A portable eye tracking experiment for the assessment of cognitive impairment in presymptomatic FTD

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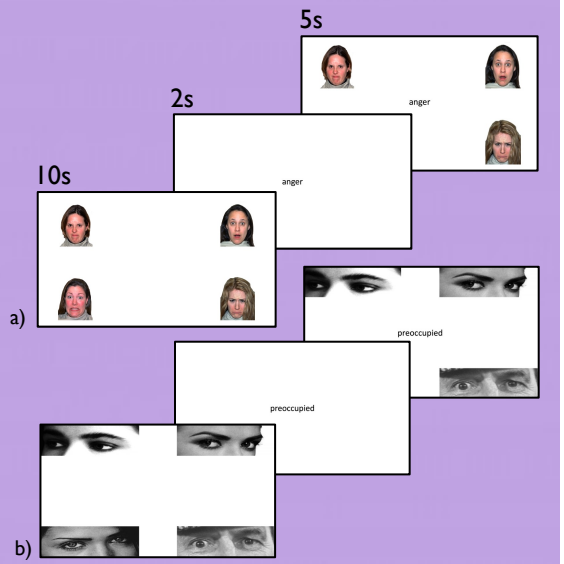

Figure 1. Examples of the stimuli for the a) simple and b) complex emotion recognition tasks used in the portable eye tracking experiment. The four emotion images are first displayed for 10 seconds, followed by an emotion word for 2 seconds, and then the images and the word together for a further 5 seconds.

Presymptomatic FTD mutation carriers perform worse on eye tracking tasks of social cognition.

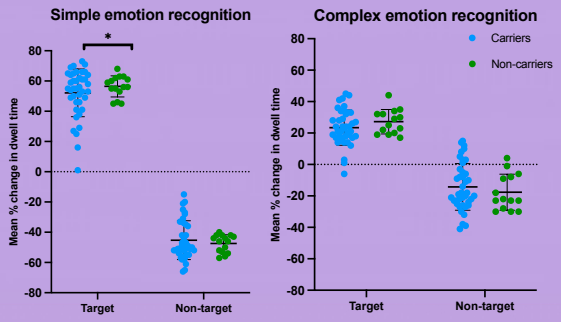

Figure 2. Results from the portable eye tracking experiment between presymptomatic mutation carriers and non-carriers. *p<0.05.

Background

Eye tracking experiments produce objective data concerning cognitive processes and could be useful for detecting presymptomatic impairment in frontotemporal dementia (FTD). However, most systems are expensive, and require experiments to be conducted in artificial settings. We developed a fully portable eye tracking protocol using the Tobii Pro Nano, a small low-cost eye tracker, to be used as a home monitoring tool in clinical trials. The aim was to investigate if the portable experiment could detect presymptomatic impairment in FTD using social cognition tasks.

Methods

Participants were recruited from the Genetic FTD Initiative (GENFI), including presymptomatic mutation carriers and first-degree relatives without a mutation (non-carriers). Participants completed tasks of simple and complex emotion recognition, first viewing four emotion faces (simple) or eyes (complex), followed by an emotion word, and then the original four images alongside the word (Figure 1). The aim of the task is to look at the correct image (target) that matches the word.

	N	Age (y)	Education (y)	Sex (% male)
Carriers	41	43.0 (11.0)	15.9 (3.57)	46.3
Non-carriers	14	40.4 (7.14)	17.5 (2.62)	57.1

Table 1. Demographic characteristics of the participants. y=years.

Methods continued

A dwell time change score was calculated by subtracting the percentage dwell time for the images before the word appeared from the percentage dwell time after the word appeared. Linear mixed effects models were used to compare performance on the tests, with the dwell time change score included as the variable of interest and age, target type (target, non-target), and genetic status (carrier, non-carrier) included in the model.

Results

Presymptomatic mutation carriers were less able to correctly identify the target emotion, looking at the target image 4.3% less after the word appeared on the simple task (p=0.025) and 3.9% less on the complex task (p=0.076) compared to non-carriers (Figure 2).

Test	Carriers	Non-carriers	Mean diff	CIs
Simple	52.2 (15.8)	56.5 (7.01)	4.27	-7.37 – -1.08
Complex	23.4 (11.2)	27.3 (7.73)	3.89	-8.18 – 0.41

Table 2. Average mean percentage dwell time change scores (SD) for the target image for carriers and non-carriers on the tasks. Mean diff=adjusted mean difference output from the models. CI=95% confidence intervals.

Conclusion

These eye tracking tasks may be a useful tool for assessing social cognition deficits in presymptomatic FTD, with evidence that carriers are impaired at recognising simple emotions. Therefore, this portable eye tracking experiment has the potential to be a low-cost biomarker for monitoring the progression of FTD in clinical trials, both at home and in the clinic.