Contextual inferences through variable exemplars: An artificial adjective learning study

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Gradable Adjectives

- **Relative** Gradable Adjectives (big, light, fun...)
- **Absolute** Gradable Adjectives (full, spotted, straight, flat... Kennedy & McNally, 2005)
- Adults have very abstract concepts: “Full” = “containing the maximal amount without spilling over”

How do we come to understand the abstract meaning of “full”? 
Syrett et al. (2010)

What do adults and children know about absolute gradable adjectives?

• 30 children (3-5 years old) and 24 adults

• They are asked to help a puppet “learn how to ask for things”
  • Their job was to determine if they could give the puppet what he asked for, and if they could not, tell him why not.

• “Please give me the X one”
Syrett et al. (2010)

What do adults and children know about absolute gradable adjectives?

Give me the sad one.
Syrett et al. (2010)

What do adults and children know about absolute gradable adjectives?

Give me the full one.
Syrett et al. (2010)

What do adults and children know about absolute gradable adjectives?
Give me the full one.
Syrett et al. (2010): "Full" Responses

<table>
<thead>
<tr>
<th></th>
<th>3 year olds</th>
<th>4 year olds</th>
<th>5 year olds</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fuller</td>
<td>Neither</td>
<td>Fuller</td>
<td>Neither</td>
</tr>
<tr>
<td>Unambiguous</td>
<td>100%</td>
<td>0</td>
<td>100%</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>96%</td>
<td>4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambiguous</td>
<td>60%</td>
<td>40%</td>
<td>70%</td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td>12%</td>
<td>88%</td>
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</table>
Three Possibilities

1. Representations are the same between kids and adults, but task demands cause differences in behavior

2. **Prototype-based learning:** Change in representation of “full” through development, based on prototypical exemplars

3. **Explanatory-based learning:** Changes in representation, based on contextual information
Possibility: Prototype-based Learning

INTENDED MEANING

“Full” =

EXEMPLARS

Learners first hypothesize “full” = “sufficient amount of content”
Possibility: Explanatory-based Learning

"Full" = INTENDED MEANING

Learners attribute variability to context, taking into account speaker intention and environment.

"Full" if you’re baking a recipe

"Full" if you’re moving tables
Question

Do learners use contextual explanations to explain away visual variability when learning absolute gradable adjectives?

We explore this question in:

1. Adults
2. Children (4-7 year olds)
Experiment 1

• Task: Teach adult English speakers (n=79, Turkers) a novel gradable adjective *pelty* = “tight-fitting” (Choi et al., 1999)

• Training (24 items):
  • With-Context: Contextual justifications
  • Without-Context: Irrelevant information

• Test (4 trials):
  • Modeled after SyreK et al. (2010)
  • “Select the pelty one.”
**Experiment 1**

<table>
<thead>
<tr>
<th>Test Trials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. With-Context</td>
</tr>
<tr>
<td>2. Without-Context</td>
</tr>
<tr>
<td>3. Neither</td>
</tr>
</tbody>
</table>

"I'm running a marathon and don't want to worry about my shoes falling off. This shoe is pety.

"I wanted to wear this shoe with my socks. This shoe is not pety.

"This is my favorite shoe. This shoe is pety."
Predictions

• If *pelty* was understood as an absolute gradable adjective, then we predict:
  • ”Tighter” responses in Unambiguous Trials
  • *Neither responses in Ambiguous Trials*
**Predictions**

- Prototype-based learning: no effect of context in responses

<table>
<thead>
<tr>
<th>Trial</th>
<th>Unambiguous</th>
<th>Ambiguous</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With-Context</td>
<td>Without-Context</td>
</tr>
<tr>
<td></td>
<td>Tighter</td>
<td>Not tighter</td>
</tr>
<tr>
<td></td>
<td>Unambiguous</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Neither</td>
<td></td>
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</tbody>
</table>
Predictions

- Prototype-based learning: no effect of context in responses
- Explanatory-based learning: effect of context (reflected in Neither responses)

<table>
<thead>
<tr>
<th>Trial</th>
<th>Unambiguous</th>
<th>Ambiguous</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unambiguous</td>
<td>Ambiguous</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>17</td>
</tr>
</tbody>
</table>

Proportion

- With-Context
  - Tighter
  - Not tighter
  - Neither

- Without-Context
  - Tighter
  - Not tighter
  - Neither
Results

Unambiguous

Ambiguous

Proportion of responses at Test

With-Context

Trial

Response
- Tighter
- Not tighter
- Neither
Results

• Listeners were able to deduce a meaning with a maximal standard when given contextual information

• Explaining away variance in exemplars: attributing to speaker intention

• Allows for deduction of a meaning that can be generalized to broader range of exemplars

• Evidence for **Explanatory-based learning**
Question

Do learners use contextual explanations to explain away visual variability when learning absolute gradable adjectives?

We explore this question in:

1. Adults → Can infer a maximum standard ✔
2. Children (4-7 year olds)
Experiment 2

• Conceptual replication of Experiment 1 with 4-7 year olds (n=49)

• Training (12 trials):
  • With-Context: Contextual justifications
  • 2AFC task

• Practice (3 trials):
  • 3AFC task

• Test (4 trials):
  • Modeled after Syrett et al. (2010)
  • “Select the pelty one.”
Experiment 2

Which bracelet should she choose?
Choose the yellow bus.
Results

Unambiguous

Ambiguous

Experiment 1: Adults

Experiment 2: Kids

Proportion

Response

Tighter
Not tighter
Neither

Trial

Unambiguous Ambiguous

Unambiguous Ambiguous
Experiment 1 and 2: Difference between adults and children

• Representations of *pelly* may be the same between adults and kids, but **task difficulty** may have caused a difference

• Representation
  • Children may have difficulty making contextual inferences

![Bar chart showing proportion of correct responses for different trial counts.](chart.png)
Conclusions

• Adults that have contextual explanations are able to
  1. Explain away visual variability based on context
  2. Extrapolate a maximum standard of comparison with a small number of exemplars

• Difference in comprehension of *pelty* between kids and adults
  • Ability to make contextual inferences may affect ability to infer abstract word meanings
Thank you!

Also thanks to: Amanda Pogue, Mike Tanenhaus, T. Florian Jaeger, Kinder Lab RAs, Experimental, Semantics, and Pragmatics group at UR
CHILDES: Use of “full”

• Providence (1-4yo)
  • Not commonly heard: average .04% of all tokens
  • “That is one full belly”
  • “Mommy is full of yawns”
  • “He found to his surprise that the bath was so full of water, it was starting to run over the side”

• Gleason (4-5yo)
  • Average .0004% of all tokens
  • “Don’t talk with your mouth full”
By trial

Unambiguous

Ambiguous
Experiment 3

Unambiguous

Ambiguous

<table>
<thead>
<tr>
<th>With-Context</th>
<th>Without-Context</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Response</strong></td>
<td><strong>Tighter</strong></td>
</tr>
<tr>
<td><strong>Unambiguous</strong></td>
<td>0.75</td>
</tr>
<tr>
<td><strong>Ambiguous</strong></td>
<td>0.50</td>
</tr>
</tbody>
</table>

Proportion

Trial
Experiment 4

Unambiguous

Ambiguous

![Graph showing response proportions for unambiguous and ambiguous trials.]

- **Response**: Tighter, Not tighter, Neither
- **Proportion**: X-axis: Unambiguous, Ambiguous
- **Y-axis**: Proportion

Response categories include:
- **Tighter**
- **Nottighter**
- **Neither**