Developmental Language Disorders:
Are There Connections between SLI and ASD?

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Talk Overview

- Examination of research comparing <u>Specific Language Impairment (SLI)</u> and <u>Autism Spectrum Disorders (ASD)</u>
  - Language Profiles
- Clinical Implications
  - Diagnosis
  - Treatment
- Concluding thoughts

Exploring Overlaps in SLI and ASD

- Specific Language Impairment (SLI)

Structural language
(grammar, semantics, phonology)

Pragmatics
Pragmatic Language Impairment (PLI)

- Autism Spectrum Disorders (ASD)

Pragmatics

Structural language
(grammar, semantics, phonology)

(ASD-LI)

Exploring Overlaps in SLI and ASD
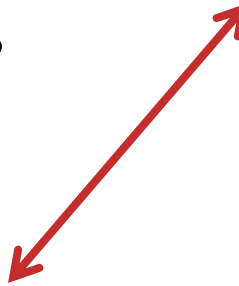
- ## Specific Language Impairment (SLI)

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 (grammar, semantics, phonology)

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- ## Autism Spectrum Disorders (ASD)

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  <u>Pragmatics</u>

  <u>Structural language</u>
  (grammar, semantics, phonology)

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Exploring Overlaps in SLI and ASD

- ## Specific Language Impairment (SLI)

- ## Autism Spectrum Disorders (ASD)

Structural language (grammar, semantics, phonology)

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Pragmatics

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Structural language (grammar, semantics, phonology)

(ASD-LI)
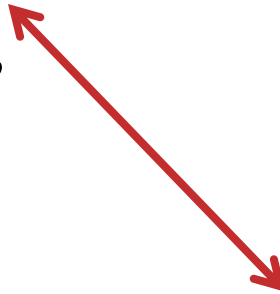
Language Phenotypes - Pragmatics

- Subset of SLI identified with Pragmatic Language Impairment (PLI)

 (Bishop, 2000; Bishop et al. 2000; Bishop & Norbury 2002; Conti-Ramsden & Botting, 1999)

- Difficulties with topic maintenance, discourse comprehension, abstract language, semantic specificity, sensitivity to conversational partner

Language Phenotypes - Pragmatics

- PLI do not meet criteria for autistic disorder (Bishop & Norbury 2002)

- Debate about the relation of PLI and the broader autism spectrum (Bishop 2000; Reisinger et al. 2011)

- Shifting diagnostic boundaries (PDD SLI) (Conti-Ramsden & Botting 2004)

- Evolution of social communication deficits and autistic features in SLI (Conti-Ramsdem et al. 2006)

Language Phenotypes – Grammar, Phonology, Semantics

- Evidence for overlap between SLI and ASD-LI

(Geurts 2008; Kjelgaard & Tager Flusberg 2001; Loucas et al. 2008; McGregor et al. 2012; Roberts et al. 2004)

- Omission of tense marking morphemes

- Phonological processing deficits (nonword repetition)

- Patterns of lexical-syntactic associations

Language Profiles – Grammar, Phonology, Semantics

- Evidence against SLI and ASD-LI overlap

- Differences in trajectories of overall language development (Williams et al. 2008)

- Different error patterns in nonword repetition (Riches et al. 2011; Whitehouse et al. 2008; Williams et al., 2013)

- SLI less accurate than ASD-LI on more complex nonword repetition task (Williams et al., 2013)

Language Profiles – Grammar, Phonology, Semantics

- Williams et al. (2013 JADD) nonword repetition

- Manipulated stimulus length, consonant cluster position, wordlikeness (use of suffix)

- Significant differences in accuracy and error patterns for SLI and ASD-LI

- ASD-LI performed like language-match controls

- Conclude different cognitive mechanisms involved

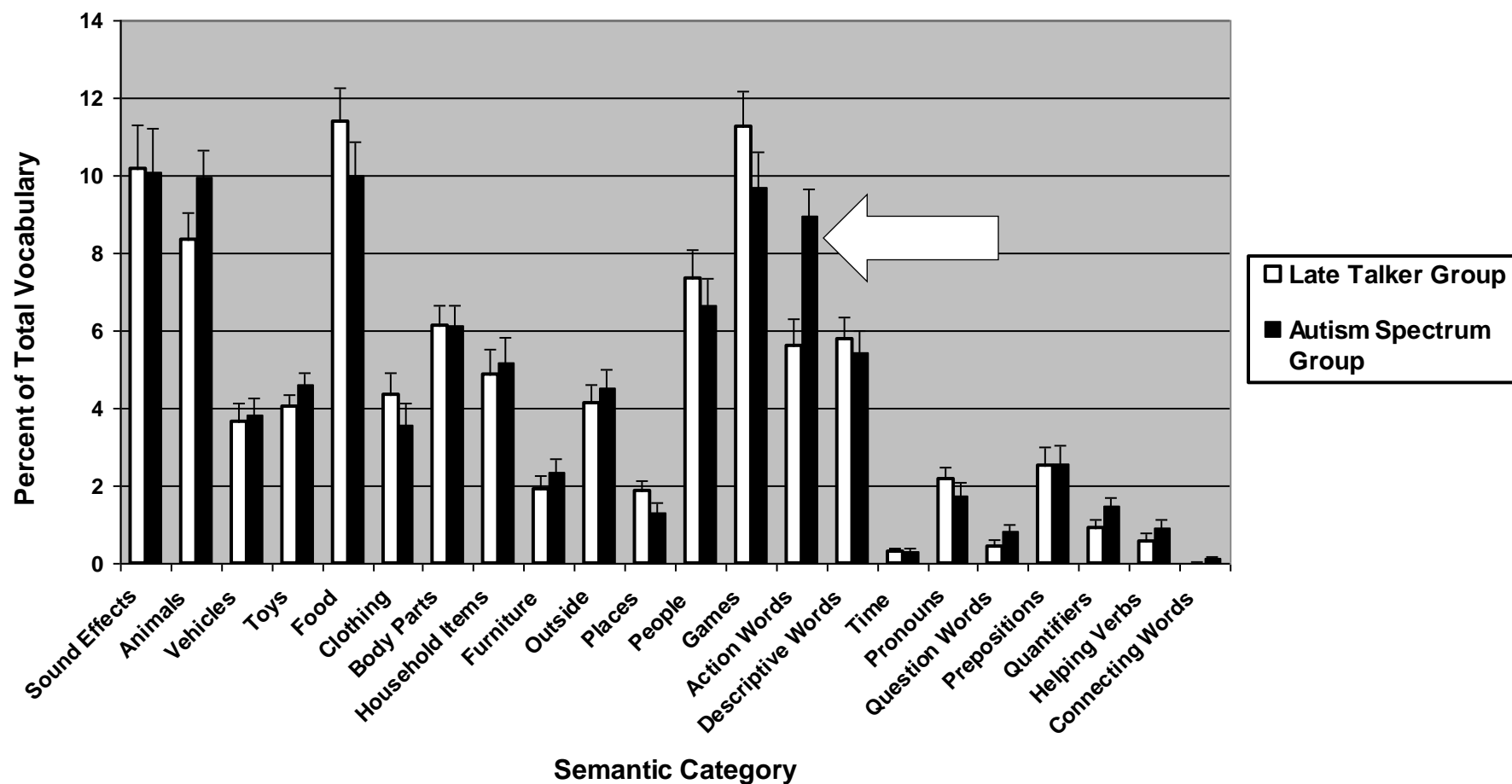# Language Phenotypes – Grammar, Phonology, Semantics

