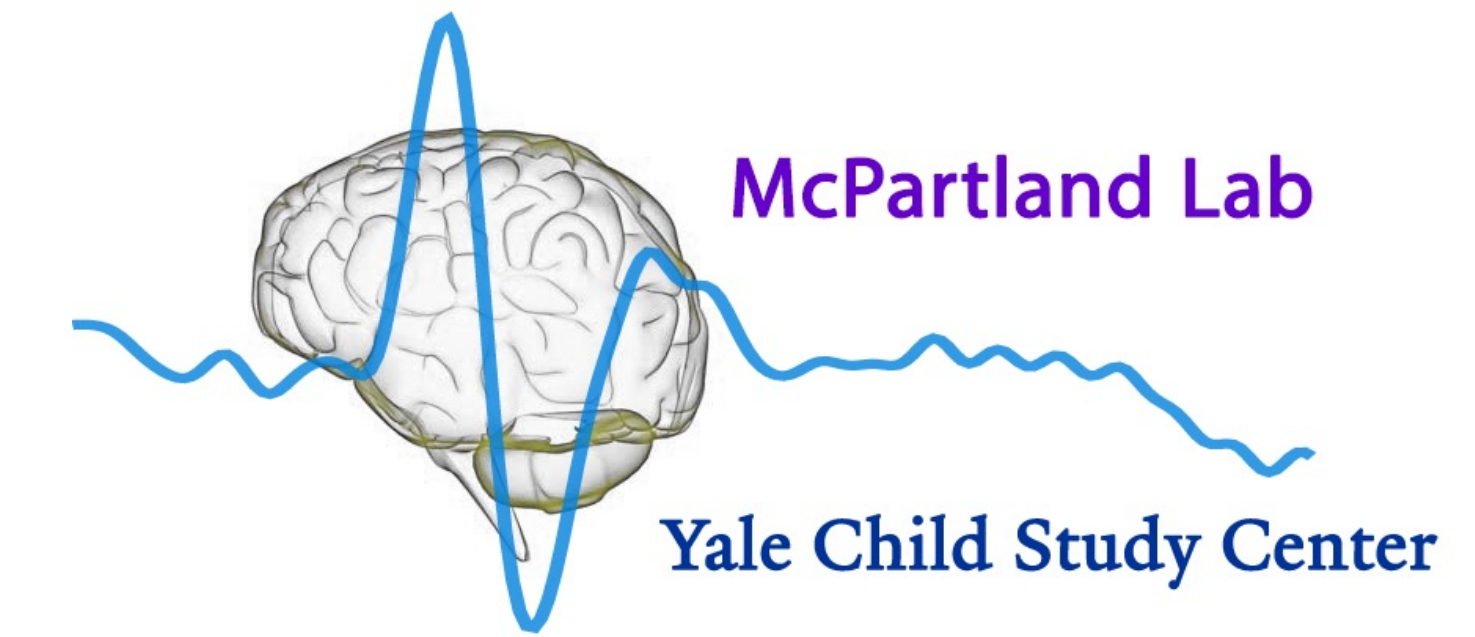# Decoding the temporal dynamics of face-specific neural representations in autism: Results from the Autism Biomarkers Consortium for Clinical Trials (ABC-CT)

#47327

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Yale Child Study Center

**ABC·CT** — Autism Biomarkers Consortium for Clinical Trials

## Objective

**Goal 1:** Characterize how face-selective neural representations unfold across time in autism

**Goal 2:** Evaluate developmental group differences in face-selective neural representation in autism

## Background

Autism impacts face-specific functional brain development and is associated with difficulty in face perception and recognition[1,2]

Reduced social input reduces neural specialization for object categorization (i.e., faces, houses), within-class discrimination (e.g., identity, emotion), and orientation-selectivity in autism[1,3]

