

Mortality and Postcombat Disorders: U.K. Veterans of the Boer War and World War I

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This study seeks to investigate the mortality rates of U.K. servicemen with postcombat syndromes following the Boer War and World War I. Random samples of veterans awarded war pensions for either disordered action of the heart (DAH) or neurasthenia/shellshock were compared with gunshot wounded ex-servicemen as controls. The destruction of pension records has led to reliance on groups of the longest lived veterans, which diminishes their representative qualities. Study groups were matched by rank and level of disability. With the exception of DAH cases in World War I, no statistically significant difference in mortality rates was found using Cox proportional hazards. The same DAH subjects were then compared with gunshot wound controls whose disability had been assessed 20% higher, and no statistically significant difference was seen. The reason why World War I veterans with DAH had a reduced life expectancy remains unclear, although it is possible that physician bias in assessment and the termination by the Ministry of Pensions of awards granted to healthy cases may have been factors. Postcombat disorders suffered by U.K. servicemen after the Boer War and World War I were not generally associated with an increased mortality.

Introduction

The question, whether servicemen who have been diagnosed with postcombat disorders suffer a reduced life expectancy, is an old but relevant one. In the aftermath of World War I, for example, Grant¹ conducted a 5-year follow-up of 263 ex-servicemen discharged from the British army with a diagnosis of disordered action of the heart (DAH), a functional disorder characterized by rapid or irregular heartbeat, shortness of breath, and chest pain. Although he found chronicity (56.2% showed no improvement and 3.2% had deteriorated), the "death-rate" was "no greater than would be expected in the general population of London for the same ages." No equivalent investigation of U.K. servicemen was conducted after World War II or the Korean conflict. One of the legacies of the Gulf War has been an enduring concern that the health of combatants has been seriously compromised. Although U.K. veterans are known to be more troubled about their health than service personnel who had not been deployed to the Persian Gulf,² the only change in their mortality that has been identified is a small, but not statistically significant, excess relating again to accidents rather than disease.³

In mortality studies of military populations, their particular characteristics, or the so-called "soldier effect" has to be considered. Because servicemen undergo an extended selection pro-

cess to filter out those of poor health, and their training is designed to engender high levels of physical fitness, they generally enjoy favorable mortality rates. A survey of 85,491 U.S. Army veterans followed up between 1947 and 1969 showed that their mortality rates were significantly below those of the general population in the years immediately after discharge.⁴ Although the effect of selection bias on subsequent mortality may persist for over 20 years, it gradually disappears as rates in veteran groups move toward those of the parent population. Studies of civilians with disorders characterized by medically unexplained symptoms have not revealed any adverse effects as regards their mortality. In 1950, a 20-year follow-up study of 173 U.S. patients with neurocirculatory asthenia did not identify a reduced life expectancy.⁵ Despite the apparently persistent morbidity associated with chronic fatigue syndrome, recent investigations of nonmilitary populations have failed to detect an increase in mortality.⁶ Such evidence is rightly considered important in discussions of the pathophysiology of these syndromes in both civilian and military settings.

This study seeks to test the hypothesis that veterans of earlier wars diagnosed with postcombat disorders may suffer adverse, long-term health consequences, including higher mortality rates. Historical war pension files, which contain both military and medical data, were identified for the Boer War (1899–1902) and World War I, although the equivalent records for World War II and the Korean conflict have yet to be released. Two diagnostic groups have been selected: functional cardiac disorders and shell shock. However, their terminology has been the subject of some controversy. In 1917, concerned by the pathological overtones of DAH, which encouraged servicemen to believe that they suffered from a serious organic condition, Lewis⁷ proposed the new term effort syndrome. He believed that its symptoms resembled an exaggeration of the normal response to physical effort. This observation was not shared by a group of U.S. doctors who worked at the Soabron Military Hospital in Colchester because many of the features were present at rest without effort.⁸ They devised the term "neurocirculatory asthenia" as it was "descriptive, non-committal as regards the heart, and shortened to the cryptic 'NCA' would be understood and not misunderstood all along the line."⁹ Shell shock, an unofficial label in widespread use by 1915, was outlawed by the military authorities 2 years later because it was considered attractive to men seeking an exit from combat duties. Soldiers who had received the diagnostic term when treated in the military and had been subsequently awarded a pension were reclassified as suffering from neurasthenia. By selecting cases of DAH, we were able to discover whether the findings relating to NCA/effort syndrome in civilians translate to the military. Furthermore, this study is de-

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signed to provide a historical comparison with the mortality studies already conducted of both Vietnam and Gulf War veterans.

