Psychosocial factors associated with psychological distress and functional difficulties in recently transitioned and current serving Regular Australian Defence Force members

Craig Hansen , Alexander McFarlane , Marie Iannos ,
Nicole Sadler , Helen Benassi , Ellie Lawrence-Wood ,
Stephanie Hodson , Amelia Searle , Miranda Van Hooff

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Highlights:

Compared to those with low distress/impairment:

- Those who were highly distressed/impaired were 18 times more likely to report insomnia (than those with low distress/impairment)
- Those who were highly distressed/impaired were seven times more likely to report low resilience (than those with low distress/impairment)
- Those who were highly distressed/impaired were seven times more likely to have more than 11 self-reported physical health symptoms (than those with low distress/impairment)
- The associations between psychological distress/impairment and insomnia and self-reported physical health symptoms were stronger among the Transitioned cohort than the Regular 2015 ADF.

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Authors:

Craig Hansen^a, Alexander McFarlane^a, Marie Iannos^a, Nicole Sadler^{bc}, Helen Benassi^{bd}, Ellie Lawrence-Wood^a, Stephanie Hodson^e, Amelia Searle^a, Miranda Van Hooff^a

Author affiliations:

- a. Centre for Traumatic Stress Studies, University of Adelaide, South Australia, Australia
- b. Department of Defence, Canberra, Australia
- c. Phoenix Australia – Centre for Posttraumatic Mental Health, Melbourne, Australia
- d. Australian National University, Canberra, Australia
- e. Department of Veteran's Affairs, Canberra, Australia

Corresponding author:

Dr Craig Hansen
School of Medicine,
University of Adelaide
ADELAIDE SA 5000
Email: cdtanalytics@gmail.com

ABSTRACT

The transition period from military-to-civilian life can be one of the most significant and stressful periods in the military life cycle. We explore the psychosocial factors associated with psychological distress and functional impairment among those who recently transitioned from the Australian Defence Force (ADF) and those currently serving in 2015. Using data from the Transition and Wellbeing Research Programme, multinomial logistic regression models were used to analyse the associations between a combined measure of psychological distress and functional impairment (K10/SDS) with various psychosocial, lifestyle, and physical health factors. There were 10,210 in the final analytic cohort (Transitioned=3,254; Regular 2015 ADF=6,956). Overall, the odds of belonging to the highly distressed/impaired group were greatest among those with insomnia (Odds Ratio 18.53), low resilience (OR 7.67), physical health symptoms (OR 7.16), and alcohol risk (OR 4.67). Other factors included pain (OR 3.36), financial issues (OR 2.38), and social strain (OR 1.98). The associations with insomnia and physical health symptoms were stronger among the Transitioned compared to the Regular 2015 ADF. Results of this research highlights the importance of taking a multi-dimensional perspective of symptoms in military populations, particularly in those recently transitioned from permanent service, as predictors of future risk of disorder.

Keywords:

Psychosocial, psychological distress, functioning, military, defence force, transitioned

Abbreviations:

ADF	Australian Defence Force
K10	Kessler Psychological Distress Scale
HD-LIF	High distress + none/low impaired functioning
HD-HIF	High distress + moderate/high impaired functioning
LD-HIF	Low distress + moderate/high impaired functioning
LD-LIF	Low distress + none/low impaired functioning
PTSD	Post-traumatic stress disorder
SDS	Sheehan Disability Scale

Conflict of interest:

Helen Benassi is employed by the Department of Defence. The views expressed herein are those of the author and do not reflect the official position or views of the Department of Defence. All other authors have no conflict of interest.

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1. INTRODUCTION

It is internationally recognised that military service has the potential for exposure to extreme physical and psychological stress (Dobson et al., 2012; Forces in Mind Trust, 2013), and that military trauma exposures convey a long-term risk of mental disorders (Del Gaizo et al., 2011; Karam et al., 2014). The 2010 Mental Health Prevalence and Wellbeing Study (MHPWS) found that 22% of the 2010 Regular Australian Defence Force (ADF) met ICD-10 criteria for a mental disorder (McFarlane et al., 2011). Over the past decade there has been a substantial body of research investigating the mental health impact of military service on currently serving military members, particularly in relation to deployments (Crum-Cianflone et al., 2016; Fear et al., 2010; Thomas et al., 2010){McFarlane, 2011 #69}. However, more recently the transition period from full-time military service has been the subject of intense research interest (Sheilds et al., 2016), and it is now recognised that the transition period can be one of the most significant and stressful periods in the military life cycle.

The transition period often brings significant changes in identity, community, residence, social networks, status, family roles, occupation, finances, routines, responsibilities, supports and culture (Demers, 2011; Harvey et al., 2011; Hatch et al., 2013; Mobbs and Bonanno, 2017; Sayer et al., 2014; Sayer et al., 2010). These changes have the potential to manifest in the development of psychosocial adjustment issues, which can include family and/or relationship conflict, mental health and substance abuse problems, criminal offending, and risk-taking behaviours. Obstacles and stress in multiple domains has been shown to place individuals at increased risk of poor outcomes (Bergman et al., 2014; Burdett et al., 2013; Castro and Kintzle, 2014; Coll et al., 2011; Pease et al., 2016; Pedlar and Thompson, 2016; Sheilds et al., 2016; Wainwright et al., 2016). It is also the case that there is a greater proportion of individuals with physical injuries and psychological disorders in those transitioning from the military compared to the serving member population. These health-related difficulties contribute to challenges of adapting to civilian life following military service.

