A Supplementary Information

A.1 Assessment of global processing quality

In Figure S1 we illustrate the partitioning of a sample image into five regions. From the verbal descriptions given by the participants of Expt2, each item in the scene was coded and identified. The number of regions which were not mentioned by the participant was recorded and used as a proxy for the quality of global processing.

A.2 Illustrative Example - Change in exploration rate amongst ASD adolescents

Figure S2 presents the mean area and scanpath evolution for a single stimulus. The path lengths increase at a fairly constant rate for both groups throughout the experiment. However, in keeping with the findings of our linear model, the rate of increase in hull area for the ASD group undergoes a change around 2500ms. At this point the ASD individuals appear to slow new exploration and fixate on points already within their convex hull. Since a similar change is not seen in scanpath length, this indicates the start of a tendency to return to/remain in previously viewed areas.

A.3 Analysis by Stimuli Type

To evidence that our results were not only found on a single type of stimulus, analysis was repeated on only those images without a centrally prominent face. Plots of the extra distance travelled, area explored and rate of new fixations with viewing time for these scenes are shown in Figure S3. The overall findings agree with the analysis of the full image set in both direction and magnitude — a consistently reduced hull area for ASD individuals (showing pointwise signficance beyond about 3000ms) which is not explained by a difference in the rate of new fixations. This suggests robustness to stimuli type. Interestingly however, differences in scanpath length between the two groups are reduced. Figure S4 plots the lagged distance (perseveration measure) and scanpath scaled distance (reversion measure). Again results agree with analysis of the complete stimuli set. Even on images without a centrally prominent face, ASD individuals are expected to be viewing a location significantly closer to the current fixation location at future times τ. There is however less evidence of a tendency to revert to previous fixations having moved away.

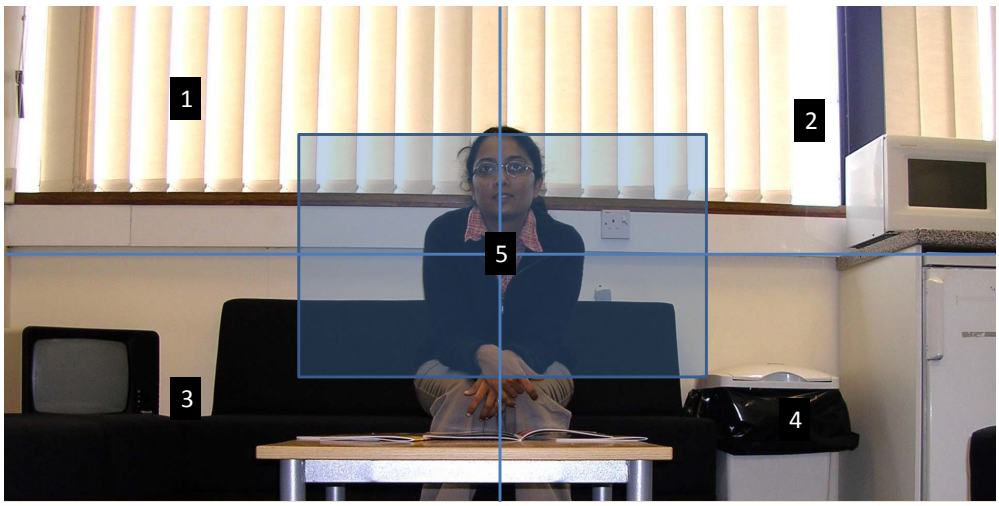
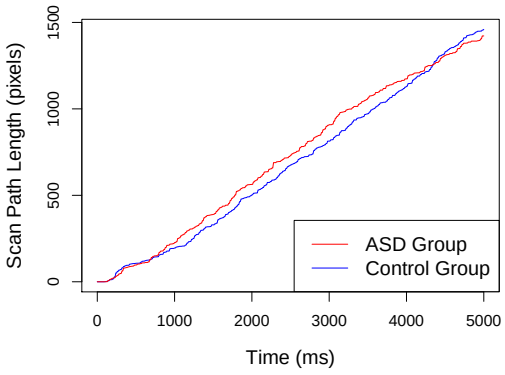


Figure S1: Partitioning of a sample image into five disjoint regions to assess spread of the verbal description data. Each item in the image was allocated to the most representative region. For this particular image, items were coded to the following regions: Area 1: window, blinds, Area 2:microwave, worktop, kitchen surface Area 3: TV, magazine, desk, books, grey trousers Area 4: bin, fridge Area 5: woman, girl, glasses, black cardigan, plug socket, she, person

