ALCOHOL USE, CIGARETTE CONSUMPTION AND CHRONIC POST-TRAUMATIC STRESS DISORDER

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(Received 23 February 2001; in revised form 17 December 2001; accepted 24 January 2002)

Abstract — Aims: The relationship between alcohol consumption, cigarette smoking and post-traumatic stress disorder (PTSD) was studied in 147 male former members of the civilian resistance against the Nazi occupation of Holland during World War II. Methods: The subjects were interviewed at home. Measures included rating of current PTSD and a self-report measure of smoking and alcohol use. Results: The weekly alcohol consumption reported by veterans was substantially below that of the general population. Furthermore, there was no significant difference in self-reported alcohol consumption between veterans with and without current PTSD. Cigarette smoking, however, was more prevalent in those with current PTSD. Conclusions: The absence in these veterans of a correlation between PTSD and alcohol consumption is contrary to the results of most studies on this subject. It may be related to the exclusion from organized resistance activities of people prone to the over-consumption of alcohol. It is hypothesized that, in trauma survivors, current substance use is associated with peri-traumatic patterns of psychological tension–reduction modes.

INTRODUCTION

There is extensive literature documenting a significant relationship between post-traumatic stress disorder (PTSD) and excessive alcohol use. In particular, a ‘traumatogenic’ basis for alcohol misuse has been endorsed by studies of Vietnam veterans. An important issue is causality: which comes first? Furthermore, it may well be possible that both conditions have common antecedents.

The hypothesis of alcohol misuse as ‘self-medication’ to relieve psychological suffering has gained popularity (Khantzian, 1997; Chilcoat and Breslau, 1998). This notion derives primarily from clinical observations and is intuitively appealing. According to this hypothesis, misuse begins as a partially successful attempt to assuage painful feelings and states of distress. This hypothesis is the more appealing, since it is clear that, among alcohol-dependent persons, the rates of anxiety and affective disorders are significantly higher than in the general population (Khantzian, 1997). Smoking is another habit with presumed psychological tension–reduction properties and strong addictive effects.

In order to gain further insights into the association between alcohol consumption, smoking and PTSD, the data of a sample of male Dutch World War II Resistance veterans were examined. In this group, patterns of regular alcohol consumption and cigarette smoking were compared between subjects with and without PTSD. Some comparisons with the Dutch population in general were also made. Based on the literature, which is reviewed below, it was expected that, compared to veterans without PTSD and to the general population, war veterans with PTSD would exhibit higher use of alcohol and would smoke more. The interrelation of these variables with PTSD was examined, since both smoking and alcohol use appear to be related to anxiety and depression (Friedman et al., 1991; Breslau et al., 1998), while, in turn, anxiety and depression are also strongly related to PTSD (Hovens et al., 1992).

Alcohol use in traumatized civilian populations

A comparison of the published studies discussed hereafter is limited by the divergent tools and criteria used for diagnosis. In a 1964 study of 227 Norwegian Resistance veterans and concentration camp survivors, excessive drinking was diagnosed in 22% of the survivors (Eitinger and Askevold, 1968). However, comparison data from the general Norwegian population at that time were not given. On the other hand, in Holocaust survivors, substance misuse was found to be less than that in other groups of trauma survivors (Yehuda et al., 1996).

In an epidemiological survey of civilians with PTSD, only a small increase in risk for substance misuse was found (Helzer et al., 1987). However, a substantially higher co-morbidity was reported in another American community sample of >5800 subjects (Kessler et al., 1995); 52% of the men and 28% of the women with PTSD met criteria for lifetime alcohol misuse/dependence. In UK police officers involved in the Hillsborough Football Stadium fire, alcohol consumption in those who were already drinkers increased after the disaster (Sims and Sims, 1998). In women, sexual assault, rape and other traumatic experiences increased the risk of problematic alcohol use (Burnam et al., 1988; Breslau et al., 1997; Resnick et al., 1997).

Also studies of the prevalence of PTSD in subjects with substance misuse showed considerable co-morbidity (Brown and Anderson, 1991; Cottler et al., 1992; Fullilove et al., 1993).