Methods

Diagnoses

DAH was a significant postcombat disorder of the late nineteenth century. Of the surviving 6,276 Boer War pension files, 3.2% were for DAH and a further 5.7% for valvular disease of the heart (VDH), which, as death certificates have shown, was at that time largely a misdiagnosed functional disorder.¹⁰ Shell shock was perhaps the preeminent, postcombat disorder of World War I, and by 1921, according to official statistics, it accounted for 65,000 pensions then in payment.¹¹

Because DAH and neurasthenia are both functional disorders, they are not listed in national statistics as official causes of death. The only way to discover more about the mortality of servicemen with postcombat syndromes is to look at individual case records, which have specific problems.

Subjects

The only surviving series of case records for the Boer War are the 6,276 war pension files of the Royal Hospital, Chelsea, held at the Public Record Office (PIN71). These are not a complete holding and represent some of the longest-lived veterans. The average age at death of the DAH group (68.2 years) suggests that as servicemen died, their files were destroyed, leaving a residual collection of healthier ex-servicemen. Although the population is representative in terms of geographical spread, it does not contain officers, who, if medically discharged, received half pay. A random selection was made of 200 cases of DAH or VDH (where subsequent reports and death certificates indicated a functional disorder). Consecutive files were extracted in proportion to their alphabetical distribution by surname.

The data source for the study of World War I veterans was an uncataloged archive of 7,800 pension files. These case records, which contained both military and medical information, were geographically representative of the United Kingdom and Ireland. However, they constitute a subgroup: the last cases administered by the Department of Social Security and refer to the longest-lived veterans (with a small number who had died earlier but whose widow was entitled to a pension). They are not representative of the entire World War I pension population. Our random survey identified 139 cases (1.8%) of DAH/VDH and 126 (1.6%) of neurasthenia/shell shock. If details about the cause of death were missing from the file, death certificates were purchased from the Family Records Center.

Comparison Group

In the aftermath of the Boer War, disability was assessed according to a veteran's ability to perform paid employment, rather than a standardized schedule of wounds or diseases. As a result, servicemen diagnosed with DAH could qualify for the full range of pension income. As controls, 200 pensioners with gunshot wounds (GSW) were randomly selected and matched by level of disability at first assessment. Because a study of World War II veterans had shown that noncommissioned officers and

TABLE I
BOER WAR DAH/VDH MORTALITY STUDY

	Hazard Ratio	95% Confidence Interval	p
DAH/VDH	1.12	0.92-1.36	0.28
DAH/VDH adjusted	1.12	0.91-1.36	0.29

officers had a significantly longer life expectancy than privates,¹² the two groups were also matched by rank.

During World War I, the Ministry of Pensions introduced a standardized schedule with increments of 10% to 20%. Veterans with DAH rarely received an award greater than 50% and more commonly were granted 20% to 30%.¹³ By contrast, shell shock, or neurasthenia, was regarded as equivalent to a severe wound, if likely to recover, or a very severe wound where the disability was considered permanent or prolonged.^{14,15} Depending on an ex-serviceman's incapacity, boards awarded pensions at all levels for shell shock, sometimes even at 100%. To offer equivalent levels of disability, veterans with GSW were again chosen as the control population. The matching was by both percentage award, region of the United Kingdom, and rank.

Statistical Methods

The data were analyzed in three ways. A Wilcoxon signed-rank test was used to give a *p* value, whereas a simple Cox regression provided a hazard ratio with 95% confidence intervals, and an adjusted Cox regression corrected for any effect of age or disability.

