Military Neuropsychology
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To our heroes: the sailors, marines, soldiers, and airmen who are fighting this war.

—Carrie H. Kennedy and Jeffrey L. Moore
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As interest in clinical neuropsychology has grown and become a recognized subspecialty, so too have the unique contributions of clinicians and researchers practicing within the Departments of Defense and Veterans Affairs. Today’s war has propelled the field of neuropsychology in general and military neuropsychology in particular given what are being called the signature injuries, namely mild traumatic brain injury and posttraumatic stress disorder. The demand for neuropsychological expertise has never been so great, in traditional hospital and clinic settings as well as on the battlefield.

Within the military, neuropsychologists contribute to such important components of military medicine as fitness and suitability determinations, acute evaluations, postdeployment evaluations, rehabilitation, disability determinations, and consultation to commands, to name but a few. These evaluations and the knowledge to provide consultation to commands require significant expertise and informed decision making, though no single resource had yet been produced in which to find this information. As is so often the case, it was our own need for such a volume that resulted in this work. It is our intention that Military Neuropsychology will provide a necessary resource for those who are treating and making life-changing career and medical decisions for our warriors. Whether the neuropsychologist or psychologist is consulting because of an acute concussion after an IED blast, writing a medical board report that will help determine long-term medical and financial benefits, or assessing the cognitive decrements of a given unit in the field due to recent sleep patterns, our service personnel demand and deserve the best professional expertise we have to offer.

Such a text required an edited volume due to the scope of the project and in recognition of the vast expertise of the authors who participated. Each author was selected in recognition of their clinical expertise, their documented record of research in the specific topic area, and/or their
recognized status as subject matter experts. Thus, each author has an appreciation of how best to integrate lessons learned from the nonmilitary setting with the practical problems of applying that knowledge to military clinical and operational settings. It is our hope that you will be able to use this information in your daily work to provide the very best services to our service members.

Carrie H. Kennedy
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Pensacola, Florida
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We would like to express our gratitude to everyone who has contributed to making *Military Neuropsychology* a reality. First and foremost we are indebted to the outstanding group of professionals who contributed the chapters for this book. Not only did the quality of their work meet or exceed our expectations, but their adherence to the time schedule and their willingness to accept editorial guidance made the process flow smoothly. Next we would like to thank our very supportive editorial staff: our original editor Phil Laughlin, and Kerry Vegliando, Jennifer Perillo, and Nancy Hale who saw it through. Not only would we have been unable to complete this effort without their assistance but the process would not have been as gratifying.

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Military Neuropsychology
“When the United States declared war on Germany on April 6, 1917, the psychologists undertook at once to promote the useful application of psychology within the armed forces” (Boring, 1945, p. 12). The United States was at a significant disadvantage to Germany, which already had a pool of well-trained and well-assigned warfighters, due to Germany’s policy of compulsory service (Terman, 1918). Terman described the problem presented to the United States:

Contrast this situation with that in an American cantonment receiving each month perhaps twenty thousand men, from all walks of life, with every kind of training and experience, of all degrees of ability, and alike only in their universal ignorance of the science and art of modern warfare. Such a body of men is not an army; it is only the raw material for an army. It will only become an efficient army in proportion as each man is assigned to the kind of duty for which he is best fitted, and is trained in the performance of that duty. As long as it remains but an assembled horde, it could easily be vanquished by a trained army of a twentieth its size. (Terman, 1918, p. 177)

The president of the American Psychological Association (APA), Robert Yerkes, set aside all other tasks in order to prepare for the war
(Kevles, 1968), and in an environment of some disagreement amongst the testing movement pioneers, the war provided a singular purpose and united the efforts of Yerkes and fellow psychologists Lewis M. Terman, Edward L. Thorndike, and Walter Dill Scott (von Mayrhauser, 1992; see also Kevles, 1968). The resulting creation of the intelligence tests, the Army alpha and beta, used to screen 1.75 million men (Zeidner & Drucker, 1988), and the validation of their statistical properties have been described as “the profession's most influential contribution to American society” (von Mayrhauser, 1992, p. 252).

The creation of the alpha and beta would have significant consequences for the psychology profession. With regard to psychological testing, the Army tests were transformed into the individual intelligence tests of today by David Wechsler, who worked at an Army camp scoring alpha administrations, initially under the supervision of Edwin G. Boring (Boake, 2002). While verbal instructions no longer begin with “Attention!” subtests and even individual test items continue to be used from the Army alpha in current versions of the Wechsler Adult Intelligence Scale and the Wechsler Memory Scale (Bronner, Healy, Lowe, & Shimberg, 1929; Wechsler, 1997a; Wechsler, 1997b; Wechsler, 2008; Yoakum & Yerkes, 1920). The beta examination continues to serve as a nonverbal ability measure for persons with limited English and literacy skills (Kellogg & Morton, 1999).

Along with the successful creation of the Army alpha and beta, and the subsequent development of the Army Performance Scale for individual testing (Bronner et al., 1929; Yoakum & Yerkes, 1920), came the commission of Yerkes as a major in the Army, setting the precedent for active duty psychologists (Kennedy & McNeil, 2006). During World War I, 132 psychologists were commissioned (Zeidner & Drucker, 1988) at a time when there were 336 members of the fledgling APA (Driskell & Olmstead, 1989). As officers, the skills of psychologists in the military were applied not only to the psychological examination of the intelligence of recruits, the selection of men for special assignments, and occupational placement based on specific aptitudes (e.g., Personnel Research Section, 1943), but also to the reeducation of men incapacitated for further military service (Baldwin, 1919).

