

Penna University of Pennsylvania

David Alexander Kahn^{1,2}, Geoffrey K. Aguirre¹

Department of Neurology, University of Pennsylvania
Center for Autism Research, Children's Hospital of Philadelphia

cfn upenn edu

Introduction:

The classic psychological finding of Miller (1956) demonstrates a limitation on unidimensional absolute identification performance occurring around seven "plus or minus two" exemplars (Shiffrin & Nosofsky, 1994). Is this limitation present in neural adaptive indexes of perceptual similarity? To approach this question, we investigated the effects of gamut and dimensionality on the ERP response to non-face objects (Op de Beeck, Wagemans & Vogels, 2001).

Stimuli: One and 2 Dimensions; Five and Nine Exemplars



Experiment: Carry-over ERP design



- 968 trials (nine-stimulus conditions), 864 trials (five-stimulus condition)
- Counterbalanced de Bruijn sequences (stimulus order & ISI; Aguirre 2011)
- Orientation of linear space & condition order was varied across subject.
- Subjects responded via button-press to target shape (every 5.5 6 trials).

Sensor Selection & Component Identification:



 Orthogonal comparison (targets versus non-targets) used to identify objectresponsive sensors-of-interest (in red).

 Center of target response was used to define object-selective component-ofinterest. Mean amplitudes were calculated for a 100 ms window (grey).



Conclusions:

We find that changes in stimulus gamut and dimensionality cause identical stimulus transitions to evince different neural responses. The attenuation of neural dissimilarity for stimulus changes within the 9 space may be the basis of Miller's limit on absolute identification. While we interpret these findings as sensory representations (Kahn, Harris, Wolk & Aguirre, 2010), additional work is needed to characterize the perceptual correlates of these ERP components.

Contact:

dakahn@mail.med.upenn.edu aguirreg@mail.med.upenn.edu Acknowledgements: Robert T. Schultz² David A. Wolk¹ Reprints: http://cfn.upenn.edu/aguirre/wiki/ lab_presentations Aguitre G, Mattar MG, Magic-Weinberg L. 2011. de Bruijn cycles for neural decoding. NeuroImage 56:1293-1300. Kahn DA, Harris AM, Wolk DA, Aguitre GK. 2010. Temporally distinct neural coding ofperceptual aimlaintry and prototrope bias. J Vis. 1012. Miller, GA. 1956. The magical number seven, plus or minux two: Some limits on our capacity for processing information. Psychol Rev. 63:319:40. Or got Beeck H, Wageman J, Vogels R. 2001. Inforcemporal neurons represent loss dimensional configurations of parameterized shapes. Nat Neurosci. 41:344-41. Submittaions. Psychol. Rev. 1013:7-361.