

frequency and intensity. Many other veterans experience subclinical PTSD symptoms after war-zone service, sometimes termed posttraumatic stress (PTS) or combat stress. These subclinical symptoms can contribute to distress and affect health, even if overall functioning is not as impaired as in the full disorder.

The definition of PTSD was modified in the fifth edition of the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders* (2013), although most individuals who had PTSD diagnosed according to the previous criteria also meet the definition under the new criteria. PTSD is defined as persistent (>1 month) symptoms occurring after a traumatic event (involving exposure to actual or threatened death, serious injury, or sexual assault). The symptoms must be associated with significant distress or impairment in social or occupational functioning. Symptoms are grouped into four categories: (1) intrusion/reexperiencing symptoms in which the person has nightmares, flashbacks, or intrusive (often involuntary) memories connected with the traumatic event; (2) avoidance symptoms where the person avoids distressing memories or people, places, situations, or other stimuli that serve as reminders of the traumatic event (for example, a crowded mall that triggers heightened alertness to threat); (3) negative alterations of cognitions or mood (for example, feeling detached or losing interest in things that previously brought enjoyment); and (4) hyperarousal symptoms in which the person is physiologically revved up, hyperalert, startles easily, and experiences sleep disturbance, anger, and/or concentration problems. Although PTSD is a clinical symptom-based case definition, it is best to think of PTSD not as an emotional or psychological/psychiatric condition, but rather as a physiologically-based response to life-threatening trauma that is associated with physical, cognitive, emotional, and psychological symptoms.

PTSD has strong biologic correlates, based in fear-conditioning responses to threat and responses to extreme stress involving neuroendocrine dysregulation and ANS reactivity. Numerous studies have shown that PTSD is highly correlated with generalized physical and cognitive symptoms—including hypertension, chronic pain, and cardiovascular disease—as well as cell-mediated immune dysfunction and shortened life expectancy. PTSD is frequently comorbid with other mental disorders such as major depressive disorder, generalized anxiety, substance use disorders, and risky behaviors (e.g., aggression, accidents); it has been estimated that up to 80% of patients with PTSD exhibit one or more comorbid conditions. Misuse of alcohol or substances is most prevalent, often reflecting self-medication. PTSD is also associated with tolerance and withdrawal symptoms related to prescription pain and sleep medications, as well as nicotine dependence (Chap. 470).

Clinicians should understand how to provide meaningful psychological education in a way that resonates with veterans who may have PTSD symptoms as a result of their military service. There is an important occupational context to consider, which is also applicable to trauma exposures that occur in other first responder professions, such as law enforcement officers and firefighters. Service members and other first responders are trained to respond to traumatic events and effectively learn to override automatic fight-or-flight reflexes in order to carry out their duties. Reactions that are labeled as symptoms of PTSD are based on adaptive survival responses that are beneficial in a combat environment. For example, physiologic hyperarousal, use of anger, and being able to shut down other emotions are very useful skills in combat and can be present even prior to traumatic events during tough realistic training. It is natural for these responses to persist after returning home, and the label of a “disorder” only gets applied when the responses that persist significantly impair functioning.

CONCUSSION/mTBI

TBI (Chap. 457e) gained increased recognition during the conflicts in Iraq and Afghanistan because of the widespread exposure of troops to improvised explosive devices. Many veterans of Iraq and Afghanistan reported experiencing multiple concussions during deployments, and many also reported ignoring concussions and not seeking treatment

at the time of injury in order to remain with their unit. However, these legitimate concerns were also counterbalanced and challenged by high prevalence estimates of deployment-related TBI that did not distinguish concussion/mTBI from moderate or severe TBI; data from animal models of blast exposure that did not necessarily extrapolate to human experiences on the battlefield; neuroimaging studies (e.g., diffusion tensor imaging) that attributed putative abnormalities to blast exposure but lacked adequate control comparisons; and fear-provoking speculation that repetitive blast exposure may lead to future dementia, based largely on case series of professional athletes (e.g., boxers, football players) exposed to highly repetitive injuries linked to chronic traumatic encephalopathy (previously termed *dementia pugilistica*) (Chap. 444e).

TBI includes closed and penetrating head injuries; closed head injuries are categorized as mild (mTBI or concussion), moderate, or severe based on the duration of loss of consciousness, duration of posttraumatic amnesia, and the Glasgow coma score (GCS) (see Table 457e-2). Several studies have estimated that 10–20% of all military personnel deployed to Iraq or Afghanistan sustained one or more concussion/mTBI events during deployment, most commonly from exposure to blasts; however, concussion injuries are also common in nondeployed environments from sports, training (e.g., hand-to-hand combatives), and accidents.

Although there is a neurophysiologic continuum of injury, there are stark clinical and epidemiologic distinctions between concussion/mTBI and moderate or severe TBI (Table 471e-1). Concussion/mTBI is defined as a blow or jolt to the head that results in brief loss of consciousness (LOC) for <30 min (most commonly, only a few seconds to minutes), posttraumatic amnesia (PTA) of <24 h (most commonly <1 h), or transient alteration in consciousness (AOC) without LOC. The majority of concussions in Iraq or Afghanistan involved AOC without LOC or PTA (which soldiers may refer to as getting their “bell rung”). GCSs in concussion/mTBI are usually normal (15 out of 15). Concussion is treated with rest to allow the brain time to heal, and

TABLE 471e-1 COMPARISON BETWEEN CONCUSSION/MILD TRAUMATIC BRAIN INJURY (TBI) AND MODERATE/SEVERE TBI

	Mild TBI (concussion)	Moderate/Severe TBI
Clinical case definition		
Loss of consciousness	<30 min (usually a few seconds to minutes)	≥30 min to indefinite
Altered consciousness	<24 h (usually <30 min)	≥24 h to indefinite
Posttraumatic amnesia	<24 h (usually <30 min)	≥24 h to indefinite
Glasgow coma score	13–15 (usually 15)	As low as 3
Focal neurologic signs	None or transient	Frequently present
Traditional neuroimaging (CT/MRI)	Usually negative	Diagnostic
Clinical usefulness of neurocognitive testing after acute injury period	Usually inconclusive	Essential and valuable
Neuronal cell damage	Metabolic/ionic processes associated with axonal swelling, which can lead to disconnection	Direct injury effects plus metabolic/ionic effects
Sequelae, natural history, and recovery	Full recovery expected in majority of individuals; no consensus on natural history; the percentage who develop persistent symptoms is debated	Based directly on injury characteristics; may be severely disabling
Predictors of persistent postconcussive symptoms or disability	Intensely debated; risk factors found to be most predictive include psychiatric conditions (e.g., depression, PTSD) and negative expectations	Not debated; predictors are directly related to injury severity and clinical progress with rehabilitation treatment

Abbreviations: CT, computed tomography; MRI, magnetic resonance imaging; PTSD, post-traumatic stress disorder.