Occupational Therapy for Service Members With Mild Traumatic Brain Injury

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KEY WORDS
• brain injuries
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• practice guidelines

More occupational therapists are needed to provide client-centered, evidence-based rehabilitation to the large numbers of service members who sustained mild traumatic brain injury (mTBI) while deployed in Afghanistan and Iraq. The Proponency for Rehabilitation and Reintegration tasked a team of occupational and physical therapists to assemble evidence-based best practices specific to mTBI. Despite the fact that evidence-based reviews, guidelines, and research regarding occupational therapy for mTBI are sparse, the team developed the Clinical Practice Guidance: Occupational Therapy and Physical Therapy for Mild Traumatic Brain Injury. Occupational therapy practice recommendations specific to client education, vision, cognition, resumption of roles, and emotional well-being are summarized for civilians and characterized as practice standards or practice options. By using evidence-informed and holistic services, occupational therapists have the potential to lead rehabilitation and reintegration efforts for service members with mTBI and advance changes in the profession itself.


Traumatic brain injury has become a matter of increased public concern because of the many service members injured in Operation Enduring Freedom (OEF; Afghanistan) and Operation Iraqi Freedom (OIF; Jackson, Hamilton, & Tupler, 2008). Although precise figures are not available, it has been estimated that 12% of the 1.6 million service members (as of October 2007) who are or have been deployed in OEF–OIF may have sustained mild traumatic brain injury (mTBI; Schneiderman, Braver, & Kang, 2008). Because of the high incidence; complex physical, cognitive, and emotional sequelae; and immediate and long-term consequences of these injuries, an increased number of clinicians trained to deliver client-centered, evidence-based care to service members with mTBI are needed (Tanielian & Jaycox, 2008).

To that end, the Army Medical Department and the Office of the Surgeon General established the Proponency for Rehabilitation and Reintegration (PR&R) in May 2007 to advance best practices, policy, and research related to the care of injured service members. In Fall 2007, the PR&R tasked a five-member team of occupational and physical therapists (militar...
was sparse; the team examined research from a variety of rehabilitation disciplines (e.g., Cicerone et al., 2000, 2005; Michel & Mateer, 2006; Ruff, 2005) and relied heavily on literature specific to mTBI incurred in sports or traffic accidents because so little literature exists about rehabilitation after mTBI sustained in combat. Advisers from military, VA, and civilian sectors, including a multidisciplinary expert panel that was convened for a 1-day summit, provided input throughout the project. This 4-month project resulted in the 183-page draft document titled Clinical Practice Guidance: Occupational Therapy and Physical Therapy for Mild Traumatic Brain Injury.

In this article, we summarize and transpose the Guidance document for civilian occupational therapists. We begin with a brief discussion of mTBI within the context of OEF–OIF. We then outline recommended occupational therapy practices for mTBI specific to inpatient and outpatient rehabilitation and lifetime care, omitting information included in the Guidance regarding occupational therapy practices in Iraq and Afghanistan and at military evacuation centers. We use the term service member to include active-duty soldiers, Reservists, National Guard, and veterans. By proposing evidence-informed therapy for mTBI, we aim to ready occupational therapists to contribute to, if not lead, rehabilitation and reintegration efforts that address the physical, emotional, social, and spiritual well-being of service members and their families.

Mild Traumatic Brain Injury

Definition and Course

There is no single definition of mTBI, nor is there agreement among scholars as to a symptom complex presented by people who sustain mTBI (Dikmen, Machamer, & Temkin, 2001). The team adopted the following definition proposed by the U.S. Department of Defense (2007): A TBI is

- a traumatically induced structural injury and/or physiological disruption of brain function as a result of an external force that is indicated by new onset or worsening of at least one of the following clinical signs, immediately following the event: any period of loss of or a decreased level of consciousness; any loss of memory for events immediately before or after the injury; any alteration in mental state at the time of injury (confusion, disorientation, slowed thinking, etc.); neurological deficits (weakness, loss of balance, change in vision, praxis, paresis/plegia, sensory loss, aphasia, etc.) that may or may not be transient; intracranial lesion. (p. 1)

The injury is considered to be an mTBI if the patient experienced a loss of consciousness of <30 min, an altered state of consciousness for up to 24 hours, or posttraumatic amnesia of 1 day or less.

