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# Neuropsychological functioning in posttraumatic stress disorder following forced displacement in older adults and their offspring

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ABSTRACT

The aim of the present study was to investigate neuropsychological performance in an untried trauma sample of older adults displaced during childhood at the end of World War II (WWII) with and without posttraumatic stress disorder (PTSD) as well as transgenerational effects of trauma and PTSD on their offspring. Displaced older adults with ($n$=20) and without PTSD ($n$=24) and nondisplaced healthy individuals ($n$=11) as well as one of their respective offspring were assessed with a large battery of cognitive tests (primarily targeting memory functioning). No evidence for deficits in neuropsychological performance was found in the aging group of displaced people with PTSD. Moreover, no group difference emerged in the offspring groups. Findings may be interpreted as first evidence for a rather resilient PTSD group of older adults that is available for assessment 60 years after displacement.

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## 1. Introduction

The experience of war is associated with long-term harm for the physical as well as the mental well-being of both military personnel and civilians (Levy and Sidel, 2009). Posttraumatic stress disorder (PTSD) has emerged as one common psychological consequence of war, that in the case of World War II (WWII) still affects a substantial proportion of people more than 60 years later (Glaesmer et al., 2010). Importantly, war-related traumatic events do not only include direct combat. In the case of WWII, approximately 12 million people fled or were displaced from former parts of Germany (e.g., from Prussia and Silesia) at the end of the war, facing a wide range of traumatic events such as looting, rape, hunger, or the loss of a relative (cf. Kuwert et al., 2009). However, this population of now older adults has hardly been studied.

Moreover, it has been suggested that not only people directly exposed to traumatic events and suffering from PTSD are affected, but also their significant others, such as their offspring (e.g., combat veterans' children: Dekel and Goldblatt, 2008). The process by which trauma associated symptoms are transferred from one person to another is termed "secondary traumatization" (Rosenheck and Nathan, 1985). Whereas a meta-analysis by Van IJzendoorn et al. (2003) shows that in nonclinical populations such transgenerational transmission is unlikely, an increased risk for the development of mental disorders, specifically PTSD, has been detected in the offspring of individuals with PTSD (Baider et al., 2000, 2006; Roberts et al., 2012; Solomon et al., 1988; Yehuda and Bierer, 2008, however, see Shrira et al., 2011). Parental PTSD is associated with psychological as well as biological effects on the offspring, such as lowered cortisol secretion (e.g., Yehuda et al., 2000).

Moreover, biased information processing has been implicated in the adult offspring of individuals with PTSD (e.g., Suozzia and Motta, 2004; however see, Wittekind et al., 2010). Whether abnormalities in the offspring of individuals with PTSD relate to more general neuropsychological domains which are commonly associated with PTSD, such as learning and memory, has not yet been investigated.

A large number of studies have reported deficits in learning and memory in individuals with PTSD (see Brewin et al., 2007). Compromised long-term memory has been primarily associated with impaired performance at encoding (e.g., Gilbertson et al., 2001; Jelinek et al., 2006; Johnsen and Asbjornsen, 2009, for meta-analysis see Brewin et al., 2007). In line with this, attenuated performance has also been found for the memory span of PTSD patients as assessed by the test Digit Span of the WAIS (e.g., Gilbertson et al., 2001; Vasterling et al., 2002, however, see Burriss et al., 2008) or the Corsi Block Tapping Test (Kim et al., 2009). In

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the elderly, PTSD has been proposed to lead to increased cognitive impairment (for review see Lapp et al., 2011).

Meta-analysis reveal that verbal memory is more consistently impaired in PTSD than nonverbal memory (see Brewin et al., 2007). It has to be objected, however, that many verbal tests (e.g., the AVLT) can be solved by participants using nonverbal encoding strategies rendering this inference questionable (cf. Jelinek et al., 2006). Likewise, in some tests nonverbal stimuli may be easily verbalized (e.g., Benton Test). To provide unconfounded indices of verbal versus nonverbal memory, our group developed the Picture Word Memory Test (PWMT), and observed deficits in *both* domains in a mixed trauma sample with PTSD relative to a group of healthy controls (Jelinek et al., 2006).

Results of reduced memory performance in PTSD refer to a large variety of trauma samples, such as victims of rape and childhood abuse, combat veterans, and Holocaust survivors. However, to our knowledge, memory performance in individuals with PTSD following displacement during WWII has not yet been investigated, leaving the neuropsychological profile of this population unexamined.

The aim of the present study was to investigate neuropsychological performance, previously described as impaired by PTSD, in an untried trauma sample of older adults displaced during childhood at the end of WWII, with and without PTSD, and compare their data to a group of nontraumatized healthy older adults. Against the background of findings in other trauma samples, we hypothesized that a diagnosis of PTSD is associated with deficits in learning and memory. Moreover, we aimed at controlling for the effect of depression, as (1) depression is common in PTSD – the two constructs also overlap with regard to diagnostic criteria – and (2) depression is associated with cognitive impairment (e.g., Brandes et al., 2002; Johnsen and Asbjornsen, 2009; for review on depression and neurocognitive impairment in older adults see, e.g., Herrmann et al., 2007). To obtain new data on the transgenerational transmission of PTSD related dysfunctions in memory, we also sought to assess mnemonic functioning in the offspring of the three groups (PTSD, Non-PTSD, Non-Trauma). Thus, neuropsychological dysfunctions were hypothesized for the offspring of displaced individuals with PTSD in comparison with the offspring of displaced individuals without PTSD and nontraumatized individuals.

