

## REVIEW ARTICLE

# COMMUNICATION DISORDERS OF ACTIVE MILITARY PERSONNEL WITH TRAUMATIC BRAIN INJURY – A REVIEW STUDY

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### Summary

Soldiers, particularly those involved in combat operations, are exposed to a continuous danger frequently resulting in various types of injuries, out of which the most common and serious is traumatic brain injury (TBI). Up to the second quarter of 2015, the Defense and Veterans Brain Injury Center has recorded 333,169 cases of active soldiers affected with TBI. TBI can be defined as an injury that results from external force to the head and causes an alternation of loss of consciousness. The key symptoms of TBI comprise physical problems, sensory impairments, behavioral changes, cognitive disorders, communication difficulties, and swallowing disorders. The purpose of this study is to review available studies on TBI among active military personnel with special focus on communication disorders. The methods applied for this study include a method of literature review of both clinical and review studies relevant for the researched issue in the acknowledged databases and a method of comparison and evaluation of their findings. The findings show that the research studies exploring communication disorders among the active military personnel are rare. In addition, earlier diagnosis of TBI is needed as well as a multidisciplinary team intervention approach to the treatment of TBI.

*Key words: traumatic brain injury; military combat personnel; communication disorders; treatment*

### INTRODUCTION

Soldiers, particularly those involved in combat operations, are exposed to a continuous danger frequently resulting in various types of injuries, out of which

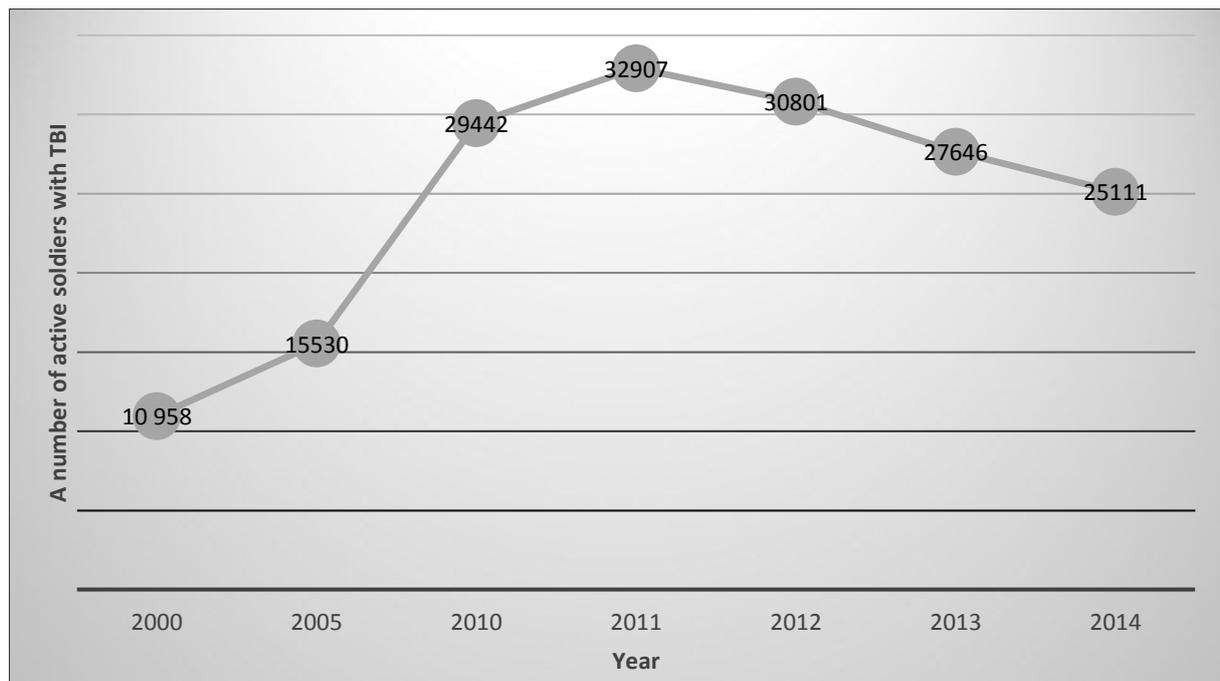
the most common and serious is traumatic brain injury (TBI), which is a common source of morbidity and mortality, both for military personnel and civilians [1]. In addition, TBI, respectively the brain injury, is considered to be one of the risk factors for cognitive decline and development of dementias such as Alzheimer's disease [2-6]. However, in comparison with the dementia, the brain injury develops quickly, while dementia progresses relatively slowly. Other risk factors include: age, being male, having a low socioeconomic status, being a minority ethnic group, addiction to alcohol, and genetics [7].