- Demouy et al. (2011 Res Autism Spect Dis) examined linguistic ability in French-speaking children

- AD _ PDD-NOS _ SLI   (mean age 9 years)

- No differences in vocabulary or phonology

- Expressive syntax, pragmatics, and certain prosodic features distinguished groups

- Different underlying mechanisms for AD and SLI with PDD-NOS intermediate

Comparison of Language Development in Toddlers with ASD and Late Talkers

- Do verbal toddlers on the autism spectrum and late talkers, matched on overall productive vocabulary, display similar use of:

    1) semantic categories,

    2) psychological state terms,

    3) word combinations and grammatical complexity?

(Ellis Weismer et al., 2011, *Journal of Autism and Developmental Disorders*)

	Autism Spectrum Group (n=40)	Late Talker Group (n=40)
CDI-WS Words Produced		
mean	108	106
SD	76	75
range	17 - 299	16 - 302
Age in Months		
mean	30.3	25.6
SD	3.6	2.8
range	23-37	22-30

(Ellis Weismer et al., 2011)

Psychological State Terms

| Emotion	mad	sad	scared	happy
Desire	hate	like	love	wish
Cognitive	pretend	think		
Physiological	taste	awake	hot	thirsty
Evaluation	good	poor	bad	pretty

•The analysis of psychological state terms from the CDI was based on a combination of categories employed in prior research (Johnston, Miller, & Tallal, 2001; Lee & Rescorla, 2002).

