Modal verbs in language development and language change

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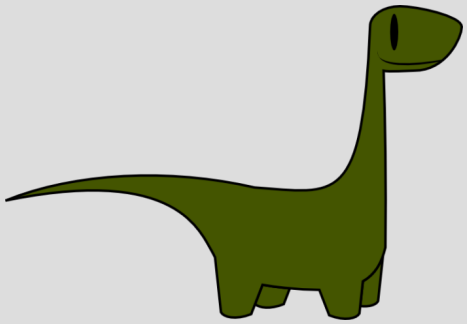
Introduction: modal verb *must*



English modal verbs (e.g., *must, could, should*) are **variable-meaning** (**deontic**, **epistemic**).

- Syntax affects flavour, the more historically innovative flavour (**epistemic**) is interpreted higher structurally:

With bare verb (ModalOnly):

1) Dinosaurio **must** eat lots of leaves…

…because his vet said so. **Deontic**

…because the trees are bare. **Epistemic**

With grammatical aspect (ModalAspect):

2) Dinosaurio **must** have eaten PERFECT **Epistemic**

3) Dinosaurio **must** be eating PROG. **Epistemic**

Kratzer 1977,1991, 2012; Condoravdi 2002; Hacquard 2006, 2010; Klecha 2016; Rullmann & Matthewson 2017 ** Bybee et al. 1994; Dasher & Traugott 2005 ** Brennan 1993; Cinque 1999.

Introduction:
cyclic change

Modal verbs show directional **syntactic** & **semantic** cyclic change in the historical record.

- Syntax is discrete ("innovation", "actuation")
- Meaning usage shifts are gradual ("incrementation")

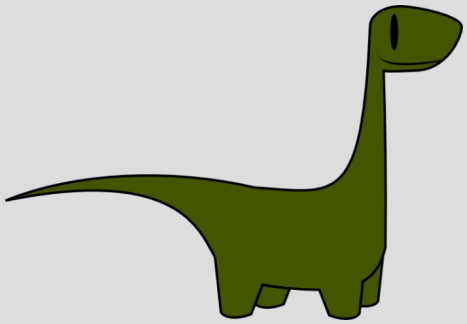
Lexical Verb → **Modal Verb** → **Loss** ⊘

Deontic → **Epistemic**

- In English today, ***must*** is used primarily epistemically; historically newer ***have (got) to*** does most deontic work

Lightfoot 1979; Roberts 1985; Roberts & Roussou 2003; Jespersen 1961; Krug 2000; Traugott 1989; Visser 1963–73; Labov 2001, 2007;Tagliamonte & D'Arcy 2007.

Introduction



Change theories appeal to child learners to explain:

- the source of innovations (e.g.,Paul 1920; Andersen 1973; Lightfoot 1979; Roberts & Roussou 2003…),
- the direction of incrementation (>5 years old) (Labov 2007; Smith et al. 2009; cf. Tagliamonte & D'Arcy 2007)

Incrementation: the increase in frequency, extent, scope or specificity of innovative variant.

*"Successive cohorts and generations of **children advance a change** beyond the level of their caretakers and role models"* (Labov 2007: 346).

Big Q: Do child learning patterns feed diachronic **incrementation**?

Introduction: *must* and modal flavour in L1A

- Children begin to use modal verbs around age 2 with root meanings, epistemic uses follow soon after (van Dooren, Dieuleveut, Cournane, Hacquard, 2017; Cournane 2015, in prep; cf. Papafragou 1998)
  - Non-linguistic implicit measures show concepts (epistemic & deontic reasoning) are in place very early (e.g, Onishi & Baillargeon 2010; Cummins 1996)
  - Young children's productions of *must* are root-biased, relative to the input, but they show variable-meaning from age 2 (van Dooren et al., 2017; Manchester Corpus; Theakston et al. 2011):

Child:	it's got mud over it.	Child:	my yellow one.
Mother:	I see. right.	Child:	can't see it.
Child:	**must**$_{root}$ wash it.	Child:	**must**$_{epis}$ be gone.
	(John, 2;08)		(John, 2;09)

Introduction: Toronto English modals

In **Toronto English (Tagliamonte & D'Arcy, 2007)**, like other dialects of English, functional modal usage is in prolonged flux (e.g., Krug 2000).

- ***Must*** remains variable-meaning for adult speakers, but deontic uses of ***must*** are proportionally very few (2% of deontic necessity). Epistemic ***must*** is robust (55% of epistemic necessity).
- ***Have to*** has taken over most of the deontic necessity space (72%), and is likewise variable-meaning, with epistemic uses (18%).

