Gaze patterns and fillers

Empirical data on the difference between Dutch ‘euh’ and ‘euhm’

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Abstract

In naturally occurring conversation, speakers use fillers such as ‘euh’ and ‘euhm’ for a variety of reasons. In this study, we explore speakers’ gaze behavior when producing a filler, as the functions that have been associated with fillers and gaze aversion show some promising similarities. Studies show that both fillers and gaze aversion are associated with a speaker being hesitant or uncertain (Kendon, 1967, De Leeuw, 2007). Also in terms of the turn taking system, the functions of fillers and gaze aversion overlap as they both play an important role as turn holding signals (Maclay and Osgood, 1959; Kendon, 1967). However, the present analysis shows that speakers’ gaze behavior when uttering a filler is not so clear cut: a sustained gaze at the interlocutor during a filler is almost as frequent as gazing away. In the second part of the analysis, we compare speakers’ gaze patterns when producing two different manifestations of the filler (‘euh’ vs. ‘euhm’ in Dutch). These formal variants show some interesting differences in the co-occurring gaze distribution. More than ‘euh’, the longer variant ‘euhm’ is accompanied by a gaze aversion or a gaze fixation to the background. The multimodal analysis we present in this study supports previous findings of an interactional difference in vocal and vocal-nasal fillers (Clark, 1994; Swerts, 1998; De Leeuw, 2007, Navarretta, 2015).

1 Introduction

In spontaneous conversation, speakers frequently produce verbal fillers such as ‘euh’ and ‘euhm’. Various functions have been attributed to these small, seemingly meaningless elements. Clark and Fox Tree (2002) distinguish three views on the English ‘uh’ and ‘um’. Traditionally, fillers are believed to be a symptom of production difficulties. According to this filler-as-symptom view, speakers use fillers when they are in doubt, for example when they have to make a choice, voice a challenging thought or have other difficulties planning their utterance. Fillers show the speaker’s hesitation and uncertainty (De Leeuw, 2007; Clark and Fox Tree, 2002). Proof for this hypothesis was found in the fact that fillers are used more frequently in describing ambiguous occurrences and abstract nouns, elements that typically demand a more complex cognitive process (De Leeuw, 2007; Reynolds and Paivio, 1968; Siegman and Pope, 1966).

However, in the last decades, researchers found that this symptom hypothesis cannot be the only factor in accounting for the use of fillers. Lake, Humphreys and Cardy (2011) found that individuals with autism use fewer filled-pause words than a control group, and show in contrast more silent pauses and repetitions. Moreover, ‘um’ occurs less frequently in deceptive speech and in human-robot interaction than in natural human-human conversation (Villar, Arciuli and Mallard, 2012; Walter, Risko and Kingstone, 2014). These findings suggest that the use of fillers lies partly within a speaker’s control. Following on this, fillers can be seen as a signal, or even a word. In the filler-as-turn management-signal view1, fillers are considered as turn management signals that speakers give to their interlocutors. According to this view, a speaker can use a filler as a signal to hold, yield or take the turn. Speakers use

1 This term corresponds to filler-as-nontlinguistic-signal as described by Clark & Fox Tree (2002). We chose to change the term to filler-as-turn management-signal, because the turn management function that fillers can fulfill is also a linguistic function.
fillers when they want to keep the floor, to indicate to their interlocutors that they are still in control of the turn (Maclay and Osgood, 1959; Clark and Fox Tree, 2002). In other contexts however, fillers can signal the speaker’s willingness to give up the turn. They can, for example, ask for the interlocutor’s co-participation in a speaker’s word search sequence (Goodwin and Goodwin, 1986; De Leeuw, 2007). Fillers can also function as turn taking signals, when a speaker starts a turn with a filler just after the completion of the previous, to indicate that he wants the next turn (Beattie, 1983; Sacks cited in Schegloff, 1982). A third view on fillers is the filler-as-word view, in which fillers are considered as words, related to interjections, which announce a delay in speaking. According to this view, announcing a delay is a filler’s primary function, while “most other functions are implicatures that follow from the relevance of announcing minor or major expected delays in the current situation” (Clark and Fox Tree, 2002). This third view, however, is criticized by O’Connell and Kowal (2005), who state that fillers do not function in the same way as interjections.