(Ellis Weismer et al., 2011)
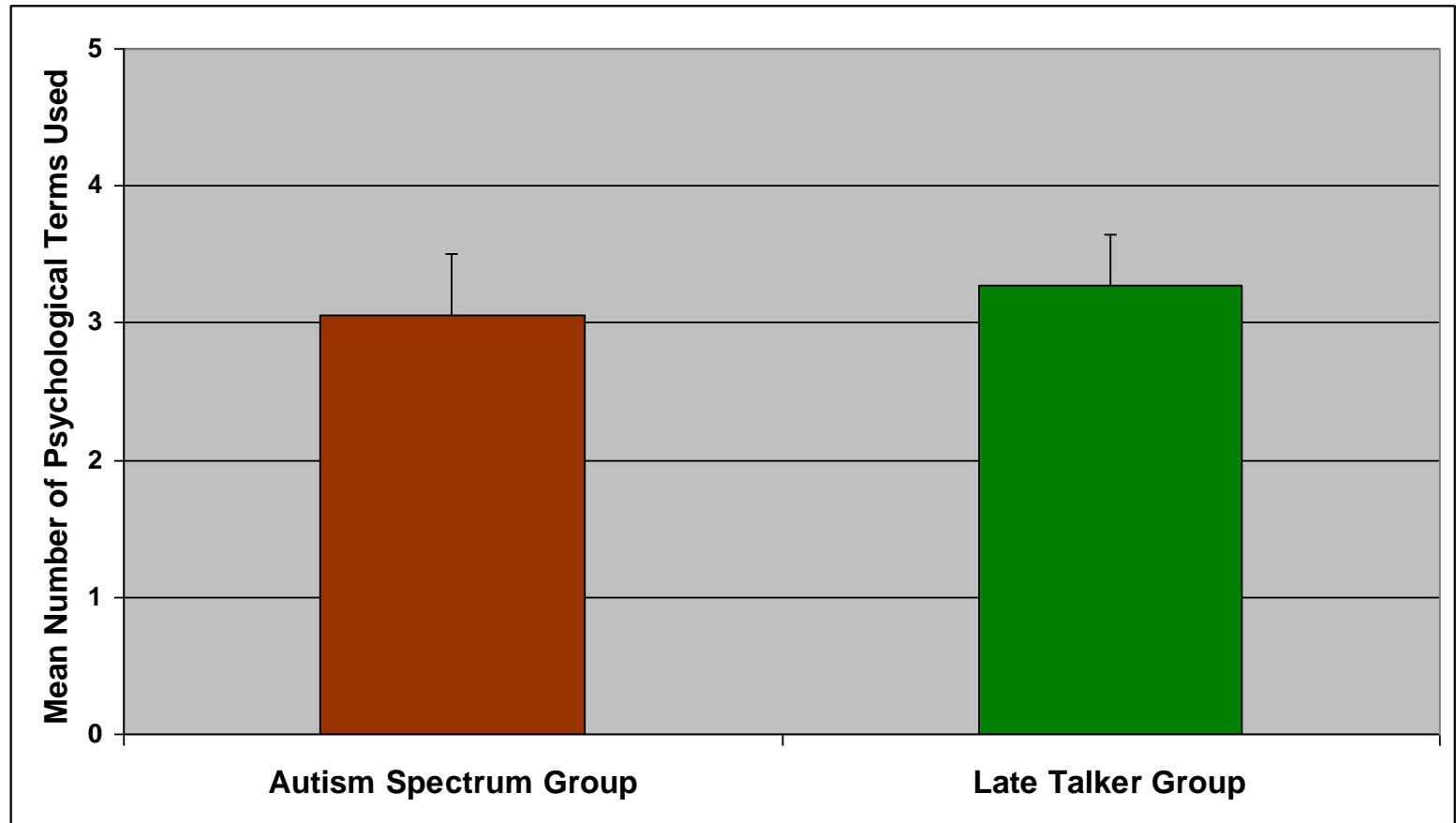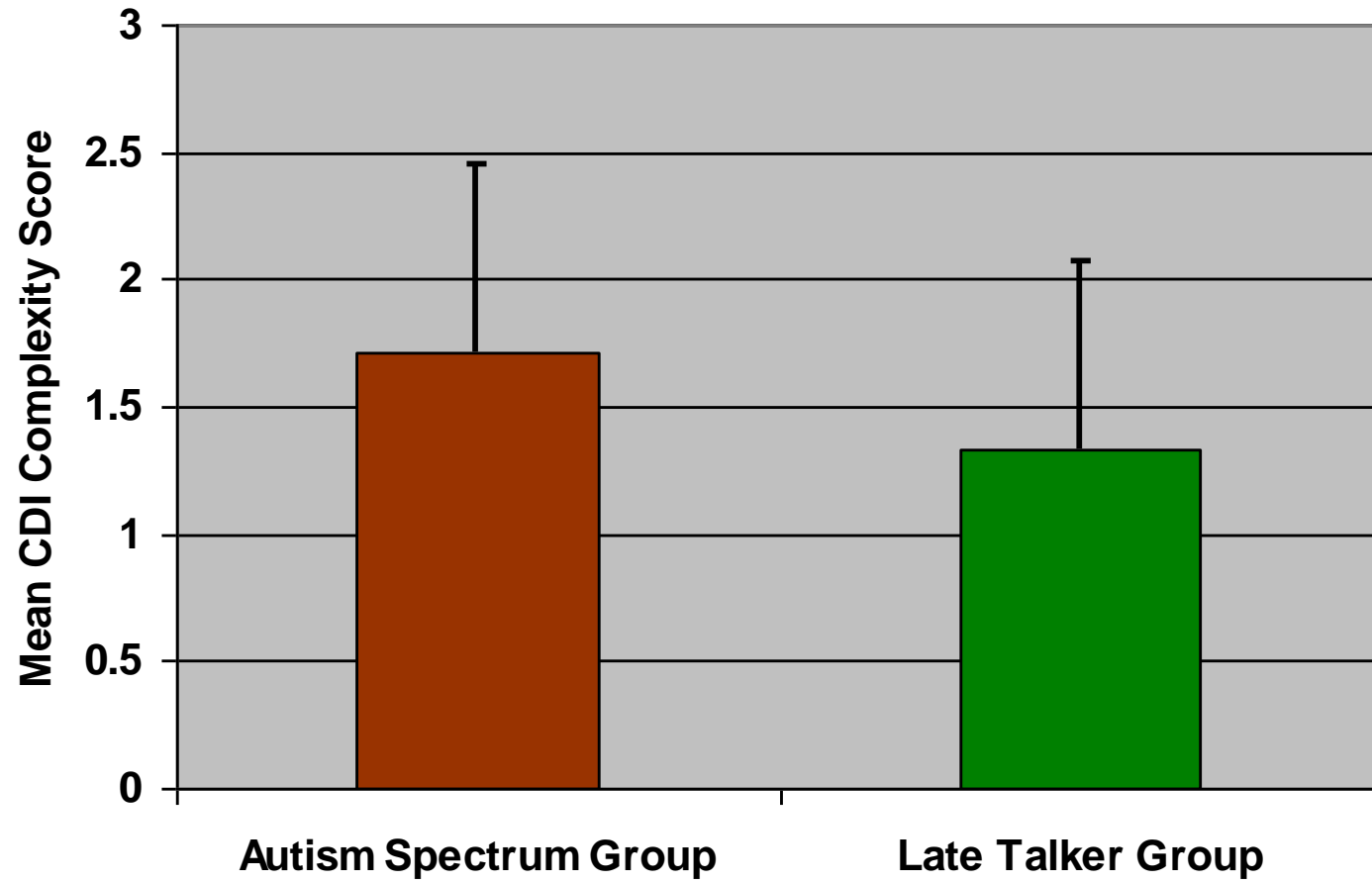
(Ellis Weismer et al., 2011)
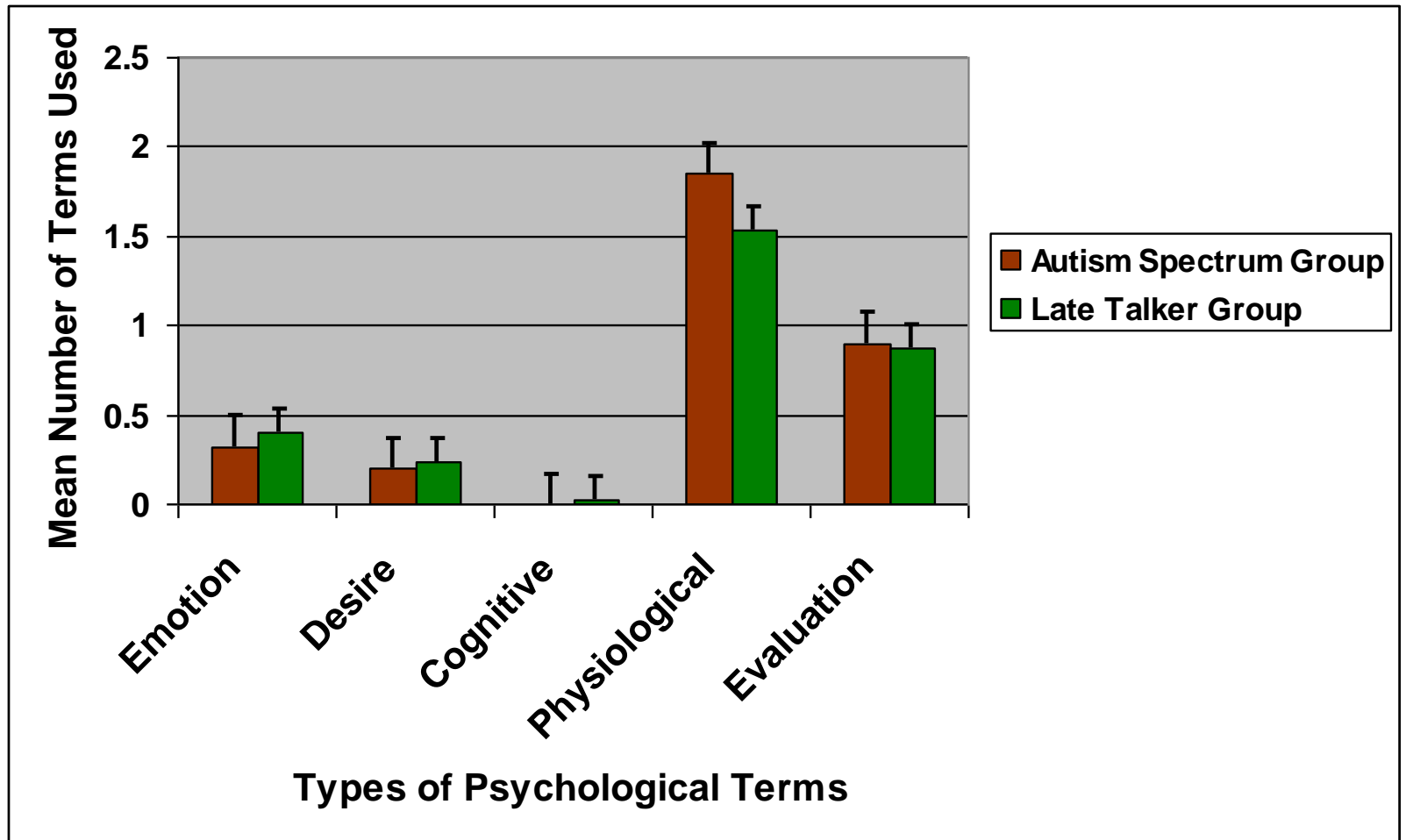
Lexical-grammatical Relationships

