



# Examining physical health conditions and associations of pain, obesity, and function of UK Veterans diagnosed with PTSD and other mental health conditions

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## ABSTRACT

**Introduction:** Little is known about the physical health conditions experienced by United Kingdom (UK) military Veterans with posttraumatic stress disorder (PTSD) or other mental health diagnoses. We aimed to explore the prevalence of self-reported physical health complaints and health behaviours in a patient sample of UK Veterans who had engaged with mental health services. **Methods:** This study used questionnaire data from a cross-sectional study that sampled Veterans engaged in a UK national Veteran's mental health charity ( $N = 403$ ). Prevalence rates of reported physical health complaints were ranked, and health behaviours were described. Adjusted multivariate logistic regression models were fitted to examine associations between the top five physical health complaints and socio-demographic factors, mental health outcomes, and health-related behaviours. **Results:** We observed that chronic pain (41.2%,  $n = 166$ ) and poor mobility (34.2%,  $n = 138$ ) were the most prevalent conditions reported. Participants with PTSD were more than twice as likely to report chronic pain (AOR = 2.25, 95% CI, 1.16–4.37,  $P \leq 0.05$ ). Of 384 Veterans in the sample, the majority had a calculated body mass index (BMI) deemed overweight or obese (76.5%,  $n = 294$ ). Obese participants were 2–4 times more likely to report prevalent physical health complaints. **Discussion:** Veterans with complex mental health problems experience a high burden of physical health complaints. Of most concern are the associations between PTSD, obesity, pain, impairment, and the potential difficulties in recovery and treatment. These findings are important for the way health services assess and treat individuals presenting with complex mental health problems.

**Key words:** chronic pain, mental health, military, obesity, PTSD, UK Veterans

## RÉSUMÉ

**Introduction :** On en sait trop peu au sujet des conditions de santé physique des vétérans du Royaume-Uni vivant avec un état de stress post-traumatique (ÉSPT) ou d'autres diagnostics de santé mentale. Cette étude cherche à explorer la prévalence des plaintes de santé physique auto-rapportée ainsi que les comportements de santé dans un échantillon de vétérans du Royaume Uni ayant eu recours aux services en santé mentale. **Méthodologie :** Cette étude a eu recours aux données d'un questionnaire d'une étude cross-sectionnelle ayant échantillonné les vétérans anglais d'un organisme caritatif en santé mentale ( $N = 403$ ). Les taux de prévalence des plaintes de santé physique rapportées furent classés et les comportements de santé décrits. Les modèles de régression logistique multivariable ajustés furent adaptés afin d'examiner les associations entre les cinq plaintes de santé physique rapportées et les facteurs socio-démographiques, les résultats en santé mentale et les comportements de santé reliés. **Résultats :** Cette étude a observé que la douleur chronique (41.2%,  $n = 166$ ) et la mobilité réduite (34.2%,  $n = 138$ ) ont été les conditions les plus rapportées. Les participants vivant avec un ÉSPT étaient deux fois plus susceptibles de rapporter une douleur chronique (AOR = 2.25, 95% CI : 1.16–4.37,  $P \leq 0.05$ ). À partir des données de 384 vétérans dans l'échantillon, la majorité fut calculée comme ayant un IMC jugé en surpoids ou obèse (76.5%,  $n = 294$ ). Les participants obèses étaient 2 à 4 fois plus susceptibles de formuler plaintes au sujet de la santé physique. **Discussion :** Les plaintes de santé physique rapportées par les vétérans ayant des conditions de santé mentale complexes exercent un lourd fardeau. Les plus grandes préoccupations portent sur la relation entre le ÉSPT, l'obésité, la douleur, la déficience et les difficultés potentielles que posent la réhabilitation et les traitements. Ces découvertes sont importantes pour les évaluations et les traitements que fournissent les services de santé aux individus présentant des troubles de santé mentale complexes.

**Mots-clés :** État de stress post-traumatique (ÉSPT); santé mentale, obésité, douleur chronique; militaire; vétérans Royaume Uni

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## INTRODUCTION

In the United Kingdom (UK) Veteran population (i.e., those who have served in the UK Armed Forces and have left military service), little is known about the physical health needs of Veterans who have been diagnosed with a mental health condition. Previous studies have assessed risk factors in current UK Armed Forces populations for physical conditions such as irritable bowel syndrome or headache,<sup>1,2</sup> and found that these physical health complaints were associated with mental health disorders. Rona et al.<sup>3</sup> assessed the impact of posttraumatic stress disorder (PTSD) on impairment in the UK military and found that those with PTSD experienced serious interference in normal daily functioning from the condition. Other Veteran studies have only considered the prevalence of mental and physical health conditions separately.<sup>4</sup> It is difficult to understand the nature of physical health complaints within the Veteran population seeking help for mental health problems, and therefore difficult to assess the most appropriate, targeted, and holistic clinical health care interventions needed to address both mental and physical health conditions concomitantly.

