London: Springer-Verlag.

Ekman, Paul, and Friesen, Wallace V. 1978. Facial Action Coding System. Palo Alto, CA: Consulting Psychologists Press.

Eisterhold, Jody, Attardo, Salvatore, and Boxer, Diana. 2006. "Reactions to irony in discourse: Evidence of the Least Disruption Principle." *Journal of Pragmatics*, 38(8): 1239–1256. doi: 10.1016/j.pragma.2004.12.003

Fernández-Martín, Andres and Calvo, Manuel. 2012. "Curso temporal en la discriminación de la sonrisa: medidas de latencia sacádica. *Psicológica*, 33: 319–343.

Fernández-Martín, Andres, Gutiérrez-García, Aida and Gutiérrez-Calvo, Manuel G. 2013. "A smile radiates outwards and biases the eye expression." *Spanish Journal of Psychology* 16(53): 1–11. doi: 10.1017/sjp.2013.68.

Gironzetti, Elisa and Menjo, Shigehito. 2014. "Smiling as a Discourse Marker of Humor." Paper presented at the 2nd Conference of the American Pragmatics Association (AMPRA), October 17-19, 2014, University of California, Los Angeles.

Gullberg, Marianne and Kenneth Holmqvist. 2006. "What speakers do and what addressees look at. Visual attention to gestures in human interaction live and on video." *Pragmatics and Cognition*, 14(1): 53–82. doi: 10.1075/pc.14.1.05gul

Hall, Edward T. and Mildred Reed Hall. 1990. Understanding cultural difference. Yarmouth, Me: Intercultural Press.

Harker, LeeAnne and Dacher Keltner. 2001. "Expressions of Positive Emotion in Women's College Yearbook Pictures and Their Relationship to Personality and Life Outcomes Across Adulthood." *Journal of Personality and Social Psychology*, 80(1): 112–124. doi: 10.1037/0022-3514.80.1.112

Hayhoe, Mary M. and Dana H. Ballard. 2005. "Eye Movements in Natural Behavior." *Trends in Cognitive Science* 9(4): 188–194. doi: 10.1016/j.tics.2005.02.009

Heerey, Erin A. and Crossley, Helen M. 2013. "Predictive and Reactive Mechanisms in Smile Reciprocity." *Psychological Science*, 24(8): 1446–1455. doi: 10.1177/0956797612472203

Hertenstein, Matthew J., Hansel, Carrie A., Butts, Alissa M., and Hile, Sarah N. 2009. "Smile intensity in photographs predicts divorce later in life." *Motivation and Emotion*, 33(2): 99–105. doi: 10.1007/s11031-009-9124-6

Hess, Ursula, and Bourgeois, Patrick. 2010. "You smile – I smile: Emotion expression in social interaction." *Biological Psychology*, 84: 514–520. doi: 10.1016/j.biopsycho.2009.11.001

Jandt, Fred E. 2010. An Introduction to Intercultural Communication: Identities in a Global Community. Los Angeles: Sage.

Jefferson, Gail. 1979. "A technique for inviting laughter and its subsequent acceptance declination." In Psathas, George (Ed.), Everyday Language. Studies in Ethnomethodology. New York: Irvington. 79–96.

Kendon, Adam. 1967. "Some functions of gaze-direction in social interaction." *Acta Psychologica*, 26: 22–63. doi: 10.1016/0001-6918(67)90005-4

Kleinke, Chris L. 1986. "Gaze and Eye Contact: A Research Review." *PsyChological Bulletin*, 100(1): 78–100. doi: 10.1037/0033-2909.100.1.78

Knackstedt, Georgia, and Kleinke, Chris. 1991. "Eye contact, gender, and personality judgments." *The Journal of Social Psychology*, 131: 303–304. doi: 10.1080/00224545.1991.9713855

Kothoff, Helga. 2003. "Responding to irony in different contexts: On cognition in conversation." *Journal of Pragmatics*, 35: 1387–1411. doi: 10.1016/S0378-2166(02)00182-0

Levine, Marion H., and Sutton-Smith, Brian. 1973. "Effects of age, sex and task on visual behavior during dyadic interaction." *Developmental Psychology*, 9: 40–405. doi: 10.1037/h0034929

Norrick, Neal R. 1993. Conversational joking: Humor in everyday talk. Bloomington, IN: Indiana University Press.

O'Donnell-Trujillo, Nick, and Adams, Katherine. 1983. "Heheh in conversation: some coordinating accomplishments of laughter." *Western Journal of Speech Communication*, 47: 175–191. doi: 10.1080/10570318309374114

Olsen, Anneli. 2012. "The Tobii I-VT Fixation Filter. Algorithm description." Retrieved from Tobii White Papers Library, http://www.tobii.com/Global/Analysis/Training/WhitePapers/Tobii_WhitePaper_TobiiIVTFixationFilter.pdf?epslanguage=en.

