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THE LONGITUDINAL RELATIONSHIP BETWEEN VOCABULARY AND GRAMMAR IN EAL LEARNERS

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ACKNOWLEDGEMENTS

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OUTLINE

1. Background on the longitudinal relationship between vocabulary and grammar
   - Issues in modeling between-person and within-person associations

2. Results from a longitudinal study of EAL learners

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RATIONALE FOR THE STUDY

1. To develop a better understanding of the relationship between vocabulary skills and grammatical skills in a group of EAL learners in the first year of primary school.

2. To model both concurrent and longitudinal vocabulary-grammar relationships while taking into account trait-like stability of individual differences.

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BILINGUAL CHILDREN IN SCHOOLS IN ENGLAND (EAL LEARNERS)

- 1 in 5 children in primary schools in England is classified by the Department for Education as an **English as Additional Language (EAL)** learner.

- The category of EAL learners, *irrespective of their proficiency in English*, includes those children whose "*first* language is any language other than English that a child was exposed to during *early development and continues to be exposed to in the home or community*".

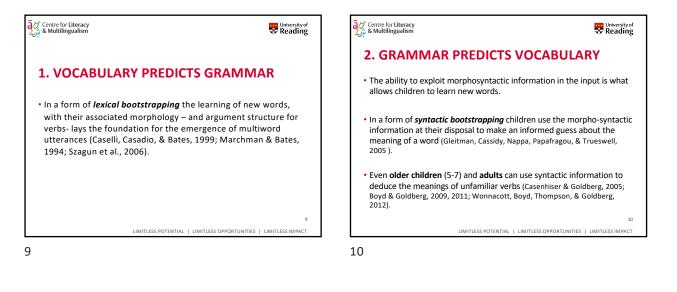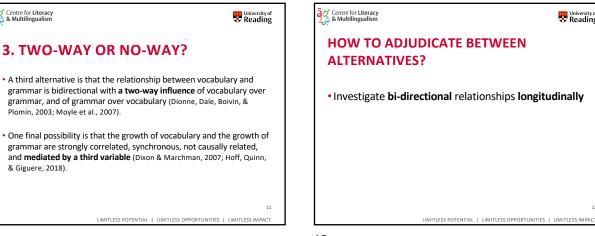
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DEVELOPMENTAL TRAJECTORIES IN THE SCHOOL YEARS

- Cross-sectional studies provide a snapshot of **current** knowledge and **concurrent** relationships.

- Longitudinal studies are crucial to understanding **development** and to building a picture of **predictors** over time.

- The existence evidence base for the UK is so far limited.

VOCABULARY & GRAMMAR

- A large body of research has repeatedly found a strong and positive association between vocabulary and grammar

> **Cross-linguistically** (Devescovi, Caselli, Marchione, Pasqualetti, Reilly, & Bates, 2005; Mariscal & Gallego, 2012; Stolt, Haataja, Lapinleimu, & Lehtonen, 2009; Thordardottir, Weismer, & Evans, 2002)

> For both **monolingual and bilingual children** (Simon-Cereijido & Gutiérrez-Clellen, 2009; Marchman, Martínez-Sussmann, & Dale, 2004; Parra, Hoff, & Core, 2011)

> For **children with DLD** (Moyle et al., 2007)

WHAT PREDICTS WHAT?

1. Does vocabulary knowledge predict grammatical development?

2. Does grammatical development predict vocabulary knowledge?

3. Is there a bi-directional relationship?

4. Is development synchronous but uncoupled?

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1. VOCABULARY PREDICTS GRAMMAR

- In a form of *lexical bootstrapping* the learning of new words, with their associated morphology – and argument structure for verbs- lays the foundation for the emergence of multiword utterances (Caselli, Casadio, & Bates, 1999; Marchman & Bates, 1994; Szagun et al., 2006).

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2. GRAMMAR PREDICTS VOCABULARY

- The ability to exploit morphosyntactic information in the input is what allows children to learn new words.

- In a form of *syntactic bootstrapping* children use the morpho-syntactic information at their disposal to make an informed guess about the meaning of a word (Gleitman, Cassidy, Nappa, Papafragou, & Trueswell, 2005).

