<div align="center">**Supplementary Material**</div>
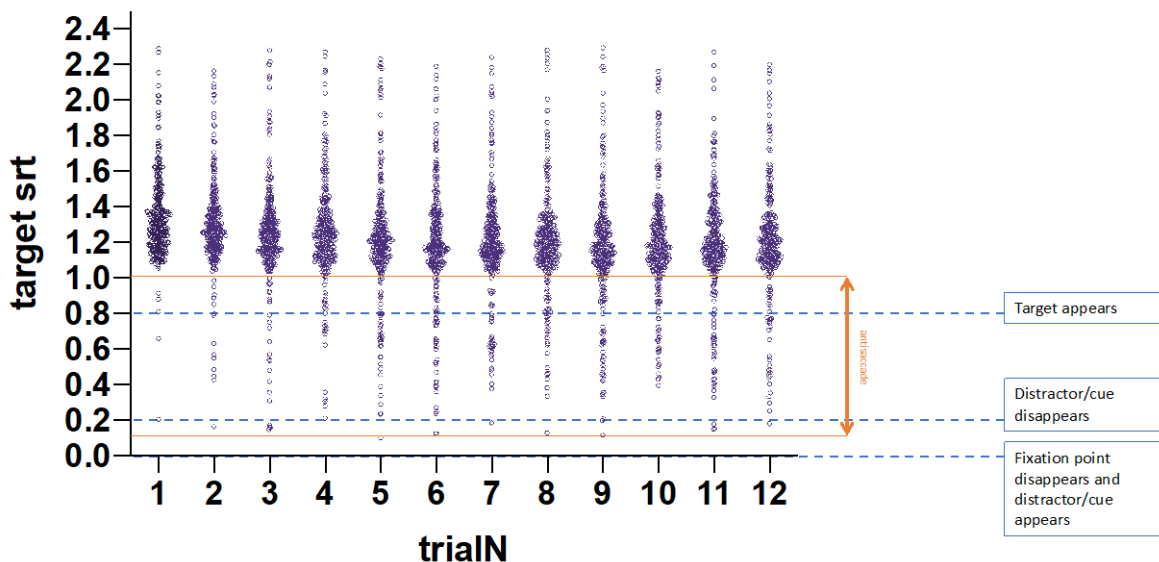
Supplementary Material A:

Reaction time to look at the distractor
The reaction time (RT) to the distractor was entered into a GEE analysis as the dependent variable. There was no significant change in the time taken for children to look at the distractor across trials or block. However, a non-significant group effect was observed across blocks, with the ASD and ID groups becoming faster to look at the distractor across blocks (compared to the comparison group (block x group coef ASD: -0.017, p=0.085 [95% CI -0.04, 0.002]; ID coef -0.021, p=0.056 [95% CI =0.042, 0.001]).

Reaction time to look at the target
All looks to target, whether anticipatory or reactive were included in this analysis. Supplementary Material Figure A shows the reaction time (RT) for children to look at the target across trials. The RT to the target (first: RT without a look to the distractor, second: RT with a look to the distractor) was entered into two separate GEE analyses as the dependent variable. Both GEE models demonstrated a significant reduction in reaction time to look at the target across trials (without a look to the distractor: coef -0.026, p=0.013 [95% CE -0.05, -0.01]; with a look to the distractor coef -0.011, p=0.005 [95% CE -0.02, -0.004]), i.e. children became quicker at looking at the target across the trials. However no block or group effects were observed in either model. As all children became faster at looking towards the target with no group effects being observed, this suggests that all groups learnt to look towards the reward.