- What meaning(s) do preschool (3-6yo) Torontonians posit for ***must***?
- Do they differ from adults in the direction **++epistemic** for modal+bare verb constructions? **Do they advance incrementation?**

3 Studies with Lil' Torontonians

Joint work with Dr. Ana Teresa Pérez-Leroux (UToronto)

1. Flavour Preference Task:

intro

- **Picture Preference Task**, comparing root and epistemic interpretations of ModalOnly and ModalAspect sentences; TO manipulation

Modal-Only Sentence

1) *Scott **must** [wear his rainboots]* — Variable

Modal-Aspect Sentence

2) *Scott **must** [be wearing his rainboots]* — Epistemic

PROGRESSIVE

3) *Jada **must**'[ve taken a bath]* — Epistemic

PERFECT

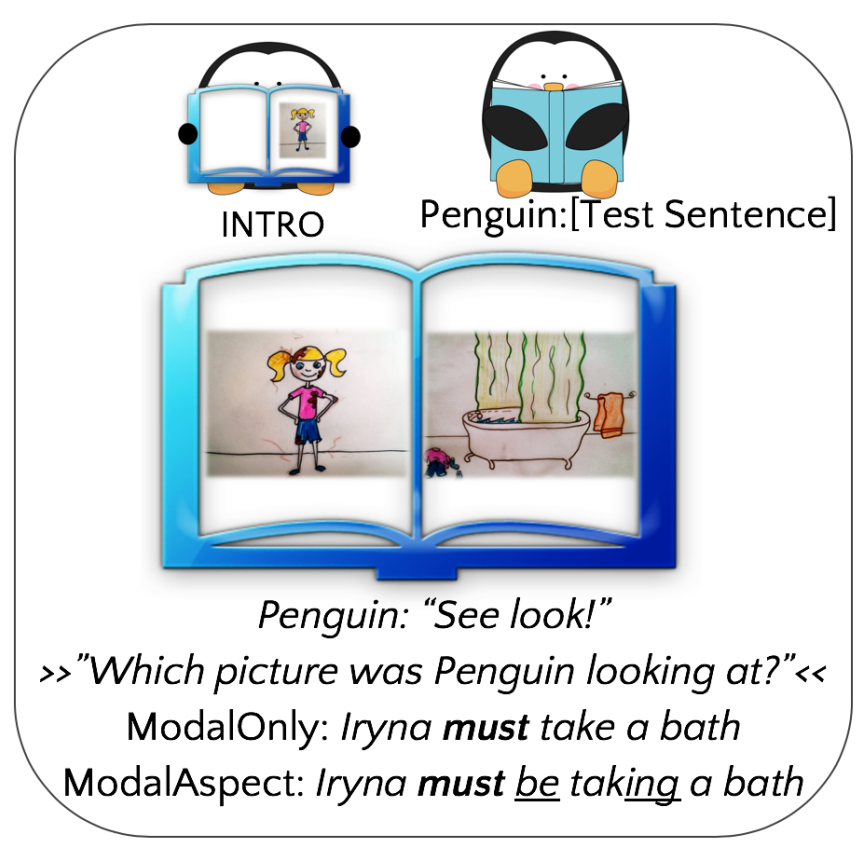
1. Flavour Preference Task:

The Incrementation Hypothesis for L1A

- **The incrementation hypothesis:** in ambiguous contexts (*must* + bare verb) children will prefer epistemic interpretations at higher rates than young adults from the same speech community
  - **deontic → ++epistemic**
- Competing hypotheses:
  - Adult-matching (children will match adult patterns)
    - **= epistemic**
  - Persistent Deontic Bias (production data) (Papafragou 1998; Cournane 2015; van Dooren et al. 2017, submitted)
    - **- epistemic**

1. Flavour Preference Task:

methods



- Presented on MATLAB_R2014a, with Psychtoolbox (Brainard & Vision, 1997)
- 3 training items, 16 test items (8 ModalOnly; 8 ModalAspect), 8 fillers; randomized
- Counterbalanced (aspect condition (perfect, progressive), story ~ sentence, picture side)

