Perceptual decision-making at fixation is biased by task-irrelevant peripheral stimuli following unilateral stroke

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Stroke-induced cerebral lesions cause pathological biases in selective attention, resulting in unilateral spatial neglect for contralesional stimuli in severe cases, particularly for lesions involving the right hemisphere. Here we measured these biases and characterised their influence on integrative processes involved in making perceptual decisions on centrally presented visual stimuli. We had left- and right-hemisphere stroke patients (N=28) judge the direction of coherent motion signals embedded within a central random-dot kinematogram (RDK) while ignoring two peripheral semi-circular RDKs in the left and right hemifields. Brief motion signals of varying directions were presented in the central RDK, while task-irrelevant signals were pulsed occasionally in the peripheral RDKs. Participants were asked to reproduce the direction of the central signals while brain activity was recorded using electroencephalography (EEG). Peripheral motion signals in both visual fields significantly biased the patients' central motion-direction judgements. Critically, motion signals presented in the contralesional hemifield had a greater effect on central judgements than those in the ipsilesional hemifield, a result that is opposite to what might be predicted if unilateral lesions reduce the attentional salience of contralesional stimuli. Our results suggest that unilateral lesions reduce inhibitory control over irrelevant stimuli in the contralesional hemifield, thereby allowing them to interfere with task-relevant processing in central vision. Multivariate EEG analyses revealed robust motion-evoked responses to both task-relevant, central signals and task-irrelevant, peripheral signals. Consistent with the behavioural findings, neural representations of contralesional peripheral sensory input were stronger than of ipsilesional, suggesting that decisions biases originate from impaired top-down regulation of perceptual processes in stroke-affected visual field.