Another development of World War I had a considerable impact on modern clinical psychology. Robert S. Woodworth created the first personality test geared toward assessing neurotic tendencies in order to screen draftees. His adjustment inventory consisted of 100 questions. “Normals” (i.e., college students) reported 10 symptoms on average,
shell-shock cases, 30, and hysterics, 40 (Woodworth, 1919). This inventory and like tests have evolved over time and now constitute integral parts of both traditional psychological and neuropsychological assessment batteries.

Unfortunately, at the end of the war “the psychologists went back to their universities, the research stopped and the accepted procedures remained about where they were” (Boring, 1945, p. 14). Yerkes in particular was frustrated with the decision to end the involvement of psychologists as soon as the war was over and felt that if the work had been allowed to continue, the country would have been better prepared to meet the demands of World War II (Kevles, 1968). Despite the temporary hiatus of psychologists working within the military, there was significant impact. Recruiters continued to administer tests to some enlistees, schools implemented widespread intellectual testing; aptitude tests started being used for entrance into college; businesses became interested in personnel testing; and the practical value of psychological science was made evident to the military (Driskell & Olmstead, 1989; Kevles, 1968).

THE BIRTH OF CLINICAL MILITARY PSYCHOLOGY AND MODERN NEUROPSYCHOLOGICAL ASSESSMENT

Psychologists in World War II picked up where those in World War I had to stop. At one point in the war, the military was able to use “seven classification tests, eleven aptitude tests, thirteen educational achievement examinations and five trade knowledge tests” (Boring, 1945, p. 17) that were developed by psychologists. The Army General Classification Test, which replaced the Army alpha and beta tests (Driskell & Olmstead, 1989), was taken by 12 million men (Harrell, 1992), and brief intellectual screening instruments were developed at a rapid pace (Hunt & Stevenson, 1946). The Minnesota Multiphasic Personality Inventory (MMPI) made its debut during World War II and was used experimentally for selection based on personality factors by the Army (Page, 1996).

Other tests made their way into the mainstream where they remain as valuable neuropsychological instruments today. The Trail Making Test, for example, currently found in the Halstead-Reitan Neuropsychological Battery, comprised part of the Army Individual Test Battery used during World War II (Armitage, 1946; Lezak, Howieson, & Loring, 2004). The Army Individual Test was created largely in response to clinicians’ needs
for tests that would provide a wider variety of information regarding behaviors and abilities and to assist with diagnostic clarification (Staff, Personnel Research Section, Classification and Replacement Branch, 1944). A compendium of individually administered tests was created as a resource for military clinical psychologists (Wells & Ruesch, 1942). Other cognitive testing was performed to choose men and women (for a discussion of women in the military, see Kennedy & Malone, 2009) for specific jobs, such as aviation (Driskell & Olmstead, 1989; Staff, Psychological Research Unit No. 2, Department of Psychology Research Section, 1944), recognizing that assessment of intelligence was not sufficient in and of itself.

In addition to testing, occupational placement, and performance evaluations, new technology (e.g., aircraft, weaponry) and other demands required an expansion of roles, and World War II saw psychologists making further advances in the areas of human factors and the effects of stress on performance (Driskell & Olmstead, 1989). As in World War I, psychologists rose to meet the call of the defense of the country. World War II saw the active duty service of 986 commissioned psychologists, and 276 additional psychologists were employed by government agencies supporting the war effort. In other words, 1,262 of the 4,500 psychologists (28%) in the United States at that time served either in the U.S. military or worked in direct support of the war effort (Boring, 1945).

As work of research psychologists grew exponentially, psychologists as military clinicians entered the scene. The formal initiation of Army clinical psychology may be dated to 1942 when six psychologists were assigned to neuropsychiatric centers of Army hospitals (Seidenfeld, 1966). The major expansion occurred during 1944 when the shortage of psychiatrists was recognized and the psychiatrist William Menninger, head of the Army mental health program, requested that psychologists be assigned to assist psychiatrists in hospitals and other facilities (Capshew, 1999). The need for appropriately trained psychologists was partly met by a clinical training program at the Adjutant General’s School, Fort Sam Houston, Texas, which graduated 281 students by the end of the war. In a move that symbolized the role of Army psychologists as health service providers, as well as physician supervisees, administrative authority over Army clinical psychologists was transferred from the Classification and Replacement Branch of the Adjutant General’s Office to the Neuropsychiatry Consultants Division of the Surgeon General’s Office.

Toward the end of the war many psychologists’ duties were shifted from classification, assessment, and selection to clinical duties due to a
shortfall of psychiatrists to meet the mental health needs of the 40,000 psychiatrically hospitalized veterans and the hundreds of thousands of veterans who were seen as outpatients (Cranston, 1986; see also Baganz & Strotz, 1941). Psychologists’ assessment abilities transferred readily from occupational categorization and selection to clinical assessment and “retraining of disabled soldiers and sailors” (Boring, 1945, p. 18). To ensure quality personnel, the Veterans Administration (VA) pushed the APA to define both the field and the basic education and training requirements for psychologists, adopting the scientist-practitioner model. The adoption of this model of training was influenced by the significant work done by research psychologists through the world wars and to the new need for clinicians. The VA created the first psychology internships in 1946 (Cranston, 1986; Phares & Trull, 1997). Following World War II, psychologists were again demobilized as after World War I. However, in 1947 psychologists achieved permanent active duty status, which has been maintained consistently since that time (Kennedy & McNeil, 2006; McGuire, 1990).

