Introduction

• The awareness of social significance of gaze-direction is old (Sartre 1942 – apprehension of another person being conscious – through experience of the Look)

• Mysterious mutual gaze (Simmel 1920 – “intimate relationship”)

• Wardell 1960: children’s behaviour affected by gaze; Gibson and Pick 1963: individual’s perception of gaze and sensitivity to its direction

• Concerned with the relationship between habits of looking and characteristics of the looker
Introduction

There were no attempts to analyse the function of the gaze within ongoing social interaction

- Goffman (1964) considered the direction of gaze
  - Initiation of contact and its maintenance
  - Gaze is the indicator of social accessibility
  - “eye-to-eye ecological huddle”

- Nielsen (1964) – role of gaze direction in interaction
  - analysis of sound films records of 2-persons discussions
  - what can be signaled by changing the direction of gaze while the conversation
Current study

• The current study is exploratory

• Main aim: “to contribute to non-existent literature on gaze-direction”
Current study

• Exploration of the link “direction of gaze” – “occurrence of utterances”

• Based on the current study to derive functions of gaze-direction:
  ▶ Gaze as an act of perception
  ▶ Gaze as an expressive sign/regulatory signal
Materials and the procedure

- Sound and film records of conversations
- Parts of 7 two-person conversations
- 13 students of Oxford university (10 male/3 female), previously unacquainted
- 30 min pre-experiment conversation
- Subjects filmed 2 frames/sec (simultaneously – mirror)
- Sound – magnetic tape
- Special device to synchronise tape recorder with frames
Materials and the procedure

• Subjects were informed about the set-up
• 5-min samples from 6 conversations, taken from last 10 min of the recording
• A 7-min and 9-min samples taken from 7th conversation

• Films transcribed frame by frame by means of positional notation using pictographic symbols
• Speech was transcribed in a synchronised manner
Results of the analyses
Proportion of time spent looking and not looking at q

P => the individual who is being discussed
Q => the person with whom P is interacting

Q-gaze = P looking at Q
A-gaze = P not looking at Q

Kendon suggests that gaze proportion is a matter of considerable variation (Table 1a)
## Results of the analyses

Proportion of time spent in looking at interlocutor for thirteen subjects in seven two-person conversations

<table>
<thead>
<tr>
<th>Subject</th>
<th>Overall</th>
<th>During long utterances</th>
<th>During silence</th>
<th>Overall</th>
<th>During long utterances</th>
<th>During silence</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB (male)</td>
<td>52.9</td>
<td>34.3</td>
<td>81.0</td>
<td>47.0</td>
<td>65.7</td>
<td>19.0</td>
</tr>
<tr>
<td>JS (female)</td>
<td>45.4</td>
<td>26.9</td>
<td>63.5</td>
<td>54.7</td>
<td>73.1</td>
<td>36.5</td>
</tr>
<tr>
<td>*JH (female)</td>
<td>65.8</td>
<td>57.5</td>
<td>79.0</td>
<td>34.2</td>
<td>42.5</td>
<td>21.0</td>
</tr>
<tr>
<td>*NL (male)</td>
<td>52.7</td>
<td>46.8</td>
<td>82.2</td>
<td>37.3</td>
<td>53.2</td>
<td>17.8</td>
</tr>
<tr>
<td>SJ (male)</td>
<td>29.0</td>
<td>20.7</td>
<td>39.3</td>
<td>71.0</td>
<td>79.3</td>
<td>60.7</td>
</tr>
<tr>
<td>W (male)</td>
<td>31.8</td>
<td>77.6</td>
<td>34.8</td>
<td>68.2</td>
<td>72.4</td>
<td>65.2</td>
</tr>
<tr>
<td>JS (male)</td>
<td>43.0</td>
<td>41.1</td>
<td>58.9</td>
<td>57.0</td>
<td>55.0</td>
<td>45.0</td>
</tr>
<tr>
<td>WJ (male)</td>
<td>69.0</td>
<td>42.4</td>
<td>57.6</td>
<td>31.0</td>
<td>58.6</td>
<td>41.4</td>
</tr>
<tr>
<td>TG (male)</td>
<td>28.7</td>
<td>22.0</td>
<td>32.0</td>
<td>71.3</td>
<td>78.0</td>
<td>68.0</td>
</tr>
<tr>
<td>VM (female)</td>
<td>44.4</td>
<td>33.2</td>
<td>52.3</td>
<td>55.6</td>
<td>60.8</td>
<td>47.7</td>
</tr>
<tr>
<td>KA (male)</td>
<td>71.2</td>
<td>62.0</td>
<td>76.8</td>
<td>28.8</td>
<td>38.0</td>
<td>23.2</td>
</tr>
<tr>
<td>T (male)</td>
<td>62.7</td>
<td>67.8</td>
<td>56.8</td>
<td>36.2</td>
<td>32.2</td>
<td>43.2</td>
</tr>
<tr>
<td>KA (male)</td>
<td>49.1</td>
<td>41.6</td>
<td>48.7</td>
<td>51.0</td>
<td>58.4</td>
<td>51.3</td>
</tr>
<tr>
<td>W (male)</td>
<td>36.2</td>
<td>31.0</td>
<td>44.0</td>
<td>63.8</td>
<td>69.0</td>
<td>56.0</td>
</tr>
</tbody>
</table>