It is not surprising, that while international literature estimates 60–75% of transitioned military members report an easy adjustment to civilian life, others, especially those who developed mental health symptoms or disorders before being discharged, may struggle during this transition period (Bowes et al., 2018; Thompson et al., 2011). Much of the international research on ex-serving military members has consistently highlighted higher rates of disorder and poorer mental and physical health and wellbeing outcomes among those who have transitioned (compared to those who remain in service) (Hatch et al., 2013; Jones et al., 2013; Pinder et al., 2012; Villatte et al., 2015).

While there has been a wealth of published research focusing on the mental and physical health of military personnel who have transitioned into civilian life, there has been limited published research investigating various psychosocial and physical health factors which may impact on psychological distress and functional impairment in both current serving and those transitioning from full-time service. Therefore, our research aims to explore the psychosocial factors associated with psychological distress and functional impairment among two distinct cohorts, 1) those who recently transitioned from the ADF, and 2) regular serving (2015) ADF members.

2. METHODS

2.1 STUDY POPULATION

The population for this study are from the Transition and Wellbeing Research Programme, which is a comprehensive research programme undertaken in Australia to establish the prevalence of mental disorders in a representative cohort of ADF members who recently (between 2010 and 2014) transitioned out of permanent ADF service. The self-reported health and wellbeing of the transitioned cohort was compared to a sample of permanent, full-time serving ADF personnel in 2015 (Regular 2015 ADF).

The methods for the research programme are described in detail elsewhere (Van Hooff et al., 2018). Briefly, 20,031 Regular 2015 ADF were invited to participate in the research programme survey and 8,480 (42.3%) participated; there were 23,974 Transitioned ADF invited and 4326 (18.0%) participated. The study roll used to invite individuals to participate in this study had largely complete and reliable contact details for Regular 2015 ADF members, however there was extensive missing information for Transitioned ADF members. A range of additional forms of advertising (via social media, and conventional media) were used to reach these individuals, however final response rates were substantially lower. The final cohort used in this study included participants who were classified as survey responders to all sections of the questionnaire that contained the questions of interest (n=10,240). The cohort was further reduced to only include participants with complete data for the outcomes of interest (n=10,210). However, small numbers of participants had missing data for each of the explanatory variables and therefore the final number in each analysis varies according to the explanatory variable being analysed (all variables had less than 2.5% missing data, except for physical activity and pain with 7.7% and 11.6% missing data respectively).

2.2 OUTCOMES OF INTEREST

Psychological Distress: Psychological distress was assessed via the Kessler Psychological Distress Scale (K10), which is a 10-item screening questionnaire that was developed for use in the United States National Health Interview Survey (US-NHIS) (Kessler et al., 2002). The K10 is typically used to inform and complement clinical interviews, and to quantify levels of current distress in those who need treatment. There are a number of categorisations of global K10 scores that can be used to quantify disorder and/or distress with the current study using the following groupings (low distress = 10-19, mild distress = 20-24, moderate distress = 25-29, high distress = 30-50). For the purpose of the analytic strategy, these were further dichotomised into two groups (1) Low Distress (LD) (based on a global K10 score of ≤ 24 indicating no/mild distress) and (2) High Distress (HD) (based on global K10 score of >24 indicating moderate/severe distress) (Australian Bureau of Statistics, 2012).

Functional Impairment: Functional impairment was assessed via the Sheehan Disability Scale (SDS) (Sheehan, 1983), a 5-item self-report measure of disability due to mental health symptoms in three inter-related domains; work/school, social life and family life. The three items assessing impairment in the 3 domains are scored from 0 to 10 and can yield a total global functional impairment score of between 0 and 30. For the purposes of the analytic strategy (described below) in this study the global SDS score was dichotomised into two groups (1) Low Impaired Functioning (LIF) (based on a total score of 0-11 indicating No/low impairment) and (2) High Impaired Functioning (HIF) (based on a total score of ≥ 12 indicating moderate/severe impairment) (Australian Bureau of Statistics, 2007).

Combined Psychological Distress/Functional Impairment: The dichotomisations of the K10 and SDS outlined above were combined to create four levels of psychological distress/functional impairment:

- 1) High distress + None/Low impaired functioning (HD-LIF)
- 2) High distress + Moderate/High impaired functioning (HD-HIF)
- 3) Low distress + None/Low impaired functioning (LD-LIF)
- 4) Low distress + Moderate/High impaired functioning (LD-HIF)

These categories were analysed as the main outcome of interest with the HD-HIF group assumed to have the highest level of mental health issues, and the LD-LIF group to have the lowest level of mental health issues (and therefore used as the reference category).

2.3 PSYCHOSOCIAL AND PHYSICAL HEALTH EXPLANATORY FACTORS

We examined the associations between the combined K10/SDS categories and the following list of psychosocial and physical health factors, further referred to as “explanatory variables”. Details of how the following explanatory variables were captured in the questionnaire and dichotomised for all analyses can be found in Supplemental Table 1.

Psychosocial Factors: Social strain and support (family and friends) (score 0-4 = less strain vs. 5-9 = more strain), level of resilience (score <3 = low vs. ≥3 = normal/high) (Smith et al., 2008), sense of identity (no vs. yes), in a significant relationship (no vs. yes), death in the family (or close family friend) (no vs. yes), if they are a parent of a child (0-19 years) (no vs. yes).

Lifestyle Factors: Alcohol problems (AUDIT: score 0-15 = low risk vs. 16-40 = high risk) (Saunders et al., 1993), smoking status (no/previous vs. current), physical activity (IPAQ: inactive vs. HEPA active/minimally active) (IPAQ, 2002), obesity (calculated BMI: <30 = not obese vs. ≥30 = obese) (Australian Government Department of Health, 2017), insomnia index (score 0-14 = no insomnia vs. 15-28 = insomnia) (Bastien et al., 2001), gambling problems (score 0-2 = none/low problem vs. 3-8 = moderate/high) (Stinchfield, 2007), financial issues (no vs. yes), experience with the law (no vs. yes), risky driving behaviour (score 0-3 = less risky vs. 4-40 = risky), housing concerns (no vs. yes).

