

Evaluation of a novel non-word repetition test as a clinical marker for language impairment in multilingually-exposed children with ASD



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BACKGROUND

Language Impairment (LI)

- Is observed in 40-60% of children with Autism Spectrum Disorder (ASD)¹
- Is a challenge to assess for in multilingual populations, as assessment tools are often developed for/normed on monolingual populations²

Sentence Repetition (SR) Tests

- Contain language-specific content (e.g. vocabulary, syntax)
- Reliably identify LI in monolingual populations³, but in bilingual populations, low performance could be LI or low exposure to language of testing⁴

Non-word Repetition (NWR) Tests

- Use non-words, which contain less language-specific content than SR and thus may be less affected by particular language exposure⁴
- Also reliably identify LI in monolingual populations⁴
- However, no NWR task has been designed to be used by individuals with different dominant languages *in* those different dominant languages

- In this context, we developed a **new, cross-language NWR test** whose stimuli work in English, French and Spanish to use as a LI-assessment tool for individuals with **varying levels of exposure** to those languages.
- The table below highlights the variables controlled for to preserve **wordlikeness** in all three languages (see **Poster 206.109**, May 3, 17:30-19:00 by Goad et al. for further detail).

Cross-Language Non-Word Repetition Test (XL-NWR)

OBJECTIVE

- Here, we present evidence relating to **four parameters** of the XL-NWR:

1. Accuracy in identification of LI in children with ASD
2. Construct validity (via comparison with established NWR tests)
3. Stability of performance across languages of testing
4. Relationship of performance to amount of language exposure

PARTICIPANTS

Variable	Group: Mean (SD)		p-value
	ASD (n=36)	TYP (n=52)	
Chronological age (years)	8.0 (1.7)	7.7 (0.1)	.373
Dominant language	20 French, 16 English	35 French, 17 English	.263
Gender	31 Males, 5 Females	40 Males, 12 Females	.283
Current amount of exposure to dominant language (%)	81.3 (18.6)	74.3 (17.9)	.082
Nonverbal IQ (Leiter-R)	106.7 (12.4)	113.1 (11.0)	.014
Maternal education (years)	14.8 (2.6)	16.2 (1.7)	.002
Diagnostic confirmation (Social Communication Questionnaire)	19.5 (6.2)	3.1 (2.8)	.000
Number of children with LI*	18/36	0/52	.000
Number of proficient bilinguals with valid data in dominant and non-dominant language	9/36	26/52	.018

* LI defined as scores ≥ 1 SD below the mean on CELF Recalling Sentences subtest in the dominant language^{5,6} in combination with documentation of significant structural-language difficulties (e.g. prior clinical assessment report).

- This study was part of a larger project examining the cognitive and linguistic abilities of monolingual and bilingual school-age children with ASD from the Greater Montreal area (Gonzalez-Barrero and Nadig, 2017).

