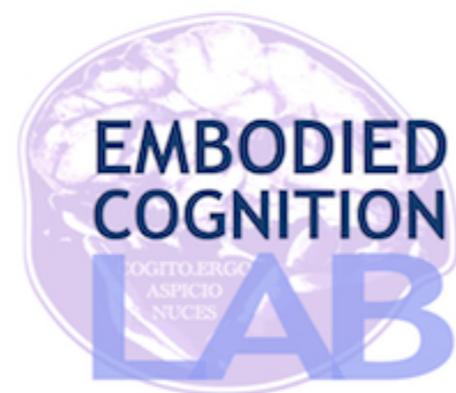


Predicting the Age of Acquisition of Concepts from Sensorimotor Experience

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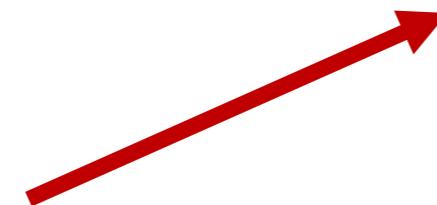


Dermot Lynott



The Leverhulme Trust

Background



[Image source](#)

Background



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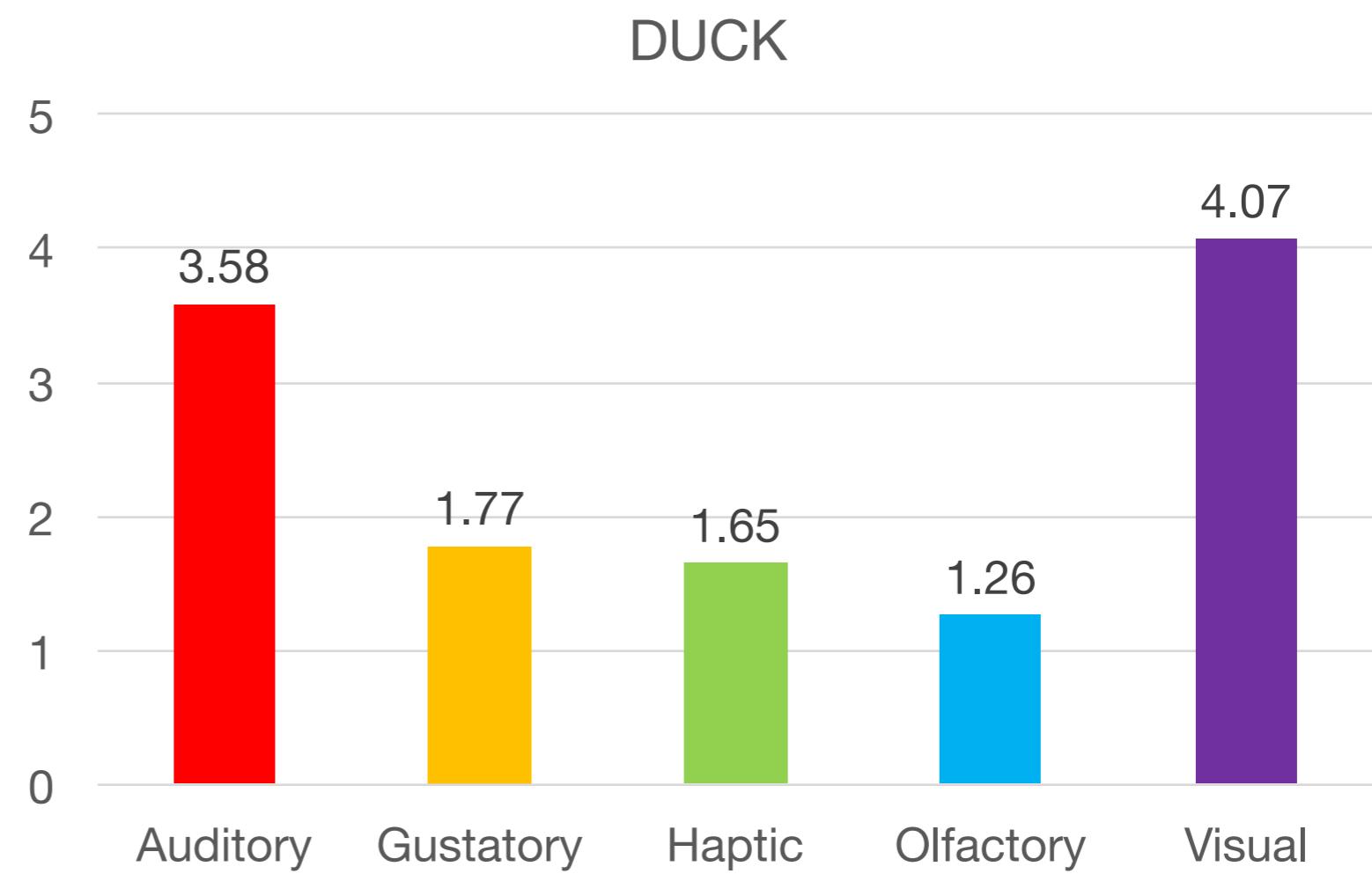