Physical Health Factors: Number of self-reported physical health symptoms (dichotomised by the median, 0-10 symptoms vs. 11+ symptoms), number of self-reported doctor diagnoses (dichotomised by the median, 0-1 diagnoses vs. 2+ diagnoses), and a pain index (grades 0/I/II vs. grades III/IV) (Von Korff et al., 1992). Items assessing current physical health were taken from the 2011 Australian Gulf War Veterans Health Study follow-up (Sim et al., 2015). This 67-item adapted version of self-report symptom questionnaire included respiratory, cardiovascular, musculoskeletal, dermatological, gastrointestinal, genitourinary, neurological and cognitive symptoms.

2.4 STATISTICAL ANALYSES

We describe the cohort using percentages and chi square tests of independence. Because we wanted to assess all explanatory factors without reducing correlated variables into domains/factors,

we examined the strength of pairwise associations between all explanatory variables by observing Cramer's V statistic from cross-tabulations.

Each explanatory variable was first assessed across the Transitioned ADF and Regular 2015 ADF cohorts using logistic regression - the odds of belonging to the Transitioned ADF cohort (e.g. vs Regular 2015 ADF as the reference). All models were adjusted for the covariates of age (18-27, 28-37, 38-47, 48-57, 58+), sex (male, female), service (Army, Air Force, Navy), rank (commissioned officer, non-commissioned officer, other), and education level (primary/secondary school, certificate/diploma, university).

Multinomial Logistic Regression: To assess the associations between the combined measure of K10/SDS (4 levels) and each of the explanatory variables (dichotomised) we used multinomial logistic regression models. The LD-LIF group was the reference category and odds ratios were calculated for membership into the LD-HIF, HD-LIF, and HD-HIF groups (in comparison to the LD-LIF group). The multinomial models were run on the entire cohort, and then on the Transitioned ADF and Regular 2015 ADF cohorts separately. Due to the large number of independent variables (e.g. explanatory variables), each variable was first assessed individually along with the covariates age, sex, Service, rank, and education level. A final model was then developed by using backwards stepwise selection (e.g. all variables are entered into the initial model and non-significant variables removed at each iteration) to establish a list of significant explanatory variables. A significance level of 0.05 was used as the criteria for removal from the model. Three models were run; 1) the entire cohort, 2) Transitioned ADF, and 3) Regular 2015 ADF.

To assess the strength of the associations, all results were ranked based on the odds ratio for the HD-HIF group (Very strong = OR >10.00; Strong = OR >3.00-10.00; Moderate = OR >1.50-3.00; Weak

= OR >1.20-1.50; No association = 1.00-1.20). All statistical analyses were performed using SAS 9.4 (SAS Institute, Cary, USA).

3. RESULTS

There were 10,210 in the final cohort used in these analyses, comprising 3,254 Transitioned ADF and 6,956 Regular 2015 ADF. All covariates (sex, age, service, rank, and education) were significantly different between the Transitioned ADF and Regular 2015 ADF (Table 1). The K10 and SDS categories were also different between the two cohorts with significantly more Transitioned ADF having high psychological distress and high impaired functioning. For the combined K10/SDS categories there were 668 (20.53%) Transitioned ADF in the HD-HIF category compared to 515 (7.40%) Regular 2015 ADF (Table 1).

As shown in Table 2, in comparison to the Regular 2015 ADF, the Transitioned ADF were twice as likely to have high psychological distress (OR 2.33; 95%CI 2.08, 2.62) and high impaired functioning (OR 2.05; 95%CI 1.86, 2.27) (Table 2). With regards to the explanatory factors among the Transitioned ADF, high-risk of alcohol problems (OR 3.69; 95%CI 3.03, 4.48) was ranked with the strongest association with transition status (Table 2). Other factors that were classified as having a moderate association between Transitioned ADF and Regular 2015 ADF were insomnia, low resilience, financial issues, inactivity, physical health symptoms (11+), housing concerns, legal difficulties, gambling issues, and high pain; all of which had odds ratios between 1.54 and 2.62 (Table 2). All other factors had a weak association or were not significantly associated.

Table 3 shows the results from the multinomial logistic regression among the Transitioned cohort. For each explanatory factor, the odds ratios represent the odds of membership into the HD-HIF, HD-LIF, and LD-HIF groups compared to the LD-LIF group (reference group). The strength of association was ranked based on the odds ratio for the HD-HIF group and results in Table 3 are presented in

descending order of strength. There were five explanatory factors ranked as having a very strong association, with insomnia being the strongest. For example, of those in the Transitioned ADF group who reported insomnia, they are 60 times more likely to belong to the HD-HIF group compared to LD-LIF group. Other factors ranked as having a very strong association were self-reported physical health symptoms (OR 45.42; 95%CI 28.70, 71.86), low resilience (OR 20.25; 95%CI 15.96, 25.69), high pain (OR 12.61; 95%CI 9.88, 16.09), and high-risk of alcohol problems (OR 10.41; 95%CI 7.67, 14.15). Many other factors were ranked as having a strong association with the next strongest being financial issues, legal difficulties, and housing concerns.

Table 4 shows the results from the multinomial logistic regression among the Regular 2015 ADF cohort. Results were very similar to those yielded from within the Transition cohort, with insomnia (OR 44.80; 95%CI 34.92, 57.47) having the strongest association, followed by self-reported physical health symptoms (OR 19.30; 95%CI 13.89, 26.82), low resilience (OR 16.63; 95%CI 13.45, 20.55), and high-risk of alcohol problems (OR 11.83; 95%CI 8.24, 16.96). Many other factors were ranked as having a strong association with the next strongest being pain, financial issues, legal difficulties, housing concerns, and legal difficulties.