* Figures based on a 16 minute sample. In all other cases the sample is 5 min. long
Results of the analyses
Proportion of time spent looking and not looking at q

- Some subjects spent 65% of their *speaking* time at Q
- Or as little as 20% of their speaking time
- Some subjects spent 30% of their *listening* time at Q
- Or over 80% of their listening time
Results of the analyses
mean length of glances

The mean Q-gaze is longer during silence than during speaking.

Q-gaze is longer than A-gaze during silence.

Q-gaze is shorter than A-gaze during speaking.

*Samples were 5-min long.
Results of the analyses
Proportion of time spent looking and not looking at q

THE PATTERN

During listening:

• P → Q with long Q-gazes broken by brief A-gazes

During speaking:

• Q- and A-gazes of more equal length are alternated
• A-gazes are longer than those occurring when listening
Results of the analyses

mutual gaze

### Table 1c

Amount of time spent in mutual-gaze (eye-contact) during five minutes from five two-person conversations

<table>
<thead>
<tr>
<th></th>
<th>Proportion of time occupied by mutual gaze (1/2 sec)</th>
<th>Mean length of mutual gaze (1/2 sec)</th>
<th>Proportion of p’s q-gaze which is mutual with q</th>
<th>Proportion of time occupied by mutual not looking</th>
<th>Mean length of mutual not looking</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB</td>
<td>22.7</td>
<td>2.00</td>
<td>43.2</td>
<td>23.5</td>
<td>2.43</td>
</tr>
<tr>
<td>JS</td>
<td></td>
<td></td>
<td>50.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*JH</td>
<td>35.43</td>
<td>2.80</td>
<td>59.0</td>
<td>10.0</td>
<td>1.59</td>
</tr>
<tr>
<td>*NL</td>
<td></td>
<td></td>
<td>61.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SJ</td>
<td>9.83</td>
<td>1.44</td>
<td>34.4</td>
<td>49.0</td>
<td>3.13</td>
</tr>
<tr>
<td>W</td>
<td></td>
<td></td>
<td>31.3</td>
<td></td>
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<tr>
<td>JS</td>
<td>30.00</td>
<td>1.91</td>
<td>70.0</td>
<td>18.7</td>
<td>1.49</td>
</tr>
<tr>
<td>WJ</td>
<td></td>
<td></td>
<td>43.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TG</td>
<td>11.85</td>
<td>1.73</td>
<td>44.1</td>
<td>39.8</td>
<td>3.32</td>
</tr>
<tr>
<td>VM</td>
<td></td>
<td></td>
<td>26.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Based on a 16 minute sample.