- Critical mass hypothesis (Bates & Goodman, 2001; Marchman & Bates, 1994)

- Associations between lexical and grammatical skills in typical development across various languages (Cox Eriksson, 2014; Dionne, Dale, Boivin, & Plomin, 2003; Maitel, Dromi, Sagi, & Bornstein; Thordardottir, Ellis Weismer, & Evans, 2002)
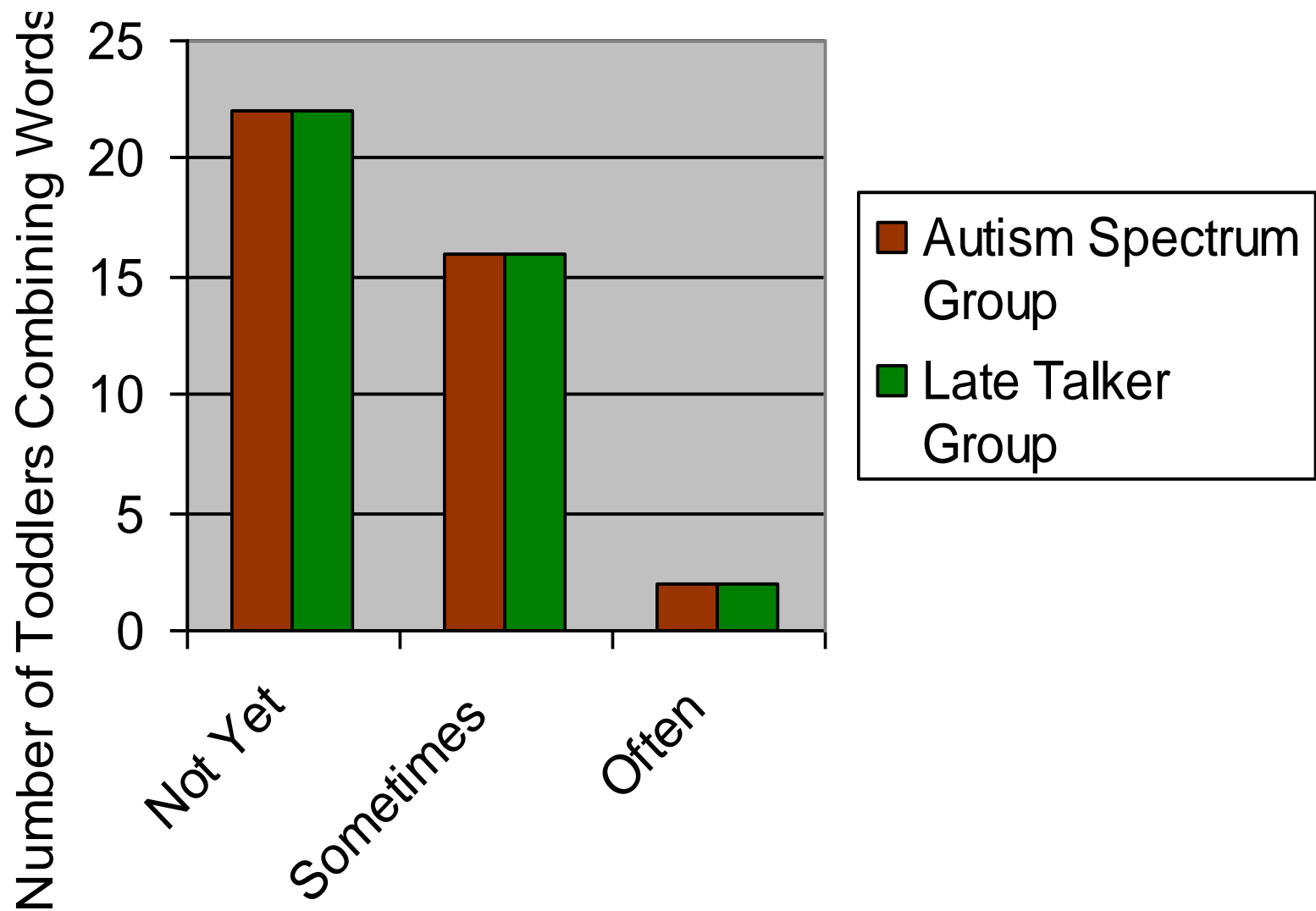
Early Lexical-Grammatical Conclusions

- When matched on overall vocabulary level, toddlers with ASD exhibited word use patterns and early grammatical abilities that were qualitatively very similar to Late Talkers without autism


(Ellis Weismer et al., 2011)

Comprehension-Production Profiles

- What is the relative level of language comprehension vs. production abilities in young children with ASD and Late Talkers at risk for SLI ?

- How does this compare to the pattern seen in Typical Development?

(Davidson, Venker, Haebig, & Ellis Weismer, in preparation)