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Vincent, Roebuck-Spencer, Cernich [7] claim that at present there are about 10%-20% of military combat personnel with TBI in the US army. Most of these people (82%) suffer from mild TBI. Figure 1 below then gives an overview of the numbers of active military personnel with TBI in the USA. These numbers are based on the monitoring data, which have

been provided by the Defence and Veterans Brain Injury Center (DVBIC) since 2000. Up to the second quarter of 2015, DVBIC has recorded 333,169 cases of active soldiers affected with TBI [8]. Figure 1 also indicates that since 2011 there has been a gradual moderate decline in these numbers. This might be caused by the end of the military operations in Iraq.



**Figure 1.** An overview of the development of military cases with TBI in the USA

Source: authors' own processing, based on the data of DVBIC [8]

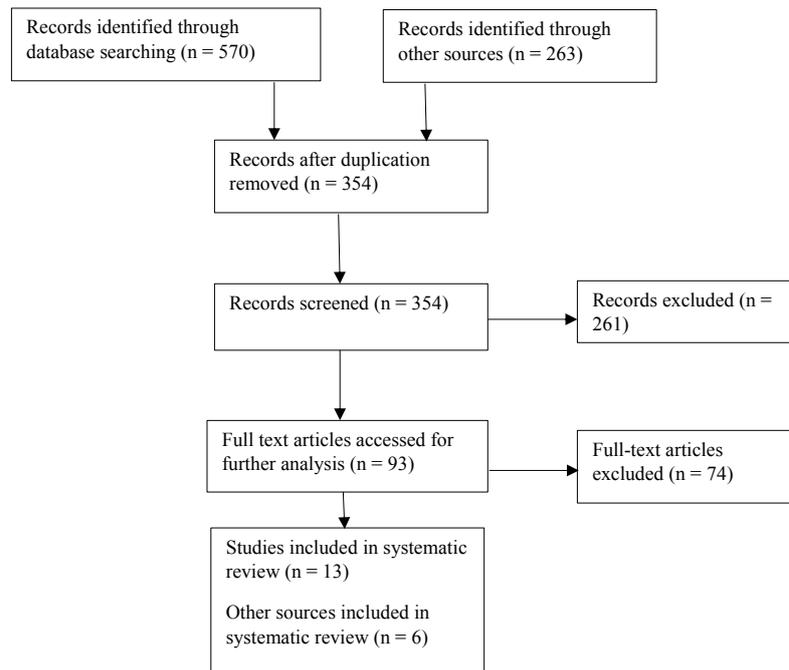
## METHODS

The authors used a method of literature review of available sources exploring both clinical and review studies focused on traumatic brain injury and communication disorders of combat soldiers in the acknowledged databases and a method of comparison and evaluation of their findings. This review was done by searching databases such as Web of Science, ProQuest, Elsevier Science Direct, Springer and Emerald in the period from 1990 to 2015 for the following key words: traumatic brain injury and soldiers, traumatic brain injury and military combat personnel, communication disorders and traumatic brain injury, communication disorders and military combat personnel with traumatic brain injury, and language impairments and military combat personnel with traumatic brain injury. In addition, other relevant studies were reviewed on the basis of the reference

lists of the research articles from the searched databases. The selection procedure of the final number of studies was done in the following four steps:

- identification (identification of the key words and consequently, available relevant sources);
- duplication check;
- assessment of relevancy (verification on the basis of abstracts whether the selected study corresponds to the set goal; after the exclusion of such studies 93 sources were analyzed and 74 eventually excluded); and
- use of available studies.

The duplication of articles was mainly found in the databases of Scopus and Web of Science when compared with other, freely accessible sources. After



**Figure 2.** Results of the systematic review

Source: authors' own processing

the close exploration of the abstracts, the articles that contained the key words but their findings were not aimed at the set goal were excluded. In addition, the studies outside the time span, those that comprised the same findings, or their findings were outdated, were also excluded (Figure 2).

