

70 | The rule-based acquisition of ordinals: evidence from Dutch and English

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Introduction

Combining numerical and linguistic development

It's well-known that children slowly learn *one* through *four* one by one, before mastering the cardinality principle and becoming CP-knowers (e.g. Almoammer et al. 2013, Le Corre & Carey 2007). Ordinal numerals are nearly absent in this discussion (cf. Colomé & Noël 2012), even though they may tell us something about how linguistic and numerical knowledge are combined.

Question & Predictions:

How are ordinals acquired? What plays a role in their acquisition?

1. Frequency? → Frequent ordinals acquired before less frequent ones.
2. Use/semantic context? → Synthetic ordinals (e.g. *fourth car*) acquired before analytic ordinals (e.g. *car four*).
3. Rules? → Regular forms (e.g. *fourth car*, *car four*) acquired before irregular forms (*third car*).

We're looking at Dutch and English.

English ordinals: cardinal + *-th*, exceptions (*second*, *third*, *fifth*)
 Dutch ordinals: cardinal + *-de* (<20); [cardinals] + *-ste* (≥20),

Synthetic ordinals		
#	Cardinal	Ordinal
1	één	eer-ste
2	twee	twee-de
3	drie	der-de
4	vier	vier-de
5	vijf	vijf-de
6	zes	zes-de
7	zeven	zeven-de
8	acht	acht-ste
9	negen	negen-de
10	tien	tien-de

Analytic (syntactic) ordinals

E.g. *auto drie* 'car three': can convey ordinal meaning, but behave differently, i.e. more like proper names/construct states.

- (1) *(De) *tweede auto* is snel.
*(The) second car is fast.
- (2) *(De) *auto twee* is snel.
*(The) car two is fast. Weird, but at least no extra morphology.
- (3) *(De) *Marie* is snel.
*(The) Marie is fast.
- (4) *(De) *graaf Tel* is snel.
*(The) count Count is fast.

Relative ordinal frequency

Ordinal	CGN	COCA
1 st	62.09	67.95
2 nd	19.81	16.27
3 rd	7.75	7.29
4 th	3.57	3.21
5 th	2.06	1.58
6 th	1.89	1.05
7 th	0.87	0.91
8 th	0.55	0.74
9 th	0.49	0.73
10 th	0.91	0.27

% based on total of 1st-10th
 CGN: 17598 ordinals;
 COCA: 416958 ordinals.

So what to consider?

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 go about collecting 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 through 7 (cardinals, synthetic ordinals, analytics ordinals), fillers

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

Results

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

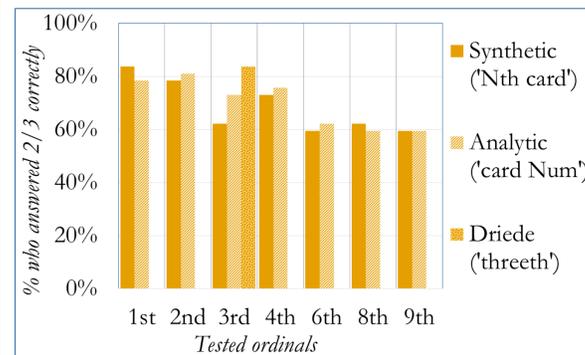


Fig. 2: Ordinals that U.S. English children (N=36) know

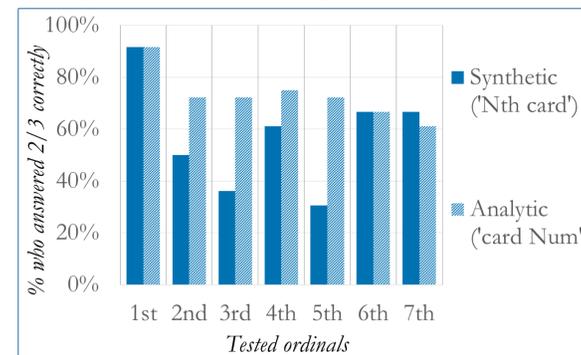
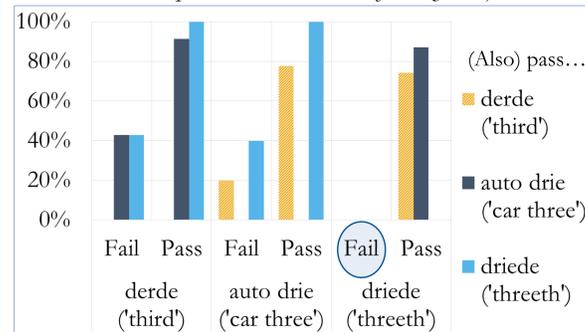


Fig. 3 Of the children who pass/fail on a given ordinal (x-axis), what % passes on the alternative forms (y-axis)?



What do these figures show?

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.

N.B. The figures do not show pre-to-3-knowers, because they do not know any ordinals (cf. Meyer et al. 2016).

Discussion & Conclusion

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

First, other plausible factors could have played a role, but

1. Frequency is not enough:
 - Analytic ordinals
 - Irregular ordinals more frequent than rule-based ones
 - Perhaps type rather than token frequency?
2. Use/semantic context?
 - Prediction not borne out: analytic ordinals (e.g. *car four*) are easy!
3. Rules? Prediction: regular forms (e.g. *fourth car*, *car four*) acquired before irregular forms (*third car*). Borne out!

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

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

WHEN does computation beat storage?

Following the Tolerance Principle and the Sufficiency Principle (Yang 2016), for English ordinals to follow a rule, a child needs to know at least 6 regular forms to compensate for the 4 exceptions. In other words if a child exhibits evidence for a rule, he must have stored all the ordinals up to and including tenth.

So, here's the idea.

Kids take in ordinals from the input.
 At some point they recognize their complexity
 (recognize cardinal root + suffix, or cardinal + movement)

They use that structure to figure out what ordinals mean...
 ...but not until they grasp cardinality. How do you know what the suffix does to the root if you don't know what the root really is, if you can't apply proper counting principles? (Something similar would apply to analytic forms.)

Not that that solves it all.

There are still open questions. → Storing 'unknown' ordinal forms?
 But where, how, with what semantics?
 Unlike learning other complex words (first simplex analysis, later complex),
 Unlike e.g. u-shaped patterns.

Want more data? Ask me about our counting data & elicited production!