Typical Talkers, Late Talkers, and Children on the Autism Spectrum

Cross-Group Comparisons
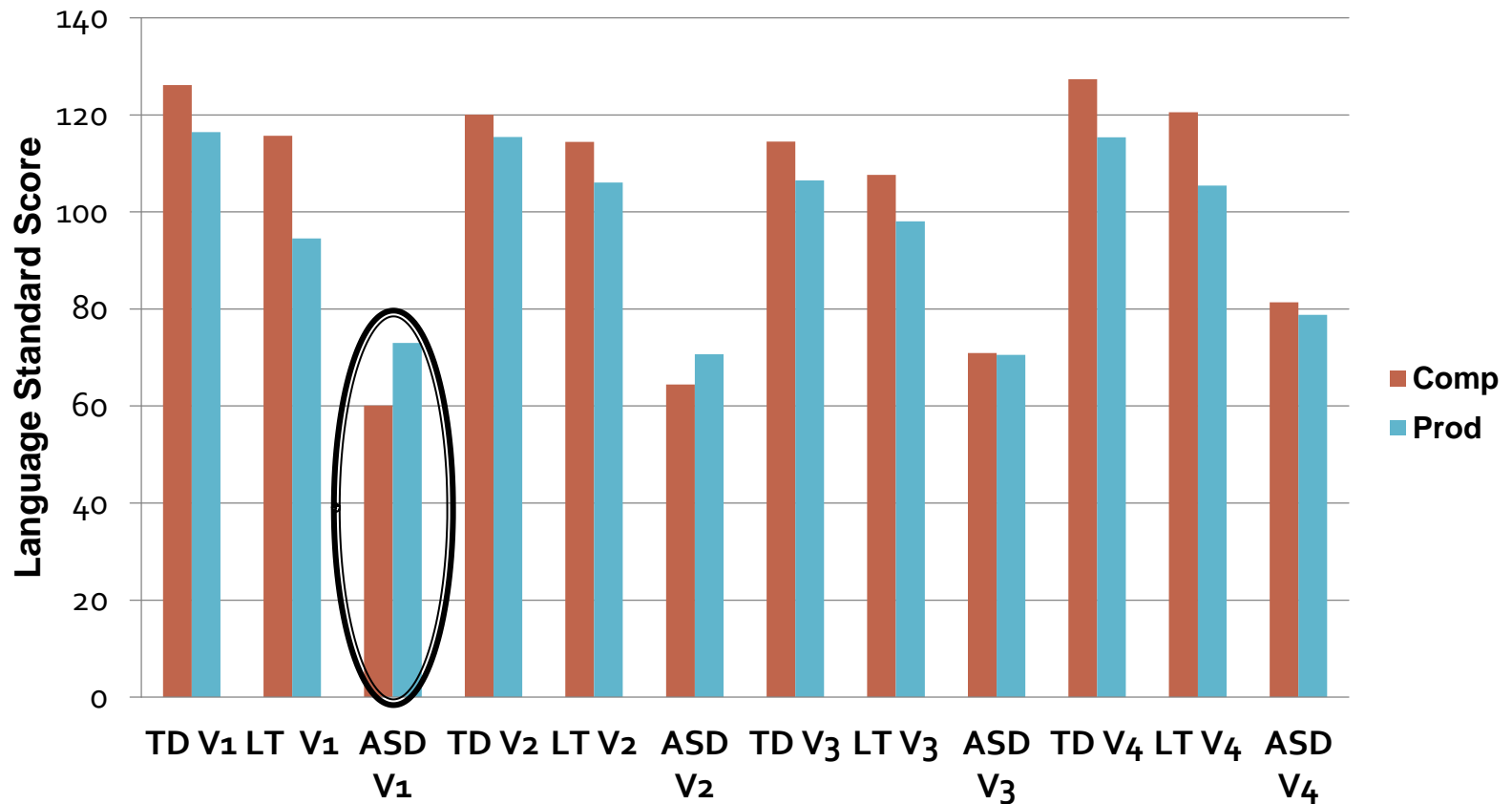
Typical Talkers, Late Talkers, and Children on the Autism Spectrum
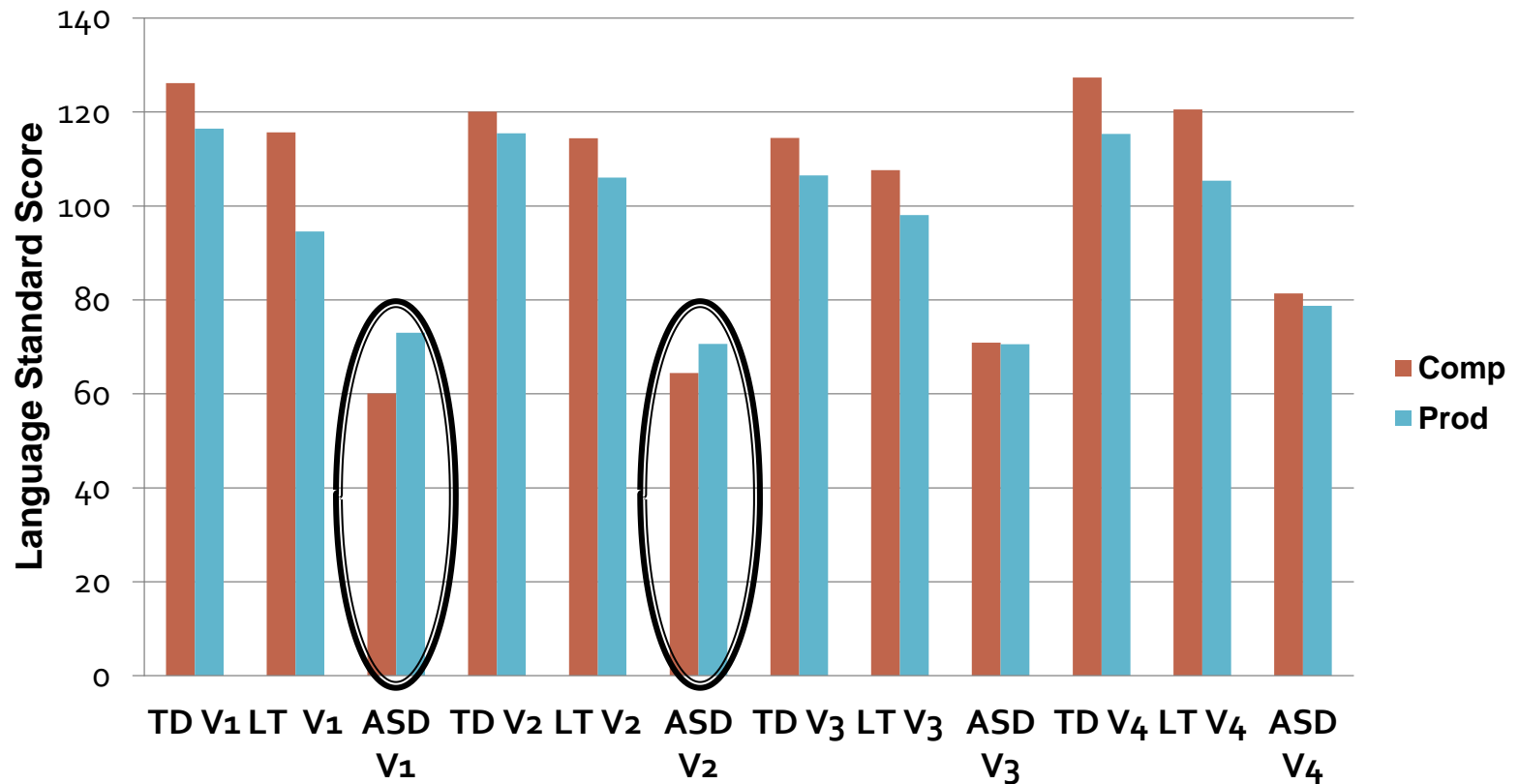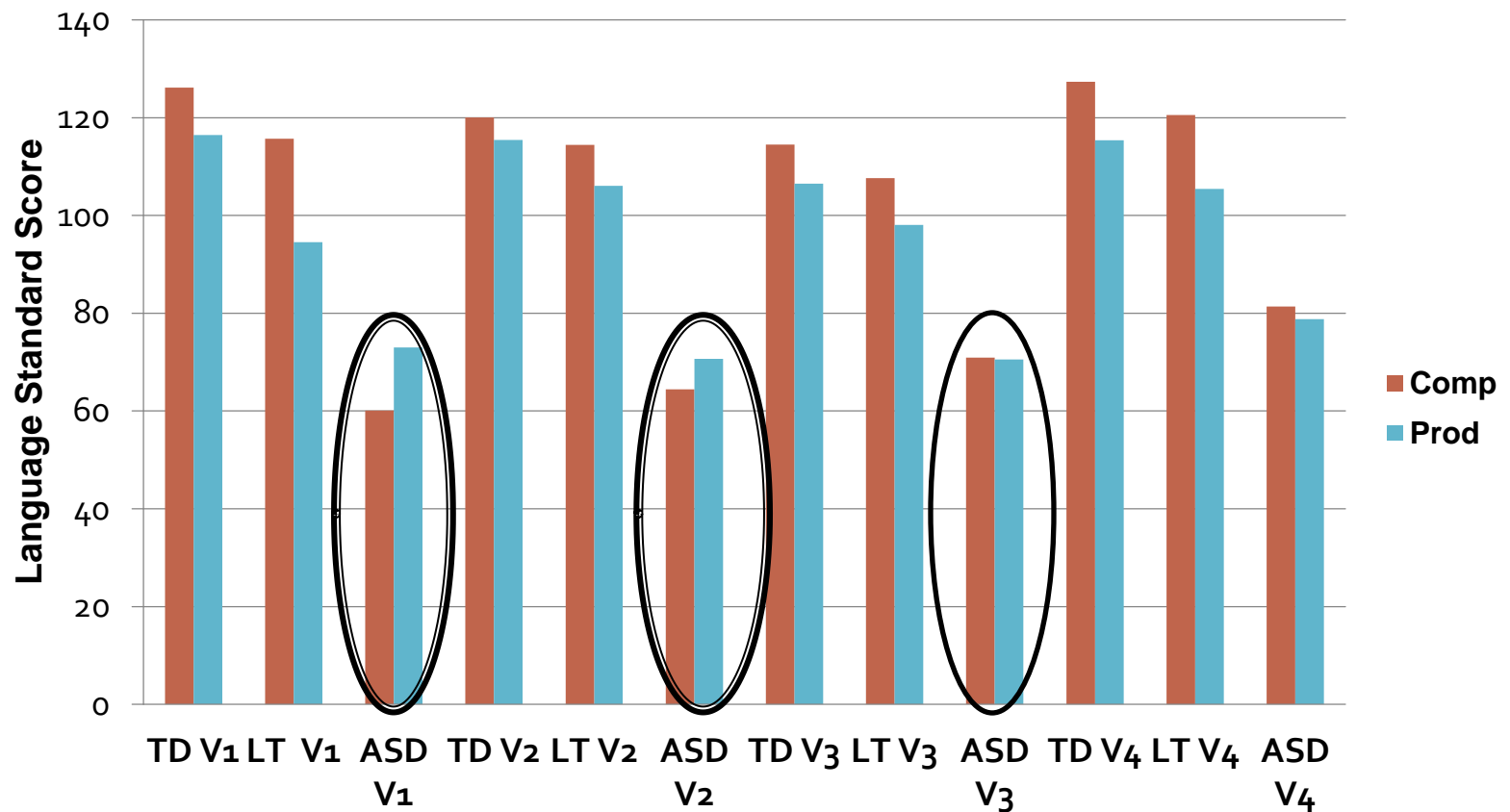

