



Identifying patterns of attention to screen media in typically developing infants

Cole Kaufmann, Elena Luchkina, & Elizabeth Spelke

Harvard Laboratory for Developmental Studies



Introduction

- Screen media become increasingly integrated into early learning.
- This is especially true for children with learning differences (e.g., ADHD, ASD).
- To benefit from screen media, children must be able to maintain attention on visual and auditory input from the screen.
- It is an open question how learning differences may interact with the attentional demands of learning from screens.
- Before addressing this open question, it is key to characterize normative patterns of variation in visual attention.
- Our goal in this investigation was to explore such patterns and identify factors that predict this variation.**

Questions

- How should attention to screen media be measured?
- What predicts differences in attention to screen media in typically developing children?

Methods

Table 1. Descriptive Statistics		
Variable	M (SD)	
Child age, days	492 (24)	
Gestational age, weeks	39 (2)	
Foreign lang. exposure	8% (15%)	
MCDI: Nouns	34 (15)	
MCDI: Verbs	5 (3)	
MCDI: Adjectives	2 (2)	
MCDI: Total Vocabulary	47 (22)	
Number of Children	2 (1)	
Number of Parents	2 (0.3)	
Parent's Age, years	34 (5)	
Income	\$137K (\$63K)	
Variable	Percentage	
Child's sex		
Female	53%	
Male	47%	
Parent's education		
2-year college degree	3%	
4-year college degree	19%	
Graduate degree	2%	
Professional degree	64%	
Some college	1%	
Country		
Other Country	17%	
United States	83%	
US Region		
Midwest States	32%	
Northeast States	24%	
Southern States	22%	
West States	22%	
Ethnicity		
Hispanic or Latino	11%	
African American	8%	
Native American	1%	
White	80%	
Asian	19%	
Another Ethnicity	1%	

- Data source:** video recordings of 15-to-18-month-olds' looking behavior in a word learning study that used a looking-while-listening procedure (test trials only).
- Demographic and language measures** (MCDI I) were collected in a parent survey (Table 1).
- $N_{\text{participants}} = 89$, 2 trials per participant ($N_{\text{trials}} = 178$).
- Attention measures:** (1) number of gaze shifts from one visual stimulus to another; (2) number of off-screen gaze shifts.
- Principal Component Analysis** (with R functions *prcomp* and *PCAtest*) identified the axes of the largest variation in the data and tested their significance.
- Exploratory linear regression** analysis evaluated the contribution of principle components to infants' attention.

Results

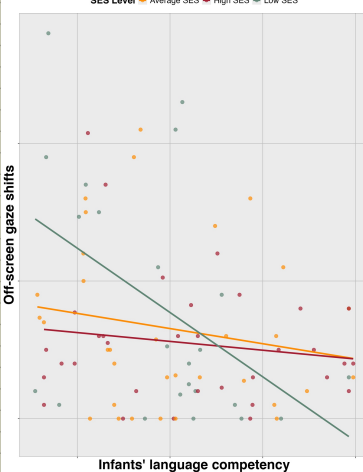
- PCA identified two significant principal components (Table 2).
- Gaze shifts among images ($M=6.3$, $SD=3.5$) were not predicted by either component.
- Off-screen shifts ($M=3.3$, $SD=3.2$) were predicted by the language component, SES component, and their interaction (Fig. 1, Table 3).

Table 3. Regression coefficients; DV: off-screen gaze shifts

	Estimate	SE	T-value	P-value
(Intercept)	9.96	1.92	5.18	<.001 ***
Language	-6.7	2.23	-3.09	.003 **
SES	-5.17	1.83	-2.83	.006 **
Language*SES	4.87	2.06	2.37	.02 *

Table 2. PCA Factor Loadings		
Variable	PC1: Language	PC2: SES
Child age, days	0.1	0.11
Gestational age, weeks	0.12	-0.13
Foreign lang. exposure	0	0.44
MCDI: Nouns	0.93 *	0.04
MCDI: Verbs	0.93 *	0.03
MCDI: Adjectives	0.88 *	-0.04
MCDI: Total Vocabulary	0.96 *	0.03
Number of Children	0.01	-0.17
Number of Parents	0.03	0.12
Parent's Age	0.05	0.52
Parent's Education	0.07	0.46
Income	0.02	0.68 *
Northeastern States	-0.01	0.4
Southern States	-0.16	-0.42
Midwest States	0.13	-0.32
Overseas States	0.01	0.48
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Figure 1. Relationship between vocabulary and off-screen gaze shifts by SES level



Conclusion

- Children's sustained attention to the screen, rather than their gaze shifts among the stimuli, is predicted by language and SES.
- Language competency has the largest effect on attention to the screen in children from a lower-SES background.
- Limitations: (1) the SES in the sample is skewed towards the higher end; more work is needed to generalize these findings beyond our sample; (2) this investigation is exploratory, future work will conduct hypothesis testing.

