Index

5-HTTLPR gene, 430 Aanat gene, 430 Abbott Concussion IQ Survey, 100 abbreviations, 683t20.1 acceleration forces in CBI, 139 acetyl-CoA role in CBI pathophysiology, 140, 141, 143 Achenbach Adult Behavior Checklist (ABCL), 445 Achenbach Behavior Checklists, 218 Achenbach System of **Empirically Based** Assessment, 290 Acquired Capability for Suicide Scale, 436 Acute Concussion Evaluation (ACE), 653 Adams, Francis, 36-37 adenosine role in the homeostatic sleep drive, 757 adenosine triphosphate (ATP), 762 consumption/production imbalance following CBL 140 adrenocorticotrophic hormone (ACTH), 775 deficiency symptoms, 768t26.1 adrenocorticotrophin (ACTH), 767 Advanced Trauma Life Support/ American College of Cardiology (ATLS/ACS) guidelines on CT scan after concussion, 602 Affective Lability Scale, 384 age risk factor for CBI, 101 risk factor for poor outcomes of CBI, 343-45 risk factor for sports concussion, 111-12 aggressive behavior assessment in concussion patients, 385

5HTT gene polymorphisms, 762

in concussion patients, 385-86 epidemiology, 446 incidence after TBI, 385 irritability after trauma, 385 personality change after TBI, 385 treatments for concussion patients, 385-86 aging antagonistic pleiotropy theory of aging, 505 attempts to distinguish from Alzheimer's disease, 520-25 defining, 502-7 disposable soma theory of aging, 505 force-of-mortality factors, 505 history of changing human life expectancy, 503 lack of universally agreed definition, 502-3 phenoptosis theory of aging, 505 programmed theory of aging, 503–4 stochastic (chance) theory of aging, 504-5 theories of aging, 503-5 time-passing-related life-history concept, 505-7 agitation following TBI, 444 alcohol enhanced response after TBI, 751 use/abuse in TBI patients, 751 all-terrain vehicle riding concussion risk, 114 Allen Human Brain Atlas project, 68 Altman, Joseph, 173 Alzheimer's disease, 639 Alzheimer's original description, 513-14 APOE ε4 allele risk factor, 313-15 attempts to distinguish from aging, 520-25 case of Auguste Deter, 501, 513-14, 517

conflicting results from TBI studies, 512-13 defining, 512-26 distinguishing between aging and AD, 514-17 fallacy of attributing causality to biomarkers, 517 inflammation and activated microglia, 519-20 physiological and pathological roles of amyloid beta, 517–20 proliferation of competing diagnostic criteria, 514-17 questioning its existence as a natural kind, 525-26 risk after earlier CBI(s), 329-35 Alzheimer's Disease Neuroimaging Initiative (ADNI), 559 amantadine, 385, 386, 753 use in post-concussive aggression, 451 American Academy of Neurology (AAN) consensus definition of concussion, 81-82 guideline on CT scan after concussion, 603 American College of Emergency Physicians (ACEP) guideline on CT scan after concussion, 600-1 American College of Rehabilitation Medicine (ACRM) diagnostic criteria for CBI, 95-96 American College of Sports Medicine (ACSM), 646 definition of concussion, 82-83 American Medical Association Guides to the Evaluation of Permanent Impairment (GEPI), 738–39 American Medical Society Sports Medicine Position Statement on Concussion and Sports, 729

American Neuropsychiatric Association, 416 American Psychiatric Association (APA), 346, 347, 403 AMPA receptor binding in CBI, 139 amygdala, 388, 389, 392 functions, 179 response to aversive and safety cues, 392 vulnerability to concussion, 179-82 amyloid beta (Aβ) aggregation and plaque formation, 639 disruption caused by TBL 331-32 pathology after TBI, 575–76 physiological and pathological roles, 517-20 potential influential factors in TBI pathology, 576 role in neurodegeneration, 168-71 amyloid precursor protein (APP), 168 transgenic mice, 169 amyloid-related processes CSF biomarkers, 640-41 amyotrophic lateral sclerosis (ALS), 171, 537 anger following TBI, 444 anger management approaches, 449 anger self-management programs, 385 animal models of concussion abnormal activity of dysfunctional neurons, 180, 187 Alzheimer's disease does not occur in rodents, 168-71 association between concussion and later dementia, 188 Barnes maze, 166 beam walking test, 165 behaviors assessed are not comparable in humans, 165-67

Index

animal models of concussion (cont.) behaviors assessed lack ecological validity, 165-67 blast injury models, 162-63 Closed Head Injury Model of Engineered Rotational Acceleration (CHIMERA), 162-63, 164 competing helpful and harmful brain change, 178-79 concussive force does not predict the degree of brain injury, 156-58 Controlled Cortical Impact Model (CCI), 160-64 damage to areas associated with functional deficits, 179-82 defining brain injury, 180 detecting neuron death in 'mild' injuries, 183-85 detecting neuron death in moderate to severe injuries, 182-83 disproportionate damage to certain brain cells, 179-82 early animal experiments, 45 ethical issues, 162 experiments with abrupt external force, 154-55 failure to replicate typical human concussion, 159-65 Fluid Percussion Injury Model (FPI), 160-61, 162-64 force best approximating human concussion is not known, 156-58 fragile brain structures associated with post-concussion neurobehavioral problems, 179-80 genetic variation and post-CBI gene expression, 187-88 hitting the wrong thing in the wrong way, 159-65 Impact Acceleration Injury Model (IAI), 160-61 inability to know how animals feel after concussion, 165 inability to study persistent problems, 167-68 individuality of humans is not considered in animals, 155 issues relating to sedation, 162 key questions for animal studies, 153–54 lack of investigation of late effects, 154-55 lack of long-term studies, 167-68

limits of optical microscope detection of brain change, 176-78 medium- to long-term studies, 188-96 methodological issues, 8 Morris Water Maze, 166 naturalistic assessments, 167 neurobiological melee of concussion, 178-79 neurodegenerative features, 168-71 neurogenesis, 171-76 neurogenesis found in rodents, 156 neuron death, 182-88 parts of the brain damaged in mice and humans, 179 parts of the brain damaged in milder concussions, 179 persistence of brain changes, 180 popular experimental models, 159-65 post-concussive memory tests, 166-67 problems with animal models, 155-78 progressive neurodegeneration, 180 questionable relevance to human concussion, 153 Radial Arm Maze, 166 role of connectivity in brain cell survival, 187 Rotarod test, 166 significance of neuronal loss, 185-88 standardization versus individual variability, 159-60 T-Maze, 166 use of species which never develop Alzheimer's disease, 156 use of transgenic mice, 169 Weight Drop Acceleration Injury Model (WDAI), 160-61 what they reveal, 178-96 anosognosia, 216 anterior cingulate cortex (ACC), 388 anterior cingulate gyrus, 179 anticonvulsants, 390 antidepressants, 389 antidiuretic hormone (ADH), 751 APOE genotype arguments for and against testing, 313-18 ethical conditions for disclosure, 315 influence on CBI outcomes, 313 risks in childhood, 315-18 APOE polymorphisms, 168 APOE £4 allele

health risks associated with, 313 pleiotropic effects, 505 possible influences on TBI outcome, 310-11 risk factor for Alzheimer's disease, 313-15 susceptibility to chronic traumatic brain injury in boxers, 313-14 APOE £4 carriers functional neuroimaging of TBI, 565-66 neuroimaging of TBI, 567-68 Applied Behavioral Analysis (ABA), 753 Aqapendente, Fabricius ab, 40 arginine vasopressin (AVP), 767, 773 deficiency symptoms, 768t26.1 aripiprazole, 385, 390 Aristotle, 499, 500 arterial dissections headache associated with, 735 ASPA gene, 141 aspartate N-acetyl transferase, 140 aspartoacylase (ASPA), 141 assessment tools, 216-18 astroglial injury CSF biomarkers, 640 athletes pressures not to report concussion and symptoms, 25-26 atypical antipsychotics, 390 Auburtin, A., 293 authority misplaced faith in, 14 Automated Neuropsychological Assessment Metrics (ANAM), 656, 675 automobile accidents traumatic brain injuries, 50 autonomic nervous system (ANS) changes in the changes in TBI and PTSD, 392 role in sleep regulation, 757 axonal injurv CSF biomarkers, 640 diffuse axonal injury, 639 finite element (FE) modeling, 266 maximal axonal strain measurement, 302 spectrum of injuries in CBL 59-63 white matter damage in TBI, 262-63 axonal stretch in TBI disruption of amyloid beta, 331-32 disruption of tau, 332-34 Babinski, Joseph, 338

Balance Error Scoring System (BESS), 648, 658, 673–75, 728 Baragazzi, Jacobo, 39-38 Barnes Maze, 166 Barroso Fatigue Scale (BFS), 748 Barrow Neurological Institute (BNI) Fatigue Scale, 744t24.2 Overall Severity Index Score, 748t24.2 baseball concussion risk, 114 basketball concussion risk, 114 Bayer, Shirley, 173 BDNF gene, 392, 434 polymorphisms, 762 val66met polymorphism, 387 beam walking test, 165 Beck Depression Inventory-II, 688 Beckett, William, 42-43 Behavioral Modification Therapy, 449 Behavioral Neurology & Neuropsychiatry certification, 416 Bell, Benjamin, 43 Bender Visual Motor Gestalt test, 403 Benson, D. Frank, 79, 328, 348, 404 Benton, Arthur, 403 Betz, Vladimir, 45-46 bicycling concussion risk, 114-18 Bigler, Erin Distinguished Neuropsychologist Award Lecture, 18-19 Binet, Alfred, 403 biomarkers fallacy of attributing causality to, 517 individualized neuroimaging biomarker detection, 274-77 biomarkers for concussion biomarkers for chronic brain changes after TBI, 642 candidate biomarkers for CBI, 9-10 chronic traumatic encephalopathy (CTE), 639 CSF biomarkers, 639-41 CSF biomarkers for amyloid-related processes, 640-41 CSF biomarkers for astroglial injury, 640 CSF biomarkers for axonal injury, 640 CSF biomarkers for neuroinflammation, 640 CSF biomarkers for neuronal injury, 640 CSF/serum albumin ratio, 639-40 definition of biomarker, 639 definition of concussion or mTBI, 639