These different views show that, from the speaker’s perspective, fillers can fulfil a communicative goal. Additionally, fillers also have an effect on the interlocutor. From the listener’s perspective, fillers facilitate recall. When an interlocutor hears a filler, he is quicker to recognize the upcoming word. Also, a listener is more likely to anticipate on a less accessible referent when the word is preceded by a filler (Fraundorf and Watson, 2011; Brennan and Williams, 1995). These views aren’t mutually exclusive though: when ‘uh’ stems from a production difficulty, for example when a speaker is searching for a word, the filler can also be used as a turn holding signal, and even announce a delay to the interlocutor. As fillers can express different functions, the context in which the filler appears plays an important role (Clark and Fox Tree, 2002).

This study explores the correlation between fillers and gaze aversion by a speaker. Gaze aversion, or breaking off the mutual gaze between participants (infra), arises for different communicative purposes, which seem to relate to certain functions of fillers. It is known that speakers look away to avoid an overload of possibly distracting visual information (Schober et al., 2012). Gazing away is therefore a frequent strategy in situations in which the speaker is planning an utterance, to focus on the cognitive resources, rather than on distracting information (Kendon, 1967; Weiβ and Auer, 2016). As fillers can function as symptoms of production difficulties, it is likely that they correlate with gaze aversion, so the speaker can avoid further distraction during the production difficulties. Gaze aversion also fits in with the turn management functions of fillers, in which fillers are seen as turn managing cues. Speakers gaze away when they want to keep the turn, as gazing at the interlocutor can offer the latter the opportunity to take the turn (Argyle and Cook, 1976; Mutlu et al., 2012). This goal of gaze aversion fits in with the filler function of turn holding and a co-occurrence is therefore very likely. Gaze aversion also occurs when a speaker wants to take the turn: speakers avert their gaze to concentrate on planning the utterance (Argyle and Cook, 1976). Because of these similarities in communicative goals, fillers are expected to frequently co-occur with gaze aversion.

In Dutch, speakers produce two different manifestations of the filler, ‘euh’ and ‘euhm’, parallel to English ‘uh’ and ‘um’. As already observed before, the formal realization of a filler affects its communicative function. The vocal ‘uh’ seems to warn the interlocutor for a short interruption, whereas the vocalic-nasal ‘um’ announces a longer delay (Clark, 1994). Accordingly, vocalic-nasal fillers in American English are found more during planning of larger units, whereas a vocal filler reflects “local lexical decision-making” (Shriberg, 1994). A related finding in Dutch is that ‘euhm’ occurs more frequently at major discourse boundaries than ‘euh’ (Swerts, 1998; De Leeuw, 2007). This functional difference correlates with another difference in form: ‘euhm’ is more likely to be surrounded by pauses than ‘euh’ (De Leeuw, 2007). Also in Danish, the vocalic-nasal filler ‘øhm’ occurs more frequently preceding phrases than the purely vocal filler ‘oh’ (Navarretta, 2015). This study hypothesizes that this formal and functional difference between ‘euh’ and ‘euhm’ is reflected in a difference in gaze pattern.

2 Methodology

The distribution of the fillers ‘euh’ and ‘euhm’ was studied in three triadic interactions. The participants held a natural conversation of approximately 15 minutes. Some potential topics were suggested to the

2 These two manifestations are found in Dutch, German and English, but their distribution differs. A comparative study of fillers in Dutch, English and German can be found in De Leeuw 2007.
groups, such as holiday plans, exchange program experiences, hobbies and social media. However, they were free to talk about anything they wanted, so they did not have to restrict themselves to the suggested topics. The participants were all acquainted students between 18 and 24 years old. Two of the groups contained two females and one male, one group consisted of only females. All participants were equipped with ‘Pupil Pro Eye-Tracking Glasses’ to track their eye movements. The screenshot in figure 1 shows the recording setup of one of the interactions. Both upper and the left lower boxes show the dynamic eye tracker viewpoint, each filmed by one of the participants’ eye tracking glasses. The lower right box shows the scene camera perspective on the interaction. The four camera perspectives were synchronized into one video file, resulting in a quadvid that shows the perspectives simultaneously. Figure 1 is a still from the synchronized video file.