People who sustain mTBI may become symptomatic at the time of the incident or days to weeks after the traumatic event. Initial symptoms often include headache, dizziness, nausea and vomiting, sleep disturbances, sensitivity to noise and light, slowed thinking and reaction time, memory problems, irritability, depression, and visual changes (Carroll, Cassidy, Holm, Kraus, & Coronado, 2004). In most cases, symptoms resolve within 3 months of injury (Ruff, 2005); however, for 10% to 30% of people with mTBI, problems persist and affect resumption of life roles and activities (Alves, Colohn, O’Leary, Rimel, & Jane, 1986; Edna & Cappelen, 1987; Ponsford et al., 2000; Ruff, Camenzuli, & Mueller, 1996).

Several possible explanations exist for the difficulties experienced by the subgroup with protracted mTBI symptoms (Ruff, 2005). One explanation is that people in this category have microscopic brain damage that is responsible (in part) for the physical, cognitive, and emotional sequelae of mTBI (Cohen et al., 2007). Others attribute problems to a vicious cycle in which the mind–body interplay of cognitive inefficiencies, distractions from physical symptoms, and situational stressors interact to compound the challenges presented by the mTBI (Montgomery, 1995). Because ordinary activities require extra effort, the person with mTBI may become hypersensitive to and anxious about errors and make misattributions regarding the root cause of deficient performance that sabotages self-confidence.

mTBI in a Military Context

Experts estimate that as many as 10% to 15% of soldiers returning from OEF–OIF present with possible mTBI (Hoge et al., 2008). The high incidence of TBI can be attributed to the consequences of blasts or explosions (Warden, 2006) caused by improvised explosive devices placed roadside or hidden in buildings. Explosions send physical matter and blast waves that occur in multiple phases (DePalma, Burris, Champion, & Hodgson, 2005). The primary phase refers to direct exposure to overpressurized air waves, which may cause diffuse axonal injury and a coup–contra coup type injury. During the secondary phase, debris follows the air waves, often causing penetrating or nonpenetrating wounds. The tertiary injury occurs when the person is thrown or displaced and hits his or her head on a stationary object, and the quaternary blast injury consists of burns or inhalation of toxic fumes. Many service members are exposed to multiple blasts, which compound the minimal neuronal damage that may occur with a single blast. The risks of mTBI related to the number of or proximity to blast exposures are unknown (DePalma et al., 2005).
**mTBI, Stress Disorders, and Polytrauma**

Like mTBI, stress disorders affect many service members returning from OEF–OIF (Tanielian & Jaycox, 2008). Many of the symptoms associated with acute stress reaction (ASR) and posttraumatic stress disorder (PTSD) mirror those evident in mTBI (Bryant & Harvey, 1998), including sleep disturbances; irritability; social isolation; and difficulty with attention, concentration, and memory. Differential diagnosis has been a struggle for health care professionals as far back as World War I (Myers, 1915). Despite the similarities, several symptoms, including visual disturbances, olfactory changes, lack of recall of the traumatic event (Bryant & Harvey, 1998), and vestibular disturbances, tend to be associated with mTBI and tend to be absent with PTSD. The mechanism of injury (i.e., blast) and the combat environment place service members who have sustained mTBI at high risk for an ASR–PTSD overlay (Kennedy et al., 2007). Occupational therapists generally work with other members of the interdisciplinary team to determine the cause of symptoms (mTBI, ASR–PTSD, or a combination of both) and tailor their intervention to service members’ specific psychosocial issues.

In addition to possible stress disorders, service members who have sustained mTBI may also have experienced several other significant injuries, such as polytrauma. Polytrauma occurs when a person suffers two or more injuries to physical regions or organ systems, one of which may be life threatening or result in physical, cognitive, or psychological disability. When coupled with other injuries, possible mTBI may go unnoticed until the service member is medically stable and a full cognitive screen can be completed.

