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Supplemental information

Modeling foot sole cutaneous afferents: FootSim

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Supplementary figures

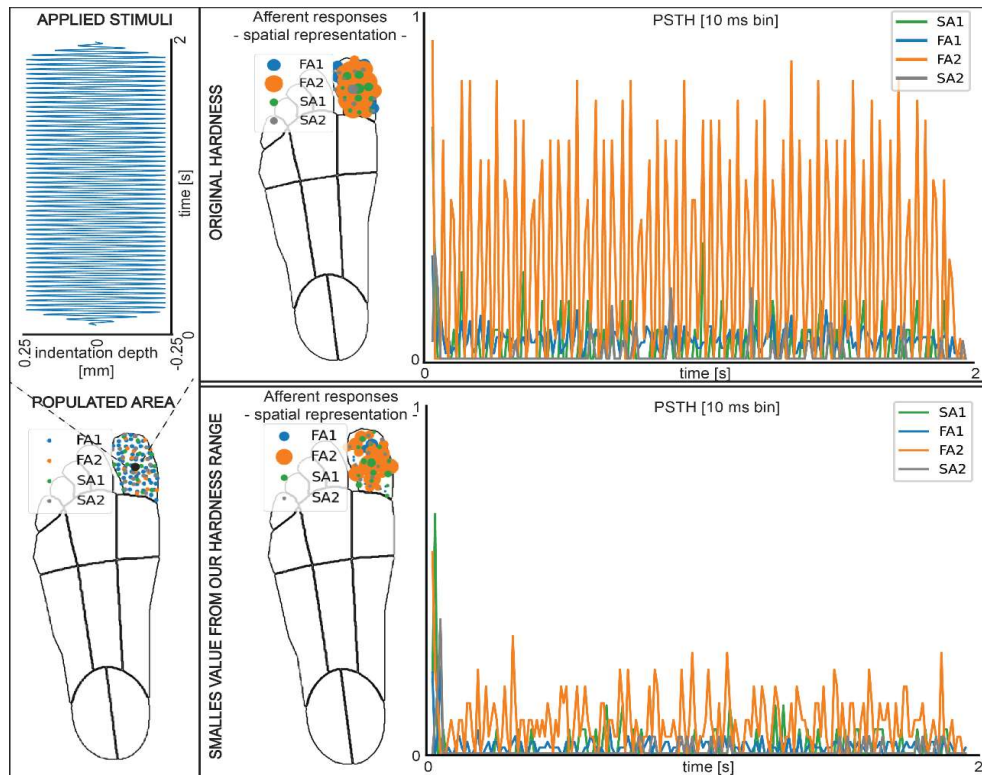


Figure S1. Response of afferents innervating the great toe with different incorporated skin hardness values; related to Figure 2. We populated the great toe with the afferents and applied sinusoidal stimuli at the middle point of this area. We show the responses of all afferents within that area when hardness was set to its original value (it is hard– maximum hardness). (left upper part) stimuli applied on the middle of the great toe. (left down part) populated great toe with all types of afferents. (right upper part) afferent responses on the applied stimuli with the high value of hardness – original one reported for the great toe. (right lower part) afferent responses on the applied stimuli with the low value of hardness. The responses are plotted spatially, where the area of each afferent dot corresponds to the firing rate of that afferent, as well as in the form of peristimulus time histogram of activity (PSTH), with a time bin of 10ms.