Variation from dyad to dyad

Mutual gaze tends to be short (lasts a bit longer than 1 sec)
Results of the analyses

- each dyad comes to ‘agreement’ whereby each looks at the other for particular length of time;
- nevertheless, for how long at a time one looks at the partner depends on the dyad

**Table 1b**
Mean length of glances for thirteen subjects in seven two-person conversations

<table>
<thead>
<tr>
<th>Subject</th>
<th>Mean length of q-directed gaze (in half-sec)</th>
<th>Mean length of away-gaze (in half-sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overall</td>
<td>During long</td>
</tr>
<tr>
<td>KA (male)</td>
<td>7.04</td>
<td>4.56</td>
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<tr>
<td>T (male)</td>
<td>7.98</td>
<td>7.32</td>
</tr>
<tr>
<td>KA (male)</td>
<td>4.04</td>
<td>3.94</td>
</tr>
<tr>
<td>W (male)</td>
<td>3.04</td>
<td>2.96</td>
</tr>
</tbody>
</table>

- **KA (the same person) shows different Q-gaze behaviour with his two partners (following the pattern of gaze-duration distribution)**
Results of the analyses

How far does the reported variability reflect stable individual differences in how much a person looks or does not look at their interlocutor?

Received results may suggest:

• Gaze-length is dyad-specific?

• Depend on stable individual characteristics of the subject?
Results of the analyses
direction of gaze in relation to utterance occurrence

• Source of variability in the amount P looks at the partner is the amount that he speaks

• P’s looking behaviour when speaking vs. gaze when listening

  ➢ during silence P → at Q in long gazes;

  ➢ during speaking P alternates between A-gazes and Q-gazes more equal in length
Results of the analyses
direction of gaze in relation to utterance occurrence

How gaze direction changes when P begins/ends a long utterance?

**Long utterances**
- require silence of the interlocutor
- planning phase
- last 5 or more seconds

**Short utterances**
- ‘emotive’ or relational utterances
- Immediate reactions to interlocutor’s behaviour
- no planning phase
- in lexical terms – old and well-established speech habits
Results of the analyses
direction of gaze in relation to utterance occurrence

<table>
<thead>
<tr>
<th>NL SPEECH</th>
<th>EYES</th>
<th>BROWS</th>
<th>MOUTH</th>
<th>HEAD GAZE</th>
<th>GAZE HEAD</th>
<th>MOUTH BROWS EYES</th>
<th>JH SPEECH</th>
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<td>352</td>
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<td>away and</td>
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<td>O</td>
<td>O</td>
<td>O</td>
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<td>O</td>
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<td>the</td>
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<td>O</td>
<td>O</td>
<td>O</td>
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<td>O</td>
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<td>other one</td>
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<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
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<tr>
<td>feed them</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

Fig. 1. Partial extract from the film-transcript showing a long utterance exchange.
Results of the analyses
direction of gaze in relation to utterance occurrence

• generally, there is some change in subject’s behaviour before he starts to speak

• the interlocutor that is finishing the utterance gives his colleague a steady look and changes his head position

• such changes allow each participant to anticipate how the other would deal with the change of speaker role

there is a clear pattern of changes in direction of gaze
Results of the analyses
direction of gaze in relation to utterance occurrence
Results of the analyses
direction of gaze in relation to utterance occurrence

The frequency % of Q-gaze for each half-second:

- P looks away when he begins a long utterance.
- P looks up at the interlocutor as the end approaches.
Results of the analyses

direction of gaze in relation to utterance occurrence

<table>
<thead>
<tr>
<th></th>
<th>Number of utterances beginning with a-gaze</th>
<th>Number of utterance beginnings</th>
<th>Number of utterances ending with q-gaze</th>
<th>Number of utterance endings</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB</td>
<td>3</td>
<td>10</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>JS</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>JH</td>
<td>8</td>
<td>10</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>NL</td>
<td>15</td>
<td>12</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>SJ</td>
<td>8</td>
<td>8</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>W</td>
<td>2</td>
<td>6</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>WJ</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>JS</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>TG</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>VM</td>
<td>8</td>
<td>8</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>KA</td>
<td>5</td>
<td>7</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>T</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>KA</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>TRW</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>73</strong></td>
<td><strong>95</strong></td>
<td><strong>72</strong></td>
<td><strong>97</strong></td>
</tr>
</tbody>
</table>
Results of the analyses
direction of gaze in relation to utterance occurrence

Suggested explanation of the pattern:

• **A-gaze at the beginning of a long utterance**
  - P is shutting out one important source of input from the interlocutor
  - withdrawing his attention from him to concentrate on the planning of his speech

• **Q-gaze at the end of a long utterance**
  - P is approaching a choice point = seeks info about the interlocutor
Alternative explanation of the pattern:

- A-gaze and Q-gaze are regular occurrences functioning as signals to P’s interlocutor, marking points of significant change in his stream of behaviour.