![Recording setup and resulting quadvid for the triadic interactions.](image)

A transcription of the speech was made in the annotation tool ELAN (Wittenburg et al., 2006), in combination with the annotation of the gaze target during, before and after the filler, gestures made during, before and after the filler, the presence of empty pauses before or after the filler and the position of the filler in the turn.

3 Analysis

3.1 Fillers and gaze aversion

Before coming to the actual analysis of the co-occurrence of fillers and gaze aversion, a note should be made on the concept of gaze aversion. Gaze aversion is in this study characterized as a ‘looking away’, and can be realized in different ways, depending on the original area of interest and the area of interest the speaker switches to. A key characteristic is that the speaker shifts their gaze to a point that is less central than the previous point of focus. The gaze shift that shows gaze aversion most clearly is a shift from an interlocutor to the background, as this is a straightforward way to avoid interference from another speaker. Secondly, a speaker can avert their gaze with a shift from one focus in the background to another one, if the shift reflects a further aversion. For example, a speaker can shift their gaze from the wall, next to one of the interlocutors, to a point on the floor or the ceiling. Thirdly, a gaze aversion can be achieved by a shift between two interlocutors. In this way, the speaker interferes with the first target’s possibilities to interrupt him. Opposed to this “looking away”, speakers can perform a ‘looking back’

3 The eye gaze of one of the participants could not be studied, due to technical difficulties. The analyses therefore encompasses the gaze behavior of eight participants.
shift, during which they shift their gaze back to a more central point in the interaction. An example is a shift from the background to an interlocutor. A third possible gaze pattern is the sustained gaze at the background or an interlocutor, when a gaze shift does not occur in close temporal relation to a filler. Because of the functional correlation between fillers and gaze aversion, we expect a filler to be accompanied by gaze aversion, a ‘looking away’ more frequently than by a shift in the opposite direction (‘looking back’). Also, when a speaker keeps their gaze fixated on one point during the production of the filler, this point is more likely to be an element in the background rather than an interlocutor.

A second note focuses on the time range within which the gaze shifts may occur. In this study, the speaker’s gaze during the filler, during the pause that often precedes or follows a filler as well as during 500 ms before the onset of the filler and preceding pause is taken into account. A qualitative study of gaze shift surrounding fillers shows that this time frame captures the most gaze shifts related to the hesitation underlying the filler, and leaves out most shifts related to other elements in the interaction.

In the corpus, 81 fillers were found. Due to technical issues with the calibration of the eye-tracker, the gaze target of the speaker could only be reliably observed for 73 fillers. Analysis of these fillers shows that the expected pattern, a looking away just before or during a filler, is frequent: in 38% of the cases (28 fillers), the speakers avert their gaze. The opposite pattern, a looking back, is far less frequent. Only 9 of the 73 fillers are accompanied by a gaze that shifts back to a more central point in the interaction. 3 of the fillers are accompanied by more complex shifts, e.g. a shift from the background, to an interlocutor and back to the background. An unexpected result, however, is how frequently a speaker keeps their gaze fixated on an interlocutor during or just before fillers. This is a pattern that occurs in 27 instances (37%), whereas a fixated gaze on the background is far less frequent (6 fillers, 8%).

<table>
<thead>
<tr>
<th>gaze behavior</th>
<th>frequency of fillers</th>
<th>relative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>looking away</td>
<td>28</td>
<td>38%</td>
</tr>
<tr>
<td>looking back</td>
<td>9</td>
<td>12%</td>
</tr>
<tr>
<td>other shifts</td>
<td>3</td>
<td>4%</td>
</tr>
<tr>
<td>background</td>
<td>6</td>
<td>8%</td>
</tr>
<tr>
<td>interlocutor</td>
<td>27</td>
<td>37%</td>
</tr>
<tr>
<td>total</td>
<td>73</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 1. Gaze aversion during fillers.