Oveis, Christopher, Gruber, June, Keltner, Dacher, Stamper, Juliet L., and Boyce, Thomas W. 2009. "Smile Intensity and Warm Touch as Thin Slices of Child and Family Affective Style." *Emotion*, 9(4): 544–548. doi:10.1037/a0016300

Paxton, Alexandra, and Dale, Rick. 2013. "Argument disrupts interpersonal synchrony." *Quarterly Journal of Experimental Psychology*, 66(11): 2092–2102. doi: 10.1080/17470218.2013.853089

Pickering, Lucy, Corduas, Marcela, Eisterhold, Jody, Seifried, Brenna, Eggleston, Alyson, and Salvatore Attardo. (2009). "Prosodic Markers of Saliency in Humorous Narratives." *Discourse Processes*, 46: 517–540. doi: 10.1080/01638530902959604

Raidt, Stephan, Bailly, Gérard, and Elisei, Frédéric. 2007. "Analyzing and modeling gaze during face-to-face interactions." 7th International Conference on Intelligent Virtual Agents (IVA), Paris, France, 100–101. doi: 10.1007/978-3-540-74997-4_60

Raskin, Victor. 1985. Semantic Mechanisms of Humor. Dodrecht: D. Reidel.

Richardson, Daniel C., Dale, Rick, and Kirkham, Natasha. 2007. "The art of conversation is coordination: common ground and the coupling of eye movements during dialogue." *Psychological Science*, 18: 407–413. doi: 10.1111/j.1467-9280.2007.01914.x

Rosengrant, Davod, Hearrington, Doug, Alvarado, Kerriann, and Keeble, Danielle. 2012. "Following Student Gaze Patterns in Physical Science Lectures." *AIP Conference Proceedings*, 1413: 323–326. doi: http://dx.doi.org/10.1063/1.3680060

Sacks, Harvey. 1974. [1989]. "An analysis of the course of a joke's telling in conversation." In Bauman, R. and Joel Sherzer (Eds.) *Explorations in the Ethnography of Speaking*. 2nd edition. 337–353. Cambridge, UK: Cambridge University Press.

Schegloff, Emauel. A., Jefferson, Gail., and Sacks Harvey. 1977. "The preference for self-correction in the organization of repair in conversation." *Language*, 53: 361–82. doi: 10.1353/lan.1977.0041

Seder, Patrick J., and Oishi, Shigehiro. 2012. "Intensity of smiling in facebook photos predicts future life satisfaction." *Social Psychological and Personality Science*, 3(4): 407–413. doi: 10.1177/1948550611424968

Tsakona, Villy. 2013. "Okras and the metapragmatic stereotypes of humour: Towards an expansion of the GTVH". In M. Dynel (Ed.), *Developments in Linguistic Humour Theory*. Amsterdam: John Benjamins. 25–48. doi: 10.1075/thr.1.03tsa

Vertegaal, Roel, Slagter, Robert, van der Veer, Gerrit, and Nijholt, Anton. 2001. "Eye Gaze patterns in Conversation: There is More to Conversational Agents Than Meets the Eyes." *CHI* 3(1): 301–308.

Ye, Zhefan, Li, Yin, Fathi, Alireza, Han, Yi, Rozga, Agata, Abowd, Gregory, D., and Rehg, James M. 2012. "Detecting eye contact using wearable eye-tracking glasses." Proceedings of the 2012 ACM Conference on Ubiquitous Computing (UbiComp'12). ACM, New York, NY, USA, 699–704. doi: 10.1145/2370216.2370368

Yu, Che, Scheutz, Matthias, and Schermerhorn, Paul W. 2010. "Investigating multimodal real-time patterns of joint attention in an HRI Word Learning Task." 5th ACM/IEEE International Conference on Human-Robot Interaction, 309–316. doi: 10.1109/HRI.2010.5453181

Wild, Barbara, Erb, Michael, Eyb, Michael, Bartels, Mathias, and Grodd, Wolfgang. 2003. "Why are smiles contagious? An fMRI study of the interaction between perception of facial affect and facial movements." *Psychiatry Research*, 123: 17–36. doi: 10.1016/S0925-4927(03)00006-4

Williams, Jason A., Burns, Erin L., and Harmon, Elizabeth A. 2009. "Insincere Utterances and gaze: Eye Contact During Sarcastic Statements." *Perceptual and Motor Skills*, 108: 565–572. doi: 10.2466/pms.108.2.565-572

Appendix A. The Smiling Intensity Scale (SIS)

The five levels of this Smiling Intensity Scale (SIS) are descriptive of different smiling behaviors:

– Level 0: Neutral. No smile, no flexing of the zygomaticus (no AU12), may show dimpling (AU14) or squinting of the eyes (caused by AU6 or AU7), but no raised side of the mouth (no AU 12), the mouth may be closed or open (AU25 or AU26).
– Level 1: Closed mouth smile. Shows flexing of the zygomaticus (AU12), may show dimpling (AU14) and may show flexing of the orbicularis oculi (caused by AU6 or AU7).
– Level 2: Open mouth smile. Showing upper teeth (AU25), flexing of the zygomaticus (AU12), may show dimpling (AU14), may show flexing of the orbicularis oculi (caused by AU6 or AU7).
– Level 3: Wide open mouth smile. Shows flexing of the zygomaticus (AU12), flexing of the orbicularis oculi (caused by AU6 or AU7), and may show dimpling (AU14). 3A: showing lower and upper teeth (AU25), or 3B: showing a gap between upper and lower teeth (AU25 and AU26).
– Level 4: Laughing smile. The jaw is dropped (AU26 or AU27), showing lower and upper teeth (AU25), flexing zygomaticus (AU12), flexing of the orbicularis oculi (AU6 or AU7); may show dimpling (AU14).

Figure 5. The five levels of the Smiling intensity Scale (0–4)