Novel eye tracking tasks assess emotional processing in individuals with behavioural variant frontotemporal dementia

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INTRODUCTION

Current tasks measuring social cognition have a number of problems when assessing individuals with behavioural variant frontotemporal dementia (bvFTD). They typically have complex test instructions and require a significant amount of conversation to complete the tasks.

METHODS

18 bvFTD and 21 Controls completed two instructionless novel emotion processing (EP) eye tracking tasks, specifically designed to overcome these issues. The Reading the Mind in the Eyes Test (RMET) was modified to assess complex EP. Four RMET images were places in the corners of a computer screen for 10 seconds, and these were replaced by an emotional word for two seconds, the the images reappeared alongside the word for five seconds. Items from the NimStim Face Stimulus Set were also used to create a similar task for simple EP. An Eyelink 1000 Plus eye tracker was used and participants basic oculomotor functions were assess. A dwell time difference score was calculated for each image using the time before and after the emotional label appeared.
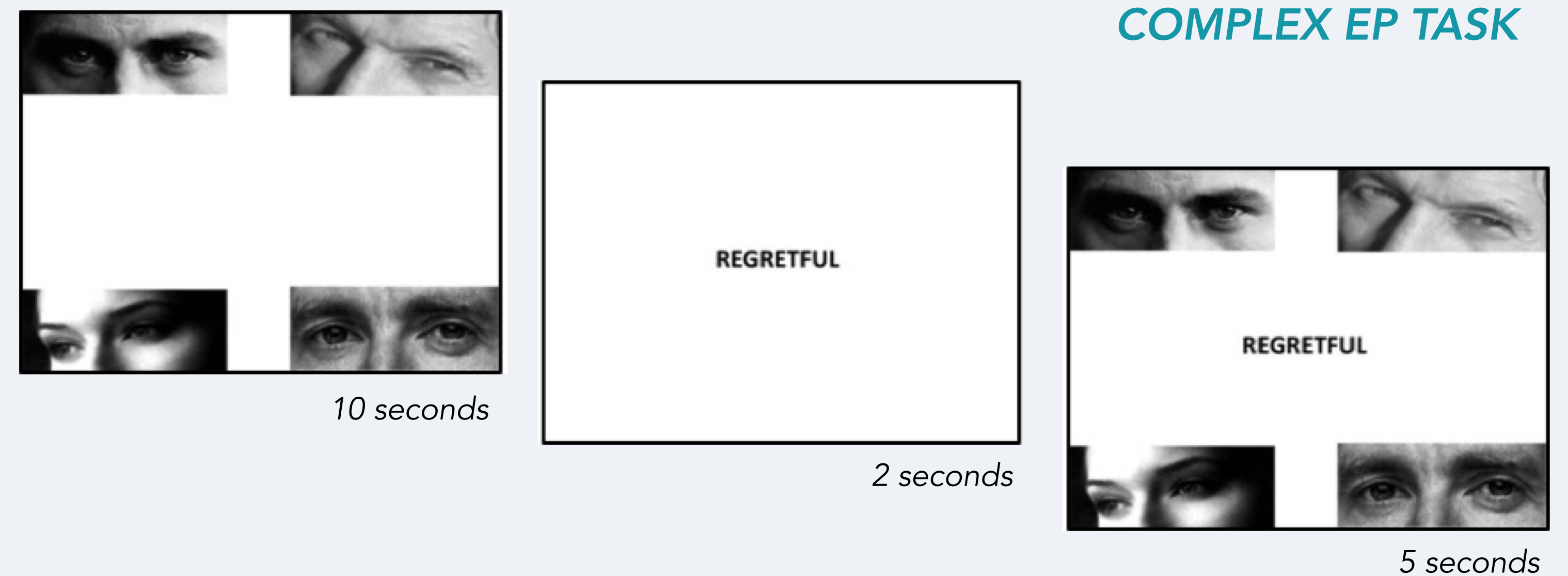
COMPLEX EP TASK