**Occupational Therapy Practice Recommendations**

Although differentiating between symptoms of mTBI and ASR–PTSD is important, occupational therapists plan and provide intervention on the basis of the service member’s unique set of circumstances, goals, and functional performance problems rather than primarily on diagnosis. In this article, we summarize a subset of practice recommendations presented in the *Guidance* that represent areas in which occupational therapists typically intervene. Areas that physical or occupational therapists tend to address (e.g., vestibular function, high-level balance, temporomandibular joint disorders, headache, cognition related to dual-task performance, and participation in exercise) are discussed in the full *Guidance* document.

Within each problem area, we provide background information that is based on the literature and summarize practice recommendations. Borrowing some of the nomenclature of Cicerone and colleagues (2000), the strength of our recommendation is characterized as either a practice standard or a practice option. Practice standards are supported by existing mTBI guidelines or published evidence-based reviews. Practice options do not have such support but are consistent with current theory, literature, or expert opinion. Standardized evaluation tools are listed in Table 1.

**Client Education**

Experts recommend the provision of verbal and written educational information about mTBI symptoms (headache, difficulties with memory or attention) as well as reassurance that the symptoms are likely to resolve over a period of weeks or a few months (Ponsford, 2005; Ponsford et al., 2002). As people with mTBI understand their symptoms, they are less likely to overreact to them or misattribute them to significant brain damage (Ponsford, 2005). Mittenberg, Tremont, Zielinski, Fichera, and Rays (1996) demonstrated that patients with mTBI who reviewed and discussed extensive written instructions with a therapist before leaving the hospital after mTBI had significantly shorter symptom duration and fewer symptoms than those receiving routine discharge information (written information and an advised period of rest).

People who experience protracted cognitive or neurobehavioral symptoms also appear to benefit from information about how to understand and manage the consequences of mTBI, even those who experience distress and disability for months to years afterward (Montgomery, 1995; Ruff, 2005). Postconcussion syndrome may be averted or ameliorated as therapists communicate an optimistic expectation for service members’ full recovery (Ruff, 2005) and as people with mTBI understand the influence of stress and personal and situational factors on the typically transient symptoms of mTBI (Mateer, Sira, & O’Connell, 2005; Montgomery, 1995; Ownsworth & Fleming, 2005) and implement compensatory strategies.

**Recommended Practices.** Occupational therapists incorporate education about mTBI into intervention plans (practice standard, supported by evidence reported in Borg et al., 2004).

**Vision**

People who have sustained mTBI may present with visual impairments such as ambient vision disturbances, diplopia, inability to visually fixate, poor convergence, scanning deficits, poor visual acuity, accommodative dysfunction, oculomotor dysfunction (Freed & Hellerstein, 1997; Padula, Argyris, & Ray, 1994), and photosensitivity (an elevated light sensitivity; Padula et al., 2007). Visual problems evident in service members who have sustained mTBI may be secondary to the head injury or to an eye injury sustained in
the blast or accident. Because the type, etiology, and severity vary, it is difficult to predict which people are at risk for visual disturbances after mTBI.

Occupational therapy vision screening helps detect potentially unrecognized visual deficits (Bryan, 2004) and informs referrals of service members with mTBI to eye professionals for a comprehensive evaluation of ocular health and function. The results of the screening also help the team better understand the service member’s array of cognitive and behavioral symptoms. As members of a larger team concerned with vision (including low-vision specialists, neuro-ophthalmologists, ophthalmologists, optometrists, orientation and mobility specialists, and physical therapists), occupational therapists perform comprehensive low-vision and visual–perceptual screens that incorporate administration of standardized tools and dynamic observation of function. Dynamic observation of function occurs as the service member with possible visual disturbances performs familiar tasks. The occupational therapist notes behaviors or complaints such as squinting, overreaching (dysmetria), inability to visually attend or dizziness when ambulating or changing position, or complaints of dizziness.

