

Study of Predictors of Suicidal Behaviour in Bundeswehr Soldiers Receiving Inpatient Care

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ABSTRACT

Background: In light of increasing stress resulting from deployment abroad, one of the psychological consequences to be expected is an increase in suicidal behaviour among soldiers.

Material and Methods: 200 soldiers receiving psychiatric inpatient care in a Bundeswehr hospital, of whom n=100 exhibiting and n=100 not exhibiting (control group) suicidal tendency, were compared in terms of sociodemographic and clinical characteristics.

Results: Significant predictors of suicidal ideation were alcohol abuse within the immediate family and pathologically high scores in the Minnesota Multiphasic Personality Inventory (MMPI). Significant predictors of suicidal acts were pathologic scores in MMPI, an unfinished vocational training, suicide attempts within the family as well as the situation of basic military training.

Conclusion: The data gathered in this pilot study indicates an influence of individual and military risk factors in the development of suicidality in Bundeswehr soldiers.

1.0 BACKGROUND AND AIM

Suicidality among members of the armed forces is an increasingly important issue, especially following deployment abroad. There were 128 reported active-duty US Army suicides in 2008 and 160 in 2009. The number of suicides was thus higher than of those killed in action and more than double the suicide rate of the US general public [18].

Within the Bundeswehr, the issue of suicides has a smaller dimension. Numbers declined between 2000 and 2007. However, there has been a slight increase since 2008, albeit on a smaller scale than earlier years. The absolute numbers by year are: 2000: 36; 2001: 44; 2002: 38; 2003: 38; 2004: 40; 2005: 26; 2006: 29; 2007: 18; 2008: 20, 2009: 24 suicides (source: Bundeswehr Institute of Military Medical Statistics and Data Management 2010).

The numbers of suicides while on deployment per year are: 2000:3, 2001:3, 2002:2, 2003:0, 2004:3, 2005:0, 2006:2, 2007:2, 2008:0, 2009:1 soldiers (source: Bundeswehr Institute of Military Medical Statistics and Data Management 2010).

Especially against the backdrop of the number of suicides within the Bundeswehr potentially rising once more, the issues of pathogenesis and psychosocial areas of conflict fostering suicidal tendency among soldiers are of particular importance. These are diverse and individual issues, both in a civilian and a military context. The WHO/EURO Multicenter Study of Suicidal Behaviour, for example, identifies a range of sociodemographic and psychopathologic factors influencing the risk and manner of suicidal

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behaviour in the general public. These factors include sex, age, religious beliefs, domestic relationships and lifestyle, financial situation, education, occupation, psychiatric pathology as well as previous suicide attempts [13].

Similar studies have been conducted in a military context.

Stress factors specific to the military, such as post-traumatic stress disorder [5], were of equal relevance to risk of suicide as social issues, depressive disorders and addiction [15].

Since the 1960s, Bundeswehr psychiatry has repeatedly addressed the issue of suicidal tendencies among soldiers [12]. However, as of today, there is no study available that has been conducted systematically and in a clinical-psychiatric treatment setting in the context of recent organisational changes and increasing deployment-related stress in the Bundeswehr.

The aim of this study was thus to evaluate psychosocial and clinical characteristics of military patients receiving inpatient psychiatric treatment for suicidal tendencies in comparison with a control group, in order to deduce hypotheses about predictors of suicidal behaviour as well as an improved suicide prevention within the armed forces.

2.0 STUDY DESIGN AND RESEARCH METHODS

Between March 2005 and November 2008, 100 Bundeswehr soldiers were treated for acute suicidal ideation or suicidal acts in Bundeswehr hospitals in Hamburg and Berlin. They received inpatient treatment in the departments for psychiatry and psychotherapy. The suicidal ideation or acts had occurred for the first time or acutely exacerbated during the month preceding admission (with suicidal thoughts including concrete plans of action). Repeat admissions for suicidal tendencies were not included in the study.

Patients were usually referred by attending general physicians (unit physicians) with some patients reporting to the hospitals' emergency rooms of their own accord or being referred by military chaplains, social workers or their superiors.

The diagnosis was made on the day of admission by a specialist in psychiatry / psychotherapy based on a non-structured clinical interview.

Clinical and socio-biographical data of patients treated in the above time frame was retrospectively gathered from existing patient records by two independent specialist researchers (patients were not chosen selectively).