Military neuropsychologists hold a wide array of current positions and require as many clinical and consultative skills. The remainder of this chapter briefly addresses those issues deemed most pertinent to military neuropsychologists and neuropsychologists serving military personnel in today’s wartime environment. Historical issues are addressed when indicated, and the chapters comprising this volume are introduced.

ETHICS OF MILITARY NEUROPSYCHOLOGY

Clinical military psychologists have faced unique ethical challenges since they first became involved with the military. Dual agency, multiple relationships, confidentiality, and issues related to competence (Grinker & Spiegel, 1945; Johnson, 2008; Kennedy & Johnson, 2009; McCauley, Hughes, & Liebling-Kalifani, 2008; Reger, Etherage, Reger, & Gahm, 2008) are perhaps the most challenging ethical dilemmas confronted, problems that began to evolve when military psychologists began to assume clinical duties during World War II (Kennedy & Moore, 2008; Page, 1996). This occurred during a time when there was no ethics code, psychology licensure, as we know it, was decades away, and the duties performed by psychologists were unprecedented. While the Ethics Code began to be developed following World War II (APA
Committee on Ethical Standards for Psychology, 1949), the first code was not established until 1953 (Canter, Bennett, Jones, & Nagy, 1996). Military psychologists were not mandated to maintain licensure until 1988 (Jeffrey, 1989).

Since that time, with the continued expansion of roles of military psychologists, ethical analysis has become more complex. Clinical psychologists and neuropsychologists now serve in every venue offered by the military, including combat zones (e.g., Campise, Geller, & Campise, 2006), with Special Forces (e.g., Picano, Williams, & Roland, 2006), and wartime detention facilities (Kennedy, Malone, & Franks, 2009). Issues related to dual agency and dual roles in these expeditionary and operational environments become magnified (Kennedy & Johnson, 2009; Kennedy & Williams, in press), and civilian psychologists serving the military are being thrust into new roles as they fill gaps created by deployed active duty providers.

Each service has begun to hire civilian psychologists and neuropsychologists at a rapid rate, creating a situation in which providers, who may be very well trained clinically, have not had any opportunity to develop the competencies required to work in the military environment. These providers are bound by military-imposed limits of confidentiality and are impacted by the inevitable dual agency conflicts that arise when working with service members. This has become especially difficult for VA clinicians, who are being asked to make fitness-for-duty recommendations, in a population that previously would not have returned to war (Stone, 2008). Fitness for military duty is a complex issue that requires understanding of specific military jobs, operational requirements, and military laws and regulations (Budd & Harvey, 2006; Budd & Kennedy, 2006). Cultural competency is further complicated since the military is an incredibly diverse organization from racial and ethnic perspectives (Kennedy, Jones, & Arita, 2007), and has its own behavioral norms, belief systems, and language (Reger et al., 2008). Providers who lack experience and training with the military in general and with service members in particular may be ineffective, resulting in ill-informed recommendations about such matters as flight status, security clearances, weapons handling, and a host of other serious matters. Bush and Cuesta (chapter 2, this volume) will address the most pertinent ethical dilemmas encountered by neuropsychologists working within the military and provide an illustrative case example demonstrating the ethical analysis recommended for use with the military population.
NEUROPSYCHOLOGICAL FITNESS-FOR-DUTY EVALUATIONS

Fitness-for-duty evaluations became a core requirement for military psychologists toward the end of World War II as psychologists began to take on clinical roles. This capacity has rapidly become the most frequently performed duty of military psychologists and neuropsychologists. Each time any mental health provider sees an active duty patient for any reason, determinations of fitness, suitability (i.e., primarily issues related to maladaptive personality traits), and deployability must be made.

The neuropsychological fitness-for-duty evaluation is essentially a comprehensive assessment of an individual's current cognitive and psychological functioning as compared to prior levels, as well as a prognosis for the future. This information is used to make significant life decisions for the individual, so it is imperative that the neuropsychological evaluation be thorough and tailored appropriately for that individual. These evaluations include not only standard portions of traditional neuropsychological evaluations but also unique components related to the military and an individual's military service. Among these are sources and interpretation of military cognitive baselines (e.g., Armed Services Vocational Aptitude Battery, Aviation Selection Test Battery, etc.), collateral information from a variety of sources to include the chain of command and service record, and unique factors related to the variety of deployment locations and missions. In addition, the military neuropsychologist must possess an excellent working knowledge of combat trauma/posttraumatic stress disorder, preexisting learning disorders (LD) and attention deficit hyperactivity disorder (ADHD), and traumatic brain injury (TBI). Kelly, Mulligan, and Monahan (chapter 3) dissect the fitness-for-duty evaluation and describe in detail the required components of these assessments. These are demonstrated by a series of illustrative cases.

