Child learners in morphosyntactic change: derivational morphology beyond analogy and productivity

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Diachronic Generative Syntax 23, NYU, June 8–10, 2022

Introduction: Change & acquisition

- Language change is considered to be causally related to L1 acquisition in generative approaches
  - Lightfoot 1991, 1995, 2006; Hale 1998, 2007; Roberts and Roussou 2003; Roberts 2007, van Gelderen 2011, 2013; Walkden 2014, 2021; Biberauer 2017, 2019; Biberauer and Roberts 2017, Cournane 2017, 2019, etc.
- Change events are **directional**
- ...but there aren't *that* many studies that explicitly address this connection from both a historical and an L1-acquisitionist perspective

... as noted in Roberts (2007) and more recently Cournane (2017: 10) ("(near-)vacuum of communication between researchers working on L1A and historical linguistics.")

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- Even more so for **morphological change**, specifically changes in **derivational and categorizing morphology**, where there is hardly any work at the intersection of morphological theory, historical linguistics and L1 acquisition.

Introduction: Change & acquisition

- Generative syntacticians tend to stay away from morphological change because word formation is supposed to belong to the **lexicon** in mainstream approaches (GB, P&P, some versions of Minimalism...), not to the core computational component ("syntax").
- Historical linguists are trained to think of such changes in terms of **analogy**, **resegmentation**, **extension** ... which have no (analytical) status in (most) generative theories of morphology.
- L1 acquisitionists who work on derivational morphology seem to be more interested in the relationship between morphological richness, productivity, and speed of acquisition (and extension) of particular categories.
  - Mostly longitudinal spontaneous production studies, e.g., Schipke and Kauschke 2011, Sommer-Lolei et al. 2021.

Few studies explicitly connect patterns in the acquisition of derivational morphology with changes observed in the historical record (Meibauer et al. 2004, Werner et al. 2020), and not necessarily from a theoretical perspective.

Introduction: Change & acquisition

The goal of this project is to use a generative, realizational theory of complex word formation to make predictions about directional changes in derivational morphology and test these with

- data from the historical record (e.g., changes in verbalizing morphology in the history of Greek)
- **experimental data from L1 acquisition**

Today's goals:

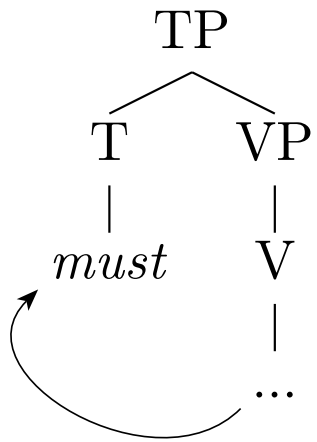
- Background: cyclical change in syntax & morphology
- Theory & typology of directional reanalysis in categorizing/derivational morphology
- Preliminary thoughts on how to test directionality/"overextension" in this domain in L1 acquisition experiments

Syntactic cycles & reanalyis

- syntactic change = *cyclic*, e.g., subject & object agreement cycle, the DP cycle, and the negation cycle, the modal cycle...
- Motivated by computational economy/"Third Factor" principles such as the Late Merge Principle (LMP) & Head Preference Principle (van Gelderen 2004, 2009, 2013...), "Maximise Minimal Means" (Biberauer 2017, 2019, Biberauer and Roberts 2017), 'Minimize Structure" (Cardinaletti and Starke 1999, Breitbarth 2017), etc.
- The LMP $\approx$ "**Upwards Reanalysis**" (**UR**, Roberts & Roussou 2003, Cournane 2014)): (lexical) material in lower projections is reanalyzed as base-generated in higher functional projections, e.g., the "modal cycle": reanalysis of lexical verbs/VP $\rightarrow$ modal auxiliaries/TP

Syntactic cycles & reanalyis

(1) UR in the "modal cycle"



(Syntactic) change/reanalysis = a given surface string in the acquirer's grammar G_2 receives a different underlying representation than in the input or "target" grammar G_1 during L1 acquisition.

- "a hearer successfully analyses an incoming sentence using a grammar different from the one that the speaker used to generate it" (Walkden 2021: 19)

The Modal Cycle in diachrony

German *müssen*, Engl. *must*: **lexical (root modality/ability) > deontic > epistemic** (ex. from Cournane 2017: 15):

(2) a. Sie ni **musan** gan so fram zi themo heidinen man.
They not be.able.3PL.PST go so far to the heathen man
"[For religious reasons] They were not able to proceed further to [the palace of] the heathen man (Pilate)." (OHG, Otfrid IV.20.4, 9th c.)

b. Tie minnera habeton die **muosan** gan.
Those no.money had they had.to walk
"Those who had no money were obliged to walk" (Late OHG, Notker I.152.1, ca. 1000)

c. Du **musst** wohl müde sein. (NHG)
you must MOD.PTCL tired be
"You must be tired." (... because you traveled all day; epistemic)

