Assessment Methods in Identifying Morphosyntactic Deficits in Children and Adolescents with Fragile X Syndrome and Autism Spectrum Disorder

Eileen Haebig, Audra Sterling & Susen Schroeder

Waisman Center and Department of Communication Sciences & Disorders, The University of Wisconsin-Madison

Background

Fragile X syndrome (FXS) is the leading cause of inherited intellectual disability, affecting approximately 1 in every 2,500 males (Hagerman, 2002). A significant number of males with FXS also meet the criteria for autism (25-30%), while the remaining display autistic-like behaviors (e.g., repetitive behaviors, language perseverations, etc.). The FXS phenotype is associated with cognitive and language delays. The language phenotype is quite variable in the syntactic domain.

Both children with fragile X syndrome and autism spectrum disorders (ASD) have language deficits, including difficulties with grammatical morphemes (Kjelgaard & Tager-Flusberg, 2001; Roberts et al., 2004; Sterling et al., 2012); however, there is currently no standard assessment method of morphosyntax in these populations. It is important that clinicians properly assess morphosyntax in order to identify appropriate therapy targets.

This study aimed to compare two assessment methods: an experimental sentence imitation task (SIT) and a standardized measure (TEGI) in adolescents with FXS and ASD. While alike in many ways, we note critical differences that could have important clinical implications.

Methods

Sixteen adolescents with FXS and five adolescents with ASD participated as part of a broader study assessing grammatical abilities. The children were given a battery of assessment measures.

- Cognition
  - Leiter – R Brief IQ
- Language
  - Test of Early Grammatical Impairment (TEGI; Rice & Wexler, 2001)
  - Sentence Imitation Task (SIT)

  Constructs Tested: third-person singular, regular and irregular past tense, be and do

Results

Participant characteristics and performance on language measures are provided in Table 1.

Table 1: Participant Characteristics & TEGI and SIT Task Performance

	FXS (N=16)			ASD (N=5)		
Measure	**Mean**	**SD**	**Range**	**Mean**	**SD**	**Range**
Chronological Age	12.6	2.3	9.0-16.4	11.7	2.0	9.1-14.1
Leiter-R Brief IQ	46.9	7.9	36-60	70	12.6	48-79
TEGI Third-Person Singular	88.4 (n=15)	26.3	0-100	80 (n=4)	27.4	50-100
TEGI Regular Past Tense Probe	60.4 (n=14)	36.6	0-100	60 (n=4)	54.8	0-100
TEGI Irregular Past Tense Probe	46.3 (n=14)	23.7	0.14-86	40 (n=4)	54.8	0-100
TEGI Be Probe	81.7 (n=14)	30.5	0-100	100 (n=4)	0	100
TEGI Do Probe	41.7 (n=14)	40.7	0-100	50 (n=4)	57.7	0-100
SIT Third-Person Singular	83.4	33.5	0-100	97.5	5.6	87.5-100
SIT Regular Past Tense	50	46.2	0-100	88	17.9	60-100
SIT Irregular Past Tense	75.4	38.9	0-100	100	0	100
SIT Be	93.8	25	0-100	100	0	100
SIT Do	18.8	40.3	0-100	100	0	100

There were significant correlations between performance on the TEGI and the SIT in the adolescents with FXS on the following constructs: third-person singular ($r = .960$, $p < .001$), be ($r = .771$, $p = .001$), and do ($r = .534$, $p < .05$).

There were no correlations between the two assessments in the adolescents with ASD.

Performance on tasks also was assessed by the number of scorable items. Several adolescents produced responses that could not be analyzed (e.g., production of a non-target form such as “She **is smelling** flowers.” instead of “She **smells** flowers.”).

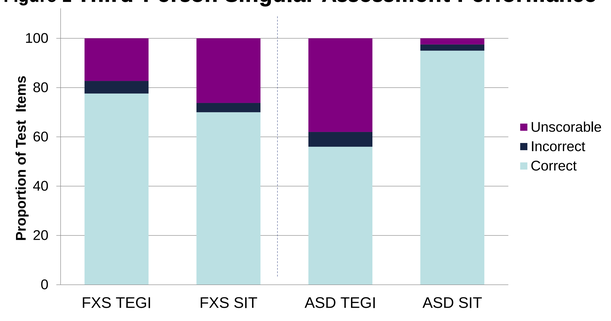
Results

Table 2 presents the percentage of unscorable items in each assessment and Figure 1 for third-person singular.

Table 2 Average Percentage of Unscorable Items in Subtest

		FXS	ASD
TEGI	Third-Person Singular	17%	38%
	Past Tense	12%	51%
	Be/Do	38%	41%
SIT	Third-Person Singular	26%	2.5%
	Regular Past Tense	34%	0%
	Irregular Past Tense	25%	0%
	Be	31%	0%
	Do	85%	0%

Figure 1 Third-Person Singular Assessment Performance



Discussion

Results indicate that there is a great deal of variation in performance among morphosyntactic markers in adolescents with FXS and ASD.

Adolescents with FXS demonstrated competency with the third-person singular grammatical marker and be verb forms, but difficulties in past tense forms and do verb forms.

Discussion

Preliminary data from the adolescents with ASD indicate similar performance on grammatical abilities as adolescents with FXS despite disparate IQ scores.

Variation also is seen between tests that assess the same morphosyntactic marker. Performance on the TEGI and SIT differed according to group. More features were correlated on the two assessments in the group with FXS than ASD.

Adolescents with FXS produced more unscorable responses on the SIT than the TEGI; adolescents with ASD demonstrated the opposite pattern.

Adolescents with ASD performed at ceiling on irregular past tense, be, and do items on the SIT, precluding correlational analyses. Performance may be explained by known repetitive features observed in individuals with ASD (e.g., echolalia).

The ability to provide scorable responses should be considered when selecting appropriate assessments.

References

Hagerman, R. J. (2002). The physical and behavioral phenotype. In R. J. Hagerman & P. J. Hagerman (Eds.), Fragile X syndrome: Diagnosis, treatment, and research (pp.3–109). Baltimore: Johns Hopkins University Press.

Kjelgaard M, Tager-Flusberg H (2001), An investigation of language impairment in autism: implications for genetic subgroups. *Language and Cognitive Processes*, *16*, 287–308.

Rice, M. L., & Wexler, K. (2001). *Rice–Wexler Test of Early Grammatical Impairment*. San Antonio, TX: The Psychological Corporation.

Roberts, J.A., Rice, M.L., & Tager-Flusberg, H. (2004). Tense marking in children with autism. *Applied Psycholinguistics. 25*(3), 429–448.

Roid, G. H., & Miller, L. J. (1997). *Leiter International Performance Scale–Revised*. Wood Dale, IL: Stoelting.

Sterling, A.M., Rice, M.L., & Warren, S.F. (2012). Finiteness marking in boys with fragile x syndrome. *Journal of Speech Language Hearing Research*, 55, 1704-1715.

Acknowledgments

We are extremely appreciative of the families who participated in this study, without whom our research would not have been possible.

Funding for this project was provided by NIH including R03 DC011616 and start-up funds from the University of Wisconsin-Madison. We are grateful for the support from the Waisman Center Core Grant (P30 HD03352, M. Mailick, PI).