“If it looks like a duck, and quacks like a duck, we have at least to consider the possibility that we have a small aquatic bird of the family Anatidae on our hands”

Douglas Adams
Dirk Gently's Holistic Detective Agency

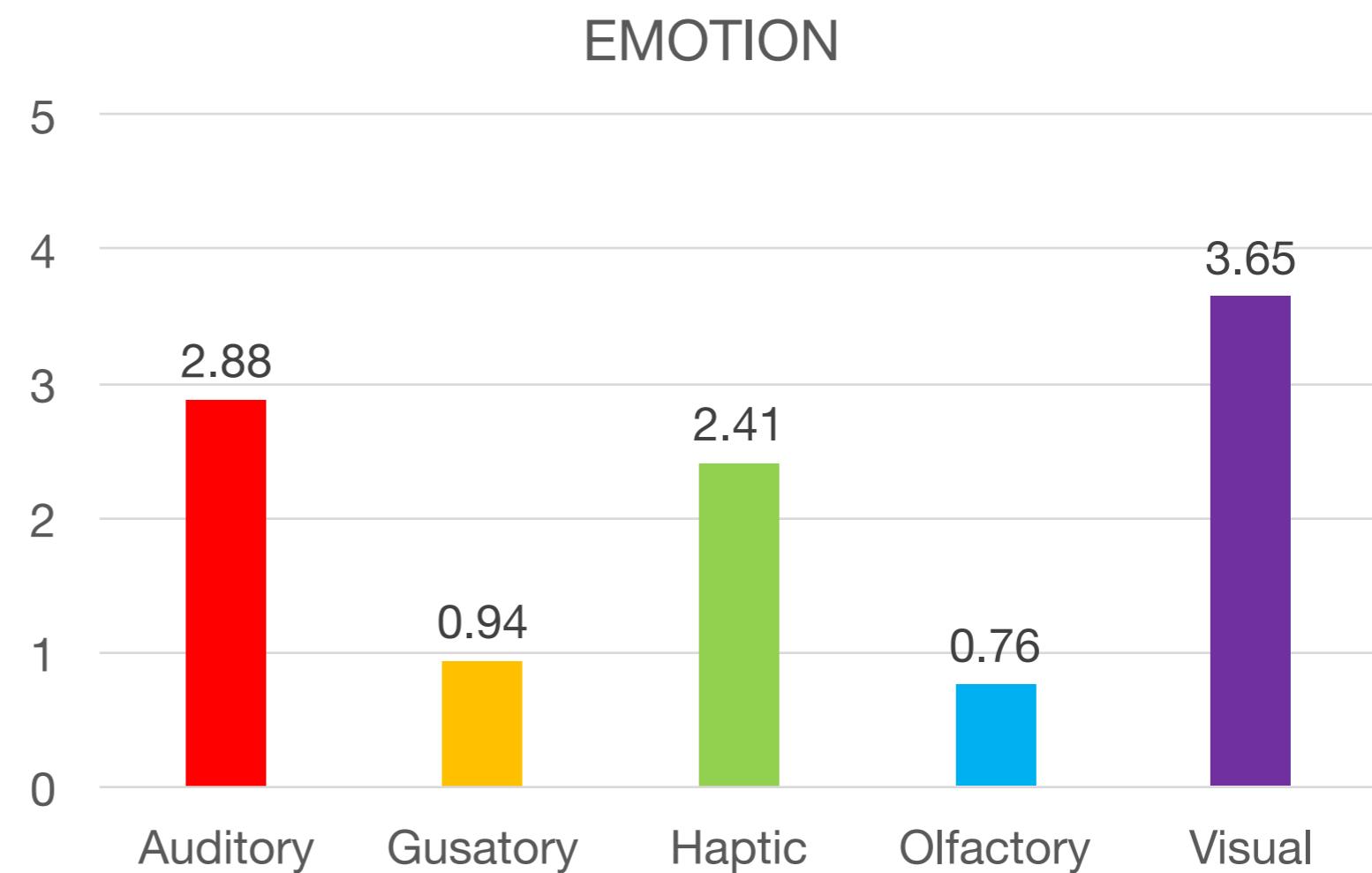
Background

Modality specific perceptual strength for 1,002 words
(Lynott & Connell, 2009; 2013)



Background

Modality specific perceptual strength for 1,002 words
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Why?

Modality specific perceptual strength more sensitive measure than:

- Concreteness
- Imageability
- Sensory experience

Known to outperform these semantic predictors in language processing tasks (Connell & Lynott, 2012; 2016)

Why?