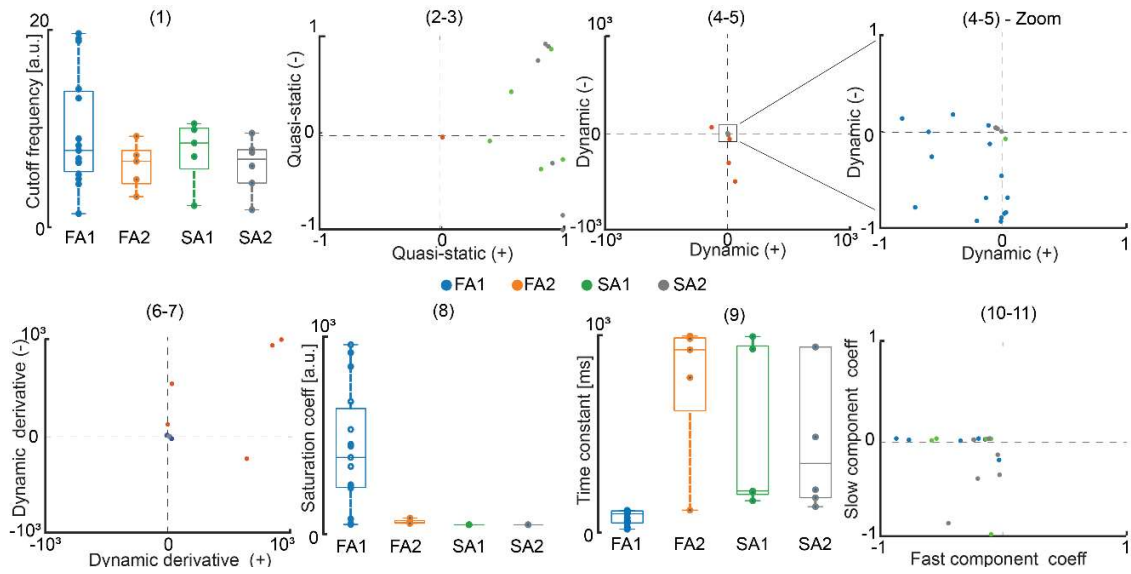


Figure S2, Parameter values for individual models of afferents; related to Figure 1. (1) low-pass filter coefficients; (2-3) positive and negative values of quasi-static coefficients; (4-5) positive and negative values of dynamic coefficients; (6-7) positive and negative values of dynamic derivative coefficients; (8) saturation coefficient; (9) time constant; (10-11) fast and slow component coefficient of postspike inhibitory kernel.