Australian Vietnam Veteran research has shown that Veterans report a higher prevalence of long-term conditions and psychiatric diagnoses compared to the general population.<sup>5</sup> Evidence from the United States (US) suggests that Veterans with mental health problems will experience more physical health conditions/complaints compared to Veterans without mental health problems.<sup>6</sup> On average, Veterans in the United States with a PTSD diagnosis have been estimated to die 17–18 years prematurely compared to Veterans without a mental health condition due to increased prevalence of physical health conditions, many related to obesity.<sup>7</sup> Within Veteran samples seeking treatment from Veteran's Affairs (VA) health care, Veterans with a PTSD diagnosis were more likely to develop nervous system, musculoskeletal, digestive, circulatory, hypertensive, and ill-defined diseases compared to Veterans without a mental health condition.<sup>8</sup> This study also indicated that Veterans with PTSD experienced early-onset of physical disease compared to other Veterans of similar ages, indicating potential increases in morbidity and earlier elevated need for health care utilization into the future. Work by Hall et al.,<sup>9</sup> found that older overweight Veterans with PTSD experienced premature functional aging, particularly in relation to lower limb functioning, compared to overweight Veterans without a PTSD diagnosis. Cohen et al.<sup>10</sup>

found that Veterans with mental health diagnoses had greater rates of smoking, hypertension, and obesity.

In broader US cohort studies or community samples, it is also well documented that Veterans with mental health problems and particularly those with PTSD experience increased obesity, cardiovascular disease, gastrointestinal disorders, autoimmune diseases, somatic symptoms, chronic pain and lower quality of life.<sup>6,11–16</sup>

Understanding the mental and physical health burden experienced in Veterans who are seeking help for mental health problems is important to understand for all national health care professionals and voluntary sector services who provide treatment for the Veteran population. This population may not only be at elevated risk of physical health complaints and need clinical interventions for their physical health, but that in only treating the mental health presentation, the resources put into treatment and improving mental health, may be offset or made redundant due to the pervasive disabling effects of the physical health condition(s). This knowledge is also important for general population samples with mental health conditions to understand more fully the potential health presentations that may exist. In the United Kingdom, more is understood about the physical comorbidities of those with severe mental illness (such as psychosis and bi-polar disorder),<sup>17,18</sup> however there is less research assessing physical comorbidities of those with depression or PTSD.<sup>19</sup> Hence this study may have wider reaching findings for general populations with PTSD diagnoses as well as those in the Veteran community.

## METHODS

### Setting and procedure

This study used data from a cross-sectional study that sampled Veterans engaged in a national Veteran's mental health charity in the United Kingdom. This charity is the largest provider of Veteran-specific clinical mental health services in the United Kingdom and receives approximately 2,500 new referrals annually.<sup>20</sup> Further details about the services the charity provides can be found elsewhere.<sup>21</sup> Data were collected using questionnaires. Questionnaires were sent to individuals twice and following this telephone tracing was used to elicit a response.

### Participants

Between February 2015 and February 2016, 3,335 Veterans were actively receiving treatment (defined as attending more than one appointment after completing an initial assessment). Twenty percent ( $n = 667$ ) of this

population were randomly selected and sent questionnaires to elicit a response. Sixty-seven individuals were excluded because they either had insufficient address information ( $n = 63$ ) or died before the start of data collection ( $n = 4$ ), leaving an effective sample size of 600. Of these, 403/600 (67.2%) returned completed questionnaires. Data was collected between January 1 and July 31, 2016. Previously published data demonstrates that no differences were present between individuals who participated in the study and those who did not.<sup>22</sup>

## Materials

Participants were asked to complete an eight-page questionnaire. For the current study, the questionnaire collected data from four areas; physical health, health-related behaviours, socio-demographic characteristics, and mental health outcomes.

## Physical health

Data on physical health was collected using a 13-item checklist of common health difficulties. This list was taken from an NHS screening tool used by a general

**Table 1.** Description of physical health problems and health-related behaviours

| Variable<br><i>n</i> (%)  | Effective sample<br>( <i>N</i> = 403) |
|---------------------------|---------------------------------------|
| Physical health complaint |                                       |
| Chronic pain              | 166/403 (41.2)                        |
| Poor mobility             | 138/403 (34.2)                        |
| Hearing impairment        | 119/403 (29.5)                        |
| High/low blood pressure   | 100/403 (24.8)                        |
| Gastrointestinal problems | 88/403 (21.8)                         |
| Heart problems            | 60/403 (14.9)                         |
| Diabetes                  | 58/403 (14.4)                         |
| Respiratory problems      | 58/403 (14.4)                         |
| Communication problems    | 56/403 (13.9)                         |
| Sight impairment          | 46/403 (11.4)                         |
| Neurological problems     | 31/403 (7.7)                          |
| Liver or kidney problems  | 30/403 (7.4)                          |
| Amputation of limb(s)     | 7/403 (1.7)                           |
| Body mass index*          |                                       |
| Normal                    | 90/384 (23.5)                         |
| Overweight                | 151/384 (39.3)                        |
| Obese                     | 143/384 (37.2)                        |

(Continued)

|                          |                |
|--------------------------|----------------|
| Current illegal drug use |                |
| Yes                      | 44/403 (10.9)  |
| Current smoker           |                |
| Yes                      | 62/403 (15.4)  |
| Alcohol problems         |                |
| AUDIT score 8 +          | 166/403 (41.2) |
| Functional impairment    |                |
| WSAS 20+ severe          | 268/403 (66.5) |

\* Body mass index data does not add up to *N* (403) due to missing data.

district hospital.<sup>23</sup> The items for this measure are listed in Table 1.