- Human conceptual system comprises ~40,000 concepts (Brysbaert et al., 2014; Warriner et al., 2013)
- Only 1,002 words with sensory ratings
- Megastudies provide richer data with greater statistical power

[Behavior Research Methods](#)
... September 2014, Volume 46, Issue 3, pp 904–911 | [Cite as](#)

Concreteness ratings for 40 thousand generally known English word lemmas

[Authors](#) [Authors and affiliations](#)

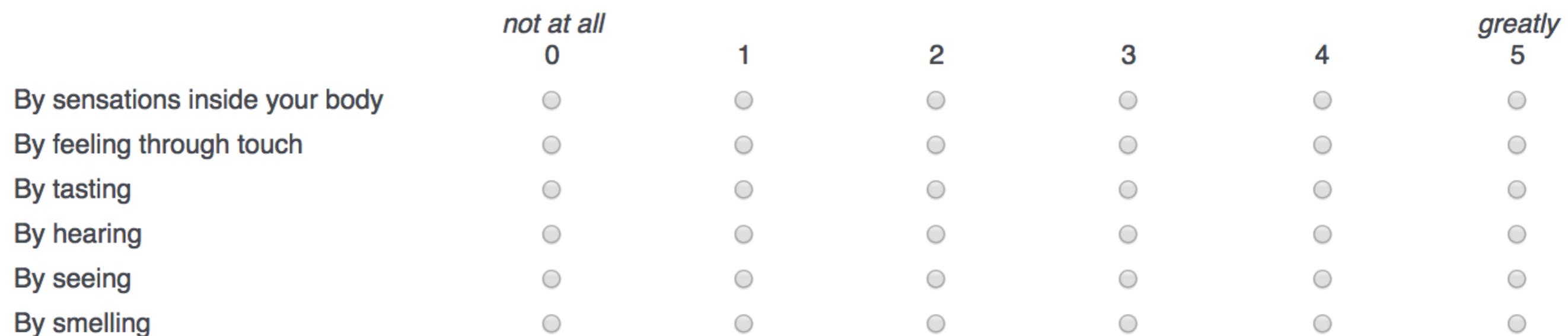
Marc Brysbaert , Amy Beth Warriner, Victor Kuperman

How?

- Sensory and motor ratings for ~40,000 concepts using MTurk
- Each concept has ~19 participant ratings
- Each participant rates 48 words
- Overall, $N = 31,851$
- 11 dimensional dataset (6 sensory, 5 motor) ratings for each concept

How?