Studies of alcohol consumption in military veterans

Forty-three per cent of Norwegian UN peace-keeping veterans having served in South-Lebanon reported increased alcohol use during the mission. Those who had been exposed to the highest levels of stress more frequently mentioned tension, restlessness and anxiety to explain the increase (Mehlum, 1999). Many studies of Vietnam veterans reported substantial positive relationships between combat exposure and subsequent

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PTSD and alcohol misuse (Lacoursiere et al., 1980; Boscarino, 1981; Blum et al., 1984; Branchey et al., 1984; Boman, 1986; Centers for Disease Control Vietnam Experience Study, 1988; Keane et al., 1988; Kulka et al., 1988; Nace, 1988; Fischer, 1991; McFall et al., 1992). In the National Vietnam Veterans Readjustment Study, it has been reported that, of those combat veterans who were suffering from PTSD, 22% also had a current diagnosis of alcohol misuse/dependence, and 75% were estimated to have a lifetime diagnosis (Kulka et al., 1988).

Severity of combat exposure was significantly associated with self-reported excessive drinking in Vietnam combatants during military service and in the first year following discharge (Lauf er et al., 1985). Exposure to heavy combat more than doubled a Vietnam veteran’s risk of post-discharge alcohol misuse (Fischer, 1991).

In Canadian World War II combat veterans living in geriatric institutions, a strong correlation between severity of combat stress and subsequent alcohol misuse was found (Herrmann and Eryavc, 1996). By contrast, American former prisoners of war from World War II and the Korean War showed greatly elevated rates of PTSD, but their rates of alcoholism were not distinctly different from those in the general population (Eberly and Engdahl, 1991). A group of 107 American combat veterans was studied in depth both before and immediately after serving overseas in World War II. They were re-examined in 1988. Alcohol misuse was not significantly correlated with combat exposure, nor with PTSD symptoms present in 1946 and 1988 (Lee et al., 1995). However, the number of subjects suffering from PTSD in 1988 was very small.

Many Vietnam veterans may have been ‘turned-on’ to alcohol and drug misuse while in Vietnam, apparently without obvious disapproval by military superiors, as a way of coping with the inordinate stresses of war (Keane et al., 1988; Boudewyns et al., 1991). Bremner et al. (1996) found that PTSD and substance misuse emerged simultaneously in Vietnam veterans, and would follow relatively parallel courses over time. Few of the studies of Vietnam veterans controlled for pre-exposure variables, especially family problems, psychiatric morbidity, and alcohol consumption. Helzer (1984) found evidence of a causal relationship between military combat and subsequent problem drinking in Vietnam veterans, yet after controlling for pre-service alcohol use, this association turned out to be weak. In a sample of Vietnam veteran inpatients, a strong correlation was found between exposure to trauma during childhood and post-war substance misuse (Triffleman et al., 1995). Furthermore, the presence of pre-war psychiatric problems contributed significantly to alcohol misuse in a sample of 196 Vietnam veterans (Green et al., 1989). Herrmann and Eryavc (1996) found that World War II combat veterans with PTSD more often reported family histories of alcohol misuse (36 vs 14%). A family history study in 36 combat veterans with chronic PTSD showed a positive history of familial alcohol/drug misuse in 60% (Davidson et al., 1985). Finally, in 309 hospitalized World War II and Korean War veterans, 35–40% reported having alcoholic parents (Druley and Pashko, 1988). Therefore, alcohol misuse after exposure to military combat may be strongly associated with already existing patterns of alcohol consumption, familial predisposition, childhood trauma and pre-exposure psychiatric problems. This may confound current associations.

Smoking in traumatized populations

There is firm evidence of a significant correlation between heavy smoking and depression, anxiety and other measures of distress (Khantzian, 1997). There are far fewer studies on smoking in traumatized populations, than on alcohol use. During the civil war in Bosnia, notwithstanding a dramatic increase in the cost of cigarettes, healthcare workers in Sarajevo showed a significant increase in cigarette smoking (Creson et al., 1996).