Cross-Group Comparisons

Typical Talkers, Late Talkers, and Children on the Autism Spectrum

Cross-Group Comparisons

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Cross-Group Comparisons

Comprehension-Production Profile Conclusions
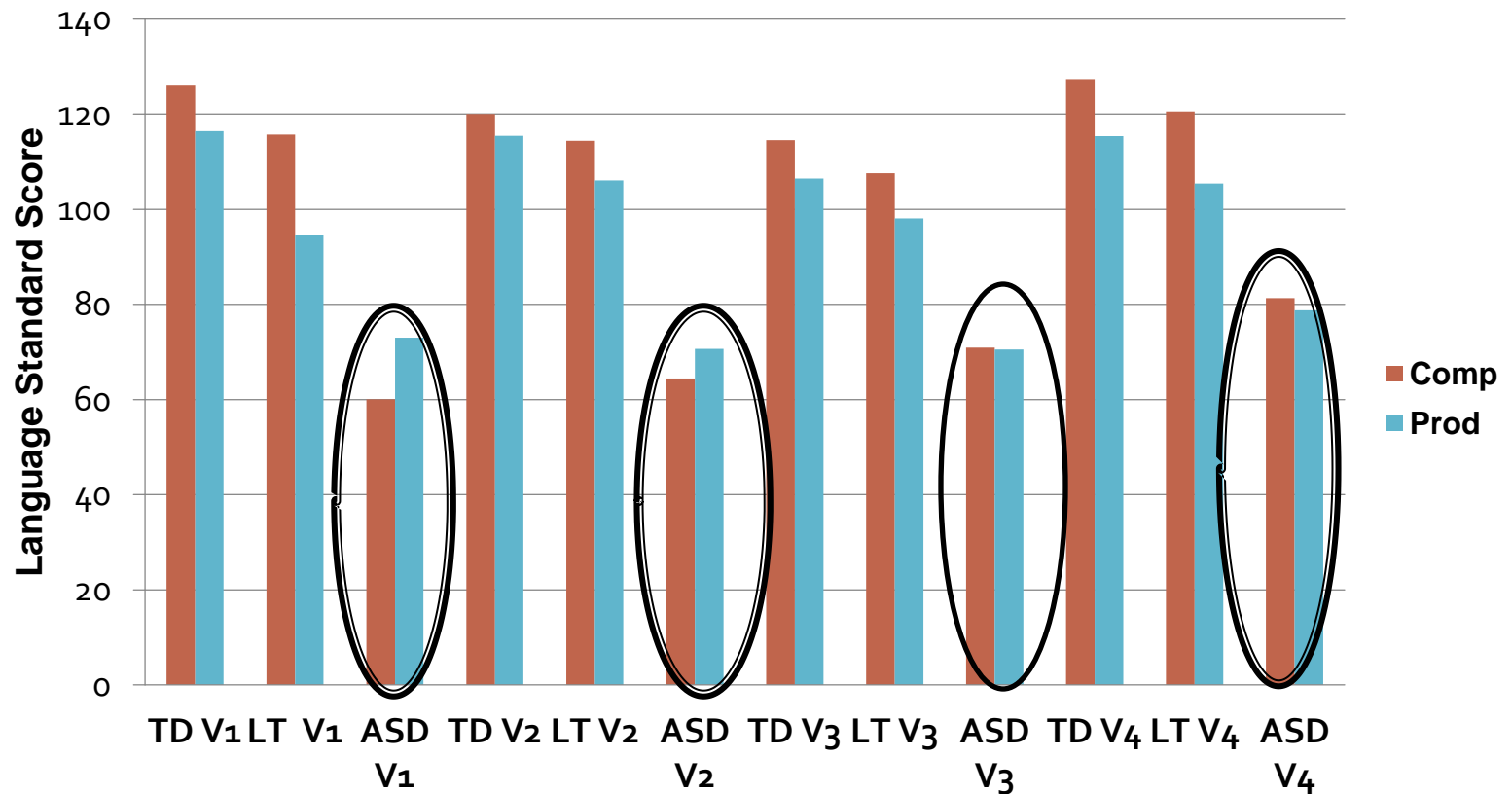
- Young children on the autism spectrum exhibit an *atypical* comprehension-production profile compared to typical talkers and late talkers <u>early</u> in development

