PERCEPTION OF CONSEQUENCES OF ACTIONS: AN FMRI STUDY

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Causal relationships among events are pervasive in the environment. The detection and perception of causal relationships is fundamental for successful interaction with the world around us. Moreover, keeping track of the events caused by actions performed by oneself, as differentiated from external causes, is critical for the maintenance of a consistent perspective. Previous fMRI studies designed to investigate the perception of mechanical causality (e.g., a ball collides with another and causes it to move) found elevated activation in motion areas, superior temporal sulcus, and left parietal areas (Blakemore et al, 2001). No influence of attention was found. Results were interpreted as supporting the view that the perception of elementary mechanical causality events is automatically processed by early low-level mechanisms not influenced by top-down processes (Michotte, 1946; Schlottman & Shanks, 1992). However, planning of motor activities crucially involves expectation of consequences, whether these are consequences of one's own or other's actions. This fMRI study focuses on identifying regions of the brain that process causality as seen in consequences of actions, looking for commonalities and differences across modalities. We use a visual display in which changes can either be consequent (causal) upon an action by the subject (self-cause) or by an unknown external factor (external-cause), in contrast to conditions in which changes of the visual stimuli are not perceived as consequence of actions (non-causal). Contrasting the causal conditions against the non-causal conditions, results show significant difference in activities in the cerebellum, Brodmann's areas, and the frontal lobe, but not in early sensory, including motion, areas.

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