

Comparing Category Learning in Preschoolers With and Without Autism Spectrum Disorder

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Abstract

Past research suggests that children with Autism Spectrum Disorder (ASD) learn and process family resemblance categories differently than typically developing children (TD). We conducted a research study with 3 - 5 year olds using computerized categorization tasks during which they learn two family resemblance categories based on a central prototype. The study used a 3 X (2) mixed factorial design with 3 between subject groups (TD 3 year olds, TD 4-5 year olds, and ASD 4-5 year olds), and a manipulated within subjects variable, learning type (exposure vs training). One category is learned by seeing 15 members and 15 nonmembers randomly intermixed while making decisions unrelated to categorizing the items (exposure). In the other condition they learn by being asked whether each item belongs to the category or not, and they are given feedback about whether they are correct or incorrect after each response (training). Preliminary results suggest that children with ASD have particular difficulty learning from exposure, but TD children learn almost equally in the two conditions.

Background

Children with ASD process many perceptual and social events differently from typically developing children, suggesting that they learn perceptual categories differently. Perceptual category learning is vital to language and social learning. Without explicit training, but rather with simple exposure, young children learn the perceptual categories that make up the speech sounds, words, and emotional gestures and facial expressions.

Research has shown that many school-aged children with high functioning (HF) ASD show impaired perceptual category learning. This difficulty learning perceptual categories might even underlie some of the social and language learning deficits because this type of learning is a fundamental base for the more complex learning (e.g. Church et al, 2010; 2015; Gastgeb et al, 2009). However, most social and language learning takes place at an earlier age and is learned through exposure rather than direct training. Therefore, it is important to compare the category learning abilities of younger children with and without ASD when they are learning by exposure. In particular, recent models of ASD suggest that deficits in basic cortical learning may explain the category learning patterns, and they predict that learning through exposure should be particularly impaired in children with ASD (Dovgopoly & Mercado, 2013; Mercado & Church, 2016).

Hypothesis: Children with ASD will show large deficits in learning by exposure compared to training. TD children will show similar learning in each.

Method

Participants

- 3 different subject groups (TD 3 year olds, TD 4-5 year olds, and HFASD 4-5 year olds)
- 8 children with HFASD (age range 4-5 years old) tested at summer program
- 20 TD children (8: 3 year-olds, and 12: 4-5 year-olds) tested at daycare

Design

3 X (2) mixed factorial design: 3 groups (TD 3s, TD 4-5s, HFASD 4-5s) and 2 learning types (exposure vs training).

- Preschoolers played computerized categorization tasks during which they learn two family resemblance categories based on a central prototype.
- **Training condition (sea ghosts):** see 15 members and 15 nonmembers and decide if member or not - they receive feedback.
- **Exposure condition (desert ghosts):** see 15 members and 15 nonmembers and decide if they think they will remember them - no feedback is provided.
- Then tested with 30 new members and non-members.

Learning (Training versus Exposure)