A.4 Size of random effects

Figure S5 shows histograms, stratified into ASD and TD groups, of the estimated random effects for individuals in both hull area and scanpath length after 5000ms stratified. They represent the range of individual variation in exploration rate, shown consistently across the images and in addition to the fixd ASD effect, within both groups i.e. the random effects for the ASD individuals relate to only their variation in exploration relative to other ASD individuals and likewise for the TD individuals. To allow some idea of their relative sizes, the plots legends show the area/path length that an average ASD/TD individual would have at this time.

As can be seen, there is considerable support for variation in individual exploration rates exhibited consistently across images within the groups. A fast/slow explorer can consistently explore a hull area of 10,000-20,000 more/fewer pixels^2 than the average for their group. Similarly, within each group, individuals can have a consistent scanpath length of up to 500 pixels longer/shorter than the group average across the images. We also note that one individual in the ASD group appears to have explored very little, as shown by the single large negative random effects for both area and scanpath length. Our earlier results on ASD/TD group differences are robust to this one individual since, as we see, their reduced exploration has been accounted for by their large personalised λ_i random effects within our model and hence not the *between group* parameter α of primary interest.



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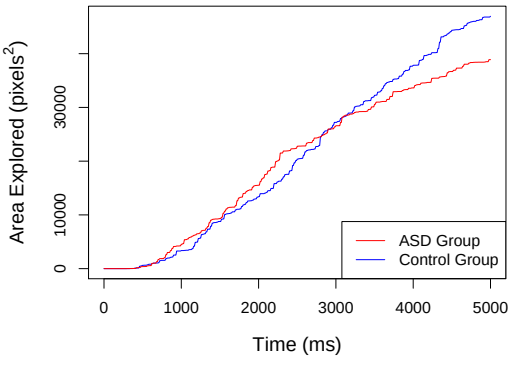

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Figure S2: A sample illustration of the mean area viewed and scanpath length.