The Modal Cycle in L1 acquisition

"Early modals denote ability or desire (*bouletic* root modality): *can* and *want*, (3a). These occur around 2;06 correlating with the development of basic desire-intentional psychology. Closer to the third birthday children begin using deontic-flavored modals like obligation *have* and permission *can* (3b). Finally, after age 3, children begin to use epistemic modals like *must* and *might* (3c). In general, root meanings precede epistemic." (Cournane 2017: 104)

(3) a. **Ability/root**: Tree can't dance. (Adam 2;08,16)
b. **Deontic**: You must have pencil. (Context: urging his mother to take a pencil, Adam 2;11,28)
c. **Epistemic**: He must be ready for his lunch. (Context: his baby brother is crying, Adam 3;05,01)

(3) isn't evidence for *innovation*, since both meanings of *must* are available in the input ("children do not use epistemic modals until they can entertain epistemic thoughts").

Summary

- Syntactic change is cyclic and directional (material diachronically moves "upwards" the syntactic tree)
- Upwards Reanalysis (UR) describes a syntactic change event whereby L1 acquirers extend the available material to higher functional projections, beyond the use of the input grammar
- For some of these cycles there is good evidence from *both* the historical and the L1 acquisition record.

Q: Does this general framework also apply to derivational/categorizing morphology (in the historical record/**in L1 acquisition**)? Can we test this experimentally?

Morphological change

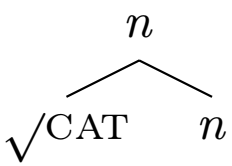
- In lexicalist approaches to morphology, word formation happens in the lexicon and there is no *a priori* reason why word formation changes should mirror syntactic changes.
- But in non-lexicalist, realizational approaches like Distributed Morphology (DM) or Nanosyntax, diachronic **reanalysis** like UR should in principle apply to "morphological" and "syntactic" changes equally.
- "Syntax" and "morphology" are not separate domains; morphology spells out or **realizes** functional heads ("terminal nodes") built by the syntax.

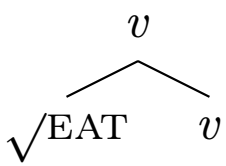
... and if this is the case, directional "syntactic" changes like those driven by UR/the LMP should also be observable in the diachrony of complex word forms, specifically, in the diachrony of **derivational morphemes** and **categorizers**.

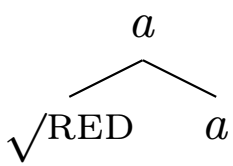
Categorizers in DM

In DM, categorially unspecified **roots** combine with (overt/covert) categorizing heads "in the syntax"/via Merge:

(4)

a. 

b. 

c. 

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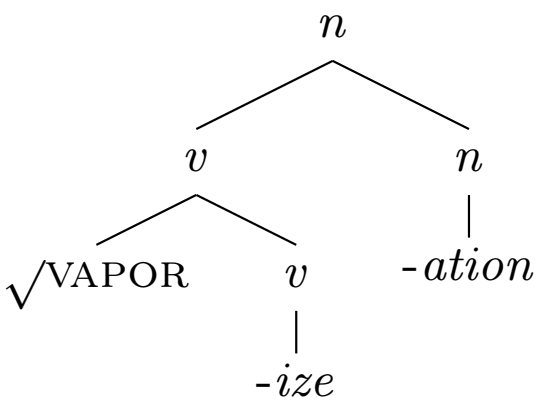


- Where do new *v*'s, *n*'s, etc., come from?
- (How) do children *extend* the use of these elements during L1 acquisition?

Diachrony of categorizers

- If reanalysis/UR applies to derivational morphemes and, e.g., (modal) auxiliaries alike, we expect to see **"cycles" of derivational morphology**

(Expected) types of UR in derivational/categorizing morphology:

I **category change** in the context of cross-categorial derivation:
  a. $n > v$ (denominal verbs/unergatives)
  b. $v > n$ (deverbal nouns/nominalizer)
  c. $a > v$ (deadjectival verbs/unaccusatives)

II **change of derivational base** (no category change) through addition of intermediate functional projections (descriptively UR) in semantically "enriched" or polysemous contexts.
  a. denominal adjectivizer → deverbal adjectivizer
  b. root-selecting v → v/*Voice*-selecting v/Asp (reanalysis of verbalizers as Voice and/or aspectual markers)

Ia): category-change, $n \rightarrow v$

Ancient Greek (AG) verbs in -*éu-ō* were originally derived from agent nouns in -*éu-* with the verbalizer *-*(j)e/o-*, (6).