To investigate these questions is of particular importance, as consequences of WWII and forced displacement in particular have been related to mental health problems among the elderly population (e.g., Glaesmer et al., 2010; Kuwert et al., 2007, 2009). Moreover, human displacement currently concerns about 42.5 million people worldwide (United Nations High Commissioner for Refugees [UNHCR], 2012) emphasizing the importance to study long-term consequences on the neuropsychological performance of displaced people as well as their offspring beyond this specific population.

## 2. Methods

### 2.1. Participants

Forty-four individuals born between 1933 and 1940 in the former German Eastern territories and displaced as children at the end of WWII as well as one of their adult children were recruited by means of an advertisement in the local media and through contacts with German displacement networks (for more recruitment details see Jelinek et al., 2013; Muhtz et al., 2011). All participants were interviewed with the German version of the Structured Clinical Interview (SCID, Wittchen et al., 1997), whereby 20 of the displaced participants were diagnosed with displacement-related PTSD, and 24 did not fulfill PTSD criteria. To complement information of the SCID and to assess traumatic experiences during displacement in more detail, the German questionnaire of traumatic events during flight by Teegen and Meister (2000) was used, which includes typical displacement-related traumatic events. Frequent traumatic experiences in the current sample were sudden loss of a relative, bombings, witnessing people die, assaults, and hunger (for more details on displacement-related characteristics of the sample, see Jelinek et al., 2013). During displacement all participants experienced traumatic events as described in the DSM-IV trauma criteria A1 and A2.

Additionally, 11 nondisplaced individuals (not married to a person displaced during WWII) as well as one of their adult children with no history of any psychiatric disorder (as verified by the SCID) were recruited (Non-Trauma group). Participants with psychotic symptoms, neurological disorders (e.g., head injury), and substance dependence were excluded. Moreover, participants with color-blindness were excluded as an emotional Stroop test was also part of the assessment battery (Wittekind et al., 2010).

To assess severity of PTSD symptoms, the Posttraumatic Diagnostic Scale (PDS, Foa et al., 1997) was administered to traumatized participants. Internal consistency for the German version of the PDS is considered excellent with $\alpha = .94$ (Griesel et al., 2006).

Depression severity was assessed in all participants using the Beck-Depression Inventory (BDI, Beck, 1995). A multiple choice vocabulary test was used to estimate premorbid intelligence level (MWT-B, Lehrl, 1995). All participants had given written informed consent prior to participation. This study was approved by the Ethics Committee of the Medical Board Hamburg.

### 2.2. Neuropsychological tasks

#### 2.2.1. Picture Word Memory Test (PWMT)

The PWMT (Jelinek et al., 2006; Moritz et al., 2009) is a memory test that provides separate indices for verbal and nonverbal memory for both memory accuracy and confidence. According to normative data, verbal stimuli are extremely difficult to visualize (e.g., *opinion*), while nonverbal stimuli (simple line drawings) are extremely difficult to verbalize. All the presented stimuli were rated as emotionally neutral. Nonverbal stimuli were appraised as easy to draw diagrams and verbal stimuli used words that are common in the German language. Verbal and nonverbal items (10 each) were presented in alternating fashion in three consecutive trials (trials 1–3) with each item being presented approximately 5 s. Subsequent to each presentation, active recall was required on a sheet of paper (i.e., drawing and writing of stimuli; no constraints were imposed regarding the order of reproduction). Following a 20-min interval, participants were asked to reproduce as many items as possible (trial 4). Afterwards, a recognition task was administered whereby participants were requested to rate their response confidence for each item on a four-point scale (1=guessing, 2=rather unsure, 3=rather sure, 4=entirely sure). Scoring of line drawings was made blind to group allocation.

#### 2.2.2. Digit Span (forward and backward)

In the Digit Span (for a detailed description also see Lezak, 1995) an increasing number of orally presented digits has to be repeated by the participant. For the Digit Span forward task, digits have to be repeated in the same order as presented by the experimenter, whereas for the in Digit Span backward task, digits have to be repeated in reversed order. After each trial (comprising two items) the number of digits is increased by one. When errors occur in both items of one trial, the test is terminated. Digit Span forward is considered to be related to efficiency of attention, whereas Digit Span backward taps into working memory functioning.

#### 2.2.3. Corsi Block Tapping (forward and backward)

In the Corsi Block Tapping Test, the experimenter taps increasingly longer sequences of blocks which the participant is asked to reproduce. For the Corsi Block Tapping forward subtask, sequences have to be repeated in the same order as presented by the experimenter, while for the Corsi Block Tapping backward subtask, sequences have to be repeated in reversed order. Two items were presented per sequence starting with two blocks (for both the forward and the backward task). The task is terminated when both items of the same sequence are repeated incorrectly by the participant (for further task description see Lezak, 1995).

#### 2.2.4. Trail-Making Test (TMT)

The TMT A and B (Reitan, 1992) were administered to measure information processing speed (TMT-A) and set-shifting (TMT-B). In version A (TMT-A), the participant is asked to connect 25 numbers in ascending order as quickly as possible. In version B (TMT-B), numbers and letters are presented, which have to be connected in alternating order (i.e., 1-A-2-B, etc.).

#### 2.2.5. Strategy of data analyses

Repeated-measure analyses of variances (ANOVA) were planned using Bonferroni corrected post-hoc tests. To measure the relation between psychopathology (PTSD, depression) and neuropsychological performance, product–moment correlations (Pearson) were conducted. To test assumptions for statistical analyses, the distribution of normality was checked for all neuropsychological test scores within each sample. All variables were normally distributed with the following exceptions: PWMT: figural recognition (PTSD offspring); trial 1, figural (PTSD parents, control parents); verbal confidence (Non-PTSD parents). In this case, groups (parents or offspring, respectively) were additionally compared on the Kruskal–Wallis test. However, results did not change regarding level of significance.

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