More Information

fluid biomarkers for brain injury, 639 future research, 642-43 indicators of bloodbrain barrier (BBB) function, 639-40 pathophysiology of concussion, 639 peripheral blood biomarkers for acute brain injury, 641–42 persistent symptoms of concussion, 639 risk factors for CTE, 639 symptoms of CTE, 639 upcoming CSF biomarkers for TBI, 641 biopsychosocial conceptualization of CBI, 684-85 bipolar disorder possible risk factor for TBI, 387-88 BIRC3 gene, 145 Bismarck, Otto von, 48, 348 blast injury concussion, 53 animal models, 162–63 blood biomarkers for acute brain injury, 641-42 blood-brain barrier (BBB) biomarkers of BBB function, 639-40 Bnip3 gene, 145 BOLD response, 716-17 Bonet, T., 40 Boston Assessment of TBI-Lifetime, 687, 689 boxing APOE £4 allele and susceptibility to chronic traumatic brain injury, 313-14 concussion risk, 118 See also dementia pugilistica; punch-drunk syndrome, 529 Brain Injury Association of America, 694 definition of concussion, 83 brain injury medicine doctors ability to care for concussion survivors, 416-17 brain-mind reciprocating trauma, 360 Brief Test of Adult Cognition, 528 Broca, Paul, 293, 401 Brodie, B.C., 44-45 Brodmann's areas of the brain, 292-93 Bryant, T., 44, 47 Buffalo Concussion Treadmill Test, 792 bupropion, 389 buspirone, 385 c-Fos, 762 caffeine

enhanced response after TBI, 751 Cajal bodies, 171 Calm3 gene, 145 Canadian CT Head Rule (CCHR), 599-600, 600t15.2, 603 candidate gene approach, 306 Cannon, Walter B., 49-50 carbamazepine, 385 carbidopa, 753 caregiver support, 389 cataplexy, 760 categorization illogical approach to, 37 Caxton, William, 37 Ccl2 gene, 145 Cellini, Benevenuto, 39 Celsus, Aulus Cornelius, 39 Center for Epidemiological Studies-Depression Scale, 436 cervicogenic headache, 731-32 Charcot, Jean-Martin, 338 cheerleading concussion risk, 118 Chen, AJ, 412 Child SCAT, 648 Child SCAT3, 653 childhood abuse long-term effects on stress reactivity, 391 risk factor for adult PTSD, 391 children concussion risks associated with APOE genotype, 315-18 choline, 74-75 MR spectroscopy, 271 chronic progressive traumatic encephalopathy, 582 chronic traumatic encephalopathy (CTE), 582, 639 Boston University CBI Research Group study (2017), 532-33 case of Michael Keck, 530 clarifying what it is and is not, 534-37 contemporary usage of the term, 527 defining, 526-40 diagnostic confusion and inconsistency, 535 distinguishing brain changes in the young from those in the old, 530-32 explaining CTE caused by repetitive trauma, 537 as a heterogeneous clinical phenomenon, 535 incidence of amyloid abnormalities, 535 incidence of polypathology in older brains exposed to multiple

concussions, 533-34

of tauopathy development, 536 investigating the link with repeated CBI, 527-30 lack of clinico pathological correlation in some studies, 532-33 original meaning of traumatic encephalopathy, 526-27 polypathy labeled as, 527 produced by a single TBI, 535–37 relationship between repeated CBI and tauopathy, 534 risk after earlier CBI(s), 329-35 risk factors, 639 risk of tauopathy with repeated concussions, 534–35 role of tauopathy, 530-32 seeding hypothesis of tauopathy development, 536 spectrum of brain changes, 535 symptoms, 639 tauopathy, 527 TDP-43 proteinopathies, 537-38 vascular hypothesis of tauopathy development, 536 circadian rhythm, 757 citalopram, 385, 389 citric acid cycle, 141 Clinical Data Interchange Standards Consortium (C-DISC), 710 clinical decision support (CDS) systems, 613 Clinical Dementia Rating scale (CDR), 512 clinical psychologists ability to care for concussion survivors, 417 Clinician-Administered PTSD Scale (CAPS), 459 Clinician-Administered PTSD Scale for the DSM-5 (CAPS-5), 391 Clock Drawing Test, 511 CLOCK gene, 761-62 clock gene polymorphisms, 761-62 Closed Head Injury Model of Engineered Rotational Acceleration (CHIMERA), 162-63, 164 cognitive behavioral psychotherapy, 385 Cognitive Behavioral Therapy (CBT), 389, 449, 468, 469,751 cognitive biases in symptom reporting, 346 cognitive development

inflammatory hypothesis

Index

effects of pediatric concussion, 654-55 cognitive domains meaning of, 17 cognitive impairment definition, 17 Cognitive Processing Therapy (CPT), 468, 469 cognitive rehabilitation systematic review of research, 783-88 cognitive testing effectiveness in assessing brain function, 21-22 misplaced faith in, 17-22 CogState battery, 675 Columbia Suicide Severity Rating Scale, 436 Common Data Elements (CDEs) instruments, 445-46 Common Data Elements (CDEs) project, 6, 217 Clinical Data Interchange Standards Consortium (C-DISC), 710 contribution to data management and analysis, 711 Federal Interagency TBI Research (FITBIR) informatics system, 696-710 goals relating to TBI, 694 history and development, 694 implementation of TBI CDEs, 696-710 remaining limitations and caveats, 710-11 sport-related concussion outcomes, 696 Transforming Research and Clinical Knowledge in TBI (TRACK-TBI), 710 Version 1.0 TBI outcome measures, 694-95 Version 2.0 TBI outcome measures, 695-96 commotio cerebri concept, 3, 35, 39 compensation issues in CBI, 348-55 controversy over 'litigation overlay', 351-53 creation of advocates and adversaries, 348-49 determining the effect on the misreporting of symptoms, 349-51 expansion of personal injury compensation, 51-52 influence of the views of Henry Miller, 351-53 means used to avoid injury compensation liability, 52-53 outcome is unknowable, 348 perverse incentives created by compensation systems, 348-49

adenosine antagonist

effect, 757

Index

compensation issues in CBI (cont.) proportion of compensationseekers which exaggerates, 354-55 unique circumstances of each CBI, 353-54 victim blaming, 351-53 ways in which compensation systems might influence symptom reporting, 353-54 compensation seeking litigation overlay, 346 compensation-system induced stress, 354 Computerized Cognitive Assessment Tool (CCAT), 656 COMT gene polymorphisms, 762 concussion changing meanings over time, 156–57 defined as a mechanical force, 33 origins of association with 'mild', 37 use of the term in medicine, 33 Concussion in Sport Group (CISG) consensus statements, 15-16 definition of concussion, 82,83 Concussion Resolution Index (CRI), 656 Concussion Vital Signs, 656, 675 concussive brain injury (CBI) controversy over persistent post-concussive symptoms, 1-2 defining, 33-35, 157 defining recovery, 78-79 diagnostic semantics, 79-80 diffuse injury, 34 efforts to produce consensus definitions, 80-84 long-term effects of injuries, 35-36 measuring the extent of the injury burden, 35-36 multifocal effects, 34 spectrum of harm, 34 Congress of Neurological Surgeons Committee on Head Injury Nomenclature, 80-81 consensus groups misplaced faith in, 14-16 contact forces in CBI, 139 Contingency Management Therapy, 449 contrecoup injury, 43 Controlled Cortical Impact Model (CCI), 160-64 conversion disorder, 346, 347 cortical-limbic disconnection model, 388 cortisol deficiency, 775-76

Courville, Cyril Brian, 3, 58 COX-2 gene, 144 craniomandibular syndrome headache caused by, 731 creatine, 74-75 MR spectroscopy, 273 CREB (cyclic AMP response element binding protein), 181 Creutzfeldt-Jakob disease, 170 CSF biomarkers for amyloid-related processes, 640-41 for astroglial injury, 640 for axonal injury, 640 for neuroinflammation, 640 for neuronal injury, 640 upcoming biomarkers for **TBI**, 641 CSF/serum albumin ratio, 639-40 CT scan after concussion Advanced Trauma Life Support/American College of Cardiology (ATLS/ ACS) guidelines, 602 American Academy of Neurology (AAN) guideline, 603 American College of Emergency Physicians (ACEP) guideline, 600-1 applications and limitations in CBL 262-63, 408 Canadian CT Head Rule (CCHR), 599-600, 600t15.2 classification of scan results, 598-99 clinical decision support (CDS) systems, 613 considerations in decision making, 603 cost-benefit analysis, 595-96 CT cannot definitively diagnose CBI, 598-99 deciding whether or not concussion patients should have a CT scan, 595-96 definition of an unnecessary scan, 619-20 Eastern Association for the Surgery of Trauma (EAST) guideline, 601-2 ethics of withholding a scan, 623 health implications if carried out or not, 596-97 implications of a negative scan, 598-99 ineffectiveness of selection algorithms, 598-99 information required by patients, 620-21 informed consent, 622-23 intracranial lesion detection rate by CT in adults, 603-4

limited information from research findings, 597-98 National Institute for Health and Clinical Excellence (NICE) guideline, 603-5 New Orleans Criteria (NOC), 600. 600t15.3 New South Wales (NSW) protocol, 601-2 objection based on cost, 618-19 objection based on radiation exposure risk, 616–18 objection to early scanning, 615-16 ongoing debate, 596-97 Ontario Neurotrauma Foundation (ONF) guidelines, 602 patient participation in decision making, 621-22 physicians' non-compliance with protocols, 612–13 proposed protocols, 599-605 psychosocial influences on decision making, 613-15 quality of studies, 608-11 reassuring the patient, 621 reliability of risk factor assessments, 611-12 Scandinavian Neurotrauma Committee (SNC) protocol, 602-4 scientifically defensible and ethical options, 623 Scottish Intercollegiate Guides Network (SIGN) guideline, 601 sensitivities and limitations of CT, 598-99 significance of non-surgical intracranial lesions, 604-5 studies used to determine CT protocols, 606-8 Veterans Administration/ Department of Defense (VA/DoD) guideline, 601 what patients want, 620-23 cytokines and sleep, 762 da Carpi, Berengario, 39-38 Damianus, Tertius, 40 Darwin, Charles, 52, 305, 501-2 Dax, Marc, 401 Dear Leader Experiment, 214-16 default mode network, 388 Defense and Veterans Brain Injury Center (DVBIC), 6, 694 defining CBI, 33-35 efforts to achieve consensus definitions, 80-84 definitions concussion as a mechanical

force, 33

dehydration headache, 731

diffuse injury, 34

dementia amyloid beta pathology after TBI, 575-76 competing contemporary definitions, 510-11 defining, 509-12 factors influencing risk after TBI, 574 historical meaning of the term, 509-10 influence of disease pathology after TBI, 578 investigating the link with CBI, 511–12 late effects of CBI, 497-98 pathological protein accumulation after TBI, 574–75 polypathology after TBI, 578 potential contributing biological factors in TBI, 511 questions on the relationship with TBI, 511 tau pathology after TBI, 576–78 TBI risk factor, 573-74 dementia pugilistica, 526, 529, 582, 639 Dencker, Sven J., 220-21 Denny-Brown, D.E., 56-58 depression definition, 427 See also mood disorders: post-concussive depression, 427 Descartes, René, 52, 328 D'Esposito, M, 412 dextroamphetamine, 389, 753 diabetes insipidus, 751, 773 diagnosis of concussion approach to diagnosis, 672 Balance Error Scoring System (BESS), 673-75 clinical and laboratory tools, 675 diagnostic semantics, 79-80 diffusion tensor imaging (DTI), 678–79 electroencephalography (EEG), 678 event-related potentials (ERPs), 678 functional MRI (fMRI), 678-79 gait measures, 677 Military Acute Concussion Evaluation (MACE), 673 multi-modal concussion assessment battery, 677 neurophysiological assessment tools, 677-79 neuropsychological testing, 675-77 on-field evaluation, 672 problems with operational (non-biological) diagnostic criteria, 95-96

