Phonological Factors Underlying Performance on a Cross-language Non-word Repetition (XL-NWR) Task

McGill **CRBLM**

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INTRODUCTION

BACKGROUND

Non-word Repetition (NWR) Tasks:
- Commonly used as clinical marker of language impairment (LI) [3,4,8,10].
- To achieve range in complexity, available tools sometimes compromise wordlikeness or do not control phonological factors across stimuli.

Example: English-medium CNRep [8]:
- Half of words are 4-5 syllables long but average for English is 2.72 (lexical types) [5].
- Presence/absence of complex onsets and codas and their position not controlled, although these factors can affect acquisition for typically-developing children [7].

OBJECTIVES

Context:
- Growing number of North American children bilingual in English-French, English-Spanish, or French-Spanish.
- Need to appropriately diagnose LI in these populations.

Goal:
- Design NWR task that can be used for monolingual and bilingual children across three languages: English, French, Spanish.
- Stimuli must control for wordlikeness and various types of phonological complexity, yet be highly similar across languages to facilitate cross-language comparison (cf. [1] on Russian-Hebrew bilinguals).

CROSS-LANGUAGE NON-WORD REPETITION TEST (XL-NWR)

METHOD

Stimuli:
- Each language: 27 non-words, 2-4 syllables in length.
- Syllables: All open, initial closed, or final closed.
- Segments: Consonants common to all three languages; vowel quality as parallel as possible across languages; codas cross-linguistically unmarked (sonorants or [s]); coda-onset profiles well-formed in each language.
- Stress: Location followed regular rules for each language.

Word Shapes			Representative Examples		
Syllables	Coda	Template	English	French	Spanish
2	none	CV.CV	[kí:nə]	[kiná]	[kína]
	Initial	CVC.CV	[délkoʊ]	[dɛlkó]	[délko]
	final	CV.CVC	[nǽgi:s]	[nagís]	[nágis]
3	none	CV.CV.CV	[fakóoli]	[fekolí]	[fekóli]
	initial	CVC.CV.CV	[féldəpi]	[feldapí]	[feldápi]
	final	CV.CV.CVC	[tú:məkal]	[tumekál]	[tumekál]
4	none	CV.CV.CV.CV	[dù:məpí:goʊ]	[dumapigó]	[dumapígo]
	initial	CVC.CV.CV.CV	[tæ̀spʊkéifi]	[taspukefí]	[taspukéfi]
	final	CV.CV.CV.CVC	[bæ̀dəmí:sɛn]	[badomisén]	[badomisén]

Participants:
- Three groups: ASD with normal language (ASD-NL), ASD with language impairment (ASD-LI), typically-developing controls (TYP).
- Two dominant languages: English, French.
- Age range: 5-10 (means: 8.0 ASD, 7.7 TYP).
- Groups did not differ significantly in age or gender (predominantly male).
- TYP and ASD-NL did not differ significantly in NVIQ or SES.
- ASD-NL and ASD-LI did not differ significantly in autism symptoms or amount of dominant language exposure.

Language Dominance	Group			Total
	TYP	ASD-NL	ASD-LI	
English	17	4	12	33
French	35	14	6	55
Total	52	18	18	88

Language Impairment:
- Defined as scores ≥1SD below mean on CELF Recalling Sentences subtest in dominant language [4,10], plus documentation of significant structural-language difficulties (e.g. prior clinical assessment report).
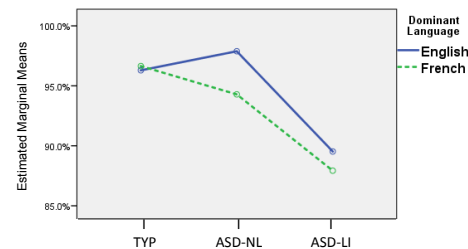
Dominant Language:
- Based on current language exposure, obtained via detailed parent report.

