The Acquisition of Temporal Connectives in Hungarian Children

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VIIIth ICLA, UIB Palma, 7–9 September 2016

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/counterfactural 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*: $\varphi \mathbf{B} \psi$
b. *After*: $\psi \mathbf{A} \varphi$

(2) $\psi \mathbf{A} \varphi$ is true at time t iff there is a time t_ψ preceding t s.t. ψ is true at t_ψ, and there is a time t_φ at which φ is true, and t_ψ **follows** t_φ.

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

(3) $t_\varphi \prec t_\psi \prec t$

Before, first attempt, as the converse of *After*:

(4) $\varphi \mathbf{B} \psi$ is true at time t iff there is a time t_φ (preceding t) at which φ is true, and there is a time t_ψ at which ψ is true, and t_φ **precedes** t_ψ.

(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. $\not\Leftarrow$???Max saw his grandchildren **after** he died

$\Rightarrow$ *Before* is non-veridical in its second argument, the argument provided by the subordinate clause. (*After*, on the other hand, is veridical.)

Modal dimension

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** látta **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*: $\exists t.[\varphi(t) \wedge \exists t'.[t' \prec t \wedge \psi(t')]]$
b. *Before:* $\exists t.[\varphi(t) \wedge \forall t'.[\psi(t') \rightarrow t \prec t']]$

Universal quantifier in the entry of *Before*: explains non-veridicality and the licensing of NPIs. In prose: there is a time t_φ 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, $t_1 \prec t_2 \prec \ldots \prec t_6$.

Reichenbach

Reichenbach (1947): Speech Time, Event Time, Reference Time.

- 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 r_2 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 r_2 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 $\prec$ deictic tense $\prec$ 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?

