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Verbal learning and memory impairments in posttraumatic stress disorder: The role of encoding strategies

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Abstract

The present study examined mechanisms underlying verbal memory impairments in patients with posttraumatic stress disorder (PTSD). Earlier studies have reported that the verbal learning and memory alterations in PTSD are related to impaired encoding, but the use of encoding and organizational strategies in patients with PTSD has not been fully explored. This study examined organizational strategies in 21 refugees/immigrants exposed to war and political violence who fulfilled DSM-IV criteria for chronic PTSD compared with a control sample of 21 refugees/immigrants with similar exposure, but without PTSD. The California Verbal Learning Test was administered to examine differences in organizational strategies and memory. The semantic clustering score was slightly reduced in both groups, but the serial cluster score was significantly impaired in the PTSD group and they also reported more items from the recency region of the list. In addition, intrusive errors were significantly increased in the PTSD group. The data support an assumption of changed memory strategies in patients with PTSD associated with a specific impairment in executive control. However, memory impairment and the use of ineffective learning strategies may not be related to PTSD symptomatology only, but also to self-reported symptoms of depression and general distress.
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1. Introduction

This study focuses on mechanisms underlying verbal memory alterations in refugees/immigrants with posttraumatic stress disorder (PTSD) after war exposure. PTSD is classified as an anxiety disorder and develops in some individuals as a response to traumatic stress and is characterized by three main clusters of symptoms: *intrusive reexperiencing*, *avoidance behaviors*, and *hyperarousal* (American Psychiatric Association, 1994). There is evidence that PTSD is associated with distinct brain dysfunction patterns and cognitive impairments (Elzinga and Bremner, 2002), and verbal learning and memory alteration have consistently been documented (e.g., Bremner et al., 2004; Gilbertson et al., 2001). In addition aspects of attention and memory dependent on executive control appear to be impaired in individuals with PTSD (Kanagaratnam and Asbjørnsen, 2007; Vasterling et al., 1998).

Previous studies on the relationship between verbal memory impairments and PTSD have reported both acquisition impairment (Yehuda et al., 2005b), and

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recall impairments related to an reduced ability to consolidate memory material (e.g., Bremner et al., 1995; Uddo et al., 1993). Lately, studies have been designed to examine more explicitly the relation between stage of processing and memory impairment. Two recent studies have provided evidence that impairment in encoding accounted for the verbal memory impairments in PTSD patients when controlling for attention and the effect of total learning (Yehuda et al., 2005a; Yehuda et al., 2004). In addition, we previously found evidence that learning and memory impairments in refugees with PTSD were related to the ability to elaborate memory material to facilitate a more efficient encoding (Johnsen et al., 2008). In that study, we found no differences between a diagnosed PTSD group and a control group on memory span, but less effective learning emerged over trials on a standardized verbal learning test. Controlling for measures of attention ruled out the possibility that the difference in verbal learning and memory was secondary to attentional dysfunction. No impairments on tests of recognition were found. This suggested a pattern of memory impairment secondary to difficulties using effective learning or organizational strategies (Sternberg and Tulving, 1977) during encoding. The above-mentioned studies did not analyze organizational strategies. Jenkins et al. (1998) reported that although their PTSD sample did not seem to be impaired on acquisition over learning trials, they were impaired at short and long delay recalls. Follow-up tests revealed no differences in semantic and serial organizational strategies. Two previous studies have analyzed recall errors, which may indicate executive failure. Both increased intrusive errors and perseverative responses were found on free recall of list-learning tests (Uddo et al., 1993; Vasterling et al., 1998).

PTSD has been seen as a failure to process and integrate trauma, and is described as an information processing disorder (Brewin et al., 1996). Decreased executive and inhibitory control of trauma memories, emotions, and impulses characterizes the disorder. The verbal memory impairments among trauma samples have been linked both to increased arousal state and intrusive reexperiencing phenomena (Kolb, 1987). If intrusive symptoms in PTSD reflect a general failure in executive control, with a deficit in the ability to suppress involuntary thoughts, it is assumed that this impairment also is seen on specific memory tests involving organizational strategies and executive control.

However, traumatized refugees exhibit a spectrum of clinical signs, and in addition to PTSD, major depressive disorder is common (Mollica et al., 1987). In a study of Bosnian refugees, comorbidity of PTSD and depression was related to high rates of psychosocial disability (Mollica et al., 1999). Most of the studies examining cognitive alteration in PTSD have been conducted on groups with coexisting psychiatric conditions (Vasterling et al., 2002; Yehuda et al., 2005b). Lately, there has been a growing awareness that complex and prolonged trauma may result in many posttraumatic outcomes (Bremner, 2002; van der Kolk et al., 2005). Some studies that have applied statistical control for comorbidity or concurrent conditions have suggested that PTSD makes an independent contribution to the group differences (Bremner et al., 2004; Gilbertson et al., 2001; Jelinek et al., 2006; Jenkins et al., 1998; Jenkins et al., 2000); other studies have found depressive symptoms in traumatized individuals to be related to the cognitive impairments (Brandes et al., 2002; Johnsen et al., 2008). In a prospective study, early depressive symptoms were found to predict PTSD better than early PTSD symptoms (Freedman et al., 1999). This makes it important to assess concurrent conditions such as depression, in order to understand if the underlying memory impairment and executive failure are specifically related to PTSD symptoms or to the depressive symptoms connected to it. Depression has been linked to impairment on tasks requiring effortful processing (Hasher and Zacks, 1979). In addition, general intellectual functioning has been found to be a risk factor for PTSD (Macklin et al., 1998) and controlling for IQ measures is necessary.

To date, neuropsychological studies of PTSD suggest that verbal memory impairments in patients with PTSD are related to problems with encoding and executive memory. However, the previous studies have focused mostly on the number of items recalled and to a lesser extent on qualitative aspects underlying the memory impairments such as intervening cognitive processes, e.g., organizational strategies and error types. The association between memory impairments and difficulties in implementing organizational strategies has been documented in other psychiatric disorders and brain disease (Gershberg and Shimamura, 1995; Lundervold et al., 1994; Savage et al., 2000). Thus, the question of whether the encoding impairments found in patients with PTSD are related to ineffective organizational strategies still remains to be answered. Studies documenting memory impairment in war-related PTSD have mostly been conducted on US war veteran samples, with only a few presenting data from civilian samples and different cultural groups. War veterans have been specially trained for challenging situations, which may affect their coping and later symptom development.

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