

Ordinal variables: Acquiring ordinal numerals in Dutch and English

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Introduction

How are ordinals acquired?

What plays a role in their acquisition? We know a lot about how cardinals are acquired (e.g. Le Corre & Carey 2007) but not ordinals (cf. Colomé & Noël 2012), even though they may provide insight in how linguistic knowledge helps develop conceptual (here: numerical) knowledge.

Focus here: **Dutch** and **English**.

Frequency synthetic ordinals				
#	Cardinal	Ordinal	CGN	COCA
1	één	eer -ste	62.09	67.95
2	twee	twee-de	19.81	16.27
3	drie	der -de	7.75	7.29
4	vier	vier-de	3.57	3.21
5	vijf	vijf-de	2.06	1.58
6	zes	zes-de	1.89	1.05
7	zeven	zeven-de	0.87	0.91
8	acht	acht-ste	0.55	0.74
9	Negen	negen-de	0.49	0.73
10	Tien	tien-de	0.91	0.27

% based on total of 1st-10th

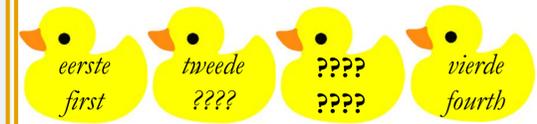
Analytic (syntactic) ordinals:

e.g. *auto twee* 'car two'.

Transparency vs. frequency vs. usage:

- Irregular ordinals are less transparent, don't follow the rule, but are more frequent than forms required to gain evidence for a rule.
- Analytic ordinals are transparent, regular... but used in special contexts and very infrequent.
- Are rules easy? (How do kids collect evidence for something they don't yet grasp?)

Main Finding



Kids acquire **irregular ordinals** (e.g. *derde* 'third') **after regular** ones (e.g. *vierde* 'fourth'), and **after analytic** forms like *auto drie* 'car three'.

They use linguistic rules to infer ordinal meaning.

Method

Give X/Give Me (e.g. Wynn 1992)



Standard Dutch

“Het derde spaarvarken mag mee! Kun je het derde spaarvarken vinden en in de koffer doen?”

N=37, 3;6–4;11, M= 4;4*
88 items, 3x each for: 1–4, 6, 8, 9 (cardinals, synthetic ordinals, analytic ordinals), *driede*, fillers

American English

“The third piggy bank gets to come! Can you find the third piggy bank and pack it in the suitcase?”

N=36, ages 3;3–5;3, M=4;4
66 items, 3x each for: 1–7 (cardinals, synthetic ordinals, analytic ordinals), fillers

*N for 4-knowers and CP-knowers. Total N Dutch sample =66; total N US sample =36.

Results

Fig. 1: Ordinals that Dutch children (N=37) know

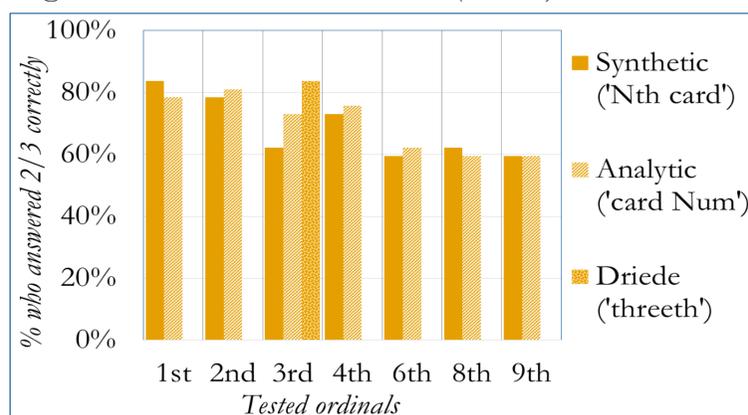
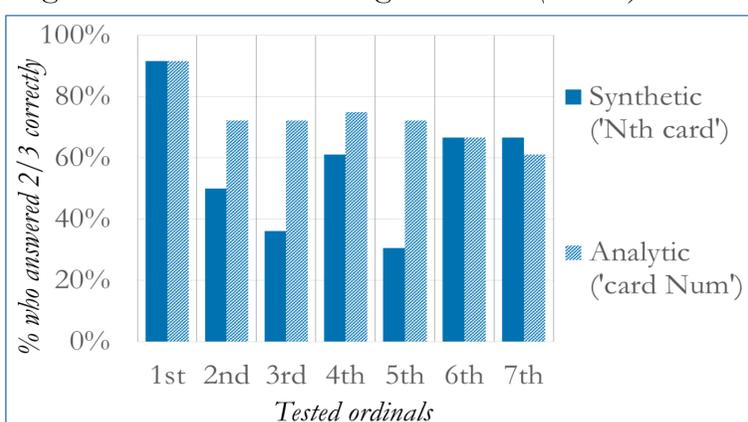


Fig. 2: Ordinals that U.S. English children (N=36) know



Data shows the same pattern for most ordinals, despite differences in **frequency, syntax, semantics**. Regular ordinals are acquired before irregular ones. (Except *eerste/first*, which are superlatives, cf. Barbiers 2007.) Ungrammatical **driede* is even easier than *derde!*

→ **What matters is regularity/transparency.**

Conclusion

Children use rules to acquire ordinals.
This is *not* straightforward!

Other plausible factors (frequency, use) could have played a role, but only rules rule: regular forms (e.g. *fourth car, car four*) are acquired before irregular forms (*third car*).

But WHY do even English-speaking kids wait for this rule? The evidence appears far down the list:

→ *First, second, third, fourth, fifth, sixth, seventh...*

Computation must beat storage.

Tolerance Principle (Yang 2016): for English ordinals to follow a rule, a child must know ≥ 6 regular forms to compensate for 4 exceptions.

In other words: if a child exhibits evidence for a rule, he must have stored all ordinals through tenth.

So, here's the idea.

Kids take in ordinals from the input, at some point recognize complexity (recognize cardinal root + suffix, or cardinal + movement), and then use that structure to figure out what ordinals mean.

Cool:

Unlike inflection (ordinals too late, no U-shape)
Unlike derivation (ordinals too early, not lexical)

Need more evidence? Ask me about our production data!

Selected references: Barbiers, S. (2007). Indefinite numerals ONE and MANY and the cause of ordinal suppletion. *Lingua* 117, 859–880. | Colomé, À. & M.-P. Noël (2012). One first? Acquisition of the cardinal and ordinal use of numbers in preschoolers. *Journal of Experimental Child Psychology* 133, 233–247. | Le Corre, M. & S. Carey (2007). One, two, three, four, nothing more: An investigation of the conceptual sources of the verbal counting principles. *Cognition* 105, 395–438. | Trabant, C. et al. (2015). On the acquisition of ordinal numbers in German. *Proceedings of GALA 2013*. Newcastle Upon Tyne: Cambridge Scholars Publishing. | Wynn, K. (1992). Children's acquisition of the number words and the counting system. *Cognitive Psychology*, 24, 220–251. | Yang, C. (2017). Rage against the machine: Evaluation Metrics in the 21st Century. *Language Acquisition* 24(2), 100–125.