(6) AG verbs in -*éu-ō*

AG verb in -*éuō*		base	
*basil-**eú**-ō*	'am king; rule'	*basil-**eú**-s*	'king'
*khalk-**eú**-ō*	'am a coppersmith'	*khalk-**eú**-s*	'coppersmith'

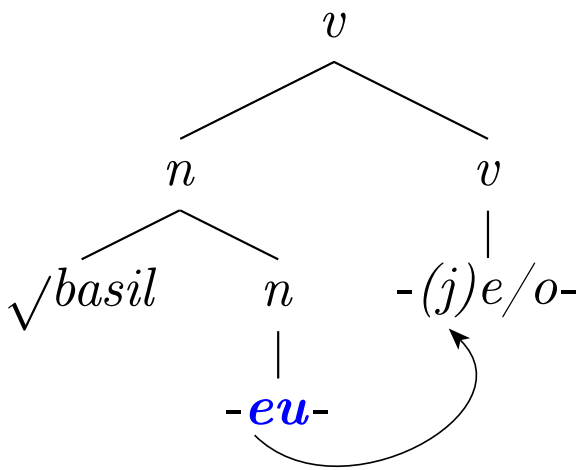
Nominal -*eu-* was reanalyzed and became a productive verbalizer in Modern Greek (MG), where it can select nouns, adjectives, adverbs and loanwords (Panagiotidis et al. 2017).

(7) Modern Greek verbs in -*ev-*

MG -*ev-o*		base	
*stox-**év**-o*	'I aim at'	*stóx-os*	'target'
*kont-**év**-o*	'I approach'	*kontá*	'near'
*xak-**év**-o*	'I hack'	Engl. *hack*	

Ia): category-change, $n \rightarrow v$

(8) "Upwards reanalysis": nominal *-eu-* + verbalizer (*)*-je/o-* → reanalyzed as part of v.



- The same type of reanalyis gave rise to a number of other MG verbalizers, e.g., *-iz*, *-(i)az*, *-on*, *-ar*, *-en* (cf. Panagiotidis et al. 2017)

Ib): category-change, $v \rightarrow n$

Type Ib) is exemplified by the historical development of the MG action noun-forming suffix -*ismos* from earlier -*is*- (aorist verb stem) + noun-forming -*mós* (Schwyzer 1939: 493; Manolessou and Ralli 2015).

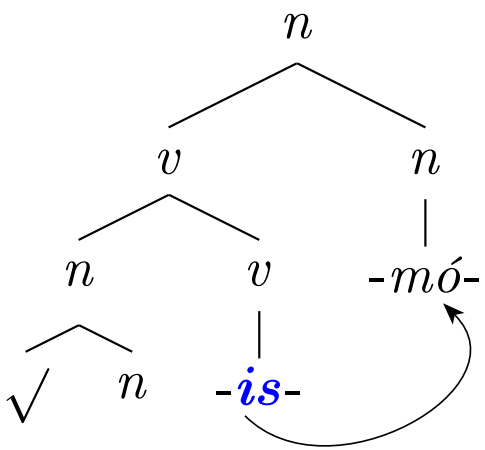
(9) Ancient Greek deverbal nouns in -*mós*

Present	Aorist	Deverbal noun
oik-íz-ō	*oík-**is**-a*	*oik-**is-mó**-s* 'foundation of a colony'
house-PRES-1SG	house-AOR-1SG	house-AOR-NMLZ-NOM
dane-íz-ō	*dane-**is**-a*	*dane-**is-mó**-s* 'money-lending'
loan-PRES-1SG	loan-AOR-1SG	loan-AOR-NMLZ-NOM

Hellenic to Modern Greek: productive denominal suffix (*dogmat-**ísmos***, *ergat-**ísmos*** 'workerism', *varoufak-**ísmos*** 'Varoufakism', ...)

Ib): category-change, $v \rightarrow n$

(10) UR of AG *-is(-)mós*



IIa): change of base, $n \rightarrow v$

Vedic Sanskrit (VS) *-ín-*, originally a possessive denominal suffix, (11a), that was reanalyzed as a deverbal (participial) suffix to morphologically characterized verbal stems (including preverbs), (11c), starting from contexts that were ambiguous between a denominal and a deverbal (state-denoting) interpretation, (11b) (Grestenberger 2021a).

(11) Vedic denominal/deverbal adjectives in *-ín-*

a. $\boldsymbol{n \rightarrow a}$

dhána- 'prize'	*dhan-**ín**-* 'possessing prizes'
parṇá- 'wing, feather'	*parṇ-**ín**-* 'winged, feathered'