Results

Boer War

The two Cox regressions and a Wilcoxon signed-rank test (*p* = 0.182) all suggested that there was no statistically significant difference in rates of mortality between DAH/VDH cases and their controls (Table I). In addition, a Pearson's correlation showed that there was no association between the assessed level of disability and age at death (-0.07 with 95% confidence limits of -0.20 to 0.07). Hence, Boer War veterans diagnosed

TABLE II
CAUSE OF DEATH FOR THE BOER WAR DAH/VDH COHORT

Cause of Death	DAH/VDH (%)	GSW Controls (%)
Heart disease	83 (41.5)	70 (35.0)
Cancer	24 (12.0)	27 (13.5)
Accident	1 (0.5)	3 (1.5)
Stroke	13 (6.5)	12 (6.0)
Chronic lung disease	14 (7.0)	14 (7.0)
Suicide	2 (1.0)	0
Pneumonia/influenza	17 (8.5)	15 (7.5)
Chronic liver disease	1 (0.5)	0
Diabetes mellitus	0	0
Other	16 (8.0)	29 (14.5)
Not known	29 (14.5)	30 (15.0)
Total	200 (100)	200 (100)

Figures in brackets are percentages.

TABLE III
MEAN AGES AT DEATH BY DIAGNOSIS

Groups	Number	Mean	SD
Neurasthenia	126	89.83	9.47
Neurasthenia controls	126	89.03	9.74
DAH	139	85.11	8.97
DAH controls	139	89.74	9.06

with postcombat disorders were not associated with an increased level of mortality when compared with GSW controls.

Regarding cause of death, a simple cross tabulation of the DAH/VDH cases and their controls showed no obvious pattern of difference (Table II). Heart disease, followed by cancer, was the principal cause in both populations.

World War I

A comparison between the neurasthenia/shell shock sample and their controls showed similar average ages at death (Table III). Two Cox regressions and a Wilcoxon signed-rank test ($p = 0.793$) each suggested that there was no statistically significant difference in mortality by diagnosis (Table IV). A Pearson's correlation showed that there was no association between the assessed level of disability and age at death (0.04 with 95% confidence limits of -0.13 to 0.22).

As regards cause of death, a simple cross tabulation of the neurasthenia cases and their controls showed no clear differences by diagnostic group (Table V). In all four groups, heart disease, followed by pneumonia/influenza, was the main cause of death. Surprisingly no suicides were documented, and this may suggest that physicians gave elderly veterans the benefit of doubt.

Analysis of the DAH/VDH sample proved more complex. The patient group had a lower average age at death than their controls (Table III). Two Cox regressions and a Wilcoxon signed-rank test ($p < 0.001$) each suggested that the DAH/VDH cohort had a significantly higher mortality rate (Table IV). However, a Pearson's correlation showed that there was no association between the assessed level of disability and age at death (0.090 with 95% confidence limits of -0.08 to 0.25).

TABLE IV
WORLD WAR I MORTALITY STUDY

Diagnosis	Hazard Ratio	95% Confidence Interval	<i>p</i>
Neurasthenia	0.97	0.75-1.24	0.794
Neurasthenia adjusted	0.97	0.75-1.25	0.797
DAH/VDH	1.69	1.32-2.17	<0.001
DAH/VDH adjusted	1.69	1.32-2.17	<0.001

VDH Cases Excluded

It is difficult to explain why a diagnosis of DAH/VDH after the Boer War and of shell shock/neurasthenia after World War I is not associated with an increased level of mortality, and yet veterans diagnosed with DAH/VDH after World War I show a reduced life expectancy. At first sight, the higher mortality rate of the DAH/VDH pensioners of World War I does not appear to have been the result of undetected cardiac disease. Known deaths from heart disease in the DAH/VDH cohort were no greater than in the control group in keeping with the seminal observations of Lewis⁷ and Wood.¹⁶ Although there were a greater number of deaths from unknown cause, which might harbor excess cardiac deaths (Table V), this seems unlikely. It is more plausible that the label of DAH/VDH on a war pension of at least 50 years duration would tend to bias a doctor in favor of recording heart disease in death certification rather than the reverse.