Reduced face recognition may result from neural representations – the specific patterns of scalp signal triggered by a stimuli – that are less distinct for the visual processing system to discriminate
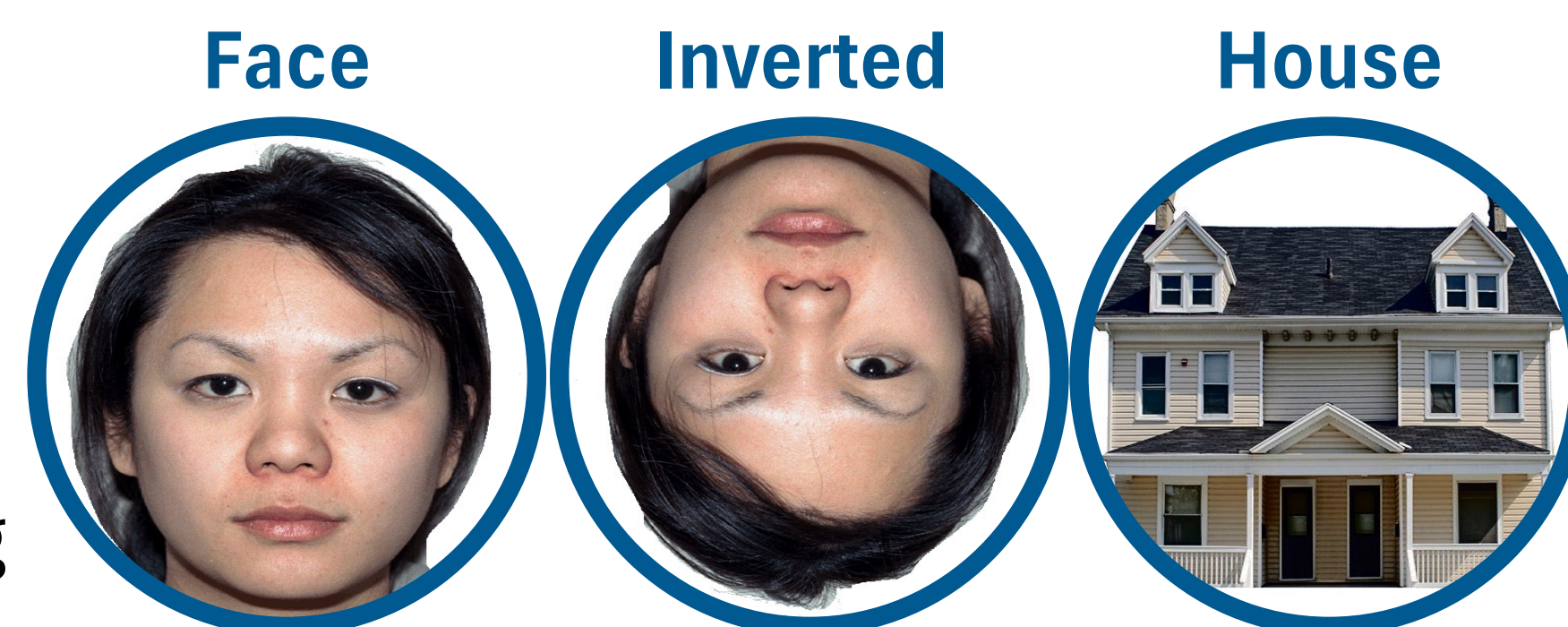
## Method

**Autism Biomarkers Consortium for Clinical Trials (ABC-CT)[4]**

Large (N = 399), multi-site study evaluating multiple electroencephalography (e.g., resting state, faces, visual evoked potentials) and eye-tracking assays in autistic and neurotypical children across multiple time points (Baseline, 6-weeks, 24 weeks)

**Faces EEG Assay**

Face | Inverted | House

216 Trials (72 per category)
3 unique exemplars
500ms exposure
128 channel EEG recording

| | Autistic | Neurotypical (NT) |
|---|---|---|
| N | 280 | 119 |
| % Male | 76.8% | 69.7% |
| Age (years) | 8.55 (1.64)[6 - 11] | 8.51 (1.61) [6-11] |
| Full Scale IQ | 96.58 (18.11) | 115.12 (12.55) |
| SRS-2 Total | 73.54 (10.92) | 42.57 (4.66) |
| ADOS-2 CSS | 7.65 (1.77) | 1.58 (0.87) |

*Note.* Mean (SD)[Range]

## Method

### Multivariate Pattern Analysis (MVPA)



ch1
ch2
ch3
128

EEG data filtered, segmented, and epoched (-200, 500 ms)

Electrode 2 / Electrode 1 / SVM Classifier

Support Vector Machine classifier to decode scalp signatures (i.e., electrical signal of each electrode) of each image and across categories (upright faces, houses)