Table 5 shows the results of the backwards stepwise multinomial logistic regression where all explanatory factors are included in the initial model and then non-significant factors (p value > 0.05) are removed at each iteration. Three models were run, 1) the entire cohort, 2) the Transitioned cohort, and 3) the Regular 2015 ADF cohort. Results were similar in all three models with insomnia, self-reported physical health symptoms, low resilience, pain, and high-risk of alcohol problems being the main factors associated with belonging to the HD-HIF group (compared to the LD-LIF group).

Based on variables remaining in the final backwards regression models, the strength of some individual associations (as reported in Tables 3 & 4) was diluted towards the null, which suggests

multicollinearity with a handful of variables being correlated. As shown in Figure 1, the level of Cramer's V suggests that insomnia had a medium-level association with physical health symptoms and low resilience. This explains the reduction in the effect that insomnia and self-reported physical health symptoms had in the final models compared to the effect reported in Tables 3 and 4 when the explanatory variables were analysed individually.

4. DISCUSSION

Our study investigated selected psychosocial and physical health factors associated with a combined measure of psychological distress and functional impairment (4 levels) among those recently transitioned out of the ADF and those in the Regular 2015 ADF. The HD-HIF group represented the most distressed and at risk on most variables. The LD-HIF group had the second highest level of a range of other adverse health indices such as pain and physical symptoms. The greater difficulties reported for insomnia and alcohol use in the HD-LIF group within the Transitioned ADF, suggests that the HD-LIF group may be experiencing a transitory period of distress and related to psychosocial stressors such as relationship problems. This finding is consistent with the diagnosis of an adjustment disorder in clinical settings, rather than having a more specific disorder such as a major depressive episode or PTSD.

Overall, in the final models insomnia had the strongest association with psychological distress and functional impairment (18 times greater in the HD-HIF group compared to the LD-LIF group). The results for insomnia are consistent with the current literature as sleep disturbance may be a nonspecific marker of distress that can arise from pain, psychological and physical morbidity (Hughes et al., 2013; Ohayon and Roth, 2003); this is also confirmed in our study by the association between insomnia and self-reported physical health symptoms, low resilience, and pain.

Insomnia has been linked to a multitude of mental health issues among both veterans (van Liempt et al., 2013) and non-military personnel. One study of the United States (US) 2009 Behavioural Risk Factor Surveillance System (analysed in 2011), for example, reported that poor quality sleep was more common among US veterans than non-veterans (non-institutionalised US adults) (Faestel et al., 2013). Other studies have reported a strong link between psychological distress and insomnia among non-military populations (Ford et al., 2015; Glozier et al., 2010; Liang and Chikritzhs, 2013). Despite this, there remains a lack of consensus as to whether this association is more common, or stronger, among veterans compared to non-military populations. There is a variety of evidence that nightmares in particular can be significantly exacerbated on exposure to further traumatic events, and should be a focus of intervention (Germain, 2013). Furthermore, the strong association between insomnia and our health measures is particularly important in the context of the established relationship between sleep problems and suicide risk, which has been noted in veteran populations (McCarthy et al., 2019). Furthermore, given the higher levels of suicidality observed among veterans in recent Australian studies (Van Hooff et al., 2018), sleep problems present an important target for screening and prevention. Hence, the documented evidence about the predictive risks of sleep disturbance highlights the potential benefits of screening for sleep disturbances and early intervention, which may include interventions such as sleep hygiene, mindfulness and cognitive behavioural strategies (Ritterband et al., 2017). Transition is a point at which screening and interventions could be implemented, and this may have the capacity to modify the emerging risk of disorder.

Interestingly, our results showed a gradient of severity for insomnia with the odds of membership into the two high psychological distress groups (HD-HIF and HD-LIF) being greater than those in the low distress groups (LD-HIF and LD-LIF [reference group]), suggesting that the strong association with insomnia is more likely driven by the psychological distress component of the combined measure than the functional impairment component. Despite insomnia being more common in the

Transitioned ADF (2.62 times more likely than the Regular 2015 ADF), stratified analyses showed that the overall association with insomnia was only slightly stronger in the Transitioned ADF (OR = 60.53) than the Regular 2015 ADF (OR = 44.80), indicating that the impact of insomnia on psychological distress and functional impairment is similar regardless of transition status. However, in the final models the effect of insomnia was diluted greatly (though still relatively strong) by other explanatory factors and the size of the association was then similar within the two cohorts (Table 5). These results suggest that while transition may be a practical point for sleep intervention, there is a need to focus on healthy sleeping behaviours for serving personnel as both a preventative and work health safety initiative.

The next two factors with the strongest associations were resilience and self-reported physical health symptoms (11+). For people who scored low on the resilience scale, or who reported 11 or more self-reported physical health symptoms, their odds of membership to the high psychological distress and functional impairment group (HD-HIF) was six or more times the odds in the reference group (all models in Table 5). The association with low resilience and self-reported physical health symptoms seemed to be driven more by the functional impairment component of the combined measure as the odds ratios were higher in the two high impaired functioning groups (HD-HIF and LD-HIF). In support of these findings, a longitudinal study of 475 US marines transitioning to civilian life reported that higher resilience scores were a protective factor for functional impairment (Hourani et al., 2012).