Occupational therapy for vision disturbances typically involves remedial and compensatory approaches (Cohen & Rein, 1992; Scheiman, 2002; Warren, 1998; Zoltan, 2007). The following are examples of occupational therapy intervention that is informed by and often overseen by an optometrist or neuro-ophthalmologist:

- Lenses, prisms, and selective occlusion for diplopia, with the goal of achieving and sustaining comfortable single vision under binocular viewing conditions
- Visual exercises to strengthen ocular muscles and improve convergence (Cohen & Rein, 1992)
- Strategies to address scanning deficits secondary to saccadic eye movements, such as engaging in activities that require gross motor movements (e.g., looking over left shoulder then right), identifying objects or visual targets, and computer-based retraining (Zoltan, 2007)
- An adaptive approach to treatment of photosensitivity problems, such as the use of tinted spectacles, sunglasses, hats with brims, dimmers on lights, and avoiding or reducing exposure to glare situations
- Restriction of activities such as driving or some sports, which may be necessary as part of the treatment program.

**Recommended Practices.**

1. A comprehensive occupational therapy low-vision and visual–perceptual evaluation is recommended for all service members with mTBI (practice option).
2. Occupational therapy intervention typically involves remedial and adaptive approaches for addressing vision disturbances (practice option).

**Cognition**

People often experience impairments in information processing (including attention and memory) for up to 3 months after mTBI (Mittenberg & Strauman, 2000). The person may experience a bottleneck in terms of the brain’s limited processing capacity as he or she attempts to manage distractions associated with symptom management (Montgomery, 1995). As a result, highly practiced skills may be preserved, but activities requiring self-awareness, problem solving,
and self-control may be more difficult or problematic (Montgomery, 1995).

Self-awareness refers to the ability to perceive oneself and one’s performance in relatively objective terms (Prigatano & Schacter, 1991). After mTBI, service members may experience impaired self-awareness because brain injury secondary to blast often affects the frontal lobe and prefrontal cortex. These cortical regions are closely associated with self-awareness subcomponents of insight, motivation, and organization (Schmitz, Rowley, Kawahara, & Johnson, 2006). Because self-awareness plays a critical role in the teaching and learning approach that is central to rehabilitation after mTBI (see earlier discussion on client education), occupational therapists incorporate evaluation and intervention strategies specific to self-awareness into their broader plans of care.

Existing guidelines provide little guidance as to the optimal timing or composition of cognitive evaluation after mTBI (Peloso et al., 2004). There appears to be general agreement that neuropsychological assessment can be of value for people who experience persistent cognitive complaints (Peloso et al., 2004), but none of the evidence-based reviews or guidelines examined by the work team specify any role for occupational therapists in this realm. That said, occupational therapists may conduct or contribute to cognitive evaluation by administering standardized assessments or observing function. Using a dynamic approach to observing function, therapists systematically manipulate and observe the influence of task, environmental, strategy, and cueing variables as clients perform semifamiliar, multistep, or unstructured tasks (e.g., money management, household, or simulated work tasks) to approximate the problem-solving demands of everyday performance (Dougherty & Radomski, 1993; Toglia, 2005).

Experts recommend cognitive compensatory strategy training for people with mTBI specific to attention, memory, and executive function difficulties (Gordon et al., 2006; Montgomery, 1995; Ponsford, 2005). Compensatory cognitive strategies are described to clients as cognitive energy-saving techniques (e.g., using a planner rather than remembering a list of tasks) that buoy their everyday functioning as the symptoms of mTBI continue to resolve. Strategy training to address attentional deficits is recommended for outpatients in the postacute phase of rehabilitation (Cappa et al., 2003; Cicerone et al., 2000, 2005). Attentional strategies might include the following: completing a single task (Tierksy et al., 2005); initiating the removal of visual or auditory distractions (Tierksy et al., 2005); performing challenging tasks during high-energy times of the day; pacing, planning breaks, and self-monitoring of fatigue and attention levels (Michel & Mateer, 2006); and using an “ideas log” so that clients can capture good ideas that come to mind but are to be addressed later (Michel & Mateer, 2006). Instruction in the use of memory aids and internal memory strategies is also supported by evidence (Cappa et al., 2003; Cicerone et al., 2000, 2005). Also supported by evidence (Cicerone et al., 2005) is training in the use of problem-solving and organization strategies as applied to real-life tasks, such as establishing a routine for daily and weekly planning, breaking multistep or complex tasks into step-by-step checklists, and using a problem-solving mnemonic to proactively and systematically think through many aspects of a problem before initiating action.