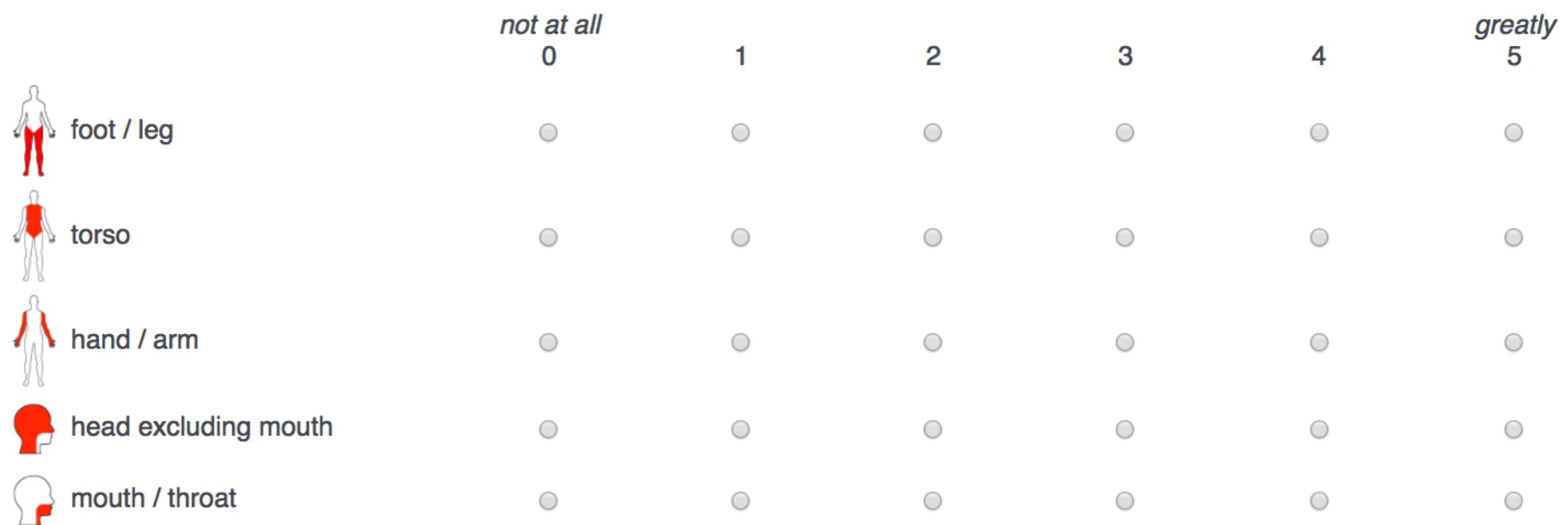
To what extent do you experience DUCK



Don't know the meaning of this word

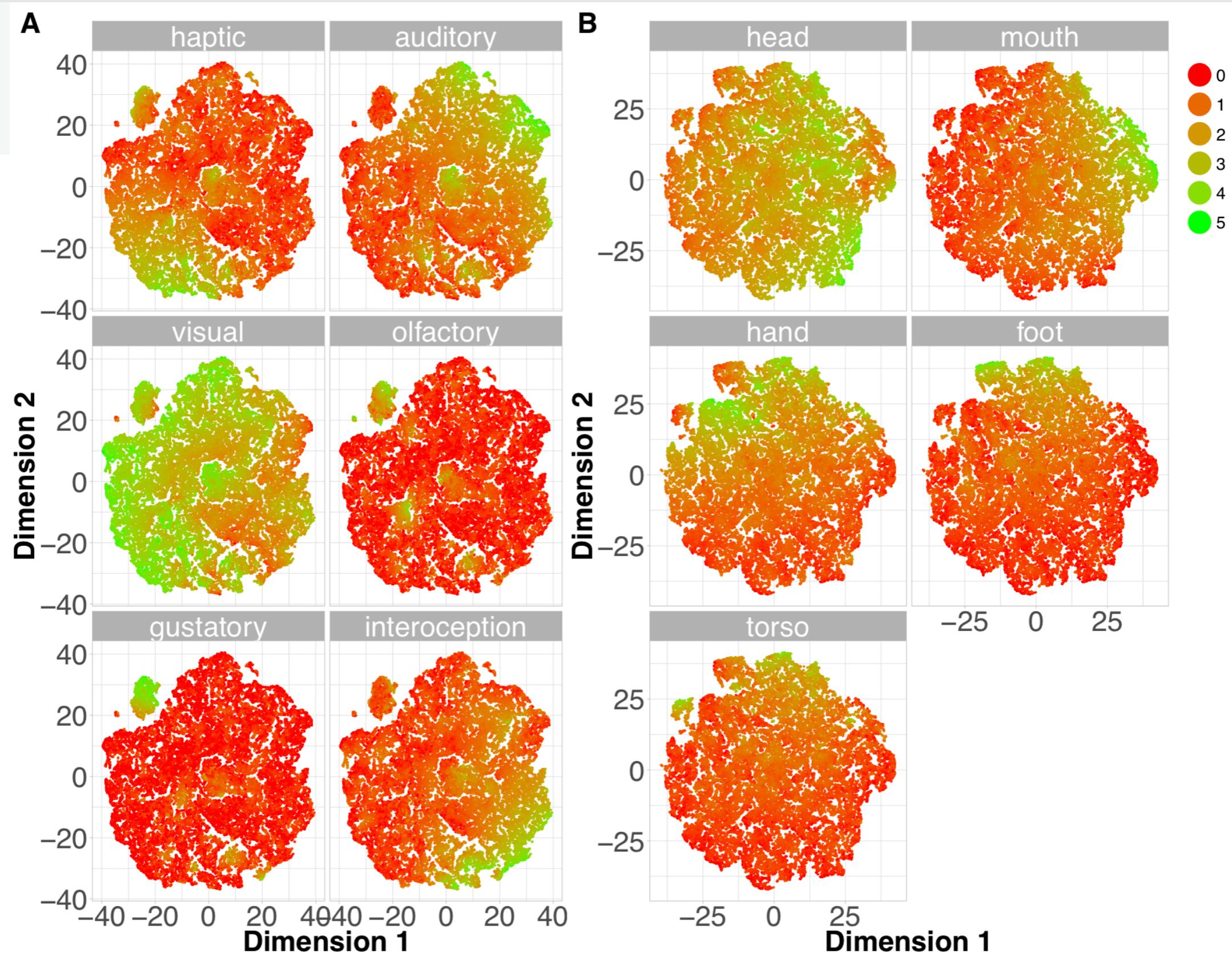
AoA and Sensorimotor information

To what extent do you experience DUCK by performing an action with the



Don't know the meaning of this word

AoA and Sensorimotor information



Hypotheses

- If sensorimotor information benefits language processing (Connell & Lynott, 2012; 2016), it could also be important for learning and the acquisition of words
- Visual and haptic strength should be really good predictors of AoA for concrete words
- Interoceptive strength should also predict AoA, but mainly for abstract words



Methods

- Sensorimotor norms (40,000 words)
- AoA norms (30,000 words - Kuperman et al., 2012)
- Concreteness norms (40,000 words – Brysbaert et al, 2014)
- Frequency (log - SUBTLEX)
- Valence (14,000 words - Warriner et al., 2012)
- Orthographic word length

= 13,182 words

(nouns, verbs, adjectives)



Results

- Hierarchical regression - sensory

Stage	Predictor	Estimate	Std. error	t	p	R ²	ΔR ²
1	intercept	16.08	0.13	121.33	.001***	.442	
	frequency	-0.81	0.01	-66.50	.001***		
	length	0.12	0.01	14.14	.001***		
	concreteness	-0.73	0.02	-42.00	.001***		
	valence	-0.24	0.01	-17.67	.001***		
2	vision	-0.25	0.02	-10.57	.001***	.465	.023
	haptic	-0.33	0.02	-14.71	.001***		
	audition	-0.16	0.02	-8.89	.001***		
	olfaction	0.01	0.03	0.23	.82		
	gustation	-0.07	0.03	-2.17	.03*		
	interoception	-0.16	0.02	-7.46	.001***		