These to some extent unexpected results can be explained by the diverse functions fillers can fulfill. As already described in section 2, fillers can be used for different purposes. Often, a filler expresses a hesitation or a planning pause by the speaker, but it can also be a sign that a speaker is polite, it can mark a syntactic boundary, etc. (Clark and Fox Tree, 2002). It is very likely that these different functions of fillers correlate with different gaze patterns, and that only fillers that truly express hesitation, co-occur with gaze aversion. A second, but related explanation may be found in the verbal form of the filler: a vocal filler could be accompanied by a different gaze pattern than a vocalic-nasal filler. This theory will be tested in the second part of this paper.

3.2 ‘euh’ vs. ‘euhm’

Next to a general correlation between fillers and gaze aversion, this study analyzes the difference in gaze pattern during the different fillers ‘euh’ and ‘euhm’. In the three studied triads, the vocal filler ‘euh’ occurs far more frequently than the vocalic-nasal ‘euhm’. A total of 66 instances of euh were found, whereas ‘euhm’ only occurs 15 times in the corpus. This low frequency implies that remarks about the difference between the two manifestations of the filler should be made with caution.

Although there are some minor individual differences, the gaze behavior of six of the eight participants conforms to this pattern.
As table 2 shows, there is a substantial and significant difference in gaze pattern between ‘euh’ and ‘euhm’ (Fisher’s exact test, p < 0.01). The most striking difference lies in the number of cases of gaze remaining fixated on the interlocutor (i.e. the category with the somewhat unexpected outcome in the first section of the analysis. In this more detailed analysis, we can see that almost all of the fillers during which the speaker keeps gazing continuously at an interlocutor, are instances of ‘euh’. It happens only once that a speaker keeps gazing at an interlocutor when uttering ‘euhm’.

<table>
<thead>
<tr>
<th>gaze pattern</th>
<th>euh</th>
<th>euhm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>absolute frequency</td>
<td>relative frequency</td>
</tr>
<tr>
<td>looking away</td>
<td>20</td>
<td>34%</td>
</tr>
<tr>
<td>looking back</td>
<td>4</td>
<td>7%</td>
</tr>
<tr>
<td>other shifts</td>
<td>2</td>
<td>3%</td>
</tr>
<tr>
<td>background</td>
<td>6</td>
<td>10%</td>
</tr>
<tr>
<td>interlocutor</td>
<td>26</td>
<td>45%</td>
</tr>
<tr>
<td>total</td>
<td>58</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 2. Formal variants of filler and gaze aversion.

This difference in co-occurrence between gaze behavior and different kinds of fillers corresponds with the functional difference described in section 2 of this paper. All formal and functional differences show the same tendency of the vocalic-nasal filler ‘euhm’ being the signal for a deeper cognitive thinking process. A vocalic-nasal filler (‘euhm’ in Dutch) is more frequent in the planning of larger units, occurs more frequently at major discourse boundaries and announces a longer delay than the purely vocalic counterpart (‘euh’ in Dutch) (Shriberg, 1994; Swerts, 1998; Clark, 1994). This functional difference is, as the results of this exploratory analysis show, also reflected in the speakers’ gaze behavior. When speakers avert their gaze more frequently when producing ‘euhm’, this may very well be related to the deeper cognitive process that the filler signals. This function is shown in example 1. In this example, one of the speakers, Sharon, asks Veronique how many exams she has to take. Veronique answers this question, but she starts her answer with an ‘euhm’ and a longer pause. Veronique already averts her gaze before Sharon’s question is finished. This gaze aversion, together with the ‘euhm’ functions as a display of a cognitive process: Veronique is probably counting her exams in order to be able to provide a correct answer. She looks back at Sharon, who asked the question, when she has almost finished her answer (‘vier’, *four*).