b. $\boldsymbol{n?/v?/\sqrt{?} \rightarrow a}$

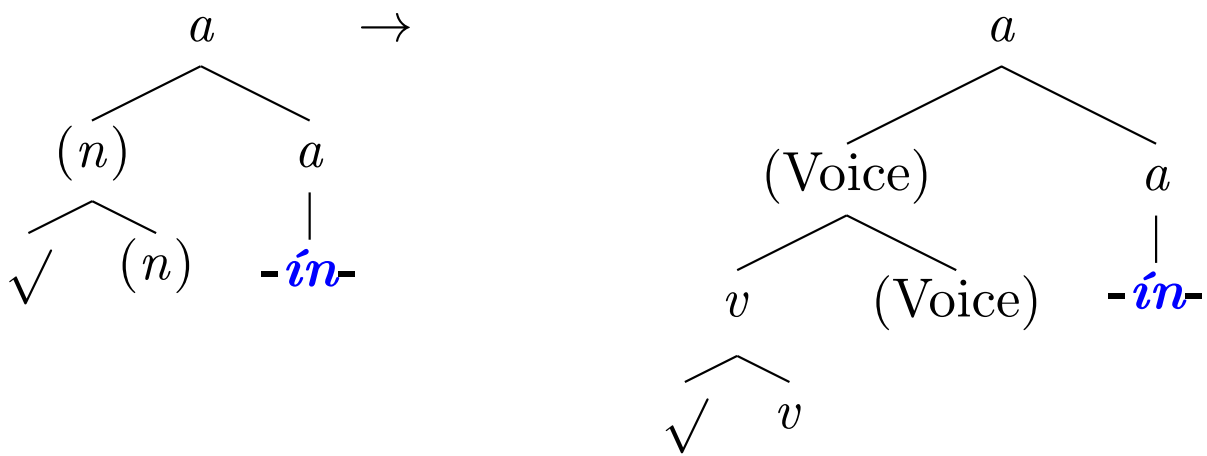
kārá- 'praise song'/*kir/kar* 'praise'	*kār-**ín**-* 'praising'
vi-rapśá- 'abundance'/*vi raps* 'abound'	*vi-raps-**ín**-* 'having abundance'

c. $\boldsymbol{v \rightarrow a}$

ví$_{\text{PRVB}}$ *car* 'wander off'	*vi-cār-**ín**-* 'wandering off'
ní$_{\text{PRVB}}$ *ram* + loc. 'stay at'	*ni-rām-**ín**-* + loc. 'staying at'
prá$_{\text{PRVB}}$ *sak-ṣ* 'conquer'	*pra-sak-ṣ-**ín**-* 'conquering'

IIa): change of base, $n \rightarrow v$

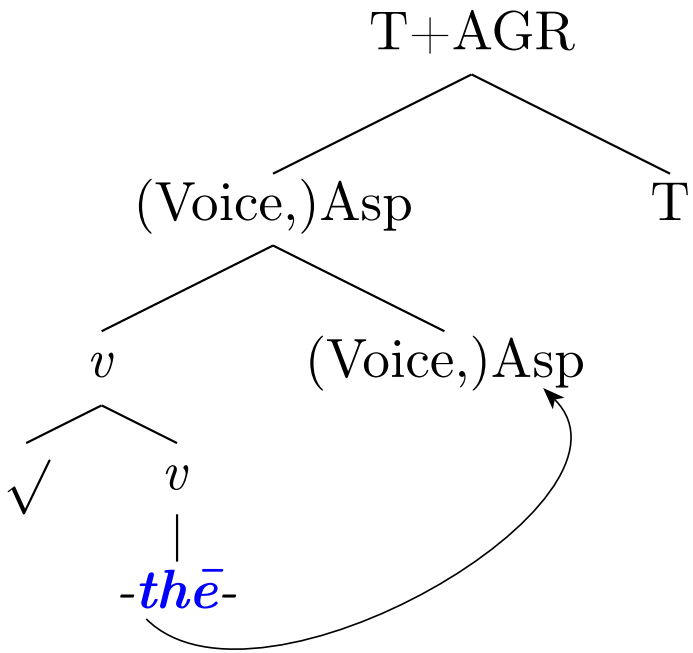
(12) UR of Vedic adjectives in -*ín*-



IIb): change of base, $\sqrt{} \rightarrow v$

The AG inchoative/passive suffix -*(th)ē*- turned from a root-selecting suffix to a *v*-selecting one, realizing a fused Voice/Asp head in MG (Christopoulos and Petrosino 2018, Grestenberger 2021b, Alexiadou 2021).

(13) UR in AG passive aorists in -*thē*-:



Why UR?

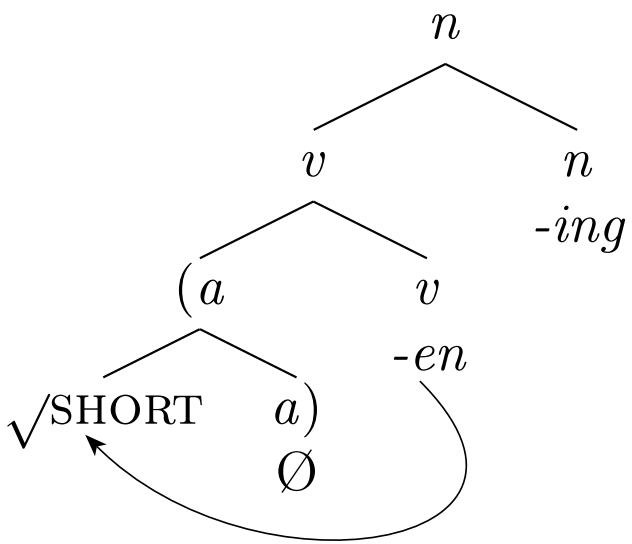
Are there any other "mechanisms" (mind Walkden 2021's criticism) in the diachronic morphology/morphosyntax-"toolbox" that could account for these changes? Why use UR?