Results

- Hierarchical regression - sensory concrete

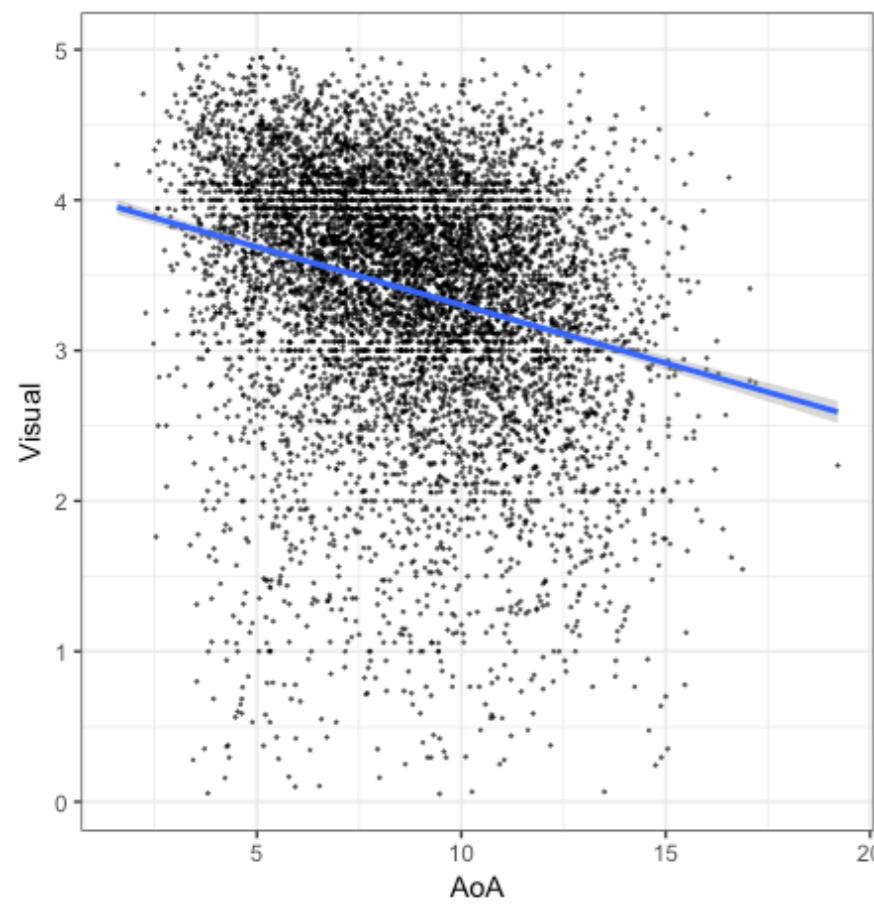
Stage	Predictor	Estimate	Std. error	t	p	R ²	ΔR ²
1	intercept	17.53	0.22	78.72	.001***	.40	
	frequency	-0.76	0.02	-44.51	.001***		
	length	0.16	0.01	13.56	.001***		
	concreteness	-1.05	0.04	-26.04	.001***		
	valence	-0.38	0.02	-18.07	.001***		
2	vision	-0.26	0.03	-7.75	.001***	.43	.03
	haptic	-0.39	0.03	-14.59	.001***		
	audition	-0.21	0.02	-9.23	.001***		
	olfaction	0.01	0.04	0.34		.73	
	gustation	-0.04	0.03	-1.33		.18	
	interoception	-0.05	0.03	-1.61		.11	



