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executive function (EF) working-memory task in the CBI patients (also see the study by Raz et al. (2011) [47] that shows MRI correlates with impaired EF performance in CBI). In the Hellyer et al. [46] investigation the MRI “classifier” not only distinguished CBI subjects, as well as those with more severe injury, from controls but also related performance to EF measures in TBI patients on average almost three years post injury.

Acknowledging that the very long-term predictive validity of such observed brain changes has yet to be determined, all of these studies support the conclusion that persistent brain injury occurs in some victims of CBI.

Numerous MR techniques currently identify trauma-related neuropathology [48, 49], with potential candidate biomarkers of CBI listed in Table 6.1. The MRI method known as diffusion tensor imaging (DTI) [50] has become the most frequently employed MRI metric in CBI research [34–36, 51]. DTI is an established neuroimaging procedure used diagnostically and in research across a variety of neuro-

and in research across a variety of neurological diseases and disorders, especially those that predominantly influence white-matter integrity [52–58]. As will be discussed in this review, CBI may be viewed, to a significant extent, as a disruption in white-matter neural networks [59–64], where damage or disruption of myelin integrity and oligodendrocytes may characterize a significant amount of of the pathology that comes from TBI when chronic problems persist [65]. The key element in networks is pathways [66], and fundamental to all pathways is *axon integrity*. In regard to contemporary neuroimaging, DTI provides the best visualization and MR metrics of water diffusion that directly assess axon integrity [67]. Indeed, the research and clinical applications of DTI are well established, including its use in providing *in vivo* visualization and analysis of white-matter integrity in CBI [68]. As such, DTI findings will be among the major technologies discussed as potential biomarkers of underlying neural pathology in concussion.

Jeff Victoroff, M.A., M.D., FAAN is Board Certified in Neurology and Psychiatry and is a Certified Neurorehabilitation and Brain Injury Specialist, He has been retained as an Expert Witness in many civil and criminal cases over the years. His first priority is determining whether an injury has occurred without regard for liability or fault and then investigates causation.

Dr, Victoroff received his medical degree from Case Western Reserve University School of Medicine and served his residencies at Harvard Medical School and a Fellowship in Behavioral Neurology at UCLA. Dr. Victoroff is currently an Associate Professor of Clinical Neurology and Psychiatry at the Keck School of Medicine at USC, a Fellow of the American Academy of Neurology and a Diplomate, American Board of Forensic Medicine.

Dr. Victoroff served as a consulting neurologist and leader of the Western U.S. Center for the National Football League's Neurological Care Program that deals with brain concussions sustained by its players. He was also associated with the Rancho Los Amigos National rehabilitation Center for twelve years as Director of the TBI/Neuropsychiatric Clinic, of the Neuro-Medicine Clinic and of the Neuropsychiatric Clinic.

Erin D. Bigler is a professor of psychology and neuroscience at Brigham Young University (BYU) where he served as chair of the Psychology Department for over six years from 1996 through 2002. Upon returning to Utah in 1990, he established the Brain Imaging and Behavior Laboratory at BYU. It studies the role of neuroimaging variables in cognitive and neurobehavioral disorders. They include traumatic brain injuries, neurodevelopmental disorders such as autism and learning disabilities, anoxic brain injuries and other acquired injuries of the brain as well as aging and Alzheimer's disease.

In addition to this, he is an Adjunct Professor Psychiatry and Radiology for the University of Utah. He is a licensed psychologist, practicing in the area of Clinical Neuropsychology, and holds a Diplomate from the American Board of Professional Psychology with special competence in clinical neuropsychology. Along with having written several neuropsychological tests, he has authored and/or edited 9 textbooks, and published over 255 peer-reviewed articles.

Currently, he serves as Treasurer of the International Neuropsychological Society and was a member of the Board of Directors for many years. He served as associate editor to the Journal of the International Neuropsychological Society for 11 years and currently sits on the editorial board of several other neuropsychology journals.

In 1999, he received the Distinguished Clinical Neuropsychologist Award from the National Academy of Neuropsychology. In that same year, he was also the recipient of the Karl G. Maeser Distinguished Faculty Lecturer Award, Brigham Young University's top faculty honor. From 1989-1990, he served as president of the National Academy of Neuropsychology. He was formerly a Professor of Psychology and Psychiatry for the University of Texas, until he returned to Utah in 1990 to assume his current position at BYU.