

The effect of familiarity on visual search performance of 2-year-old toddlers with and without Autism Spectrum Disorder (ASD)

Laura Keegan, Hayley Smith, & Zsuzsa Kaldy, PhD

Developmental and Brain Sciences Program, Psychology Department, University of Massachusetts Boston



Background

Visual Search is an attention task that measures how efficiently a person is able to find a target among distractors. It has been found before that children diagnosed with ASD can perform better at visual search when compared to age-matched typically developing children (Kaldy et al., 2011, 2013).

Our team conducted a follow-up study with slightly different stimulus parameters (Smith et al., 2015) and two different potential target objects (in this task, an apple vs. a carrot). The results showed that the identity of the target object influenced toddlers' search performance: they were slightly faster at finding the target when it was the apple than the carrot. This study aims to further explore why this phenomenon occurred. We hypothesized that it may be related to either familiarity (apples are more familiar than carrots) or prior knowledge of language measured by a standard cognitive assessment tool (Mullen Scales of Early Learning; Mullen, 1995).

Question: Do familiarity or language skills affect how well a toddlers with an ASD diagnosis, and aged-matched typically developing children, will perform in a visual search task?

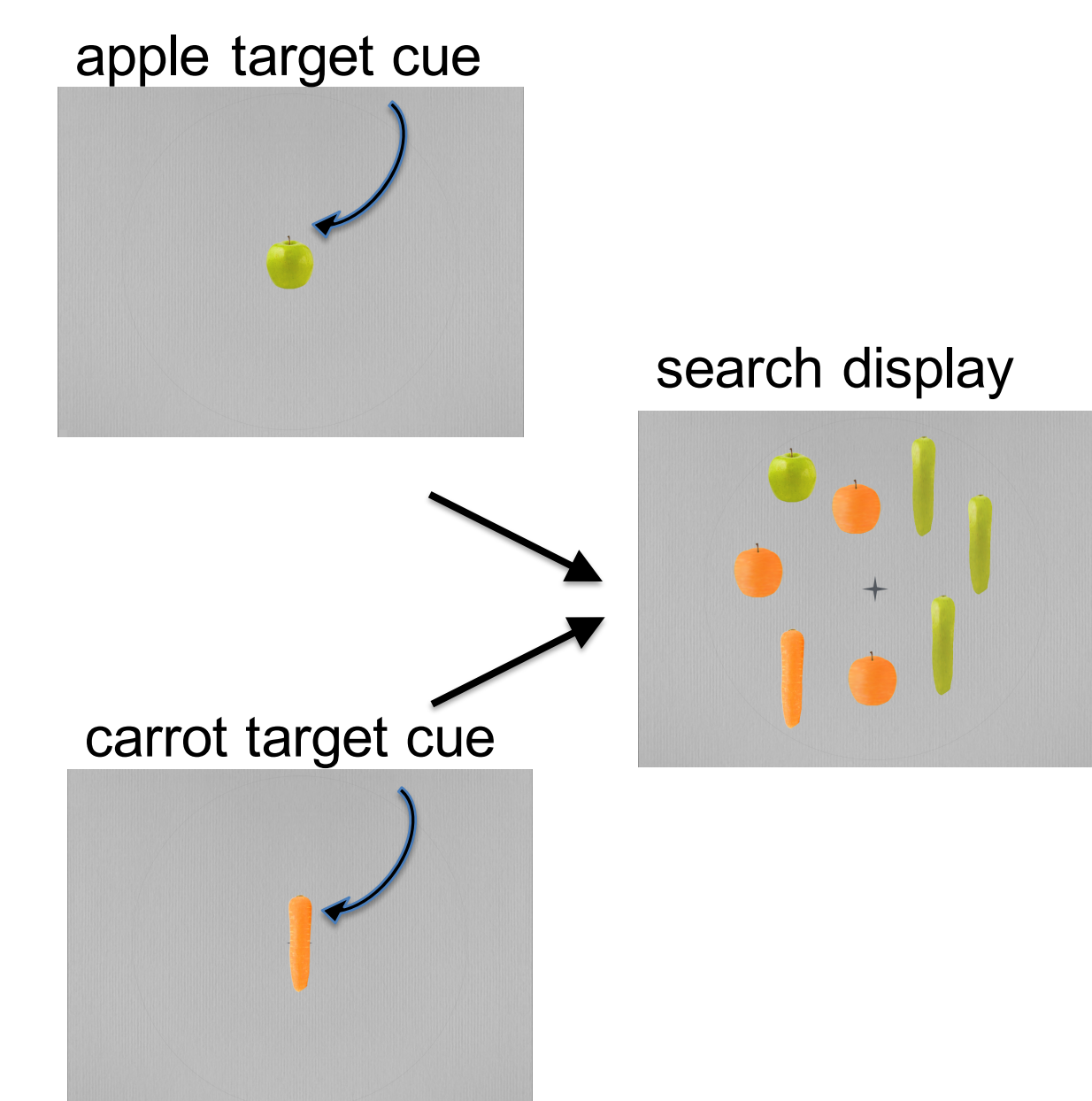
Method

Participants: 38 toddlers (age range: 18-36 months) diagnosed with ASD (mean age: 27.7 months, 2 females) and 45 typically developing toddlers (mean age: 28.1 months, 22 females) participated in this study.

Apparatus: Tobii T120 Eyetracker, sampling at 60 Hz

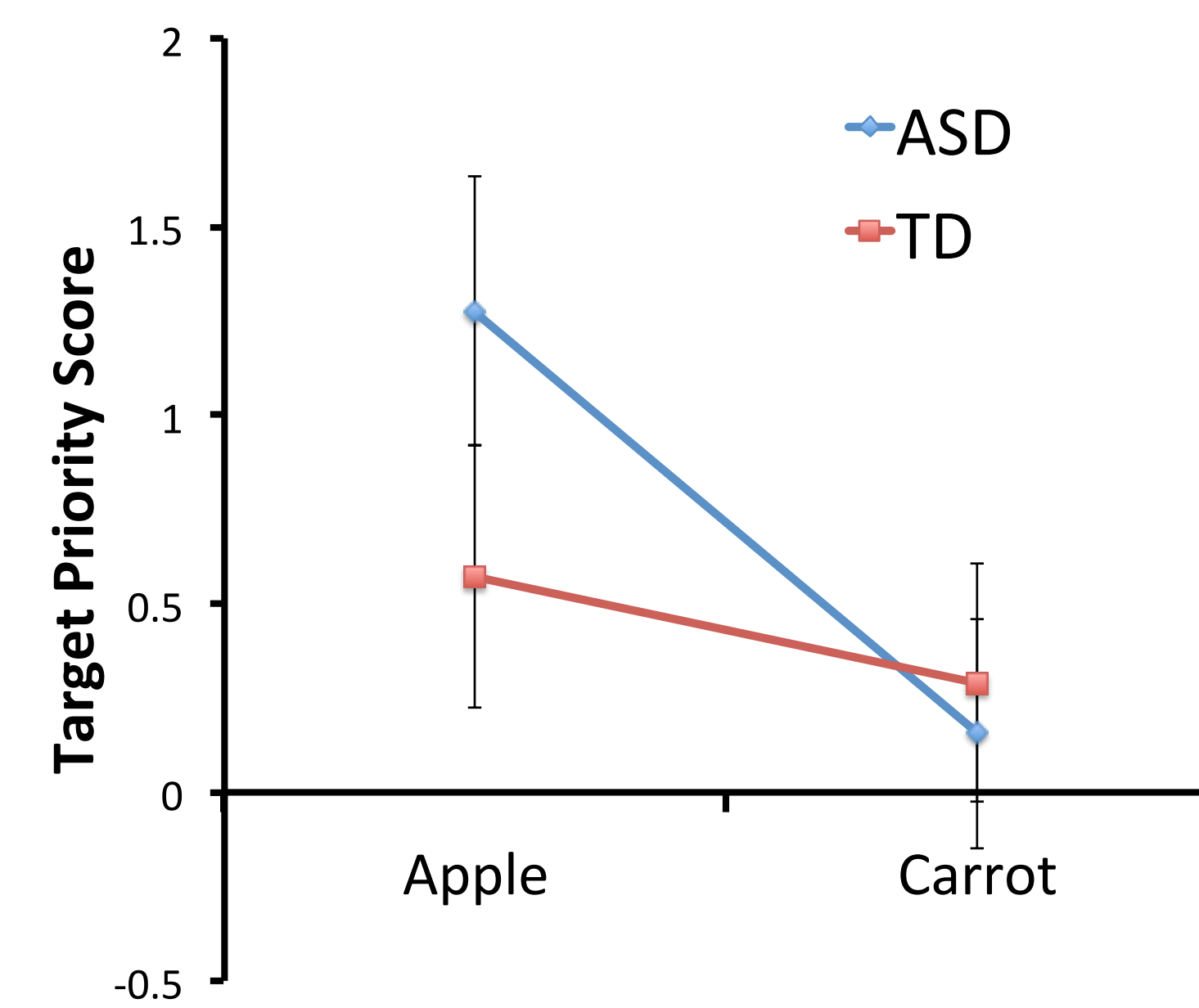
Procedure: Children watched a series of test displays while the Tobii Eyetracker tracked their eye gaze. The original study consisted of three phases, but only Phase 1 (5 trials) was used for the current analysis.