Resilience is often characterised by a person's ability to bounce back after significant adversity or trauma and is strongly associated with psychological well-being (Smith et al., 2008). In a recent US study, exposure to traumatic events during service in the military highly impacted on functional impairment and resilience significantly moderates this relationship (Taylor et al., 2018). In our study the Transitioned ADF (OR = 2.08) were more likely to report low resilience compared to the Regular

2015 ADF. However, the association between low resilience and psychological distress and functional impairment was slightly stronger among the Regular 2015 ADF (OR = 8.54) compared to the Transitioned ADF (OR = 7.05). Similar to insomnia, these associations for low resilience were diluted in the final models (compared to the individual models) for Transitioned ADF (OR = 20.25) and the Regular 2015 ADF (OR = 16.63). Once again this highlights the complex matrix of relationships among the strongest explanatory variables. However, one variable that could not be examined in these analyses was the duration of symptomatic distress, a factor that may progressively erode resilience and coping. While resilience is an important predictor of adaptation, there is likely to be a bidirectional relationship between resilience/coping, based on previous longitudinal studies (Campbell-Sills et al., 2006; Spurrell and McFarlane, 1993).

Self-reported physical health symptoms were based on a 67-item questionnaire that included respiratory, cardiovascular, musculoskeletal, dermatological, gastrointestinal, genitourinary, neurological and cognitive symptoms. Previous findings from this and other similar populations (Davy et al., 2012; Kelsall et al., 2018) indicates that the number of symptoms across categories is a good indicator of somatic distress. We did not analyse these symptoms (or groupings) individually as this was beyond the scope of the current paper. We did not analyse these symptoms (or groupings) individually, and instead used the median number of health symptoms (11) as a cut-off point as a proxy of overall physical health. In the final stratified models, within the Transitioned ADF (OR = 11.24) the impact of self-reported physical health symptoms on psychological distress and functional impairment was almost twice the association within the Regular 2015 ADF (OR = 6.03).

Physical symptoms are a frequent manifestation of PTSD and other psychiatric disorders (Afari et al., 2014; Asnaani et al., 2014), and this is consistent with the reporting of high levels of these symptoms in the HD-HIF group. Furthermore, the LD-HIF group also reported an increased rate of these symptoms. Individuals presenting with high levels of somatic distress are particularly vulnerable to

under-diagnosis (Wilhelm et al., 2008) and these problems with diagnoses extend to anxiety disorders (Kroenke et al., 2007) and depression (Valenstein et al., 2001). These somatic presentations are also associated with high levels of combat exposure highlighting the importance of the careful assessment of this axis of distress in those with a history of deployment (Killgore et al., 2006). Although not reported in our analyses, 50.8% of the LD-HIF group scored over the screening cut-off for PTSD (based on the PTSD Checklist - PCL), highlighting that a proportion of this group had a mixture of somatic and subsyndromal PTSD symptoms that are a predictor of future disorder (Pietrzak et al., 2009). This observation underscores the importance of taking a dimensional perspective of symptoms in military populations as predictors of the future risk of disorder.

Other standout associations where the odds ratios for membership into the HD-HIF group were greater than three, were alcohol misuse (high risk on the AUDIT scale) and pain (high) with the associations slightly higher among the Transitioned ADF. The association between alcohol misuse and membership into the HD-HIF group was only slightly higher among the Transitioned ADF (OR = 5.23) compared to the Regular 2015 ADF (OR = 4.36), suggesting that this association is not moderated by transition status. In other words, the relationship between alcohol misuse and psychological distress and functional impairment is strong in both cohorts. Similarly, results from a recent study among US veterans found that endorsement of alcohol use was similar during active duty and after transition to civilian life (Derefinko et al., 2018). Our finding of increased rates of alcohol misuse in the Transitioned ADF may reflect the use of alcohol to self-medicate their higher levels of disorder (Jacobsen et al., 2001) as alcohol has been shown to attenuate symptoms of hypervigilance and an exaggerated startle response (Davis et al., 2013). The comorbidity of PTSD and alcohol abuse has long been recognized and is likely to reflect the increasing rates of problematic use with the passage of time post discharge in the transitioned cohort (McFarlane, 1998). This finding highlights the importance of addressing the risk of increasing alcohol

consumption in those with disorders at the time of transition, particularly if treatment is leading to only partial amelioration of symptoms.

The association between pain and psychological distress and impaired functioning was slightly higher in the Transitioned ADF (HD-HIF OR = 4.47) than the Regular 2015 ADF (HD-HIF OR = 3.06). In both cohorts the odds ratios for pain were highest in the two high impaired functioning groups (HD-HIF and LD-HIF), suggesting that the association is driven more by the impaired functioning component of the combined K10/SDS. Chronic pain is a major concern among the veteran population and it is often a comorbid condition to PTSD (Shipherd et al., 2007), highlighting the shared vulnerability and mutual maintenance of these conditions and the greater levels of impairment (Liedl et al., 2010). In general, the greater impairment in this group is accounted for by the comorbidity which increases the clinical complexity of the management. In clinical settings, it is important that pain is considered in the assessment of patients as a routine issue and incorporated as one routine dimension in the therapeutic plan.

The remaining factors of interest where the odds ratios for membership into the HD-HIF group were greater than two, were housing concerns and financial issues in both cohorts; legal difficulties and increased family strain in the Regular 2015 ADF; and less sense of identity and less family support among the Transitioned ADF. It is common for veterans to feel a loss of identity when transitioning to civilian life (Coll et al., 2011; Herman and Yarwood, 2014), however this area of research is largely understudied (Hack et al., 2017). With regards to social support, a recent study examined the impact of social support on PTSD, depression, anxiety and suicidal ideation among Canadian veterans and current serving personnel and found that less social support increases the risk of these mental health outcomes (Ketcheson et al., 2017). Housing instability has also been associated with mental distress among veterans (Bossarte et al., 2013), however, for comparative purposes it is

unknown how much housing instability impacts mental distress among the current serving military members.