In a study conducted in 1946–1947 of 566 Danish resistance veterans who survived concentration camp imprisonment, 58% reported increased smoking (Thygesen, 1952). In military veterans, a positive relationship between level of combat and subsequent alcohol use was found; smoking shows a comparable trend. Stellman et al. (1988) found that 56% of high-combat Vietnam veterans were cigarette smokers, compared to 33% of low-combat veterans. A smoking prevalence of 66% was reported in Israeli Lebanon War veterans with PTSD, in contrast to 33% in age-matched veterans without PTSD (Shalev et al., 1990). Of 124 help-seeking Vietnam combat veterans, 60% smoked cigarettes; those who smoked reported higher levels of PTSD symptoms, depression and anxiety. Increase in depression was associated with increased chain-smoking. In this study, smokers mentioned an increased urge of smoking in response to combat memories (Beckham et al., 1995). In an additional study by Beckham et al. (1997) of 445 Vietnam veterans, those with PTSD reported similar occurrence of smoking, compared to veterans without PTSD. However, the veterans with PTSD reported significantly higher rates of heavy smoking. Acierno et al. (1996) examined effects of victimization in women in relation to, and independently of, PTSD diagnosis. Both PTSD and depression were associated with increased rates of smoking. These authors found that nearly 40% of the women with a background of victimization were current smokers, compared to 25% of non-victimized women. In women with a past history of smoking, victimization was followed by an increased use of cigarettes. Finally, in a study of 73 survivors of the disastrous capsizing of the Ferry ‘Herald of Free Enterprise’, many reported an increase in cigarette consumption besides post-traumatic symptoms (Joseph et al., 1993).

Regular alcohol and tobacco use in The Netherlands

Between 1950 and 1985, an almost fourfold increase in alcohol consumption was observed among the adult population in The Netherlands. At the time this study was conducted (1986–1988), 87% of the adult population was estimated to regularly use alcohol, with the group of male drinkers being proportionally larger than the female group (Projectgroep Alcohol Voorlichtingsplan, 1988). Alcohol use tends to decrease with age (Centraal Bureau voor de Statistiek, 1984). Level of education influences regular alcohol consumption. In subjects aged 56–75 years, 45% of those with a lower education level said they never drink, compared to 17% of those with a higher education level (Bosma, 1988). In The Netherlands, the prevalence of alcohol misuse among subjects aged ≥65 years was estimated to be 1–5% (Speckens and Heeran, 1991).

Data on smoking by the Dutch population are available from the Centraal Bureau voor de Statistiek (1984). Since World War II, cigarette smoking has decreased in all age groups. In
1960, 81% of Dutch subjects aged ≥65 years smoked tobacco; in 1985, this figure had decreased to 52%.

**MATERIALS AND METHODS**

**Subjects**

During 1986–1988, we conducted a study about the well-being and general health situation of former members of the Dutch civilian Resistance against the Nazi occupation of The Netherlands. A general governmental register of all war victims and resistance veterans was never made. Therefore, we approached by letter all males (n = 813) who were registered with ‘Stichting 1940–1945’ as acknowledged resistance participants living in The Netherlands, and who were between 60 and 65 years of age on January 1, 1986. ‘Stichting 1940–1945’ is a government-supported, private foundation that actively promotes the interests of former resistance participants and their next-of-kin. This foundation is responsible for investigating and acknowledging the factual resistance records of claimants for a government-funded veterans’ disability pension. This formal registration is based on a series of impartial witnesses’ reports, which have to provide proof of exposure to severe war stress. The objectively documented war history of each veteran was accessible for research. Of the initially contacted subjects, 619 (76%) agreed to participate. All of them received a war disability pension. Many of them had undergone therapy for PTSD in the past, but were not being treated at the time of the study. From this group of 619 veterans, a random sample of 182 subjects was drawn. Complete or near-complete (less than two missing items per list) questionnaire and interview data were collected from 147 subjects (81%). Details about the selection procedure and instruments have previously been described (Hovens et al., 1992; Op den Velde et al., 1993, 1996).

These resistance veterans were compared to 252 males, aged 55–64 years, who had been included in a national, representative sample survey about lifestyles, general health, and smoking and drinking habits by The Netherlands Central Bureau for Statistics (Centraal Bureau voor de Statistiek, 1984). The occurrence of PTSD in this sample is unknown.

