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Habituation describes the progressive decrease of the amplitude or frequency of a motor response to repeated sensory stimulation that is not caused by sensory receptor adaptation or motor fatigue. Habituation can occur in different time scales: habituation within a testing session has been termed short-term habituation, whereas habituation across testing sessions has been termed long-term habituation. Generally, the more spaced the stimuli for inducing habituation are presented (i.e. the slower habituation is induced), the longer it seems to take to recover the behavioural response to its initial magnitude. Habituation is opposed by behavioural sensitization, which is thought to be an independent mechanism that leads to an increased behavioural response, especially if the sensory stimulus is annoying or aversive. Habituation provides an important mechanism for filtering sensory information, as it allows filtering out irrelevant stimuli and thereby focussing on important stimuli, a prerequisite for many cognitive tasks. The importance is demonstrated in mental disorders that are associated with disruptions in habituation, e.g. schizophrenia and autism spectrum disorders. The inability to filter out irrelevant information in patients with these disorders strongly correlates with disruptions in higher cognitive functions, such as in different types of memory and attention. Habituation is also considered to be the most basic form of non-associative implicit learning, and it can be observed throughout the animal kingdom. Based on the importance of habituation for cognitive function and therefore for the survival of an animal, it is assumed that habituation mechanisms are highly conserved across species. On the other hand, there is emerging evidence for a multitude of homo- and heterosynaptic mechanisms underlying habituation, depending on the modality of sensory stimulation, the level of sensory information processing where habituation occurs, and the temporal composition of sensory stimulation. Eric Kandel used the sea hare *Aplysia* in order to study habituation mechanisms of the gill withdrawal reflex; however, the molecular mechanisms remain largely elusive to date. A multitude of different organisms, behaviours, and experimental approaches have been used since in order to study habituation, but still surprisingly little is known about the underlying mechanisms. New insights also come from an unexpected side: in the recent past, groups that have been studying molecular mechanisms underlying short- and long-term synaptic plasticity phenomena in different parts of the rodent brain are starting to link these plasticity processes to behavioural habituation. The scope of this Frontier Research Topic is to give an overview over the concept of habituation, different animal and behavioural models used for studying habituation mechanisms, as well as the different synaptic and molecular processes suggested to play a role in behavioural habituation through Original Research Articles, Methods, Hypothesis & Theory Articles, and Reviews.