## Health-related behaviours

Participants were asked their height and weight, and then body mass index (BMI) was calculated. Previous research has suggested the positive utility of BMI to explore obesity in UK military populations.<sup>24</sup> We explored substance use by asking participants if they were current smokers. Illegal drug use was assessed using the screening item from the Drug Use Disorder Identification Test (DUDIT), and participants were recorded as users of illicit substances if they confirmed using non-prescription drugs at least once over the last month.<sup>25</sup> Alcohol misuse was explored using the 10-item World Health Organization (WHO) Alcohol Use Disorders Identification Test (AUDIT) with problem drinking defined as a score of 8 or above.<sup>26</sup> A cut off of eight on the AUDIT was deemed appropriate to be able to compare Veteran civilian outcomes with the UK general population and to assess alcohol use at levels that the WHO deem start to impact physical health outcomes. Functional impairment was assessed using the Work and Social Adjustment Scale (WSAS). The WSAS contains five items that explore different components of functioning: the ability to work, to perform home management responsibilities, to engage in social and private leisure activities, and to engage in family relationships. Scores range from 0 to 40, with scores of 20 or above indicating severe functional impairment.<sup>27</sup>

## Demographic characteristics

Factors included age, relationship status (single or in a relationship), employment status (working, not working, or not working due to ill health), number of years between leaving the Armed Forces and seeking help

from the charity (dichotomized to greater than or less than 5 years), whether participants were early service leavers from the military (defined as leaving after less than 4 years of service) and type of discharge from the military (voluntary, medical discharge, or non-voluntary discharge).

### Mental health and brain injury

Symptoms of PTSD were assessed using the 20-item PTSD Checklist of DSM-5 (PCL-5). Scores on the PCL-5 range from 0 to 80. In Veterans, a score of 38 or above has been suggested to indicate the presence of PTSD.<sup>28</sup> Symptoms of common mental health difficulties (CMD) (anxiety and depression) were assessed using the 12-item General Health Questionnaire (GHQ-12). To meet case criteria for CMD participants needed a score of four or above.<sup>29</sup> Problems with anger were examined using the 5-item Dimensions of Anger Reactions (DAR-5) and participants needed to score 12 or more to meet case criteria.<sup>30</sup>

### Analysis

The first stage of analysis was to rank the prevalence rates of the 13 physical health complaints and describe the health-related behaviours. The next stage of analysis was to examine associations between the five most prevalent physical health complaints and socio-demographic characteristics. This was done by fitting multivariate logistic regression models to calculate the odds ratios between reporting each of these five health complaints and socio-demographic factors. These regression models were adjusted for all of the demographic variables (age, relationship status, employment status, years to seek help, early service leavers, and method of discharge from military). These analyses were repeated to calculate associations between reporting the five most prevalent physical health complaints and mental health outcomes and then health-related behaviours. All analyses in this study were conducted using STATA 13.0 (StataCorp, College Station, TX, 2013).

### Profile of UK Veteran sample seeking support

The profile of the sample has been described in Murphy et al.<sup>22</sup> For the purposes of understanding the context of this study, the sample is complex in its presentation. The most commonly endorsed mental health difficulty is PTSD (82.2%), followed by problems with anger (74%), common mental health disorders (72%) and

alcohol misuse (43%). Comorbidity in this sample is frequent, with only 4.8% presenting with PTSD alone.

## RESULTS

From the sample of 403 Veterans engaged in a UK national Veterans mental health charity, the top five most reported physical health complaints from a 13-item checklist of common health difficulties were: chronic pain (41.2%,  $n = 166$ ), poor mobility (34.2%,  $n = 138$ ), hearing impairment (29.5%,  $n = 119$ ), High/low blood pressure (24.8%,  $n = 100$ ) and gastrointestinal/digestive problems (21.8%,  $n = 88$ ). Just over 10% reported current illegal drug use ( $n = 44$ ), 15.4% ( $n = 62$ ) reported that they were current smokers and a significant minority scored eight or more on the AUDIT alcohol use measure (41.2%,  $n = 166$ ). Two-thirds of the sample scored 20 or more on the WSAS functional impairment measure (66.5%,  $n = 268$ ), on average the most endorsed domains of functional impairment from an 8-point Likert scale were in the “social” ( $M = 5.38$ ), “family” ( $M = 4.93$ ) and “home” ( $M = 4.55$ ) domains (not reported in tables). Of the 384 Veterans in the sample, the majority were calculated to have a BMI deemed overweight (39.3%,  $n = 151$ ) or obese (37.2%,  $n = 143$ ); hence, only a minority had a BMI in the normal range (23.5%,  $n = 90$ ). Table 2 shows the associations between physical health difficulties and socio-demographic characteristics.

### Chronic pain

Participants were more likely to report chronic pain if they were in the older age groups, 45–54 years old (AOR = 3.03, 95% CI, 1.39–6.63,  $P \leq 0.05$ ) and 55 + years old (AOR = 2.28, 95% CI, 1.02–5.08,  $P \leq 0.05$ ) compared to those aged less than 35 years old. Participants who were ill and not working compared to those working, and those who had received a medical discharge from military service compared to those who had left voluntarily, were over two and a half times more likely to report chronic pain (AOR = 2.68, 95% CI, 1.60–4.51,  $P \leq 0.05$ ; and AOR = 2.55, 95% CI, 1.56–4.17,  $P \leq 0.05$ )

### Poor mobility

Compared to those aged under 35 years old, the odds of reporting poor mobility increased as age categories increased (age group 35–44 years, AOR = 3.04, 95% CI, 1.13–8.14,  $P \leq 0.05$ ; age group 45–54 years, AOR = 4.01, 95% CI, 1.54–10.5,  $P \leq 0.05$ ; age group

