
Figures and figure supplements

Modulation of alpha oscillations by attention is predicted by hemispheric asymmetry of subcortical regions

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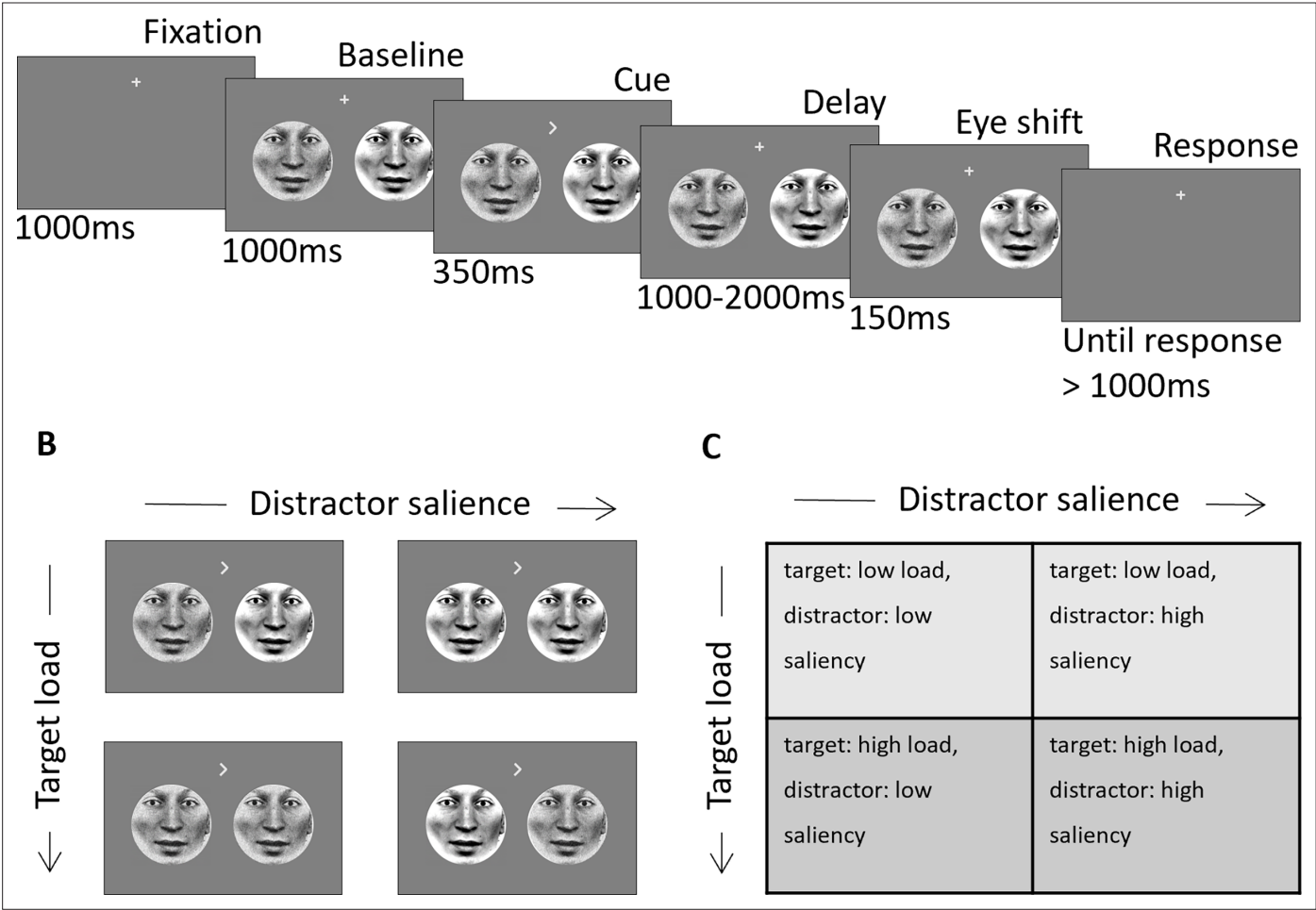


Figure 1. Schematic of experimental design. (A) Two face stimuli were presented simultaneously in the left and right hemifield. After baseline, a directional cue indicated the location of the target. After a variable delay interval (1000–2000ms) the eye-gaze of each stimulus (independent of the other) shifted randomly to the right or left. Subjects had to indicate the direction of the target eye movement after the delay interval. (B) Examples of visual stimuli for each of the four conditions. (C) Table with the labels of the four load/saliency conditions. Adapted from Figure 1 of *Gutteling et al., 2022*.

