Introduction
Understanding others’ intentions in communication is both: a developmental milestone and an everyday event
• For children, direct comm. acts are easier to understand than indirect communicative acts as evidenced by behavioral measures\(^1,2,3\) – but no studies about processing demands
• In adults, indirect communication has higher processing demands (larger amplitudes in ERPs or wider pupil dilation)\(^4,5,6,7\)

Research question
Q: Are there differences in the processing demands of direct vs indirect communication and if yes, when do they occur?
• H1: Differences occur in accuracy: children choose more correctly when hearing direct comm.\(^1,2,3\)
• H2: Differences occur in reaction times: children choose faster when hearing direct comm.\(^8,9,10,11,12\)
• H3: Differences occur during processing: children show wider pupil dilation during/after hearing indirect communicative acts?

Methods – Communication task\(^13\) (8 trials)

context
(baseball the dog)
baseline still frame
puppets’ utterance:
• indirect communication (e.g., I have a carrot)
• direct communication (e.g., I want the rabbit)
post-utterance still frame
object choice (pressing a button corresponding to object on screen)
post-choice still frame
play sequence (puppets are performing an action)

Results

Children’s reaction times by age and condition

<table>
<thead>
<tr>
<th>Indirect comm.</th>
<th>Direct comm.</th>
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<tbody>
<tr>
<td>3yo</td>
<td>5yo</td>
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<tr>
<td>Mean fixation times (in ms)</td>
<td>FIX: 12.9 DLS: 27</td>
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<tr>
<td>FIX: 8.1 DLS: 10</td>
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<tr>
<td>FIX: 6.4 DLS: 39</td>
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</tbody>
</table>

Change in pupil dilation during utterance stimulus

direct comm. indirect comm.

3yo 0.20 (0.15) 0.23 (0.13)

5yo 0.35 (0.13) 0.26 (0.16)

Children’s mean pupil dilation difference between baseline and post-utterance (in mm, SD in brackets).

• no effect for comm. (F(1)=7.33, p=.02, n\(^2\)=.09)
• 5-year-olds > 3-year-olds (F(1)=4.995, p=.004, n\(^2\)=.097)
• no effect for comm. (F(1)=.02, p=.912, n\(^2\)=.000)
• 5yo > 3yo (F(1)=1.065, p=.002, n\(^2\)=.111)

• 1st fixation at chance
• Reaction times: effects for mode of comm., age & comm.*age interaction (all p's <.025)
• Differential looking score\(^15\), effect for comm. (F(1)=16.528, p<.001, n\(^2\)=.148)
• Effects for mode of comm., age & comm.*age interaction (all p's <.002)
• 5yo > 3yo (F(1)=7.517, p<.007, n\(^2\)=.069)

Discussion
➢ Basal processing seems similar but indirect communication elicits a more elaborate object choice?
• Perhaps children compare the utterance with the choice options ➔ match in direct communication condition / mismatch in indirect communication condition
• Explicit reasoning about intentions in indirect communication after having understood the intention intuitively\(^6\)
• Implicit understanding vs explicit behavior\(^6\)
• Differences in processing depth?
• Syo seem to process utterance more deeply right after hearing ➔ faster look to intended object, less fixations, faster reaction times, more correct choice

References