**Table 2.** Associations between 5 most prevalent physical health difficulties and socio-demographic characteristics

|                            | Chronic pain |                                   | Poor mobility |                                   | Hearing impairment |                                   | High/low blood pressure |                                   | Gastrointestinal/digestive problems |                                   |
|----------------------------|--------------|-----------------------------------|---------------|-----------------------------------|--------------------|-----------------------------------|-------------------------|-----------------------------------|-------------------------------------|-----------------------------------|
|                            | %            | OR* (95% CI)                      | %             | OR* (95% CI)                      | %                  | OR* (95% CI)                      | %                       | OR* (95% CI)                      | %                                   | OR* (95% CI)                      |
| <b>Age (years)</b>         |              |                                   |               |                                   |                    |                                   |                         |                                   |                                     |                                   |
| <35                        | 30.6         | 1.00                              | 14.3          | 1.00                              | 20.4               | 1.00                              | 8.1                     | 1.00                              | 14.3                                | 1.00                              |
| 35–44                      | 36.8         | 1.91<br>[0.86, 4.42]              | 25.3          | 3.04<br>[1.13, 8.14] <sup>†</sup> | 17.9               | 0.93<br>[0.38, 2.27]              | 13.7                    | 1.63<br>[0.49, 5.49]              | 15.8                                | 1.27<br>[0.47, 3.43]              |
| 45–54                      | 49.1         | 3.03<br>[1.39, 6.63] <sup>†</sup> | 34.6          | 4.01<br>[1.54, 10.5] <sup>†</sup> | 21.8               | 1.07<br>[0.45, 2.54]              | 20.0                    | 2.32<br>[0.73, 7.37]              | 23.6                                | 1.96<br>[0.76, 5.07]              |
| 55+                        | 41.6         | 2.28<br>[1.02, 5.08] <sup>†</sup> | 46.3          | 5.92<br>[2.25, 15.6] <sup>†</sup> | 45.6               | 3.03<br>[1.29, 7.07]              | 40.9                    | 5.36<br>[1.73, 16.7] <sup>†</sup> | 26.9                                | 1.85<br>[0.71, 4.83]              |
| <b>Relationship status</b> |              |                                   |               |                                   |                    |                                   |                         |                                   |                                     |                                   |
| Not single                 | 42.9         | 1.00                              | 34.8          | 1.00                              | 32.6               | 1.00                              | 29.4                    | 1.00                              | 22.3                                | 1.00                              |
| Single                     | 37.7         | 0.72<br>[0.45, 1.15]              | 33.1          | 0.85<br>[0.52, 1.39]              | 23.1               | 0.65<br>[0.39, 1.08]              | 21.5                    | 0.78<br>[0.45, 1.34]              | 20.8                                | 0.89<br>[0.53, 1.52]              |
| <b>Employment status</b>   |              |                                   |               |                                   |                    |                                   |                         |                                   |                                     |                                   |
| Working                    | 27.8         | 1.00                              | 14.3          | 1.00                              | 23.8               | 1.00                              | 14.3                    | 1.00                              | 13.5                                | 1.00                              |
| Not working                | 36.0         | 1.38<br>[0.72, 2.66]              | 39.0          | 2.31<br>[1.12, 4.76] <sup>†</sup> | 41.0               | 10.5<br>[0.54, 2.06]              | 38.0                    | 1.93<br>[0.92, 4.05]              | 27.0                                | 1.96<br>[0.92, 4.21]              |
| Ill, not working           | 53.7         | 2.68<br>[1.60, 4.51] <sup>†</sup> | 45.8          | 4.47<br>[2.43, 8.12] <sup>†</sup> | 27.1               | 0.91<br>[0.51, 1.62]              | 24.9                    | 1.77<br>[0.91, 3.43]              | 24.9                                | 1.95<br>[1.03, 3.69] <sup>†</sup> |
| <b>Military discharge</b>  |              |                                   |               |                                   |                    |                                   |                         |                                   |                                     |                                   |
| Voluntary                  | 33.2         | 1.00                              | 29.3          | 1.00                              | 25.4               | 1.00                              | 24.4                    | 1.00                              | 21.0                                | 1.00                              |
| Medical                    | 56.9         | 2.55<br>[1.56, 4.17] <sup>†</sup> | 46.3          | 1.89<br>[1.13, 3.16] <sup>†</sup> | 37.4               | 1.85<br>[1.09, 3.14] <sup>†</sup> | 27.6                    | 1.10<br>[0.63, 1.92]              | 26.0                                | 1.21<br>[0.70, 2.10]              |
| Non-voluntary              | 38.0         | 1.37<br>[0.76, 2.46]              | 29.6          | 1.22<br>[0.65, 2.33]              | 29.6               | 1.60<br>[0.85, 3.04]              | 19.7                    | 0.95<br>[0.47, 1.94]              | 18.3                                | 0.93<br>[0.46, 1.89]              |

\* ORs adjusted for all other variables in table.

<sup>†</sup> =  $p \leq 0.05$ .

OR = odds ratio; CI = confidence interval.

55 +, AOR = 5.92, 95% CI, 2.25–15.6,  $P \leq 0.05$ ). Poor mobility was associated with not working or being ill and not working (AOR = 2.31, 95% CI, 1.12–4.76,  $P \leq 0.05$ ; AOR = 4.47, 95% CI, 2.43–8.12,  $P \leq 0.05$ ), and with those who had received a medical discharge from military service (AOR = 1.89, 95% CI, 1.13–3.16,  $P \leq 0.05$ )

### Other physical health difficulties

Participants were more likely to report hearing impairment if they had received a medical discharge from military service (AOR 1.85, 95% CI, 1.09–3.14,  $P \leq 0.05$ ). High/low blood pressure was associated with being in the highest age category, 55 + years (AOR = 5.36, 95% CI, 1.73–16.7,  $P \leq 0.05$ ). Gastrointestinal/digestive problems were associated with being ill and not working

compared to those who were working (AOR = 1.95, 95% CI, 1.03–3.69,  $P \leq 0.05$ ) (Table 3).