More Information

Sensory Organization Test (SOT), 676 sideline tools, 672-75 Sport Concussion Assessment Tool - 3rd edition (SCAT-3), 675 Standardized Assessment of Concussion (SAC), 673 summary of assessment tools, 679-80 symptom checklists, 672-73 virtual reality (VR) testing environment, 676-77 diagnosis threat after CBI, 346 diaschisis, 295 diffuse axonal injury, 62, 263, 639 diffuse injury definition, 34 diffusion tensor imaging (DTI), 62-63, 678-79 Diller, Leonard, 403 Disability Assessment Schedule 2.0 (WHO), 289, 357-58 disability payments expansion of, 51-52 disease changing conceptions of, 290-91 dopamine, 767 dorsal nucleus of the vagus nerve, 392 dorsolateral prefrontal cortex (DLPFC), 179, 389 dorsomedial thalamus, 392 dorsomedian thalamic nucleus, 388 drama of attribution, 348, 357-58 draw-a-person test, 403 drugs use/abuse in TBI patients, 751 DSM-5, 346, 347 classification of mood disorders, 386 DSM system problems with, 502 DTI (diffusion tensor imaging), 264, 265-66 ADC (apparent diffusion coefficient), 266-67 fractional anisotropy (FA), 266-70 hemosiderin detection, 269-75 role in CBI investigation, 267-75 dualism resistance to the idea that brains mediate mental functions, 209 straw man issue, 328 dysautonomic headaches, 735 early brief interventions systematic review of research, 791 early single session interventions

Eastern Association for the Surgery of Trauma (EAST) guideline on CT scan after concussion, 601-2 Eban, Abba, 14 Ebbinghaus, Hermann, 401 Edwin Smith Surgical Papyrus, 38 effort-induced headache, 731 Eif4g2 gene, 145 electroconvulsive therapy (ECT), 389 electroencephalography (EEG), 678 electron transport chain, 141, 145 emotional distress prioritizing emotions in neuropsychology, 415 stress vulnerability genes, 312-13 emotional disturbances barriers to accurate incidence and prevalence accounting after concussion, 387 characteristics of emotions, 383 complexity of human emotions, 383 disruption of prefrontal circuits by TBI and CBL 384 emotional lability, 384-85 features of, 384 interplay of factors in TBI and CBI, 383 irritability and aggression, 385-86 lack of evidence for post-concussion syndrome, 383-84 new approaches and understandings, 383 pathophysiology associated with TBI and CBI, 383 post-concussive symptoms, 383-84 post-traumatic stress disorder (PTSD), 383 recognition that post-CBI brain change is common, 383 relation to the circumstances of the concussion, 384 role of the prefrontal cortex in emotional regulation, 384 See also mood disorders; posttraumatic stress disorder (PTSD), 390 emotional lability, 384-85 Affective Lability Scale, 384 assessment, 384 change in personality pattern, 384 conditions associated with, 384-85

features of, 384 overlap with other disorders, 384-85 possible pharmacotherapies, 385 prevalence following concussion, 384 treatments for persistent emotional lability, 385 emotions characteristics of, 383 Empedocles, 500 Enhancing Neuro Imaging Genetics through Meta-Analysis (ENIGMA) study, 298-300 epidemiology of CBI age risk factor, 101 causes, 102-3 CDC pyramid barriers to complete accounting of CBI, 98–100 estimates of unreported concussions, 100 sources of the CDC figures, 97-100 CDC triangle estimates of annual incidence of CBI, 100-1 estimates of lifetime cumulative incidence, 101 potential sources of numerical error, 100 human and health care costs, 128-29 implications of lack of data, 94-97 military concussion, 104-8 need for prospective, longitudinal, population-based studies, 129 problems with operational (non-biological) diagnostic criteria, 95-96 race/ethnicity and CBI risk, 102 risk factors for CBI, 101-3 risk of recurrence, 103-4 sex differences in CBI risk, 101-2 sports-related concussion, 108-28 unreported cases, 96 what counts as brain injury, 93-94 why prevalence of brain injury may never be known, 128-29 epigenetics, 306-7 epilepsy post-traumatic, 387 epistasis, 306 Epworth Sleepiness Scale (ESS), 753

Index

equestrian sports concussion risk, 118-19 Erichsen, John, 44, 48, 49 escitalopram, 385 estrogen replacement therapy, 776 ethics restraints on concussion research, 213-16 Evaluation of Lifetime Stressors, 687 event-related potentials (ERPs), 678 excitatory amino acids (EAAs), 139 exercise interventions for post-CBI fatigue, 750 systematic review of research, 789-90 exertional headache, 730-31 expert witnesses collective bargaining approach, 806 duties under the British system, 804 expert shopping by parties to litigation, 804-5 history of use of, 803-4 position in the U.S. legal system, 804-5 pressures on, 803 problem of biased experts in the U.S., 805 voluntary duty clause, 805-6 Eye Movement Desensitization and Reprocessing (EMDR), 469-71 Fabry, Wilhelm, 40 factitious disorder, 346 fatigue after concussion anatomical considerations, 744-46 assessment, 747-48 behavioural/lifestyle interventions, 749-52 causal factors, 744 energy conservation, 751-52 enhanced response to alcohol, 751 enhanced response to caffeine, 751 environmental modifications, 752 epidemiology, 743-44 exercise interventions, 750 features of post-TBI fatigue, 743 fluid dysregulation after TBI, 751 genetic influences, 746 growth hormone deficiency, 746-47 hydration, 751 hypopituitarism, 746-47 incidence and prevalence, 743t24.1 individual variation, 746

813

systematic review of

research, 791

Index

fatigue after concussion (cont.) management, 748-53 management recommendations, 753-54 medication review, 753 mental fatigue, 744-46 neuroendocrine assessment, 748 neuroendocrine considerations, 746-47 neurostimulants, 753 pharmacological approach, 752-53 phenotypic fatigue measurement, 746 sleep hygiene, 750-51 substance use, 751 Fatigue Impact Scale (FIS), 748, 748t24.2 fatigue management, 794-95 Fatigue Severity Scale (FSS), 744, 748, 748t24.2, 753 FBPK5 gene, 392 fear conditioning role of the hippocampus, 392 Federal Interagency TBI Research (FITBIR) informatics system, 696-710 female sex risk factor for poor outcomes of CBI, 337-43 FIFA Medical Assessment and Research Centre, 82 finite element modeling (FEM) of CBI, 300-2 FLAIR, 264t6.1 fluid dysregulation after TBI, 751 Fluid Percussion Injury Model (FPI), 160-61, 162-64 fluoxetine, 389 Foley, Joe, 24 football (American style) CBIs classified as non-concussions, 121-23 concussion reporting methods, 119-23 concussion risk, 119-23 See also sport-related concussion, 123 force of the CBI impact predictive value for outcomes, 299 - 302Ford, Henry, 50 fractional anisotropy (FA), 266–70 Freud, Anna, 403 Freud, Sigmund, 11, 52, 54, 402, 403 frontal lobotomy, 403 frontotemporal dementia (FTD), 171 frontotemporal lobar degeneration with ubiquitinated inclusions (FTLD-U), 537 Functional Independence Measures (FIM), 289

functional MRI (fMRI), 76, 678-79 advantages and limitations in TBI, 724 applications in mTBI, 716 BOLD response, 716-17 clinical challenges in fMRI research following TBI, 722–23 effects of TBI on the fMRI response, 716-17 emotional sequelae following TBI, 723 impetus for developing objective psychiatric metrics, 723 methodological and analytical challenges in TBI studies, 717-18 neurovascular coupling, 716-17 physiology of the fMRI response, 716-17 recognition the CBI can cause brain change, 716 review of current findings from the literature, 718-22 studying chronic effects of brain injury, 559-60 functional neuroimaging APOE £4 carriers with TBI, 565-66 multiple concussions, 560-63 subconcussive head trauma, 564-65 gait measures, 677 Galen, 39, 289, 291, 360, 501 Galileo Galilei, 33 Gall, Franz Joseph, 292 Galton, Francis, 16 Galveston Orientation and Amnesia Test (GOAT), 96 Gama, Jean-Pierre, 45, 262 Gandhi, Mahatma, 501 Gap43 gene, 145 Garrod, Archibald E., 210, 288, 291, 298, 358, 544 gene-environment interactions, 306 gene expression after CBI, 68–72 three-dimensional patterns, 307-10 gene-gene interactions, 306 gene modulation after concussion, 144-45 genetic factors gene variants which appear to influence TBI outcome, 310-11 risk factors for mood disorders associated with **TBI**, 387 risk factors for PTSD, 392

risk of post-concussive PTSDtype distress, 461–63

variations, 305-18 search for genes linked to neurobiological traits, 311-12 stress vulnerability genes, 312–13 genetic variation influence on size and shape of brain parts, 297 genome-wide association studies (GWAS), 311 GFAp biomarker, 640, 641 Gilberti, Vincent, 3 Giza, Christopher, 94 Glasgow Coma Scale (GCS), 96, 648 applications and limitations, 408 measure of awakeness, 291-92 misinterpretation of scores, 138 not a measure of injury severity, 291-92 Glasgow Outcome Scale (GOS), 78 Glasgow Outcome Scale-Extended (GOSE), 217 Glasgow Outcome Score (GOS), 289 Global Fatigue Index (GFI), 748 globus pallidus, 388 glucose metabolism derangement following ČBI, 140 GluR2 gene, 145 glutamate, 179, 762 binding to ionic channels in CBI, 139 glutamate and glutamine (Glx) MR spectroscopy, 271 glutathione MR spectroscopy, 273 glycolysis temporary increase following CBI, 140 Golden, C.J., 406 Goldstein, Kurt, 56, 58 Golgi, Camillo, 45-46 gonadotrophins, 767 deficiency symptoms, 768t26.1 good-old-days bias in symptom reporting, 346 Grin2d gene, 145 growth hormone, 767 deficiency after concussion, 746-47 deficiency symptoms, 768t26.1 replacement therapy, 776 guiding principles for clinical practice, 793-96 acute and sub-acute management, 793-94 balancing rest versus activity, 794-95

role in CBI outcome

fatigue management, 794-95 neurobiology as a guiding principle, 794 post-acute assessment, 794 prioritizing and treating comorbidities, 795 tailoring subsequent treatment to the individual, 795–96 Gulf War Syndrome, 684 Guthrie, G.J., 44 gyrus rectus, 388 Haddon Matrix, 210, 358-60, 430, 432, 446 hallucinations related to sleep disorders, 760 Halstead, W.C., 406 Halstead-Reitan Neuropsychological Battery, 406-7 Hartmann, Heinz, 403 Head Impact Telemetry System, 300 headache variants, 730-35 cervicogenic headache, 731-32 craniomandibular syndrome, 731 dehydration headache, 731 dysautonomic headaches, 735 effort-induced headache, 731 exertional headache, 730-31 headache associated with arterial dissection, 735 medication induced headache, 735 medication overuse headache, 734,735 migraine headaches, 733-35 musculoskeletal headache, 731 neuritic and neuralgic head pain, 732 occipital neuralgia, 732 paroxysmal hemicrania, 735 post-traumatic cluster headache, 735 post-traumatic migraine, 733-35 rebound headache, 734 temporomandibular joint dysfunction (TMJD), 731 tension-type headache, 732-33 third occipital nerve headache, 732 trauma-triggered migraine, 734-35 See also post-concussive headache, 735 HeadMinder Concussion Resolution Index, 675 Health Related Quality of Life (HRQOL), 216 Hebb, Donald, 403 hemosiderin detection neuroimaging, 269-75 Hewett, P., 44 hippocampus, 388