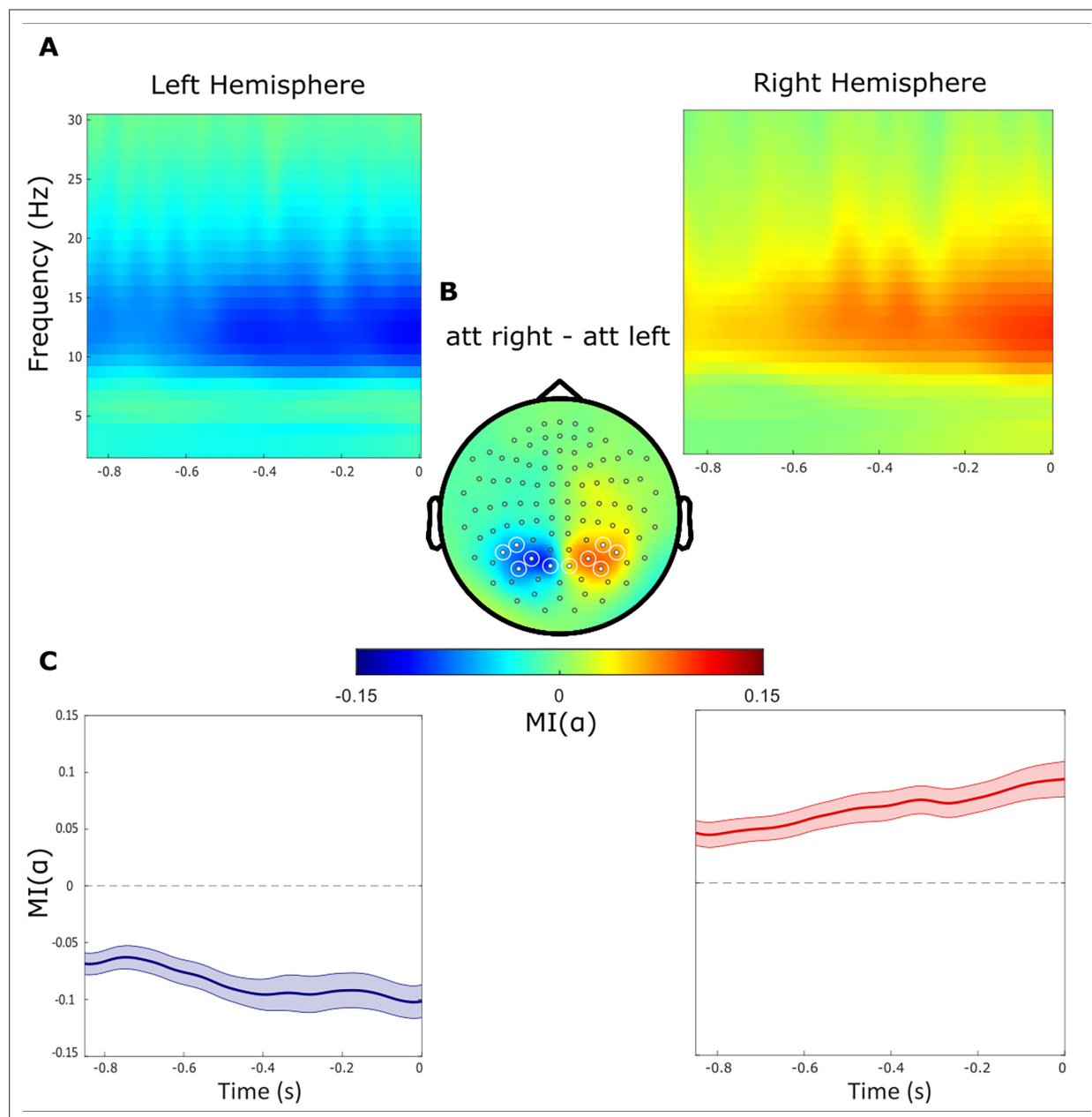


Figure 2. Alpha power decreases contralaterally and increases ipsilaterally with respect to the cued hemifield. **(A)** Time-frequency representations of power demonstrate the difference between attended right versus left trials ($t=0$ indicate the target onset). **(B)** Topographical plot of the relative difference between attend right versus left trials. Regions of Interest sensors (ROIs) are marked with white circles. **(C)** The alpha band modulation $MI(\alpha)$ averaged over ROI sensors within the left and right hemispheres, respectively. The absolute $MI(\alpha)$ increased gradually during the delay interval until the onset of the target stimuli.