These signals may be exploited by P to regulate Q’s behaviour:

- Looking away at the beginning = forestalling any response from Q.
- Looking up = Q is giving P his attention but he sees that P is ceasing to talk; P is ‘offering the floor’ to Q.
Results of the analyses
direction of gaze during long utterances

So far:

- P tends to look at Q more while listening than when speaking
- Q-glances during speech tend to be shorter than those during listening

Is there any connection between the structure of P’s speech and where he is looking during its production?
Results of the analyses
direction of gaze during long utterances

Speed of speech and direction of gaze

- Long utterances require planning => P looks away as he can’t monitor Q’s behaviour and plan his speech simultaneously
- Hesitations = lag between the organisational process and actual verbal output
- Fluent speech = production of well-organised/ pre-learned phrases

Kendon’s hypothesis:

P is unlikely to look at Q during the periods of speech organisation (=hesitant speech)
Results of the analyses
direction of gaze during long utterances

<table>
<thead>
<tr>
<th>Subject</th>
<th>Mean speech rate while looking in syllables per half-second</th>
<th>Mean speech rate while not looking in syllables per half-second</th>
<th>Number of stretches of continuous speech where speech rate was faster while looking than while not looking</th>
<th>Number of stretches of continuous speech where speech rate was slower while looking than while not looking</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB</td>
<td>2.4</td>
<td>2.1</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>JS</td>
<td>2.6</td>
<td>2.0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>JH</td>
<td>2.3</td>
<td>1.7</td>
<td>14</td>
<td>4</td>
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<td>NL</td>
<td>2.3</td>
<td>1.9</td>
<td>16</td>
<td>10</td>
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<tr>
<td>SJ</td>
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<td>2.3</td>
<td>9</td>
<td>4</td>
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<tr>
<td>W</td>
<td>2.4</td>
<td>2.0</td>
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<td>0</td>
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<tr>
<td>JS</td>
<td>2.7</td>
<td>2.2</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>WJ</td>
<td>2.8</td>
<td>2.4</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Overall mean</td>
<td>2.5</td>
<td>2.03</td>
<td>57</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(72.8%)</td>
<td>(26.2%)</td>
</tr>
</tbody>
</table>

* The dyads TG/VM, KA/TRW and KA/T have been omitted because they did not offer a sufficient number of long stretches of continuous speech for comparison.

Rate of speech production (syllables/half-sec) during A-gaze & Q-gaze
Results of the analyses
direction of gaze during long utterances

Fluent speech, hesitant speech and pausing, and
direction of gaze

• *Utterance* = series of phrases (complete grammatical units), separated by phrase boundary pause.

• *Variation of fluency within*: breaks in word production, hesitation noise, repetitions = hesitant speech

Current analysis distinguishes hesitant speech, fluent speech, phrase beginning, ending and pausing.
Results of the analyses
direction of gaze during long utterances

Fluent speech, hesitant speech and pausing, and

<table>
<thead>
<tr>
<th>Table 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction of gaze and its association with certain aspects of the structure of long utterances</td>
</tr>
<tr>
<td>RB</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>227</td>
</tr>
<tr>
<td>117</td>
</tr>
<tr>
<td>51.5</td>
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<td></td>
</tr>
<tr>
<td>74</td>
</tr>
<tr>
<td>21</td>
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<td>23.4</td>
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<td>34</td>
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<td>31.0</td>
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<td>20</td>
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<tr>
<td>7</td>
</tr>
<tr>
<td>35.0</td>
</tr>
</tbody>
</table>

50% vs 20.3%

63.5% vs 46%
Results of the analyses

Typical pattern of gaze-direction with the occurrence of ph-boundary

- 2 subjects
- 16min conversation
- sharp differences in P’s distribution of Q-gaze