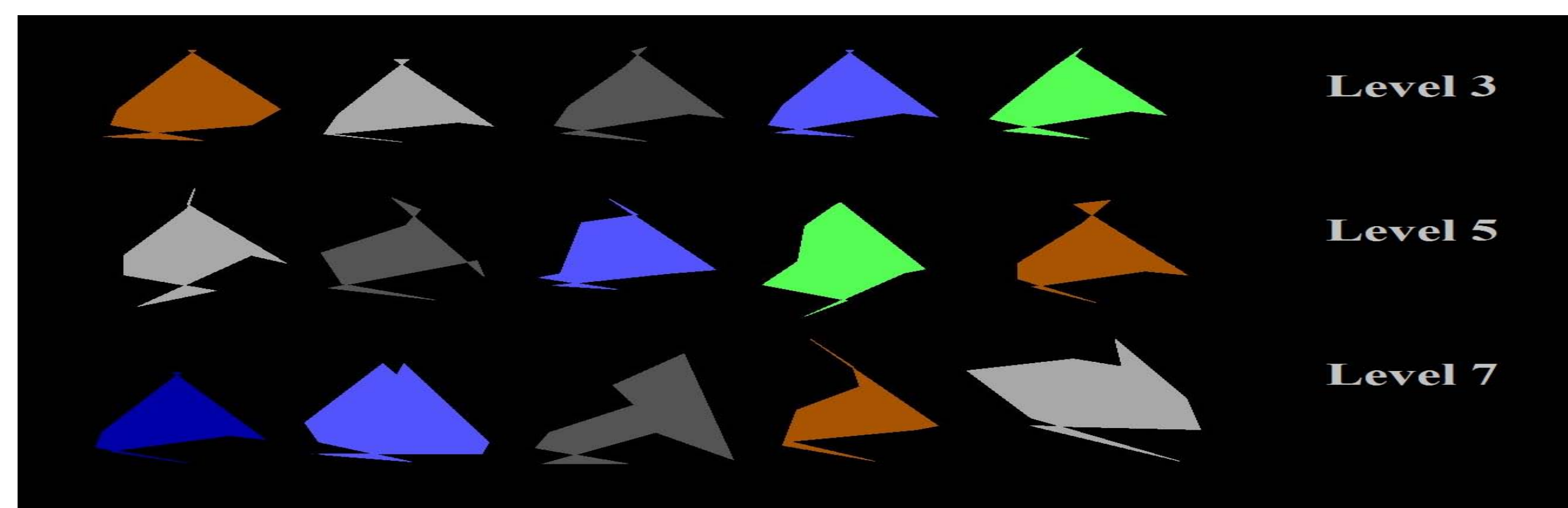


Figure 1. Examples of category-members shown during training

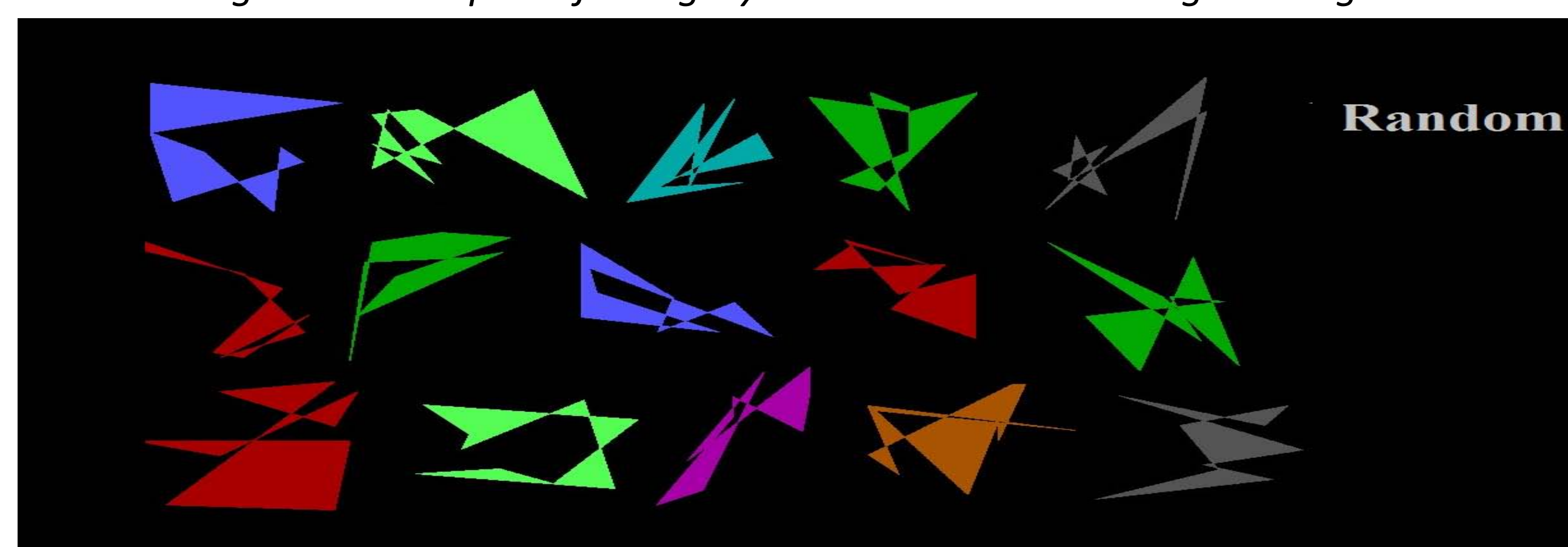


Figure 2. Examples of non-category-members shown during training

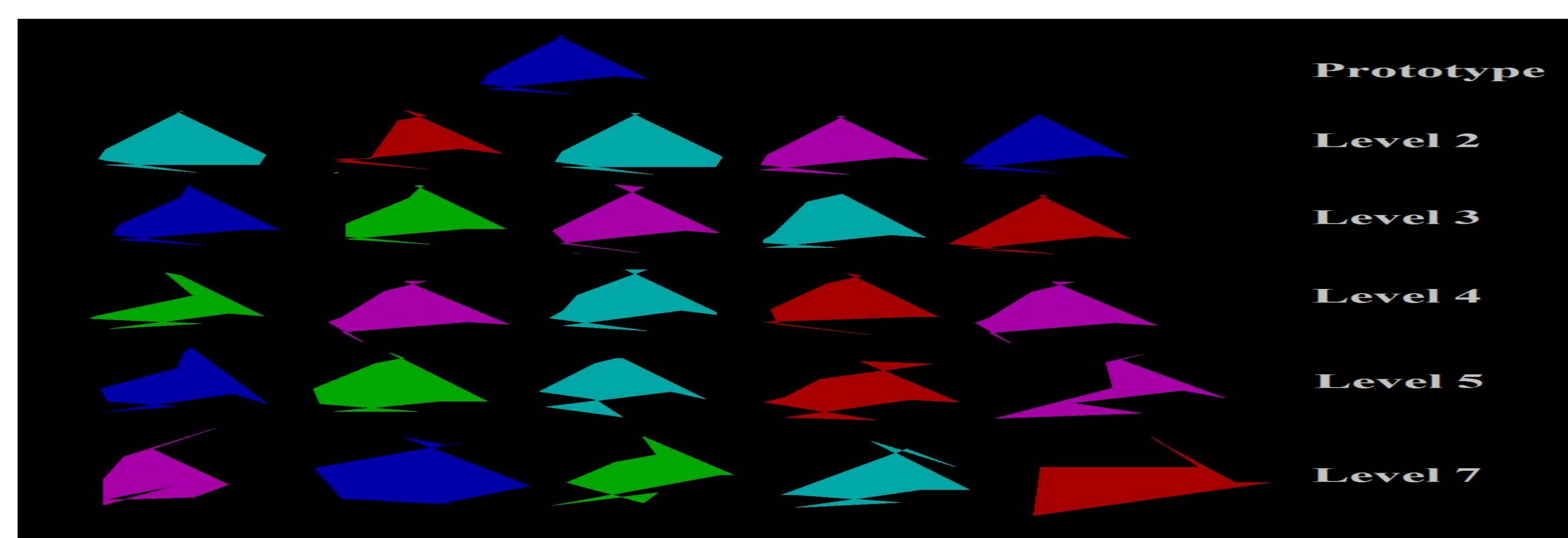


Figure 3. Examples of distorted levels of prototype shown during testing