Figure 1: Displays an example of the stimuli seen in the complex emotion processing task.
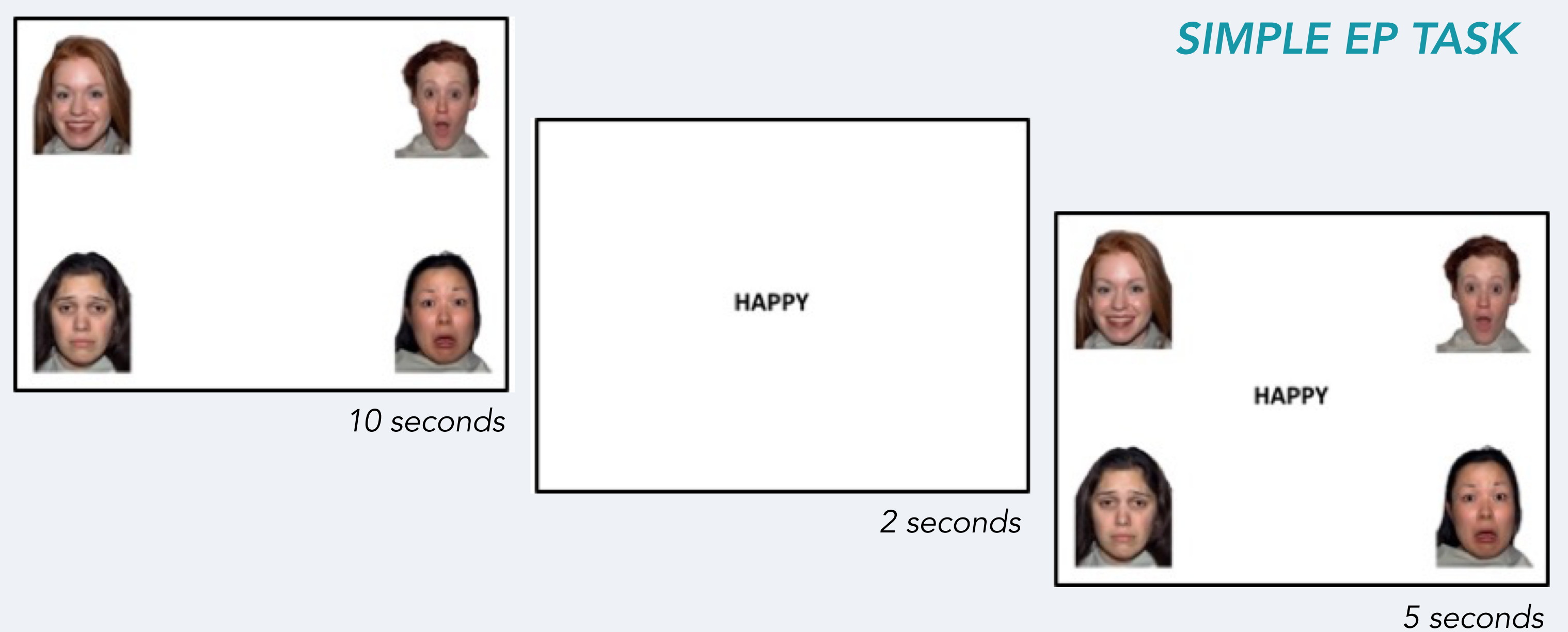
SIMPLE EP TASK