More Information

functions, 179 neurogenesis during sleep, 756 neurogenesis in adults, 173 role in fear conditioning, 392 volume reduction in PTSD patients, 392 vulnerability to concussion, 179–82 Hippocrates, 33, 360 Hippocratic view of concussion, 36-38 histamine, 757 histopathology versus imaging, 263 historical views of concussion, 36 1600-1700, 40-42 1700-1800, 42-43 1800-1900, 44-45 1900-1925, 50-53 1930 and beyond, 55-56 Ancient Egypt, 38 arrival of the microscope, 45-47 association with 'mild', 37 attorneys and the invention of mild TBL 54 beyond the Hippocratics, 38-40 blast injury victims, 53 casualties of World War I, 50-52 Cellini, Benevenuto, 39 clarity at the outset of the 20th century, 49-50 commotio cerebri concept, 39 controversy over the accepted benignity of concussion, 56-58 da Carpi, Berengario, 39-38 early animal experiments, 45 Edwin Smith Surgical Papyrus, 38 effect of workers' injury compensation schemes, 47-49 expansion of payments for personal injury, 51-52 experimental concussion, 45 fallacy of benignity, 53-54 Hippocratic view, 36-38 Homer's Iliad, 38-39 hysteria, 47-49 illogical approach to categorization, 37 influence of increasing litigation, 54-55 means to avoid injury compensation liability, 52-53 narrowing of the definition, 37 Paré, Ambroise, 39-40 popularity of psychological explanations, 52-53 pressure to rate the severity of concussion, 54-55 progress in recognition of structural change, 55

reasons for inconsistent use of the term 'concussion', 54-55 shell shock, 50-52, 53 tendency to view as a single disorder, 37 translation by Francis Adams, 36-37 translation by William Caxton, 37 traumatic neurosis, 47-49 history of prior TBI influence on later CBI outcome, 329-35 Hitler, Adolf, 403 Holbourn, A.H.S., 59-60, 262 homeostatic sleep drive, 757 Homer's Iliad, 38-39 Hooke, Robert, 45 hormones risk factors for PTSD, 391-92 Hovda, David, 94 human brain Brodmann's areas, 292–93 diaschisis, 295 differences in MZ twins, 294-95 evidence against localizationism, 294-99 gene-mediated variation in size and shape of brain parts, 297 genetic variation in brain structure, 312 history of localizationism, 292-93 variations in, 292 human concussion debate, 205-6 accurate baseline data is rarely available, 210 clinicians encounter nonrepresentative samples of CBI survivors, 208 Dear Leader Experiment, 214-16 detecting persistent change requires effort, 210-12 difficulty of determining clinico pathological correlations, 209 ethical restraints on research, 213-16 individual variation not considered in Western nosology, 210 lack of a systematic review of human outcome data, 218 limitations of animal experiments, 210 no single method assesses outcome with reliability and ecological validity, 216-18 opinions harden in the face of uncertainty, 213 patient-generated barriers to understanding, 212

persistent belief in mind/brain dualism, 209 post-concussion syndrome, 210 reasons why there is still a debate, 208-18 recoverv is not confirmable, 212 resistance to the idea that brains mediate mental functions, 209 socioeconomic pressures on patients with persistent complaints, 212-13 three-month recovery myth, 210-12 typical post-CBI problems, 207-8 Western medical approach to concussion assessment, 210-12 Human Connectome Project, 264-65, 297-99 human studies review, 218 approaches to analysing the results, 234-41 challenge of comparing study results, 234-41 conclusions, 249-50 effect of controlling for premorbid status, 241 estimating the prevalence of persistent neurobehavioral problems, 248 features of the Tables of results, 221-34 group averages hide individual variations, 220-21 normal test scores do not exclude the possibility of brain injury, 221 quantitative approach when meta-analysis is not possible, 248 recovery may be behavioral adaptation, 248-49 studies included in the results, 242 study by Sven J. Dencker (Sweden, 1954), 220-21 study selection criteria, 219–20 Table 3 (studies without controls), 242 Table 4 (studies with controls), 242-44 Table 5 (medium- to long-term studies with healthy or ill controls), 244-47 unreliability of predictions of long-term outcome, 221 weaknesses in study designs, 249 Hunter, John, 44 hydration in CBI patients, 751 hypersomnia, 758

Index

hypocretin receptor blockers, 763-64 hypocretin-1, 760 hypopituitarism after concussion, 746-47 hypothalamic-pituitary-adrenal (HPA) axis changes in PTSD, 392 effect of childhood abuse, 391 hypothalamus, 388, 392 interaction with the anterior pituitary, 767 production of orexin, 760 hypoxic/ischemic theory of CBI, 262 hysteria, 47-49 explanation given for female CBI outcomes, 338 ICD diagnostic criteria, 95 ice hockey concussion risk, 123-24 IL-1b gene, 144 imaginary/intentional dichotomy of symptoms, 13-14 Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT), 656, 675 Impact Acceleration Injury Model (IAI), 160-61 Impact of Event Scale, 459 incomplete sentences tests, 403 individualized neuroimaging biomarker detection, 274-77 inertial forces in CBI, 139 inflammation role in CBI pathophysiology, 66-68 inflammatory hypothesis of tauopathy development, 536 insula, 388 interleukin-1 (IL-1), 762 interleukin-4 (IL-4), 762 interleukin-6 (IL-6), 762 intermittent explosive disorder (IED) following TBI, 444 International Collaboration on MTBI Prognosis, 384 International Ice Hockey Federation (IIHF), 82 International Mission on **Prognosis Analysis** of Clinical Trials in Traumatic Brain Injury (IMPACT) initiative, 7 International Olympic Committee (IOC) Medical Commission, 82 inter-subject variability, 296 intra-subject variability, 296 IQ testing, 403

Index

irritability after trauma, 385-86 assessment in concussion patients, 385 epidemiology, 446 features of, 385 following TBI, 444 incidence, 385 personality change after TBI, 385 progression to aggressive behavior, 385 treatments, 385-86 Irritability Questionnaire, 385 Jackson, Hughlings, 402 James, William, 499, 500 Jansen, Zacharias, 45 Johnson, Ted, 119 kainate receptor binding in CBI, 139 Kaplan, Michael, 171-72, 173 karate concussion risk, 124 Keck, Michael CTE case history, 530 Kennard, Margaret, 654 King-Devick test (K-D), 657-58 knowledge about CBI current controversies, 1-2 knowledge about CBI, barriers to, 2 author bias, 22-24 insufficient empirical investigation, 3-10 lack of a meaningful outcome measure, 11 levels of suspicion of malingering or fraud, 24-25 misplaced faith in a dated trichotomy of symptoms, 11-14 misplaced faith in authority, 14 misplaced faith in cognitive testing, 17-22 misplaced faith in consensus groups, 14-16 misplaced faith in flawed modes of enquiry, 14-22 pressures to minimize reporting of concussion and symptoms, 25-26 Korean War post-concussion syndrome or neurosis, 684 Krause, Feodor, 293 Krebs' cycle, 141 Kris, Ernst, 403 lacrosse

concussion risk, 124–25 lamotrigine, 390 Lashley, Karl Spencer, 401–2 late effects of CBI Auguste Deter case of Alzheimer's disease, 501

case of Chani, 496-97 categorization of phenomena, 499-501 challenges of diagnosis, 496-97 challenges to traditional disease categories, 499-501 classification of differences by degree or by kind, 501-2 defining aging, 502-7 defining Alzheimer's disease, 512-26 defining chronic traumatic encephalopathy (CTE), 526-40 defining dementia, 509-12 defining neurodegeneration, 507 - 9dementia risk, 497-98 distinguishing between normal and abnormal, 499-501 distinguishing between same and different, 499-501 efforts to mitigate deleterious effects, 543-44 future developments, 544 pediatric concussion, 665-66 possible link between TBI and later MS, 538-40 problems with the DSM system, 502 research studies needed, 542-43 risk of, 497-98 role of tau oligomers, 543-44 summary of take-home messages, 538 time-passing-related lifehistory concept of aging, 505–7 towards a rational neurological nosology, 540-42 unresolved concepts and terminology, 498-99 late effects of TBI functional neuroimaging studies, 557-59 Late Effects of Traumatic Brain Injury study methodological issues, 800-1 lateral orbitofrontal circuit (LOPFC) role in post-TBI mood disorders, 388 legal cases British system for expert witnesses, 804 collective bargaining approach for expert witnesses, 806 expert shopping by parties to litigation, 804-5 expert witnesses under the U.S. system, 804-5 history of use of expert

witnesses, 803-4

problem of biased expert witnesses in the U.S., 805 voluntary duty clause for expert witnesses, 805-6 legal implication of sport-related concussion, 127-28 Lethality of_Suicide Attempts Rating Scale, 436 leucotomy, 403 Lezak, Muriel D, 407 Life Events Checklist, 687 Life Span Study (LSS) of atomic bomb survivors, 617 linear acceleration in CBI, 139 linear no-threshold (LNT) model, 617 lithium carbonate, 390 Littré, A., 42 localizationism history of, 292–93 Lowenstein, Rudolph, 403 Luria, Alexander, 402, 404 Luria-Nebraska Neuropsychological Battery, 406-7 Lyell, Charles, 305 Maddock's questions, 648 malingering, 51-52, 55, 346, 347, 353, 354 APA diagnostic criteria, 346 levels of suspicion among doctors, 24-25 marijuana effects on post-concussive aggression, 451-52 Marshall, Lawrence F., 24 martial arts concussion risk, 124 Martland, Harrison S., 555 Massaquoi, Steve, 352 maximal axonal strain predictive value for CBI outcome, 302 mechanical forces involved in CBI, 139 medication induced headache, 735 medication overuse headache, 734, 735 MEG (magnetoencephalography), 274-77 melatonin, 757 disruption after CBI, 762 melatonin receptors single nucleotide polymorphisms (SNPs), 762 memory loss myth of missing traumatic memory, 106-7 Mendeleev, Dmitri, 500 Mesulam, M.M., 296 meta-analyses of concussion studies, 18-21 methylphenidate, 385, 389, 753

pressures on expert

witnesses, 803

Meyers, Charles, 104 Mickle, William, 422 microscope influence on investigation of concussion, 45-47 microscopy findings affected by different staining techniques, 176-78 limits in discovery of post-concussive brain change, 176-78 Migraine Disability Assessment (MIDAS) questionnaire, 738 migraine headaches, 733-35 mild misleading use in relation to **TBI**, 138 origins of association with concussion, 37 questioning its application to TBI/CBI, 77–78 mild TBI (mTBI) invention of, 54 World Health Organization definition, 84 Miles, Alexander, 46-47 Military Acute Concussion Evaluation (MACE), 673 military concussion epidemiology, 104-8 association between concussion and PTSD, 106 incidence of TBI/CBI in recent conflicts, 105-6 myth of missing traumatic memory, 106-7 rates of PTSD in those with CBI, 107-8 reasons for the CBI/PTSD link, 108 shell shock, 104 military personnel assessing current symptoms and functioning, 687-89 assessment approaches for PCS/PPCS, 689 assessment approaches for PTSD, 689 biopsychosocial conceptualization of CBI, 684-85 comorbidities of deployment-related TBI, 685-86 comorbidity of CBI and PTSD, 683 considerations for treatment and rehabilitation, 689-90 context and motivational factors influencing symptom report, 688-89 depression comorbid with TBI and PTSD, 685