**Instruments**

All veterans were interviewed at home. This interview included a rating of the presence of current PTSD by means of the Structured Clinical Interview schedule (SCID) for DSM-III-R-defined PTSD (Spitzer et al., 1985; Dutch adaptation: Koster van Groos, 1986). The interviewers also posed open questions about substance and drug use. A self-report measure about last years’ presence of chronic diseases was also administered (Centraal Bureau voor de Statistiek, 1984). This questionnaire includes one question about the average daily use of number of glasses (= units) of alcoholic beverages (including beer), and one question about the number of cigarettes smoked each day. This was the same questionnaire as used in the comparison sample.

Both alcohol and cigarette consumption were re-calculated as a weekly rate, since this procedure was used by the Centraal Bureau voor de Statistiek.

The veterans also completed the trait anxiety scale of the Spielberger State–Trait Anxiety Inventory (STAI) in the Dutch version (Van der Ploeg et al., 1980), and the (revised) Dutch version of the Zung Depression Scale (Mook et al., 1989).

Twenty-five questionnaires were excluded from analysis, because of missing values on the use of alcohol and/or cigarette smoking. Therefore, the results will be based on 125 completed questionnaires regarding alcohol use, and 122 regarding smoking.

**RESULTS**

In our sample of male former resistance participants, highest level of completed education was: primary school 37%, vocational training 27%, high school 30%, university 6% (Op den Velde et al., 1993). This implies that, compared to the general male population of about the same age, these resistance veterans showed a higher level of education (Centraal Bureau voor de Statistiek, 1984).

Fifty-eight per cent of the 125 veterans were currently suffering from PTSD. None of these subjects admitted to ever having used illicit drugs, such as marihuana, cocaine, amphetamines, or heroin. This is not surprising, since, in their age group, use of illicit drugs is extremely low.

Table 1 shows the prevalence of weekly alcohol and cigarette consumption in these resistance veterans, compared to the general population rates of males of about the same age (Centraal Bureau voor de Statistiek, 1984).

Weekly alcohol consumption in resistance veterans (n = 125) was significantly lower than in the general population (χ² = 18.76; df = 4; P < 0.001). In these veterans, alcohol use was similar in subjects with or without PTSD (χ² = 4.5; df = 4; P = 0.34). There was no significant difference in weekly cigarette consumption between resistance veterans (n = 122) and the general population (χ² = 2.14; df = 4; P = 0.71). However, smoking rates among veterans with PTSD were significantly higher than those in veterans without (χ² = 9.61; df = 4; P = 0.05).

In order to evaluate the effects of smoking and alcohol consumption on PTSD, a logistic regression analysis was performed, including anxiety (STAI trait anxiety) and depression (Zung scale) as co-variates, plus their two- and three-way interactions because of the substantial interdependence of these variables (Table 2). Highly significant effects were found for anxiety and smoking and for their interaction. Alcohol consumption and depression did not contribute to the prediction of PTSD after the effects of smoking and anxiety had been taken into account. The above significant interaction reveals an effect of anxiety on PTSD that differs for smokers and non-smokers. It is positive for both groups, which means that the risk for PTSD increases with the degree of anxiety, but the effect of anxiety on PTSD is stronger for non-smokers than for smokers. Taking into account the large effect of smoking on PTSD, this effect can be interpreted as follows: smokers with a relatively low anxiety are at a higher risk for PTSD than non-smokers with low anxiety, but non-smokers with a relatively high anxiety are at lower risk for PTSD than non-smokers with a high anxiety. Put differently, for high values of anxiety, the effect of anxiety outweighs the effect of smoking on the risk for PTSD.
DISCUSSION

Alcohol use and PTSD

Self-reported alcohol consumption in this sample of Dutch resistance veterans, a considerable number of whom were currently suffering from PTSD, was substantially less than that in controls (Table 1). This observation is strikingly unusual for two reasons. First, it is observed in this sample of resistance veterans with over-representation of those in middle and higher education, yet alcohol consumption tends to be lower in those with less education. Second, the comparison group of the general population was of a somewhat younger age, and, in general, alcohol consumption tends to decrease with age.

Furthermore, veterans with current PTSD did not consume significantly more alcohol than those who did not suffer from PTSD. Therefore, neither our expectation that resistance veterans would show a higher alcohol consumption than the general population, nor that there would be a positive association between alcohol use and PTSD, was confirmed.