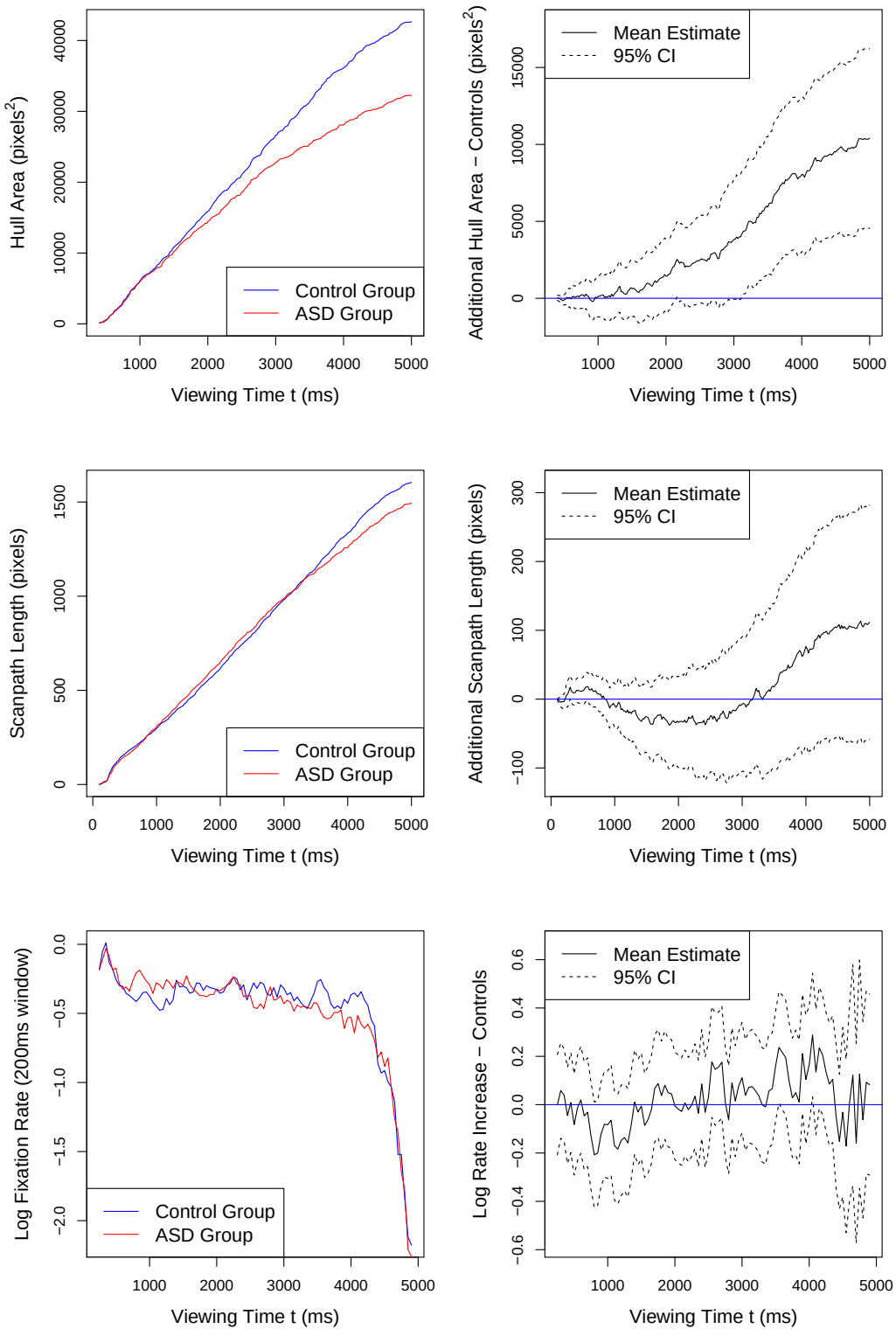

Figure S3: *Linear model results for evolution of area, scanpath distance and fixation rate using only those images without a prominent centrally positioned face. The left hand plots show the estimates for each group. The right hands plots show $\alpha(t)$ — the additional area, distance and rate of the TD group compared to the ASD group — together with their pointwise 95% confidence intervals. Positive values of $\alpha(t)$ indicate that the TD group have a larger hull area/scanpath length/fixation rate respectively.*