Finally, although not designed specifically for people with mTBI, the Toglia and Kirk Self-Awareness Training Model (as cited in Goverover, Johnston, Toglia, & Deluca, 2007) outlines intervention principles that may advance improved self-awareness after mTBI. According to this model, therapy sessions involve task performance that incorporates the following features: having the client define a task, predict performance, anticipate possible errors, choose strategies to compensate for errors, assess the amount of assistance needed, and journal at the end of each session to reflect on performance. Videotaping and audiotaping or small group discussions may be beneficial.

**Recommended Practices.**

1. Occupational therapists assess cognition to identify possible cognitive deficits that may interfere with everyday functioning and guide discharge recommendations in situations in which no neuropsychological data are available (practice option). Occupational therapists interpret findings, appreciating that distractions associated with pain, fatigue, or PTSD may influence the service member’s performance as much as the mTBI.

2. If service members with mTBI report or demonstrate problems with cognition that interfere with everyday functioning, occupational therapists incorporate compensatory strategy training into their intervention plans (practice standard supported by state-of-the-science literature review [Gordon et al., 2006] and two evidence-based reviews [Cicerone et al., 2000, 2005]).

3. If service members with mTBI evidence problems with self-awareness, occupational therapists incorporate self-awareness training into the intervention plan (practice option).

**Resumption of Everyday Tasks and Life Roles**

An mTBI may lead to inefficiencies in the performance of personal, household, family, transportation, leisure, and work tasks that make up life roles. People who sustain an mTBI without other concomitant injuries or conditions...
typically retain their ability to independently dress, feed, and bathe themselves, albeit with greater concentration and effort (Montgomery, 1995). Efficiency of performance may suffer because of difficulties with attention and concentration, decision making, and disruption in the daily routine. People with mTBI may experience errors and inefficiencies in resuming household, family, work, and leisure roles because tasks making up those roles typically involve less automation, involve more steps and, therefore, place greater demands on higher-order thinking abilities (planning, prioritizing, self-monitoring; American Occupational Therapy Association, 2008). For service members with mTBI returning from OEF–OIF, resumption of household, family, work, and leisure roles may be further complicated by lingering stress from combat experiences (Kennedy et al., 2007) and challenges associated with reentering social contexts that have changed in their absence. Similarly, family well-being, happiness of couples, parenting roles, sexual functioning, and friendships can be affected (Eriksson, Tham, & Fugl-Meyer, 2005; Hall et al., 1994; Testa, Malec, Moessner, & Brown, 2006).

The ability to carry out everyday tasks and resume life roles often depends on access to transportation. Many service members returning from OEF–OIF have been driving in combat zone conditions, environments that require aggressive, fast driving, often on sidewalks and down small alleys—skills that do not translate to safe driving at home. Driving behaviors of service members at home on leave or after multiple deployments are dangerous compared with behaviors of service members who have not served in a combat zone (E. Stern, personal communication, December 11, 2007). Given the stress involved, service members may decrease their engagement in tasks and life roles that require driving or transporting family members.

**Occupational Therapy Intervention Related to Resumption of Everyday Tasks and Life Roles.** Little empirical literature specifies occupational therapy intervention to enable the patient with mTBI to quickly and fully resume everyday tasks and return to his or her valued life roles. Moreover, it is difficult to determine the extent to which evidence regarding interdisciplinary intervention for moderate to severe brain injury applies (Klonoff et al., 2006). Trombly, Radomski, and Davis (1998) and Trombly, Radomski, Trexel, and Burnett-Smith (2002) did report that individualized outpatient occupational therapy contributed to goal achievement for people with mild to moderate TBI; many of those goals pertained to resumption of work and social roles.