- **Grammaticalization** (Hopper and Traugott 2003 etc.):
  - ✓ predicts directional change
  - ✗ usual criteria (semantic bleaching, phonological weakening, change in discourse status...) do not apply to the changes categorizing affixes described above.
- **Analogy/analogical extension** (e.g., Arndt-Lappe 2015, Rainer 2015):
  - ✗ doesn't predict directionality
  - ✗ no similarity in form/meaning that could account for "new uses" of the target suffixes
- **Resegmentation/affix telescoping/conglutination** (Haspelmath 1995)
  - ✗ doesn't predict directionality (also pointed out by Haspelmath)
  - ✗ not necessary that phonological reduction, the putative trigger for "affix growth", precedes reanalysis

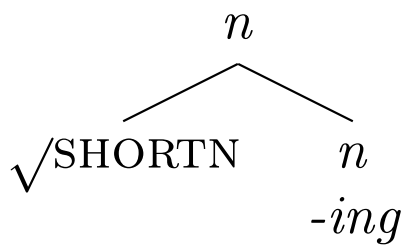
Digression: a possible counterexample

"Root augmentation" (Grestenberger and Kastner Forthcoming): A categorizer is reanalyzed as part of the root (ex. *shortening* 'baking aid' courtesy of Alec Marantz):

(14) **a.**



→ **b.**



- "Downwards", but extends lexical entry of the root (no new "functional" vocab. item)

Summary

- In a framework like DM, mechanisms of syntactic change = mechanisms of morphological change, in particular economy principles like UR (LMP...), etc.
- Rise of new nominalizers and verbalizers → case studies (primarily) in the verbal domain suggest that this is on the right track.
- Crucially, we don't expect to see "downwards reanalysis" in the same contexts (e.g., a verbalizer becoming reanalyzed as a nominalizer in the context of denominal verbs)
  - In terms of linear order, cp. Haspelmath's observation that reanalysis of the type [XY][Z] → [X][YZ] is amply attested, while [X][YZ] → [XY][Z] only occurs in the reanalysis of *roots*.

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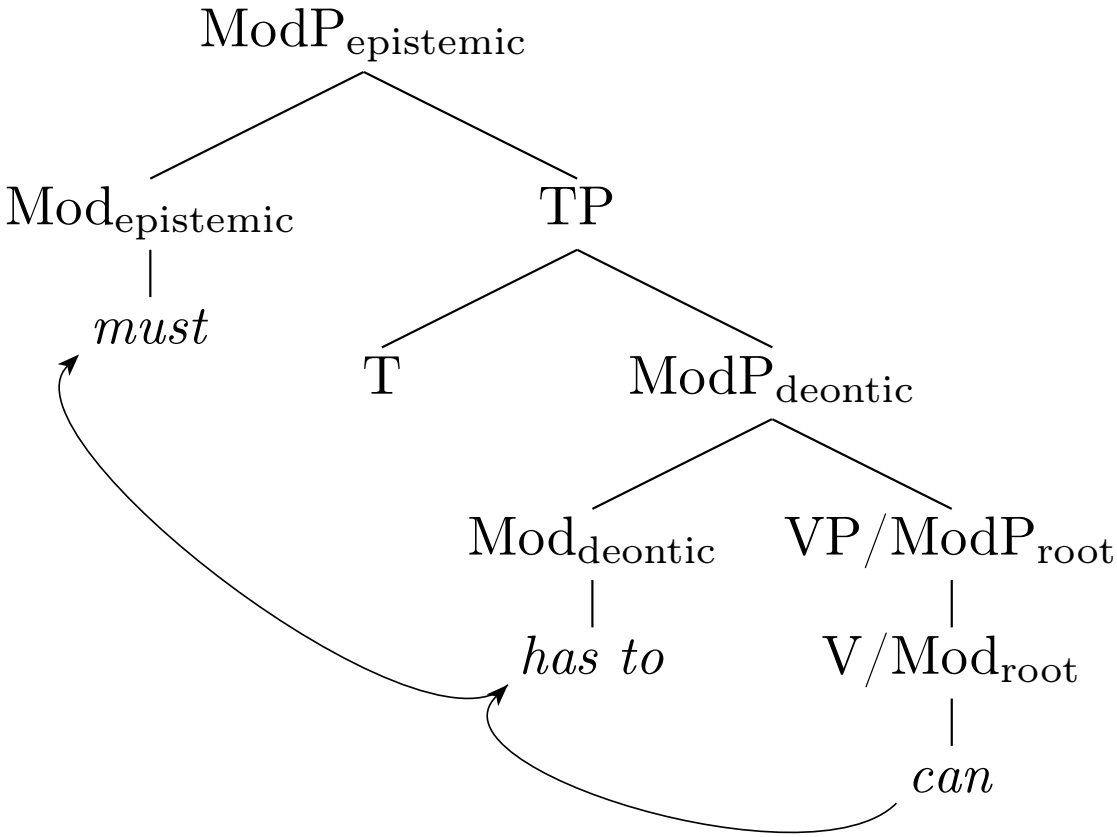
... this leads us to the second conjunct of the "both in the historical record and the L1 acquisition record"-hypothesis.