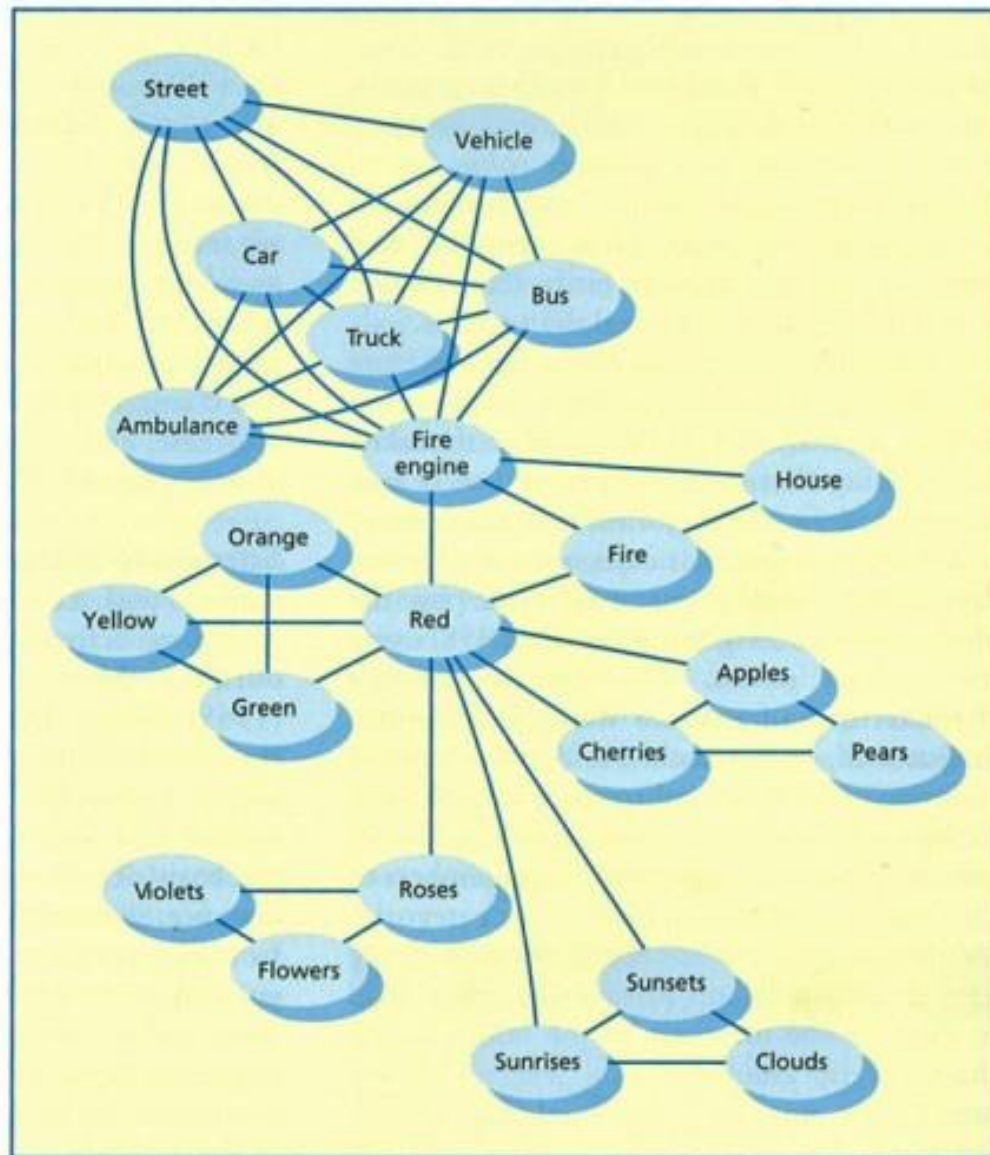- However, by 5-6 years of age this profile appears to normalize

School-Age Lexical-Semantic Knowledge

- Does semantic network size impact lexical processing differentially in children with ASD, SLI or Typical Development who are matched on receptive vocabulary?

(Haebig, Kaushanskaya, & Ellis Weismer, in preparation)

Sample Semantic Map

	TD n = 30; 17 female		SLI n = 28; 14 female		ASD n = 27; 4 female	
	Mean	SD	Mean	SD	Mean	SD
AGE (yrs.)	**9.0**	1.0	**10.0**	1.0	**9.5**	1.2
Receptive Vocabulary (GSV)	**175**	10	**174**	11	**175**	16
Receptive Vocabulary (SS)	**107**	14	**98**	11	**103**	16
Cognition	**108**	12	**101**	13	**103**	17
CELF-Receptive Language	**105**	13	**87**	14	**85**	17
CELF-Expressive Language	**104**	10	**82**	12	**86**	17

Lexical Decision Task

- Children asked to identify words vs. nonwords
- Listened and pressed button on computer

- Words divided into High vs. Low density of semantic network using normative resource

- Controlled all other differences between words (frequency, concreteness, phonotactic probability, and phonological neighborhood size)

Lexical Decision Task Results

- Real word accuracy > nonword accuracy
- High semantic neighborhood > low semantic neighborhood accuracy
- RT faster for words than nonwords
- No group interactions (same pattern TD, SLI, ASD)

- The same cognitive factors – working memory and task shifting – predicted performance on the lexical decision task for all groups

Summary of SLI-ASD Comparisons

- Empirical findings mixed

- Unlike genetic disorders (FXS, DS) or sensory disorders (HI), both SLI and ASD have unknown etiology

- Continuing debate as to whether evidence suggests shared etiology and if this cross-group comparison is productive (Williams et al. 2008; Bishop 2010; Tomblin 2011)

Clinical Implications - Diagnosis

- Implementing classification schemes in borderline cases of SLI and ASD

- As supplement to symptoms detailed by ICD-10 and DSM-5, use points of <u>distinction</u> from empirical findings in research comparing SLI and ASD for purpose of differential diagnosis

Clinical Implications - Diagnosis

- Severe <u>receptive</u> language deficits typically indicative of ASD rather than SLI (Bartak et al. 1975; Manolitsi & Botting 2011; Paul & Ellis Weismer, 2013)

- Prosodic deficits reported in ASD across different languages and distinguishes ASD from SLI (Demouy et al. 2011; Eigsti et al. 2012; Paul et al. 2005)
  - Use of automated approaches to assessing prosodic/vocal characteristics of children in naturalistic settings

Clinical Implications - Diagnosis

- Error patterns on nonword repetition tasks differentiate ASD and SLI groups (Riches et al. 2011; Whitehouse et al. 2008)

- Alternately, nonword repetition task developed by Williams et al. (2013) that manipulates length, cluster position, presence of suffix yields differences in group accuracy (SLI<ASD)

Clinical Implications - Diagnosis

- Use of narrative language samples

- Qualitative language differences revealed in narratives produced by SLI and ASD children across different languages (Manolitsi & Botting 2011; Norbury & Bishop 2003)

- SLI, PLI and high functioning autism groups distinguished by referencing skills in narration; children with autism produced more ambiguous nouns and pronouns than SLI and PLI (Norbury & Bishop 2003)

Clinical Implications - Treatment

- Pharmaceutical vs. behavioral interventions

- Can interventions be used effectively with different diagnostic groups?

