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Increasing our understanding of emotion recognition impairment among frontotemporal dementias

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Commentary on "Error profiles of facial emotion recognition in frontotemporal dementia and Alzheimer's disease" by Gressie *et al.*

Frontotemporal dementia (FTD) is a heterogeneous group of dementias featuring progressive frontal and/or temporal deterioration resulting in declining cognitive processes such as executive function, social cognition, and language abilities (Bang et al., 2015). Under the umbrella term of FTD, there are three subtypes: behavioural variant frontotemporal dementia (bvFTD) characterised by behavioural change and deteriorating executive function and social cognition (Rascovsky et al., 2011); non-fluent variant primary progressive aphasia (nfvPPA, or PNFA) which presents with agrammatism in production and effortful and halting speech (Grossman, 2012; Neary et al., 1998); and semantic-variant primary progressive aphasia (svPPA, also called SD), typically characterised by semantic loss of word and conceptual knowledge. About 30% of svPPA have greater temporal lobe atrophy on the right (hereafter labelled SD-right), resulting in behavioural change and perceptual disorders such as prosopagnosia (Neary et al., 1998).

Diagnosis of FTD takes on average four years, in part because disease onset is often in younger individuals (<65 years), when dementia is not necessarily expected, but also because the varying behavioural and psychiatric symptoms complicate disease presentation (Loi et al., 2022). This is precious time as FTD can swiftly progress, leading to death within ten years, on average (Moore et al., 2020). Consequently, the search for clinical markers to support diagnosis of the subtypes of FTD and to facilitate differential diagnosis from other dementias such as Alzheimer's disease (AD) is an important ongoing process.

Social cognition is considered a core feature of the clinical manifestation of FTD and may facilitate differential diagnosis between AD and bvFTD, for instance. Social cognition is a broad construct, however, and includes multiple processes underlying social interactions, including emotional processing, understanding the thoughts and feelings and intentions of others and attribution bias (Setién-Suero et al., 2022). Consequently, it can break down in a number of ways, for example, individuals in the early stages of bvFTD have notable impairments in theory of mind, while individuals in comparable states of AD only have difficulties on highly complex theory of mind tasks that may require other executive processes (Setién-Suero et al.). Understanding the specific patterns of impairments in the processes comprising social cognition in different subtypes of FTD and other dementias could effectively aid diagnosis.

Emotion recognition, a capacity subserving social cognition which is critical to social interactions, could prove useful in the diagnostic period, with bvFTD found to demonstrate poorer emotion recognition compared with AD (Bora et al., 2016; Jiskoot et al., 2021; Torralva et al., 2009); a finding present across several FTD subtypes (Kumfor & Piguet, 2012). Reduced capacity to recognise emotional expressions can also place great strain on the relationship between the person with dementia and their loved ones due to emotional insensitivity or misunderstanding (Kaizik et al., 2017). More specific understanding of the nature of these difficulties may assist with managing the disease, including assisting the burden and challenges experienced by carers.

A notable pattern emerging for both bvFTD and svPPA is increased difficulty in identifying negative emotions such as anger and disgust (Bora et al., 2016; Fernandez-Duque & Black, 2005; Kipps et al., 2009). In a recent study, Gressie et al. (2023) examined facial emotion recognition, and analysed error patterns in all four FTD subtypes (bvFTD, SD, SD-right, PNFA) and AD. They replicated the pattern of increased difficulty in recognising negative facial emotions. The novel aspect of this study was that Gressie et al. sought to delineate whether the pattern and type of emotion recognition errors differed among FTD subtypes, compared with AD and age-matched controls. The authors reasoned that investigation of error patterns among FTD subtypes may increase knowledge of how each FTD subtype manifests, which could aid the diagnostic process. Gressie et al. were also motivated by the impact emotion recognition difficulties can have on an individual's ability to understand and participate in social interactions, in particular, the impact decline in social cognition can have on the often strained person living within a dementia-care partner

relationship (Kaizik et al., 2017). Increased, and more specific understanding, may provide an opportunity to reduce care partner burden.