MALINGERING OF COGNITIVE DEFICITS

“During the war, 1914 to 1918, an authoritative recommendation was made that malingerers should be treated by a very strong faradic current, the forcible application of which was said to be almost infallible. It was held that the malingerer might stand one or two applications, but quickly recovered under the prospect of a daily repetition” (Doherty & Runes, 1943, p. 133; see also Shephard, 2000). This extreme “treatment” reflects the frustration that exists with regard to those suspected of
malingering, an issue that has been formally addressed by the U.S. military since the Civil War (Lande, 1997; see also Greiffenstein, chapter 4). Sick-call riders, sick-call rangers, sick-call ninjas, sickbay commandos, malingering racketeers, masters of malingering, goldbrickers, frequent flyers, profile rangers, shirkers, grippers, those riding the sick book, or just plain malingerers and fakers provide a challenge to all medical professionals, and this is no more true than in the military (Altus & Bell, 1945; Budd & Harvey, 2006; Campbell, 1943; Hulett, 1941; Kennedy & McNeil, 2006; Waud, 1942). While there is a rather vast literature on malingering in the military, it is notable that other early researchers and clinicians also described malingering among criminals (Hopwood & Snell, 1933; Karpman, 1926; Myerson, 1931), work-related compensation seekers (Edgar, 1931; Garner, 1939), and amnestic husbands seeking to avoid negative consequences of contraindicated marital behavior (Kanzer, 1939).

Early military malingerers adopted such strategies as placing sugar in urine samples to mimic diabetes; placing blood in urine samples; using a variety of drugs, alcohol, and fasting; and claiming nonexistent sensory defects (largely visual and auditory; e.g., Bruner, 1934; Jackson, 1897), paralysis, pain conditions, tuberculosis, brain injury, speech disorders, encephalitis, meningitis, epilepsy, psychosis, feeblemindedness, illiteracy, and amnesia (Brussel, Grassi, & Malniker, 1942; Dillon, 1939; Gill, 1941; Good, 1942; Kahn, 1943; Myers, 1916; Seltzer, 1936; No author noted, 1943). While there are no data that elucidate good estimates of malingerers through the various conflicts, Seltzer (1936) states of World War I that there were 300,000 veterans with service-connected disabilities but 1,060,000 applications to the VA for disability compensation.

Military malingerers have been depicted in numerous ways. A U.S. Army psychiatrist following World War I described malingerers as “marked psychopaths, emotionally unstable, or decidedly inadequate” (Meagher, 1919, p. 969). Lumsden (1916) noted that malingering during times of both peace and war was “a disease of the highest conscious cerebral centres in the frontal lobes” (p. 862). In the Royal Air Force during World War II, military malingerers were noted to present “a clinical picture of symptoms without signs, ruthless egocentricity with little sense of social responsibility” (Ballard & Miller, 1944, p. 40). Others noted that they were “never seen as an isolated phenomenon but most frequently as a manifestation of psychopathic personality” (Rosenberg & Feldberg, 1944, p. 141; see also Good, 1942). Still others noted of military malingerers, “there has been an unmistakable, severe neurosis or infantilism”
During World War II, psychologists at the U.S. Naval Training Station in Rhode Island were tasked with determining whether or not an individual might be malingering "feeblemindness or illiteracy" to avoid military service. The initial screening method consisted of a brief intelligence test, a passing score resulting in a return to duty, a borderline score resulting in a trial-duty period, and a failing score resulting in further testing. These psychologists employed a flexible battery; "the specific tests given vary with the demands of each case" (Hunt, 1943, p. 598). Tests and methods employed at the training center within the neuropsychiatry department included the Wechsler-Bellevue, the General Classification Test, Rorschach Ink Blots (see also Rosenberg & Feldberg, 1944), "the importance of test scatter as a diagnostic aid" (p. 599; see also Hunt & Older, 1944), and the electroencephalogram (see Jasper, Kershman, & Elvidge, 1940; Serota, 1940). The Rorschach Method in particular enjoyed widespread use and was used in the Army to delineate postconcussion syndrome from neurotics and malingers by differentiating between organic and neurotic indicators upon testing (Brussel, Grassi, & Melniker, 1942). In other locations barbiturate narcosis or narcoanalysis was utilized (Ludwig, 1944; Wilde, 1942), as were the hand dynamometer and the tuning fork pressure test (Fetterman, 1943).

Hunt and Older (1943), again working at the Newport Naval Training Station, employed psychometric testing to parse out the malingerers from the truly feebleminded, noting that "it is not as easy to appear feebleminded as the layman might believe.... A malingerer attempting to appear feebleminded does act dumb and makes mistakes, but the dumbness is not the dumbness nor are the mistakes the mistakes which are typical of true feeblemindedness" (p. 1318). They instructed a group of normal individuals to simulate feeblemindedness on Arithmetical Reasoning, the Easy Directions Test, and the Kent Emergency Test, and they compared their scores to an adult group of individuals with an average mental age of 9.7 years. They found that the simulated malingerers demonstrated significant inconsistency of performance throughout the tests, a phenomenon the authors dubbed internal scatter.

It is notable that while most think of the production or exaggeration of symptoms of disorders as malingering, the military frequently sees those who attempt to reverse malinger (Hulett, 1941) to be accepted into the military (Kahn, 1943; Saul, 1943), to obtain special jobs within the
military (e.g., aviation, special forces), or to avoid a mental health diagnosis (Budd & Harvey, 2006). Hunt and Older (1943) surmised that this phenomenon was much more common than that seen in individuals who attempted to feign illness to get out of military duty.

