

Relationship between School-age Executive Function and Language Skills

Executive Functions

Executive functions is a collective term that encompasses several related cognitive skills that are responsible for goal-oriented behaviors. Executive functions are comprised of attentional and inhibitory control; working memory; planning and organizing; initiation and shifting; self-monitoring, and emotional control. Executive functions engage to organize responses and behaviors into viable and timely plans for achieving goals. Collectively, executive functions are complex metacognitive skills which are essential for success in daily life.

Development of Executive Functions

Executive functions emerge during the preschool years, develop rapidly throughout childhood, and reach maturity in early adulthood. Development occurs in spurts that tend to correspond with frontal lobe refinement and maturity.

Executive Functions and Language Skills

•A few studies have found correlations between isolated executive function skills and certain language processes (Cohen, Vallance, Barwick, Im, Menna, Horodezky, & Isaacson, 2000, Hoffman & Gillam, 2004, Im-Bolter, Johnson, & Pascual-Leone, 2006, Marton & Schwartz, 2003)

Research Conclusions:

- Children with specific language impairment (SLI) may have deficits in attention, narrative language skills, and auditory working memory (Hoffman & Gillam, 2004; Marton & Schwartz, 2003)
- Significant correlation is evident between preschooler's narrative language abilities and executive functions skills of inhibition, working memory, flexibility, and planning, measured by the BRIEF (Trainor, 2010)
- Typically developing adolescents and adolescents with SLI differ in executive functions measured by the BRIEF (Hughes, Turkstra, and Wulfeck, 2009)

Purpose

- This study expands the current knowledge of school-age executive functions and language by examining the relationship between a functional measure of executive functions (based on parental ratings of children's skills in daily life) and language abilities.
- The purpose of this study is to determine the relationship between language and executive functions in school-age children using the *Behavior Rating Inventory of Executive Function* (BRIEF), the *Peabody Picture Vocabulary Test* (PPVT), the *Clinical Evaluation of Language Fundamentals* (CELF), and the *Test of Narrative Language* (TNL).

Sarah Lambeth & Jacquelyn Liesen, B.A., Eastern Illinois University

Jill Fahy, M.A., CCC-SLP, Eastern Illinois University

Rebecca Throneburg, PhD, CCC-SLP Eastern Illinois University



Subjects:

- 27 male and female school-age children
- 14 first grade students (age 6;5-7;3)
- 13 third grade students (age 8;4-9;2)
- Attending a general education classroom in a central Illinois public school

Measures:

Language:

- Peabody Picture Vocabulary Test* (PPVT)
 - Standardized assessment of one-word receptive vocabulary (measures understanding of single words)
- Clinical Evaluation of Language Fundamentals* (CELF)
 - Standardized assessment of overall language ability
 - Nine subtests were administered
 - Scores included: (1) Core Language Score, (2) Expressive Language Index, (3) Receptive Language Index, (4) Language Content Index, (5) Language Structure Index (6) Working Memory Index

Test of Narrative Language (TNL)

- Standardized assessment of narrative language ability, including sub-scores for narrative comprehension and oral narration (measures ability to understand, re-tell, and generate stories)

Executive Functions:

- Behavioral Rating Inventory of Executive Functions* (BRIEF)
 - Standardized assessment of executive function skills used in daily life, measured through a parental questionnaire.
 - Measures eight subdomains of executive functions: Initiate, Working Memory, Plan/Organize, Organization of Materials, Monitor, Inhibit Control, Shift Control, and Emotional Control.
 - Provides a Global Executive Composite score comprised of Behavioral Regulation Index and Metacognition Index.