10-trial averages; 5-fold validation
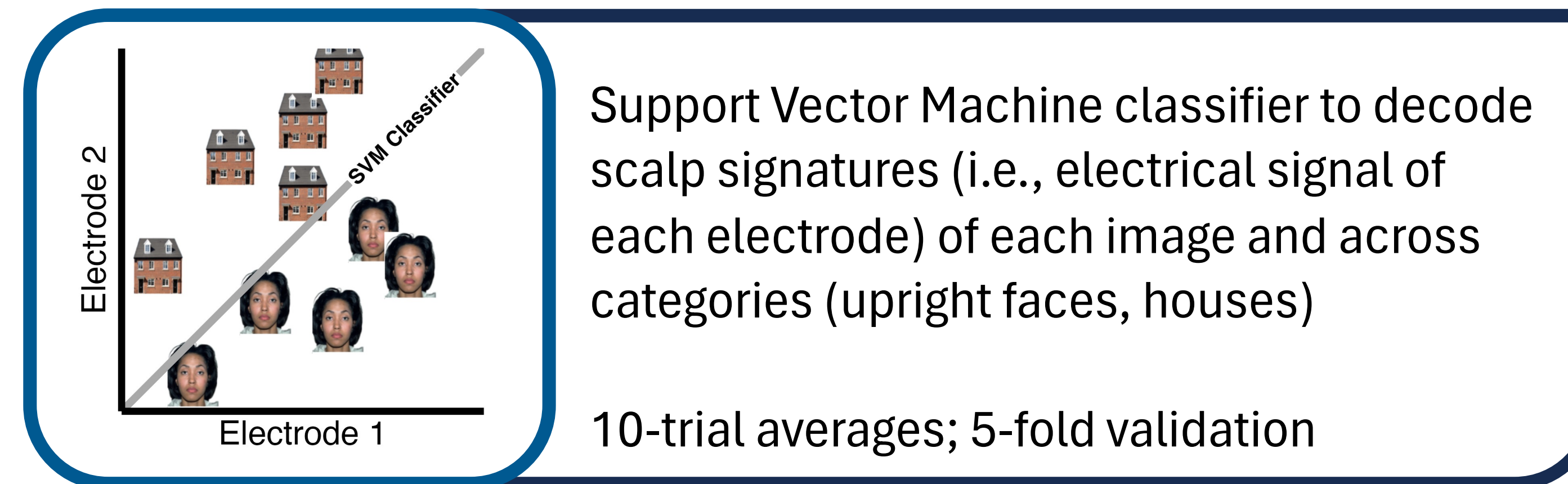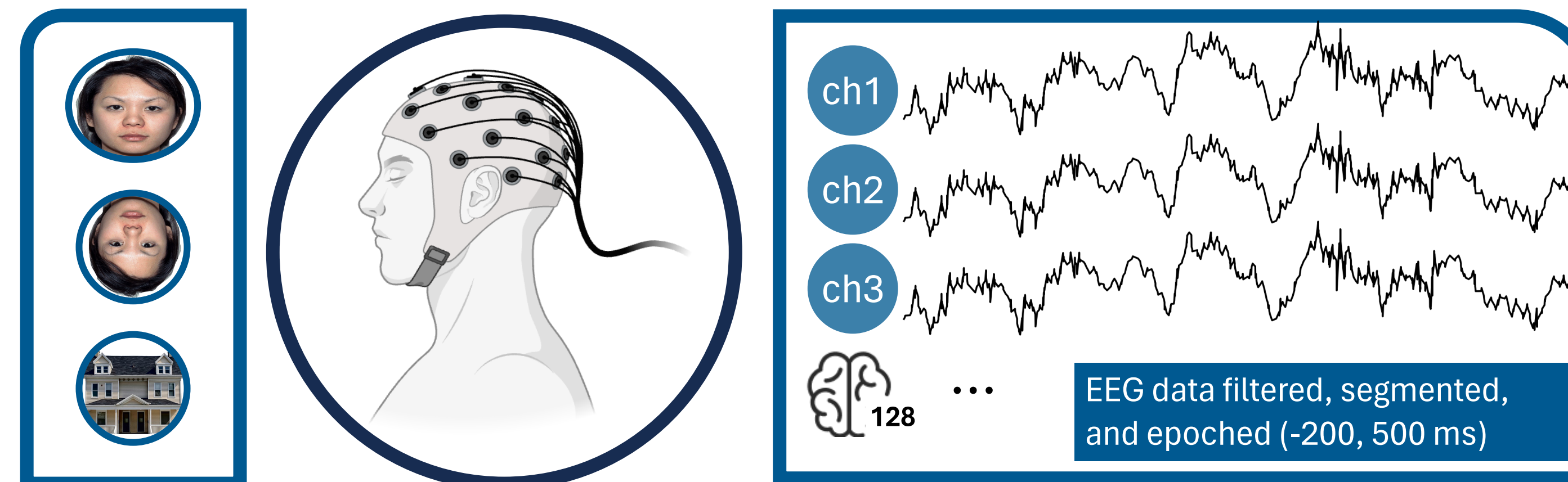
## Results

