Identifying Features of ASD Language Impairment in Narrative Retellings

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Background

Motivation

- Although language difficulties are not among the diagnostic criteria for ASD, they are frequently observed in the ASD population.

  - Are these language difficulties in some children with ASD indicative of a co-morbid developmental language disorder (DLD)?
  - Alternatively, are they characteristic of a distinct subtype of ASD?

- Narrative recall performance correlates with language measures.

  - Do children with DLD perform at the same level as children with ASD who meet the criteria for a language disorder?
  - Are there differing patterns of recall in the two groups?

Objectives

- Explore diagnostic utility of the NEPSY Narrative Memory subtest [1].

- Determine whether alternative method of scoring retellings can reveal differences in language impairment between children with DLD and children with ASD who meet criteria for a language disorder.

Data

Experimental Subjects

- ASD diagnosis: ADOS, ADI-R, DSM-IV criteria
- DLD diagnosis: Tomblin Epi-SLI criteria [2] or a CELF index score at -1 s.d. plus a spontaneous language measure at -1 s.d.
- Large subset of ASD children met criteria for DLD (ASD+DLD)
- **All** diagnoses made via clinical consensus.

	TD	ASD (no DLD)	DLD	ASD+DLD
n	45	18	25	27
Age	6.27	6.38	6.63	6.87

NEPSY Narrative Memory (Free Recall)

- Subject listens to NEPSY narrative, then retells the story to the examiner.

- During examination, the examiner notes the number of **story elements** the subject uses in his retelling: **summary score**.

- Retellings transcribed for off-line scoring and analysis.

Jim was a boy whose best friend was Pepper. Pepper was a big black dog. Jim liked to walk in the woods and climb the trees. Near Jim's house was a very tall oak tree with branches so high that he couldn't reach them. Jim always wanted to climb that tree, so one day he took a ladder from home and carried it to the oak tree. He climbed up, sat on a branch, and looked out over his neighborhood. When he started to get down, his foot slipped, his shoe fell off, and the ladder fell to the ground. Jim held onto a branch so he didn't fall, but he couldn't get down. Pepper sat below the tree and barked. Suddenly Pepper took Jim's shoe in his mouth and ran away. Jim felt sad. Didn't his friend want to stay with him when he was in trouble? Pepper took the shoe to Anna, Jim's sister. He barked and barked. Finally, Anna understood that Jim was in trouble. She followed Pepper to the tree where Jim was stuck. Anna put the ladder up and rescued Jim. Wasn't Pepper a smart dog?

Text of NEPSY Narrative Memory with approximate story elements underlined.

Standard Scoring

- Child receives two points for every correctly recalled story element.

- Score: sum of these points, ranging from 0 to 34.

Story Elements

1. Jim	7. climbed the tree/oak	13. Anna
2. Pepper	8. got a ladder *or* carried a ladder to the tree	14. Jim's sister
3. big	9. looked out over the neighborhood *or* looked around	15. took her Jim's shoe
4. black	10. slipped, shoe fell, ladder fell, got stuck, *or* couldn't get down	16. barked and barked
5. liked to walk in the woods *or* climb trees	11. Pepper ran for help, went to get help, *or* ran away	17. Anna put the ladder back up, rescued Jim, *or* helped Jim
6. tree/oak with branches too high for Jim to reach	12 Jim was sad *or* thought Pepper didn't want to stay	

Alignment Scoring

- Try to find a match in the source narrative for each word in the retelling as a measure of how on-topic the retelling is.