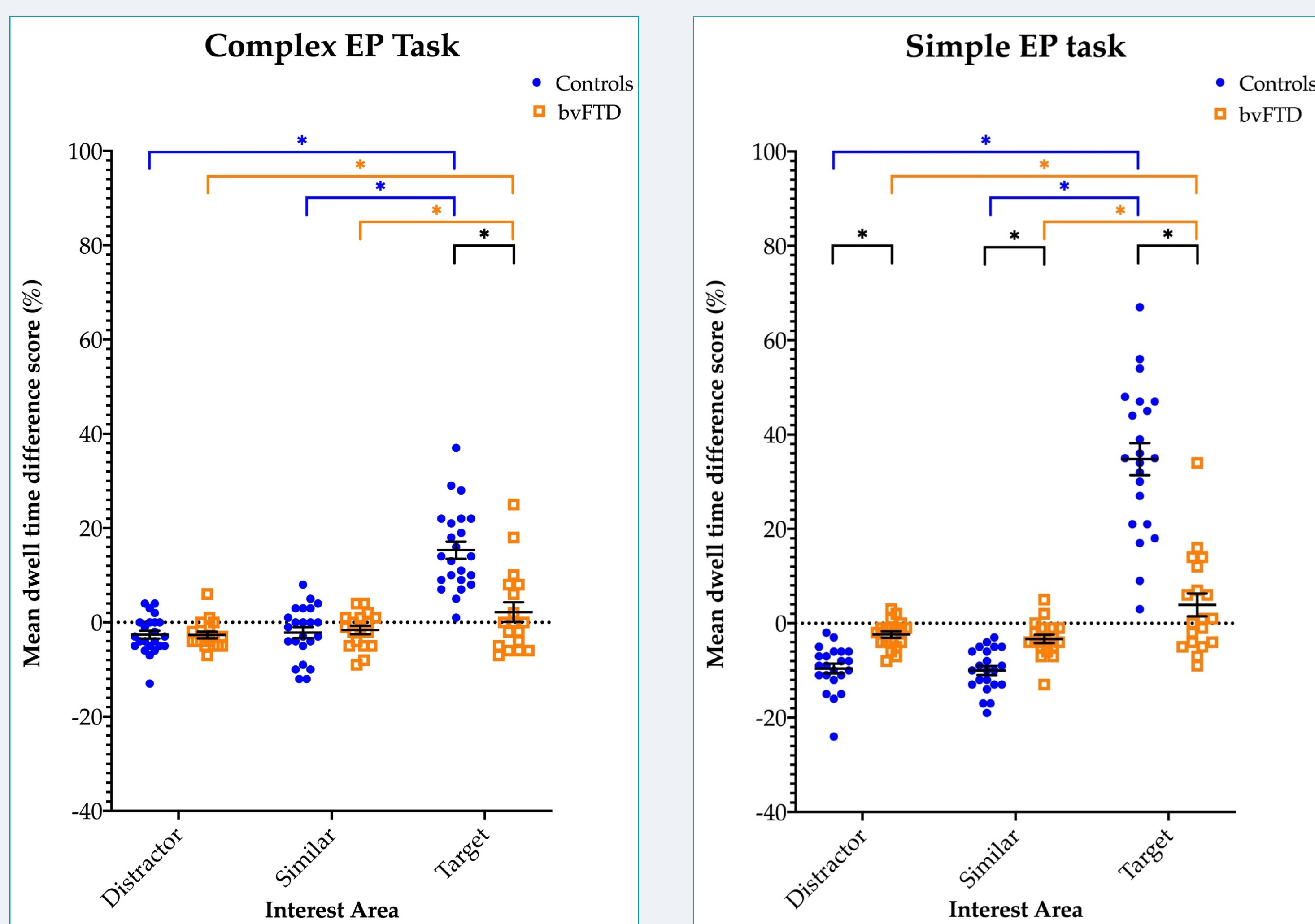*Figure 2: Displays an example of the stimuli seen in the simple emotion processing task.*

Figure 3: The graph on the left displays performance on the complex emotion processing task whilst the graph on the right shows performance on the simple task. The blue significance bars relate to within control group differences, the orange relate to within bvFTD group differences, and the black relate to differences between the groups.

RESULTS

Using a mixed effects model, the bvFTD group performed significantly worse than controls on the target image (Complex: Controls = 15%, bvFTD = 2%; Simple: Controls = 35%, bvFTD = 5%; $p < 0.001$ on both tasks). The target image was looked at significantly more than the distractor images, for each group, on the two tasks and this was not due to oculomotor problems. When looking at the valence of the simple emotions, those with bvFTD performed significantly worse than controls on both positive and negative emotions ($p < 0.001$). Across the individual simple emotions in the control group, fear was processed significantly worse than all other emotions; this pattern was not seen in the bvFTD group. However, the bvFTD group did perform significantly worse than controls across all emotions.