These findings run counter to the generally positive associations between PTSD and alcohol use, as reported in the literature (see Introduction). However, two other studies, one on American former prisoners of war from World War II and the Korean War, and another on American World War II combat veterans, reported a non-elevated rate of alcohol use (Eberly and Engdahl, 1991; Lee et al., 1995).

Methodological limitations

We can only speculate to explain the contrary findings in our Dutch veterans of the civilian Resistance. In several respects, the present study is not an ideal vehicle for clarifying the lasting effects of wartime stress on smoking and alcohol consumption. First, the group studied — male veterans of the civilian Resistance during World War II who were entitled to a disability pension — does not represent the average Dutch population. Second, the pattern of current use of alcohol and cigarettes was studied by a simple self-report measure; the data do not allow for a reconstruction of individual drinking and smoking histories. Third, the comparison group consisted of males who participated in a national survey about lifestyles. This group was 55–64 years old, and the resistance veterans were aged 60–65 years at the time of study. Moreover, no relevant data about the war experiences of the comparison group were available. However, in a large random sample of the Dutch population aged 63–72 years, the prevalence of current PTSD was estimated to be 4% (Branssen, 1995). Fourth, higher smoking rates as well as alcohol misuse could account for an increased mortality of resistance veterans prior to data collection in the present sample (Wiseman, 1996).

The study of Dutch resistance veterans (see Hovens et al., 1992; Op den Velde et al., 1993, 1996) was not initiated with a PTSD and alcohol and smoking association in mind, but had two positive methodological features. Firstly, there was impartial evidence that all subjects had been exposed to severe and long-lasting war stress. Secondly, the study group was collected without the distorting effects of psychiatric patient status or potential secondary gain, because permanent disability claims had been allotted prior to the study.

The limited reliability of self-reported alcohol consumption is well known, particularly in subjects with alcohol dependence/misuse (Babor and Del Boca, 1992). Also, selection bias

<table>
<thead>
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<th>Parameter</th>
<th>0</th>
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<th>11–20</th>
<th>21–40</th>
<th>&gt;40</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>General population</td>
<td>27</td>
<td>32</td>
<td>21</td>
<td>15</td>
<td>4</td>
<td>229</td>
</tr>
<tr>
<td>Resistance veterans without PTSD</td>
<td>50.0</td>
<td>15.4</td>
<td>19.2</td>
<td>9.6</td>
<td>5.8</td>
<td>52</td>
</tr>
<tr>
<td>Resistance veterans with PTSD</td>
<td>37.0</td>
<td>24.7</td>
<td>13.7</td>
<td>17.8</td>
<td>6.8</td>
<td>72</td>
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</tbody>
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<table>
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<tr>
<th>Average number of cigarettes smoked weekly (%)</th>
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<tr>
<td>Parameter</td>
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</tr>
<tr>
<td>General population</td>
</tr>
<tr>
<td>Resistance veterans without PTSD</td>
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<tr>
<td>Resistance veterans with PTSD</td>
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Table 1. The weekly use of alcohol and cigarettes by male Resistance veterans (aged 60–65 years) (n = 122–125) compared to the Dutch population aged 55–64 years (Centraal Bureau voor de Statistiek, 1984)

Table 2. A model for the interaction of smoking, anxiety and the prediction of post-traumatic stress disorder

<table>
<thead>
<tr>
<th>Parameter</th>
<th>B</th>
<th>SE</th>
<th>d.f.</th>
<th>Wald</th>
<th>P</th>
<th>Exp (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td>6.39</td>
<td>2.39</td>
<td>1</td>
<td>7.14</td>
<td>0.0075</td>
<td>597.64</td>
</tr>
<tr>
<td>Anxiety</td>
<td>0.19</td>
<td>0.04</td>
<td>1</td>
<td>19.41</td>
<td>0.0000</td>
<td>1.21</td>
</tr>
<tr>
<td>Interaction</td>
<td>-0.12</td>
<td>0.05</td>
<td>1</td>
<td>5.77</td>
<td>0.0163</td>
<td>0.89</td>
</tr>
<tr>
<td>Constant</td>
<td>-8.75</td>
<td>1.99</td>
<td>1</td>
<td>19.25</td>
<td>0.0000</td>
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</tr>
</tbody>
</table>

B = regression coefficient.
may have played a role, since subjects were invited by letter to participate. It cannot be ruled out that veterans with excessive alcohol use refrained from participating. However, both the study group and the comparison group were contacted by mail, were studied by means of identical self-report questionnaires, and were guaranteed anonymity. This probably rules out substantial differences in reliability of answers. Mortality due to disease associated with excessive smoking and alcohol consumption should possibly also not be ruled out as a confounding factor.