Measures: We calculated a Target Priority Score for each trial: the difference of the rank orders of the Target and the Non-Target during search. (E.g. if the Target was looked at second, and the Non-Target third, then the priority score would be 1.)



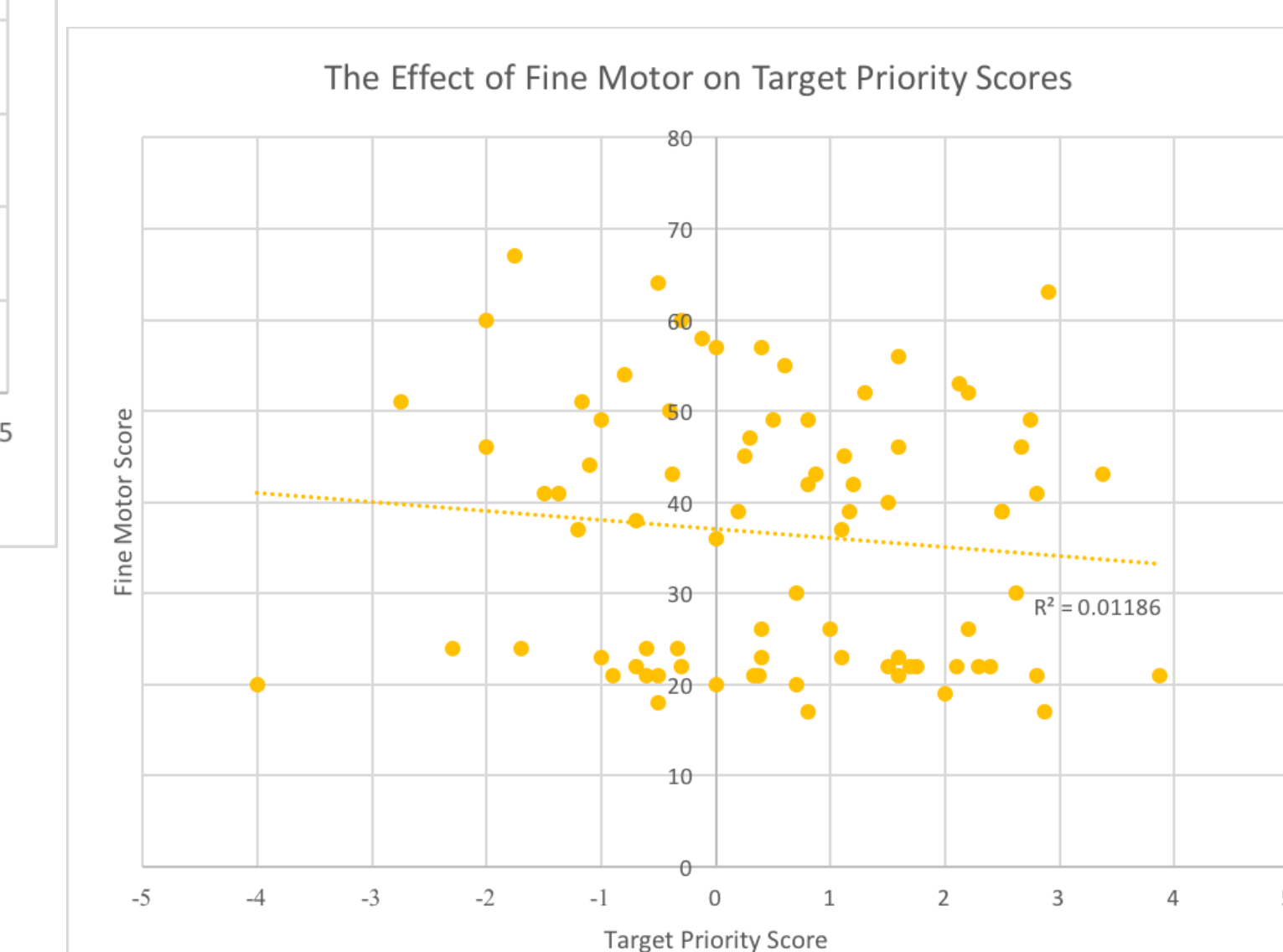
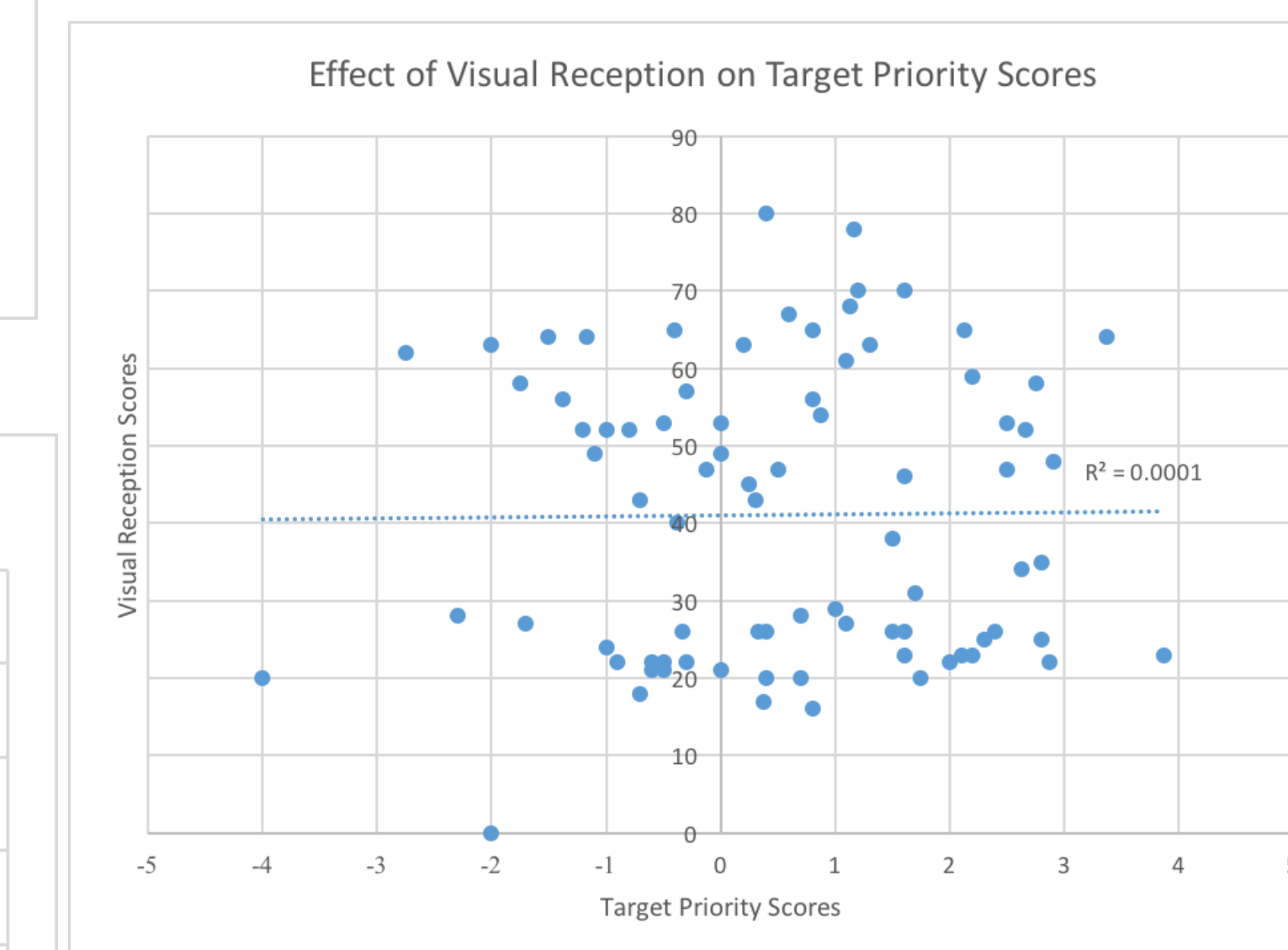
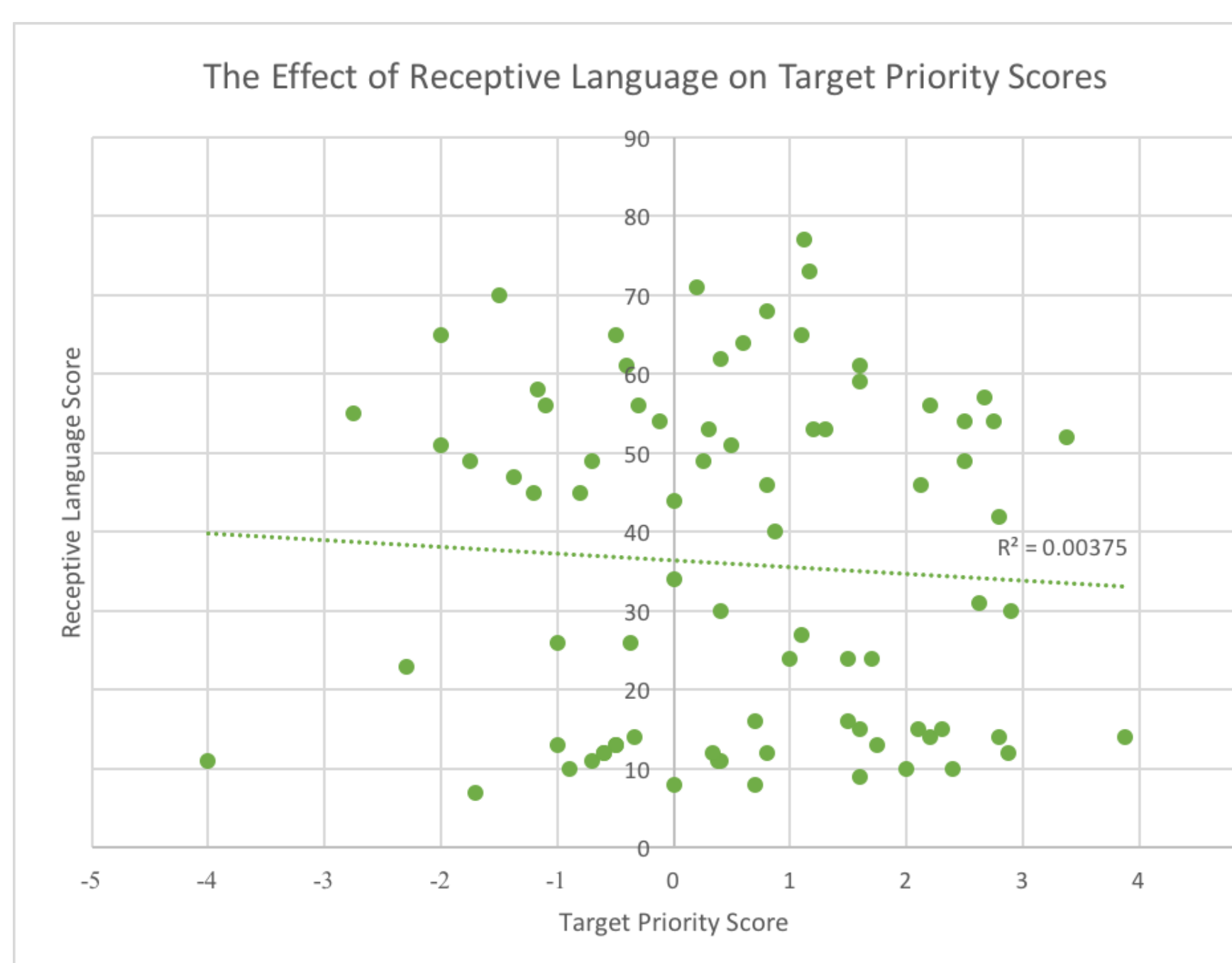
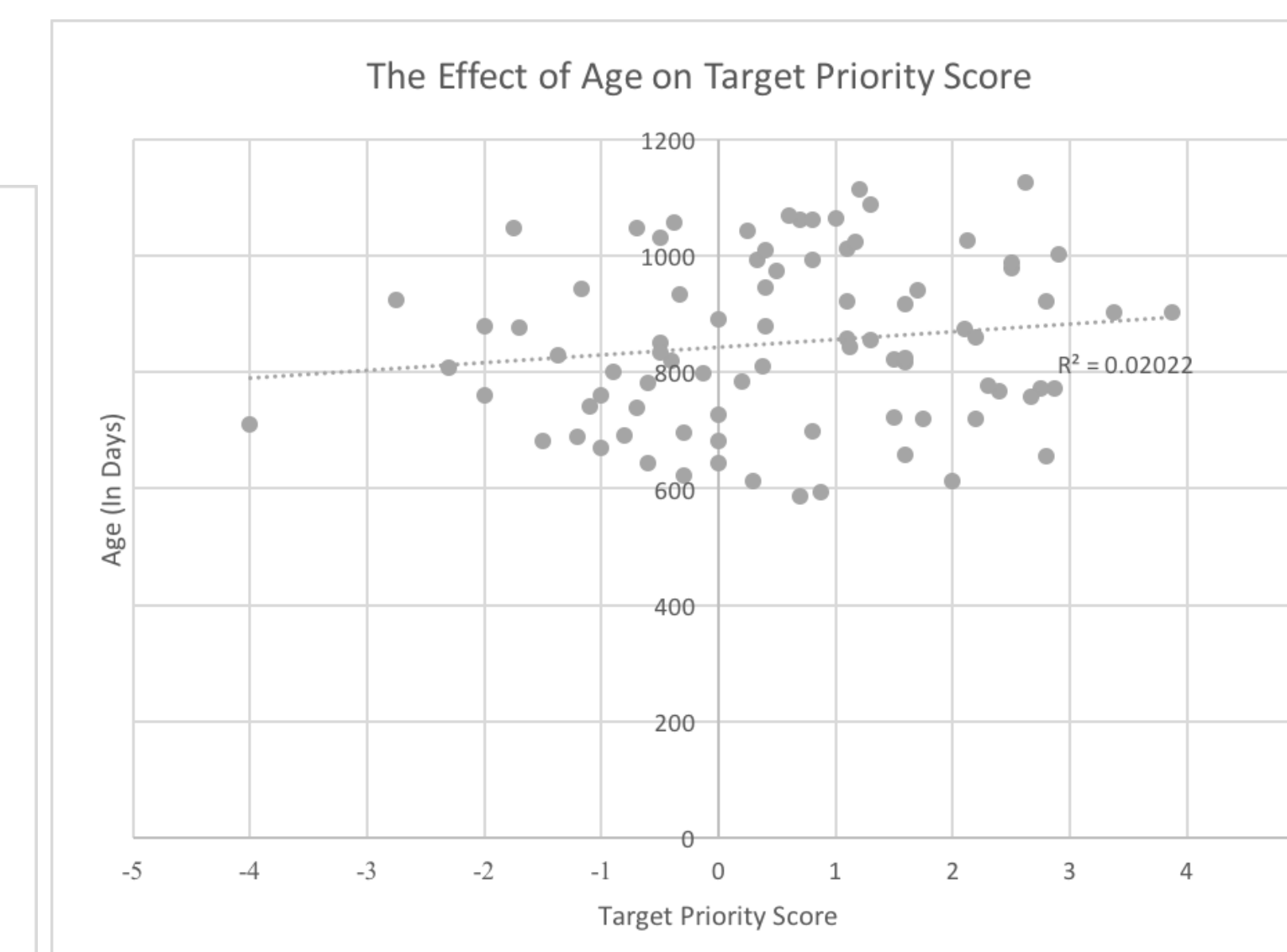
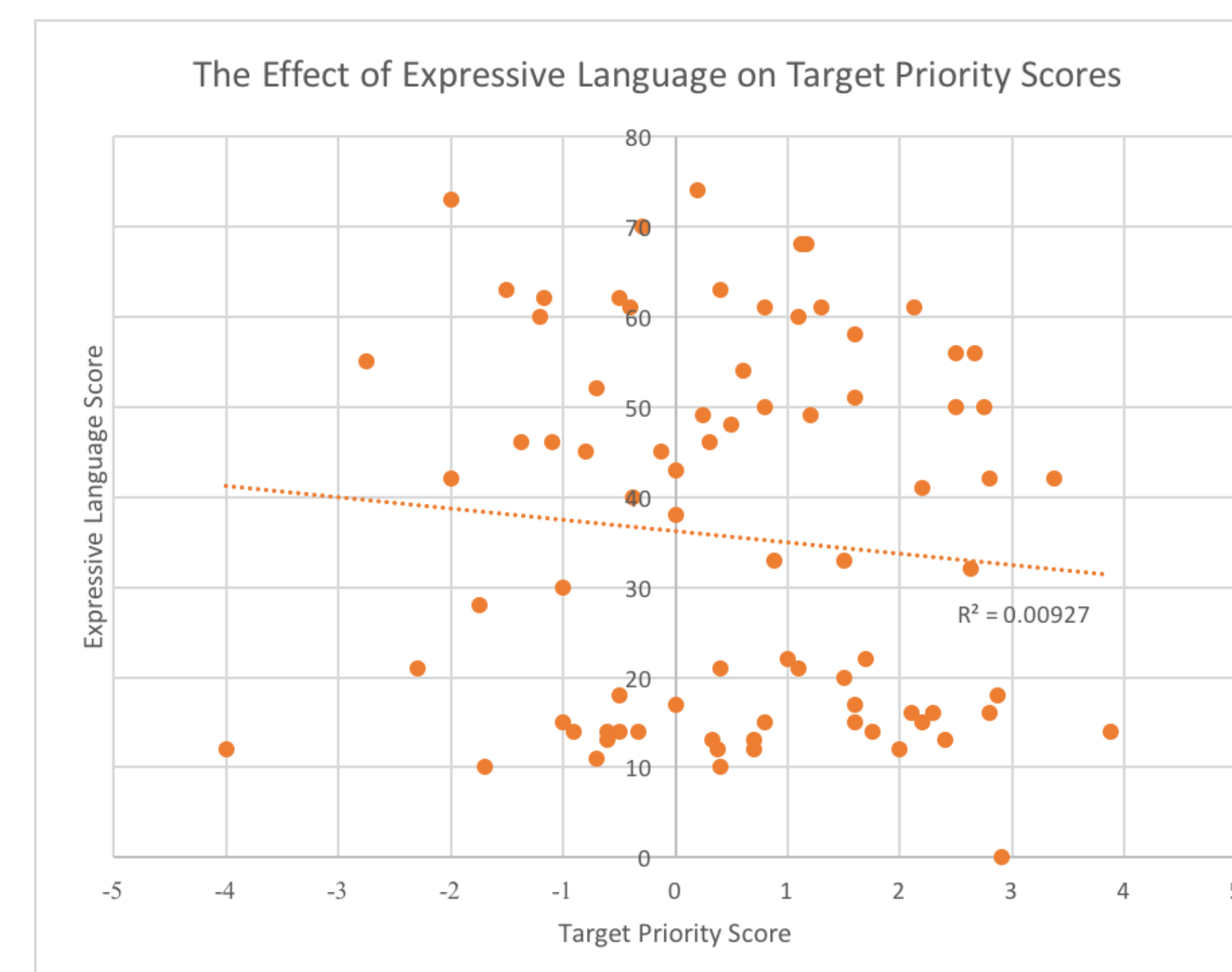
Test trial: The target object flew in before each test trial, spun around and made a honking noise. Then the search display was presented for 4 seconds. After this, the target spun around again and participants heard a clapping sound (reinforcement). In the **Apple** condition the target object was the green apple and the non-target object was the orange carrot. In the **Carrot** condition, the roles were reversed.