This group of 100 suicidal soldiers was compared against a control group of 100 non-suicidal inpatients with a military background. The control group was comprised of 100 quasi-randomly chosen inpatients (weighted and uniformly distributed by date of admission and alphabetical position) who had been treated at the Bundeswehr hospitals in Hamburg and Berlin between 2005 and 2008 and not displayed signs of suicidal tendencies during admission and treatment. These patients were evaluated according to the same criteria as the group of patients exhibiting suicidal tendencies.

The suicidal patients were divided into two groups:

- Suicidal ideation with plans of suicide but no suicide attempt (n=45)
- Suicidal acts according to ICD-10 (n=55) from blocks X60-69 (intentional self-poisoning by medication/drugs), X70-79 (cuts, hanging, firearm discharge), X80-84 (jumping from a high place/intentional crashing of motor vehicle)

The samples showed no significant differences in groups regarding age (age: $F=2.33$; $df=2$; $p=.1$; education: $\chi^2=13.58$, $df=12$, $p=.328$). However, there were statistically significant differences regarding sex ($\chi^2=10.49$, $df=2$; $p=.005$).

Table 1 illustrates the distribution of socio-demographic variables of age, sex and level of education.

For the purpose of illustrating main diagnoses, all psychiatric diagnoses were classified in accordance with ICD-10.

The frequency distribution of the diagnosis groups shows a statistically significant difference between groups ($\chi^2=38.2$; $df=12$; $p<.001$). While both the control sample as well as patients who had committed suicidal acts showed lower prevalence of neurotic personality disorders, the majority of patients experiencing suicidal ideation displayed affective disorders (table 2).

To characterise the group of patients who had committed suicidal acts, table 3 contains an overview of methods used in suicide attempts. Patient histories showed that 23 of 100 suicidal patients and 5 of 100 members of the non-suicidal control group had attempted suicide on one or more occasions.

The groups were compared with regard to the frequency and distribution of psychosocial characteristics (Yes/No encoded, if not otherwise stated):

Demographic factors

- age in years
- sex (m/f)

Military-specific factors:

- status: conscript, temporary-career volunteer (enlistment term: 4-20 years), career soldier
- past foreign deployment
- distance between place of residence and place of service (in kilometres)
- suicide attempt or suicidal thoughts during basic training
- disciplinary problems (violations of military duties, such as absence without leave)
- conflicts with superiors (repeated or ongoing stressful situations of conflict)
- conflicts with fellow soldiers (repeated or ongoing stressful situations of conflict)
- problems with internal structure of the Bundeswehr (e.g. conflicts with authority)

Medical / psychiatric factors:

- psychiatric diagnosis in accordance with ICD-10 (classified as F1, F2, F3, F4, F5, F6)
- psychiatric comorbidity diagnosis in accordance with ICD-10 (yes/no)
- MMPI scale scores as established with brief test upon admission [3]
- substance abuse (established through patient history or positive test result)
- suicide attempt or suicidal ideation under the influence of alcohol
- previous suicide attempts

Social factors:

- existing relationship
- quality of the relationship (availability of emotional support)
- current conflicts within the relationship

- number of children
- debts of more than 1000 Euros
- education (failure to graduate, graduation from special needs school, lower secondary education, secondary education, vocational high school, university entrance qualification, university degree)
- completed vocational training
- occupation before entry into service (unemployed, permanent employment, student)

Biographical factors:

- healthy relationship with parents
- alcohol abuse in family of origin
- number of siblings
- family history of suicide attempts

(Data was analysed in accordance with the Declaration of Helsinki and stored and evaluated anonymously). An ethics committee was not involved as data was retrospectively collected from medical records. Patients had given their informed consent (“collection of anonymised data for research purposes”).