- Consider research findings regarding points of <u>similarity</u> between SLI and ASD

- Better Communication Research Programme (UK) reported children's individual characteristics, rather than their classification (Language Impairment vs. ASD), predicted their learning needs; but classification determined resources

Clinical Implications - Treatment

- Reisinger et al. (2011, JADD) suggest disregarding categorical boundaries to focus on commonalities for Tx
  - Children with PLI and ASD may benefit from social skills intervention

  - Similarly, ASD-LI with grammatical deficits similar to SLI, could benefit from use of techniques to improve syntax (modeling, sentence recasting, expansions)

Clinical Implications – Treatment
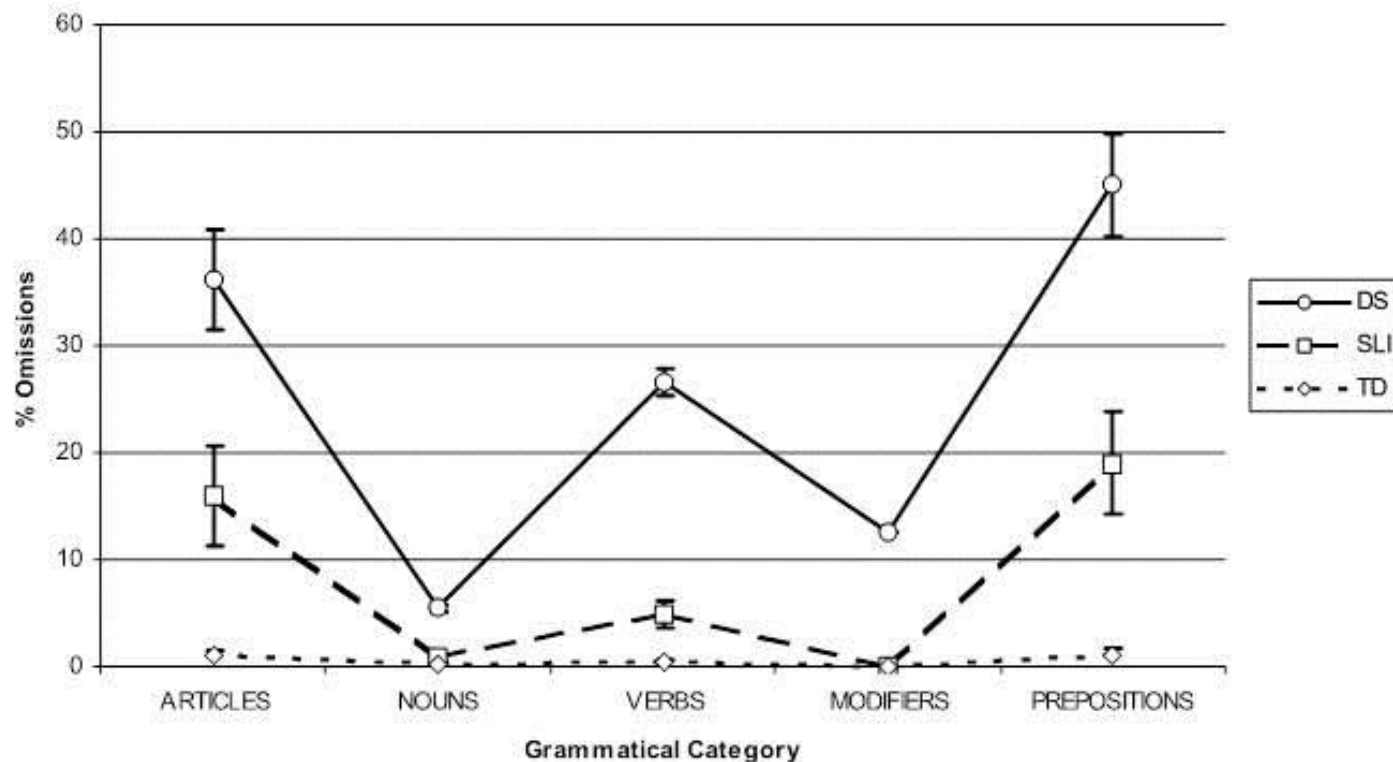## Caselli et al. (2008 Neuropsychology, Fig. 2, p.32)

Figure 2. Phrase Repetition Test: Percentages of omissions in the different grammatical categories considered; vertical lines depict standard errors of the means. DS = Down syndrome; SLI = specific language impairment; TD = typical development.

Concluding Thoughts

- Utility of research comparing SLI and ASD

- Whether or not shared etiology, determine if common interventions geared towards points of overlap yield similar response to treatment

~ Dank je wel ~

Thank you

Acknowledgments

- Language Processes Lab research team

- Children and families who participated

Related Readings

- Ellis Weismer, S. (2013). Developmental language disorders: Challenges and clinical implications of cross-group comparisons. *Folia Phoniatrica & Logopaedia, 65,* 68-77. PMCID: PMC4004334.

- Ellis Weismer, S. (2013). Specific language impairment (Chapter 5). In L. Cummings (Ed), Cambridge Handbook of Communication Disorders, Cambridge University Press.

- Ellis Weismer, S., Gernsbacher, M.A., Stronach, S., Karasinski, C., Eernisse, E., Erickson, C., & Sindberg, H. (2011). Lexical and grammatical skills in toddlers on the autism spectrum compared to late talking toddlers. *Journal of Autism and Developmental Disorders, 41,* 1065-1075. PMCID: PMC3049899

- Ellis Weismer, S., Lord, C., & Esler, A. (2010). Early language patterns of toddlers on the autism spectrum compared to toddlers with developmental delay. *Journal of Autism and Developmental Disorders, 40,* 1259-1273. PMCID: PMC2941531

- Ellis Weismer, S. (2010). Language and communication on the autism spectrum. In M. Barnes (Ed.), *Genes, Brain and Development: The Neurocognition of Genetic Disorders.* Cambridge, UK: Cambridge University Press.

- Ellis Weismer, S. (2007). Typical talkers, late talkers, and children with specific language impairment: A language endowment spectrum? In R. Paul (Ed.), *Language disorders and development from a developmental perspective: Essays in honor of Robin S. Chapman* (pp.83-101). Mahwah, NJ: Lawrence Erlbaum Associates.

- Paul, R., & Ellis Weismer, S. (2013). When is late talking a matter for concern? In L. Rescorla & P. Dale (Eds), *Late Talkers: Research to Practice.* Baltimore, MD: Brookes Publishing.