Cycles in syntax: Cournane (2014, 2015)

Cournane (2014, 2015) studied the **Modal Cycle** (lexical verb > root modal > epistemic modal) from an experimental L1 acquisitionist perspective, using **sentence repair production tasks** and **preference tasks**.

(15)



Cycles in syntax: Cournane (2014, 2015)

- Cournane's studies found that children were more likely to use lexical verbs in "low" modal contexts and modal functional verbs in "higher" non-root contexts (i.e., epistemic modality) than adults → "overextension", **Upwards Reanalysis**
- Crucially, extension in the opposite direction did not occur systematically

Two experiments: sentence-repair production task, preference task with monolingual English speakers (mean age 5;5) and adult controls.

Experiment 1: **Sentence-repair production task**

English-acquiring children were asked to complete a sentence in which the modal verb (the target) had been obscured by noise (a barking dog):

(16) a. Experimenter "Oh my! There is a big scaly tail coming out of a cave. What do you think, Elmo?"
b. Elmo (sound file): "It «woof woof» be a dragon"

Target sentence-repair: "(Elmo said), 'it must be a dragon."'

- Five "flavors" of modals were tested: ability, deontic, teleological, future, epistemic; divided into root and non-root (future, epistemic)

Results:

- "Children showed a slight preference, though not significant, for directional errors consistent with the syntactic hypothesis" (=UR; Cournane 2014: 111)
- However, children's context-to-lexeme mappings varied widely compared to that of the adults

Experiment 2: **Preference task**

Participants were introduced to two different aliens that had visited Earth and were trying to learn English. The aliens commented on pictures, and the children were asked to judge which alien's version of a given sentence sounded better with respect to modal verb targets.

(17) Experimenter: "This is Chris. He is reading a book about snakes. Why is he making that face?"

a. Alien 1: "He must be scared."
b. Alien 2: "He has to be scared."

- Two lexical contrast pairs per test (*might*/*can*, *must*/*have*), contrasting a nonroot modal to a root modal.

Results:

- "a significant child learner bias toward upwards errors" (Cournane 2014: 115) consistent with the UR hypothesis.
- Children were more likely to choose an upwards competitor modal in both lexical contrasts than were adults (14% vs. 2%).
- No difference between child/adult responses in "downwards" contexts (as expected).

Summary

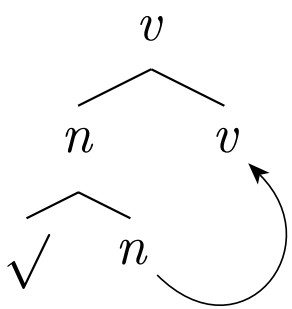
- Children used more "low" (root) modals in "high" epistemic contexts than adults - to a statistically significant extent in experiment 2, and as a (not significant) tendency in experiment 1 — "evidence for a learner bias towards extending root (= low) modals upwards to cover nonroot domains."
- Small group of participants, but subsequent experiments with larger groups of pre-school children (e.g., Cournane and Pérez-Leroux 2020) confirmed their "epistemic overgeneration".
- Is this approach also suitable for detecting UR in morphological acquisition?

L1 acquisition & UR in derivational morphology

- Hypothesis: Children use "low" categorizing morphology in "high" contexts to a greater extent than adults do (they directionally overextend), just like with the modals in Cournane's experiments.
  - With (type I) or without (type II) a **category-change** of the target morpheme
- For example, in the context of denominal (Engl. *vapor-ize*) and deadjectival (Engl. *pur-ify*) verbs, children will use *nominal* and *adjectival* morphology to form verbs *to a greater extent than adults do.*
- Extension in the "downwards" direction should not occur systematically.

(18)

a.