3.0 STATISTICS

For the purposes of a binary logistic regression, three models of regression were analysed:

1. control group vs. suicidal ideation
2. control group vs. suicidal acts
3. suicidal ideation vs. suicidal acts

The dependent variable for control group differences is suicidality. For the purposes of the regression model, this is generated as a dichotomous variable. Potential regressors are determined in advance using a bivariate method of analysis (χ^2 test, Mann-Whitney U-tests, t-tests). All variables that are proven to be statistically significant in comparison of groups ($p \leq .05$) are integrated into a forward stepwise binary logistic regression model. Regression models for the following potential regressors are analysed based on the established group differences:

- sex
- diagnosis
- drug abuse
- status
- deployment abroad
- distance between place of residence and place of service
- suicide attempt or suicidal thoughts during basic training
- relationship
- education
- vocational training
- occupation before entry into service
- alcohol abuse within the family
- family history of suicide attempts
- patient history of previous suicide attempt
- MMPI scores

In cases of categorical variables having more than two expressions, a dichotomous variable is generated for each expression.

Statistics to assess the goodness of fit of the models used include the Omnibus Test of Model Coefficients, deviance and measures to assess the variation explained in the model. Nagelkerke's R^2 is given as a measure of the variance explained by the regression model. For the purpose of analysing MMPI scales, patients scoring a t-value > 70 on the lie-scale were excluded.

SPSS 18 was used.

4.0 RESULTS

4.1 Control group vs. patients experiencing suicidal ideation

After excluding all patients scoring > 70 on the MMPI's lie-scale, a total of 137 patients remained, of whom 93 control patients and 44 patients experiencing suicidal ideation.

Three factors showed a significant influence on the model and thus the suicidality as predicted by the model ($\chi^2=53.442$, $df=11$, $p<.001$):

- MMPI Psychasthenia scale ($p=.001$)
- MMPI Schizophrenia scale ($p=.047$)
- alcohol abuse within the family ($p=.004$).

The odds ratio of the variable "alcohol abuse within the family" is a significant value. The relative risk of experiencing suicidal ideation was 6.7 times higher in those that had experienced alcohol abuse within the family. Table 4 indicates that this model allows for a prediction accuracy of 77.4% and an explained variation of 45.2%.

4.2 Control group vs. patients exhibiting suicidal acts

The total group size in this comparison of groups was 144 patients, of whom 93 were control patients and 51 were patients following suicide attempt.

The following variables were identified as significant model factors:

- vocational training ($p=.003$)
- basic military training ($p=.004$)
- suicide attempts within the family ($p=.019$)
- MMPI scale psychasthenia ($p=.044$)

With regard to the odds ratio, the regressor of a family history of suicide attempts entails a probability of suicidal actions 17.6 times higher than in patients with no known suicide attempts within the family. Soldiers currently engaged in basic training are at a risk for suicidal acts that is 5.5 times higher. This model has a prediction accuracy of 77.6 % ($\chi^2 = 51.940$, $df = 12$, $p<.001$) and an explained variation of 41.8%.

4.3 Patients experiencing suicidal ideation vs. those exhibiting suicidal acts

In this comparison of groups, 'suicidal act' is generated as a dichotomous variable. In MMPI scales, no differences between groups below a significance level of $p < .05$ can be detected. The inclusion criterion of a T-value < 70 is thus disregarded in this section.

The resulting total group size was 100, of whom 55 were patients exhibiting suicidal acts and 45 were patients experiencing suicidal ideation.

In the context of a bivariate analysis, the variables

- F3 diagnosis;
- F4 diagnosis;
- no vocational training;
- occupation before entry into service; and
- basic training

proved to be significant variables in a comparison of the groups.

In this regression model, an F3 diagnosis ($p = .043$) and a lack of vocational training ($p = .007$) were found to be statistically significant predictors of suicide attempts ($\chi^2 = 27.665$, $df = 6$, $p < .001$). The prediction accuracy of this model is 71.7%.

The predictors of the three regression models are summarised in table 4.

5.0 DISCUSSION

In this controlled pilot study conducted on Bundeswehr soldiers in a clinical setting, alcohol abuse in the family of origin and elevated MMPI scale values (schizophrenia / psychasthenia) were found to be predictors of suicidal ideation prior to inpatient treatment in a psychiatric facility. Apparent predictors of suicidal acts were a raised MMPI scale score (psychasthenia), a lack of completed vocational training, the particular situation during basic military training as well as a family history of suicide/suicide attempts.

Since this first estimate is based on the comparison of suicidal patients with a control group consisting of patients with mental illness, its transferability to the entire Bundeswehr is limited. The use of these groups for comparison could most likely identify factors which may foster suicidal tendencies beyond an existing mental illness. However, due to reasons of liability and duty of care, members of the Bundeswehr exhibiting suicidal tendencies are subject to particular medical care and are thus treated and assessed as inpatients. The differences in diagnostic and therapeutic emphasis between Bundeswehr hospitals are marginal. This underlines the representative nature of the sample surveyed in this study.

