Grasping Development: How right hand use relates to measures of motor, cognitive, and social development in preschool children

Nicole van Rootselaar, Jeffery McCormack, Robbin Gibb, Fangfang Li, Claudia L.R. Gonzalez
The Brain in Action Laboratory, Department of Kinesiology & Department of Neurosceince. University of Lethbridge, Lethbridge, AB, Canada

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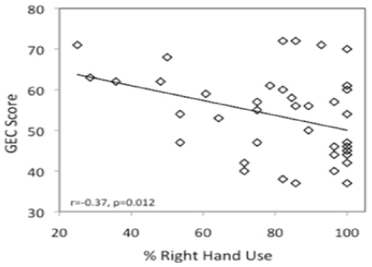
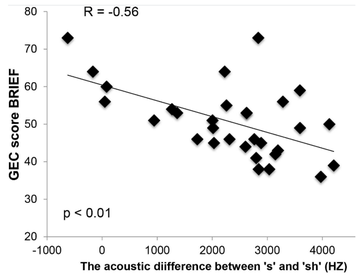
Introduction

What we know:

- Social development in children is related to executive function (EF: a group of processes which inform and adapts goal directed behaviour, including emotional decision making) [1,2].



- Increased right hand use is significantly associated with better executive function (a lower GEC score) in preschool children [3].



- Speech development (better differentiation between speech sounds) is significantly related to better executive function (a lower GEC score) in preschool children[4].

What we DO NOT know:

- If right-hand use is related to measures of social competence in preschool children.
- If there are relationships in table-top measures of language, EF, and social competence (not exclusive to parent-reported questionnaires, such as the EF GEC measure)

Research Question

Is there a demonstrable relationship between interactive measures of lateralized hand use, language, executive function, and **social competence**?

Methods

Participants:

24 preschoolers (15 females, mean age: 4.12 (0.76) years)

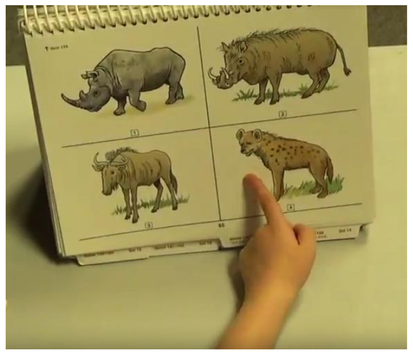
Right Hand Use:

Right hand use was calculated based on the percent points a child used their right hand to point to an image during the PPVT-IV (Peabody Picture Vocabulary Task).

Language Measure:

Score from the PPVT-IV (Peabody Picture Vocabulary Test). Children select one image which matches the word pronounced by the experimenter. Children continued to pass levels (sets of 12 pages) until selecting 75% incorrect images in a single level. The total number correct is the child's raw vocabulary score.

PPVT sample page:



Normal Animals:

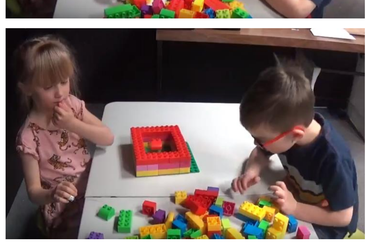
Mismatched Animals:

Executive Function Measure:

Children completed an age-appropriate version of the Stroop Task, known as Animal Stroop. First, the child completes a trial and names animals that appear on the cards. In the inhibition task, the child is shown animals with mismatched heads and bodies, and asked to name only the head of the animal.

Social Measure:

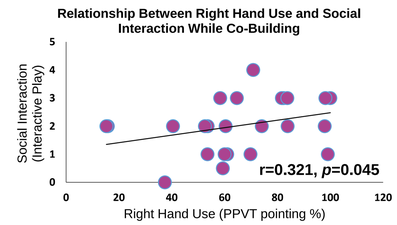
Interactive Play. We provided children with blocks and instructed them to build together for five minutes. After, they were scored according to the below criteria.

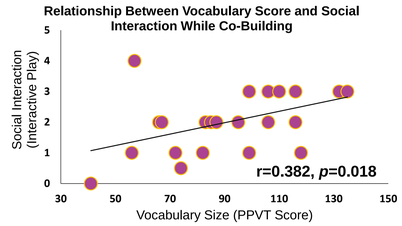


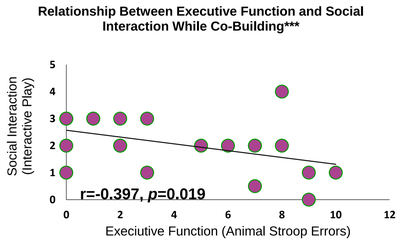
Social Scoring:

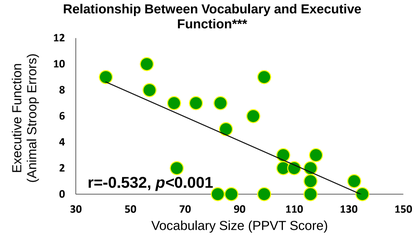
Category	Criteria
Type of play	1.Parallel play 2.Associative play 3. Cooperative play
Interaction	**1. Focused on toy** **2. Adult directed bids** **3. Child directed bids**
Affect/ engagement	1. Neutral 2. Some enjoyment 3. Positive affect
Sum of categories:	**Social competence score**

Results

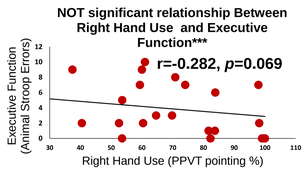








***For Executive Function measure (Animal Stroop Errors), a lower score indicates BETTER executive function (fewer errors)



Discussion

- The children demonstrated a relationship between measures of language, executive function, and social competence. This finding supports results from previous studies, and indicates these skills are interlaced.
- Lateralized hand use for pointing significantly correlated with social interaction. It did not significantly relate to any other variables, but was approaching significance in the correlation with executive function. It is possible that communicative pointing interacts differently with executive function and language compared to grasping to eat or build, as found in previous studies.

Future Directions

- Examine right-hand motor training as an avenue for simultaneously training and improving social skills in young children
- Compare different forms of lateralized hand use (pointing, grasp-to-place, grasp-to-eat) and their relationship with higher-level cognitive functions (social and executive functions) to better understand the role of right-handed action in child development

1.Alduncin, N., Huffman, L. C., Feldman, H. M., & Loe, I. M. (2014). Executive function is associated with social competence in preschool-aged children born preterm or full term. *Early human development*, *90*(6), 299-306.
2.Gonzalez, C. L. R., van Rootselaar, N. A., & Gibb, R. L. (2018). Sensorimotor lateralization scaffolds cognitive specialization. *Progress in brain research*, *238*, 405. DOI:10.1016/bs.pbr.2018.06.011
3.Gonzalez, C. L., Mills, K. J., Genee, I., Li, F., Piquette, N., Rosen, N., & Gibb, R. (2014). Getting the right grasp on executive function. *Frontiers in psychology*, *5*, 285.