



es

TABLE 1 C

FTD

	F	T	p
Demographic and clinical			
No. (M:F)	14 (12:2)	29 (15:14)	n.s.
Handedness (R:L)	13:1	24:5	n.s.
Age	65.3 (5.8)	64.3 (5.0)	n.s.
Education	10.3 (5.84M)	10.6 (5.63T)	0.7 (2.6s.)

While it is well established that musical expertise can shape brain structure and function (1, 2), the potential of music to modify the clinical expression of neurodegenerative brain pathologies has been largely unexplored. Limited evidence suggests that training on a musical instrument may benefit cognitive task performance in domains such as executive function and verbal memory, and may enhance the task-related functional connectivity of neural networks (3–5). Moreover, musicians may have a reduced incidence of dementia (6, 7). However, the mechanism of any protective effect and its disease specificity have not been clarified.

On neurobiological as well as clinical grounds, this issue may be particularly pertinent in the behavioural variant of frontotemporal dementia (bvFTD). This syndrome typically presents with impaired social and emotional awareness, empathy and perspective taking, accompanied by diverse abnormal behaviours including disinhibition, impulsivity, tactlessness, mental rigidity, obsessionality, perseveration and inertia (8). Music processing and social cognition engage common neural mechanisms, and these same mechanisms are targeted early and relatively selectively in bvFTD (9, 10). Long-term musical exposure is associated both with enhanced emotion recognition (11) and increased connectivity and functional integration in the salience network (1), a core target of the pathological process in bvFTD. This is in line with other work suggesting that certain occupational and lifestyle exposures may attenuate the phenotypic impact of bvFTD (12). Further, developmental amusia ('tone deafness') is associated with deficits of social signal processing in otherwise cognitively normal adults (13). Taken together, such evidence suggests that musical experience might modulate vulnerability to the clinical expression of bvFTD, putatively via effects on neural network resilience and reserve (12, 14).

Here we addressed whether past musical experience, current musical listening habits and/or musical perceptual skills affect the phenotypic expression of bvFTD. We studied a well-characterised bvFTD cohort, assessing patients musically using a customised caregiver survey and cognitive tests. Based on available evidence (1, 2, 9, 10, 12), we hypothesised that cumulative past musical experience would modulate behavioural symptoms of socio-emotional dysfunction in patients with bvFTD, independently of effects on general executive and other cognitive abilities.

Fourteen consecutive patients with bvFTD were recruited via a national tertiary referral centre in London, United Kingdom. All fulfilled consensus diagnostic criteria for bvFTD (8), supported by a comprehensive clinical, neuropsychological and behavioural assessment (Table 1) and brain MRI showing a compatible profile of atrophy. Exclusion criteria comprised inability to understand English or give informed consent, or neurological or psychiatric comorbidities. To interpret the clinical and musical profile of the bvFTD cohort, patients were referenced to a historical cohort of 29 demographically similar, healthy older British adults (details in

Table 1

### Figure 1: Correlations of past musical experience with other cognitive and behavioural measures in the bvFTD group

Correlations of past musical experience with other cognitive and behavioural measures in the bvFTD group are presented in [Figure 1](#) and [Table 2](#). Within the bvFTD group, a higher past musical experience score was associated with significantly lower CBI-R score ( $\beta \pm SE = -17.2 \pm 5.2$ ; 95% CI [-5.2, -29.3]; BIC/AIC=134/129;  $R^2=0.79$ ;  $p=0.01$ ) and higher MIRI perspective-taking subscore ( $\beta \pm SE = 2.8 \pm 1.1$ ; 95% CI [0.3, 5.3]; BIC/AIC=90/85;  $R^2=0.71$ ;  $p=0.03$ ). Greater past musical experience was also significantly associated with lower US past musicence was also significantly associated with lower BDC 8tg (en-US)/MCID55 (t

additionally investigate the effects of continued musical performance (er)-76m(f)9 (o)12 ((er)-76m(fr)-6 (f)9 (o)12 ((er)-76m(f)9 (o)12 ((er)E76m.9))19 ,(finally i



## Author Contributions

JH: Conceptualization, Formal Analysis, Investigation, Software, Visualization, Writing – original draft, Writing – review & editing. EB: Data curation, Writing – review & editing. CA: Data curation, Writing – review & editing. JJ: Data curation, Writing – review & editing. BL: Writing – review & editing. LC: Writing – review & editing. M-CR-K: Data curation, Writing – review & editing. CH: Writing – review & editing. BT: Writing – review & editing. YP: Writing – review & editing. JW: Conceptualization, Funding acquisition, Methodology, Project administration, Supervision, Writing – review & editing.

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## Conflict of Interest Statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Supplementary Material

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## Supplementary Material for Frontiers in Aging Neuroscience

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fneur.2024.1341661/full#supplementary-material>

## References

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