Assuming that suicidal acts are psychopathologically more severe than suicidal ideation, the hypothesis deduced from this comparative study could be that an accumulation of especially social stress factors is associated with an increased severity of suicidality in the surveyed inpatient group.

Some of the psychosocial and medical-psychiatric predictors of suicidal behaviour identified in this study have previously been identified in other studies, both civilian and military. These include addiction in the family [16] as well as relevant MMPI and MMPI-2 scale scores and associated personality profiles [2, 11]. The correlations identified in Bundeswehr soldiers may thus be a reflection of aetiological correlations affecting the general public, rather than a phenomenon exclusive to the military environment.

However, stress factors specific to the Bundeswehr environment are especially relevant to the group of patients examined in this study, with the situation of basic military training being especially prominent. Conflicts resulting from processes of separation and detachment are characteristic for the period of basic training (soldiers aged 17-22 years) and are associated, among other things, with a delay in the maturing process, as is not uncommon in this age group [7, 14]. Raised MMPI scale scores for psychasthenia in this study may be an expression of these delays in maturity. This constellation may have fostered reactions

which are due to an inability to cope and include suicidal behaviour. Thus, in this aspect, effects specific to personality and age may have indirectly influenced the pathogenesis of suicidal tendencies.

Conflicts with authority, perceived and acted out both directly with superiors as well as on a more abstract level with general military structures of hierarchy, and possibly entailing disciplinary problems, are generally not correlated to age [12, 20]. A new study of 66 suicides among Canadian soldiers who had participated in peacekeeping missions has similarly identified conflicts in the work area as well as with the hierarchical structure of the military as predictors of suicidal behaviour [17].

The low (and thus statistically irrelevant) number of soldiers with experience in foreign deployment in the group of suicidal patients (n=3) seems surprising. A possible reason are the high standards for soldiers' health applied by the Bundeswehr as a prerequisite for participation in such deployment, thus ruling out soldiers suffering from mental instability or illness. Previous studies with a military background conducted in other countries have identified stresses resulting from foreign deployment as risk factors for developing suicidal tendencies [5].

Other predictors that were shown to influence the risk of suicidal tendencies in other studies appeared to be not significantly relevant, among them factors such as age, diagnosis/comorbid diagnoses and level of education [6, 9, 10, 14, 17], previously experienced critical incidents [11], alcohol and/or drug abuse, lack of a relationship or conflicts with one's partner [19, 8] and low income [8]. These differences may in part be due to the small sample size of this study, the inclusion of exclusively clinical patient groups for comparison, as well as the particularities inherent in study subjects of a military background, i.e. external restrictions (regarding alcohol and drug consumption) and a good resource situation (solid employment, good physical condition).

6.0 LIMITATIONS

Some methodic limitations should be mentioned. Generalisability of the results is limited due to the inclusion of subjects who form a homogenous sample of military patients receiving inpatient clinical treatment.

Further, the retrospective cross-sectional study design employed without standardised collection of data is methodically inferior to the connection of a potential risk factor with the eventual outcome in a clinical longitudinal study.

The clinical control group was not matched to the survey group. It can thus not definitely be ruled out that some of the observed differences may be explained on the grounds of differences in distribution of gender or diagnoses between the groups. However, this bias is compensated for by inclusion of relevant characteristics into the statistical models.

A presumable further bias results from the exclusion of a relevant portion of the sample from statistical evaluation due to high scores on the MMPI lie-scale. This portion of the sample did not differ significantly from the main sample regarding the parameters ascertained, its exclusion however led to a decrease in sample size. A further possible selection bias due to univariate selection of variables may have led to an overestimation of established significances.

7.0 CONCLUSION AND IMPLICATIONS FOR CLINICAL PRACTICE

The findings of this pilot study point to risk factors for suicidal tendency in Bundeswehr soldiers and suggest further research be done, especially using a longitudinal study design prior to and during military service as well as foreign deployment.