Fig. 3. Frequency of q-directed gazes in association with phrase boundary pauses (upper figure) and within phrase hesitations (lower figure) for two individuals. Total sample: 48 phrase boundary pauses and 43 hesitation pauses.
Results of the analyses
direction of gaze during long utterances

Fluent speech, hesitant speech and pausing, and
direction of gaze
Gaze direction regulates speakers’ behaviour:

• when P withdraws his gaze, he can concentrate on utterance organisation

• also, he signals the intention ‘to hold the floor’

• when looking up he can check on the interlocutor’s reaction on what has been said and signal to him that he is looking for some feedback
Results of the analyses
direction of gaze during long utterances

Gaze direction in relation to the occurrence of short utterances

Short utterances are simple content-wise; they include:

1. accompaniment signals
2. exclamations
3. attempted interruptions
4. short answers/questions
Gaze direction in relation to the occurrence of short utterances

Accompaniment signals:

- the attention signal proper (P signals Q that he’s attending and following the thread)

- ‘point granting’ or assenting signal (P develops an argument, presenting a series of points for which he asks Q’s agreement; lexical “yes quite”, “surely”, “I see”)
Results of the analyses
direction of gaze during long utterances

Gaze direction in relation to the occurrence of short utterances

➤ When P produces an attention signal – Q-gaze
➤ When producing an agreement signal – A-gaze (briefly dropping the eye-lids)

Table 8
Short utterances and gaze-direction

<table>
<thead>
<tr>
<th>Type of utterance</th>
<th>Number associated with $q$-gaze</th>
<th>Number associated with $a$-gaze</th>
<th>Sign test (two-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accompaniment signals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Attention signals</td>
<td>37</td>
<td>16</td>
<td>$p &gt; 0.05$</td>
</tr>
<tr>
<td>(b) Agreement signals</td>
<td>2</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
**Results of the analyses**

Direction of gaze during long utterances

Gaze direction in relation to the occurrence of short utterances

Exclamations and laughter

---

**Table 8**

<table>
<thead>
<tr>
<th>Type of utterance</th>
<th>Number associated with $q$-gaze</th>
<th>Number associated with $a$-gaze</th>
<th>Sign test (two-tailed)</th>
</tr>
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<tbody>
<tr>
<td><strong>Accompaniment signals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Attention signals</td>
<td>37</td>
<td>16</td>
<td>$p &lt; .002$</td>
</tr>
<tr>
<td>(b) Assenting signals</td>
<td>2</td>
<td>25</td>
<td>$p &lt; .0005$</td>
</tr>
<tr>
<td><strong>Short questions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laughter</td>
<td>31</td>
<td>10</td>
<td>$p &lt; .04$</td>
</tr>
<tr>
<td><strong>Exclamatory utterances</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive exclamations</td>
<td>10</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>(surprise, delight, joy, increased interest)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative exclamations</td>
<td>1</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>(horror, disgust, sadness, disagreement, embarrassment)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

marked/prolonged changes in head position & change of facial expression
Results of the analyses
direction of gaze during long utterances

Gaze direction in relation to the occurrence of short utterances

Attempted interruptions and short questions

- P looks at Q when asking his question
- A-gaze – in case the question is asked hesitantly (and it’s been shown that P looks away during hesitant speech); also, cutting down the emotionality
Results of the analyses
mutual gaze and emotional arousal

“..though the watcher has the advantage over the watched, if the watched can also watch the watcher, the two become equal to one another.”

• The mutual gaze is the integral part, the indicator that each is still taking into account of the other.
• Extended mutual gaze indicates the intensification of the direct relations between the participants.

Amount of looking can serve to regulate the level of shared emotional arousal (based on 1 16-min sample only)
Results of the analyses
mutual gaze and emotional arousal

Indicator of the level of emotionality – smiling

Smiling is a symmetrically reciprocated response, which means both participants are likely to be emotionally aroused to roughly the same degree

Intensity scaled to 3 points: slight/definite/extreme

We’re interested in the amount of time P and Q
Results of the analyses
mutual gaze and emotional arousal

Fig. 4a. Mean level of smiling, proportion of time spent in mutual gaze, and proportion of time spent by p in looking at q, for successive 25 second intervals. First sample from the first seven minutes of a conversation.