PROCEDURE

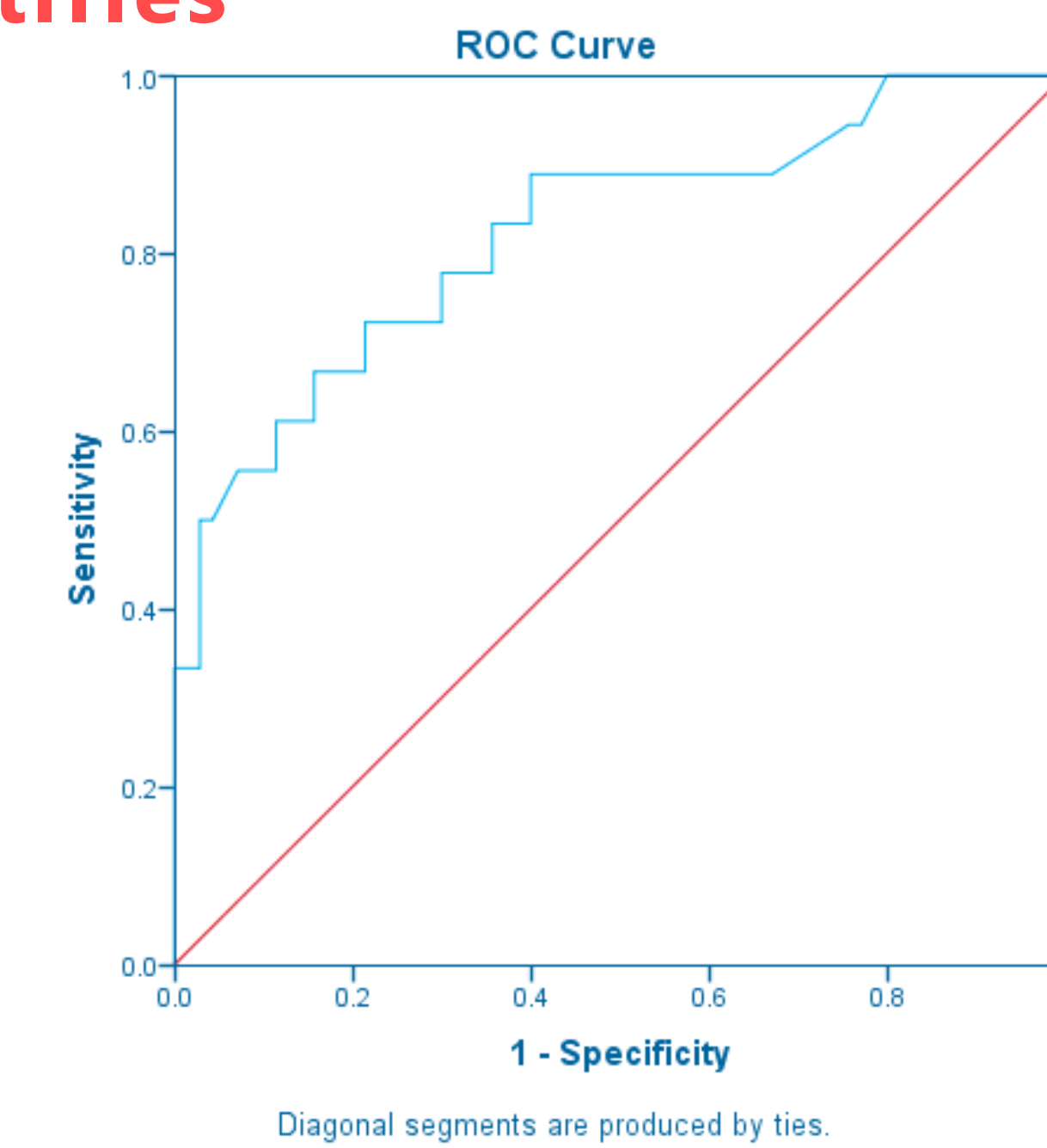
- Every child was administered the XL-NWR and a SR test in their dominant language.
- Proficient bilinguals were also administered the XL-NWR in their non-dominant language.
- Sessions: two weeks apart with diff. researchers.
- XL-NWR administrations: subject to fidelity criteria and transcribed twice, blind to LI-status.
- Scoring was blind to LI-status, 98.8% consistent (inter-reliability analysis: 20% of data).