Results



The effect of Target identity

The graphs below show the effect of Age on Target Priority Score, followed by the effects of the four different subscales of the Mullen Scales of Early Learning (Receptive Language, Expressive Language, Visual Reception and Fine Motor Skills)



None of the above factors had a significant correlation with Target Priority Scores.

Summary of Results

- There was a significant difference in TPS between the two targets ($p=0.038$): Apples were found sooner during search than carrots, but there was no interaction with Group (ASD/TD) ($p=0.210$). The main effect of Group was not significant ($p=0.391$).

- There was no significant correlation found between Target Priority score and MSEL sub-scores (Expressive Language ($p=0.850$), Receptive Language ($p=0.646$), Fine Motor ($p=0.186$), or Visual Reception ($p=0.905$)).

Conclusions

- There is a statistically significant difference in Target Priority Scores between the two potential targets. Both children with and without ASD searched slower when the target was the carrot.
- Contrary to our hypotheses, neither of the two language sub-scales of the Mullen Scales of Early Learning (Receptive Language and Expressive Language), predicted performance in the task.
- It is possible that the MSEL was too indirect of a tool to measure linguistic knowledge that is relevant here. We speculate that more specific language measures (knowledge of the words *apple* and/or *carrot*) could explain the performance difference between the two targets.

References

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