- Score: percentage of words in a retelling that can be aligned to the narrative, ranging from 0 to 100.

```
Jim      loved    walking    in    the    forest
 |         |         /\        |      |       |
Jim      liked    to walk     in    the    woods
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Example Retellings and Scores

He had a friend named Pepper. Pepper was a black dog. Pepper. I forgot. Pepper got his shoe. I don't know. Jim was a little boy. Pepper was his friend. Pepper was a black dog, and Pepper rescued his shoe when he brought it to Anna. That's all I know. And then they, then Anna rescued him.
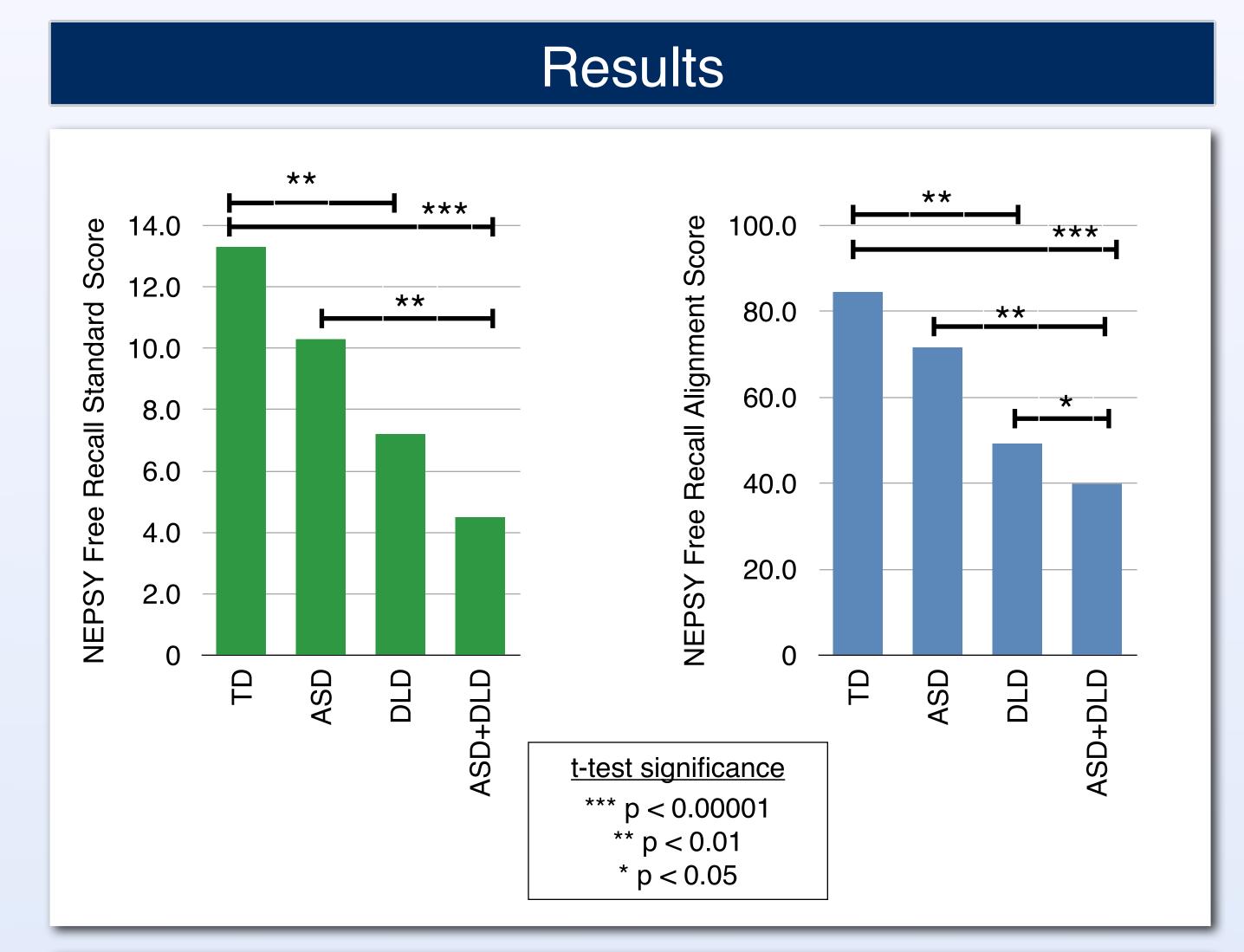
Sample retelling from child with DLD.
Standard score = 10
Alignment score = 56.1%

The way he go down and hurt himself. His shoe fell off. And the ladder go down to the ground. The boy took a picture of the girl. And he stopped taking a picture. And he was about to walk to the best thing. He went off to the zoo, and the girl went on with us, too because she went to the zoo. She sold lots of animals, and the boy sells lots of animals, too.

Sample retelling from child with ASD also meeting DLD criteria.
Standard score = 2
Alignment score = 21.1%

Results

t-test significance
*** p < 0.00001
** p < 0.01
* p < 0.05

- Both scoring procedures distinguish between groups meeting the criteria for a language disorder and other groups.

- The alignment scoring method additionally distinguishes between DLD-only group and ASD subgroup meeting the DLD criteria.

- This suggests that retelling may tap into something specific about language impairment in ASD:

  - ASD+DLD children include off-topic content in their retellings.
  - DLD children report the facts, albeit with great difficulty and without the required story elements.

Conclusions and Future Work

- Novel scoring method for NEPSY Narrative Memory subtest reveals differences in retelling strategies in DLD and ASD with DLD.

- Offers utility for distinguishing DLD from ASD-related language impairment.

- Future work will focus on generating alignments automatically using existing computerized techniques and exploring other features extracted from these alignments.

References and Acknowledgements

[1] M. Korkman, U. Kirk, and S. Kemp. 1998. *NEPSY: A developmental neuropsychological assessment.* The Psychological Corporation.
[2] J.B. Tomblin. 1996. Genetic and environmental contributions to the risk for specific language impairment. In M.Rice (ed.), *Genetics of Specific Language Impairment.* Hillsdale, NJ: Lawrence Erlbaum Associates, 191–210.