RESULTS

1. The XL-NWR reliably identifies LI in children with ASD.

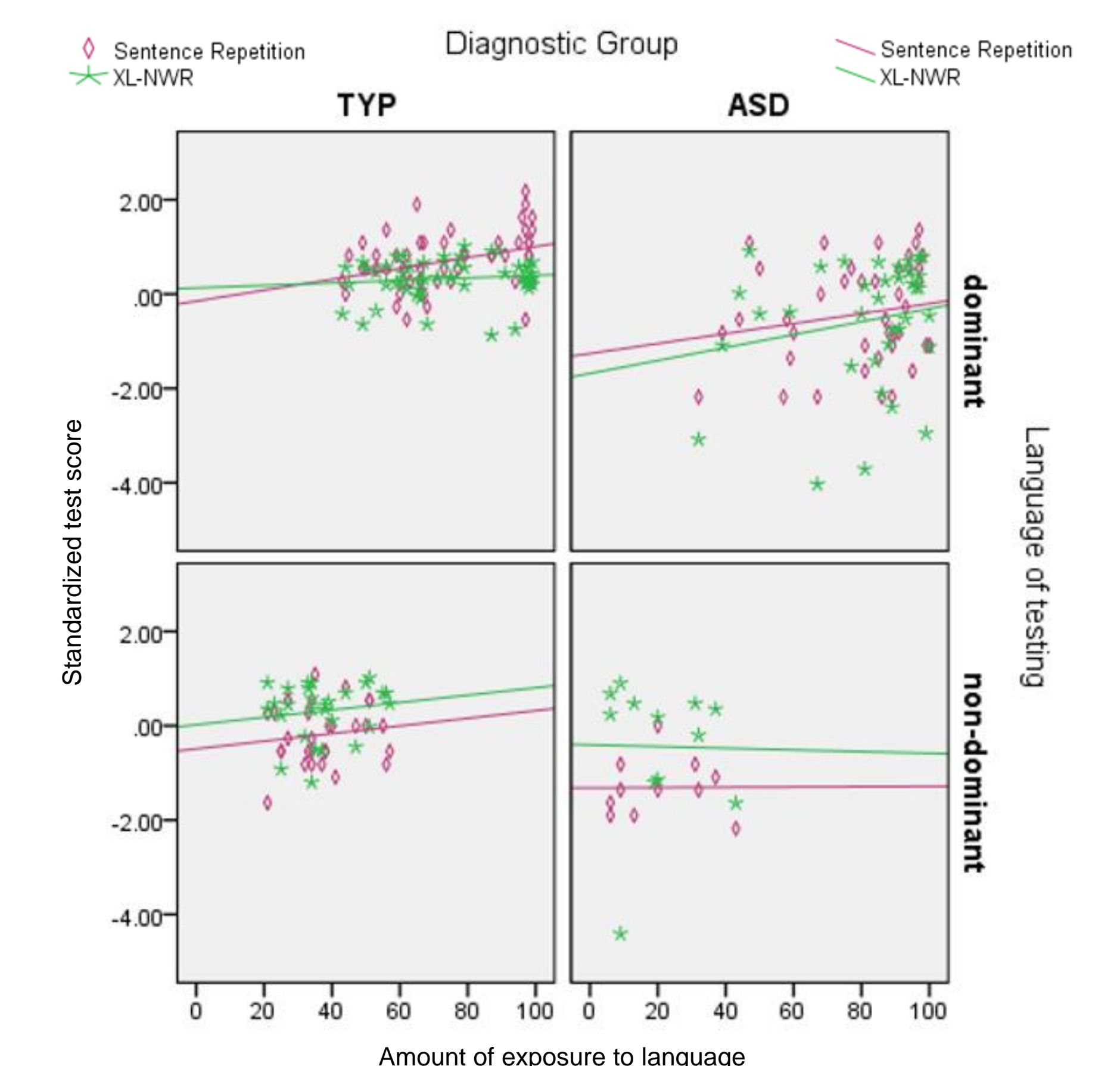
PPC cut-off	Sensitivity	Specificity
0.9462	66.7%	80.0%
0.9490	66.7%	78.6%
0.9512	72.2%	78.6%
0.9531	72.2%	78.6%
0.9547	72.2%	77.1%
0.9567	72.2%	75.7%
0.9580	72.2%	71.4%
0.9585	72.2%	70.0%
0.9589	77.8%	70.0%
0.9593	77.8%	68.6%
0.9598	77.8%	67.1%
0.9606	83.3%	64.3%

Sensitivity measures the detection rate of true positives (i.e. presence of LI), while **specificity** measures that of true negatives (no LI). The XL-NWR achieved $\geq 70\%$ in **both**, e.g. at the cut-offs highlighted above.



The **area under the ROC curve (AUC)** measures utility of a diagnostic test. The XL-NWR's AUC was **.823** (se=.06; 95% CI: .705-.941), indicating a **good level of utility**⁷.

4. XL-NWR performance is not predicted by language exposure.



2. The XL-NWR correlates significantly with established NWR tests.

- | | |
|------------------------------|------------------------------|
| French: | English: |
| • Courcy (2000) | • Gathercole et al. (1994) |
| • n=21, item-level scoring | • n=12, PPC scoring |
| • r = .600 , p = .004 | • r = .894 , p < .001 |

3. The XL-NWR shows stability of performance across languages.

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|--|---|
| Regression analysis (see point 4) indicates dominant language was not a significant predictor of XL-NWR performance. | Correlation analysis of XL-NWR performance of bilinguals tested in both languages: r = .683 , p < .001 (n=35, PPC scoring). |
|--|---|

Predictor	XL-NWR PPC (dominant language)		SR standard score (dominant language)	
	B	β	B	β
Amount of exposure to dominant language	-.000	.113	.034	.176*
Diagnosis (ASD/TYP)	-.038	-.455**	-4.275	-.586** nd
Dominant language (French/English)	.006	.069	1.601	.216**
Age	.000	.214* nd	n/a	n/a
R ²	.235		.424	

* p < .05, ** p < .01, nd significant predictor in non-dominant language (n=40)

- **Amount of language exposure** and **dominant language** were significant predictors for SR performance **but not** for XL-NWR performance.
- **Diagnosis** was a significant predictor for both tests: consistent with only the ASD group having participants with LI.

CONCLUSIONS

Findings across four parameters support the use of the Cross-Language Non-Word Repetition test (XL-NWR) when assessing for language impairment in children with ASD who speak English, French or both.

High performance of the participants in this 5- to 10-year-old sample indicates future work should examine the performance of preschool-age children on the XL-NWR.

Next is the incorporation of data from Spanish speakers (monolingual or otherwise) to explore the utility of the XL-NWR in the third language for which it was designed.