- Even **older children** (5-7) and **adults** can use syntactic information to deduce the meanings of unfamiliar verbs (Casenhiser & Goldberg, 2005; Boyd & Goldberg, 2009, 2011; Wonnacott, Boyd, Thompson, & Goldberg, 2012).

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3. TWO-WAY OR NO-WAY?

- A third alternative is that the relationship between vocabulary and grammar is bidirectional with **a two-way influence** of vocabulary over grammar, and of grammar over vocabulary (Dionne, Dale, Boivin, & Plomin, 2003; Moyle et al., 2007).

- One final possibility is that the growth of vocabulary and the growth of grammar are strongly correlated, synchronous, not causally related, and **mediated by a third variable** (Dixon & Marchman, 2007; Hoff, Quinn, & Giguere, 2018).

HOW TO ADJUDICATE BETWEEN ALTERNATIVES?

- Investigate **bi-directional** relationships **longitudinally**

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DEVELOPMENTAL ORDERING

- Most of the studies investigating the vocabulary-grammar relationship have investigated **concurrent relationships** (Dixon & Marchman, 2007; Pérez-Leroux, Castilla-Earls, & Brunner, 2012).

- Even in longitudinal studies it is important to consider the **bi-directionality** of the relationship and not just the vocabulary-grammar route (Bates et al., 1988; Conboy & Thal, 2006).

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DEVELOPMENTAL ORDERING

- A number of recent studies have used **cross-lagged panel models (CLPM)** to analyse the longitudinal and bi-directional relationship between vocabulary over time.

- The models are **crossed**, as they estimate relationships from one variable to another, and vice versa.

- They are **lagged** because they estimate relationships between variables across different time points.

- Taken together, cross-lagged panel models estimate **the directional influence** that variables have **on each other over time**.

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MODELING CHANGE AT THE WITHIN-SUBJECT LEVEL

- One problem with CLPM is that they assume that **every individual varies over time around the same mean for each of the constructs**, i.e. they do not take into account of trait-like **individual differences** that are time-invariant, i.e. which endure over time.

- Traditional CLPM therefore only allow the investigation of the cross-lagged relationship between two construct at the **between-subject** level but not at the within-subject level.

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DIFFERENT LEVELS: WITHIN-PERSON VS. BETWEEN PERSON

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MODELING CHANGE AT THE WITHIN-SUBJECT LEVEL

- The addition of random intercepts to CLPM (Hamaker et al., 2015; Brinchmann et al., 2019) accounts for trait-like, time-invariant stability i.e. the longitudinal consistency in the rank order of individual children.
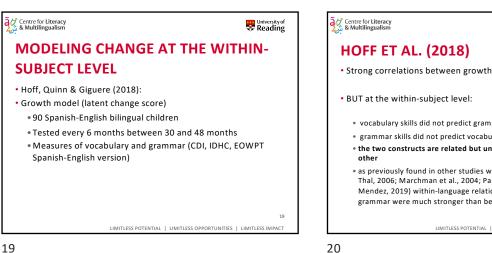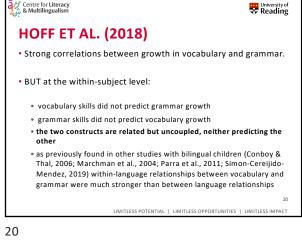
- This random intercept partials out between-person variance such that **the lagged relationships in the RI-CLPM concern within-person dynamics** over and above any time-variant association.
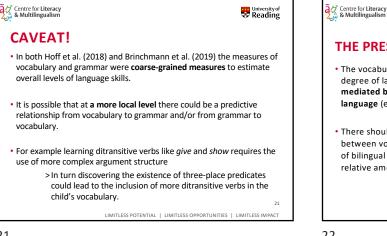
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BRINCHMANN ET AL. (2019)

- 217 Norwegian monolingual children
- Tested three times between 4;3 and 6;3
- Norwegian standardized version of BPVS II
- Norwegian standardized version of TROG 2

- The best fitting RI-CLPM model was the one with **unidirectional effects from grammar to vocabulary.**

  - small but positive and statistically significant cross-lagged effect from grammar measured at age 4 to vocabulary at age 5
  - no cross-lagged effects from vocabulary to grammar.