**Smoking and PTSD**

It has been known for some time that anxious people tend to smoke more (Friedman et al., 1991; Breslau et al., 1998). This was replicated in our study. We found a strong relationship between anxiety (disposition) and smoking on the one hand and PTSD on the other. In a recent paper (Bramsen et al., 2000), it was found that personality factors that had been evaluated before traumatic experiences took place did indeed predict later development of PTSD. Our results may be interpreted in a similar way.

**The possible role of peri-traumatic alcohol use and smoking**

Resistance veterans are in many respects extraordinary subjects and not representative of the Dutch population (Hovens et al., 1992; Op den Velde et al., 1993, 1996). They belong to a small minority that, at the time, deliberately and of their own choosing, became involved in heavy risks. There are no objective data on alcohol consumption by resistance participants during World War II. However, the interviews that were conducted suggest that regular alcohol consumption was not of major significance in resistance activities. Drinking was often considered too risky, given the high level of vigilance that had to be maintained. Resistance groups were most often formed spontaneously and they would expand by incorporating people who were considered safe and reliable in every respect. Secrecy was paramount for the safety of resistance fighters and indiscretion was an ever-present danger. Known drinkers were considered risky and consequently were generally avoided.

Many Resistance veterans mentioned cigarette smoking as a popular, but not always readily available, manner of tension reduction during the war. Their current smoking habits were therefore analysed. Cigarette smoking was more frequent in PTSD subjects; this could be explained by the difference in proportion of non-smokers, which was 66% for veterans without PTSD and 43% for those with current PTSD.

It is not unlikely that substances were being used as one of a number of ways to release the stresses of war and resistance activities. One of the core phenomena of PTSD is the painful and distressing re-experiencing of war-related memories. We assume that re-experiencing may induce an urge for distress reduction by substance use similar to that at the time of war (the peri-traumatic period). This promotes the hypothesis that peri-traumatic substance use may be one of the determining factors in sustained post-traumatic use. In most studies on co-morbidity of PTSD and alcoholism, subjects were military veterans, in particular from the Vietnam war. The drug and alcohol cultures of Vietnam veterans differed from those of the people in occupied Europe during World War II. Evidence suggests that, in Vietnam veterans, alcohol and drug misuse during actual service played an important role (Lauf et al., 1985; Boudewyns et al., 1991). Yet, also in civilian populations, a positive relationship between PTSD and alcohol misuse/dependence has been reported (Kessler et al., 1997). It may, however, be quite possible that alcohol misuse increases the risk of exposure to traumatic events, and the subsequent development of PTSD (Cottler et al., 1992; Fullilove et al., 1993).

The present observations suggest that a positive association between chronic PTSD and alcohol misuse may not be a universal one. There are complex interactions, in which pre-traumatic as well as post-traumatic personal and social factors may play important roles. In addition, this study supports the idea that peri-traumatic substance use increases the risk for subsequent perpetual use and misuse/dependency. However, further study is required to confirm this relationship. If it were to be established that there are positive associations between the use of potentially addictive and psychotropic substances and peri-traumatic stress, this may well have consequences for the selection and management of population groups at risk, such as military personnel, police officers and rescue workers.

**Acknowledgements** — Financial support for this study was granted by Stichting Dienstverlening Verzetsoedeelners, Stichting 1940–1945, Stichting Fondsverwerving Militaire Oorlogs- en Dienstlachtoffers, and Stichting ICODO. P. A. J. Timmermans and M. A. J. van Duijn conducted the statistical analyses.

**REFERENCES**


Bramsen, L., Dirkzwager, A. J. E. and Van der Ploeg, H. M. (2000) Predeployment personality traits and exposure to trauma as...


