

Neuronal Firings in AD Patients Detected via Quantum Sensing MRI: A Preliminary Study With Age-Sex-Matched Cognitively Healthy Subjects

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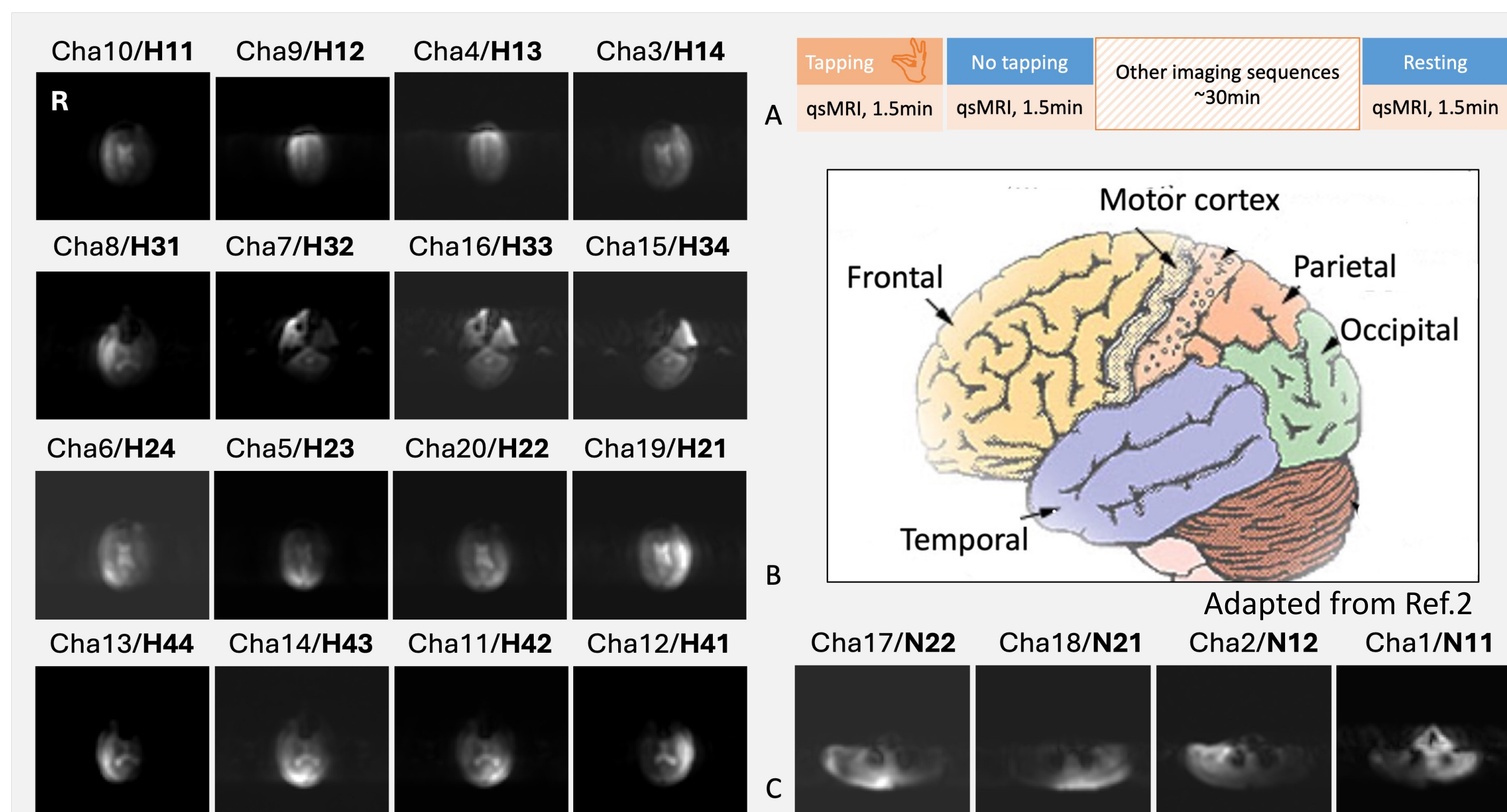


Fig. 1. Study set-up for 12 patients with early-stage AD (age 71.9 ± 9.2 yr, 6/6 fe/male) and age-sex-matched healthy controls (HC). Finger-tapping at 1.0 Hz for 1.5min. FIDs acquired on a 3T MRI scanner (Prisma, Siemens) with a Head/Neck 20-channel coil. Neuronal magnetic field $B_{n,z}$ calculated using custom code. Firing rate measured in a window of first 500ms with high SNR using peak search. Sensing volumes defined by MRI images from the B_0 -shimming data.

