Over the past 20 years, a number of advances in experimental methodologies have provided a wealth of knowledge concerning infants' discriminative capacities, preferences, and memory. However, only a few of these methodologies have been able to assess categorization and in particular, categorization of multi-dimensional stimuli. Additionally, available assessments require many repetitions of the same stimulus and/or implicitly direct the infant's attention to a predefined (relevant) dimension.

In the present studies, we demonstrate use of the anticipatory eye movement (AntiEM) paradigm (McMurray & Aslin, 2000, 2002) to assess visual and auditory categorization and present a new methodology based on tracking moving objects behind an occluder. These methods yield a measure of categorization of multi-dimensional stimuli that avoids previous pitfalls. We demonstrate the reliability of this new paradigm, two ways to examine the structure of categories, and also its power to reveal individual differences in categorization.

After the training-stimulus, a short animation-reward appears on one side of the screen or the other. The location of the reward is consistently paired with the identity of the visual stimulus.

During training, the delay between the training-stimulus and the reward increases, prompting the infant to make anticipatory eye movements toward the side of the screen where (s)he expects the reward to appear. During testing, reinforced training stimuli alternate with unreinforced generalization stimuli.

Eye movements are assessed using an ASL 504 remote eye-tracker coupled to a magnetic head tracker. The result is a real-time, 30 Hz record of gaze position in screen coordinates.

After training, categorization of new generalization stimuli can be assessed. By varying the composition of the training stimuli and the generalization stimuli, we assessed multidimensional categorization in two ways:

1) Feature Weighting (Exp. 1 & 2): The infant is trained on stimuli varying along two dimensions and tested on all possible novel combinations. Consistent generalization along one of these dimensions indicates a preference for one dimension over another when forming categories.

2) Category structure (Exp. 3): The infant is trained on stimuli varying on one dimension and then tested on stimuli which vary on one or more 'extraneous' dimensions. By determining when performance degrades, one can see which dimensions tend to be naturally grouped together.

Training Results (30 trials)
- 75% Correct (H6=4,290, p=.0005).
- 15 out of 19 infants showed correct anticipation behavior to training trials (H6 and V3)

Generalization Results (M=18.9 trials)
Each infant's 'dimensional-bias' was based on their responses to novel stimuli (H5 and V6). Infants who generalized showed eye-movements consistent with either orientation or spatial frequency. Infants who did not generalize looked consistently to the right or left.

- 9 Infants showed generalization, 10 did not.
- No consistent preference for spatial frequency or orientation—individual differences are detectable using AntiEM paradigm.
- Of the 9 who generalized, all scored better than 50% on the training trials (X²(18)=4.6, p=.03).
- Generalization preference strength correlated with training strength (R=+.472, p=.04): generalization derives from learning.

Conclusions
- AntiEM has sufficient repeated measures (M=20.0 trials) to assess multidimensional categories and individual differences.
- Poorer learning with occlusion, but more “responses” (Exp 1: 2.8 s/trial; Exp 2&3: 4.5 s/trial)
- Spatial freq. and orientation weighted equally.
- Color outweighs shape.
- Poorer learning with occlusion.