CONCLUSIONS

These novel tasks demonstrate that eye tracking is a viable tool to assess EP in bvFTD, allowing for a quantitative analysis whilst minimizing the test instructions. This suggests that other domains may also be tested using eye tracking, allowing the development of a range of tasks to quantitatively assess cognitive abilities in FTD.
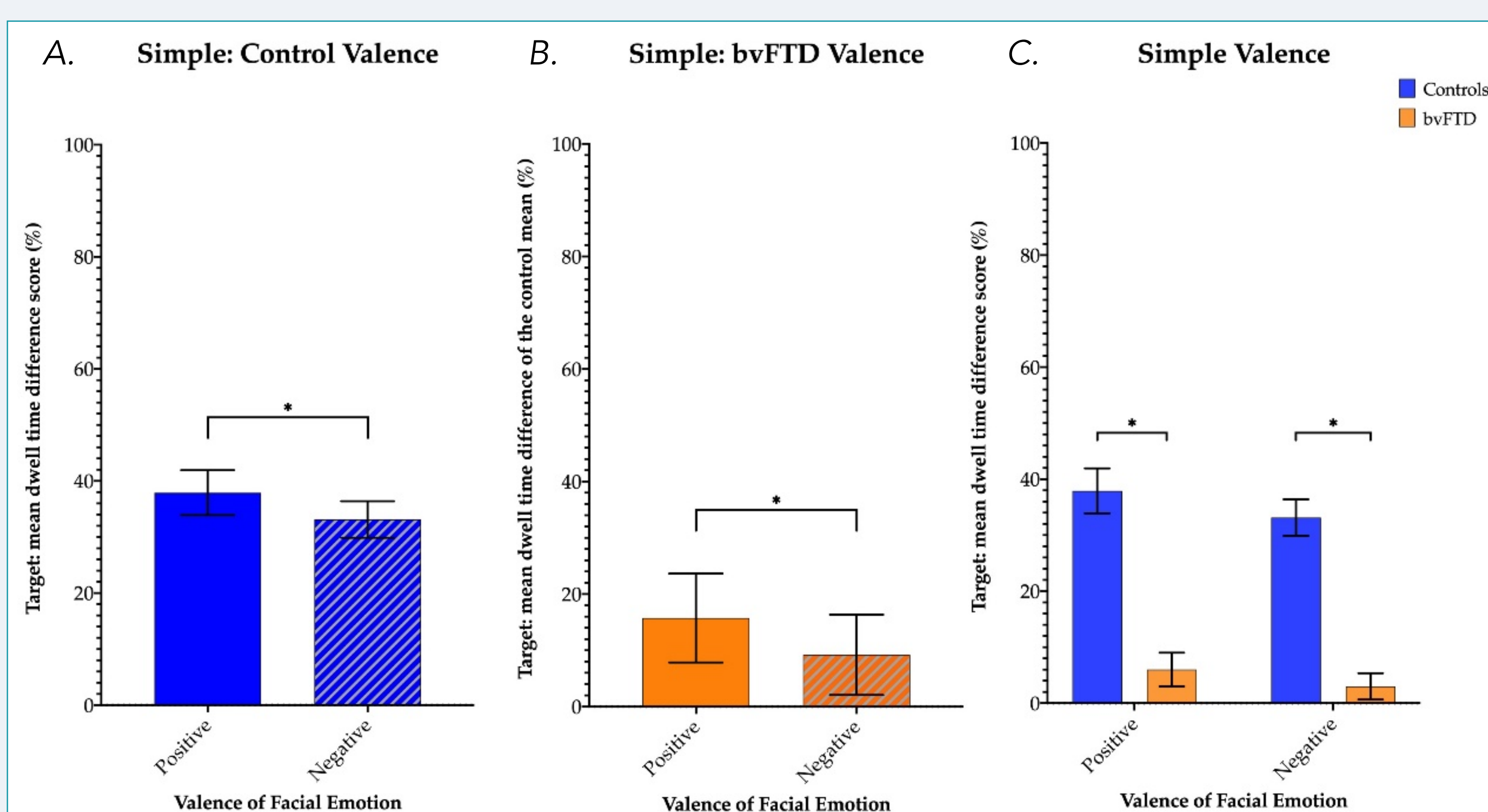