1. Flavour Preference Task:

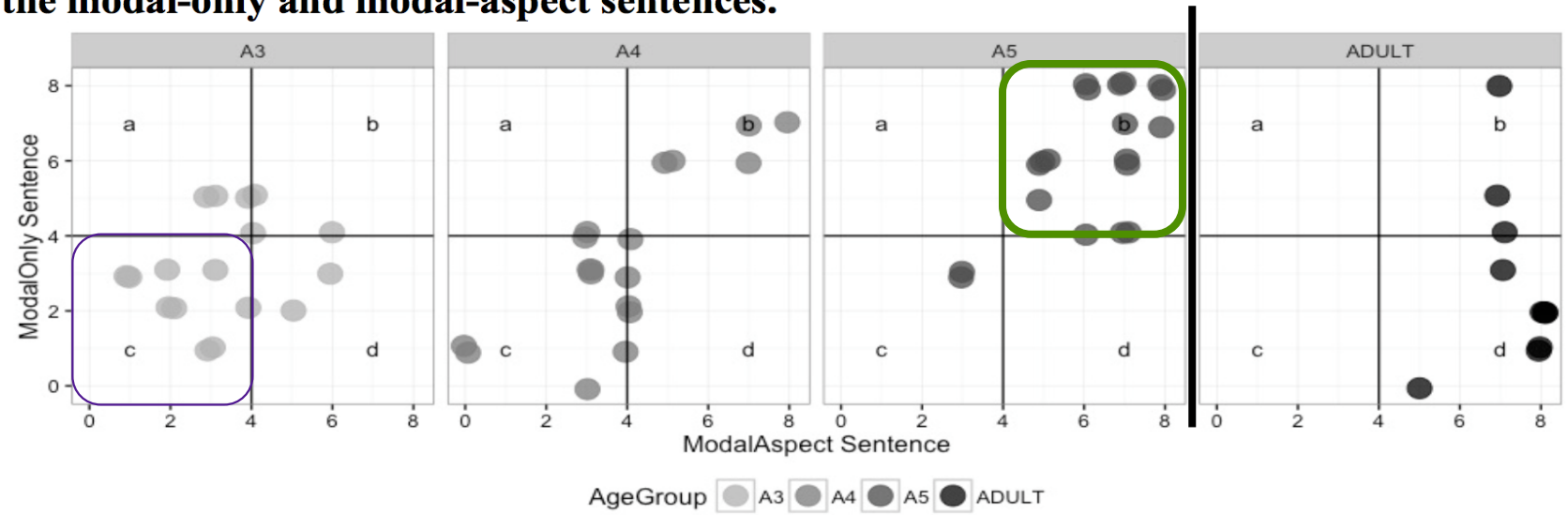
methods

Participants:

- 54 monolingual English children, born and raised in the Toronto area, divided into three groups:
  - 3-year-olds (*n*= 17: 36-47mos, *M*= 41.9, *SD*= 3.5),
  - 4-year-olds (*n*=18: 48-59mos, *M*= 53.3, *SD*= 3.1),
  - 5-6-year-olds (*n*=19: 60-77mos, *M*= 66.8, *SD*= 4.2).
- 10 dialect-matched young adults controls (age: 18-25); no exposure to a second language before 7.

1. Flavour Preference Task: results

Figure 2. Individual speakers plotted by the number of epistemic picture choices given to the modal-only and modal-aspect sentences.

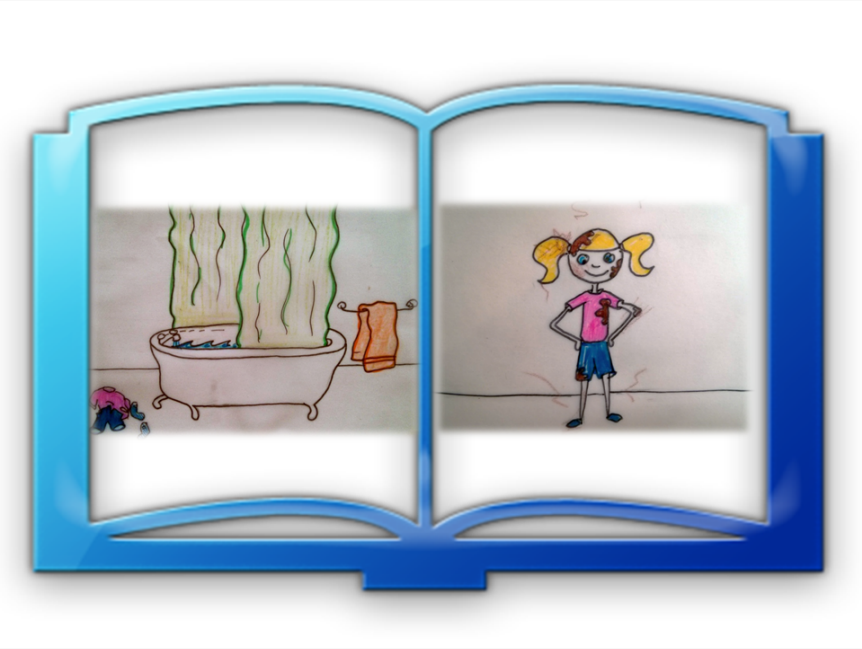


Note. *Quadrant a* is 'contrarian' to target for both sentence conditions. *Quadrant b* is 'epistemic dominant'. *Quadrant c* is 'deontic dominant'. *Quadrant* d is 'target-oriented'.