Supplementary Figure A: Reaction time to target across trials

Supplementary Material B:

Sensitivity analysis – prosaccade GEE model
A sensitivity analysis was conducted to evaluate changes in prosaccades over the course of the task, but excluding block 4 due to its lack of trial effect. This GEE model yielded similar results to the full model described in the manuscript text, but larger effect sizes were observed. Overall, the clinical groups made a smaller number of prosaccades compared to the comparison group (ASD: coef -2.46,

p<0.001 [95% CI -3.74, -1.18]; ID: coef -2.04, p=0.011 [95% CI -3.61, -0.48]). There was a reduction in the number of prosaccades made across trials (coef -0.281, p<0.001 [95% CI -0.39, -0.17]) and across blocks (coef -0.637, p=0.005 [95% CI -1.08, -0.19]). This decrease across trials was reduced in the clinical groups compared to the comparison group (ASD: 0.266, p<0.001 [95% CI 0.13, 0.40]; ID: coef 0.266, p=0.001 [95% CI 0.10, 0.43]). The reduction in prosaccades across trials was found to be less evident across blocks in the clinical groups compared to the comparison group (ASD: coef -0.121, p<0.001 [95% CI -0.18, -0.06]; ID: coef -0.100, p=0.009 [95% CI -0.18, -0.02]).

Sensitivity analysis – antisaccade GEE model

A sensitivity analysis was conducted to evaluate changes in antisaccades over the course of the task, but excluding block 4 due to the lack of effect found in this block compared to blocks 1-3. Similar results to the full model described in the main Results section were found when excluding block 4: an increase in number of antisaccades made across trials (coef 0.288, p<0.001 [95% CI 0.17, 0.40]) was found; and this increase was smaller in the ASD group compared to the NT group (coef -0.231, p=0.051 [95% CI -0.46, 0.001]).

Supplementary Material C:

SES analysis - Kuppuswamy's Socioeconomic Status Scale
A sub-group analysis was conducted on participants where there was data available to calculate the Kuppuswamy's Socioeconomic Status Scale (see methods). For the participants where this data was collected, 17 participants (100%; but n=15 missing data) in the comparison group were from a lower SES status, compared to 13 (34.21%; n missing=8) in the ASD group, and 10 (47.62%; n missing=5) in the ID group (p=0.001). A GEE analysis was conducted to investigate whether the relationships between prosaccades or antisaccades and trial, blocks and groups were sensitive to the SES status of participants.

No significant main effect of SES (coef -0.860, p=0.097 [95% CI -1.87, 0.15]) and no significant interaction effects on group (coef 0.473, p=0.254 [95% CI -0.34, 1.29]), trial (coef 0.001, p=0.979 [95% CI -0.06, 0.06]) or block (coef 0.074, p=0.602 [95% CI -0.20, 0.35]) were identified for prosaccades.

No significant main effect of SES (coef -0.358, p=0.678 [95% CI -2.05, 1.33]) and no significant interaction effects on group (coef 0.537, p=0.440 [95% CI -0.82, 1.90]), trial (coef 0.011, p=0.834 [95% CI -0.10, 0.12]) or block (coef -0.003, p=0.988 [95% CI -0.422, 0.42]) were identified for antisaccades.

SES analysis – maternal education
A GEE analysis was conducted to investigate whether the relationships between prosaccades or antisaccades and trial, blocks and groups were sensitive to the maternal education (as a proxy measure of SES) of participants.

No significant main effect of maternal education (coef -0.142, p=0.521 [95% CI -0.58, 0.29]) and no significant interaction effects on group (ASD: coef 0.277, p=0.173 [95% CI -0.12, 0.68]; ID: coeff 0.066, p=0.756 [95% CI -0.35, 0.48]), trial (coef -0.002, p=0.886 [95% CI -0.02, 0.02]) or block (coef -0.036, p=0.454 [95% CI -0.13, 0.06]) were identified for prosaccades.

No significant main effect of maternal education (coef 0.183, p=0.584 [95% CI -0.47, 0.84]) and no significant interaction effects on group (ASD: coef -0.425, p=0.103 [95% CI -0.94, 0.09]; ID: coeff

0.225, p=0.381 [95% CI -0.28, 0.73]), trial (coef 0.011, p=0.522 [95% CI -0.02, 0.05]) or block (coef -0.081, p=0.286 [95% CI -0.23, 0.07]) were identified for antisaccades.

Supplementary Material D:

Relationship between antisaccades and prosaccades
Because an inverse pattern of change in the number of prosaccades and antisaccades, across trials and blocks, was observed, we sought to explore the relationship between antisaccades and prosaccades and found a moderate significant negative correlation between the two variables (Pearsons r=-0.3788; p<0.001).