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Abstract: Assessing neuronal activity by non-invasive functional brain imaging techniques which are based on the hemodynamic response depends totally on the physiological cascade of metabolism and blood flow. At present, functional brain imaging with near infrared spectroscopy (NIRS) or BOLD-fMRI is widely used in cognitive neuroscience in healthy subjects where neurovascular coupling and cerebrovascular reactivity can be assumed to be intact. Local activation studies as well as studies investigating functional connectivity between brain regions of the resting brain provide a rapidly increasing body of knowledge on brain function in humans and animals. Furthermore, functional NIRS and MRI techniques are increasingly being used in patients with severe brain diseases and this use might gain more and more importance for establishing their use in the clinical routine. However, more and more experimental evidence shows that changes in baseline physiological parameters, pharmacological interventions, or disease-related vascular changes may significantly alter the normal response of blood flow and blood oxygenation and thus may lead to misinterpretation of neuronal activity. In this article we present examples of recent experimental findings on pathophysiologische Interferenz mit neurovasculärer Kopplung parameters in animals and discuss their potential
implications for functional imaging based on hemodynamic signals such as fNIRS or BOLD-fMRI. To enable correct interpretation of neuronal activity by vascular signals, future research needs to deepen our understanding of the basic mechanisms of neurovascular coupling and the specific characteristics of disturbed neurovascular coupling in the diseased brain.