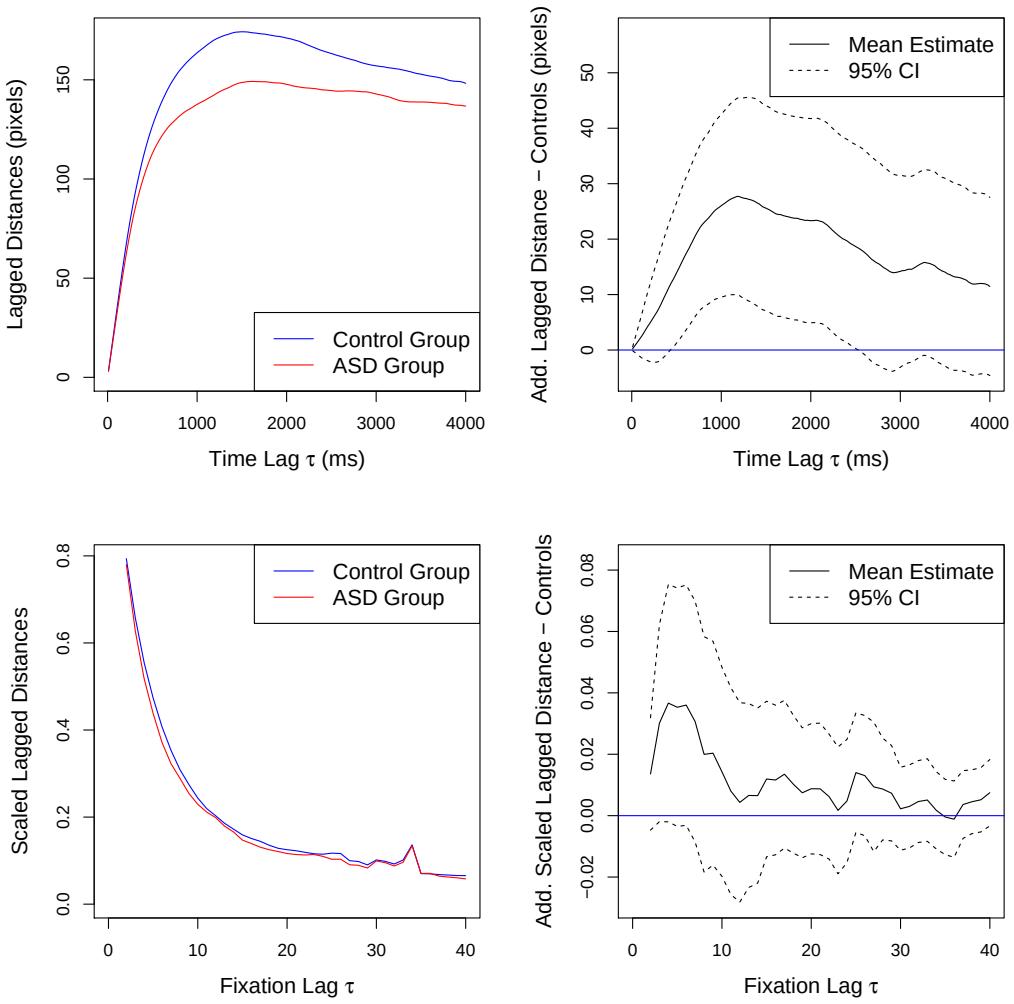

Figure S4: *Linear model results for lagged distance (persistence) and scanpath scaled distance (reversion) using only those images without a prominent centrally positioned face. The left plots show the mean for each group. The right hands plots show, for each measure, the additional distance as a function of lag τ within the TD group compared to the ASD group, again with pointwise 95% confidence intervals. Positive values indicate greater persistence/reversion amongst the ASD group.*

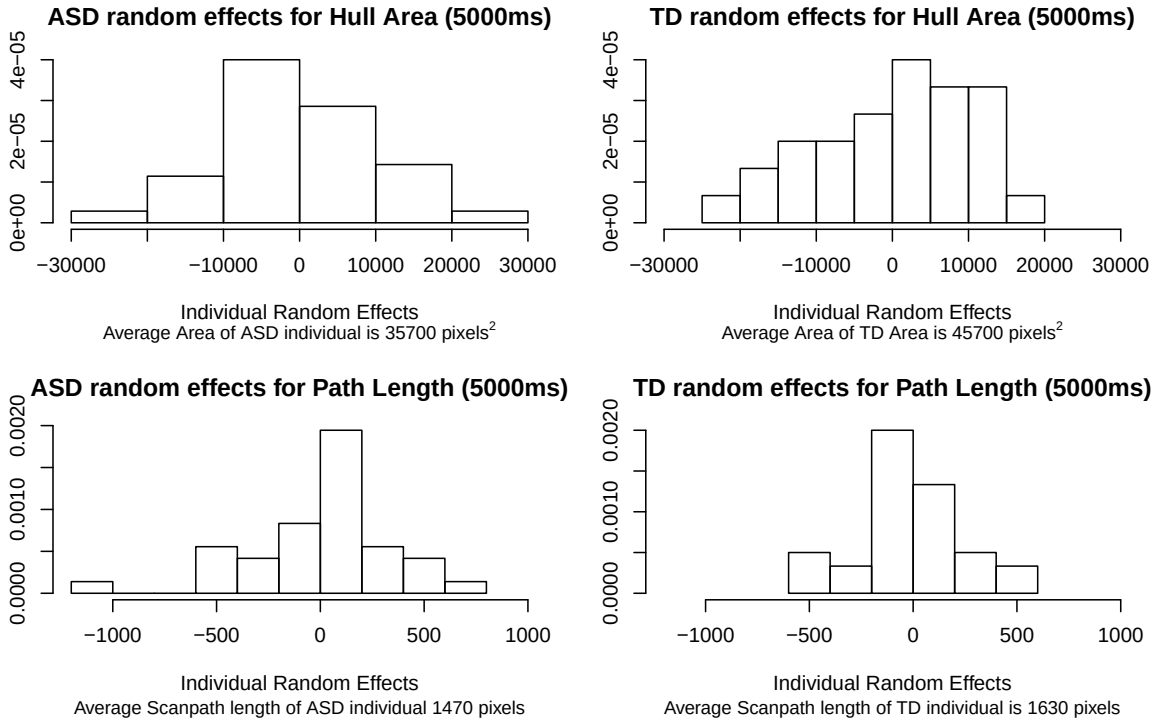

Figure S5: *Histograms of estimated random effect terms for each individual for the area explored and scanpath length at 5000ms. These can be contrasted with the expected values for a TD/ASD individual at this time.*