### Traumatic Brain Injury

TBI has been defined by the Department of Defense and the Department of Veterans Affairs as any 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 the injury (e.g., confusion, disorientation, slowed thinking); neurological deficits (e.g., weakness, balance disturbance, praxis, paresis/plegia, change in vision, other sensory alterations, aphasia.) that may or may not be transient; or intracranial lesion [9]. Chapman, Arrastia, [1] emphasize that combat brain injuries are frequently embedded in longer continuous missions rather than appearing as discrete events as it is often the case in civilian

brain injuries such as car accidents or falls. Weiner, et al. [10] state that the combat brain injury is most often a closed head injury that results from being exposed to an explosion, vehicle accident, fall, or physical activity.

On the basis of its degree of severity, TBI is divided into mild (ie, loss of consciousness lasting less than one hour or amnesia lasting less than 24 hours), moderate (ie, loss of consciousness lasting between one and 24 hours or posttraumatic amnesia lasting for one to seven days) or severe (ie, loss of consciousness lasting for more than 24 hours and posttraumatic amnesia lasting for more than a week) [11-12]. As it has been already stated in the Introductory part, most of the traumatic brain injuries, be it military or civilian, are classified as mild. The effects of TBI can be transient, lasting for a shorter period of time, or chronic, ie, lifelong [7].

The common symptoms of TBI comprise physical problems, sensory impairments, behavioral changes, cognitive disorders, communication difficulties, and swallowing disorders. The physical problems involve loss of consciousness, headache, dizziness, tiredness, vomiting, decreased muscle strength, or balance problems. The sensory impairments can involve all sensory modalities depending

on the areas of the brain that are involved. It can affect soldier's sensitivity to light or noise, makes his vision blurred, or causes ringing in the ears. The behavioral changes can involve changes in mood, depression, emotional changes, distress, anxiety, agitation, irritability, or reduced frustration tolerance. The cognitive disorders include changes in awareness of one's surroundings, difficulty with attention and concentration when doing tasks, problems with completing tasks, problems with processing and understanding information, problem solving, judgment and reasoning problems, or planning and organization difficulties. Although new learning is impacted by memory deficits, long-term memory for events and things that occurred before the injury is generally unaffected (eg, the person will remember names of friends and family). The communication difficulties consist in problems with understanding or producing speech correctly (aphasia), slurred speech consequent to weak muscles (dysarthria), and/or difficulty in programming oral muscles for speech production (apraxia). In addition, people with TBI usually have difficulties understanding both written and spoken utterances. They may also have difficulty with spelling, writing, and reading. Thus, some people might have problems with social interactions, eg, start a conversation or take turns in it [13]. Some symptoms of TBI can overlap with posttraumatic stress disorder [14]. Furthermore, the repetitive TBI can develop into chronic traumatic encephalopathy (CTE) which is mainly associated with behavioral changes, loss of memory and cognitive disorders. Its progress is slow [15].

Since the research studies on communication disorders of the combat military personnel are rare, the authors of this study explore them in more detail in the following section.

### **Communication disorders of the combat soldiers suffering from TBI**

American Speech-Language-Hearing Association (ASHA) defines communication disorders as impairment in the ability to receive, send, process, and comprehend concepts or verbal, nonverbal and graphic symbol systems. A communication disorder can be evident in the processes of hearing, language, and/or speech. It can range in severity from mild to severe. It can be developmental or acquired. The affected people can demonstrate one or any combination of communication disorders. The communication disorder can result in a primary disability or it may be secondary to other disabilities [16].

In their clinical research study, Norman, et al. [17] conducted with 303,716 veterans who participated in Iraq and Afghanistan wars to show that 1,848 of these soldiers had communication disorders and 40% of them suffered from TBI. Regardless of the degree of TBI severity, the most common communication disorders were firstly aphasia, followed by fluency difficulties due to dysarthria (poor articulation of phonemes) [18] and dysphonia (a voice disorder caused by an inability to produce sounds by using the vocal organs) [19]. Also another study by Moffett, et al. [20] confirms these findings by pointing at the fact that the soldiers participating in the Persian Gulf War have difficulties with finding the right words and recalling names. Thus, aphasia seems to be the most frequent communication disorder among combat military personnel. Its symptoms can vary in dependence on the location of damage in the brain. The most common symptoms include an inability to find the right word and name things [21]. The main symptom of dysarthria is then dysfunction of speech muscles, which makes it very hard to pronounce words. In the worst cases dysarthria may result in anarthria, ie, a total loss of speech [22].

