

The Relationship Between Executive Functioning Skills (EF) and Spontaneous Focusing on Numerosity (SFON) in Preschoolers



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What is Executive Function?

- Cognitive skills essential for school achievement and the preparation and adaptation of our future workforce
- Begin to develop between ages 3 and 6 in the prefrontal cortex
- Three skills include: Inhibitory Control, Working Memory and Cognitive Flexibility

What is Spontaneous Focusing on Numerosity?

- A child's tendency to focus attention specifically on the number of a set of items without being told to do so
- Naturally picking number aspects out of the environment
- A child may focus on number in the presence of distracting characteristics, like color or shape

Why do these skills matter?

- EF is a predictor of academic skills, especially math in early education (Fuhs et al., 2014).
- Higher levels of SFON predict better early math skills (Hannula, Lepola & Lehtinen, 2010).
- We hypothesize that one of the ways that young children's EF skills help children with early math is by allowing them to focus on number amid distractions.

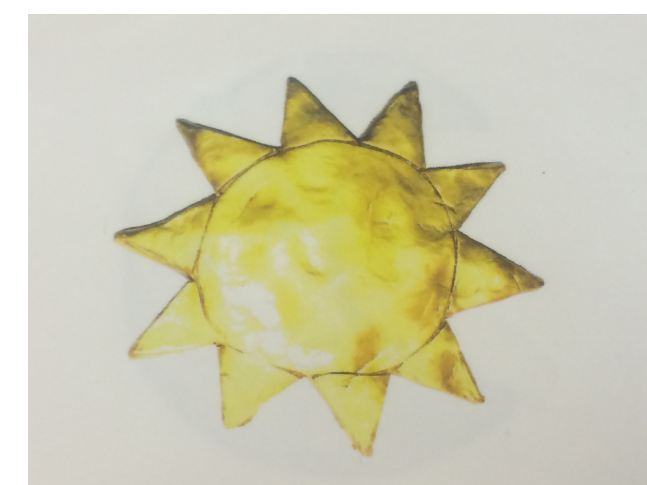
Ongoing Research:

Participants:

- 52 children from local preschool and daycare centers
- Participants were 58% female
- Ages ranged from 3-5 ($M = 50$ months, $SD = 7.34$ months)

Materials:

- EF is being measured with the Day and Night Task, Corsi Blocks, and the Dimensional Change Card Sort Task
- SFON is being measured with a Set-Matching Task



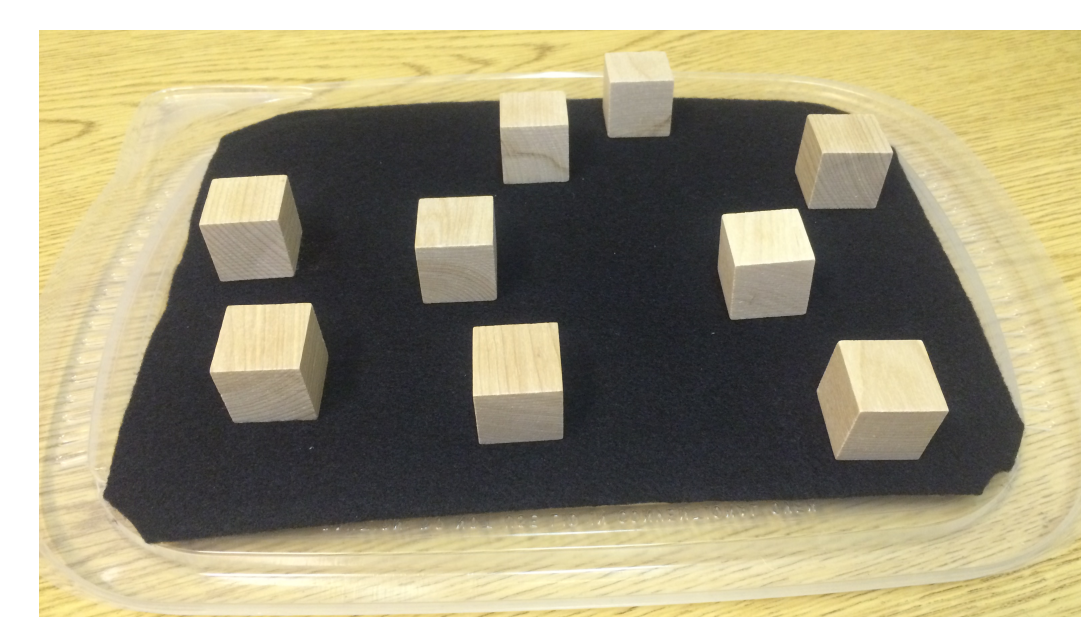
The Day/Night Task measures inhibitory control.



The Dimensional Change Card Sort Task measures cognitive flexibility.



The Set-Matching Task measures a child's SFON.



Corsi Blocks measures working memory.

Results:

Partial Correlations between EF skills and SFON (Gender and Age Controlled)

	Day/Night	DCSS	Corsi (Forward)	Corsi (Backward)	Set-Matching
Day/Night	---	.484**	.263	.039	.491**
DCSS	---	---	.359*	-.021	.363*
Corsi (Forward)	---	---	---	.077	.468**
Corsi (Backward)	---	---	---	---	.054

** - Correlation is significant at the .01 significant level

* - Correlation is significant at the .05 significant level

Conclusion:

- We tested if children's EF skills are associated with their ability to attend to number amid distractions.
- We found that children's EF skills in all three domains were associated with their SFON skills.
- These findings suggest that one possible mechanism through which EF affects early math skills is by allowing children to focus on number in their environment.
- The relationship between SFON and working memory could be confounded by the fact that both tasks used to measure these skills were similar (i.e. following what the other person does). We are following these children longitudinally to see if their EF skills predict growth in SFON over time.
- Understanding how and why EF skills and math learning are so closely related in early childhood will shed light on ways that we can create early learning environments that foster attention to and understanding of numbers and numerical relationships.

References:

- Fuhs, M. W., & McNeil, N. M. (2013). ANS acuity and mathematics ability in preschoolers from low-income homes: Contributions of inhibitory control. *Developmental Science*, 16(1), 136-148. doi:10.1111/desc.12013
- Hannula, M. M., Lepola, J., & Lehtinen, E. (2010). Spontaneous focusing on numerosity as a domain-specific predictor of arithmetical skills. *Journal Of Experimental Child Psychology*, 107(4), 394-406. doi:10.1016/j.jecp.2010.06.004