Example 1

1. **SHARON**: en hoeveel examens hebde gij? and how many exams do you have?
   gaze **VER**: *SHARON* **BACKGROUND* SHARON

2. **VERONIQUE**: euhm:: (-) vier (-) um:: (-) four (-)
   gaze **VER**: *BACKGROUND* **SHARON* SHARON

3. **VERONIQUE**: ja yes
   gaze **VER**: *SHA*. SHARON

4. **VERONIQUE**: en gij? and you?
   gaze **VER**: *SHARON*
This is a typical situation in which the speakers in the studied triads use ‘euhm’. The pure vocalic filler ‘euh’, however, is used in far more varied situations. An example can be seen in example 2. Maarten is talking about a Spanish girl who he and Sharon met during their stay in Spain. He is searching for the name of one of their friends who lived with the Spanish girl. During this word search, he utters ‘euh’ two times. While he is searching for the name, he keeps gazes at Shana, apparently to appeal to her to finish his sentence and say the name of the friend. In this case, the filler ‘euh’ is not used as a turn holding cue, but rather as a turn yielding cue. This example supports Goodwin and Goodwin’s (1986) findings that during a word search, when a speaker’s gaze is directed towards an interlocutor, the speaker asks the interlocutor to participate in the word search. In this word search, this gaze behavior is successful: Sharon finishes Maarten’s utterance and supplies the name he’s searching for.

Example 2
1 MAARTEN ma ja da was wel goeie kotgenoten twas geen vieze  
   but yeah that was good roommates it was no dirty 
   gaze MAA SHARON 
   mexicaan of  
   mexican or 
   gaze MAA SHARON 

2 SHARON h[a ]  
   h[a ]  
   MAARTEN [of] die hysterische spanse van: euh: (.) 
   [or] that hysterical spanish girl from uh:(.) 
   gaze MAA SHARON 

3 MAARTEN in: euh:  
   in: uh:  
   gaze MAA SHARON 

4 SHARON ja [oh: ] Eva  
   yeah [oh: ] Eva  
   MAARTEN [lacht ]  
   [laughing]  
   gaze MAA SHARON NO DATA

4 Discussion

The first hypothesis in this study, stating that fillers are often combined with gaze aversion, could not be supported. People do avert their gaze during or just before 38% of the fillers, but they also keep gazing at their interlocutor during 37% of the fillers. Other patterns, such as a constant gaze at the background or a gaze shift back to the interlocutor are less frequent. However, the data do support the second hypothesis as a correlation between the kind of filler and gaze patterns could be found: speakers in the corpus avert their gaze more often during ‘euhm’ than during ‘euh’. The sustained gaze at the speaker, which turned out to be more frequent than expected in the first part of the analysis, only occurs once during ‘euh’, but is a very persistent pattern for ‘euh’. These divergent gaze patterns can be attributed to the functional difference between the vocal and vocalic-nasal fillers, a tendency that occurs in most Germanic languages. The nasal variant ‘euhm’ occurs frequently at major discourse boundaries, reflecting a cognitive thinking process, typically when the speaker is planning their discourse. ‘Euh’, on the contrary, is used more often when speakers are involved in a word search, making a more local lexical decision (Swerts, 1998; Shriberg, 1994; Navarretta, 2015). Since this study only analyzed a limited
number of fillers, a more comprehensive corpus study, analyzing more attestations of both kinds of fillers, is needed to strengthen these results.

The different gaze pattern during vocal and vocalic-nasal fillers sheds some light on the gaze distribution during fillers, but cannot account for all of the differences in gaze distribution. Especially during occurrences of ‘euh’, we have observed quite a lot of variation in the gaze pattern. Qualitative research on the function of these fillers should point out whether this differentiated gaze behavior corresponds with different functions. In this respect, also other features of fillers, such as the duration of the filler and contextual gesture should be taken into account. Since the gaze behavior in ‘euh’ and ‘euhm’ diverges considerably, a correlation between gaze behavior and functional differences between fillers is likely to occur.

References


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