**Autistic children show less distinct face-selective neural representations; Persists across time**



Neurotypical | Autism

10-11
8-9
6-7

Decoding Accuracy (40%–80%), Time (-200 to 500)
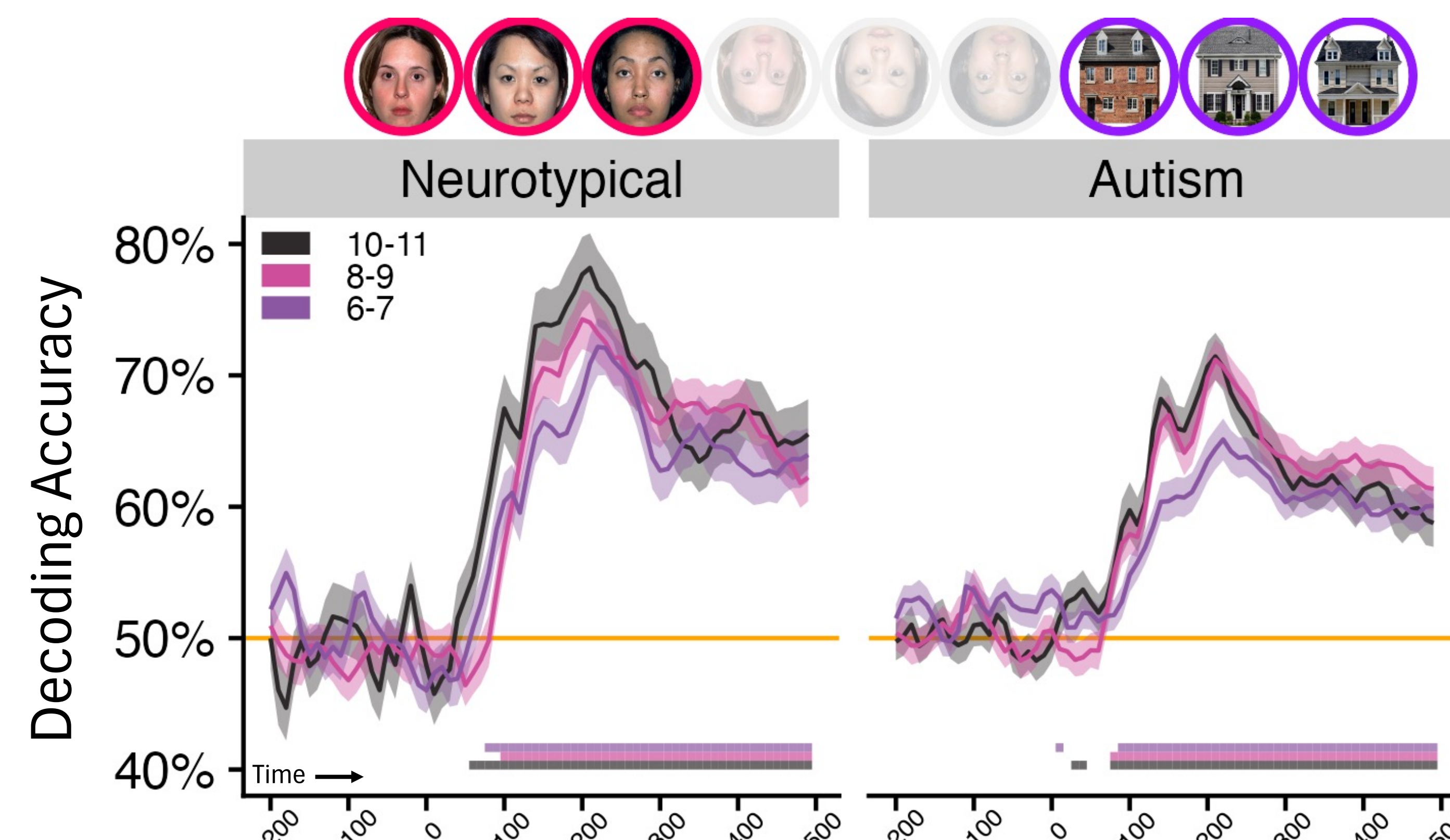
**Autistic children do not show increasing functional specificity in neural categorization across development**