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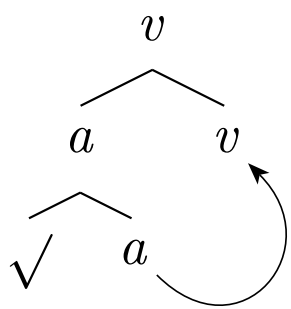

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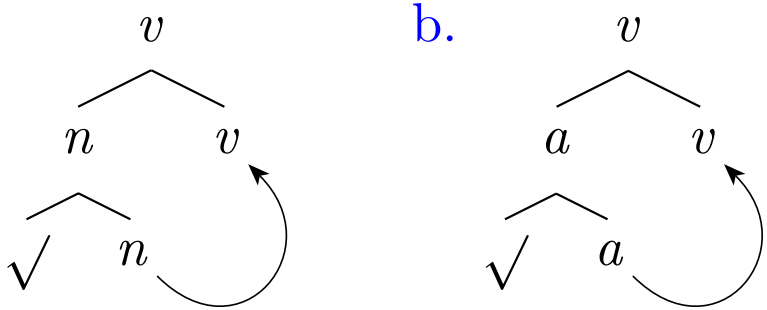
(18) a. b.



To test this, we need a language that has a bit more derivational morphology than English (sorry, English...).

The goal

- Adapt Cournane's experiments to testing extension of derivational morphology by L1 acquirers in languages with rich synthetic (preferably suffixing) derivational morphology → **Greek**, **Italian**, **Czech**, **Lith.** ...
  - Excluding prefixes for now because their theoretical status ("prefix-suffix asymmetry") and semantic range (at least in German) is much less clear.
  - Focus on IE languages of Europe because of 1) my background and 2) long attestation history and accessible historical record, but should in principle also apply to other languages/language families with similar typological profile and historical record (e.g., Tamil, some Semitic and Sino-Tibetan languages...)
- Some encouraging results from derivational morphemes production and judgment tasks in Modern Greek (Diamanti et al. 2018) and masked morpheme imitation tasks in Czech (Smolík and Matiasovitsová 2021) suggests that these tasks can be adapted to test morphological productivity and, hopefully, directionality.

Contexts for UR

... the more doable intermediate goal: pilot study with German-speaking children at the Babelfisch Lab (University of Vienna, `https://psy-ling.univie.ac.at/en/babelfisch-lab/`). Three possible contexts/results of child-language "UR":

1. "horizontal" extension of productive suffix to new lexical item, no change in category of the target suffix
   - E.g., Gm. agent/instrument nouns in ***-er***:

     (19) a. *kop-**ier**-en* 'copy' : *Kop-**ier**-**er*** 'copy machine' →
     b. *fris-**ier**-en* 'to comb; dress hair': **Fries-**ier**-**er*** 'hairdresser' for standard *Friseur*, etc.

   - "Analogy" or "Extension" in historical linguistics/morphology
   - no category change

Contexts for UR

2. new denominal/deadjectival verb (or deverbal noun) compared to adult grammar, but without change in category of the target suffix (basically same as 1. but with zero derivation)

(20) a. *hin-glitz**er**-n*
onto-glitter-INF
'spread glitter onto sth.'
b. *roll**er**-n*
scooter-INF
'to ride a scooter'

- no category change
- type II/"ambiguity" contexts (cp. VS -*ín*-)

3. **new denominal/deadjectival verb (or deverbal noun) compared to adult grammar with clear change in category of the target suffix.**

Ideally, children will produce more items fitting these three contexts than adults, especially the decisive third context.

Experiment 1: Derivational morpheme production task

Participants will be presented with visual input accompanied by a sentence with a **cue** ("critical word") and one with a target. The target will be either obscured or missing and participants will be asked to supply it. (21) shows a possible verbal target.

(21) Theo ist **durst-ig**. Er [xxx]/durst[xxx] seit zwei Stunden
Theo is thirst-y He **(target)** for two hours
"Theo is thirsty. He [xxx] for two hours."

- Target: a deadjectival verb from *durst-ig* 'thirsty'. Standard lexicalization *hat Durst* 'has$_{\text{Aux}}$ thirst' excluded by word order.
- "overextended" *durst-**ig**-t* 'thirst-y-3SG.PRS' would fit
- ...but strictly speaking would only show a non-standard deadjectival verb, not clear that *-ig-* verbalizes here (cf. *satt* 'sated, full' — standard *sätt-**ig**-en* 'to satiate, make full')
  - Context 2/type II (? no clear change in category of the target suffix)

Experiment 1: Derivational morpheme production task

Verbal target:

(22) Theo ist **müde**. Er [xxx]/müd[xxx] seit zwei Stunden
Theo is tired He **(target)** for two hours
"Theo is tired. He [xxx] for two hours."

- Target: *müd-**ig**-t* 'tired-V-3SG.PRS' → **Context 3/type I**, apparent change in category
- This will be extremely difficult to elicit (cf. children's context-to-lexeme mappings in Cournane's experiment 1)
- The production task is most likely to give good results for contexts 1–2

Experiment 2: Derivational morpheme preference task

Participants will be provided with visual input accompanied with two sentences, each containing a target with different derivational morphology (a standard and a non-standard, productively derived form). Participants will be asked to judge which sentence better describes the input.