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MODELING CHANGE AT THE WITHIN-SUBJECT LEVEL

- Hoff, Quinn & Giguere (2018):
- Growth model (latent change score)
  - 90 Spanish-English bilingual children
  - Tested every 6 months between 30 and 48 months
  - Measures of vocabulary and grammar (CDI, IDHC, EOWPT Spanish-English version)

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HOFF ET AL. (2018)

- Strong correlations between growth in vocabulary and grammar.

- BUT at the within-subject level:

  - vocabulary skills did not predict grammar growth
  - grammar skills did not predict vocabulary growth
  - **the two constructs are related but uncoupled, neither predicting the other**
  - as previously found in other studies with bilingual children (Conboy & Thal, 2006; Marchman et al., 2004; Parra et al., 2011; Simon-Cereijido-Mendez, 2019) within-language relationships between vocabulary and grammar were much stronger than between language relationships

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CAVEAT!

- In both Hoff et al. (2018) and Brinchmann et al. (2019) the measures of vocabulary and grammar were **coarse-grained measures** to estimate overall levels of language skills.

- It is possible that at **a more local level** there could be a predictive relationship from vocabulary to grammar and/or from grammar to vocabulary.

- For example learning ditransitive verbs like *give* and *show* requires the use of more complex argument structure
  - In turn discovering the existence of three-place predicates could lead to the inclusion of more ditransitive verbs in the child's vocabulary.

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THE PRESENT STUDY

- The vocabulary-grammar relationship is characterised by a high degree of language-specificity in bilingual children and it is **mediated by the relative amount of input received in each language** (e.g. Marchman et al., 2004) .

- There should be strong and positive within-language association between vocabulary and grammar in the language of schooling of bilingual children which should in turn be predicted by the relative amount of input in that language.

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THE PRESENT STUDY

1. What is the longitudinal and reciprocal relationship between vocabulary and grammar in the language of schooling for EAL learners between the ages of 5 and 6 at **between-person level and within-person level**?

2. How do **age** and **relative amount of English input** affect this relationship?

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OUR PARTICIPANTS

- 100 EAL learners in 9 schools in the South East of England

- 89 children took part in all testing sessions

- Mean Age at testing:
  - Time 1: 5;8 – beginning of year 1
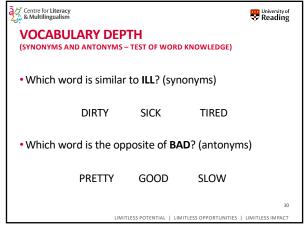 - Time 2: 6;2 – end of year 1
  - Time 3: 6;8 – beginning of year 2

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OUR PARTICIPANTS

- 28 different languages
  - **43% Polish**, 7% Hindi, 5% Arabic, 5% French, 5% Romanian, 4% Malayalam, 4% Nepali, 3% Bengali, 3% Punjabi, 3% Russian, 3% Tamil

- Cumulative exposure to English at time 1: M = 30 months (range: 1 - 62)

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WHAT WE ASKED CHILDREN (AND THEIR PARENTS) TO DO

- **Parents** were asked to complete a written questionnaire to estimate the relative exposure to the home language(s) and English.

- **Children** were seen in two one-to-one sessions and took part in a series of tasks to get a measure of:
  - **Non-verbal cognition** > a puzzle task
  - **Attention** > counting tones, spotting inconsistencies in stories
  - **Memory** > repeating numbers and words forward and backward
  - **Vocabulary breadth** > matching a word to a picture
  - **Vocabulary depth** > synonyms and antonyms
  - **Grammar (morpho-syntax)** > matching a sentence to a picture/provide endings

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GRAMMAR: MORPHOSYNTAX
(WORD STRUCTURE SUB-TEST CELF 4-UK)

"Here is one book. Here are two…"
"Here is one horse. Here are two…"

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GRAMMAR: RECEPTIVE SYNTAX
(TEST OF RECEPTION OF GRAMMAR)

"The boy is pushed by the elephant"

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VOCABULARY BREADTH
(BRITISH PICTURE VOCABULARY SCALE 3)

- Can you point to the **apple**?