Fig. 4b. Mean level of smiling, proportion of time spent in mutual gaze, and proportion of time spent by p in looking at q, for successive 25 second intervals. Second sample taken twenty minutes later.
The more smiling there is, the less amount of time is spent in mutual gaze.

There is a limit to the level of acceptable emotionality.

Once the limit is reached, there is a need for some mechanism to lower the excitement $=>$ A-gaze.
Discussion

• The results demonstrated that the direction of gaze changes regularly, and there are observable patterns

• Individual’s perceptual activity in interaction functions in two ways:
  • by looking/not P controls the degree at which he monitors Q, i.e. monitoring function of gaze
  • P can seek to control Q’s behaviour, i.e. regulatory and expressive function
Monitoring gaze function:

Data demonstrated that P places his Q-gazes when he may well be expected to be looking for feedback from interlocutor, which would tailor his subsequent behaviour

⇒ Q-gazes at the end of long utterances
⇒ P looks for guidance
⇒ P checks whether Q is still attending

But there were differences between the subjects in the amount of time spent looking;

“are individual differences stable”
“are some people more dependent on visual info in interaction”
“are women more field-dependent than men”
Discussion

Regulatory and expressive gaze function:

Before starting a long utterance, P looks away to signal Q that he is about to speak; P’s stable Q-gaze at the end of the utterance indicates that he is about to finish his cue

⇒ “floor-appointment” function

⇒ confirmation the ideas are coming across

⇒ forestalling Q’s response by not looking at him

⇒ A-gaze at the points of high emotion as a cut-off act

⇒ Q’s short aversion of gaze as ‘point-granting’, i.e. not challenging P
Discussion

Mutual gaze and significance of the Look:

The amount of gaze depends on how much only one of the subjects is looking

The one who used A-gaze was showing that his emotional level reached the permitted limit ("eye-contact is arousing")

Look:
• affiliation
• challenge
• effectiveness in communication: P is seeking eye-contact to verify that P is affecting Q in some way = progress
Coordination of Gaze and Speech in Communication Between Children With Hearing Impairment and Normal-Hearing Peers

Olof Sandgren et al


Reading through the decades: Influential papers in Psycholinguistics
November 20, 2015 presented by Alena Vasilevich
Introduction

• Interaction consists of more than the verbal exchanges that make up the sound stream (gaze to partner)
• Sandgren et al. demonstrated that NH children displayed increased p of gaze-to-partner when asking questions vs. statements
• => linguistic & pragmatic content influences gaze behaviour
Introduction

Hypothesis:
Children with HI gaze more to the partner than NH peers during various verbal events (questions/statements/back-channeling/silence) in a referential communication task
Background

Gaze in typical populations:
- Listeners look more at the speakers that vice versa (Kendon 1967)

- Turkstra et al. 2003 (“interactive behaviours in adolescents”): 65% of Q-gaze when listening vs. 40% speaking
- Kendon 1967: 30-80% vs. 20-65%
- Great variation due to technical limitations
Background

Gaze in typical populations:

- Kendon: lower Q-gaze at the start of utterances and higher at the end (suggested gaze-turn-taking link)
- Cummins 2012: gaze not just regulates turn-taking, it creates short windows for back-channeling
- Turkstra 2005: atypical gaze can cause “negative outcomes” – missing cues and misperceiving emotional communication
Background

Gaze in atypical populations:

- Gaze is affected by ASDs (lower rate to Q-gaze; distorted timing of gazing)
- Williams syndrome (atypically high gaze levels)
- Nadig et. al (2010): children with ASD speaking about personal interest exhibited more atypical verbal production but typical gaze (highly practiced topic = available cognitive resources, directed to partner as Q-gaze); cognitive load -> aversion of gaze
Present study

• Increased use of visual cues as compensatory strategy, aiding speech processing of HI children (degraded auditory input, restriction to use incidental hearing for learning)

• Skelt 2006: gaze initiation and withdrawal controlled turn exchanges of HI adults

• HI students are less prone to ask clarifying questions despite misunderstanding; difficulties in turn-taking
Present study

• Data on middle childhood

“HI children would consistently exhibit higher probability of gaze-to-partner than NH group, possibly using gaze-to-partner as a compensatory strategy”
Present study