4.1 STRENGTHS AND LIMITATIONS

Our study has several strengths and limitations. The Transition and Wellbeing Programme is a large comprehensive research programme focusing on the mental and physical health of both current serving and transitioned personnel, the only study of its kind in Australia. The relatively large sample size of this study enabled robust investigation into a broad range of psychosocial and physical health factors associated with psychological distress and impaired functioning.

The major limitation of our study is that while there was a large sample, there was a reasonably low response rate (13.6% in the final analytic cohort) for the Transitioned ADF, suggesting that our results may not be entirely representative of the broader Transitioned ADF population. A challenge when exploring many psychosocial factors within a unique population is the difficulty to tease out mutually exclusive associations. This was evident with strong effects of some individual explanatory variables being diluted in the final models. However, given the large sample we were still able to identify key factors while taking into consideration other explanatory variables, meaning that important associations remained statistically significant despite these relationships. Furthermore, given that the K10 and SDS were both dichotomised, some of the richness of the continuous global scores may be diminished. However, these dichotomies were based on categorisations developed by the Australian Bureau of Statistics which allows for comparison to the Australian population.

A further issue is that the associations examined are unable to dissect the issues of directionality of causation. For a number of the phenomena examined there are possible bidirectional relationships that require further elucidation in longitudinal analyses. Another limitation was the missing data across explanatory variables. For example, when analysing explanatory variables individually the

percentage of missing data was small. However, in the final backwards stepwise regression models 2,353 cases were excluded due to combinations of missing data on all explanatory variables.

5. CONCLUSION

In conclusion, insomnia, low resilience, self-reported physical health symptoms, high-risk of alcohol misuse, and high levels of pain, all showed the strongest associations with a combined measure of psychological distress and functional impairment. The strength of associations was similar across the Transitioned ADF and Regular 2015 ADF for most factors examined, except for physical health symptoms being stronger within the Transitioned ADF. Associations with insomnia and high-risk alcohol misuse exhibited more of a severity gradient across the levels of psychological distress, while the associations with resilience, physical health symptoms, and pain exhibited more of a severity gradient across the levels of functional impairment.

While these analyses give a cross-sectional perspective, an important question is how individuals may move between these different patterns of adaptation with time. There is an increasing literature focusing on the importance of taking a staging approach to the risk and onset of psychiatric disorder (McFarlane et al., 2017; McGorry et al., 2006), and these groups may represent different stages in a continuum of distress and disability. This perspective also provides potential insights into the opportunities for screening and early intervention in both current serving and transitioned ADF members. Importantly, the psychosocial factors identified as having a impact on psychological distress and functional impairment, should be considered in future military focused mental health or wellbeing screening protocols and provide potential target area for early intervention.

Table 1. Complete Cohort (n=10,210): Descriptive profile of the study cohort.

	Total n (%)	Transitioned n (%)	Regular 2015 ADF n (%)	Chi Square test P value
TOTAL	10,2010	3,254	6,956	
Sex				
Female	1880 (18.41)	491 (15.09)	1389 (19.97) ¹	<.0001
Male	8330 (81.59)	2763 (84.91)	5567 (80.03)	
Age (yrs)				
18-27	749 (7.34)	308 (9.47)	441 (6.34)	<.0001
28-37	2849 (27.90)	892 (27.41)	1957 (28.13)	
38-47	3338 (32.69)	857 (26.34)	2481 (35.67)	
48-57	2505 (24.53)	704 (21.63)	1801 (25.89)	
58+	649 (6.36)	470 (14.44)	179 (2.57)	
Missing	120 (1.18)	23 (0.71)	97 (1.39)	
Rank				
Officers	4018 (39.35)	1026 (31.53)	2992 (43.01)	<.0001
NCO	5127 (50.22)	1584 (48.68)	3543 (50.93)	
Other	1065 (10.43)	644 (19.79)	421 (6.05)	
Service				
Air Force	3218 (31.52)	792 (24.34)	2426 (34.88)	<.0001
Army	4674 (45.78)	1816 (55.81)	2858 (41.09)	
Navy	2318 (22.70)	646 (19.85)	1672 (24.04)	
Highest Education Level				
Primary/secondary school	2310 (22.62)	719 (22.10)	1591 (22.87)	<.0001
Certificate/diploma	4298 (42.10)	1557 (47.85)	2741 (39.40)	
University	3499 (34.27)	959 (29.47)	2540 (36.52)	
Missing	103 (1.01)	19 (0.58)	84 (1.21)	
K10 (Psychological Distress)				
Low distress (LD)	8544 (83.68)	2426 (74.55)	6118 (87.95)	<.0001
High distress (HD)	1666 (16.32)	828 (25.45)	838 (12.05)	
Sheehan Functional Impairment (SDS)				
Low impaired functioning (LIF)	7506 (73.52)	2046 (62.88)	5460 (78.49)	<.0001
High impaired functioning (HIF)	2704 (26.48)	1208 (37.12)	1496 (21.51)	
Psychological distress/functional impairment				
High distress + High impaired functioning (HD-HIF)	1183 (11.59)	668 (20.53)	515 (7.40)	<.0001
High distress + Low impaired functioning (HD-LIF)	483 (4.73)	160 (4.92)	323 (4.64)	
Low distress + High impaired functioning (LD-HIF)	1521 (14.90)	540 (16.59)	981 (14.10)	
Low distress + Low impaired functioning (LD-LIF)	7023 (68.79)	1886 (57.96)	5137 (73.85)	

1. This is representative of the female participation in the ADF during 2015 (Air Force 18.6%, Army 12.1%, Navy 18.8%)

Source: <https://www.defence.gov.au/annualreports/17-18/Downloads/WomenInTheADFReport2017-18.pdf>

Table 2. Complete cohort (n=10,210): Association between psychosocial factors and transition status
(Transitioned ADF vs. Regular 2015 ADF).