Participants who were case positive for probable PTSD were over twice as likely to report chronic pain compared to those without a probable PTSD diagnosis (AOR = 2.25, 95% CI, 1.16–4.37,  $P \leq 0.05$ ). Those case positive for probable PTSD however were less likely to report hearing impairment or gastrointestinal/digestive problems (AOR = 0.48, 95% CI, 0.25–0.92,  $P \leq 0.05$ ; AOR = 0.46, 95% CI, 0.22–0.97,  $P \leq 0.05$ ). Those who were case positive for a common mental health disorder were 2.8 times more likely to report gastrointestinal/digestive problems compared to those without a probable CMD diagnosis (AOR = 2.80, 95% CI, 1.39–5.64,  $P \leq 0.05$ ). Participants who were case positive for anger

**Table 3.** Associations between 5 most prevalent physical health difficulties and mental health difficulties & brain injury

|                            | Chronic pain |                                   | Poor mobility |                                   | Hearing impairment |                                   | High/low blood pressure |                      | Gastrointestinal/digestive problems |                                   |
|----------------------------|--------------|-----------------------------------|---------------|-----------------------------------|--------------------|-----------------------------------|-------------------------|----------------------|-------------------------------------|-----------------------------------|
|                            | %            | OR*<br>(95% CI)                   | %             | OR*<br>(95% CI)                   | %                  | OR*<br>(95% CI)                   | %                       | OR*<br>(95% CI)      | %                                   | OR*<br>(95% CI)                   |
| <b>PTSD (PCL-5)</b>        |              |                                   |               |                                   |                    |                                   |                         |                      |                                     |                                   |
| Not case                   | 25.0         | 1.00                              | 23.6          | 1.00                              | 43.1               | 1.00                              | 19.4                    | 1.00                 | 23.6                                | 1.00                              |
| Case (38+)                 | 44.7         | 2.25<br>[1.16, 4.37] <sup>†</sup> | 36.6          | 1.64<br>[0.82, 3.28]              | 26.6               | 0.48<br>[0.25, 0.92] <sup>†</sup> | 26.0                    | 1.48<br>[0.70, 3.13] | 21.5                                | 0.46<br>[0.22, 0.97] <sup>†</sup> |
| <b>CMD (GHQ-12)</b>        |              |                                   |               |                                   |                    |                                   |                         |                      |                                     |                                   |
| Not case                   | 38.2         | 1.00                              | 26.4          | 1.00                              | 29.1               | 1.00                              | 18.2                    | 1.00                 | 11.8                                | 1.00                              |
| Case (4+)                  | 42.4         | 0.82<br>[0.50, 1.36]              | 37.6          | 1.25<br>[0.73, 2.15]              | 30.0               | 1.26<br>[0.72, 2.20]              | 27.2                    | 1.36<br>[0.74, 2.52] | 25.9                                | 2.80<br>[1.39, 5.64] <sup>†</sup> |
| <b>Anger (DAR-5)</b>       |              |                                   |               |                                   |                    |                                   |                         |                      |                                     |                                   |
| Not case                   | 30.8         | 1.00                              | 26.9          | 1.00                              | 35.6               | 1.00                              | 23.1                    | 1.00                 | 16.4                                | 1.00                              |
| Case (12+)                 | 45.2         | 1.47<br>[0.86, 2.51]              | 37.1          | 1.37<br>[0.78, 2.42]              | 27.9               | 0.93<br>[0.53, 1.62]              | 25.5                    | 1.03<br>[0.56, 1.90] | 23.8                                | 1.78<br>[0.91, 3.52]              |
| <b>Brain injury (BISI)</b> |              |                                   |               |                                   |                    |                                   |                         |                      |                                     |                                   |
| Not case                   | 35.1         | 1.00                              | 28.4          | 1.00                              | 29.9               | 1.00                              | 23.7                    | 1.00                 | 19.9                                | 1.00                              |
| Case                       | 47.9         | 1.67<br>[1.11, 2.51] <sup>†</sup> | 40.6          | 1.67<br>[1.08, 2.57] <sup>†</sup> | 29.1               | 0.97<br>[0.62, 1.52]              | 26.0                    | 1.13<br>[0.70, 1.83] | 24.0                                | 1.19<br>[0.73, 1.94]              |

\* ORs adjusted for all other variables in table, and for age.

<sup>†</sup>  $p \leq 0.05$ .

OR = odds ratio; CI = confidence interval; PTSD = posttraumatic stress disorder; PCL-5 = PTSD Checklist of DSM-5; CMD = common mental health disorders; DAR-5 = Dimensions of Anger Reactions; BISI = Brain Injury Screening Index.

problems were no more likely than those without anger problems to report any of the top five most reported physical health difficulties in the sample. Finally, participants were more likely to report chronic pain or poor mobility if they scored case positive for a brain injury compared to those without possible brain injury (AOR = 1.67, 95% CI, 1.11–2.51,  $P \leq 0.05$ ; AOR = 1.67, 95% CI, 1.08–2.57,  $P \leq 0.05$ ) (Table 4).