Gressie et al. (2023) used the Facial Affect Selection Task (Kumfor et al., 2014; Miller et al., 2012) which involves identifying the six basic emotions (happy, angry, sad, surprise, fear and disgust) and neutral expressions. In addition to lower accuracy of AD and all FTD subgroups except PNFA than control participants, they found the relatively understudied SD-right group had the lowest accuracy of all groups. Errors in all groups were predominantly on emotions of negative affect, particularly disgust and fear. Error responses across groups and emotions did differ but syndrome-specific error patterns were not identified. One exception was that in the bvFTD and SD-right groups only, the primary error responses were disgust. Additionally, the SD-right group was the only subtype that produced an error response of happy for surprised expressions, and fear for neutral expressions. Gressie et al.'s findings indicate that while recording overall accuracy on a facial emotion recognition task would provide useful information during clinical work-up for dementia, error responses are not distinct enough to distinguish the dementia subtypes. The exception is that if bvFTD or one of the SD subtypes are part of differential diagnosis, the additional recording of error responses during such a task could be useful.

Recognition of basic emotional facial expressions during diagnostic work-up could be complimented by assessment of self-conscious emotions (such as embarrassment or guilt), which are thought to guide social behaviour. Jimenez and Mendez's (2022) found decreased self-conscious emotions in bvFTD compared to AD on care partner ratings in a pilot study. In contrast, self-reports of these emotions (using the Embarrassability (EMB) Scale, Mendez et al., 2020) failed to discriminate bvFTD and AD, presumably reflecting reduced emotional insight and self-awareness of bvFTD patients. Care partner ratings, but not self-reports on the EMB scale, were significantly correlated with skin conduction responses of the participant to an embarrassing event, providing converging measures of emotion impairment. This preliminary evidence suggests that self-reports should be avoided when examining self-conscious emotions, but that care partner ratings of these emotions may assist with discriminating bvFTD and AD during diagnostic work-up.

The need to reduce the time to diagnosis in young onset dementia is a priority. Loi et al. (2022) made this case and showed that having a specialist young onset dementia service significantly reduced the time to diagnosis by 12 months. Another important avenue to reducing diagnostic time, is providing clinicians with further assessment tools that can be used during the diagnostic process to support a differential diagnosis. The assessment of

facial emotion recognition accuracy, as suggested by Gressie et al. (2023), would be a feasible, short measure that could be included in a young onset dementia service such as that suggested by Loi et al. As shown by Gressie et al. recording error types during this task would be useful if bvFTD or one of the SD subtypes was part of the differential diagnosis, and may contribute to improving the timely and accurate diagnosis of dementia. This may be further enhanced by including care partner ratings of self-conscious emotions (Jimenez & Mendez, 2022). Perhaps a complement to Gressie et al.'s suggested assessment of emotion recognition in a research setting could be the inclusion of other short measures of social cognition, such as Reading the Mind in the Eyes (Baron-Cohen et al., 2001) a TOM task, which combined with facial emotion recognition may be sensitive to earlier stages of change.

Gressie et al. (2023) completed the first study that examined systematically the pattern of error responses in a facial emotion recognition task across all subtypes of FTD as well as AD. The inclusion of the SD-right subgroup showed how the performance of this group differed from the other FTD subtypes on this task and that their different patterns of responses on the facial emotion recognition task might enable more timely diagnosis. Additional clinical benefits may follow from increasing understanding of the emotional recognition deficits in FTD subtypes, ultimately leading to better disease management, and improving the person living with dementia - care partner relationship.

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Description of authors' roles

The authors, Ashleigh O'Mara Baker and Professor Lynette J. Tippett, equally contributed to the manuscript, revised, read, and approved the submitted version.

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