It was hypothesized that the inclusion of 60 cases of VDH may have introduced a limited element of cardiac pathology, which accounted for the difference in the mortality rates. We repeated the analyses, excluding the cases of VDH. The Cox regressions and a Wilcoxon signed-rank test ($p < 0.001$) all showed that the DAH cohort still had significantly higher rates of mortality than their controls (Table VI). A Pearson's correlation also demonstrated that there was no association between the assessed level of disability and age at death (0.26 with 95% confidence limits of 0.03-0.45). An analysis of the cause of death in the 79 DAH cases vs. controls did not reveal any significant difference for

TABLE V
CAUSE OF DEATH FOR THE WORLD WAR I COHORTS

Cause of Death/ Diagnostic Groups	Neurasthenia (%)	GSW Controls (%)	DAH/VDH (%)	GSW Controls (%)
Heart disease	36 (28.6)	44 (34.9)	49 (35.3)	46 (33.1)
Cancer	9 (7.1)	14 (11.1)	15 (10.8)	11 (7.9)
Accident	3 (2.4)	2 (1.6)	0	1 (0.7)
Stroke	11 (8.7)	16 (12.7)	8 (5.8)	10 (7.2)
Chronic lung disease	6 (4.8)	3 (2.4)	2 (1.4)	8 (5.8)
Suicide	0	0	0	0
Pneumonia/influenza	21 (16.7)	19 (15.1)	17 (12.2)	27 (19.4)
Chronic liver disease	0	0	0	0
Diabetes mellitus	0	0	0	0
Other	6 (4.8)	11 (8.7)	6 (4.3)	9 (6.5)
Not known	34 (27.0)	17 (13.5)	42 (30.2)	27 (19.4)
Total	126 (100)	126 (100)	139 (100)	139 (100)

Figures in parentheses are percentages.

TABLE VI
DAH AND DAH/VDH COMPARED WITH ADJUSTED CONTROLS

	Hazard Ratio	95% Confidence Interval	p
DAH alone	1.55	1.11-2.16	0.010
DAH adjusted	1.55	1.13-2.13	0.007
DAH/VDH vs. GSW (+20%)	1.22	0.96-1.54	0.101
DAH/VDH vs. GSW (+20%) adjusted	1.22	0.96-1.55	0.112

heart disease, stroke, chronic lung disease, pneumonia/influenza, although cancer rates were significantly greater (Table VII).

Adjusted GSW Controls

The DAH/VDH sample was then compared with GSW veterans with a 20% higher level of disability (the smallest increment allowed by the pensions system). Two Cox regressions, both giving hazard ratios of 1.2, and a Wilcoxon signed-rank test ($p = 0.237$) showed that there was no significant difference in rates of mortality between the two groups (Table VI). In other words, the DAH/VDH cohort had the same life expectancy as GSW veterans whose disability had been assessed 20% higher.

Discussion

No significant difference was found between DAH/VDH cases from the Boer War and their GSW controls. Similarly, the neurasthenia/shell shock cases from World War I showed no increase in mortality.

In the last decade, concerns have been expressed that veterans diagnosed with postcombat disorders may suffer adverse health consequences, including higher mortality rates.¹⁷ These have focused on servicemen who fought in the Gulf War, and one study of U.S. forces detected a small but significant excess of deaths mainly caused by accidents.¹⁸ A 7-year follow-up, by contrast, showed that this phenomenon had disappeared and that the risk of death from natural causes among Gulf War veterans was lower than in non-Gulf War veterans.¹⁹ Vietnam veterans have been shown to have higher mortality rates, but most of the increase was due to external causes such as accidents of all kinds, suicide, and homicide.²⁰⁻²² A similar short-term increase in mortality due to accidents, suicide, or homicide had also been observed in follow-up studies of ex-prisoners of war from World War II and the Korean War.^{23,24}

While we have shown that veterans with postcombat disorders

TABLE VII
WORLD WAR I DAH/VDH MORTALITY STUDY

Cause of Death	Hazard Ratio	95% Confidence Interval	p
Heart disease	1.08	0.59-1.99	0.798
Cancer	4.55	1.46-14.19	0.009
Stroke	1.46	0.47-4.57	0.515
Lung disease	1.38	0.19-10.04	0.752
Pneumonia/influenza	1.37	0.63-2.97	0.427

from the Boer War and World War I did not suffer adverse health consequences associated with premature mortality, an important qualification has to be made. We were forced by the limited survival of case files to investigate subpopulations of servicemen. These long-lived veterans may not have been typical of the entire ex-service population. Nevertheless, we were able to follow many subjects throughout the course of their lives as a result of regular medical examinations and were not wholly reliant on death certificates for mortality data. It has to be emphasized that our studies, although not ideal in their design, are all that the surviving historical records will permit.