Participants who were overweight were more likely to report poor mobility and gastrointestinal/digestive problems (AOR = 2.12, 95% CI, 1.11–4.09,  $P \leq 0.05$ ; AOR = 2.20, 95% CI, 1.04–4.64,  $P \leq 0.05$ ). Being obese was associated with reporting chronic pain (AOR = 2.14, 95% CI, 1.21–3.81,  $P \leq 0.05$ ), poor mobility (AOR = 3.15, 95% CI, 1.65–6.01,  $P \leq 0.05$ ), high/low blood pressure (AOR = 4.01, 95% CI, 1.90–8.45,  $P \leq 0.05$ ) and reporting gastrointestinal/digestive problems (AOR = 2.44, 95% CI, 1.16–5.13,  $P \leq 0.05$ ). Obese participants were therefore 2–4 times more likely to report these physical health difficulties compared to those who had a BMI in the normal range.

Those currently using illegal drugs were over two times more likely to report gastrointestinal/digestive

problems (AOR = 2.20, 95% CI, 1.06–4.55,  $P \leq 0.05$ ). Reporting chronic pain or poor mobility was positively associated with scoring in the severe range of functional impairment (AOR = 2.85, 95% CI, 1.76–4.63,  $P \leq 0.05$ ; AOR = 2.28, 95% CI, 1.37–3.80,  $P \leq 0.05$ ). Scoring eight or more on the AUDIT alcohol use measure was not associated with any of the top five most reported health difficulties.

## DISCUSSION

Veterans within this sample report a breadth of physical health problems highlighting the distinct burden of comorbid health needs. As explored in a previous paper, the mean number of physical health problems reported was 2.41 (out of 13),<sup>22</sup> and comorbid mental health problems were common.

### Prevalence comparisons

Of note are the high levels of chronic pain and poor mobility reported by the sample. These findings replicate other US Veteran studies from the VA found in Outcalt et al.<sup>16</sup> where PTSD was strongly associated with multiple domains of pain as measured by the Brief

**Table 4.** Associations between 5 most prevalent physical health difficulties and health-related behaviours

|                              | Chronic pain |                                   | Poor mobility |                                   | Hearing impairment |                      | High/low blood pressure |                                   | Gastrointestinal/digestive problems |                                   |
|------------------------------|--------------|-----------------------------------|---------------|-----------------------------------|--------------------|----------------------|-------------------------|-----------------------------------|-------------------------------------|-----------------------------------|
|                              | %            | OR*<br>(95% CI)                   | %             | OR*<br>(95% CI)                   | %                  | OR*<br>(95% CI)      | %                       | OR*<br>(95% CI)                   | %                                   | OR*<br>(95% CI)                   |
| Body mass index              |              |                                   |               |                                   |                    |                      |                         |                                   |                                     |                                   |
| Normal                       | 31.1         | 1.00                              | 18.9          | 1.00                              | 25.6               | 1.00                 | 12.2                    | 1.00                              | 12.2                                | 1.00                              |
| Overweight                   | 37.1         | 1.38<br>[0.78, 2.47]              | 33.1          | 2.12<br>[1.11, 4.09] <sup>†</sup> | 33.8               | 1.40<br>[0.76, 2.57] | 20.5                    | 1.66<br>[0.77, 3.59]              | 23.8                                | 2.20<br>[1.04, 4.64] <sup>†</sup> |
| Obese                        | 51.8         | 2.14<br>[1.21, 3.81] <sup>†</sup> | 45.5          | 3.15<br>[1.65, 6.01] <sup>†</sup> | 27.3               | 0.90<br>[0.48, 1.68] | 37.8                    | 4.01<br>[1.90, 8.45] <sup>†</sup> | 26.6                                | 2.44<br>[1.16, 5.13] <sup>†</sup> |
| Current smoker               |              |                                   |               |                                   |                    |                      |                         |                                   |                                     |                                   |
| No                           | 41.9         | 1.00                              | 35.2          | 1.00                              | 31.4               | 1.00                 | 25.5                    | 1.00                              | 22.6                                | 1.00                              |
| Yes                          | 37.1         | 0.69<br>[0.38, 1.29]              | 29.0          | 0.70<br>[0.37, 1.36]              | 19.4               | 0.58<br>[0.28, 1.20] | 20.1                    | 0.84<br>[0.40, 1.74]              | 17.7                                | 0.72<br>[0.34, 1.52]              |
| Drug use                     |              |                                   |               |                                   |                    |                      |                         |                                   |                                     |                                   |
| No                           | 40.1         | 1.00                              | 33.7          | 1.00                              | 29.0               | 1.00                 | 25.4                    | 1.00                              | 20.3                                | 1.00                              |
| Yes                          | 43.1         | 1.04<br>[0.52, 2.11]              | 38.6          | 1.48<br>[0.71, 3.09]              | 34.1               | 1.90<br>[0.92, 3.89] | 20.5                    | 0.69<br>[0.28, 1.68]              | 34.1                                | 2.20<br>[1.06, 4.55] <sup>†</sup> |
| Alcohol problems (audit)     |              |                                   |               |                                   |                    |                      |                         |                                   |                                     |                                   |
| Not case                     | 43.9         | 1.00                              | 34.6          | 1.00                              | 32.5               | 1.00                 | 25.7                    | 1.00                              | 21.5                                | 1.00                              |
| Case (8+)                    | 37.4         | 0.74<br>[0.47, 1.16]              | 33.7          | 1.16<br>[0.72, 1.88]              | 25.3               | 0.77<br>[0.47, 1.26] | 23.5                    | 1.26<br>[0.75, 2.14]              | 22.3                                | 1.25<br>[0.74, 2.09]              |
| Functional impairment (WSAS) |              |                                   |               |                                   |                    |                      |                         |                                   |                                     |                                   |
| <20                          | 26.7         | 1.00                              | 25.2          | 1.00                              | 30.4               | 1.00                 | 21.5                    | 1.00                              | 23.0                                | 1.00                              |
| 20+ (severe)                 | 48.5         | 2.85<br>[1.76, 4.63] <sup>†</sup> | 38.8          | 2.28<br>[1.37, 3.80] <sup>†</sup> | 29.1               | 1.21<br>[0.74, 1.98] | 26.5                    | 1.52<br>[0.87, 2.64]              | 21.3                                | 0.91<br>[0.53, 1.54]              |

\* ORs adjusted for all other variables in table, and for age.