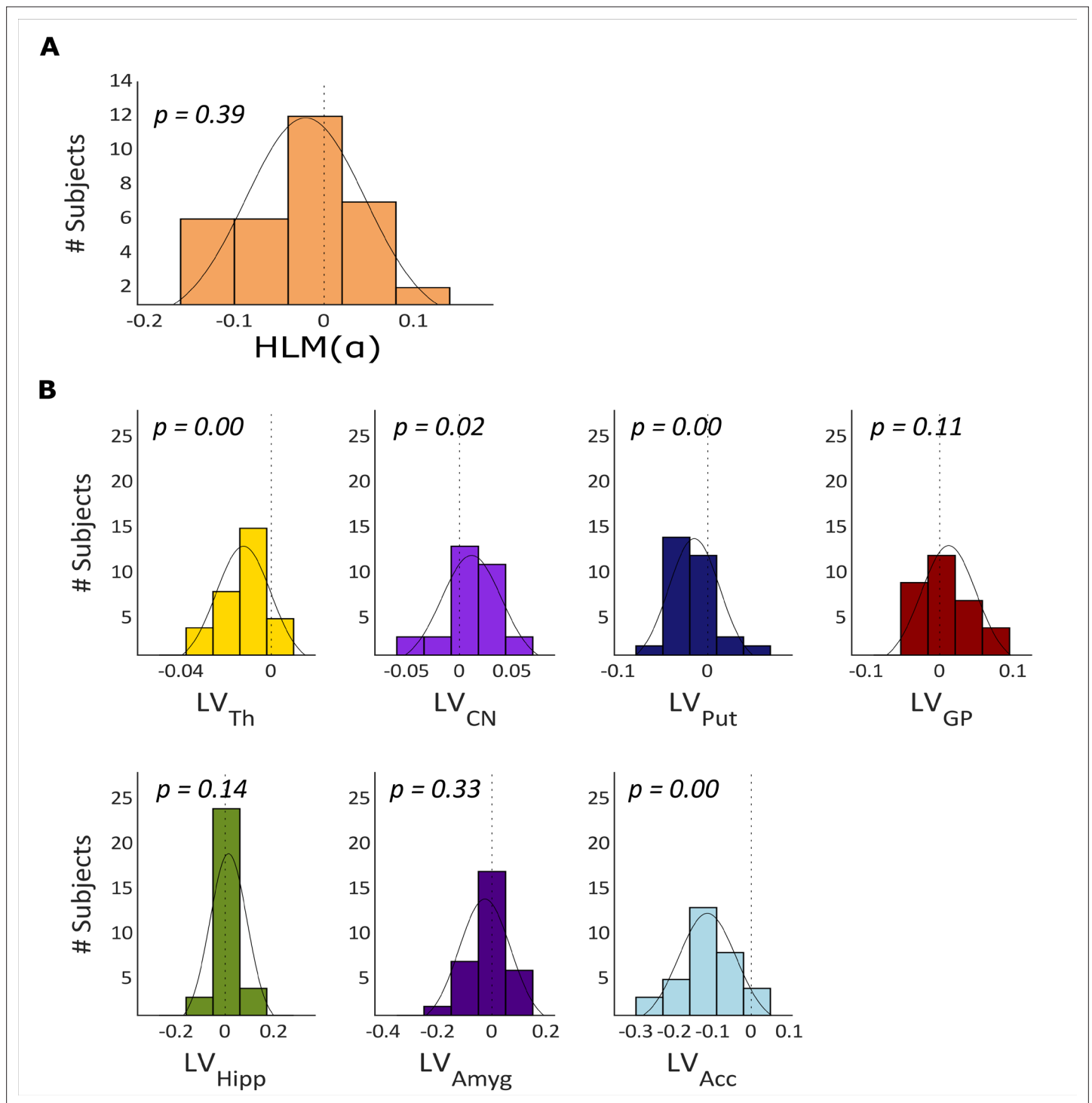


Figure 3. Hemispheric lateralization modulation (HLM(α)) grand average and basal ganglia volumes across all participants. **(A)** The HLM(α) distribution across participants. While there was considerable variation across participants, we observed no hemispheric bias in lateralized modulation values across participants (p -value = 0.39). **(B)** Histograms of the lateralization volumes of subcortical regions. We found that caudate nucleus was right lateralized (p -value = 0.021), whereas, putamen, nucleus accumbens, and thalamus volumes showed left lateralization (p -value = 0.004, p -value <0.001 and p -value <0.001, respectively). Th = Thalamus, CN = Caudate nucleus, Put = Putamen, GP = Globus pallidus, Hipp = Hippocampus, Amyg = Amygdala, Acc = Nucleus accumbens.