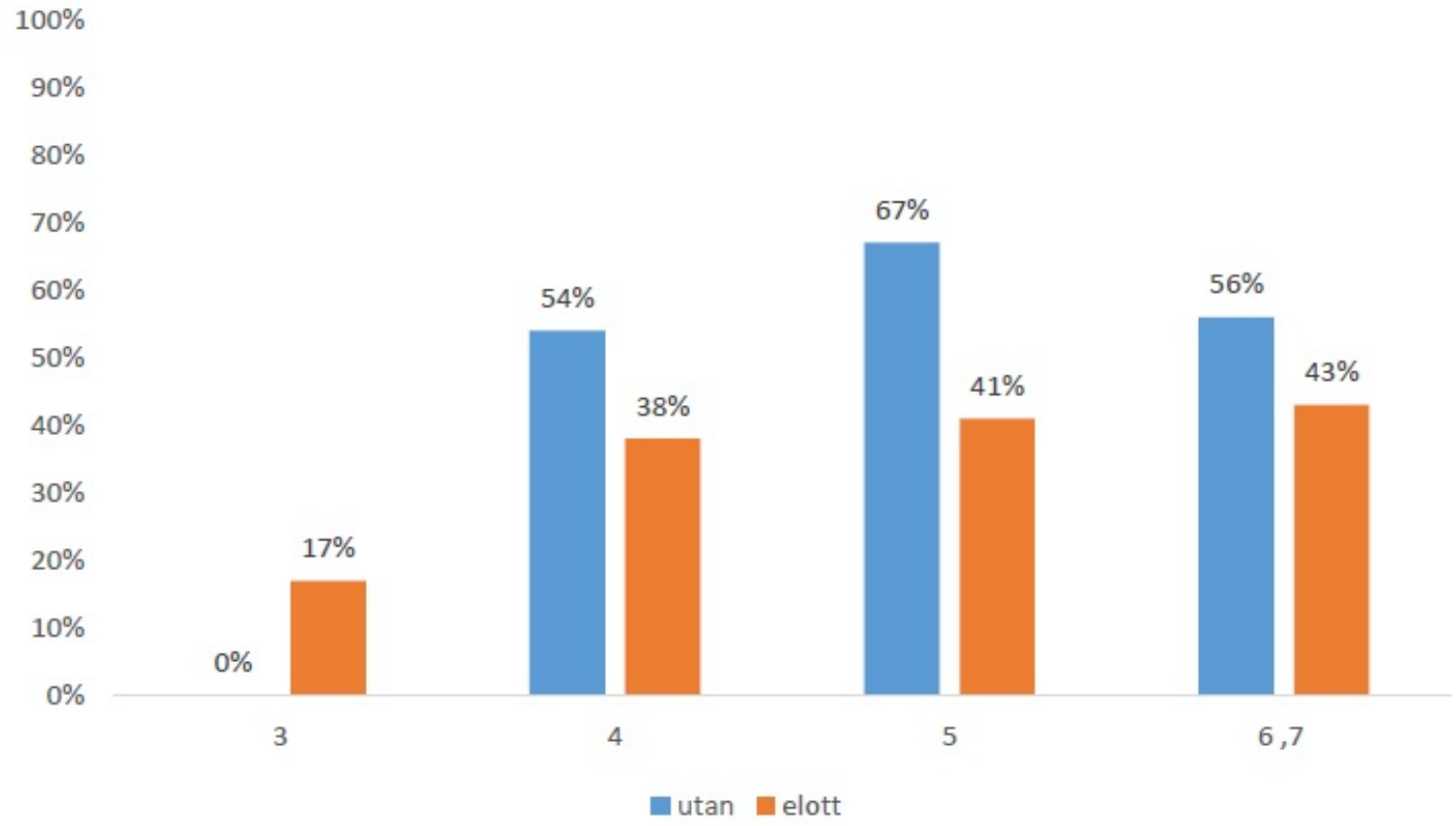
Results with *Before*

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.

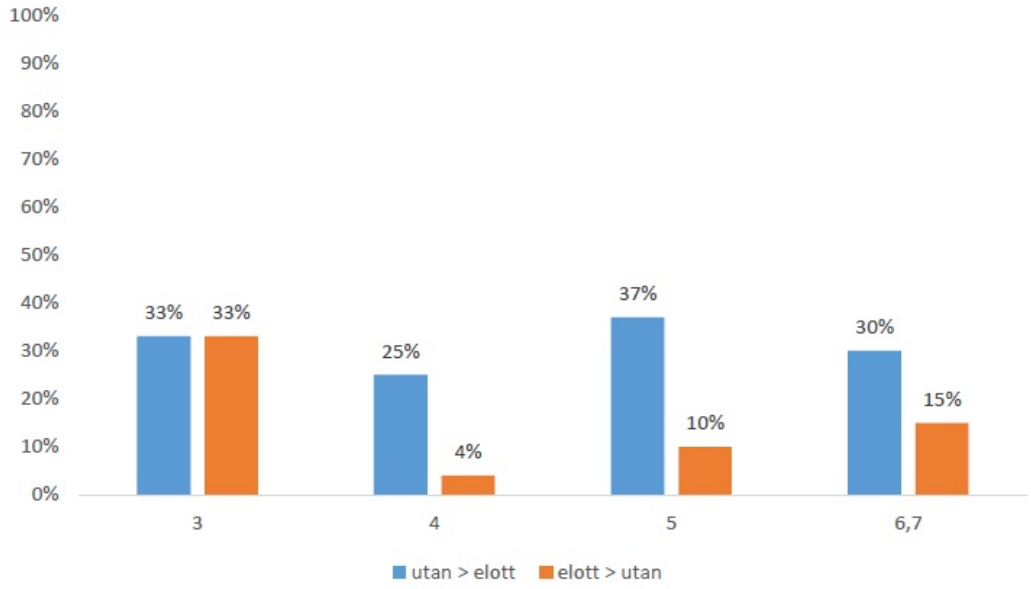
Results in detail

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).
- $\chi^2(3) = 16.35, p < 0.001$.

Getting Creative

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*).

Discussion

• 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 $\rightsquigarrow$ 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

- Take a closer look at 'habitual', 'totally out of context' answers. Who? Why? How?
- 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 *Before*-clauses, and how children take to such contexts. (Working hypothesis: Background, Elaboration, Explanation, Reason, ...— 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!]

Bonus Exx

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!

Research supported by the Hungarian NSRF, project # 108951.

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