The Acquisition of Temporal Connectives in Hungarian Children

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Plan

1. Hypothesis
2. Theoretical background in support of hypothesis
3. Experiment
4. Discussion
• Hypothesis: Acquisition of Hungarian ($mi-/az$-) előtt `before’ follows acquisition of ($mi-/az$-) után `after’ and other temporal connectives. (Contra Clark (1971), in line with Stevenson and Pollitt (1987).)

• Reason: the semantics of Before. In modeltheoretic semantics, Before corresponds to an operator whose second argument (the temporal clause) has a modal/counterfactual dimension. In addition (/therefore) Before is not optimally suited for temporal anaphora.
Modeltheoretic semantics: temporal connectives are functors with two arguments.
First argument: supplied by the main clause.
Second argument: supplied by the subordinate (temporal) clause.
Here: retrospective versions of connectives (Anscombe (1964), Landman (1991)).

(1) a. Before: $\varphi B \psi$
b. After: $\psi A \varphi$

(2) $\psi A \varphi$ is true at time $t$ iff there is a time $t_\psi$ preceding $t$
s.t. $\psi$ is true at $t_\psi$, and there is a time $t_\varphi$ at which $\varphi$ is true, and $t_\psi$ follows $t_\varphi$.

In prose: a sentence of the form $\psi After \varphi$ is true (at $t$), iff there exist times that make each clause true, and the time at which the main clause is true ($t_\psi$) follows the time at which the temporal clause is true ($t_\varphi$).

(3) $t_\varphi < t_\psi < t$
Before, first attempt, as the converse of After:

(4) \( \varphi B \psi \) is true at time \( t \) iff there is a time \( t_\varphi \) (preceding \( t \)) at which \( \varphi \) is true, and there is a time \( t_\psi \) at which \( \psi \) is true, and \( t_\varphi \) precedes \( t_\psi \).

(5) \( t_\varphi \prec t_\psi \prec t \)
Before is not the converse of After

Anscombe (1964):

(6) a. Max died **before** he saw his grandchildren
b. ???Max saw his grandchildren **after** he died

⇒ Before is non-veridical in its second argument, the argument provided by the subordinate clause. (**After**, on the other hand, is veridical.)
Beaver and Condoravdi (2003):

(7)  
  a. The police defused the bomb before it exploded.  
  b. If the police hadn’t defused the bomb, it would have exploded.
Hungarian complications (i) : Irrealis

(8) Max meghalt, **mielőtt** láttá **volna** az
    Max PRT-died, what-before saw COND the
    unokáját
    grandchild-POSS.3SG-ACC
    ‘Max died before he saw/could see his grandchildren’
    Lit.: ‘Max died before he would have seen his
    grandchildren’
(9) a. **Every** student who knows **anything** about Sanskrit was present.

b. ???

Every student of mine knows **anything** about Sanskrit.

(10) a. They left the country **before** **anything** happened

b. ???

They went **anywhere** **before** they graduated

(11) a. ???

**Anything** happened **after** they left the country

b. ???

They graduated **after** they went **anywhere**

⇒ Before licenses NPIs in its second argument (unlike After).
⇒ Before (but not After) corresponds to a functor which is downward monotone in its second argument. (The Fauconnier—Ladusaw generalisation, Ladusaw (1979)).
Hungarian complications (ii) — information structure (≈ given/new information) — not exclusive of előtt ‘before’, and not exclusive of Hungarian (e.g. de Swart (1999)). Surface form considerably more complex in Hungarian, however (L. Pintér’s talk!).

(12)   a. Mari fogat mosott, mielőtt iskolába ment  
‘Mary washed her teeth before she left for school’    
— Simple sequence

   b. Mari az előtt mosott fogat, mielőtt iskolába ment  
‘It was before she left for school that Mary washed her teeth’  
— Answers ‘When did Mary brush her teeth?’

   c. Mielőtt Mari iskolába ment, fogat mosott  
‘Before she left for school, Mary washed her teeth’  
— Answers ‘What did Mary do before she left for school?’
Anscombe (1964) (see also Landman (1991)):

(13)  

a. After: \( \exists t. [\varphi(t) \land \exists t'. [t' \prec t \land \psi(t')]] \)

b. Before: \( \exists t. [\varphi(t) \land \forall t'. [\psi(t') \rightarrow t \prec t']] \)

Universal quantifier in the entry of Before: explains non-veridicality and the licensing of NPIs. In prose: there is a time \( t_\varphi \) at which the main clause was true, and all times at which the subordinate clause may be true are preceded by \( t \). Not guaranteed that there are in fact such times that verify the truth of the subordinate clause.
Temporal anaphora: incremental building of discourse representation includes the construction of a web of temporal relations. (DRT, Kamp and Reyle (1993).) Precondition: accessible temporal discourse referents that can be related to other temporal discourse referents. Not shown here: REFERENCE TIMES.

(14) a. Yesterday\(t_Y\) the bunny got up \(t_1\) and brushed her teeth \(t_2\). Then she had breakfast \(t_3\), and washed her teeth again \(t_4\). Her mother praised her for it \(t_5\). After that she left for school \(t_6\).

b. Within the interval \(t_Y, t_1 < t_2 < \ldots < t_6\).

- English Simple Past: \((ET = RT) \prec ST\);
- English Present Perfect: \(ET \prec (RT = ST)\);
- RT can be supplied by time adverbials (e.g.)