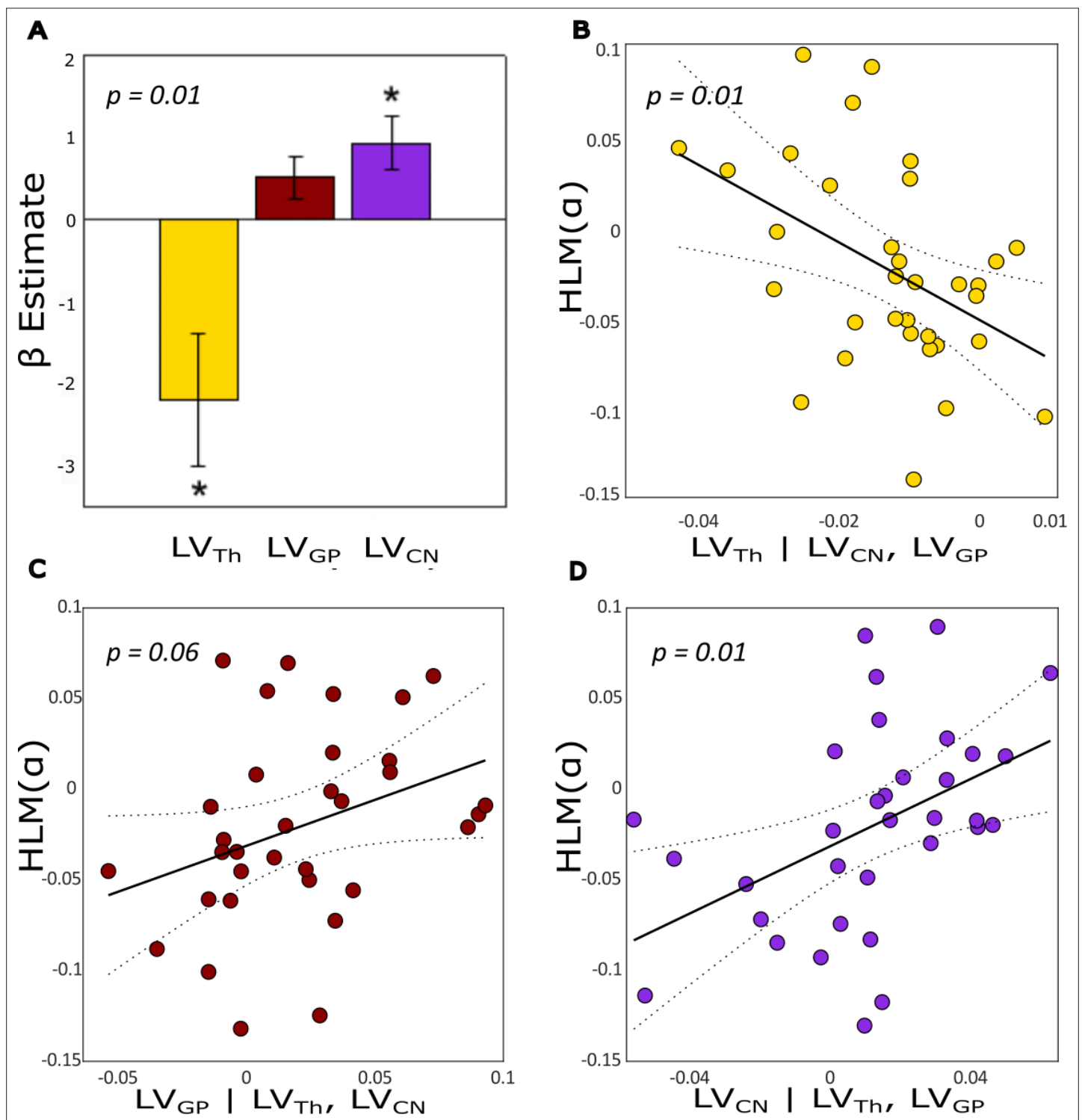


Figure 4. Lateralization volume of thalamus, caudate nucleus, and globus pallidus in relation to hemispheric lateralization modulation of alpha ($HLM(\alpha)$) in the task. **(A)** The β coefficients for the best model (containing three regressors) associated with a generalized linear model (GLM) where lateralization volume (LV) values were defined as explanatory variables for $HLM(\alpha)$. The model significantly explained the $HLM(\alpha)$ (p -value = 0.0007). Error bars indicate standard errors of mean (SEM), $n = 33$. Asterisks denote statistical significance; $*p$ -value < 0.05. **(B)** Partial regression plot showing the association between LV_{Th} and $HLM(\alpha)$ while controlling for LV_{GP} and LV_{CN} (p -value = 0.01). **(C)** Partial regression plot showing the association between LV_{GP} and $HLM(\alpha)$ while controlling for LV_{Th} and LV_{CN} (p -value = 0.061). **(D)** Partial regression plot showing the association between LV_{CN} and $HLM(\alpha)$ while controlling for LV_{Th} and LV_{GP} (p -value = 0.008). Negative (or positive) LVs indices denote greater left (or right) volume for a given substructure; similarly negative $HLM(\alpha)$ values indicate stronger modulation of alpha power in the left compared with the right hemisphere, and vice versa. The dotted curves in B, C, and D indicate 95% confidence bounds for the regression line fitted on the plot in red.