More Information

diagnostic challenges of post-deployment polytrauma, 683t20.1 diagnostic considerations and challenges for CBI and psychological trauma, 686-89 distinguishing mild TBI from PTSD, 390 establishing injury events and psychological trauma exposure, 686-87 etiologies of contemporary polytrauma, 684-85 Gulf War Syndrome, 684 history of deployment-related polytrauma health concerns, 683–84 incidence of chronic pain, 686 incidence of post-deployment CBI, 683 incidence of PTSD, 683 incidence of PTSD associated with TBI, 390 overlapping symptoms across disorders, 687-88 physical comorbidities with TBI, 686 polytrauma triad (pain, PPCS and PTSD), 686 post-concussion syndrome or neurosis (World War II, Korean War), 684 Post-Deployment Health Assessment, 688 Post-Deployment Health Re-Assessment, 688 post-TBI substance abuse, 685-86 PTSD comorbid with TBI, 685 research into mTBI and PTSD, 7 results of head injuries in 20thcentury conflicts, 403-4 risk factors for persistent post-concussive symptoms, 684-85 shell shock (World War I), 684 structural brain changes in TBI and PTSD patients, 393 Mill, John Stuart, 499, 500 Miller, Henry, 351-53 Miller, Timothy, 544 Mini-Mental State examination, 511 mitochondria, 93 calcium overloading in CBI, 139 mixed, multidisciplinary interventions systematic review of research, 790-91 modafinil, 753 Modified Fatigue Impact Scale (MFIS), 748, 748t24.2 monoamine oxidase inhibitors (MAOIs), 389

Montreal Cognitive Assessment (MoCA), 511 mood disorders barriers to accurate incidence and prevalence accounting after concussion, 387 classification systems, 386 clinical presentation and diagnosis, 386 comorbidities, 386 diagnostic criteria, 386 epidemiology of traumatic emotional change, 387-88 functional impact, 386 genetic risk factors after TBI, 387 pathophysiology of post-TBI mood disorders, 388-89 possible causal factors, 386 psychosocial risk factors before and after TBI, 387 role of prefrontal circuits, 388-89 role of the lateral orbitofrontal circuit (LOPFC), 388 role of the orbitalventromedial prefrontal circuit (OVMPFC), 388 treatment, 389-90 with depressive features, 386, 387, 389 with manic, hypomanic, and mixed features, 387-88, 389-90 with manic, hypomanic, or mixed features, 386 mood stabilizers, 389-90 Morris, John, 512 Morris Water Maze, 166 Mott, Frederick, 56, 57, 104 MRS (MR spectroscopy), 266, 271-76 choline, 271 creatine, 273 glutamate and glutamine (Glx), 271 glutathione, 273 myo-inositol, 271-73 NAA (N-acetyl aspartate), 271 studies of multiple concussions, 566-67 MTHFR gene polymorphisms, 387, 434 Multidimensional Assessment of Fatigue (MAF), 748t24.2 Multidimensional Fatigue Inventory (MFI), 748 Multi-dimensional Fatigue Severity Scale, 744 multifocal effects of CBI, 34 multi-modal concussion assessment battery, 677 multiple sclerosis (MS) adolescent TBI as possible trigger for later MS, 538-40

multiple sleep latency test (MSLT), 758, 762 Munro, D., 56 musculoskeletal headache, 731 myelin basic protein (MBP) biomarker, 641 myo-inositol MR spectroscopy, 271–73 NAA (N-acetyl aspartate), 74-75 MR spectroscopy, 271 role in CBI pathophysiology, 140-43 narcolepsy, 760 NAT8L (N-acetyltransferase 8-like), 140, 141 NAT8L gene, 141 National Ambulatory Medical Care Survey (NAMCS), 98 National Athletic Trainers' Association definition of concussion, 82 National Center for PTSD, 391 National Collegiate Athletic Association (NCAA) Injury Surveillance Program, 112, 113 National Electronic Injury Surveillance System-All Injury Program, 646 National Hospital Ambulatory Medical Care Survey (NHAMCS), 98 National Hospital Discharge Survey (NHDS), 98 National Institute for Health and Clinical Excellence (NICE) guideline on CT scan after concussion, 603-5 National Institute of Neurological Disorders and Stroke (NINDS), 3, 694 National Institute on Disability and Rehabilitation Research (NIDRR), 694 National Institutes of Health Toolbox, 290 National Taiwan University Irritability Scale, 385 natural kinds, 499, 501 Natural Setting Behavior Management, 449 near-infrared spectroscopy, 277 neprilysin polymorphisms, 168 network analyses integrating structural and functional neuroimaging, 274 neuralgic head pain, 732 neuritic head pain, 732 Neurobehavioral Symptom Inventory, 385, 459, 688, 689 neuroendocrine dysfunction pituitary gland structure and function, 767

Index

neurocircuits disruption in comorbid TBI and PTSD, 463-65 neurodegeneration in animal models of concussion, 168-71 association with CBI, 72-77 classification of TBI-induced disorders, 578-79 defining, 507-9 distinguishing normal and abnormal changes, 508-9 grey matter volume reduction and functional decline, 509 grey matter volume reduction in pregnancy, 509 lack of a shared definition, 507 neuronal loss and functional decline, 509 no-new-neurons hypothesis, 509 potential candidates for defining elements, 507-8 TBI risk factor, 573 neuroendocrine dysfunction clinical consequences of hypopituitarism, 774 effects of concussion in children and adolescents, 773-72 future research, 776 natural history of hypopituitarism, 773-74 pathophysiology of pituitary trauma injury, 768 pituitary hormone deficiency after CBI, 767 pituitary hormone replacement therapies, 775-76 posterior pituitary (neurohypophysis) dysfunction, 773 prevalence of anterior pituitary dysfunction after TBI, 768–72 prevalence of post-traumatic hypopituitarism, 767-68 repetitive concussion in adults, 772 screening protocols, 774-75 neurofilament heavy (NF-H) biomarker, 640, 641 neurofilament light (NF-L) biomarker, 639, 640 neurogenesis evidence in adults, 171-73 the 'no new neurons' dogma for adults, 171-73 role in post-CBI recovery, 173-76 neuroglobin role in CBI, 139-40 neuroimaging of CBI APOE £4 carriers with TBI, 567-68

Index

neuroimaging of CBI (cont.) asking the right questions, 278-79 asymptomatic persistent brain change, 556 candidate neuroimaging biomarkers, 263-77 delayed onset persistent symptoms, 556-57 DTI (diffusion tensor imaging), 264, 265-66, 267 - 75finite element (FE) modeling, 266 FLAIR, 264t6.1 future developments in biomarkers, 278-79 hemosiderin detection, 269-75 heterogeneity of late effects of repeated CBI, 629-30 histopathology versus imaging, 263 Human Connectome Project, 264-65 hypoxic/ischemic theory of CBI, 262 improvements in technology, 263 individualized neuroimaging biomarker detection, 274-77 interest in the late effects of CBL 555-56 levels of structure within the nervous system, 265-67 limitations of CT (computed tomography), 262-63 MEG (magnetoencephalography), 274–77 MRS (MR spectroscopy), 266, 271-76 MRS studies of multiple concussions, 566-67 near-infrared spectroscopy, 277 need for a multi-modal approach, 568 need for biomarkers of brain change, 261-62 network analyses that integrate structural and functional neuroimaging, 274 network theory of CBI outcomes, 556-57 neurobiological significance of observed changes, 266-67 neurometabolic cascade, 263 new clinical paradigm of CBI, 277-78 pediatric concussion, 658-59 PET (positron emission tomography), 277 quantitative MRI, 264t6.1 repeated subconcussive trauma, 567

review of studies of late effects of TBI, 557-59 shear injury in TBI, 262-63 situation before neuroimaging was available, 260-61 SPECT (single photon emission computed tomography), 277 structural MRI, 263-75 structural neuroimaging, 263 SWI (susceptibility weighted imaging), 264t6.1 symptomatic persistent brain change, 556-57 white matter damage in TBI, 262-63 neuroinflammation CSF biomarkers, 640 neurologists ability to care for concussion survivors, 416 neurology anti-intellectualism in medicine, 803 psychological traits of neurologists, 801-2 resistance to a logical nosology, 801-2 neurometabolic cascade, 63-66, 94, 263, 762 neuronal injury CSF biomarkers, 640 neurophysiological assessment tools, 677-79 Neuropsychiatric Inventory (NPI), 445 neuropsychiatrists ability to care for concussion survivors, 416 Neuropsychiatry Inventory (NPI), 385 neuropsychological assessment need for biomarkers of brain change, 261-62 three month myth of CBI recovery, 260-61 neuropsychological testing, 675-77 limitations, 124 neuropsychologists ability to care for concussion survivors, 417-18 neuropsychology acknowledgment of the limitations of the discipline, 413-14 beginnings of professional neuropsychology, 403-4 behavioral observations during psychological testing, 414-15 care for the persistently distressed CBI patient, 415-18 changing views on the use of psychological testing, 412

comparison of brain imaging and psychological testing, 404 consequences of World War II, 402-3 damage versus dysfunction debate, 407 development of batteries of tests, 406-7 development of testing methods, 403-4 developments using virtual reality, 414 distinction between psychiatric disorders and brain disorders, 402-3 early controversies, 404-5 ethical issues, 413-14 forensic role and ethics, 413-14 future directions of the discipline, 414 historical development of the discipline, 401-12 implications of recognition of persistent distress in **CBI**, 399 influence of psychoanalysis, 403 limitations of psychological testing in concussion, 408-11 limitations of psychological testing in sports-related brain injury, 411-12 limitations of testing and imaging, 407-8 new approaches to administering stimuli, 414 observing responses, 414-15 prioritizing emotions, 415 psychological testing to identify brain damage, 402-3 question of validity of testing methods, 403-7 reinventing the field, 399-401 sports neuropsychology, 411-12 support for psychological testing in sports-related concussion, 411-12 timing of testing and imaging in CBI, 407-8 treatment and the healthcare system, 415-18 what tests to administer, 412-13 neurostimulants, 753 neurovascular coupling, 716-17 New Orleans Criteria (NOC), 600, 600t15.3 New South Wales (NSW) protocol for CT scan after concussion, 601-2