Neurotypical | Autism

10-11
8-9
6-7

Decoding Accuracy (10%–18%), Time (-200 to 500)
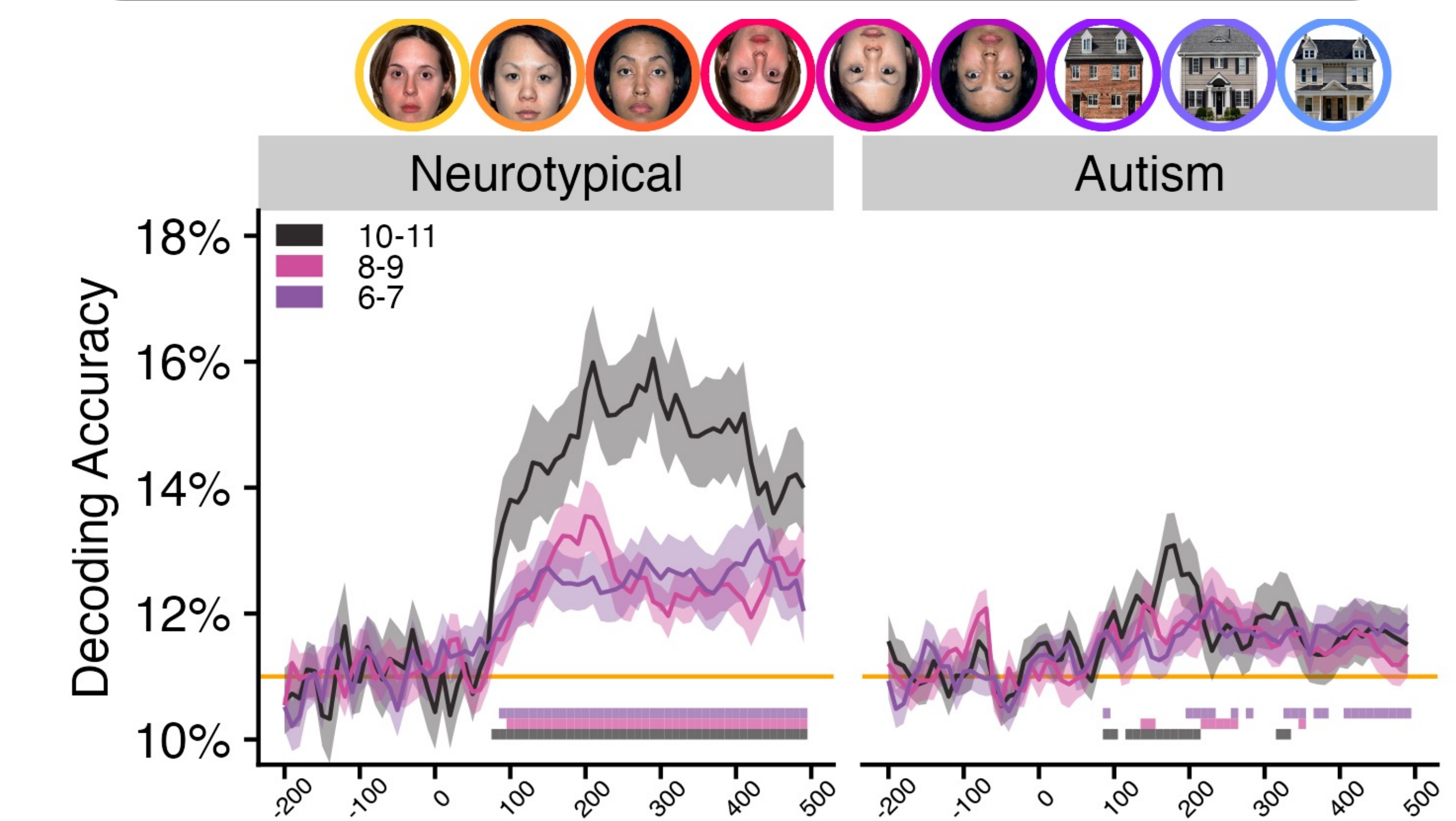
## Conclusions

Autistic compared to NT children exhibited less distinct face-specific neural representations across time, including identity discrimination, suggesting a mechanistic basis for face perception difficulties in autism

While NT children demonstrated increasing distinctiveness of neural representations with age, this developmental pattern was attenuated in autistic children, indicating altered experience-driven neural specialization for face processing

## References

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2. Griffin, J.W., et al. (2023). Investigating the face inversion effect in autism across behavioral and neural measures of face processing: A Bayesian multilevel meta-analysis. JAMA Psychiatry, 80(10), 1026–1036.
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4. Webb, S. J., et al. (2023). The Autism Biomarkers Consortium for Clinical Trials: Initial Evaluation of a Battery of Candidate EEG Biomarkers. The American journal of psychiatry, 180(1), 41–49.

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