(glmer, Epistemic~AgeGroups+(1|Participant), AGEGROUPFIVE-YEAR-OLDS β=1.818, <0.001**)

1. Flavour Preference Task: results

Follow up question, 5 year-old, Washing Story (Progressive)
Test Sentence: Modal-only, "***Iryna must wash herself***" [Child picks Epistemic picture]
Exp: "*How do you know Penguin was looking at that picture?*"
Child: "*I can't see her. She's in the water and her clothes is on the floor.*"



1. Flavour Preference Task:

discussion

- Adults differentiate flavour by syntax. Children do not.
- 3yos show weak deontic bias, as with with prior work (see Papafragou 1998; Cournane 2015; van Dooren et al. 2017; Veselinović & Cournane, 2018)
- 5yos are more adultlike for ModalAspect (x-axis) but **significantly overgenerate epistemic interpretations for ModalOnly** (y-axis), consistent with **incrementation**.

2. Epistemic *must* Task:

intro

A **sentence-preference task** focusing on ***must*** in epistemic contexts, with aspect marking constant.

Question:

- When the choice is between marking epistemic or not, do young children abandon *must*?
- Note (1) and (2) are both felicitous in epistemic (indirect evidence) contexts (von Fintel & Gillies 2010).

Hypothesis: in ambiguous picture contexts (**EPISTEMIC**) children will avoid ***must*** (***must*** is being replaced by *have to* even in epistemic contexts in TO English[6]).

must → **++No*must***

1) Scott [is wearing his rainboots].
No-*must* sentence

2) Scott **must** [be wearing his rainboots].
***Must*-sentence**

2. Epistemic *must* Task: methods

Experimental Design:

- 4 Training, 8 Fillers, 16 test trials equally divided by context (actual, epistemic). Two mirror-image orders.

2. Epistemic *must* Task:

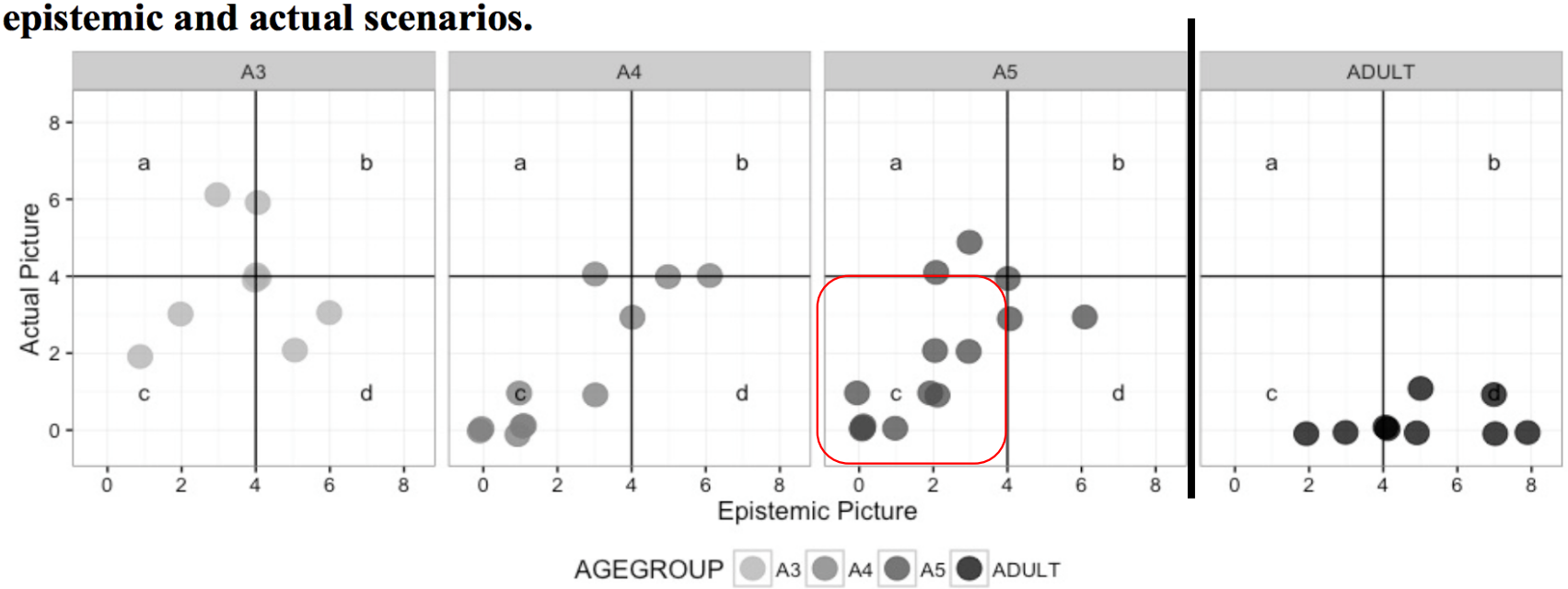
participants

Participants:

- 35 monolingual English-speaking children, born and raised in the Toronto area.
  - 3-year-olds (*n*= 9: 37-44mos, *M*= 40.4, *SD*= 1.9),
  - 4-year-olds (*n*= 11: 48-59mos, *M*= 53, *SD*= 4.4),
  - 5-year-olds (*n*= 15: 60-71mos, *M*= 65.2, *SD*= 3.8).
- 9 dialect-matched monolingual adults (age: 19 – 30), with no exposure to another language before age 7.