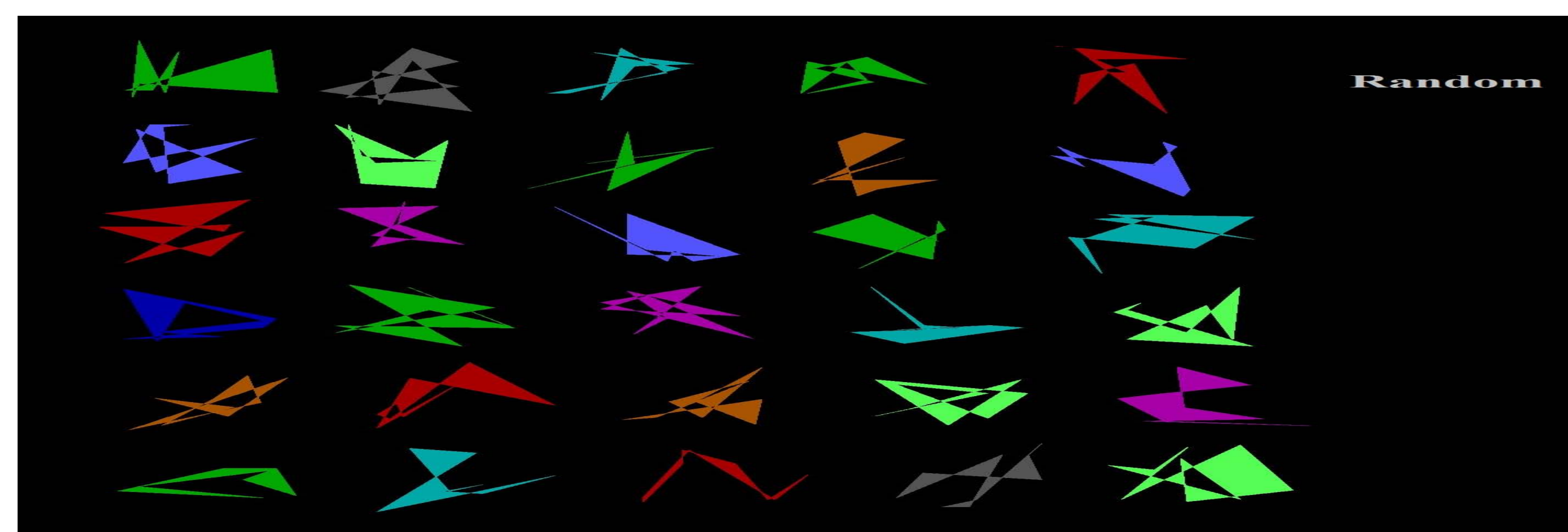
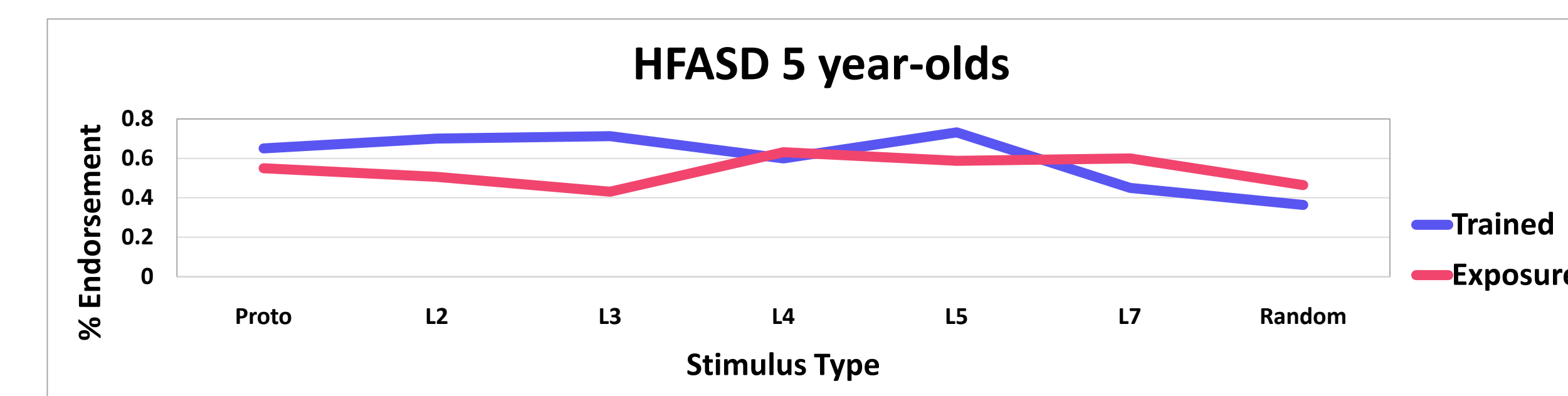
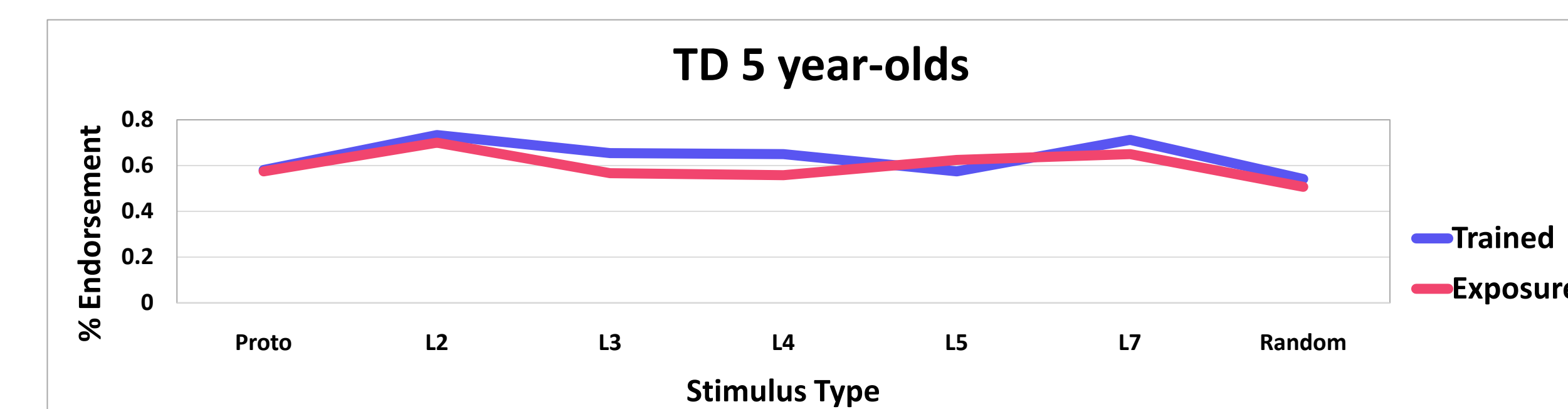
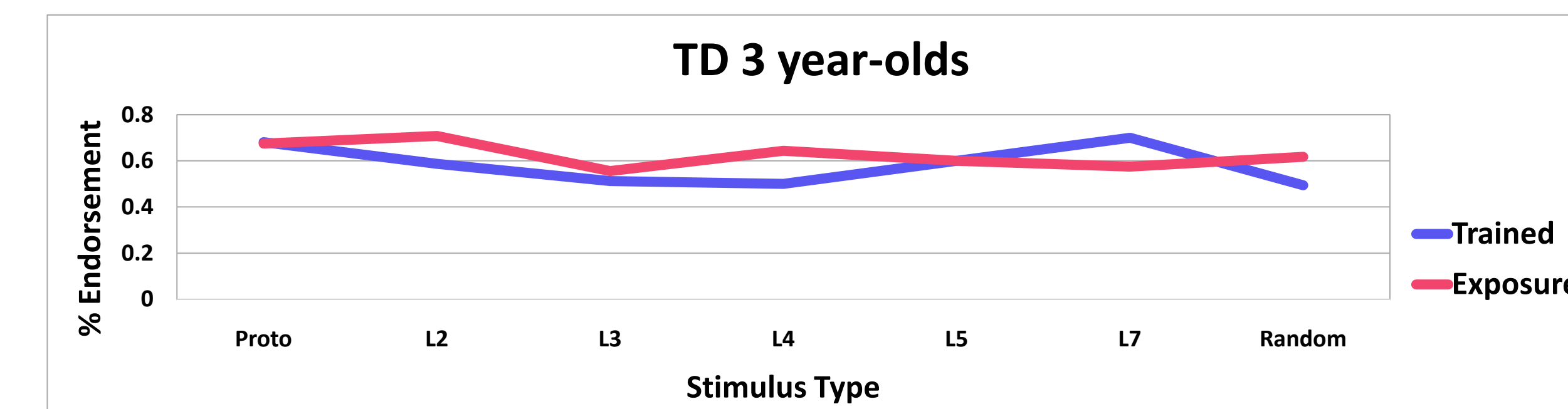


Figure 4. Examples of non-category-members shown during testing

Results



Discussion

- To date, the results suggests that though 3-5 year old TD children have more difficulty learning the categories to high levels of performance than adults, they can learn by both training and exposure, and the amount of learning is similar.
- However, none of the young children with HFASD could learn about the central tendency of the category during the exposure condition; though many showed significant learning during the training condition.
- This suggests that this difficulty learning from exposure may be specific to children with ASD.
- This may have serious implications for social and language learning.

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