To unit physicians providing primary care, the study's findings may serve as suggestions on how to improve early recognition and prevention of suicidal behaviour among soldiers by paying special attention to the situation of young soldiers at the beginning of their service and to psychosocial conflict situations. The development of training and education programmes, as successfully implemented in the civilian sector, could be helpful [1, 5].

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9.0 ANNEX

Table 1: descriptive characteristics of the patient groups

	control group	patients experiencing suicidal ideation	patients exhibiting suicidal acts	significance
male	n=80 / 80%	n=42 / 93	n=53 96.4	p=0.005
age (M, SD)	25.28 (7.4)	26.73 (8.2)	23.56 (6.6)	p=0.1
education (n=)				p=0.328
<i>failure to graduate</i>	n=3 (3%)	n=3 (6.7%)	n=6 (10.9%)	
<i>special needs education</i>	n=1 (1%)	n=2 (4.4%)	n=1 (1.8%)	
<i>lower secondary education</i>	n=27 (27%)	n=11 (24.4%)	n=17 (30.8%)	
<i>secondary education</i>	n=50 (50%)	n=16 (35.5%)	n=26 (47.3%)	
<i>vocational high school</i>	n=4 (4%)	n=2 (4.4%)	n=1 (1.8%)	
<i>university entrance qualification</i>	n=13 (13%)	n=9 (20%)	n=4 (7.3%)	
<i>university degree</i>	n=2 (2%)	n=2 (4.4%)	0	
(n=)	100	45	55	

Note: The variables of “sex” and “education” are expressed as absolute frequencies, whereas the variable “age” is represented as mean (M) and standard deviation (SD).

Table 2: absolute frequency of groups of diagnosis (n= / %)

	F1	F2	F3	F4	F5	F6	Z	n=
control group	6/6	1/1	17/17	69/69	3/3	4/4	0/0	100
patients experiencing suicidal ideation	3/7	0/0	18/40	17/38	0/0	7/15	0/0	45
patients exhibiting suicidal acts	1/2	0/0	6/11	33/60	0/0	14/25	1/2	55

Note: F1 = mental and behavioural disorders due to use of psychoactive substances; F2 = schizophrenia, schizotypal and delusional disorders; F3 = affective disorders; F4 = neurotic, stress-related and somatoform disorders; F5 = behavioural syndromes associated with physiological disturbances and physical factors; F6 = disorders of adult personality and behaviour; Z = personal history of self-harm

Table 3: mode and frequency of suicide attempts committed by patients exhibiting suicidal acts

mode of suicide attempt	number (n=/%)
self-poisoning by medication	n=23 / 39.7%
self-poisoning by illegal drugs	n=1 / 1.7%
slashing of the wrists	n=16 / 29.1%
other cuts	n=4 / 6.9%
hanging	n=2 / 3.4%
jumping from a high place	n=5 / 8.6%
intentional crashing of motor vehicle	n=2 / 3.4%
firearm discharge	n=4 / 6.9%
other	n=1 / 1.7%

Note: multiple answers were permitted

Table 4: overview of predictors for all models

predictor	B	OR	95%-CI	p-value
model 1: control group vs. patients experiencing suicidal thoughts ($\chi^2 = 53.442$, $df = 11$, $p < .001$)				
MMPI scale psychasthenia	0.162	1.176	1.066 – 1.297	.001
alcohol abuse within the family	1.903	6.708	1.866 – 24.121	.004
MMPI score schizophrenia	-0.071	0.931	0.868 – 0.999	.047
model 2: control group vs. patients exhibiting suicidal acts ($\chi^2 = 51.940$, $df = 12$, $p < .001$)				
no vocational training	1.477	4.381	1.651 – 11.622	.003
currently in basic military training	1.705	5.504	1.727 – 17.539	.004
suicide within the family	2.868	17.606	1.612 – 192.345	.019
MMPI scale psychasthenia	0.086	1.090	1.002 – 1.186	.044
previous suicide attempt	0.807	2.241	0.969 – 5.185	.059 (n.s.)
model 3: patients experiencing suicidal thoughts vs. patients exhibiting suicidal acts ($\chi^2 = 27.665$, $df = 6$, $p < .001$)				
no vocational training	-1.579	0.206	0.066 – 0.647	.007
F3 diagnosis	1.468	4.343	1.050 – 17.968	.043

Note: B = regression coefficient; OR = odds ratio; CI = confidence interval of OR; p = probability value of Wald test