That said, the central focus of occupational therapy intervention specific to resumption of everyday tasks and life roles after mTBI is twofold: (1) teaching service members to compensate for mTBI-related errors and inefficiencies and (2) supporting the development of life skills and routines, given new demands and absence-related changes in home, work, and social environments. For example, prompts to initiate various household or work tasks might be incorporated into a weekly planning procedure involving a memory aid. For unstructured multistep home repair projects, the client can be taught to break the task into a sequence of steps before beginning work. Clients may realize improved efficiency and accuracy with newly formed routines as they use checklists to reestablish a consistent sequence of task performance that, with enough repetition, will once again become automatic (Radomski & Davis, 2008). Checklists to reestablish automatic routines may prove beneficial with everyday activities that are typically performed with a consistent sequence of steps, including presleep wind-down (to promote improved sleep–wake
hygiene) and leaving the house, office, or barracks (to ensure that the person has any needed items, has turned off lights, and has locked doors). Intervention regarding driving involves remediation of driving-related subskills, provision of adaptive strategies, or desensitization. Recommendations are made in conjunction with a driving rehabilitation specialist, as available.

To help service members enter new and unfamiliar life roles, occupational therapists use skills training and role playing to assist with vocational readiness (e.g., job searching strategies, interview strategies, on-the-job skill development, work communication, self-monitoring, environmental adaptations), return to school (cognitive skills training, pacing, insight, stress reduction strategies, and load reduction), and family participation (interactive, activity-based family group work, such as cooking or use of games).

**Recommended Practices.**

1. Occupational therapists use a combination of interview and observational methods to assess resumption of everyday tasks and life roles (practice option).
2. Occupational therapists teach skills and strategies that help service members perform everyday tasks and that support service members’ response to new demands and absence-related changes in home, work, and social environments (practice option).

**Emotional Well-Being**

Beyond the symptoms associated with the mTBI itself, functional performance may be affected by fatigue, stress, medications, sleep disturbance, or pain associated with musculoskeletal injuries—all of which sabotage emotional well-being (Zasler, Katz, & Zafonti, 2007). Occupational therapy intervention may include teaching self-management strategies to minimize functional disability and pain-related distress and encouraging people with TBI and pain to participate in preferred family, vocational, and recreational activities as a means to avoid developing maladaptive avoidance and illness behavior. For those with chronic pain, occupational therapy intervention may incorporate relaxation training, biofeedback (Stein, 2001), social and assertiveness skills training, guided imagery, and habit reversal (Zasler et al., 2007).

Occupational therapists also provide intervention that contributes to service members’ sense of resiliency—that is, their ability to overcome setbacks and obstacles and to maintain positive thoughts during times of adversity (Gerardi & Newton, 2004; McColl, 2002).

**Recommended Practices.** Occupational therapists incorporate a wide range of holistic interventions to contribute to service members’ well-being and sense of resiliency as they recover from mTBI, referring elsewhere for other supports and services as needed (practice option).

**Summary and Reflections**

This article summarizes the Clinical Practice Guidance: Occupational Therapy and Physical Therapy for Mild Traumatic Brain Injury and outlines evidence-informed occupational therapy assessment and intervention after mTBI. By discussing mTBI incurred in a military context, we aim to extend occupational therapists’ existing brain injury expertise and ready them to serve soldiers and veterans returning from OEF–OIF.

Three themes that emerged during the Guidance development process beg our attention and action: (1) Many people experience aftereffects of mTBI that interfere with everyday functioning, (2) occupational therapy may benefit service members with mTBI, and (3) woefully little empirical evidence exists to guide occupational evaluation and intervention after mTBI. We further realized that the mind–body interplay that characterizes recovery from mTBI requires the dispelling of language, payment, and practice conventions that characterize occupational therapy expertise as separate silos (physical disabilities or mental health or work). Just as World Wars I and II inspired the development of the field to address the needs of wounded soldiers, so, too, does the provision of integrated and holistic occupational therapy to service members returning from OEF–OIF (and research thereof) promise to establish new precedents in best practice that will similarly shape the profession itself.

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