# Pre-Data-Collection Poster Satellite Abstract Booklet (VSS 2025)

## Saturday Afternoon

## Banyan Breezeway, 2.45pm – 6.45pm

### 26.339. From providing to predicting: expanding the information-driven attentional capture hypothesis

Alenka Doyle, Emily Gonzales, Michael A. Grubb

Trinity College-Hartford

### 26.340. Visual learning in childhood: The use of partially explored knowledge to optimize learning

Samantha O'Keefe, Ellie Cross, Camille Liska, Susie Ju, Sophia Vinci-Booher

Department of Psychology and Human Development, Vanderbilt University

Early childhood is a time when knowledge is rapidly developing through visual and motor exploration. Young children progress to reading full sentences from no alphabet knowledge in only a few years, but how do they do this? One possibility is that children optimally balance exploration of new knowledge and exploitation of old knowledge by seeking partially explored knowledge to prioritize learning. Here, we propose to investigate the explore-exploit trade-off in childhood learning by testing exploration of partially explored knowledge. We will use eye-tracking to examine whether visual attention to individual alphabet letters during free viewing in 3-4-year-old children (n=138 for an effect size of 0.1) depends on prior knowledge of the letter (unknown/new, partially known, well-known/old). For each participant, we will use a card sorting task to identify two letters that are

unknown, partially known, and known, for a total of six letters. We expect that attention to the partially-known letters will be greatest because further exploration of a partially-known letter is more likely to solidify knowledge of that letter than exploration of an unknown or known letter. Additionally, we will measure motor attention using a coloring worksheet to assess if attention varies between visual-only (i.e., free viewing) and visual-motor exploration (i.e., coloring). The results of the study will provide evidence of how young children optimally balance the explore-exploit trade-off to prioritize their learning as well as shedding light on how the visual and motor attention systems interact during learning.

## 26.341. Spatiotemporal dynamics and inter-subject variability of neural responses to naturalistic images in developmental prosopagnosics and neurotypical individuals

Alexis Kidder (1), N Apurva Ratan Murty (2), Brad Duchaine (3), Chris I Baker (4)

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Developmental prosopagnosia (DP) is a neurodevelopmental disorder characterized by impaired face recognition and intact early visual processing. While DP is defined by face recognition deficits, it is a behaviorally and neurally heterogeneous disorder (e.g. extent of face recognition deficit, object recognition ability, and spatiotemporal neural responses to visual categories). Understanding this variability is a central challenge in DP research, and may shed light on the organization of typical visual systems. Traditionally, studies investigate DP using group-level univariate responses to stimulus categories, masking possible stimulus- and individual-level differences. The overarching goal of this project is to more fully understand the variability of visual processing in DP compared with neurotypical (NT) visual systems. To investigate intra- and inter-subject variability during visual processing, we will combine magnetoencephalography with a multi-pronged analysis approach to generate in-depth neural profiles of 20 DP and 20 NT participants to individual naturalistic images. In sensor space, we will evaluate neural variability over time using image response variability and neural typicality measures. In sensor and source space, we will determine stability of visual representations using multivariate decoding and temporal generalization. Lastly, we will develop ANNs using source-space time series to predict spatiotemporal responses to novel visual stimuli. By leveraging these complementary analyses, our results will characterize features and images driving neural and behavioral differences within- and between-participant groups, identify when and where these

differences may originate, and develop models to predict which images most differentiate DP and NT groups.

## 26.342. Impact of deception on movement prediction

Anna Filina, Maryam Vaziri-Pashkam

University of Delaware

To understand how deception impacts people's movement prediction in a real-life setting, we developed a simple experiment that allows us to test how people respond to the deceptive versus non-deceptive movements. In the experiment, subjects were assigned two roles: an attacker, who performs the movement, and a blocker, who predicts and responds to the attacker's movement. Subjects are sitting across from each other at the table, where each of them has a starting point and two targets. The attacker receives an instruction through headphones on which target to hit, and the blocker's task is to predict their movement and hit the same target as fast as possible. In this experiment, movement trackers are attached to subjects' index fingers, which allows for measuring subjects' reaction time, accuracy, and trajectory of their movements. The study has a within-subjects design; one pair of subjects participates in both conditions: deception and control. We want to explore the following questions: How does performing deceptive movements impact a person's ability to predict said movement? How often would the person deceive when given the choice? Which deceptive movement pattern would have the highest success rate? This research allows us to gain a better understanding of how humans use their movement to deceive others and how they perform movement prediction in a setting where deceptive movements are present.

## 26.343. Measuring correlations in vision

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When researchers correlate two psychophysical measures across many observers, they face a familiar obstacle: The measurements are noisy. Noise diminishes the observed correlation. This bias is inconsequential if merely trying to reject a no-correlation

hypothesis, but it poses an obstacle to estimating the true correlation. Crowding distance (the minimum spacing required to recognize an object in clutter) is an auspicious biomarker, already showing correlations with the size of V4, informational masking ("auditory crowding"), and reading speed. Using visual crowding and reading speed as an example, we show how to estimate correlations with minimal error relative to the ground truth. Diedrichsen et al. (2021) provide an unbiased estimator of correlation, a promising starting point. However, while it eliminates bias, it increases variance. We care about total error, including bias and variance. Our simulations show that the unbiased estimator's bias-variance trade-off is optimal only for sample size over 40, true correlation magnitude over 0.25, and variance across measurements no more than four times the variance across observers. While sample size is under the experimenter's control, the latter two factors are not. Our pilot crowding and reading speed measurements show that our full study with 200 online observers will satisfy the requirements for the unbiased estimator to reduce total error. We anticipate that our correlation will improve from a raw value of –0.4 to an unbiased estimate of –0.65. This procedure will help quantify the correlation between crowding and reading speed and will aid other investigations of correlated measures.