<sup>†</sup>  $p \leq 0.05$ .

OR = odds ratio; CI = confidence interval; CMD = common mental health disorders.

Pain Inventory.<sup>31</sup> In this study, Veterans with PTSD or depression had 50% more risk of disability days, defined as individuals reducing usual activity by 50% due to physical or emotional health or due to pain specifically. Equally, Hall et al.<sup>9</sup> found that PTSD was negatively associated with worse physical function/lower limb function in older overweight military Veterans.

Hearing impairment was the third highest reported physical health problem in this study (29.5%). The Royal British Legion (RBL) household survey found self-reported hearing difficulties in the Veteran population of 11%.<sup>4</sup> While we could expect higher levels of conditions in the study treatment-seeking samples,<sup>32</sup> the RBL sample could also be skewed toward higher hearing impairment due to the older age profile of the whole Veteran population<sup>33</sup> (average age of Veteran population 67 years, compared to the study sample age of 51 years).

Those who were medically discharged were more likely to report hearing impairment. It is, therefore, a matter of interest for health care providers to assess hearing impairment in Veterans with mental health problems, especially if they have been medically discharged from military service.

Current illegal drug use was high in the sample at 10.9%. Illegal drug use may inhibit recovery in the long-term if being used as a maladaptive coping technique<sup>34</sup> or encourage unhealthy lifestyle behaviours such as smoking or risk-taking behaviour.<sup>35,36</sup> Current smoking status prevalence (15.1%) was lower than that found in a longitudinal cohort study of UK service personnel between 21%–25%,<sup>37</sup> and slightly lower than that found in the UK male general population of 19.3% (ONS 2015). This may be explained by the study sample being older than members of the longitudinal cohort study and smoking

being more common at younger age groups. Smoking behaviours are important due to the association found between psychological distress, PTSD symptoms,<sup>37</sup> and smoking's concurrent repercussions for physical health problems, such as hypertension, respiratory problems, and heart problems.<sup>38,39</sup> Our study found that 41.2% of the sample scored 8 or more on the AUDIT, which could indicate harmful or hazardous drinking that would require an Alcohol Brief Intervention, as recommended by the WHO.<sup>26</sup> Alcohol use in the Armed Forces has consistently found high levels of drinking<sup>40,41</sup> and high comorbidity with PTSD.<sup>42,43</sup> However, in the current sample alcohol use was not associated with the top five most reported physical health conditions. Other UK military studies have used a cut-off of 16 on the AUDIT when assessing alcohol use in service personnel and Veterans due to high drinking levels.<sup>40,44,45</sup> Sensitivity analysis was conducted to assess whether a higher cut off on the AUDIT of 16 would be associated with the top five reported physical health complaints; however, again no significant associations were found.

Both Cohen et al.<sup>10</sup> and Andersen et al.<sup>8</sup> assessed the physical health diagnoses from medical records of US Veterans seeking treatment for mental health problems. The prevalence of hypertension in their samples were 10.4% and 9.2%, respectively, compared to 24.8% in the study sample. The higher prevalence in the study sample may partly be explained by the method of self-report or individuals endorsing the item for low blood pressure as well as high blood pressure due to the inventory schedule placing both issues together. However, due to the obesity profile of the study sample (discussed later), it is assumed most of the category would have been endorsed for high blood pressure.

Obesity and diabetes in the study sample were far higher than the Cohen sample 37.2% versus 16.9% (obesity) and 14.4% versus 1.7% (diabetes); however, smoking was lower in the study sample compared to the Cohen study (15.4% vs. 21.7%). The study sample compared to the Andersen study, however, found a lower prevalence of respiratory problems (14.4% vs. 25.3%) and gastrointestinal/digestive problems (21.8% vs. 35.5%).

Overall it is difficult to compare the study sample's prevalence with US studies who have different methods of data collection (e.g., assessment of medical records compared to self-report). Additionally, differences between findings may in part be age related as the study sample is older with an average age of 51 years, compared to Cohen's sample of 31 years old and Andersen's sample of 29

years old. However, an interesting difference to explore is the higher obesity recorded in this study. This higher obesity would not be expected if the military samples mirrored the country-specific general population obesity prevalence. The US general population, compared to the United Kingdom's, has a higher obesity profile nationally of 38.2% compared to the United Kingdom, 26.9% (OECD 2017). Fear et al.<sup>46</sup> found that self-reported height and weight measures underestimated obesity levels in the UK military; therefore, we can predict that this study may also underestimate the level of obesity problems. The prevalence of obesity is important as it can indicate a higher number of physical health burdens that pose challenges when experienced in combination with mental health problems.