Figure 4: Performance on the positive vs negative emotions from the simple task. A: control performance; B: bvFTD performance as expressed as a percentage of the controls; C: Group differences.
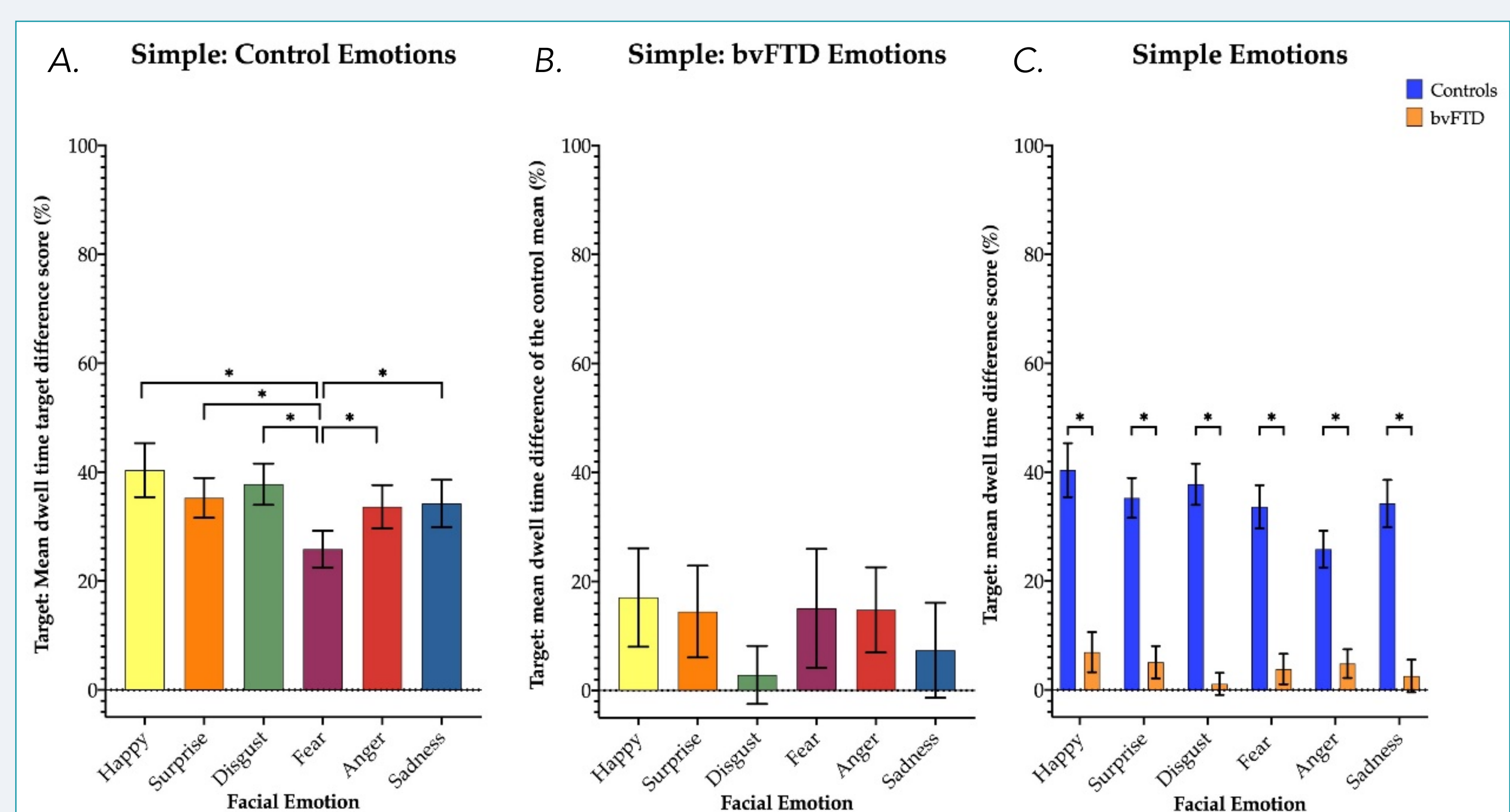

Figure 4: Displays performance on each individual emotion on the simple task. A: control performance; B: bvFTD performance as expressed as a percentage of the controls; C: Group differences.

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