Frequency-tagging the animate-inanimate visual object categorization in human adults and infants

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Introduction:

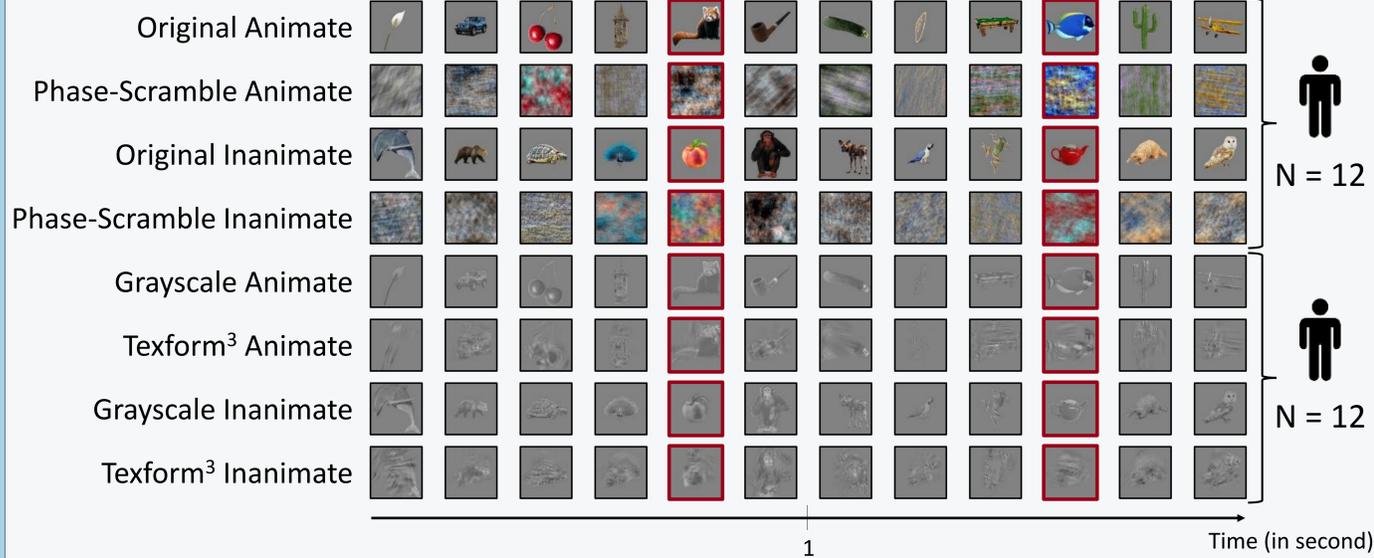

- Animate
- Inanimate

Very early on, humans begin organizing objects of the world in Animate – Inanimate[1,2]
1) Can this distinction be based on the mere visual appearance of the objects?
2) Which visual features primarily contribute to this categorization?

Design:

Original Animate
Phase-Scramble Animate
Original Inanimate
Phase-Scramble Inanimate

N = 12

Grayscale Animate
Texform[3] Animate
Grayscale Inanimate
Texform[3] Inanimate

N = 12

Time (in second)

Base-rate stimulation of 6 Hz; oddball images (red squares) appearing at (6/5) 1.2 Hz