In the military, the label of malingering has historically brought legal consequences. This has presented a challenge to military physicians/psychiatrists and later to psychologists throughout the history of the American military. Bowers cautioned in 1943 that “extreme care must be exercised in recommending court-martial on the grounds of malingering because a grave injustice may be done the patient” (p. 509). While today’s military mental health providers have no role in the recommendation of legal action, the malingering label may result in such action. In the same light the outcome of disability determinations is profoundly impacted by a finding or suspicion of malingering. These issues become even more complicated in the context of current blast injuries and concussion, posttraumatic stress disorder, and other mental health sequelae of combat, and the rapidly increasing need for mental health and neuropsychological services for active duty, reserve and guard personnel, and veterans. Greiffenstein (chapter 4) will address military regulations as they pertain to malingering, the current state of the art of neuropsychological assessment of malingering, and the unique challenges presented by today’s service personnel.

BLAST INJURIES

Blast injuries have been described since the Civil War, though not on a grand scale until World War I when hundreds of thousands of men were exposed to blast waves of exploding shells, while also being somewhat protected from shell fragments and peripheral injury due to being sheltered in trenches. Cases of those who experienced unconsciousness following an explosion but with no external injuries “complained of headache, dizziness, lethargy and inability to concentrate—in short, they exhibited all the major signs and symptoms of the postconcussion syndrome of peacetime” (Fulton, 1942, p. 228). These cases came to be differentiated from shell shock cases described below. World War II then saw an even greater use of high explosive bombs and shells, both on civilian and military populations during the war, though little research was conducted on the effects this had on humans (Fulton, 1942).
The issue of blast injuries has arisen again in today’s war, where the enemy utilizes improvised explosive devices heavily and modern protective equipment serves to protect service members from many forms of physical injury. Unfortunately, the question of whether or not primary blast effects directly cause TBI and if so, to what extent is still unanswered. French, Spector, Stiers, and Kane (chapter 5) discuss what is known about blast injury in today’s conflict. The authors will address the pathophysiology of mild TBI (mTBI), the gamut of blast effects, and the influence of other comorbid injuries and disorders.

**BATTLEFIELD NEUROPSYCHOLOGICAL EVALUATIONS**

Today’s conflict marks the first time where neuropsychologists are needed on the ground in the war zone, due to the large numbers of suspected concussion/mTBI. To address the issue of mTBI, in October 2008, Congress mandated predeployment cognitive testing for all service members due to the large numbers of TBIs and the pressing need to make better assessments of possible impairment without unnecessarily removing service members from the war zone.

A history of this kind of assessment does not exist in the military. The most appropriate parallel comes from the arena of sideline sports concussion assessment. From the assessment and recovery literature on athletes involved in sports with a high risk of head injury (e.g., football, ice hockey, etc.), the military has modeled its current predeployment assessment and clinical practice guidelines for in-theater assessment and decision making. Barth, Isler, Helmick, Wingler, and Jaffee (chapter 6) discuss the evolution of sports concussion assessment to battlefield assessment, the various instruments used in assessment (e.g., Military Acute Concussion Evaluation, Neurocognitive Assessment Tool), confounds to assessment (e.g., effort, sleep issues, mental health symptoms), and the various guidelines used for making return-to-duty decisions in the war zone.

**TBI ASSESSMENT AND REHABILITATION**

Prior to World War I most significant brain trauma resulted in death; subsequently assessment and rehabilitation was not often required.
However, this changed in World War I due to advances in neurosurgery and consequent high numbers of head injury survivors from war wounds (Boake, 1989). This was not just an issue in the United States. Other countries faced the need for head injury assessment and rehabilitation as well. Germany, for example, employed a highly progressive model that included care from the initial injury through community reentry and vocational rehabilitation to long-term follow-up (Poser, Kohler, & Schönle, 1996).

The United States was apparently not as organized as Germany in its implementation of specialized head injury services. One of these reasons was due to a professional argument between orthopedic surgeons, who felt that all rehabilitation services should fall under medical control, and vocational educators, who disagreed. Consequently, rehabilitation services formed in military general hospitals, as opposed to specialty clinics or hospitals, and services were not generally felt to be optimal (Boake, 1989).

There were some organized efforts to implement brain injury rehabilitation within these U.S. hospitals to address the needs of the military’s wounded. Franz (1923), of the Government Hospital for the Insane, published an unprecedented work on nervous and mental reeducation, in essence an early primer for rehabilitation. He addressed such issues as paralysis, ataxia, speech problems, and psychosis (a catch-all category for mental health, cognitive and behavioral problems), using the techniques of electrotherapy, hydrotherapy, physiotherapy, rudimentary cognitive strategies and involving the family in the treatment program. His goals for those with personality and behavioral disturbance were to reconstruct the activities of the individual so that “he becomes capable of behaving like the normal people in his environment” (p. 203). He noted four conditions that made for poor outcomes: lack of insight into the need for behavior change, lack of motivation, lack of self-confidence “in his ability to overcome the condition or abnormality” (p. 205), and lack of proper goal setting on the part of the reeducation program.

The two World Wars served as significant research opportunities for TBI (Figure 1.1). Egas Moniz, Nobel Prize winner for his controversial work with lobotomy, furthered the understanding of neurological injuries following World War I (El-Hai, 2005). In Germany during World War I, Kurt Goldstein (1942) and Walther Poppelreuter (1917/1990) produced seminal works on aphasia rehabilitation and visual attention disorders. Teuber, working at the Naval Hospital in San Diego, researched the behavioral effects of penetrating brain injuries in both World War II and
Korea veterans (Meier, 1992), and Weinstein and Teuber (1957) examined the effects of preinjury education and intelligence on head-injured soldiers after World War II. Reitan and Benton (Figures 1.2 and 1.3) also began their long career of neuropsychological research and test construction with brain-injured service members in the 1940s (Aita, Armitage, Reitan, & Rabinovitz, 1947; Benton, 2003; Meier, 1992; Reitan, 1989). Zangwill (1945) conducted evaluations of British military personnel in the Brain Injuries Unit at Edinburgh to determine fitness-for-duty status, using intelligence, memory, comprehension, motor, sensory perception, and emotional assessment. His work during the war established a role for psychologists as valued members of the interdisciplinary team in neurological units in Britain (Collins, 2006).