RESULTS

PHONEMES

Percent Phonemes Correct
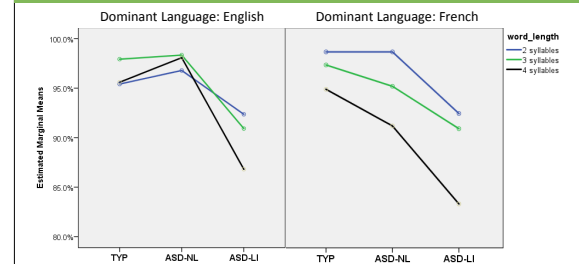
- Main effect of group ($p<.001$): ASD-LI sig lower than TYP ($p<.001$); ASD-NL not sig diff from TYP.
- No main effect of language.
- No group x language interaction.
- XL-NWR reliably identifies LI in children with ASD across languages ([see further [9]).

References:
[1] Armon-Lotem & Meir (2016) Diagnostic accuracy of repetition tasks for the identification of specific language impairment (SLI) in bilingual children: evidence from Russian and Hebrew. *Int J Lang Commun Disord* 51. [2] Boerma et al. (2015) A quasi-universal nonword repetition task as a diagnostic tool for bilingual children learning Dutch as a second language. *JSLHR* 58. [3] Chiat (2015) Nonword repetition. In *Methods for assessing multilingual children: Disentangling bilingualism from language impairment*. Multilingual Matters. [4] Conti-Ramsden, Botting & Faragher (2001) Psycholinguistic markers for specific language impairment (SLI). *J Child Psychol Psychiatry* 42. [5] Cutler, Norris & Sebastián-Gallés (2004) Phonemic repertoire and similarity within the vocabulary. ICSLP 8, Jeju, Korea. [6] dos Santos & Ferré (2018) A nonword repetition task to assess bilingual children's phonology. *Language Acquisition* 25. [7] Fikkert (1994) *On the acquisition of prosodic structure*. HIL. [8] Gathercole, Willis, Baddeley & Emslie (1994) The Children's test of Nonword Repetition: A test of phonological working memory. *Memory* 2. [9] Li, Gonzalez-Barrero, Goad & Nadig (2019) Evaluation of a novel non-word repetition test as a clinical marker for language impairment in multilingually-exposed children with ASD. INSAR, Montreal. [10] Thordardottir et al. (2011) Sensitivity and specificity of French language and processing measures for the identification of primary language impairment at age 5. *JSLHR* 54.
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WORD LENGTH

Dominant Language: English   Dominant Language: French

- Main effect of group ($p<.001$): ASD-LI sig lower than TYP ($p<.001$); ASD-NL not sig diff from TYP.
- No main effect of language.
- Sig word length effect ($p<.001$).
- Sig wd length x lang interaction ($p<.05$).
- Sig wd length x group interaction ($p<.05$).

Longer words in English have two stresses, unlike in French; stress facilitates production of 4-syllable words in English (for ASD-LI).

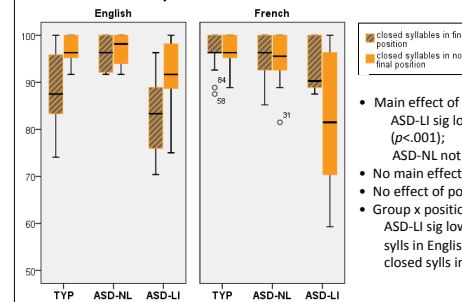## SYLLABLE SHAPE AND STRESS

Open vs. Closed Syllables:
- Open sylls sig higher than closed sylls ($p=.001$).

Stress:
- Sylls with primary stress sig higher than sylls with no primary stress ($p<.001$).

Syllable shape and stress impact performance.

Position of Closed Syllables: Final vs. Non-final:

English   French

- Main effect of group ($p<.001$): ASD-LI sig lower than TYP ($p<.001$); ASD-NL not sig diff from TYP.
- No main effect of language.
- No effect of position of closed syll.
- Group x position sig ($p<.001$): ASD-LI sig lower on *final* closed sylls in English and on *non-final* closed sylls in French.

English and French differ in stress location (non-final vs. final): stress facilitates production of complex (closed) syllables.

CONCLUSION

- Need to be sensitive to phonological factors when designing NWR tasks, both within and across languages (see also [2,3,6]).
- Word length, syllable shape, location of stress and their interaction can all influence performance.
- More nuanced scoring system may be needed, beyond percent phonemes correct.