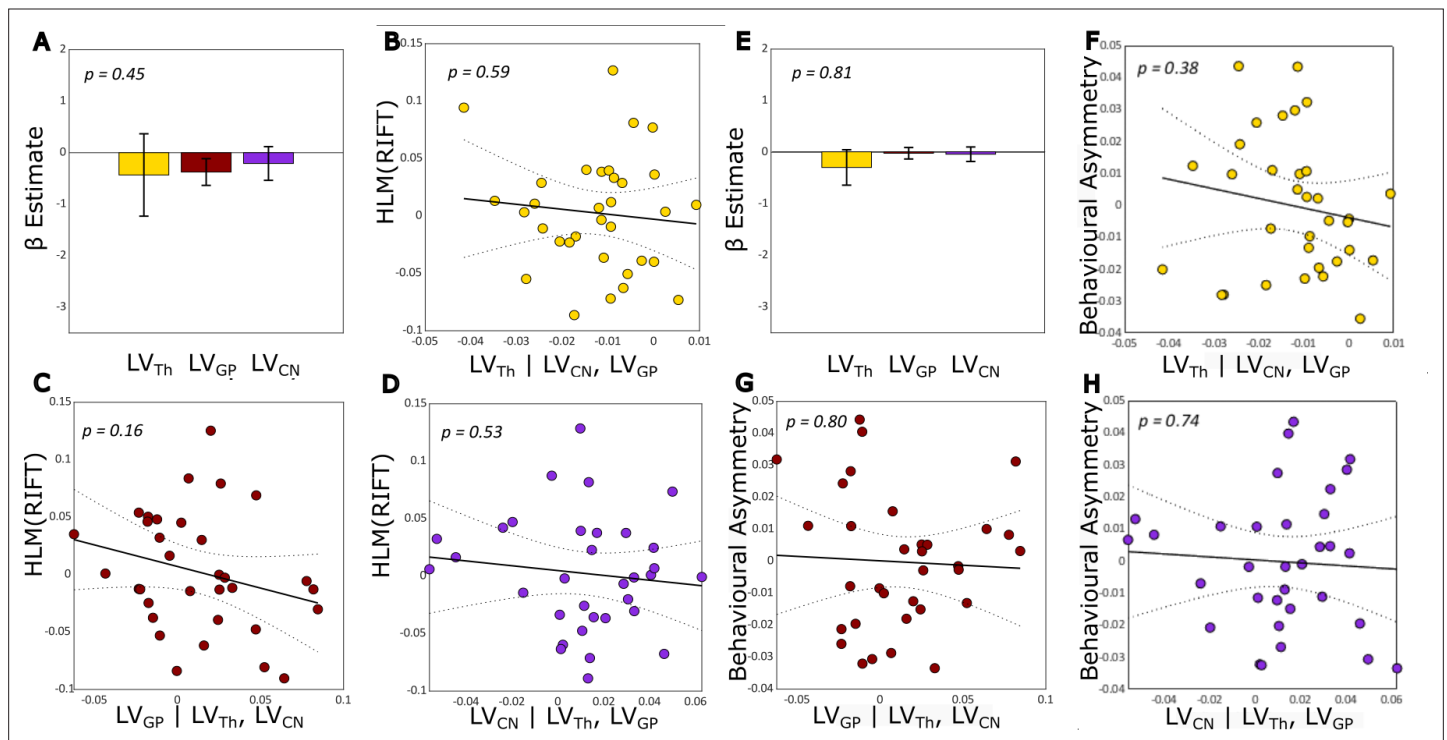


Figure 4—figure supplement 1. Lateralization volume of thalamus, caudate nucleus, and globus pallidus in relation to hemispheric lateralization modulation of rapid invisible frequency tagging (HLM(RIFT)) on the right and behavioural asymmetry on the left. (A and E) The β coefficients for the best model (having three regressors) associated with a generalized linear model (GLM) where lateralization volume (LV) values were defined as explanatory variables for HLM(RIFT) (A) and behavioural asymmetry (E). Error bars indicate standard errors of mean (SEM), $n = 33$. (B and F) Partial regression plot showing the association between LV_{Th} and HLM(RIFT) (B, p -value = 0.59) and behavioural asymmetry (F, p -value = 0.38) while controlling for LV_{GP} and LV_{CN} . (C and G), Partial regression plot showing the association between LV_{GP} and HLM(RIFT) (C, p -value = 0.16) and behavioural asymmetry (G, p -value = 0.80) while controlling for LV_{Th} and LV_{CN} . (D and H) Partial regression plot showing the association between LV_{CN} and HLM(RIFT) (D, p -value = 0.53) and behavioural asymmetry (H, p -value = 0.74) while controlling for LV_{Th} and LV_{GP} . Negative (or positive) LVs indices denote greater left (or right) volume for a given substructure; similarly negative HLM(RIFT) values indicate stronger modulation of RIFT power in the left compared with the right hemisphere, and vice versa; positive behavioural asymmetry value shows higher accuracy when the target was on the right as compared with left, and vice versa for negative behavioural asymmetry values. The dotted curves in (B, C, D, F, G, and H) indicate 95% confidence bounds for the regression line fitted on the plot in red.