nitric oxide (NO) synthase activation in CBI, 139 nitrosative stress caused by CBI, 139-40 nitroxyl, 139 NMDA receptor binding in CBI, 139 non-cognitive behavioral complications of CBI, 384 nosology conservative approach in neurology, 801-2 illogical approach to categorization of concussion, 37 lack of consideration of individual variation, 210 lack of valid criteria for psychiatric conditions, 346 limitations which delay understanding of CBI, 802-3 towards a rational neurological nosology, 540-42 Nottebohm, Fernando, 173 NPY gene, 392 Nr4a1 gene, 145 NSE biomarker, 640, 641, 642 nuclear factor kappa B (NFkB), 762 nucleus of the solitary tract, 392 obstructive sleep apnea, 758-60 occipital neuralgia, 732 Ohio State University TBI Identification Method, 687 olanzapine, 390 oligodendrocytes, 141 Ontario Neurotrauma Foundation (ONF) guidelines on CT scan after concussion, 602 Oppenheimer, D.R., 66-67 orbital-ventromedial prefrontal circuit (OVMPFC) role in post-TBI mood disorders, 388 orbitofrontal cortex, 388 orexin, 757, 760 disruption after CBI, 762 orexin receptor blockers, 763-64 organic/psychological dichotomy of symptoms, 12-13 non-existence of, 320-28 Osler, William, 210, 291 Osnato, Michael, 3 outcome measures. See Common Data Elements (CDEs) project outcomes of CBI age-related risk for poor outcomes, 343-45 APOE genotype risks to

children, 315-18

More Information

arguments for and against APOE genotype testing, 313-18 bad outcome risk factors most commonly cited in studies, 318-19 barriers to understanding persistent post-CBI symptoms, 345-48 brain individuality in structure and function, 292-99 brain injury is not a disease, 290-91 brain-mind reciprocating trauma, 360 brain reserve hypothesis of social disadvantage, 356-57 changing conceptions of disease, 290-91 compensation issues, 348-55 difference between cause and risk factor, 291 different causal pathways to post-CBI symptoms, 328-29 drama of attribution, 348, 357-58 duration of impact, 301-2 effects of axonal stretch on AB and tau, 331-34 emergence of PTSD, 303 epigenetic influences, 306-7 evidence against localizationism, 294-99 failure to return to work, 356 female sex risk factor for poor outcomes, 337-43 finite element modeling (FEM) of CBI, 300-2 functional outcome measures, 289 gene-environment interactions, 306 gene-gene interactions, 306 gene variants which appear to influence outcome, 310-11 genetic variation in brain structure, 312 Haddon Matrix, 358-60 Head Impact Telemetry System, 300 heterogeneity of outcomes, 285-86 history of localizationism, 292-93 how brainstuff produces the different CBI symptoms, 328-29 idealized and actual recovery trajectories compared, 285-86 influence of APOE genotype, 313 influence of prior TBI(s), 329-35

influence of premorbid neuropsychiatric problems, 335-37 inheritance of acquired changes in DNA (epigenetics), 306-7 interactions between the force and individual biology, 328-29 interplay of multiple factors, 358-60 lack of a meaningful outcome measure, 11 lack of valid psychiatric nosology, 346 measures of outcomes, 289-90 non-existence of the organic/ psychological dichotomy of symptoms, 328 non-linear course of recovery, 302-5 number of alternative pathways, 290 point-of-no-return theory, 334-35 post-concussion syndrome, 292 predictive value of maximal axonal strain, 302 predictive value of the force of the impact, 299-302 problem of explaining why outcomes vary, 286-87 problems with psychological explanations, 345-48 professional concussion deniers (PCDs), 346-47 recognition that there is no single outcome, 288-89 relative change from baseline, 289-90 relative change from baseline on multiple measures, 290 response bias in symptom reporting, 345-55 risk factors for persistent problems (systematic review), 319-20 risk factors for worse outcome, 291-92 risk of later Alzheimer's disease, 329-35 risk of later chronic traumatic encephalopathy (CTE), 329-35 similar forces are followed by different effects, 290 social disadvantage risk factor for poor outcome, 355-57 straw man issue of mind/body dualism, 328 stress vulnerability genes, 312-13 symptoms at different follow-up times, 302-5 three-dimensional patterns of gene expression, 307-10

transcriptomics, 305-10 uniqueness of every concussion, 360 up- and down-regulation of genes in response to CBI, 305-10 variance related to genetic factors, 305-18 variance related to time after impact, 302-5 output brainstem nuclei, 392 oxcarbazepine, 390 oxidative stress caused by CBI, 139 OXTR gene, 306 oxytocin, 767 Paaw, Peter, 40 Page, James D., 403 Pain Disability Questionnaire (PDQ), 738 Paré, Ambroise, 39-40 Parker, Harry L., 555 paroxetine, 389 paroxysmal hemicrania, 735 pathological change definition, 540 pathophysiology of CBI altered protein degradation, 72-77 ATP/ADP ratio, 140, 141, 142, 145, 146 biological definition of CBI, 58-59 clinical implications, 147-49 competition between degenerative and regenerative pathways, 144-45 complexity and individual variation, 68-72 consequences of misleading terminology and definitions, 138 consistent findings, 59 contact forces, 139 defining CBI as a disease or a biological problem, 77 defining recovery, 78-79 derangement of glucose metabolism, 140 external force and the metabolic cascade, 138-40 from biomechanical to biochemical effects, 138-40 gene expression after CBI, 68–72 gene modulation after concussion, 144-45 goal of reducing the toll of TBI/CBI, 84 imbalance between ATP consumption and production, 140

threshold between injury and

non-injury, 334-35

Index

inertial (acceleration) forces, 139 inflammatory response, 66-68 ionic cellular derangement, 139 key issues for future studies, 149 linear acceleration, 139 measuring and monitoring postconcussive metabolic imbalance, 140-43 mechanical forces involved, 139 misleading use of the term 'mild', 77–78, 138 mitochondrial calcium overloading, 139 neurodegeneration, 72-77 neurometabolic cascade, 63–66 nitrosative stress, 139-40 oxidative stress, 139 possible causes of CBI symptoms, 138 post-concussive melee, 144-45 potential public health impact of CBI, 138 proteolysis of voltage-gated sodium channels, 139 release of neurotransmitters, 139 role of acetyl-CoA, 140, 141, 143 role of N-acetyl aspartate (NAA), 140–43 role of neuroglobin, 139-40 rotational acceleration, 139 second impact syndrome, 145-47 shear forces, 139 spectrum of axonal injuries, 59-63 stretch or strain forces, 139 temporary increase in glycolysis, 140 toxic accumulation, 72-77 transfer of mechanical forces to the brain, 139-40 vulnerability of the postconcussive brain, 145-47 window of metabolic brain vulnerability, 141-42 patient-generated barriers to understanding concussion, 212 Patient Health Questionnaire-9, 436 patients anosognosia, 216 pediatric concussion acute symptom onset and recovery, 648-49 benefits of physical activity for the brain, 666 brain changes in children with no symptoms, 646

Index

pediatric concussion (cont.) concussion safety laws and sports-specific rule changes, 662-64 differences to adult concussion, 647 difficulty of estimating true incidence, 646 imaging, 658-59 immediate assessment, 647-48 impact quantification, 664 incidence of sport-related concussion, 646 influence on cognitive development, 654-55 initial signs and symptoms, 647 initiatives to reduce risk, 666 late effects, 665-66 neurobiological tests, 657-58 office assessment and neuropsychological evaluation, 655-57 pediatric vulnerability, 648 persistent post-concussive psychiatric symptoms, 655 physical and cognitive rest, 659-62 post-concussive symptoms, 652-54 prolonged recovery, 650-52 repeat injury risk, 649–50 second impact syndrome, 650 sex differences in outcomes of sport-related concussion, 652 subconcussions, 664-65 symptom assessment, 657 peer support programs, 389 Peerless, S.J., 61 Penfield, Wilder, 295, 402 PER3 gene polymorphisms, 762 periaqueductal gray matter, 388 peroxynitrite, 139 persistent deleterious post-traumatic brain change, 535 persistent or delayed-onset encephalopathy following repeated CBI structural neuroimaging, 630–31 persistent post-concussive psychiatric problems, 384 current lack of knowledge about, 422 disorders are not unique to post-concussion, 423 influence of premorbid status, 423-25 most common problems, 425-26 occurrence where there are no cognitive problems, 422-23 pediatric patients, 655

post-concussive aggression, 442-53 post-concussive depression, 427-35 post-concussive suicidality, 435-42 premorbid personality, 423-25 review of studies, 425-26 persistent post-concussive symptoms (PPCS), 2 barriers to understanding, 345-48 controversy over, 1-2 pediatric patients, 650-52 problems with psychological explanations, 345-48 personality testing, 403 PET (positron emission tomography), 277 Petit, Jean Louis, 42 phenylketonuria (PKU), 318 Phlda1 gene, 145 phospho-tau (P-tau) biomarker, 642 phrenology, 292-93 physiatrists ability to care for concussion survivors, 416 physical therapy interventions systematic review of research, 790 Pigray, P., 42, 44 Pinel, Phillippe, 510 pituitary dysfunction biomarker for brain changes, 642 pituitary gland anterior pituitary (adenohypophysis) hormones, 767 clinical consequences of hypopituitarism, 774 effects of concussion in children and adolescents, 773-72 effects of repetitive concussion in adults, 772 natural history of hypopituitarism, 773-74 pathophysiology of trauma injury, 768 posterior pituitary (neurohypophysis) dysfunction, 773 posterior pituitary (neurohypophysis) hormones, 767 prevalence of anterior pituitary dysfunction after TBI, 768–72 prevalence of post-traumatic hypopituitarism, 767-68 screening protocols for hypopituitarism, 774-75 structure and function, 767 pituitary hormones clinical consequences of deficiencies, 767-68

deficiency after CBI, 767 hormone replacement therapies, 775-76 Plato, 499 polypathology after TBI, 578 polypathy labeled as CTE, 527 polytrauma triad (pain, PPCS and PTSD), 686 Porsolt test, 181 Portland Digit Recognition Test (PDRT), 351 positivism in medicine, 35 Post-Concussion Scale (PC Scale), 653 Post-Concussion Symptom Inventory (PCSI), 654, 657 Post-Concussion Symptom Scale (PCSS), 657 post-concussion syndrome, 210, 292, 320 lack of evidence for, 383-84 post-concussion syndrome or neurosis (World War II, Korean War), 684 post-concussive aggression, 442-53 abnormal threat response, 447-48 agitation, 444 anger, 444 cannabinoid intervention, 451-52 causes, 446-49 defining aggression, 442-43 detection and measurement, 444-46 effects of marijuana, 451-52 epidemiology, 446 intermittent explosive disorder (IED), 444 irritability, 444, 446 kindling hypothesis, 448-49 link between TBI and imprisonment, 442 management approaches, 449-52 management recommendations, 452-53 non-pharmacological management, 449-50 pharmacological management, 450-52 range of terms and concepts used to describe, 443-44 risk factors, 446-47 post-concussive depression, 427-35 causes, 430-32 definition of depression, 427 detection and measurement, 427-28 epidemiology, 428–30 functional findings, 431-32 management approaches, 432-34