### PTSD and obesity

Of the study participants, 76.5% were calculated to have a BMI deemed overweight or obese. The association between obesity and PTSD or a common mental health problem is well documented in US military literature. Rush et al.<sup>47</sup> found in a study of Veterans and service personnel that those with obesity were more likely to screen positive for depression and PTSD. Another US military study using data from the Millennium Cohort Study found that PTSD was associated with weight gain and development of obesity over a 3-year period.<sup>48</sup> There are several proposed mechanisms for this association. The Hall et al.<sup>49</sup> literature review suggests that PTSD may be negatively associated with physical activity and unhealthy eating behaviours in military and general populations. One paper in the review suggested that individuals with PTSD may be less likely to exercise because of fear of bodily arousal symptoms such as shortness of breath and increased heart rate.<sup>50</sup> There is also evidence that those with PTSD may choose not to exercise due to heightened concerns for safety.<sup>51</sup>

Other studies have noted the effects of PTSD and unhealthy relationships with food, such as emotional eating<sup>52</sup> and binge eating.<sup>53</sup> Klingaman et al.<sup>54</sup> found that Veterans with PTSD reported more barriers to weight loss than Veterans with no mental health problems. These barriers included stress and depression as obstacles to improving eating habits, medications increasing appetite and weight gain, feeling too tired to exercise due to sleep disturbances, chronic pain inhibiting physical activity, and lack of social support to sustain healthy eating. There is also evidence that PTSD has underlying biological and neurological effects that produce biological

markers consistent with a broad range of inflammatory disorders, including cardiovascular and autoimmune disease.<sup>11</sup> Hence both the mental and physical ramifications of PTSD related to obesity and subsequent health problems can be profound for individuals with PTSD.

Our study also found an intersection of obesity, chronic pain and reduced function. Veterans were over two times more likely to report chronic pain and three times more likely to report poor mobility if they were obese. Veterans who reported chronic pain or poor mobility were nearly three times more likely to score in the severe range of functional impairment. Here we can surmise there is an unhelpful combination of PTSD/other mental health conditions and obesity, decreasing exercise, decreasing mobility, decreasing function, which in turns increases the propensity for weight gain and further creates a poorer quality of life, in a negative reinforcing cycle. Other studies support these findings: Rush et al.<sup>47</sup> found that higher obesity in service personnel and Veterans was associated with increased PTSD, depression, and lower function scores. Jakupcak et al.<sup>55</sup> found a strong association of PTSD severity with poorer health functioning and notes the “unique influence of PTSD on physical health in treatment-seeking Iraq and Afghanistan War Veterans.”

Finally, our research found that Veterans who were ill and not working and those who had been medically discharged were more likely to report chronic pain and poor mobility, and more likely to report hearing impairment and gastrointestinal problems. This finding, therefore, highlights extra factors for Veterans with mental health problems that may predict increased physical health needs, and this should be important information for mental health providers to take into account when assessing overall health.

### Strengths and limitations

This study provides new evidence on the physical health needs of a Veteran group with mental health problems who are currently in treatment. To our knowledge, there are no other studies in the United Kingdom that explore this issue within the Veteran population. This study is important in that this group of Veterans may be some of the most complex in their mental health presentation, most in need of health care, potentially resource intensive, and from evidence in the study, may also present with complex physical health needs and health behaviours. As many Veterans receive their treatment through NHS mental health services and Armed Forces charities, this

information is vital for all service providers to provide appropriate care that considers physical and mental health needs together. This study also provides evidence on physical health needs for individuals with conditions such as PTSD, depression, and anxiety, for which there is little research in the general UK population. Hence, this study may have far broader implications for the UK general population.

This study has limitations in the self-report nature of the data collection. Individuals may not be accurate in the physical health conditions that they report. Hence, use of medical records may be a more accurate way to assess physical health needs; however, the perception of health needs and experience of somatic symptoms is important for this group, and therefore self-report may also reflect an accurate depiction of Veterans lived experiences of their health. This study provides evidence for populations who are treatment seeking and who potentially present with acute and complex mental health presentations. The results of this study may not be generalizable to populations not receiving treatment or those who experience milder mental health problems. This study also only explored associations with the top five reported physical health conditions. It is possible that interesting associations were not explored related to conditions that were reported at lower prevalence rate.

### Implications and conclusions

This study has provided confirmatory evidence in the United Kingdom that Veterans with mental health problems report a broad spectrum of comorbid physical health conditions. This study has also provided additional evidence that individuals with PTSD may be more likely to experience chronic pain and may present with obesity. These findings are crucial for providers of mental health treatment services to consider for Veterans or individuals with a PTSD diagnosis within their services. It is apparent that mental and physical comorbidities should be assessed and treated simultaneously to increase the likelihood of positive reinforcing health outcomes. Veterans with PTSD may need tailored programs to support losing weight; however, the benefits gained from physical improvements in health may have a positive effect on mental health through increased mobility and function both physically and socially. Equally, treatment of PTSD or mental health problems may also improve the ability of individuals to be active, and lower the risk for physical health conditions such as hypertension and subsequent ramifications of this condition on other health

outcomes.<sup>56</sup> Hence only treating cognitive or physical health needs in isolation may limit health outcomes and may prove costlier and resource intensive to health service budgets. Finally, providers of mental health services for Veterans should be aware of the employment status or medical discharge history of Veterans, as this is an indicator of multiple health needs that will need complex and joined up treatment plans. Future research should assess the health economics of health programs that provide joint mental and physical health assessment and treatment of those with PTSD. Additional research should assess the physical health needs of Veterans with mental health problems on a broader scale, using medical records where possible to assure diagnoses, as there is a distinct need to add more evidence to our knowledge in this field.

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Authors Murphy and Busuttill conceived and designed the study and acquired data. Murphy carried out the main analyses. Sharp helped select research questions and helped conceive the design of analysis approach. Murphy wrote the methods section. Sharp conducted the literature review and authored the main discussion with all authors revising the article for important intellectual content. All authors approved the final version submitted for publication.

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