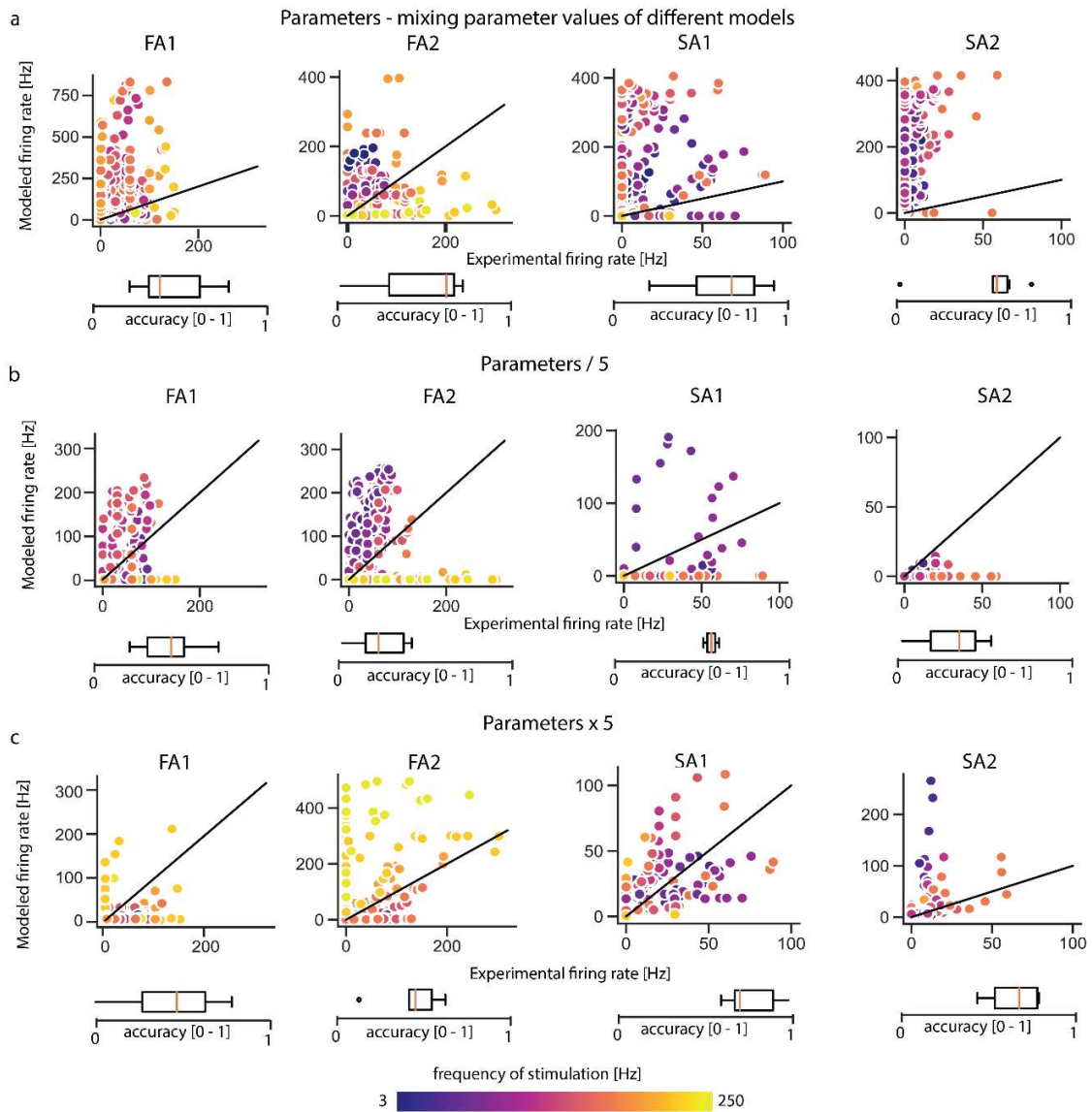


Figure S3, Exploring the individual models parameter space; related to Figure 7. We changed afferent model parameters in 3 different ways and check their behavior. Scatter plots on the left side of the panels show empirical versus modelled firing rates. Individual panels show comparisons for different afferent classes. Each dot corresponds to a tested frequency-amplitude pair, colored by frequency. Boxplots are showing the accuracy of the f models in predicting the firing rate of the afferents. a) Changing the existing models of each afferent type by choosing a value for each parameter of the model from the set of all values for the specific parameter (sampling with repetition). b) reducing the single parameter values 5 times c) increasing the single parameter values 5 times

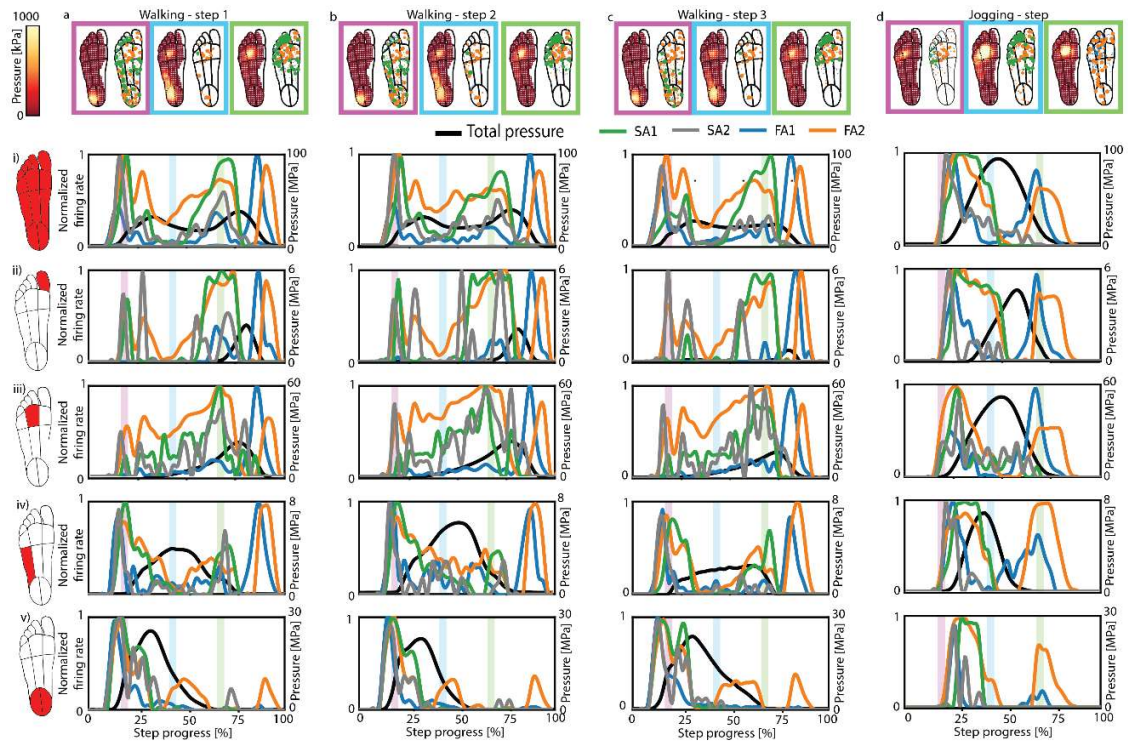


Figure S4, The spatial indentation profile and the population responses during different type of steps, analyzed by the location on the foot sole; related to Figure 8. a), b) walking step c) walking step when person is turning d) jogging step. Top of all panels: the spatial indentation profile and the population response. Each afferent's marker is scaled by its firing rates during heel strike (pink box), mid-step (light blue box) and toe push-off (light green box). i) whole foot area ii) great toe area iii) middle metatarsal area iv) lateral arch area v) heel area of the foot sole. Total pressure during an average step as a function of time (black line). Shaded areas denote the three time periods depicted in the top of all panels. The firing rate of the afferents is averaged and normalized by afferent class over time (25ms window).