	Total	Transitioned	Regular 2015 ADF	Transitioned vs. Regular 2015 ADF	
	n = 10,210 n (column %)	n = 3,254 n (column %)	n = 6,956 n (column %)	Odds Ratio (95% CI)	Strength of association
K10 (Psychological Distress)					
High distress (HD)	1666 (16.32)	828 (25.45)	838 (12.05)	2.33 (2.08,2.62)	Moderate
Sheehan Functional Impairment (SDS)					
High impaired functioning (HIF)	2704 (26.48)	1208 (37.12)	1496 (21.51)	2.05 (1.86,2.27)	Moderate
Explanatory variables of interest					
AUDIT (high risk)	535 (5.24)	339 (10.42)	196 (2.82)	3.69 (3.04,4.48)	Strong
Insomnia (yes)	1390 (13.61)	731 (23.08)	659 (9.72)	2.62 (2.31,2.97)	Moderate
Resilience (low)	1625 (15.92)	755 (23.20)	870 (12.51)	2.08 (1.85,2.34)	Moderate
Financial issues (yes)	1480 (14.50)	715 (21.97)	765 (11.00)	2.07 (1.84,2.34)	Moderate
Physical exercise (inactive)	1819 (17.82)	707 (24.45)	1112 (17.04)	1.75 (1.56,1.97)	Moderate
Physical health symptoms (11+)	5271 (51.63)	2005 (61.62)	3266 (46.95)	1.75 (1.60,1.92)	Moderate
Housing concerns (yes)	798 (7.82)	360 (11.06)	438 (6.30)	1.67 (1.42,1.95)	Moderate
Legal difficulties (yes)	207 (2.03)	99 (3.05)	108 (1.56)	1.66 (1.23,2.25)	Moderate
Gambling issues (moderate/high)	405 (3.97)	194 (5.96)	211 (3.03)	1.65 (1.32,2.05)	Moderate
Pain (high)	1641 (16.07)	681 (23.88)	960 (15.55)	1.54 (1.37,1.74)	Moderate
Sense of identity/belong military (less)	5418 (53.07)	1973 (60.82)	3445 (49.68)	1.53 (1.40,1.68)	Moderate
Dr diagnoses (2+)	4185 (40.99)	1583 (48.65)	2602 (37.41)	1.50 (1.36,1.65)	Weak
Risky driving score (risky)	2514 (24.62)	984 (30.24)	1530 (22.00)	1.45 (1.31,1.60)	Weak
Family social support (less support)	1081 (10.59)	445 (13.69)	636 (9.16)	1.44 (1.25,1.65)	Weak
Friend social support (less support)	2343 (22.95)	888 (27.40)	1455 (20.97)	1.37 (1.24,1.53)	Weak
Family social strain (more strain)	3313 (32.45)	1199 (36.87)	2114 (30.47)	1.37 (1.24,1.50)	Weak
Obese (BMI >30)	2529 (24.77)	946 (29.53)	1583 (23.05)	1.37 (1.23,1.52)	Weak
Experience with the law (yes)	1817 (17.80)	702 (21.57)	1115 (16.03)	1.25 (1.11,1.40)	Weak
Friend social strain (more strain)	769 (7.53)	299 (9.23)	470 (6.77)	1.23 (1.05,1.45)	Weak
In a significant intimate relationship (yes)	8453 (82.79)	2615 (81.01)	5838 (84.95)	0.79 (0.70,0.89)	Weak
Current smoker (yes)	1240 (12.14)	445 (13.76)	795 (11.51)	1.11 (0.97,1.27)	No Assoc.
Death in family (yes)	2786 (27.29)	935 (28.73)	1851 (26.61)	1.05 (0.95,1.16)	No Assoc.
Parent of children (yes)	6905 (67.63)	2163 (67.05)	4742 (69.11)	0.90 (0.81,1.00)	No Assoc.

Table 3. Transitioned ADF (n=3,254): Multinomial logistic regression, odds ratios (95% CI) representing membership to the LD-HIF, HD-LIF, and HD-HIF levels of psychological distress/functional impairment, in comparison to the LD-LIF group (reference).