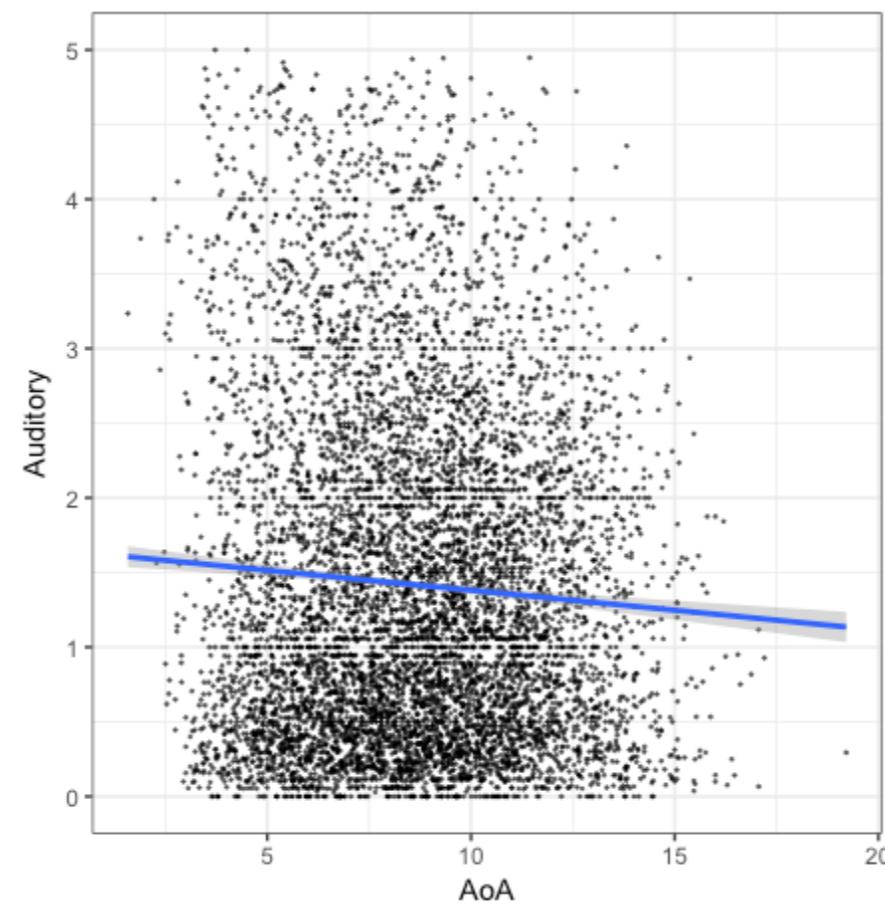
AoA and Sensorimotor information

Results

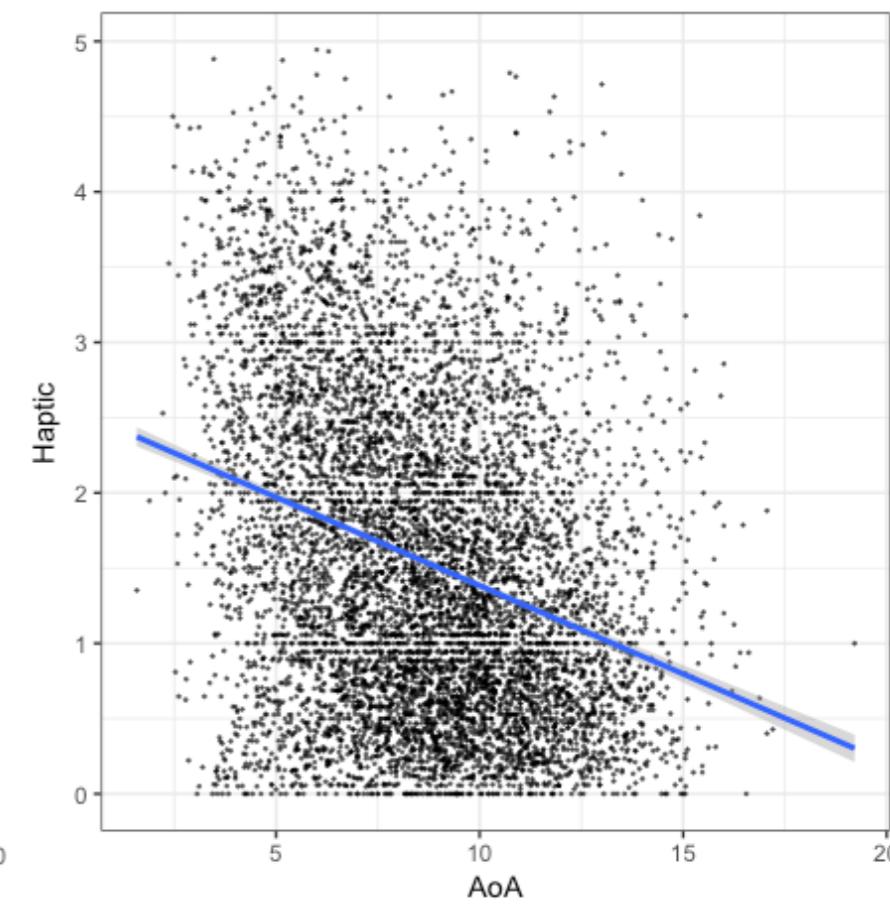
Visual



Auditory



Haptic





Results

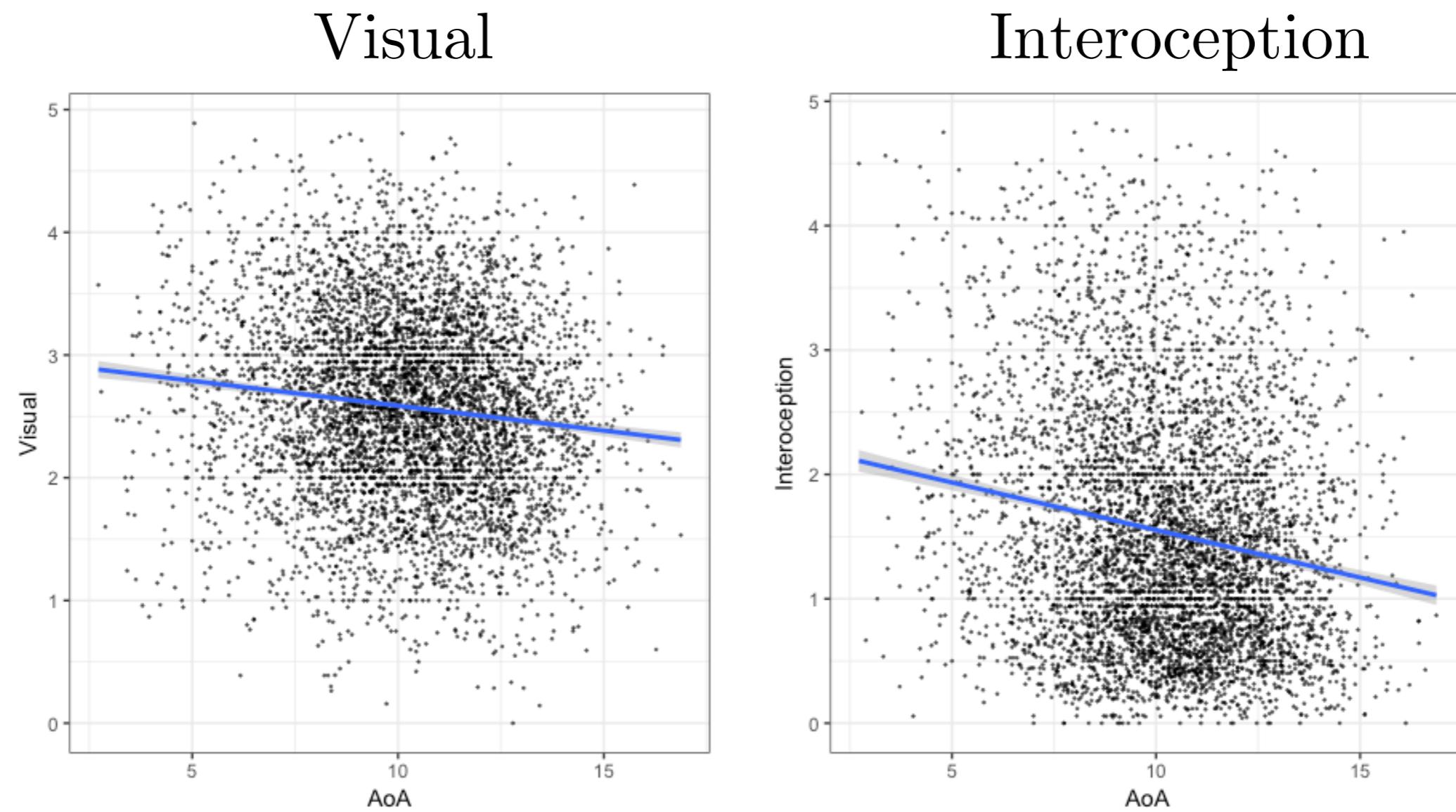
- Hierarchical regression - sensory abstract

Stage	Predictor	Estimate	Std. error	t	p	R ²	ΔR ²
1	intercept	15.06	0.21	70.05	.001***	.40	
	frequency	-0.87	0.02	-51.99	.001***		
	length	0.08	0.01	7.81	.001***		
	concreteness	-0.42	0.06	-7.01	.001***		
	valence	-0.08	0.02	-4.74	.001***		
2	vision	-0.26	0.03	-7.57	.001***	.43	.03
	haptic	0.00	0.05	0.01	.99		
	audition	-0.03	0.03	-0.94	.35		
	olfaction	-0.06	0.10	-0.63	.53		
	gustation	-0.11	0.09	-1.21	.23		
	interoception	-0.28	0.03	-10.76	.001***		



AoA and Sensorimotor information

Results





Next steps

- These are norms from adults...
- Look at CDI and CHILDES datasets (following from Thill and Twomey, 2016)
- Small scale norming from younger participants?
- Assess concreteness from sensorimotor dimensions (Connell et al., in prep)



Thanks



Results

- Hierarchical regression - motor

Stage	Predictor	Estimate	Std. error	t	p	R ²	ΔR ²
1	intercept	16.08	0.13	121.33	.001***	.442	
	frequency	-0.81	0.01	-66.50	.001***		
	length	0.12	0.01	14.14	.001***		
	concreteness	-0.73	0.02	-42.00	.001***		
	valence	-0.24	0.01	-17.67	.001***		
2	head	-0.11	0.03	-4.56	.001***	.456	.014
	hand	-0.28	0.02	-12.14	.001***		
	foot	-0.24	0.03	-8.22	.001***		
	torso	0.30	0.03	9.10	.001***		
	mouth	-0.13	0.02	-7.17	.001***		