Early Detection of Frontotemporal dementia (EDoF) – a digital biomarker study

Rhian S. Convery[1], Lucy L. Russell[1], Martina Bocchetta[1], Jonathan D. Rohrer[1]

[1]Dementia Research Centre, Department of Neurodegenerative Disease, UCL Queen Square Institute of Neurology, University College London, London, United Kingdom

BACKGROUND

With the commencement of clinical trials in frontotemporal dementia (FTD), robust biomarkers that can detect the earliest signs of the disease and also measure treatment effect, are essential. The ubiquitous use of digital devices allows for more frequent, often continuous, assessment from home, whilst producing a wealth of objective data. The Early Detection of Frontotemporal dementia (EDoF) study aims to develop a series of digital measures that may be useful for the diagnosis of FTD and for outcome measures in trials.

METHODS

The EDoF study includes: a computerised cognitive battery, a mobile eye tracking device, a novel app that passively measures cognitive function by monitoring smartphone metadata, speech and language analysis using machine learning algorithms, actigraphy, and gait analysis (Figure 1). These measures are being validated in a large control population before being tested in symptomatic and presymptomatic genetic FTD within the Genetic FTD Initiative (GENFI) study.

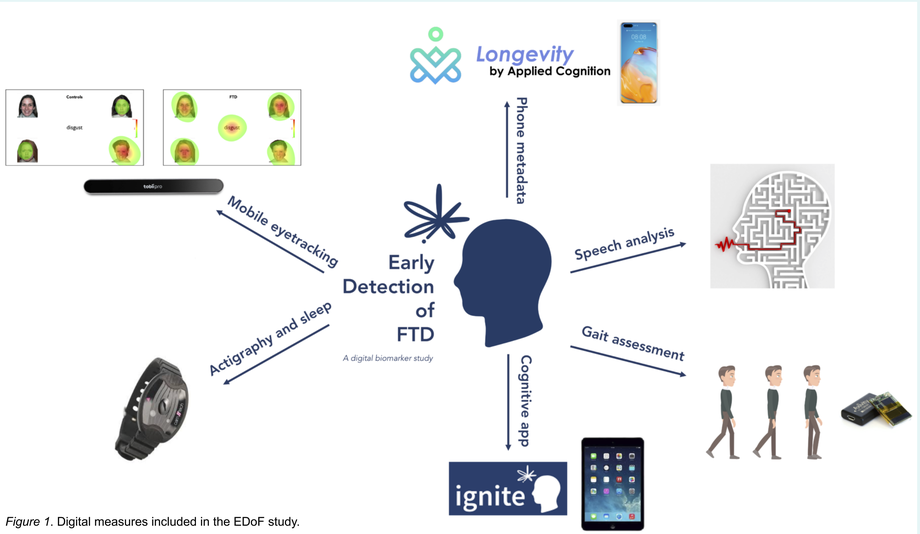

Figure 1. Digital measures included in the EDoF study.

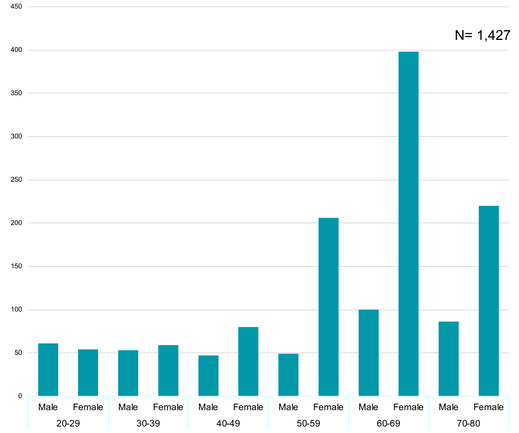

Figure 2. The number of healthy controls that have completed the computerised cognitive battery ("Ignite") by age and gender.

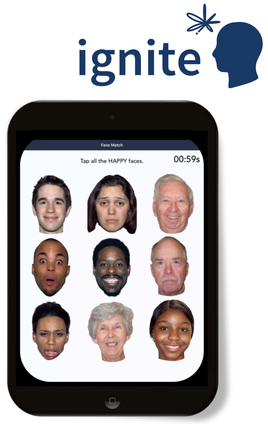

Figure 3. Face Match. A computerised test of social cognition included in the Ignite battery. Participants are required to select the emotional faces that match the word.

RESULTS

We are currently recruiting participants to the initial arms of the study, with over 1,400 healthy controls having already completed Ignite, the computerised cognitive battery (Figure 2). The battery includes tests heavily weighted on executive function and social cognition, including a computerised emotion recognition task (Figure 3). We have also started recruitment for the Longevity study, where individuals download an app that collects smartphone metadata, which will be analysed to generate digital biomarkers of cognitive function.

The mobile eye tracking device uses instructionless tasks to measure eye movement abnormalities, social cognition, and executive function. Pilot data from a spatial anticipation task[1,2] (Figure 4) shows patients with bvFTD make fewer correct anticipatory eye movements towards the location of a forthcoming target in a sequence, when the pattern has clearly emerged (p=0.01) (Figure 5).

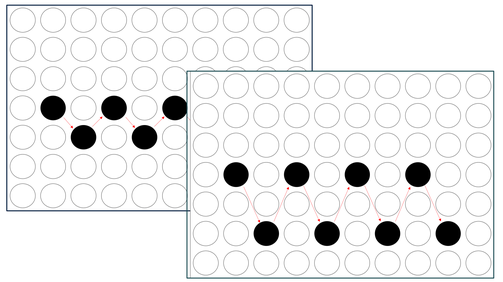

Figure 4. The spatial anticipation eye tracking task. The bold circles are presented one at a time for 500ms in a 10x7 matrix and move across the matrix following a designated pattern. The bold circle appears on either the left or right side of the matrix before moving across seven spatial positions. Arrows indicate the direction of movement.

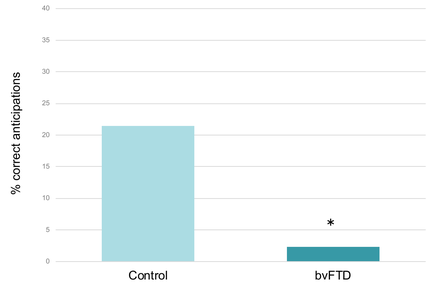

Figure 5. Percentage of correct anticipations towards the forthcoming target in a sequence. Only data from the last part of the sequence, when the pattern has been established, is included. A Mann-Whitney *U* was used to test for differences between groups. The asterisks (*) represents a significant difference.

CONCLUSION

EDoF is the first study aiming to use a comprehensive set of digital measures to detect early FTD. Pilot data reveals impairments in bvFTD in an instructionless test of executive function. Therefore, mobile eye tracking, as well as other digital measures in EDoF, may prove useful for home monitoring within future therapeutic trials of FTD.

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References

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