management recommendations, 434 - 35non-pharmacological approaches, 432-33 pharmacological approaches, 433-34 risk factors, 430-32 structural findings, 431 post-concussive headache approach to assessment and treatment, 739 classification systems, 728 classification systems for post-traumatic headache, 730 clinical testing, 736 evaluation, 735-36 future research directions, 739 guidelines, 729 impairment rating, 738-39 inconsistent nomenclature and definitions, 728 management, 736-37 neurobiology, 729-30 neuroimaging, 736 neuromedical management, 736-37 pathoetiologies, 728, 729-30 patient history, 735 physical examination, 735-36 prognosis, 738 psychological management, 737 psychological testing, 736 rehabilitative management, 736-37 risk factors, 728 variants, 728 post-concussive PTSD-type distress case of Reema, 453, 458 causes, 461-65 challenging PTSD as a diagnostic entity, 453-57 detection and measurement challenges, 458-59 disruption of neurocircuits, 463-65 effect of an amnestic interval, 457-58 epidemiology, 459-61 Eye Movement Desensitization and Reprocessing (EMDR), 469-71 genetic factors, 461-63 imaging, 465-67 management approaches, 467-71 management recommendations, 471-73 neurobiology, 467 non-pharmacological management, 468-71 pharmacological management, 471

More Information

PTSD-associated symptoms, 457 questions relating to, 453 post-concussive suicidality, 435-42 anatomical and physiological correlates, 441-42 barriers to confidence in published conclusions, 435-36 detection and diagnosis, 436 epidemiology, 436-39 factors associated with suicide, 435-36 long-term follow-up of brain-injured Finnish soldiers, 435 management, 442 nature of self-destructive behavior, 435 risk factors, 440-41 risk in persons with PTSD, 439-40 post-concussive symptoms, 383-84 pediatric patients, 652-54 professional concussion deniers (PCDs), 346-47 response bias in symptom reporting, 345-55 post-traumatic amnesia significance of, 292 Posttraumatic Checklist (PCL), 459 post-traumatic cluster headache, 735 Posttraumatic Diagnostic Scale, 459 post-traumatic headache, 728 classification systems, 730 headache subtypes, 730-35 post-traumatic headache (PTHA), 728 post-traumatic migraine, 733-35 Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5), 459 Pott, Percival, 36, 43 Pourfour du Petit, Francious, 42 prazosin, 763 prefrontal circuits disruption by TBI and CBI, 384 role in post-TBI mood disorders, 388-89 prefrontal cortex role in emotional regulation, 384 structural changes in PTSD patients, 392-93 pregnancy grey matter volume reduction, 509 pre-morbid neuropsychiatric problems influence on CBI outcomes, 335-37 Princip, Gavrilo, 51

prion protein (PrP^c), 170-71 prion protein (PrP^{sc}), 170 processing bodies (PBs), 171 professional concussion deniers (PCDs), 346-47 progesterone, 305 prognosis for mTBI World Health Organization view, 14 prolactin, 767 deficiency symptoms, 768t26.1 Prolonged Exposure Therapy (PE), 468, 469 propranolol, 385 proton Magnetic Resonance Spectroscopy (1HMRS), 74-75, 142, 147 psychiatrists ability to care for concussion survivors, 416 psychoanalysis influence on neuropsychology, 403 psychoeducational programs, 449 psychosocial risk factors for mood disorders associated with TBI, 387 psychotherapy systematic review of research, 788-89 PTGS2 gene, 144 PTSD (post-traumatic stress disorder), 383 amnesia for the traumatic event, 391 association with concussion in military personnel, 106 changes in the autonomic nervous system (ANS), 392 changes in the HPA axis, 392 childhood abuse risk factor, 391 definition, 390-91 distinguishing from mild TBI, 390 DSM-5 classification of symptom clusters, 390-91 DSM-5 diagnostic criteria, 391 emergence after CBI, 303 epidemiology of PTSD following TBI, 391 functional studies, 393 genetic risk factors, 392 hormonal risk factors, 391-92 incidence among military personnel with TBI, 390 incidence following TBI, 391 influence of physical injury on PTSD risk, 392 management of mTBI plus PTSD nightmares, 763 myth of missing traumatic memory, 106-7

overlap of symptoms with TBI, 390 pathophysiology, 392 phenomenological presentation, 390-91 rates in military personnel with CBI, 107-8 reasons for the CBI/PTSD link, 108 response to aversive and safety cues, 392 risk factors, 391-92 risk of post-concussive suicidality, 439-40 structural brain changes overlap with TBI, 392-93 treatment, 393-94 type of stressors associated with, 390 PTSD Checklist for DSM-5, 391, 688 PTSD Symptom Scale-Interview Version, 459 PTSD-type post-concussive distress case of Reema, 453, 458 causes, 461-65 challenging PTSD as a diagnostic entity, 453-57 detection and measurement challenges, 458-59 disruption of neurocircuits, 463-65 effect of an amnestic interval, 457-58 epidemiology, 459-61 Eye Movement Desensitization and Reprocessing (EMDR), 469-71 genetic factors, 461-63 imaging, 465–67 management approaches, 467-71 management recommendations, 471-73 neurobiology, 467 non-pharmacological management, 468-71 pharmacological management, 471 PTSD-associated symptoms, 457 questions relating to, 453 Pudenz, R.H., 60 punch-drunk syndrome, 529, 639 quantitative MRI, 264t6.1 quetiapine, 385 race/ethnicity and CBI risk, 102 Radial Arm Maze, 166

Rakic, Pasco, 173

Rancho Los Amigos Scale of

Cognitive Levels, 444

ramelteon, 763

enrichment, 306 rehabilitation psychologists ability to care for concussion survivors, 417 Reitan, Ralph, 403, 406 Rennie, Drummond, 15 repeated concussions functional neuroimaging, 560-63 heterogeneity of late effects, 629-30 injury risk in pediatric patients, 649-50 investigating the later effects, 527-29 MRS studies, 566-67 range of brain rattlings defined by, 527-29 relationship to tauopathy, 534 risk of tauopathy, 534-35 sport-related risk, 113 structural neuroimaging of persistent or delayed-onset encephalopathy, 630-31 vulnerability of the postconcussive brain, 145-47 window of metabolic brain vulnerability, 141-42 repeated subconcussive trauma neuroimaging, 567 research anti-intellectualism in medicine, 803 ethical restraints on concussion research, 213-16 funding for CBI/TBI research, 4-5 insufficient empirical investigation, 3-10 lack of a meaningful outcome measure, 11 methodology of the Late Effects of Traumatic Brain Injury study, 800-1 need for prospective longitudinal studies of concussion, 10, 129, 800 - 1

Index

Rank, Otto, 403

recovery

rehabilitation

reactive nitrogen species (RNS)

generation in CBI, 139-40

reactive oxygen species

rebound headache, 734

(ROS), 93

generation in CBI, 139

defining for CBI, 78-79

inability to define and

confirm, 212

network theory, 556-57

role of environmental

may actually be behavioral

three-month myth, 260-61

adaptation, 248-49

Index

research (cont.) pressing research issues, 8-10 TBI reseach initiatives in the 21st century, 6 uncertainties which delay understanding of CBI, 802-3 response bias in CBI symptom reporting, 345-55 reticular activating system (RAS), 757 retractions bulbs of Cajal, 61 Rewcastle,, N.B., 61 Rey Auditory Verbal Learning Test (RAVLT, Rey), 409 Rey-Osterrieth Complex Figure Test, 21-22 Rhazes, 39 ribonucleoprotein (RNP) granules, 171-72 Richardson, Natasha, 96 Risk of Suicide Questionnaire, 436 risperidone, 390 Rivermead Post-concussion Symptoms Questionnaire (RPSQ), 217, 289, 290, 445, 653, 744 Rock1 gene, 145 rodeo concussion risk, 125-26 Rorschach Inkblot Test, 402, 403 Rotarod test, 166 rotational acceleration in CBI, 139 rugby concussion risk, 126 Russel, Colin, 55-56 Russell, W.R., 56-58 S100B biomarker, 640, 641, 642 Sachs, Hans, 403 Scandinavian Neurotrauma Committee (SNC) CT protocol, 602-4 Schaller, Walter, 51 Scottish Intercollegiate Guides Network (SIGN) guideline on CT scan after concussion, 601 second impact syndrome, 103, 113, 145-47, 537 pediatric patients, 650 selective serotonin reuptake inhibitors (SSRIs), 385, 389 Sensory Organization Test (SOT), 676 serotonin-norepinephrine reuptake inhibitors, 389 serotonin transporter (5HTT) polymorphisms, 387 sertraline, 385, 389 serum neurofilament light (NFL)

sport-related concussion risk, 112-13 sex differences in CBI outcome differences observed in concussed brains, 341 hysteria explanation, 338 pediatric sport-related concussion, 652 risk factors, 337-43 sexual dimorphism in heads and brains, 338-40 vulnerable phase of the female menstrual cycle, 342-43 Sh3glb1 gene, 145 shear forces in CBI, 139 shear injury in TBI, 262-63 Shelden, C.H., 60 shell shock (World War I), 50-52, 53, 104, 684 single nucleotide polymorphisms (SNPs), 306, 461 Skae, F.M.T., 47 skateboarding concussion risk, 126 skiing concussion risk, 126 SLC6A4L gene, 392 sleep disorders after CBI atypical post-CBI sleep disorders, 758-60 changes in sleep architecture, 757-58 circadian rhythm, 757 clinical problems associated with, 761 control and regulation of sleep, 757 cytokines and sleep, 762 distinction from postconcussive fatigue, 756 genetic factors, 761–62 homeostatic sleep drive, 757 hypersomnia, 758 hypnagogic/hypnopompic hallucinations, 760 importance of sleep for CBI recovery, 756 management, 762-63 management alternatives, 763-64 management of mTBI plus PTSD nightmares, 763 melatonin and orexin disruption, 762 narcolepsy, 760 neurometabolic cascade, 762 normal sleep cycle, 757 obstructive sleep apnea, 758-60 pathophysiology, 760-61 prevalence, 758 quality of life impacts, 756-57 range of sleep disorders, 756 REM and NREM sleep, 757 role of the autonomic nervous system, 757 sleep hygiene, 750-51 sleep paralysis, 760