2.Epistemic *must* Task: results

Figure 5. Individual speakers plotted by the number of *must* responses given to the epistemic and actual scenarios.



Note. *Quadrant a* is 'contrarian' to expected for both sentence conditions. *Quadrant b* is '*must*-dominant'. *Quadrant c* is '*must*-avoidant'. *Quadrant* d is 'target-oriented'.

(glmer, MustChoice~Condition*Group+(1|Participant), PICTUREEPISTEMIC:GROUPCHILD:β=-0.622, <0.001**)

2. Epistemic *must* Task: discussion

- Adults vary, but prefer to mark with ***must*** in indirect evidence contexts (**EPISTEMIC**).
- 3yos at chance (evidential task likely too hard; see Ünal & Papafragou 2016, i.a.).
- 4 and 5yo children avoid picking ***must,*** with many 4 & 5yos at floor (Quadrant c).
  - This is felicitous, and note it's not about how *must* is interpreted, but whether to use it or not. Kids prefer not to (see also Noveck 2001; Ozturk & Papafragou, 2015).
  - ***must*** → **++No*must***

3. Deontic *must* Task:

intro

A **sentence-preference task** focusing on ***must*** in obligation contexts

Questions:

- Do older preschoolers have root interpretations for *must*? **Or, have older preschoolers abandoned root meanings altogether?**

Hypothesis: *Must* is a functional modal and gets its meaning compositionally (Hacquard 2006, i.a.); we thus expect children to have deontic interpretations with eventive complements.

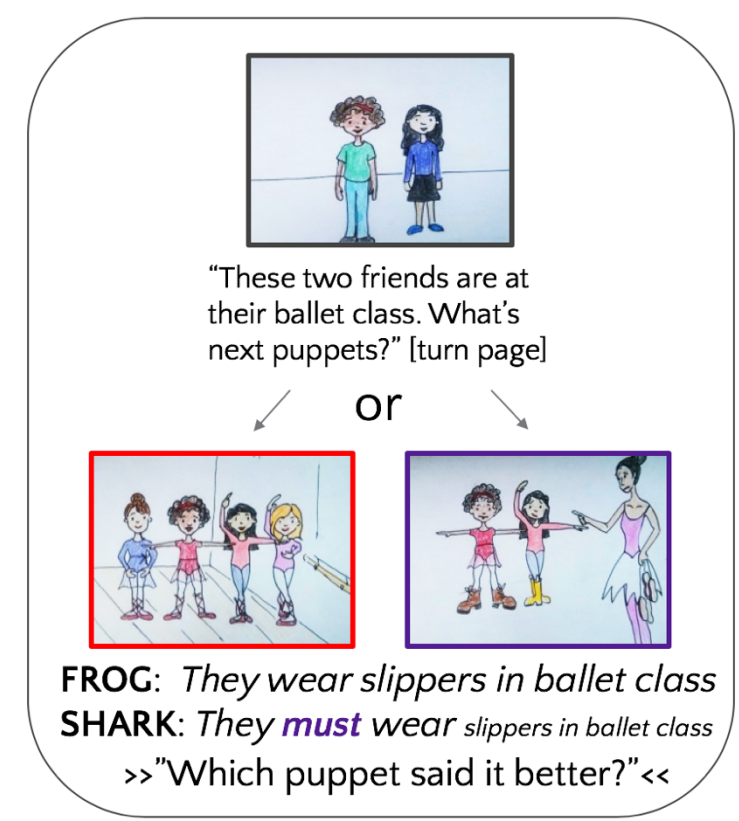
must vs. No*must*

1) The boys [wash their hands with soap].
No-*must* sentence

2) The boys **must** [wash their hands with soap].
***Must*-sentence**

3. Deontic *must* Task:

methods



Experimental Design:

- Training pre-test, followed by 10 test trials equally divided by context (actual, deontic), interspersed with 5 distractors. Two mirror-image orders.