Figure 1.1 Distribution of IQs obtained by psychological tests before injury and before and after training. Wepman (1951) used estimates of general cognitive ability to demonstrate the benefit of intensive aphasia therapy in a sample of 68 World War II veterans with traumatic aphasia. The veterans' preinjury score was estimated from the Army General Classification Test administered at induction. The “before training” score represents the Wechsler-Bellevue performance scale and the “after training” score the full Wechsler-Bellevue scale. Wepman concluded that “while there is a measurable loss of IQ after injury, this loss is frequently not permanent and may be reversed through training” (p. 75). The work by Wepman and others at specialized brain-injury rehabilitation centers contributed to the design of civilian stroke rehabilitation. (Reproduced by permission from Wepman, J. M. [1951]. *Recovery from aphasia*. New York: Ronald Press. Reprinted with permission of John Wiley & Sons.)
Treatment of brain-wounded World War II veterans created the basic model for multidisciplinary physical rehabilitation programs. In Russia, Luria directed a rehabilitation hospital where he applied his theories of cortical functioning to the benefit of many wounded veterans (Glozman, 2007), and he worked to promote and define relationships between psychologists and neurologists to optimize services for patients (Teuber, 1950). In the United States, military clinical psychologists helped to pioneer rehabilitation of aphasia. For example, Wepman (1951) reported on outcomes of a specialized aphasia rehabilitation program at Dewitt General Hospital and Letterman General Hospital, both in California, where veterans received intensive treatment for up to 18 months.

In the United States, neuropsychological research on soldiers with penetrating brain wounds resumed during the Vietnam conflict (Black, 1973) and continues through the Vietnam Head Injury Study (VHIS;
Lieutenant Arthur Benton (1909–2006), U.S. Navy, circa 1945. Benton pioneered modern objective assessment of brain-injured service members, stimulated by the neurologist Morris Bender, a coworker during their service at the Naval Hospital in San Diego in World War II. (Photo courtesy of Abigail Sivan.)
Salazar, Schwab, & Grafman, 1995). The VHIS was initially designed as a registry to obtain outcome data for the survivors of combat-related brain injuries. Approximately 2000 veterans were registered, and data from the first two phases of the long-term medical follow-up program have provided valuable data regarding how the brain compensates for injury, how frontotemporal areas of the brain function, and how specific injury characteristics are related to posttraumatic epilepsy (Grafman & Salazar, 1999). In 1993 the VHIS was integrated into the Defense and Veterans Head Injury Program.

Currently, active duty military members and veterans, within both military treatment facilities and the Veterans Health Administration, are afforded the gamut of care required by today’s brain injuries. Pickett, Bender, and Gourley (chapter 7) present the current state of brain injury rehabilitative services available to service members, with an emphasis on services provided by the Department of Veterans Affairs (VA).

**ATTENTION DEFICIT HYPERACTIVITY DISORDER AND LEARNING DISORDERS**

ADHD has had a significant impact on the military. Recognized as a disorder for the first time in 1980 (American Psychiatric Association), it has created a situation in the last decade, as those first diagnosed grew to adulthood, for significant military resources to be devoted to the issue. This has been observed largely in making determinations as to whether the disorder renders a particular individual suitable or unsuitable for duty. While the assessment of LD has evolved over the years into a fairly well-understood and structured process, ADHD assessment continues to be varied among a diverse array of providers (e.g., psychologists/neuropsychologists, pediatricians, family practice physicians, psychiatrists, etc.). To maintain the safety of individual military members and fellow troops, the military has begun to lean heavily on neuropsychological assessment in this determination. Most often this is not done to establish the diagnosis of ADHD, but rather to objectively assess the continued presence of cognitive impairment into adulthood or to establish likely resolution of ADHD symptoms.

Hess, Hardin, and Kupke (chapter 8) discuss military regulations as they pertain to ADHD and LD and provide case examples of fitness-for-duty evaluations. In addition, evolving guidelines for aviation personnel seeking waivers for histories of ADHD and LD are described as is the experience of an active duty ADHD clinic.
HUMAN IMMUNODEFICIENCY VIRUS

As much more has been discovered about HIV, its progression and treatment, military regulations and practice have adapted. Early in the years of the epidemic, HIV was considered medically disqualifying for military service, and service members testing positive were automatically medically retired. However, these policies have changed significantly over the years as research into the disease has improved the medical management and outcomes of these individuals. The Department of Defense has excellent medical treatment facilities and resources for HIV-positive service members, beginning with early detection, given military policies about routine HIV testing of all service members.

Once diagnosed, HIV positive service members undergo mandatory routine medical evaluations to monitor the progression of the disease so that optimal treatment decisions can be made in a timely manner. A part of these routine visits includes psychological evaluation and, increasingly, neuropsychological assessment. HIV-Associated Neurocognitive Disorders impact a large percentage of HIV-positive individuals. In the military the more subtle Mild Neurocognitive Disorder and Asymptomatic Neurocognitive Impairment (i.e., impairment on neurocognitive testing that is not evident in daily functioning) are the more difficult to disposition from a fitness-for-duty perspective. Woods, Weber, McCutchan, and Heaton (chapter 9) provide an overview of HIV, discuss the range of cognitive disorders associated with HIV, and provide recommendations regarding neuropsychological assessment of HIV-positive military members.