Adults:
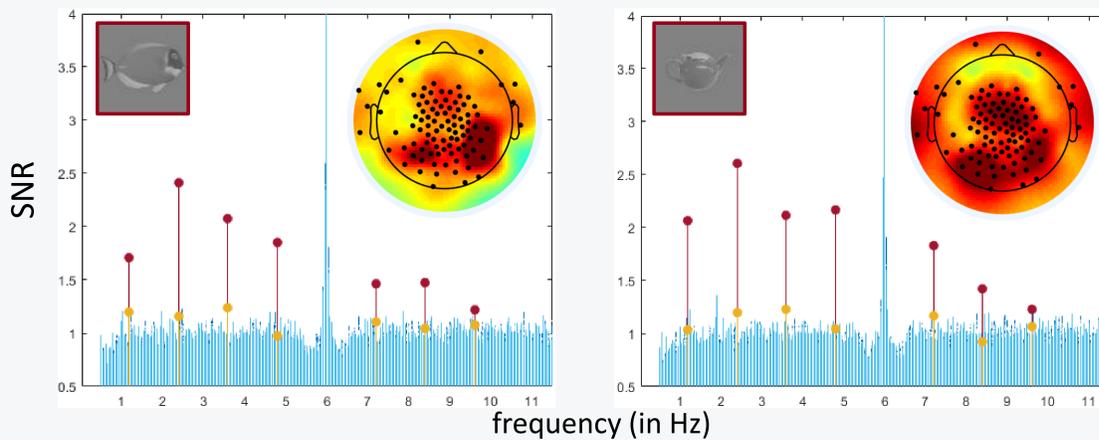
Animate

Inanimate

SNR
frequency (in Hz)
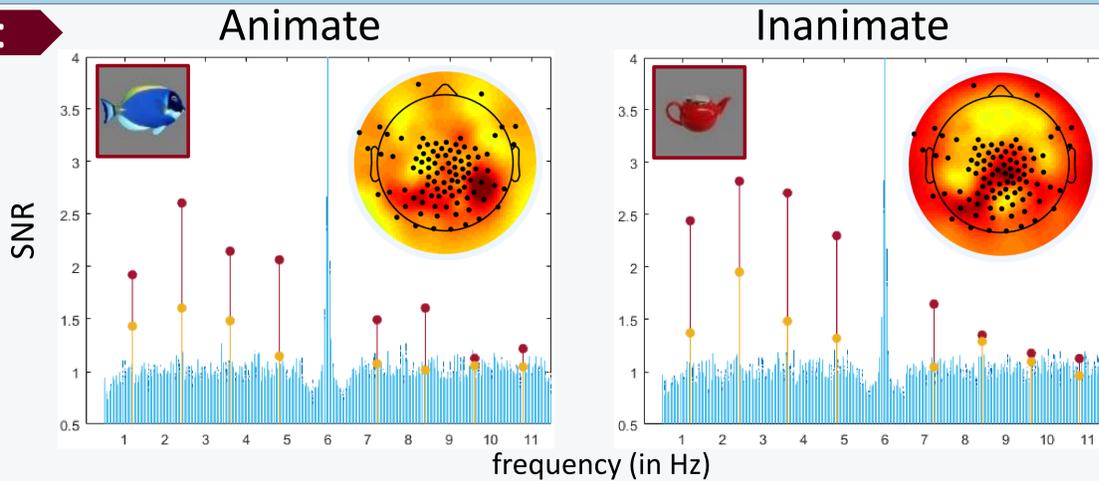
Experiment 1

— SNR of the oddball Original

— SNR of the oddball Phase-scramble

Topographies: warmer colors show higher response for the original images

Experiment 2
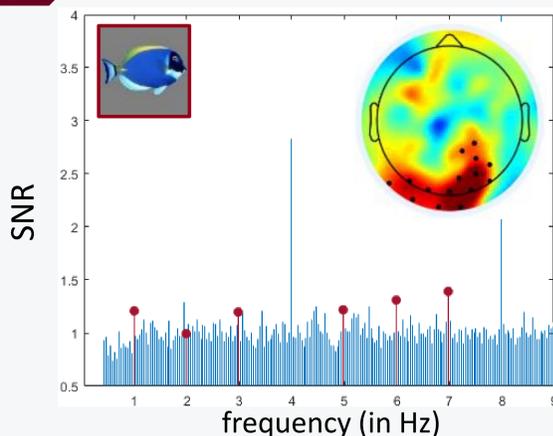
— SNR of the oddball Grayscale

— SNR of the oddball Texform[3]

Topographies: warmer colors show higher response for the grayscale images
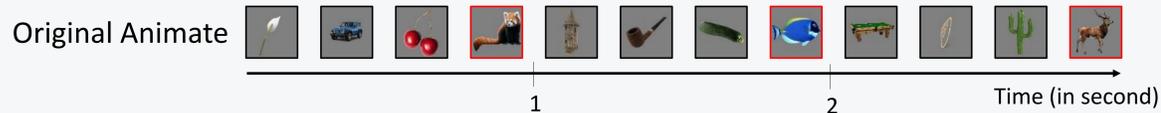
Infants:

Original Animate

SNR
frequency (in Hz)

N = 12

4-month-olds; oddball 1 Hz

Original Animate

Time (in second)

— SNR of the oddball Original

Topographies: warmer colors show high response

Discussion:

- We can capture an automatic and fast response of the animate and inanimate categorization, for all type of image: original, phase-scrambled, grayscale and texform
- This response is smaller for the impoverished images compare to the full images

- Animacy is resilient to the impoverishment of the visual imput
- Low- (phase-scramble) and mid- (texform) level visual features are sufficient to drive the categorical response, although they do not account for the full response
- The automatic and fast animate-inanimate categorization is present early on in life

References:

1 Caramazza, A. and Shelton, J.R. (1998) *Journal of Cognitive Neuroscience* 10, 1–34
2 Spriet, C. *et al.* (2022) *Proc. Natl. Acad. Sci. U.S.A.* 119, e2105866119
3 Deza, A. *et al.* (2019) , in *2019 Conference on Cognitive Computational Neuroscience*, Berlin, Germany