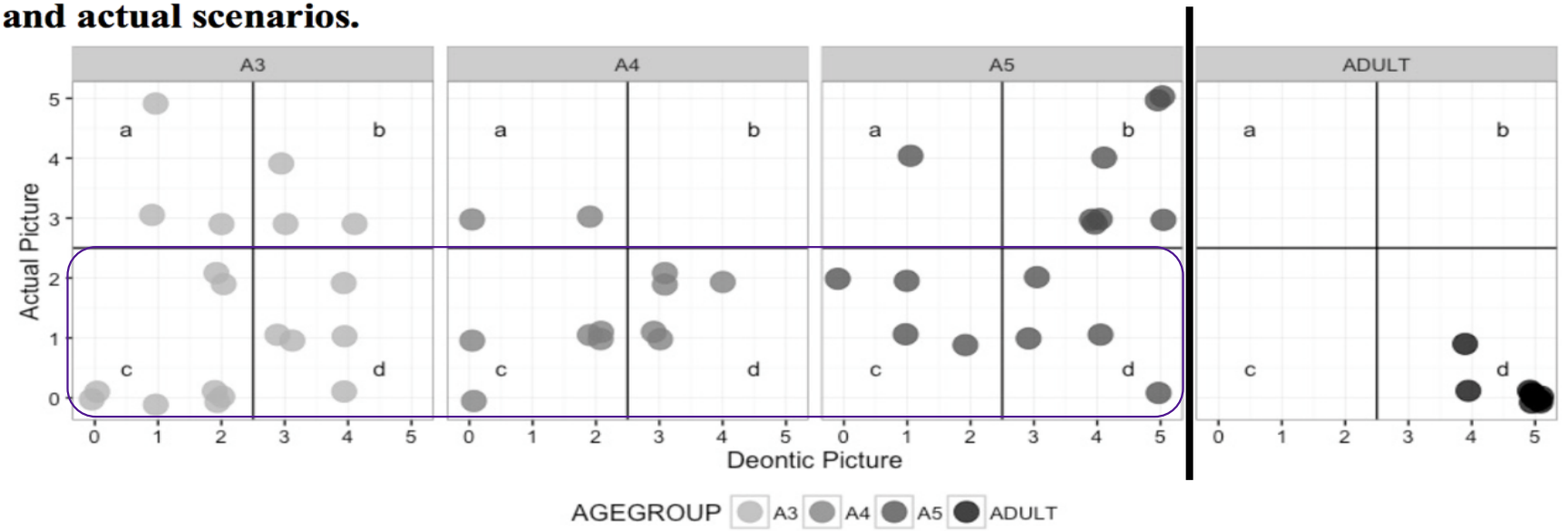
3. Deontic *must* Task: methods

Participants:

- 52 monolingual English children, born and raised in the Toronto area, divided into three groups:
  - 3 year-olds (*n*= 20, range: 38-47 mos, *M*=42.2 mos, *SD*= 3),
  - 4 year-olds (*n*= 15, range: 48-56 mos, *M*= 50.9, *SD*= 2.2),
  - 5-6 year-olds (*n*= 17, range: 60-77mos, *M*= 66.5, *SD*= 4.9).
- 10 dialect-matched monolingual English adults (age: 18-22) with no exposure to a second language before 7.

3.Deontic Detection Task: results

Figure 7. Individual speakers plotted by the number of *must* responses given to the deontic and actual scenarios.



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(glmer, MustChoice~Condition+(1|Participant)+(1|Item), PICTUREACTUAL:β=-0.622, <0.003**)

3. Deontic *must* Task: results

- Imageable obligations that 3yos will know rely on societal norms – English Simple Present is **generic** – so we got a weakened signal.
- We anticipated this, so we also systematically probed for qualitative data, asking "Why Frog/Shark?":

They must draw on paper but they're drawing on the wall.
5yo, Deontic, *must*

You wear slippers in ballet class
3yo, Deontic, *must*

Must means *have to*
4yo

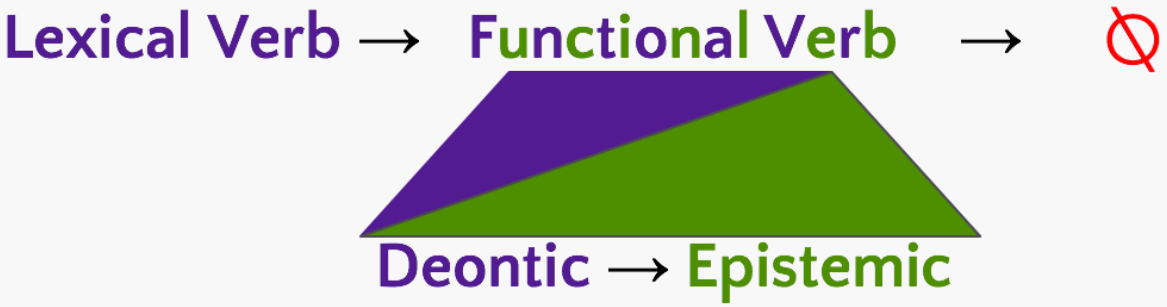
Not different because *must* means maybe they will
5yo, Actual, both