It is difficult to explain why the World War I veterans with DAH/VDH should have experienced increased mortality rates and those ex-servicemen with a diagnosis of shell shock/neurasthenia did not. The symptoms of shell shock and DAH are not as distinct as might be expected. In 1917, Lewis⁷ noted that many servicemen with DAH had also acquired "the diagnosis of neurasthenia from time to time qualified by the phrase 'of the vaso-motor type' especially when brisk reflexes are associated with mental irritability or exhaustion." Our study of postcombat disorders from the Boer War to the Gulf War based on historical medical files also demonstrated a common thread of symptoms.²⁵ Given the overlap in symptomatology, it is curious that the mortality rates are not similar.

First, it was hypothesized that physician bias, introduced during the assessment, was responsible for the disparity. By 1918, DAH was increasingly recognized as a functional disorder and had been reclassified as NCA or effort syndrome. Although shell shock fell into disrepute among the military authorities following the Southborough Report,²⁶ popular opinion continued to be sympathetic to its sufferers and many regarded it as an honorable outcome of battle. In practice, pensions for neurasthenia/shell shock tended to be more generous than those for DAH. Randomly selected samples of veterans showed that the average award for neurasthenia was 41% compared with 33% for DAH, whereas the proportion of attributed, rather than aggravated, pensions was also higher, 82% and 68%, respectively.

Physicians, who were less sympathetic to servicemen with a diagnosis of DAH, may have assessed their health more critically. This accords with contemporary accounts. Rivers²⁷ argued that officers were "less likely to be content with the crude solution of conflict between instinct and duty which is provided by such disabilities as dumbness or the helplessness of a limb" because they were better educated and more mentally complex. Many doctors, including Sir Frederick Mott,²⁸ believed that neurasthenia was the outcome of the stress of responsibility in sensitive individuals, whereas somatization was the less sophisticated response to pressure found in private soldiers. Hence, the disability of a soldier with a somatic disorder, such as DAH, may have been underassessed in comparison with a servicemen diagnosed as neurasthenic.

How, then, might this bias have impacted on mortality rates? None of the comparisons revealed an association between the first assessment of disability and age at death. This is probably because no objective measures were provided by the pension authorities on which to base an impairment of function. In the case of neurasthenia and DAH, the physician made a recommendation based on the severity and range of unexplained medical symptoms. For GSW, a simple table of injuries was drawn

up. The loss of two or more limbs, for example, qualified a veteran for a 100% pension, loss of speech 80%, amputation above the knee 60%, and the loss of two fingers an award of 20%.²⁹ Given that most applicants were men in their early 20s, it is not surprising that disability assessments did not correlate with mortality. On the assumption, therefore, that veterans with DAH were consistently underassessed by pension boards, this should not have translated into reduced life expectancy.

If physician bias was responsible for the disparity between DAH/VDH and neurasthenia/shell shock, then it operated in an indirect manner. The discrediting of DAH provided the Ministry with the justification it needed to terminate pensions during the interwar period if a veteran were reassessed as being in sound health. Although the medical status of shell shock was questioned, popular opinion remained sympathetic to veterans with the disorder. It is possible, therefore, that healthy DAH cases had their pensions curtailed more readily than veterans diagnosed with neurasthenia. Evidence from reports by the Ministry of Pensions supports this hypothesis. An analysis of all stabilized (those with a finally agreed percentage) pension awards in March 1929 showed that 3.2% of the 47,668 neurasthenia/shell shock awards were at the 70% to 100% level. By comparison, only 0.3% of the 38,367 DAH awards were at that high level.³⁰

Conclusion

The general finding is that postcombat disorders following the Boer War and World War I were not associated with an increased level of mortality when compared with GSW controls. These results are consistent with the postwar mortality rates observed in veterans of recent conflicts. To date, the only significant effect found in such studies has been a short-term increase in accidents (largely motor vehicle). The life expectancy of veterans with postcombat disorders does not appear to be compromised in terms of disease-related causes.

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