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## Preface

In general, it is hard to compare tests used in the clinic in humans with tests used in animal models. While the term “translational” is being talked about a lot these days, there is little consensus about what translational might stand for. There are actually only a few examples of translational laboratories that critically use and compare models of behavioral analysis in both animal models and humans. Such endeavors are not trivial and are open to a lot of criticism about how well particular behavioral analyses might compare across species. Even if it might be hard to compare all aspects of certain behavioral analyses, there is still great value in pursuing such translational approaches. Based on what is learned in the animal models, tests and treatment strategies might be developed to improve brain function in humans suffering from neurological conditions. In addition, knowledge obtained from human behavioral studies can be used to further improve the animal models of behavioral analysis. Therefore, this book focuses on approaches to translate and compare behavioral tests used in animals with those used in humans. These tests not only increase our understanding of brain function across species but also provide objective performance measures and bridge the gap between behavioral alterations in humans with cognitive disorders and animal models of these conditions. In Chapter 1, the use of eyeblink conditioning in the investigation of neurological conditions at the beginning and end of the life span is discussed. In Chapter 2, the anatomy, physiology, and behavioral analysis of the visual system are reviewed. In Chapter 3, correlates and analysis of motor function and animal models of Parkinson’s disease are described. In Chapter 4, spatial learning and memory in animal models and humans are discussed. Spatial learning and memory can be assessed in most animals and humans and are relevant as they are affected by aging and many neurological conditions. Emotional learning and memory, such as measured in fear conditioning, are reviewed in Chapter 6. In Chapter 6, the use of conditioned place preference to assess drug reward in humans and animal models is reviewed. Chapter 7 describes how analysis of social behavior in animal models can be used to study autism. In Chapter 8, the representation of uncertainty in the human and animal brain is discussed. Questions like how and where this occurs in the brain are pertinent to neurological disorders such as schizophrenia that are characterized by a fundamental misrepresentation of uncertainty, arising through increased stochastic noise in neural circuits. Maladaptive styles of coping with uncertainty could be critical for generalized anxiety disorders as well. In Chapter 9, the importance of considering circadian variation in the physiological and behavioral analysis of humans and animals is discussed. In Chapter 10, the behavioral sequelae following Traumatic Brain Injury in humans and animal models are discussed. This is highly relevant as traditionally these sequelae have been used to screen candidate therapeutics for brain-injured patients. In Chapter 11, methods are reviewed to measure psychomotor sensitization in mice. Self-reports of sensitized vigor and energy levels in humans may relate to the more direct measurements of psychomotor sensitization in animals. These studies are important as they allow genetic investigations aimed at determining susceptibility to behavioral sensitization and neuroadaptations related to drug abuse. Chapter 12 discusses behavioral analyses critical to brain injury studies of experimental stroke or cardiac arrest.

These analyses are used to develop therapies to protect the brain during ischemic episodes and to enhance its potential for plasticity and repair after ischemia remains paramount. Finally, in Chapter 13, the use of magnetic resonance imaging (MRI) and in particular diffusion tensor imaging (DTI) to obtain information about cellular microstructure through measurements of water diffusion is discussed. This methodology can be used to characterize cellular morphological changes, for example, those associated with development of the cerebral cortex. Data collected in five species (mouse, rat, ferret, baboon, and human) were compared to determine whether similarities in the trajectory of DTI measurements with development exist in the literature. The ability of DTI to detect changes in neuroanatomy in the normal developing cerebral cortex allows detecting cortical abnormalities associated with various developmental disorders.

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