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Unimodal and Cross-Modal Causality on the Skin Tomohisa Asai and Noriaki Kanayama.

Sommario/riassunto	The problem of how humans and other intelligent systems construct causal representations from non-causal perceptual evidence has occupied scholars in cognitive science for many decades. Most contemporary approaches agree with David Hume that patterns of covariation between two events of interest are the critical input to the causal induction engine, irrespective of whether this induction is believed to be grounded in the formation of associations (Shanks & Dickinson, 1987), rule-based evaluation (White, 2004), appraisal of causal powers (Cheng, 1997), or construction of Bayesian Causal Networks (Pearl, 2000). Recent research, however, has repeatedly demonstrated that an exclusive focus on covariation while neglecting contiguity (another of Hume's cues) results in ecologically invalid models of causal inference. Temporal spacing, order, variability, predictability, and patterning all have profound influence on the type of causal representation that is constructed. The influence of time upon causal representations could be seen as a bottom-up constraint (though current bottom-up models cannot account for the full spectrum of effects). However, causal representations in turn also constrain the perception of time: Put simply, two causally related events appear closer in subjective time than two (equidistant) unrelated events. This reversal of Hume's conjecture, referred to as Causal Binding (Buehner & Humphreys, 2009) is a top-down constraint, and suggests that our representations of time and causality are mutually influencing one another. At present, the theoretical implications of this phenomenon are not yet fully understood. Some accounts link it exclusively to human motor planning (appealing to mechanisms of cross-modal temporal adaptation, or forward learning models of motor control). However, recent demonstrations of causal binding in the absence of human action, and analogous binding effects in the visual spatial domain, challenge such accounts in favour of Bayesian Evidence Integration. This Research Topic reviews and further explores the nature of the mutual influence between time and causality, how causal knowledge is constructed in the context of time, and how it in turn shapes and alters our perception of time. We draw together literatures from the perception and cognitive science, as well as experimental and theoretical papers. Contributions investigate the neural bases of binding and causal learning/perception, methodological advances, and functional implications of causal learning and perception in real time.