Results

Mean, Range, SD of Composite Scores

	PPVT	CELF- Core	TNL- Total Narrative	BRIEF- GEC
Mean	112	105	107	52
Range	84-159	82-126	76-127	32-76
Standard Deviation	19	12	13	12
Clinical Significance	<85	<85	<80	>65

Relationships between Language & EF Measures

	BRIEF (GEC)	BRIEF (Behavior Regulation)	BRIEF (Metacognition)
PPVT	-.317	-.298	-.371
CELF Core	-.448*	-.419*	-.428*
CELF Receptive	-.307	-.235	-.230 (initiate -.418*)
CELF Expressive	-.481*	-.445* (shift -.606**)	-.479* (plan/organize-.579**, monitor -.490**, initiate -.436*)
CELF Working Memory	-.236	-.189	-.224
TNL- Narrative Comprehension	-.345	-.307	-.378 (WM -.485*)
TNL- Oral Narration	-.414*	-.391* (shift -.614**)	-.353 (plan/organize -.522**, monitor-.408*)
Total Narrative Language Index	-.502**	-.457*	-.428*

*Indicates significance at the .05 level

**Indicates significance at the .01 level

Discussion

- Stronger relationships were found between executive functions and expressive language (CELF and oral narration subtest of TNL) than receptive language (PPVT and narrative comprehension subtest of TNL)
- Results compliment research by Trainor on the preschool population. No significant correlation was found between the PPVT and the BRIEF. Strong relationship exists between the BRIEF and narrative language ability.
- Results suggest that expressive language skills in functional tasks such as storytelling and discourse engage perhaps not only language abilities, but also executive functions such as inhibitory control, organization, flexibility and planning.
- SLP's should assess executive functions within their testing battery and adjust compensatory strategies that rely on intact executive functions.
- Future research is needed on executive functions and children with language impairments.

References:

- Anderson, P. (2002). Assessment and development of executive function (EF) during childhood. *Child Neuropsychology*, 8, 71-82.
- Anderson, V. A., Anderson, P., Northam, E., Jacobs, R., & Catroppa, C. (2001). Development of executive functions through late childhood and adolescence in an Australian sample. *Developmental Neuropsychology*, 20, 385-406.
- Cohen, N. J., Vallance, D. D., Barwick, M., Im, N., Menna, R., Horodezky, N. B., & Isaacson, L. (2000). The interface between ADHD and language impairment: An examination of language, achievement, and cognitive processing. *J. Child Psychiatry*, 41, 353-362.
- Dunn, L., & Dunn, D. (Ed.). (2007). *Peabody picture vocabulary test*, fourth edition. Minneapolis, MN: Pearson Assessments.
- Gillam, R.B. & Pearson N.A. (2004). *Test of Narrative Language*. Austin, TX: Pro-Ed.
- Gioia, G. A., Isquith, P. K., Guy, S. C., & Kenworthy, L. (2000). Behavior rating inventory of executive function. *Child Neuropsychology*, 6, 235-238.
- Hoffman, L. M., & Gillam, R. B. (2004). Verbal and spatial information processing constraints in children with specific language impairment. *Journal of Speech, Language, and Hearing Research*, 47, 114-125. doi: 1092-4388/04/4701-0114
- Hughes, D. M., Turkstra, L. S., & Wulfeck, B. B. (2009). Parent and self-ratings of executive function in adolescents with specific language impairment. *International Journal of Language and Communication Disorders*, 44(6), 901-916 doi: 10.3109/13682820802425693
- Im-Bolter, N., Johnson, J., & Pascual-Leone, J. (2006). Processing limitations in children with specific language impairment: The role of executive function. *Child Development*, 77, 1822-1841.
- Marton, K., & Schwartz, R. G. (2003). Working memory capacity and language processes in children with specific language impairment. *Journal of Speech, Language, and Hearing Research*, 46, 1138-1153. doi: 1092-4388/03/4605-1138
- Richard, G. J., & Fahy, J. K. (2005). The source for development of executive functions. East Moline, Illinois: Linguistics.
- Trainor, K. (2010). The relationship between preschool executive function skills and oral narrative skills. Unpublished manuscript, Department of Communication Disorders and Sciences, Eastern Illinois University, Charleston, Illinois.