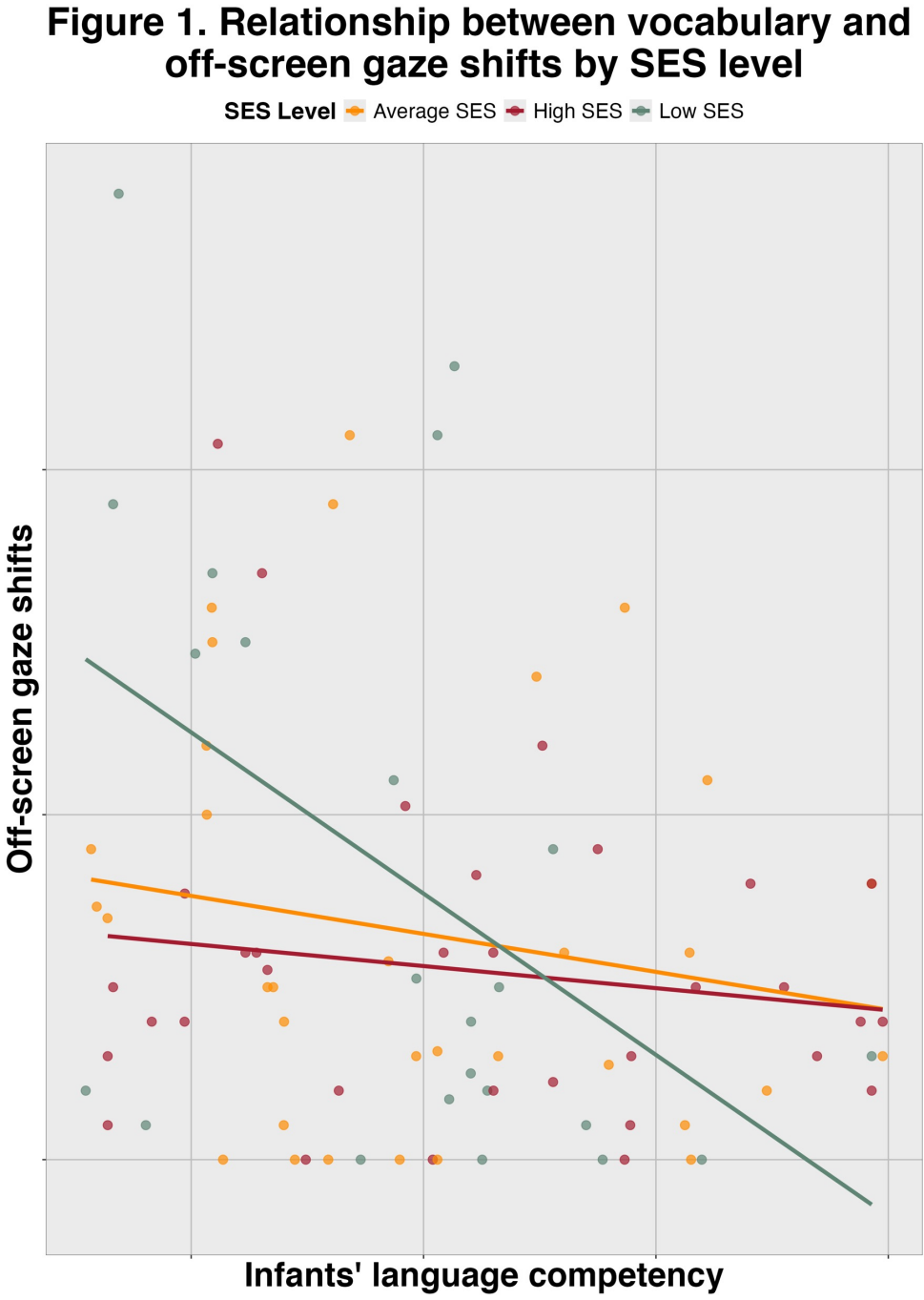
Future work: Clinical Extension

- We aim to identify risk and protective factors of learning from screen media among children with ADHD and ASD.
- The double dissociation between ADHD and ASD (language and attention deficits) is instrumental in exploring factors predicting success in learning from screens among clinical populations.
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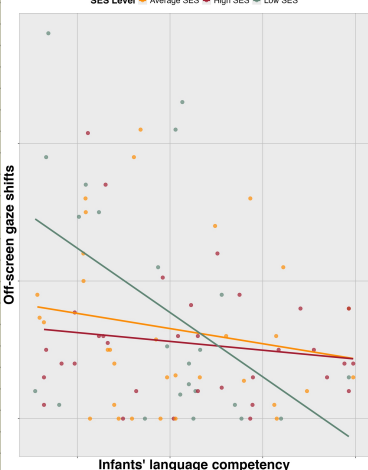
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