REPATRIATED PRISONERS OF WAR

Of all military members, repatriated prisoners of war (RPW) are perhaps the best studied psychologically and neuropsychologically. The prisoner-of-war (POW) experience through the various conflicts is diverse, and while all World War I RPWs are now deceased, those from World War II and all other conflicts since continue to receive specialized care. To understand an RPW, one must take into consideration his or her unique POW experience with a focus on where and by whom they were held, duration of captivity, availability of medical care, nutritional factors, torture experience, and pertinent individual characteristics.

Following the repatriation of the Vietnam POWs in the 1970s, the Army, Air Force, and Navy medical departments undertook structured
POW studies. The Army and Air Force discontinued their programs in 1978 but the Navy's continued under the leadership of Captain Robert E. Mitchell, a Navy flight surgeon. The Robert E. Mitchell Prisoner of War Studies Center now falls under the command of the Naval Operational Medicine Institute in Pensacola, Florida, where RPWs from all services from the Vietnam era forward are seen routinely for medical care and routine reevaluation. This has included serial neuropsychological testing. Moore (chapter 10) discusses the literature as it relates to RPWs, the current operations of the Robert E. Mitchell Center, and the longitudinal neuropsychological data acquired from the Vietnam RPWs.

NEUROPSYCHOLOGY AND SUSTAINED OPERATIONS

Military personnel face significant challenges in the routine course of their work. By virtue of frequent service in a combat zone in today's conflict, work hours are long and the need for vigilance and self-protection is high. In these dangerous and fast-paced environments, sleep is often sacrificed. Fatigue is a service member's enemy, and decisions regarding rest and sleep significantly impact cognition (Boring, 1945). Sleep deprivation and fatigue have historically been major topics of study for the military, particularly in high-risk populations such as aviation (McFarland, 1942).

The military has searched for solutions to the problem of fatigue and sleep deprivation since World War II. In some populations, such as aviation, special forces, and medical personnel, stimulants have been studied and are used as one solution (Ryan, Zazeckis, French, & Harvey, 2006). Researchers have dedicated significant time to the issue, with particular emphasis on the negative impact upon higher order or executive cognitive abilities, namely performing novel and/or complex tasks or having to find a novel solution to a problem (Wesensten, Belenky, & Balkin, 2006). In the high-risk combat environment, in particular, a decline of these cognitive abilities creates significant risk and is known to result in poor decision making and problem solving leading to unnecessary loss of life.

Wesensten and Balkin (chapter 11) review the cognitive effects of sleep deprivation on service members and the operational implications of lack of sleep. To effectively relate the impact of sleep deprivation on individuals in operational environments, they review both aviation and ground catastrophes, linked directly to the sleep deprivation of
personnel. They provide cogent recommendations for the optimization of sleep in operational environments, which military psychologists can use to provide valuable consultation to commands. Of particular benefit to neuropsychologists, using these guidelines regarding sleep needs and time needed to restore normal cognitive functioning following a variety of sleep deprivation scenarios can inform in-theater neuropsychological assessment and return-to-duty decisions. In particular, and with the large numbers of concussed individuals requiring assessment, better determinations regarding return to duty and appropriate waiting periods with which concussed individuals must wait prior to engaging meaningfully in neuropsychological screening can be made.

POSTTRAUMATIC STRESS DISORDER

Historically, the concept of a psychological reaction to the trauma of war has been described in many ways. While the labels change with each new war, the struggle does not. In World War I a comparable term was “shell shock,” though other labels of mental health sequelae were “effort syndrome, war neurosis, gas hysteria, Da Costa’s syndrome, irritable heart syndrome, and not yet diagnosed nervous” (Campise, Geller, & Campise, 2006, p. 215). Early in World War I, shell shock was described as a “mysterious kind of nervous disorganization (which) occurred in those who were submitted to close shelling, and it was natural that this clinical syndrome should be thought to be due to the physical effects of explosion” (Denny-Brown, 1943, p. 509), and the term “shell shock” was synonymous with “shell concussion” (Fulton, 1942). However, these symptoms of sensory and motor disturbance, “loss of memory, insomnia, terrifying dreams, pains, emotional instability, attacks of unconsciousness or of changed consciousness, epileptic fits, obsessive thoughts, usually of the gloomiest and most painful kind, even in some cases hallucinations and incipient delusions” (Smith & Pear, 1917, pp. 12–13) became largely reconceptualized as an emotional response to trauma as opposed to the neurological consequence of shelling injury. Shell shock became an umbrella term for a variety of conditions, to include concussion, malingering, cowardice, hysteria (Lumsden, 1916), psychopathy, exhaustion delirium, psychosis, and even schizophrenia when wartime experiences were felt to have propagated the illness (Baganz & Strotz, 1941). Shell shock was considered to be the most difficult war-related diagnosis to treat (Jones & Wessely, 2005).
By World War II the term had been dropped in favor of such diagnoses as “psychoneurosis, effort syndrome, combat exhaustion, battle fatigue and operational fatigue” (Campise, Geller, & Campise, 2006, p. 215). Korea saw battle fatigue and combat exhaustion. During Vietnam the current diagnostic and descriptive labels of combat stress and post-traumatic stress disorder (PTSD) first arose to be further described as “combat stress reaction” during the first Gulf War, an umbrella term used today. Service members currently experience high rates of PTSD and brain injury, with some researchers concluding that mTBI cases are strongly associated with PTSD (Hoge et al., 2008), akin to that of World War I’s shell shock. Early military providers struggled with differentiating psychogenic war neurosis (i.e., shell shock) from concussion resulting from a blast (i.e., shell concussion, Fulton, 1942), a direct parallel to today.