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VOCABULARY DEPTH
(SYNONYMS AND ANTONYMS – TEST OF WORD KNOWLEDGE)

- Which word is similar to **ILL**? (synonyms)

  DIRTY   SICK   TIRED

- Which word is the opposite of **BAD**? (antonyms)

  PRETTY   GOOD   SLOW

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BIVARIATE GROWTH MODELS

- A combination of growth models and CLPM including
  - growth parameters (intercept and slope)
  - autoregressive and cross-lagged relationships

- The **growth curve** part captures **between-person** differences in initial levels (the intercept) and development (the slope) of the variables of interest.

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BIVARIATE GROWTH MODELS

- A combination of growth models and CLPM including
  - growth parameters (intercept and slope)
  - autoregressive and cross-lagged relationships

- The **autoregressive** parameters describe the **within–person** relationship of the same variable at consecutive time points (e.g. between vocab at time 1 and vocabulary at time 2)

- The **cross-lagged** parameters indicate whether there is a **within-person** relationship between variable x and y at adjacent time points (e.g. between vocabulary at time 1 and grammar at time 2

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RESULTS

- Including direct cross-lagged effects did not improve any of the models:
  - No evidence **of within-person** associations between vocabulary and grammar

- All of the bivariate growth models showed a correlation between vocabulary and grammar, but failed to show any correlation between their growth
  - vocabulary and grammatical skills are correlated in EAL children, but these abilities grow independently

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VOCABULARY BREADTH & MORPHO-SYNTAX

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VOCABULARY DEPTH & MORPHO-SYNTAX

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VOCABULARY BREADTH & SYNTAX

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VOCABULARY DEPTH & SYNTAX

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GRAMMAR & VOCABULARY

- Children with **better morpho-syntactic abilities** at the beginning of year 1 had a **more significant growth in vocabulary breadth and in vocabulary depth** than children who started with lower grammar abilities.

- Vocabulary growth at more advanced stages is mostly driven by the acquisition of new **morphologically-inflected forms**, rather than new root words (Anglin, 1993; Carlisle, 2007; Nagy & Anderson, 1984).

- Children's ability to recognise and use suffixes and affixes allows them to infer the meaning of new, previously unknown words.

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MATTHEW EFFECTS IN VOCABULARY DEPTH GROWTH

- Growth in **vocabulary depth (slope)** was positively correlated with the initial depth of children's vocabularies (intercept), in a pattern that could be described as a Matthew effect.

- **Age** and **English input at Time 1** also predicted **vocabulary depth skills:**

  - older children and those exposed to more English had deeper vocabularies
    - these children increased their vocabulary depth faster than less skilled children and those with less English input

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TESTING CAUSALITY AT WITHIN-PERSON AND BETWEEN-PERSON LEVEL

- Intervention studies?

- A recent systematic review of intervention studies (Rogde, Hagen, Melby-Lervåg & Lervåg, 2019) reported that he effect of linguistic comprehension instruction on generalized outcomes of linguistic comprehension skills is small in studies of both the overall immediate and follow-up effects.

- Analysis of differential language outcomes shows **small effects on vocabulary and grammatical knowledge** and moderate effects on narrative and listening comprehension.

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TESTING CAUSALITY AT WITHIN-PERSON AND BETWEEN-PERSON LEVEL

- BUT intervention studies that measure change at a different level of granularity (i.e. the relationship of particular words to particular constructions) should shed light on the bi-directional relationship between vocabulary and grammar.

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IF YOU WANT TO KNOW MORE

- Please visit our website to find out more as our project evolves:
  https://research.reading.ac.uk/bilingual-children/

Grazie, danke, thanks, dzięki, شکر, धन्यवाद, merci, mulțumiri, ನನ್ನಿ, ধন্যবাদ, ਧੰਨਵਾਦ, Спасибо, நன்றி

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