(23) Context: Two aliens visit Earth and decide to learn German. They see Theo, who is really tired. Which sentence sounds better?

a. Alien 1:

Armer Theo, er **müd-ig-t** so!
Poor Theo he tired-V?-3SG.PRS

b. Alien 2:

Armer Theo, er ist so müde!
Poor Theo he is so tired

- This experiment is expected to produce more reliable results for the crucial third context.

Experiment 2: Derivational morpheme preference task

- To ensure that children correctly distinguish between the grammatical but non-standard forms (like *Train-ier-er*, *(er)-müd-ig-en*) and ungrammatical forms, fillers with ill-formed words from the same root will be added.
- Problem: appropriate fillers and control contexts that would hypothetically show "downwards reanalysis" and should be rejected by participants
- While we expect children to have high acceptance rates for the standard form, we also predict them to be more accepting of the non-standard, though productively formed target, (23b), than adults, and we predict a sharp and statistically significant difference in their treatment of contexts like (23a-b) on the one hand and ungrammatical/ill-formed words (like **Train-ist*) on the other.

Experiment 3: Graded grammaticality judgement task

E.g., Ambridge et al. 2008, Ambridge et al. 2014 (verb argument structure)

- Participants are asked to rate sentences on a 5-point "smiley face"-scale
- Acceptable (green counter)/unacceptable (red counter) and grade of (un)acceptability (placement of counter) can be measured and compared
- Works well with children in the relevant age group and is easy to combine with experiment 2
- Potential to compare children's intuition w.r.t. grammaticality directly with those of adults

Experiment 3: Graded grammaticality judgement task

Context: Theo is tired.

(24) Der Theo ist so müde!
DEF Theo is so tired

(25) Der Theo **müd-ig-t** so!
DEF Theo tired-V?-3SG.PRS so
"Theo is so tired!"

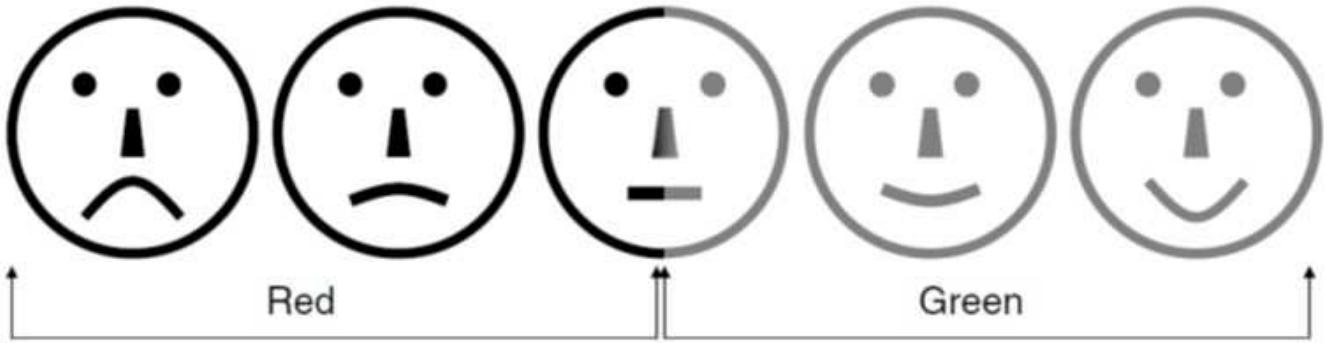


Fig. 2. The five-point rating scale used by all participants to rate sentences for grammatical acceptability.

(Ambridge et al. 2008: 105)

Summary

- The L1 experiments proposed here are explicitly designed to test the hypothesis that children show overextension of derivational morphology consistent with UR phenomena in syntactic change
- Not much previous work that looks at categorizer change both in the historical record and in contemporary L1 acquisition, so these experiments are modelled on better-studied acquisition of syntactic categories
- Caveat: We don't expect children to "repeat" changes that have already been completed, even though the trajectory of L1 acquisition can sometimes create this impression (e.g., in that root meanings for modals are acquired earlier than epistemic modality), cf. Cournane 2017
  - An issue with some previous literature, e.g., Meibauer et al. 2004, and some methods that are usually suggested for studying children's grasp of derivational rules ("why don't you just do a wug test?")
- Rather, the goal is to observe "new" category changes

Conclusion

- Directional changes in the categorial affiliation and selectional properties of categorizing/derivational morphology are not easily captured by the mechanisms that are standardly used to describe morphological change (grammaticalization, analogy, extension, affix telescoping, conglutination...)
- A piece-based, "syntacticocentric" model of word-formation in which syntactic structure maps to morphological structure (e.g., DM) allows us to extend principles of syntactic change like UR to changes in word structure and make testable predictions w.r.t. the directionality of these changes
  - in the historical record (✔)
  - during L1 acquisition (to be tested)

Thank you!

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FWF Der Wissenschaftsfonds.

FWF V850-G “The diachrony of verbal categories and categorizers”

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