It is the left hemisphere of the brain which is particularly connected with the language functions. There are two specific areas of the brain whose damage causes language impairments. Those are Broca's area in the posterior frontal lobe and Wernicke's area in the temporal lobe. Harm to Broca's area causes difficulties with language fluency, while harm to Wernicke's area affects the speech which is fluent, however, it lacks the content [23].

Table 1 below then summarizes the main symptoms of communication difficulties of the combat soldiers with TBI.

## **DISCUSSION**

Clinical research studies [24-25] confirm that communication skills are to some degree associated with cognitive competences. Therefore if there is a decline of cognitive functioning, then language deteriorates as well. In addition, behavioral symptoms such as depression or anxiety may also have an impact on the process of communication [3], [26]. That is why the authors found especially the studies which focused on the examination of cognitive decline or depression among the military combat personnel, and the communication disorders, respec-

**Table 1.** An overview of communication disorders of combat soldiers

Type of communication disorder	Main symptoms
aphasia	<ul style="list-style-type: none"> <li>• difficulty in understanding language</li> <li>• difficulty with pronunciation, not due to muscle paralysis or weakness</li> <li>• difficulty in speaking spontaneously</li> <li>• difficulty in forming words</li> <li>• difficulty in naming things</li> <li>• difficulty in repeating phrases</li> <li>• difficulty in speaking grammatically correct</li> <li>• difficulty in spelling, reading and writing</li> </ul>
dysarthria	<ul style="list-style-type: none"> <li>• disordered speech</li> <li>• slurred speech</li> <li>• non-articulated speech</li> <li>• low audibility</li> <li>• slow speech</li> </ul>
dysphonia	<ul style="list-style-type: none"> <li>• dysphonic, harsh, rough speech</li> </ul>

Source: authors' own processing

tively language impairments, were explored in these studies only marginally such as in [3], [7], [10], [14], or [27-28].

Furthermore, the identification of TBI, particularly in its mild form is difficult, and combat soldiers even do not report any changes of their state of health or behavior because they do not consider them a barrier in performing their everyday military duties. Thus, many cases of mild TBI are missed [29]. Therefore, the Department of Veterans Affairs in the USA has taken several steps towards the better identification of TBI which involve: TBI screening for all US veterans; veterans with a positive TBI screening then undergo a thorough evaluation with specialty providers who make the final diagnosis; and an individualized Rehabilitation and Reintegration Treatment Plan of Care for those veterans whose state of health requires such rehabilitation services. They also invested 100 million US dollars in the research of identification and treatment of mild TBI as well as posttraumatic stress disorder [30].

Generally, soldiers' TBI has a profoundly negative impact on the overall quality of their life. Moreover, the TBI symptoms have an influence on the lives of people around them who try to assist them in performing their daily tasks. And it is even worse if communication between these people with TBI and their caregivers does not function properly due to the communication impairments. In dependence on the length of such assistance, caregivers' state of health inevitably worsens, too. They start to suffer from sleeping disorders, anxiety and other

behavioral problems [31]. Therefore, many research studies [32-33] call for a multidisciplinary team treatment approach to TBI, which would include medical professionals (eg, psychiatrist, neurologist, or psychologists), social workers, rehabilitation specialists, and speech therapists. Moreover, specialist medical professionals emphasize a benefit of the so-called integrated treatment approach of antidepressants, cholinesterase inhibitors, vitamins, diet, healthy lifestyle, and physical activities, which may have a positive effect on cognitive functioning [34]. Lately, there has also been a rise in using assistive technologies such as telemedicine in military TBI which can remotely connect patients with their doctor specialists; provide prescriptions online; provide real-time video visits with family members; or receive information about health [35]. All this effort may then lead to the early diagnosis of TBI, improvement of patient's health and also to the cost cuts of their treatment and care [36].

## CONCLUSION

Traumatic brain injury seems to be a serious disease among the military combat personnel, however, in many cases still not successfully diagnosed. As the research studies explored above indicate, active combat soldiers are at particular risk. In addition, the effects of TBI can be chronic and influence the development of aging diseases in their later life since TBI is comorbid disease and might have persistent sequelae, out of which cognitive functioning,

including communication, appear to be essential. Therefore, the need for the multidisciplinary team treatment approach and further research in the field of military TBI focused on cognitive and communication disorders is of high importance.

## DISCLOSURE

The authors have no conflicts of interest to declare.

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