Fig. 2. FID signals and neuronal firings of a healthy subject (89 years old, female) at resting state. A-C) The first readout for FID signals from all the 20 channels (Neck Cha @ 1,2,17,18). D) Neuronal firings in A-C. E) Neuronal firings from the following FIDs # 2-4.

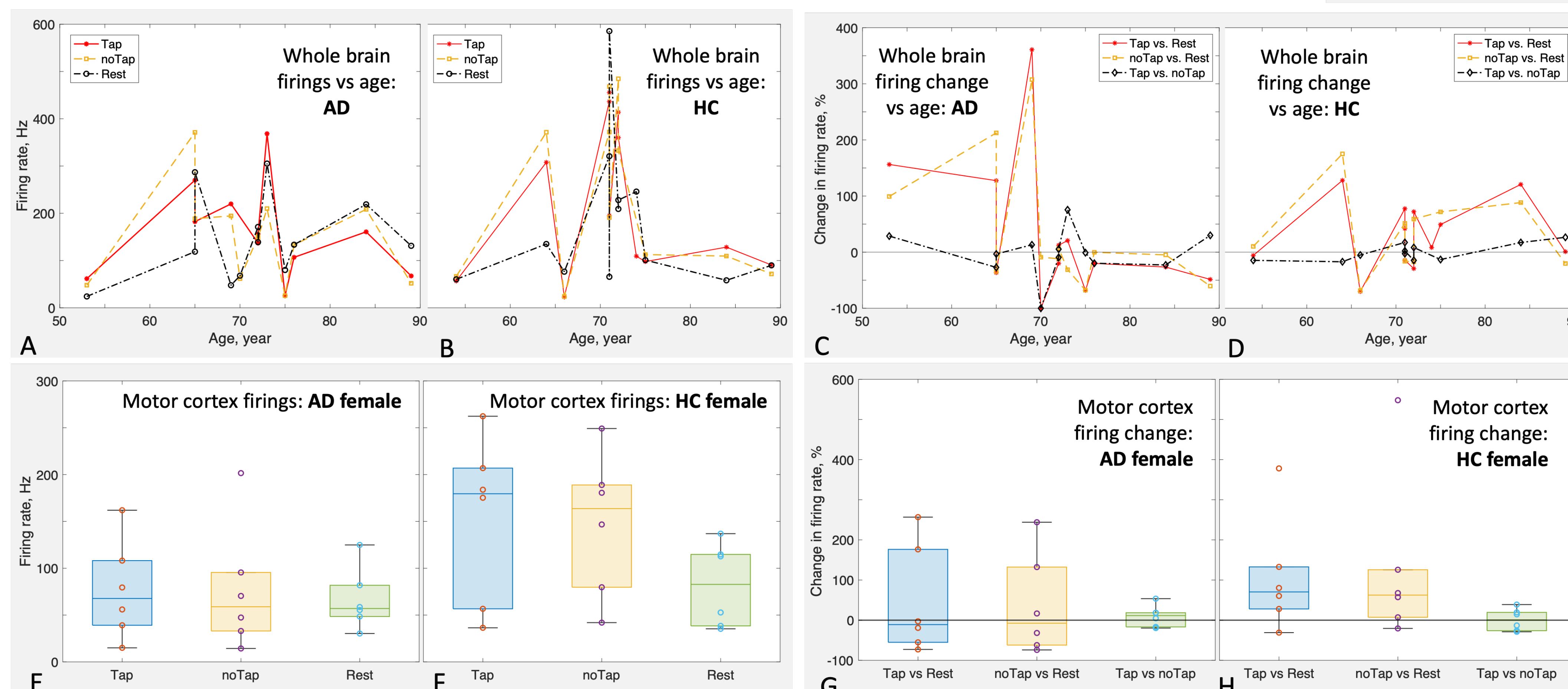
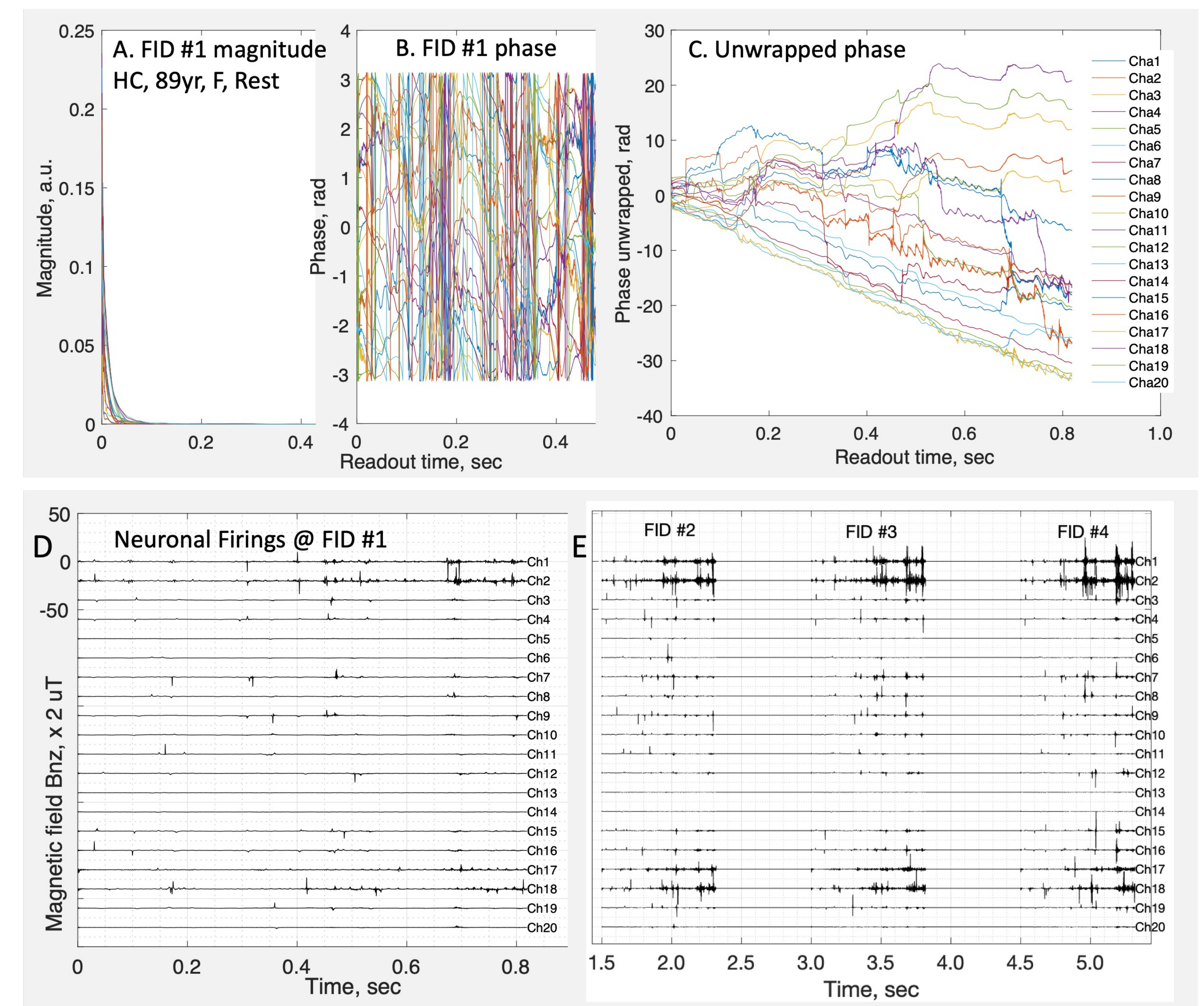


Fig. 3. Results. A large variation in firing rate with age did not secure a significant difference ($P \leq 0.05$) between the AD and HC groups. In the sex subgroup, a significance was found between HC female group and other groups: $P \leq 0.02$ (Tap/noTap vs Rest) in the frontal, temporal, occipital lobes and whole brain between HC female vs male in relative change of firing rate, and $P \leq 0.10$ (Tap vs Rest) in the frontal lobe for females (HC vs AD). In contrast, the male groups did not show such a difference.

References:

1. Qian Y, et al. arXiv. 2026 Mar 13; arXiv:2601.16423v2.
2. <https://training.seer.cancer.gov>.

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