Smeaton, John, 803 snowboarding concussion risk, 126 soccer concussion risk, 126-28 effects of deliberate heading of the ball, 126-28 social disadvantage brain reserve hypothesis, 356-57 component risk factors, 355 failure to return to work, 356 inequality, 355 low education level, 356 low occupational status, 355 low social standing, 356 lower socio-economic status (SES), 356 minority status, 355-56 neurobiology of, 356-57 poor social support, 356 poverty, 355 race, 355-56 risk factor for poor outcome in CBI, 355-57 underlying mechanisms of social stress, 355-56 unmarried status, 355, 356 why it is associated with worse outcome for CBI, 356-57 social support role in human CBI recovery, 167 Society for Behavioral and Cognitive Neurology, 416 somatic symptoms disorder (SSD), DSM-5, 347 somatoform disorders, 346 SPECT (single photon emission computed tomography, 277 spectrin breakdown products (SBDPs) biomarkers, 641 aII-spectrin breakdown products (SBDPs), 641 Spencer, Herbert, 295 Sport Concussion Assessment Tool - 3rd edition (SCAT-3), 675 sport-related concussion activity-related differences in risk, 113 age-related risk factors, 111-12 all-terrain vehicle riding, 114 annual rates of concussions in sports, 111 approach to diagnosis, 672 awareness and responsibility for long-term damage caused, 315-18 Balance Error Scoring System (BESS), 673-75 barriers to epidemiological knowledge, 109-10 baseball, 114 basketball, 114

bicycling, 114-18 boxing, 118 cheerleading, 118 clinical and laboratory tools, 675 Common Data Elements (CDEs) outcome measures, 696 diffusion tensor imaging (DTI), 678-79 electroencephalography (EEG), 678 equestrian sports, 118-19 event-related potentials (ERPs), 678 football (American style), 119-23 functional MRI (fMRI), 678-79 gait measures, 672 genetic susceptibility in children, 315-18 Head Health Initiative, 7 ice hockey, 123-24 implications of exposing children to likely brain injury, 127-28 incidence in pediatric patients, 646 karate, 124 lack of recognition of the problem of brain injury, 108–9 lacrosse, 124-25 late effects of pediatric concussion, 665-66 legal implication, 127-28 limitations of neuropsychological testing, 124 martial arts, 124 Military Acute Concussion Evaluation (MACE), 673 multi-modal concussion assessment battery, 677 neurophysiological assessment tools, 677-79 neuropsychological testing, 675-77 on-field evaluation, 672 pressures on athletes not to report concussion and symptoms, 25-26 rate of CBI incidence in various sports, 113-17 rate of CBI recurrence in various sports, 113-17 relative incidence in various sports, 113-14 repeat-until-demented cycle, 104 risk of recurrence, 103-4 risk of recurrent concussions, 113 risks associated with APOE genotype, 315-18 rodeo, 125–26 rugby, 126

assays, 218

risk of CBI, 101-2

sex differences

More Information

second impact syndrome, 103, 113 Sensory Organization Test (SOT), 676 sex differences in outcomes in pediatric patients, 652 sex differences in risk, 112-13 sideline tools, 672-75 skateboarding, 126 skiing, 126 snowboarding, 126 soccer, 126-28 Sport Concussion Assessment Tool - 3rd edition (SCAT-3), 675 sports participation rates, 110–11 Standardized Assessment of Concussion (SAC), 673 summary of assessment tooİs, 679–80 symptom checklists, 672-73 taekwondo, 124 virtual reality (VR) testing environment, 676-77 why prevalence of brain injury may never be known, 128-29 wrestling, 127 Sports Concussion Assessment Tool (SCAT), 647-48,657 sports neuropsychology, 411-12 Sports Neuropsychology Society, 411 Standardized Assessment of Concussion (SAC), 653, 657,673 straw man issue of mind/body dualism, 328 stress granules (SGs), 171 Stress Inoculation Training (SIT), 449, 469 stress vulnerability genes, 312-13 Stressful Life Events Screening Questionnaire, 459 stretch or strain forces in CBI, 139 striatum, 388, 389 Strich, Sabrina, 50, 60-61, 262 structural MRI, 263-75 range of techniques, 264 structural neuroimaging, 263 future technologies, 633-35 near-future technologies, 632-33 persistent or delayed-onset encephalopathy following repeated CBI, 630-31 potential contributions to TBI management, 635 present technologies, 631-32 Structured Interview for TBI Diagnosis, 687, 689 Stuss, DT, 406 subconcussions, 65, 528 functional neuroimaging, 564-65

neuroimaging of repeated subconcussive trauma, 567 pediatric patients, 664-65 substance use in TBI patients, 751 Suicidal Behaviors Questionnaire-Revised, 436 Suicide Ideation Questionnaire, 436 suprachiasmatic nucleus (SCN), 757 suvorexant, 764 SWI (susceptibility weighted imaging), 264t6.1 Swiss Watch Theory of Behavioral Neurology, 22, 292-93, 296, 402 Symbol Digit Modalities Task (mŠDMT), 746 Symonds, Charles, 55, 56, 154, 212, 249, 328 symptom checklists, 672-73 symptoms assessment of pediatric patients, 657 denial, 346 imaginary/intentional dichotomy, 13-14 misplaced faith in a dated trichotomy, 11-14 organic/psychological dichotomy, 12-13 pressures on athletes not to report, 25-26 under-reporting, 353 syndrome of inappropriate antidiuresis (SIAD), 773 T-maze, 166 T-tau biomarker, 640 taekwondo concussion risk, 124 tau disruption by axonal stretch in TBI, 332-34 hyperphosphorylation and aggregation, 639 pathology after TBI, 576-78 role in neurodegeneration, 168 - 71as a serum biomarker, 642 tau oligomers efforts to mitigate late effects in CBI, 543-44 role in late effects of CBI, 543-44 tauopathy in CTE, 527 inflammatory hypothesis of development, 536 relationship to repeated CBI, 534 risk in persons exposed to repeated concussions, 534-35 role in CTE, 530-32

development, 536 vascular hypothesis of development, 536 TBI Identification Clinical Interview, 687 TBI Quality of Life (TBI-QOL) Fatigue Short Form, 748t24.2 TDP-43 biomarker, 642 TDP-43 proteinopathies, 537-38 Tedeschi, C.G., 59-60 Tef gene, 762 temporomandibular joint dysfunction (TMJD) headache caused by, 731 tension-type headache, 732-33 testosterone replacement therapy, 776 Teuber, Hans-Lucas, 3 thalamus, 179, 388 Thematic Apperception Test (TAT), 403 third occipital nerve headache, 732 threat response abnormal response following TBI, 447–48 three-month myth, 210–12 thyroid stimulating hormone (TSH), 767 deficiency symptoms, 768t26.1 deficiency treatment, 776 time after impact of CBI outcome variance related to, 302–5 Trail Making tests, 405 transcriptomics, 305-10 Transforming Research and Clinical Knowledge in TBI (TRACK-TBI), 710 trauma-triggered migraine, 734-35 traumatic brain injury (TBI) distinguishing mild TBI from PTSD, 390 overlap of symptoms with PTSD, 390 structural brain changes overlap with PTSD, 392-93 Traumatic Brain Injury Act, 6, 7 traumatic encephalopathy classification of TBI-induced neurodegenerative disorders, 578-79 etiologies, 582 features of, 582 lack of clinical diagnostic criteria, 582 neuropathology, 582 origin of the term, 582 original meaning of the term, 526-27 terms used to describe, 582 traumatic encephalopathy review approach to review of published cases, 582

seeding hypothesis of

Index

challenges to discovery of diagnostic criteria, 585–91 lack of clinical diagnostic criteria, 582 limitations of the review process, 585-91 method, 583 provisional research diagnostic criteria, 585 results, 583-85 Traumatic Life Events Questionnaire, 687 treatment after mTBI appropriate interventions, 780 mTBI as a diagnostic construct, 780-81 post-concussive symptoms, 781 treatment-seeking CBI patients, 781 treatment of CBI acute and sub-acute management, 793-94 balancing rest versus activity, 794-95 fatigue management, 794-95 guiding principles for clinical practice, 793-96 neurobiology as a guiding principle, 794 post-acute assessment, 794 prioritizing and treating comorbidities, 795 tailoring subsequent treatment to the individual, 795-96 treatment research systematic review, 781-82 challenge to define evidence-based rehabilitation interventions, 791-93 clarifying the construct, 793 clinical question, 782 cognitive rehabilitation, 783-88 determination of practice recommendations, 783 discussion, 791-93 early brief interventions, 791 early single session interventions, 791 exercise interventions, 789-90 guiding principles for clinical practice, 793-96 heterogeneity of the CBI population, 793 inclusion/exclusion criteria, 782-83 lack of consistent outcome measures, 792 methodology, 782 mixed, multidisciplinary interventions, 790-91

Index

treatment research systematic review (cont.) physical therapy interventions, 790 psychotherapy, 788-89 results, 783-91 sampling subpopulations, 793 search strategy, 782 sensitivity of assessment measures, 792-93 study quality evaluation, 783 tricyclic antidepressants (TCAs), 389 Trotter, Wilfred Batten Lewis, 53-54, 55, 57, 58 Tsc22d3 gene, 145 tumor necrosis factor (TNF), 762 twin studies differences in the brains of MZ twins, 294-95 U.S. Centers for Disease

Control, 95 CDC Blue Book, 97 definition of concussion, 83 ubiquitin C-terminal hydrolase-L1 (UHCL1) biomarker, 641 United Council for Neurologic Subspecialties (UCNS), 416 unreported cases of CBI, 96 estimates of numbers, 100 valproate, 385, 390 van Leeuwenhoek. Anton, 45 variable number tandem repeats (VNTRs), 306, 461 Vdac1 gene, 145 Vegfa gene, 145 ventrolateral prefrontal cortex, 388 ventromedial prefrontal cortex, 179 Veterans Administration/ Department of Defense

(VA/DoD)

guideline on CT scan after

concussion, 601

Vietnam Head Injury Study, 6

virtual reality (VR) testing environment, 676-77 Visual Analogue Scale for Fatigue (VAS-F), 748 Wailoo, Keith, 25 Wallace, Alfred Russell, 305 war neurasthenia (World War I), 684 war neurosis (World War I), 684 water consumption dysregulation after TBI, 751 Wechsler, David, 403 Weight Drop Acceleration Injury Model (WDAI), 160-61 Wernicke, Carl, 293, 296, 401 Western medicine approach to concussion assessment, 210-12 white matter assessing damage in TBI, 262-63 spectrum of axonal injuries in CBI, 59-63 Willis, Thomas

brains mediate mental functions (1664), 209, 328 Witkowski, L., 46 workers' injury compensation schemes effects on views of concussion, 47-49 World Health Organization, 95, 96, 98 definition of mTBI, 84 prognosis for mTBI, 14 World War I blast injury victims, 53 head injury casualties, 50–52 shell shock, 50-52, 53, 104,684 World War II post-concussion syndrome or neurosis, 684 wrestling concussion risk, 127 Wundt, Wilhelm, 401

Zangwill, Oliver, 403–4 ziprasidone, 390