Vasterling, MacDonald, Ulloa, and Rodier (chapter 12) present the current status of PTSD in the context of military service and trauma. The neuroanatomical findings, neuropsychological correlates, difficulties related to comorbidities, functional impact, and clinical implications of PTSD are addressed. The chapter concludes with a description of emerging empirically based treatments for PTSD.

COGNITION IN EXTREME SITUATIONS AND ENVIRONMENTS

While much of neuropsychology is concerned about changes in cognitive and emotional functioning as a result of injury, disease, or psychological trauma, cognition in military environments can be impaired in healthy, high-functioning service members. The combat theater and other environments in which military members operate are frequently life threatening (search and rescue, special operations, humanitarian missions, etc.). Making decisions and being able to implement learned skills in these environments can be inordinately challenging, and it is known that there can be an observed cognitive decline in these situations. This concept of Operational Demand Related Cognitive Decline (ODRCD) is intimately linked to known physiological aspects of functioning. McNeil and Morgan (chapter 13) will address the literature as it pertains to military cognitive demands and the interrelationships between extreme stress and norepinephrine, epinephrine, cortisol, neuropeptide-Y, and dehydroepiandrosterone.
THE TRAINING OF NEUROPSYCHOLOGISTS IN THE MILITARY

The history of neuropsychologists in the military is a relatively short one. The Air Force began training neuropsychologists in the early 1980s. By the mid-1980s, neuropsychologists were assigned to Wilford Hall (Texas), Wright-Patterson (Ohio), David Grant (California), and Malcolm Grow (Maryland) Medical Centers, and the Air Force personnel system began to recognize neuropsychology as a subspecialty of clinical psychology. This designation, called a shred-out, required completion of a fellowship. During the early 1990s, Air Force neuropsychologists went to civilian institutions for 1 year of training; from 1992 on, the training period was extended to 2 years. Training sites include the University of Texas at Galveston, the University of California at San Diego, the University of Florida, the University of Oklahoma, Brown University, the University of Virginia, Ohio State University, and the Oregon Health Sciences University. One Air Force neuropsychologist was trained at Walter Reed Army Medical Center. More than 20 active duty Air Force psychologists have now been trained as neuropsychologists.

The Army provides 2-year in-service postdoctoral fellowships in clinical neuropsychology for Army psychologists at Walter Reed Army Medical Center in Washington, DC, and Tripler Army Medical Center in Honolulu, Hawaii. The program at Walter Reed Army Medical Center began in 1991 and has graduated a total of 14 fellows, 6 of whom remain on active duty. The program was accredited by the APA in 2002 and was the first postdoctoral program in the country with a specialization in clinical neuropsychology to obtain accreditation. The program at the Tripler Army Medical Center began in 1994 and was recognized by the Association of Psychology Postdoctoral and Internship Centers in 1995. The program has graduated a total of nine fellows consisting of five active duty and four civilian neuropsychologists. All of the five active duty fellows remain on active duty. Operational needs and individual preferences determine the nature of assignments following completion of the fellowships. While it is not typical for Army neuropsychologists to remain in assignments with a major focus on clinical neuropsychology following a utilization tour, most will apply skills gained during fellowship to a broad variety of other activities involving leadership, telemedicine, deployment health, and special operations.

The Navy has been providing the 2-year postdoctoral fellowship since the mid-1980s in a duty under instruction model. In essence this
means that the Navy (like the Air Force) sends commissioned psychologists to a civilian site for 2 years of training. Navy psychologists have trained at the University of Texas Medical Branch at Galveston (1), University of Alabama (1), University of Oregon (2), University of Florida (2), Georgetown University (2), University of Virginia (4), and University of California, Los Angeles (1). To date, the Navy has trained 13 neuropsychologists, 4 of whom currently serve on active duty. While the three branches of service adopt slightly varying methods of delivery of the fellowship, they are united in their commitment to the Houston Conference training model (Hannay et al., 1998).

THE FUTURE OF MILITARY NEUROPSYCHOLOGY

The future of military neuropsychology cannot ignore its past. Major current challenges include the assessment and treatment of blast injuries and the psychological trauma of war, the most profound psychology-oriented problems encountered in all of the prior wars. New to this war is the need for active duty neuropsychologists to serve in the combat zone to address these challenges. Seegmiller and Kane (chapter 14) summarize the most pertinent directions for military neuropsychology in both the near and distant future. Included in these challenges are improving battlefield concussion assessment, denoting the appropriate use of predeployment cognitive assessment, better delineating strategies to differentiate the complex interplay of war-related cognitive and psychiatric diagnoses, improving training and manning needs, using teleneuropsychology, and remaining relevant. In many ways, the challenges faced by military neuropsychologists are not new; however, there is perhaps more at our disposal at this time to more successfully meet the needs of service members and the military. This volume is intended to delineate the current state of military neuropsychology and provide a primary resource to any neuropsychologist serving our active, reserve, guard, and veteran populations.

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