- HI-NH dyads (7 female, 13 male; mean age 12.4)
- 10 participants – documented bilateral mild-to-moderate HI
- Age of HI identification = 3.7 years
- Age of amplification = 5.2 years
- Oral-speaking families and educational settings
- No speech impairment, no formal training in sign language
- Another 10 participants (4 female, 6 male) – NH
- Max 1 year in age difference; partners brought by HI children
- NH-NH dyads (10 female, 10 male) – control group, matching age
- No difference in receptive grammar
Present study

Materials and procedure

– Experimental task: unscripted referential communication
– A screen displaying 16 pictures of faces, visible to the speaker only
– 24 pictures of faces, visible to the listener
– Task: identify the face the speaker is talking about & place it in the correct position
– Focus on the process of task resolution, not result

– Eye-tracking system
– Video of forward-facing camera (25 frames/sec)
– Real-life-like conversational condition (eye-contact; visual cues)
– Quiet room
Present study

Materials and procedure

- ELAN to annotate audio-video data
- Speech was categorised in 4 groups of verbal events
- Annotation of verbal and eye-movements

<table>
<thead>
<tr>
<th>Verbal event type</th>
<th>Description</th>
<th>Example</th>
<th>n (HI)</th>
<th>n (NH)</th>
</tr>
</thead>
</table>
| Requests          | Questions   | “Has she got blue eyes?”\textsuperscript{a}  
“Did you say she had blue eyes?”\textsuperscript{b}  
“What color are her eyes?”\textsuperscript{c}  
“He looks a bit like your dad.”  
“Uh-huh.” “Mhm.” | 288 (194)\textsuperscript{a} (54)\textsuperscript{b} (40)\textsuperscript{c}  
254 (182)\textsuperscript{a} (57)\textsuperscript{b} (15)\textsuperscript{c} |
| Nonrequests       | Statements  |         | 176    | 309    |
| Back channeling   | Feedback    |         | 269    | 165    |
| Silence           | Partner speaking | | 745    | 740    |
| Total             |             |         | 1,478  | 1,468  |

Note. \( n \) shows number of verbal events of each type.

\( ^a \) Request for confirmation of new information. \( ^b \) Request for confirmation of old information. \( ^c \) Request for elaboration.
Present study

Data analysis
- 2,946 verbal events
- Q-gaze = dependent variable; scored on 10-ms intervals
- 3000-ms time window
Present study

Raw data examination

Figure 2. Mean probability of gaze-to-partner during requests (solid line) and nonrequests (dotted line) for participants with NH (upper panel, n = 10) and participants with HI (lower panel, n = 10). The horizontal axis shows time, with 0 ms marking the onset of the verbal event.
Present study

Survival function
- Data fitted to a Kaplan-Meier survival analysis:
  - estimate the event time from beginning of measurements to occurrence of gaze-to-partner for the verbal events
  - display the estimate as a cumulative survival

HI showed lower survival rates (figures on next two slides) for all verbal events
Present study

Figure 3. Kaplan-Meier estimates of survival probabilities during requests (left panel) and nonrequests (right panel) for participants with HI (solid line) and participants with NH (dotted line). The horizontal axis shows time, with 0 ms marking the onset of the verbal event. Data labels present censored data.
Present study

Figure 4. Kaplan-Meier estimates of survival probabilities during back channeling (left panel) and silence (right panel) for participants with HI (solid line) and participants with NH (dotted line). The horizontal axis shows time, with 0 ms marking the onset of the verbal event. Data labels present censored data.
Discussion

- increased probability of concurrent gaze-to-partner during verbal events for HI compared to NH
- Kaplan-Meier survival showed significantly reduced rates for HI, i.e. there is a higher tendency to gaze in association with all verbal requests
Discussion

• The results support the presented hypothesis:
  HI participants do gaze more to their partner than NH ones
• HI display significantly lower survival distribution

Points to consider:

➢ Task-dependent features can influence gaze behaviour (lab setting may have caused longer gaze than it could be the case)
➢ Higher probability of Q-gaze as a way to compensate for the degraded auditory signal
Comments? Questions?

Thank you