3. Deontic *must* Task: discussion

- Adults categorically pick *must* in **DEONTIC;** No*must* in **ACTUAL**
- All child groups show a weak but significantly reliable preference for *must* in **DEONTIC**.
  - Simple present (the NoMust sentence) is **generic**; stories talk about behavioural norms, muddling child results.
- Qualitative prompts and analysis show **clear knowledge of deontic *must* *in all child groups,*** but translations to *have to* a.o.
  (cf. Tagliamonte & D'Arcy, 2007)

General Discussion

- **Study 1**: 5yos prefer epistemic interpretations of *must* for ambiguous bare verb sentences, above adult rates.
- **Study 2**: 4 & 5yos prefer not to mark sentences with *must* in epistemic contexts, contra adults.
- **Study 3**: Children maintain deontic interpretations throughout development.
  - **5yos are incrementing in Study 1, not just categorically updating *must* to "epistemic only"**



Why so?

Internal Factors: English Syntax-Semantics

Why might children overgenerate epistemic *must*?

- Epistemic functional modals interpreted above Tense and Aspect, root functional modals below (see Brennan 1993; Cinque 1999; Hacquard 2006, 2010, i.a.).

LF: [Subj [***must***$_{\text{EPISTEMIC}}$ [Tense [Aspect [***must***$_{\text{ROOT}}$ [...VP]]]]]]

- In English, *must* is <u>overtly</u> above aspect marking: once kids reliably acquire aspect, they overgenerate high epistemic interpretations.
- Learners show robust widespread biases towards **isomorphism** (Musolino, 1998, i.a.), **one-to-one mapping** (Clark, 1973 i.a.), and **regularity** (Hudson-Kam & Newport, 2009, i.a.)

Main Claim: Learning biases may feed well-known patterns of language change; here **Deontic** → **+Epistemic** incrementation and loss of older forms.

Some Concluding Questions

- What is the role of formal registers (…reading, school…) in maintenance of conservative deontic ***must***?
  - Not the only factor; compositional semantic universals (see Hacquard 2006, 2013) for functional modal interpretation crosscut registers
- What is the role of other modals in the system – both other functional modals, and lexical epistemic markers like *probably* or *know*? (Cournane, in press)
- Our data are **comprehension** but incrementation theory is based on **production** (see Tagliamonte & D'Arcy 2009, for s-side overview). What to do?
  - Hirzel, Cournane, Hacquard (in prep) have a production task with **possibility, necessity x teleological (root), epistemic**, based on Cournane (2014); running on 3yos & adults in M.D, plans to run teenagers. (So far, zero *must*!)

BCS Extension

Joint work with Dr. Dunja Veselinović (NYU)

Bosnian/Croatian/Serbian (BCS): Modal Flavour Task

Replicated the Modal Flavour Task in BCS.

- BCS *morati* 'must' is uniformly:
  - biclausal structure when epistemic,
  - monoclausal structure when root (Veselinović, 2017)
- *Morati* is overwhelmingly root in the input (Veselinović & Cournane, 2020)

Nonetheless, the results are just like for English *must*:

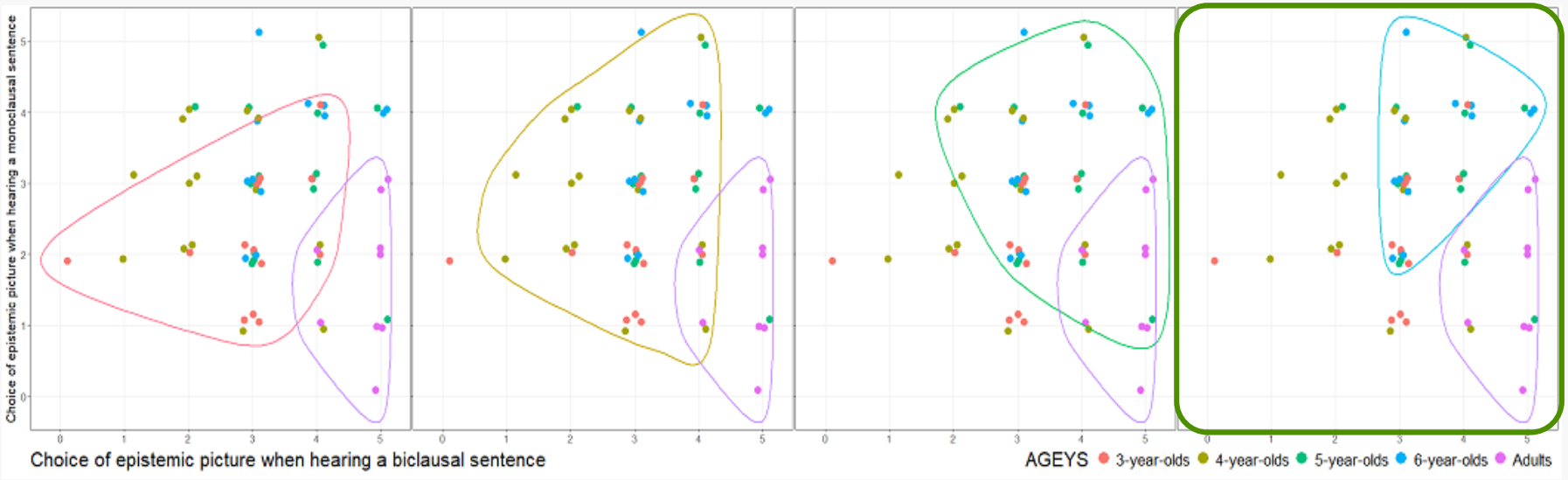
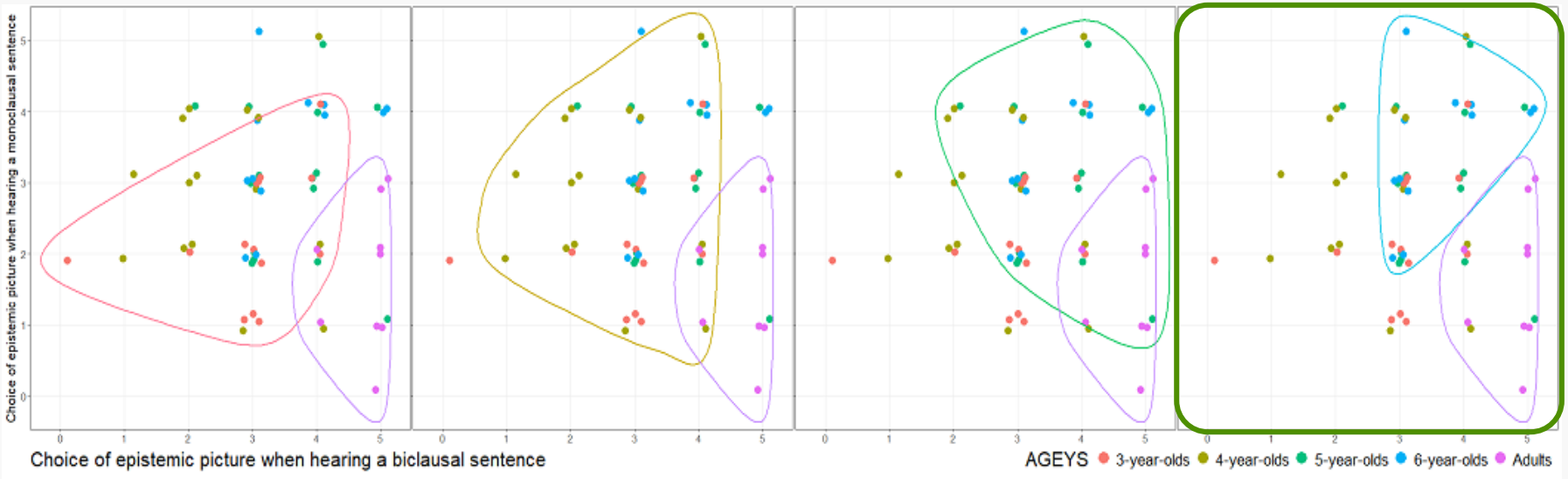


Figure 4: Individual speakers plotted by the number of responses choosing the epistemic picture, in response to biclausal (x-axis) and monoclausal (y-axis) sentences (Axes Maxima = 5). Adult results (purple) compared to results of (left-to-right) 3, 4, 5 and 6-year-olds. Test for trend in proportions shows a significant trend toward becoming adultlike in responding to epistemic ($X^2 = 21.795$, $p<0.0001$) but not root sentences ($X^2 = 0.0335$, $p = 0.85$).

Bosnian/Croatian/Serbian (BCS): Modal Flavour Task

Why so like English?

- Input patterns don't predict this…
- Syntax doesn't allow variable interpretation, unlike English…
- **Over-adherence to pragmatic inferences of the type "If you must, you will" (in change theory: Dasher & Traugott, 2005)?** I.e., Children understand deontic *morati*, but quickly infer that if the subject of the sentence *is obliged* to take a bath, then he will do so. This allows them to select the epistemic picture (indirect evidence for an ongoing event) despite hearing a deontic sentence.



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- **A warm thank you to all the participating daycares, JK/SK programs, parents and adorable children in Toronto!**

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