# Monday Morning

## Banyan Breezeway, 8.30am – 12.30pm

### 43.347. Cultural Differences Across Global and Local Processing in Ensemble Perception

Gaomong Lo, Bo Yeong Won, Ph.D.

California State University, Chico

Ensemble perception refers to the mind's ability to extract and summarize statistical visual information about a group of items with limited conscious awareness. However, few studies have investigated whether culture influences ensemble perception. Given that ensemble perception involves both global and local processing, an important question arises: Does culture influence subconscious visual ensemble perception when people assess average versus individual properties of objects? In this study, we address this question by comparing three groups: first-generation individuals born and raised in an

Eastern culture, native individuals born and raised in a Western culture, and second-generation individuals raised in a Western culture but are from Eastern cultural backgrounds. The experiment will be conducted online using a paradigm adapted from previous studies. Participants will be briefly shown displays containing circles of varying sizes and then be asked either about the average size of the entire group (i.e., global processing, 80% of trials) or the size of a specific individual circle within the group (i.e., local processing, 20% of trials). Results will be analyzed to identify potential cultural differences in global versus local processing within ensemble perception. We anticipate that participants raised primarily in Western cultures will show less accurate average size estimates but better accuracy in estimating individual circle sizes. This study's findings will contribute to a better understanding of cultural differences in global versus local processing and address the current gap in the literature regarding whether these cultural cognitive differences extend to subconscious visual processes like ensemble perception.

## 43.348. Spatiotemporal Integration of Motion in Human Crowds

Jiayi Pang, William H. Warren

Brown University

People routinely perceive and coordinate their locomotion with others to form collective motion in everyday crowd settings. For example, when pedestrians walk within a crowd, they adjust their heading and speed to align with multiple surrounding neighbors. Visual information about the motion of neighbors plays a critical role in this process. However, the underlying visual processing mechanism remains unknown. In this study, we plan to investigate how visual information about multiple moving neighbors is spatially and temporally integrated by a pedestrian walking with a crowd. We evaluate three hypothesis: (1) Simultaneous sampling (i.e. ensemble perception), in which the movements of all neighbors are integrated at once and averaged to produce a precise estimation of group motion; (2) Sequential sampling, in which neighbors are sampled one at a time, and successive samples are averaged over time; and (3) Subsampling, in which a subset of neighbors is sampled simultaneously, and successive samples are averaged over time. Using behavioral experiments in immersive virtual crowd, combined with eye tracking data, we measure a participant's change in walking direction in response to brief perturbations of neighbors' heading direction over space and time. By manipulating the perturbation duration, the number of neighbors perturbed, and the variability of their headings, we aim to determine the number of neighbors that is simultaneously integrated, and the temporal integration window for successive samples. Overall, the study will reveal how humans

process complex motion in the context of locomotor control, and contribute to improving vision-based models of collective motion.

## 43.349. Assessing effects of task and simulated self-motion on neuronal activation in the human parietal region with a novel stimulus set

Kaylie Capurro, Mark Lescroart

University of Nevada, Reno

Many neuroimaging studies have found effects of the type, target, and difficulty of tasks to be stronger than effects of stimuli in the parietal lobe. However most such studies use relatively simple stimuli, such as static images of standalone objects sampled from a few visual categories (e.g. faces, places, objects). Here, we propose to investigate the degree to which motion drives responses in these areas independent of task (and vice versa). To control the presence of motion and other features in our stimuli, we have developed kinematograms in which not only the motion but also the color and binocular disparity of dots are determined by an underlying virtual scene. These “multi-cue kinematograms” allow us to manipulate task difficulty by manipulating the coherence of the motion, color, and/or depth of the dots. We aim to ask participants to perform four different tasks on these stimuli. Different tasks will direct attention to the motion of a target object or the observer, and to the shape of the target or the background. Preliminary data suggests that decreasing the amount of overall coherence in a scene systematically increases task difficulty. We aim to present our stimuli in an fMRI experiment in which participants see each stimulus under each task condition. We will then model responses as a function of stimulus motion and task labels, and we will test whether stimulus or task models better explain the data. We will also test whether some areas are uniquely engaged by one or more tasks.

## 43.350. Sensorimotor interactions in primate areas MT and MST during locomotion

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Primate areas MT and MST have been extensively studied as the hub of visual motion processing. However, possible neural dynamics of motion processing in naturalistic environments and during behavior are difficult to explain since most of the studies required animals to be constrained and passively view simple motion stimuli. In the current study, we ask how locomotion and visual motion processing interact in primate areas MT and MST. To investigate this, we trained common marmosets to run volitionally or stay stationary on a ball while being head-fixed within a virtual reality dome. The stimulus projected onto the dome simulates the realistic optic flow pattern when the animal is looking at the horizon three meters away. The visual stimulus is updated in real time to be consistent with concurrent locomotion in the “closed-loop” condition, and the same visual patterns are displayed in the “replay” condition but not coupled to ongoing locomotion For neural recordings, the rig is devised to conduct widefield imaging and simultaneous neuropixel recording from areas MT and MST through the same window. At the same time, the behaviors/movements are recorded with a camera that captures the entire side-view of the animal body, and the eye movements are recorded with high-precision eye-tracking. The to-be-collected datasets could potentially uncover how the coherence between visual information and behavior would affect neural activities and show the differences in motion processing in primate areas MT and MST. This gives insights into sensorimotor interactions and dynamics in primate motion processing under naturalistic conditions.