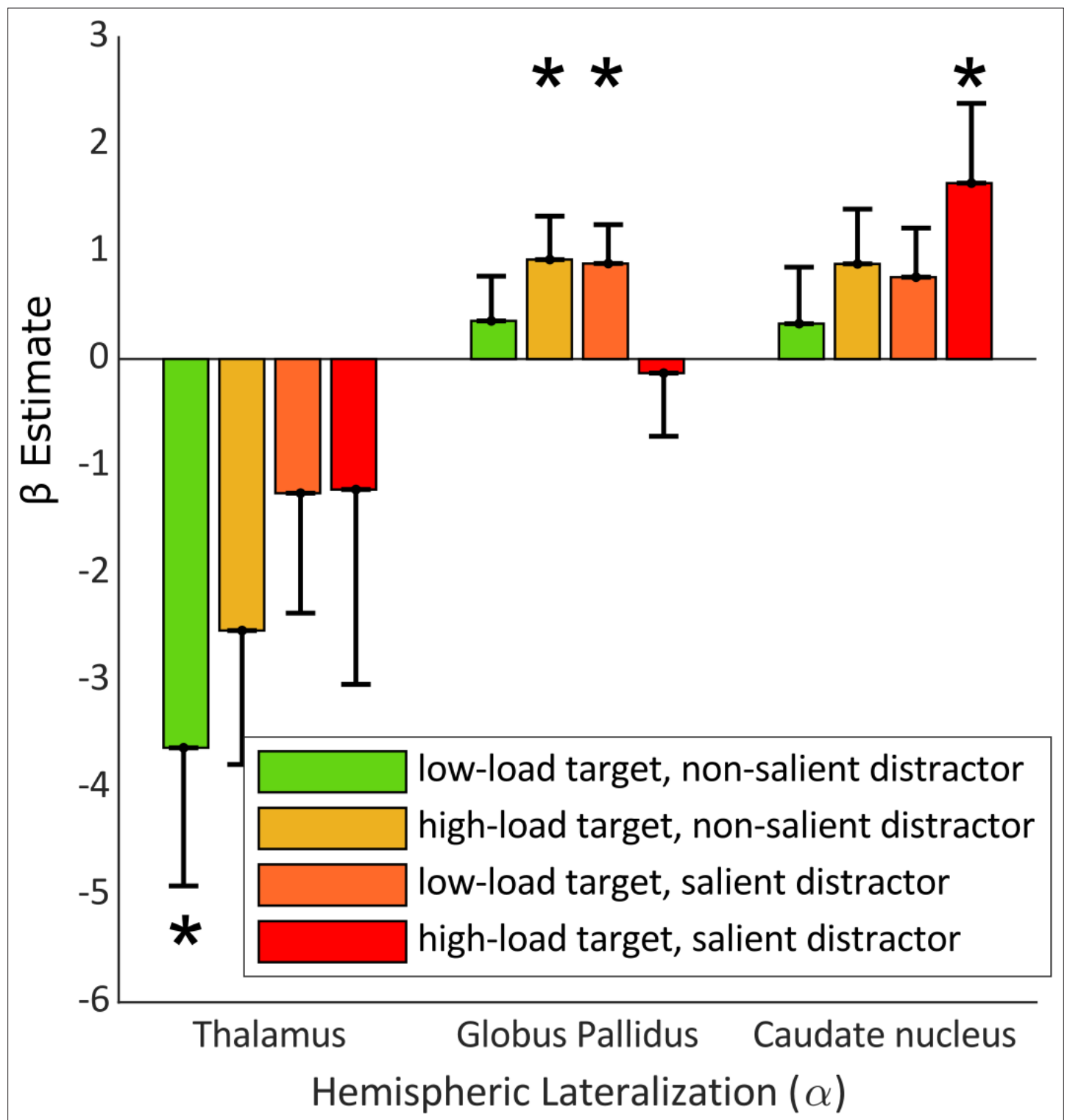


Figure 5. β estimates of subcortical nuclei from a multivariate regression model predicting HLM(α) in the four perceptual load conditions. Here, the HLM(α) values for the four load conditions are the dependent variables and the lateralization volume of subcortical structures are the explanatory variables. The model significantly explains HLM(α) variability (p-value = 0.001) in comparison with null model. Error bars indicate SEM, n = 33. Asterisks denote statistical significance; *p-value < 0.05.