Temporal Anaphora: with the mediation of reference times.

Hinrichs (1986), Partee (1984): RT like a floating point that gets updated as discourse proceeds.

- Telic sentences (in narratives) carry RT forward.
- Statives, processes INCLUDE RT, no linear order.
Before and Temporal Anaphora

Partee (1984) (inspired by Hinrichs): temporal clauses anchor the main clause by providing a reference time against which the main clause is evaluated. Even veridical uses of Before fail to provide a useful reference time, as opposed to After or When.
From Partee (1984), examples and analysis:

(15)  a. Mary turned the corner. After she crossed the street, John saw her. She hurried into a store.

       b. \[
           r_0 \quad r_2 \quad r_3 \\
           e_{turn} \preceq r_1 \preceq e_{cross} \prec e_{see} \preceq e_{hurry} \preceq r_4
           \]

(16)  a. Mary turned the corner. Before John saw her, she crossed the street. She hurried into a store.

       b. \[
           r_0 \quad r_2 \quad r_3 \\
           e_{turn} \preceq r_1 \preceq e_{cross} \preceq e_{hurry} \preceq r_4 \\
           \prec e_{see}
           \]
Hinrichs, Partee: *Before*-clauses (even when they are true) do not provide a suitable reference time. The *Before*-clause is ‘outside’ the main course of events.

Inspiration for acquisition studies, for e.g. Stevenson and Pollitt (1987), Sellar (1999–2000).
Hungarian children

Experiment: spinoff of comparison of spatial/temporal reasoning in children (Vera Harmati-Pap’s poster). Assumed: stage model (aspect ≺ deictic tense ≺ connectives and the rest, cf. e.g. van Geenhoven (2006) and references cited there).

- 45 children
- of age 3;6 – 7;5 (m = 5;4).

3× 3 picture-sequences, each picture depicting an everyday event familiar to children (getting up, having breakfast, washing, ...). Sequences could be understood in a ‘natural’ temporal order (breakfast follows getting up, e.g.)
Introduction: ‘We are going to see what a kitty does in the afternoon.’

3 questions after each sequence, elicited production and forced choice:

(17) a. When did the kitty wash his hands? Before or after he ate?
b. When did he wash his teeth?
Results with Before

1. Reduced frequency.
2. Exchanged for another connective.
3. The invention of a new event that stood in the ‘right’ temporal relation with the queried event.
(18)  
a. Q: When did the kitty wash his hands? (Picture One)  
b. Expected answer: Before he ate.  
c. ‘Reversed’ answer: After he ate.  
d. Inventive answer: After he got up in the morning. (No such picture.)  
e. ‘Out of context’ answer: When his hands get dirty.
Results in detail

The rate of correct use of Before (orange) and After (blue):

No strong correlation. \( \chi^2(3) = 23.52, p < 0.001. \)
Mix-ups

- Using *After* (blue) instead of *Before* (orange): 31% (of the entire group).
  \[ r = 0.30 \] (positive correlation; age × mix-ups).
- Using *Before* instead of *After*: 13% (of the entire group).
  \[ r = -0.09 \] (no correlation; age × mix-ups).
- \( \chi^2(3) = 16.35, p < 0.001 \).
56% of all children replaced *Before* with *After*, including those who invented an additional event.
17% of all children added an extra event (preceding the events in the pictures). Used *When* or *After* (but not *Before*).
• Hungarian children tended to use After (or When) instead of Before.
• Strategy$_1$: Reversing the order of events depicted in the pictures, producing ‘incorrect’ answers.
• Strategy$_2$: Inventing an event preceding the queried event, so they could correctly use After or When.

Why?
Results have shown that (these) Hungarian children acquire *Before* later than *After* (and *When*).

Experimenter’s questions view a sequence of events from a more ‘abstract’ or ‘bird’s eye view’ perspective, stepping away a bit from the tight narrative that the original sequences suggested.

One kind of response: disregard for the (episodic) sequence of events depicted in the pictures. (‘The kitty washes his hands when they get dirty.’)

Responses that counted: children remained within the confines of the narrative sequence. *Before*-clauses are not optimally suited for linear narratives, and children tended to disregard them even when they were asked to talk about the pictures in a non-narrative fashion.
For the Future

- Learn more about causal relations, hypothetical reasoning in children.

(19) The police defused the bomb **before** it exploded.

- Future experiments: What kind of contexts accommodate \textit{Before}-clauses, and how children take to such contexts. (Working hypothesis: Background, Elaboration, Explanation, Reason, \ldots — Rhetorical Structure Theory, Mann and Thompson (1988).)

(20) a. The kitty had dinner. He’d washed his hands before he sat down to dinner, you know.

b. Yesterday András went to school for the first time. He’d turned seven two months before that. [Sounds A LOT better in Hungarian!]
Beaver–Condoravdi:

(21) a. ???Ágnes (=ÁBF) ate a lot of spinach before she won her Olympic medals
b. OK Katinka trained hard before she won her three Olympic medals
(Hungarian swimmer Katinka Hosszú did win 3 gold medals and one silver at the Rio de Janeiro Olympics)
¡MUCHAS GRACIAS!
MOLTES GRACIES!
THANK YOU!
KÖSZÖNJÜK SZÉPEN!