All variables of interest (ordered by strength of association in the HD-HIF group)	High distress		Low distress	
	High impaired functioning (HD-HIF)	Low impaired functioning (HD-LIF)	High impaired functioning (LD-HIF)	Low impaired functioning (LD-LIF)
	Strength of Assoc.			
Insomnia	60.53 (45.06,81.31)	6.40 (4.08,10.05)	8.12 (6.03,10.93)	Very strong
Physical health symptoms (11+)	45.42 (28.70,71.86)	1.86 (1.33,2.60)	7.25 (5.63,9.34)	Very strong
Resilience (low)	20.25 (15.96,25.69)	2.36 (1.51,3.68)	4.31 (3.34,5.55)	Very strong
Pain (high)	12.61 (9.88,16.09)	2.22 (1.39,3.56)	6.21 (4.84,7.98)	Very strong
AUDIT (high risk)	10.41 (7.67,14.15)	4.15 (2.45,7.04)	3.52 (2.45,5.07)	Very strong
Financial issues (yes)	8.84 (7.08,11.04)	2.95 (1.96,4.42)	3.30 (2.57,4.24)	Strong
Legal difficulties (yes)	6.48 (3.95,10.63)	1.41 (0.42,4.78)	1.67 (0.82,3.37)	Strong
Housing concerns (yes)	5.68 (4.33,7.45)	2.88 (1.75,4.76)	2.21 (1.58,3.10)	Strong
Gambling issues (moderate/high)	3.86 (2.71,5.51)	2.30 (1.20,4.40)	2.26 (1.49,3.44)	Strong
Family social support (less support)	3.81 (2.98,4.88)	2.43 (1.56,3.78)	2.09 (1.57,2.78)	Strong
Friend social strain (more strain)	3.73 (2.81,4.96)	2.03 (1.18,3.49)	1.73 (1.22,2.46)	Strong
Friend social support (less support)	3.44 (2.83,4.18)	1.46 (1.01,2.12)	1.69 (1.36,2.11)	Strong
Family social strain (more strain)	3.26 (2.70,3.94)	1.43 (1.02,2.02)	1.66 (1.36,2.03)	Strong
Dr diagnoses (2+)	3.18 (2.59,3.91)	1.00 (0.69,1.45)	2.00 (1.61,2.49)	Strong
Risky driving score (risky)	2.97 (2.45,3.59)	1.33 (0.93,1.92)	1.42 (1.14,1.76)	Moderate
Current smoker	2.10 (1.65,2.67)	0.74 (0.42,1.30)	1.26 (0.95,1.69)	Moderate
Obese (BMI >30)	2.10 (1.72,2.56)	1.28 (0.88,1.84)	1.54 (1.24,1.91)	Moderate
Experience with the law (yes)	2.09 (1.69,2.58)	1.07 (0.71,1.63)	1.41 (1.11,1.79)	Weak
Physical exercise (inactive)	1.96 (1.57,2.45)	1.03 (0.67,1.59)	1.43 (1.13,1.81)	Weak
Death in family (yes)	1.79 (1.47,2.17)	1.12 (0.78,1.62)	1.42 (1.15,1.75)	Weak
Parent of children (yes)	1.39 (1.12,1.73)	1.05 (0.71,1.55)	1.16 (0.92,1.47)	Weak
Sense of identity/belonging to the military (less)	1.29 (1.07,1.56)	1.50 (1.06,2.12)	1.40 (1.14,1.72)	Weak
In a significant intimate relationship (yes)	0.71 (0.56,0.89)	0.73 (0.48,1.10)	0.82 (0.64,1.06)	No assoc.

Each predictor (independent variable) is assessed separately while adjusting for the covariates of age, sex, Service, rank, and education.

Table 4. Regular 2015 ADF (n=6,956): Multinomial logistic regression, odds ratios (95% CI) representing membership to the LD-HIF, HD-LIF, and HD-HIF levels of psychological distress/functional impairment, in comparison to the LD-LIF group (reference).

All variables of interest (ordered by strength of association in the HD- HIF group)	High distress		Low distress	
	High impaired functioning (HD-HIF)	Low impaired functioning (HD-LIF)	High impaired functioning (LD-HIF)	Low impaired functioning (LD-LIF)
	Strength of Assoc.			
Insomnia	44.80 (34.92,57.47)	5.11 (3.57,7.31)	7.32 (5.80,9.25)	Very strong
Physical health symptoms (11+)	19.30 (13.89,26.82)	1.03 (0.81,1.29)	4.81 (4.11,5.62)	Very strong
Resilience (low)	16.63 (13.45,20.55)	1.71 (1.18,2.49)	4.81 (4.00,5.79)	Very strong
AUDIT (high risk)	11.83 (8.24,16.96)	4.13 (2.35,7.28)	3.80 (2.57,5.61)	Very strong
Pain (high)	5.74 (4.64,7.10)	1.06 (0.72,1.56)	3.61 (3.04,4.30)	Strong
Financial issues (yes)	4.17 (3.34,5.21)	1.39 (0.97,1.99)	2.56 (2.11,3.11)	Strong
Housing concerns (yes)	4.20 (3.21,5.50)	1.66 (1.08,2.56)	2.07 (1.61,2.68)	Strong
Legal difficulties (yes)	4.09 (2.43,6.90)	1.23 (0.44,3.44)	3.50 (2.24,5.48)	Strong
Family social strain (more strain)	3.51 (2.91,4.24)	1.04 (0.80,1.34)	2.03 (1.76,2.34)	Strong
Family social support (less support)	3.45 (2.71,4.39)	1.50 (1.03,2.19)	2.33 (1.89,2.87)	Strong
Gambling issues (moderate/high)	3.00 (2.05,4.38)	0.80 (0.37,1.74)	1.84 (1.29,2.62)	Strong
Friend social support (less support)	2.58 (2.11,3.15)	0.99 (0.74,1.33)	2.24 (1.92,2.61)	Moderate
Friend social strain (more strain)	2.36 (1.77,3.15)	1.59 (1.07,2.36)	1.47 (1.14,1.91)	Moderate
Dr diagnoses (2+)	2.34 (1.92,2.84)	0.87 (0.67,1.13)	2.41 (2.07,2.79)	Moderate
Risky driving score (risky)	2.26 (1.86,2.75)	1.30 (1.00,1.69)	1.54 (1.31,1.80)	Moderate
Physical exercise (inactive)	1.80 (1.42,2.28)	0.99 (0.72,1.37)	1.35 (1.12,1.63)	Moderate
Obese (BMI >30)	1.76 (1.44,2.16)	1.08 (0.83,1.42)	1.55 (1.32,1.82)	Moderate
Sense of identity/belonging to the military (less)	1.73 (1.43,2.09)	1.04 (0.83,1.32)	1.34 (1.17,1.55)	Moderate
In a significant intimate relationship (yes)	0.66 (0.52,0.84)	0.70 (0.52,0.95)	1.00 (0.82,1.22)	Moderate
Death in family (yes)	1.40 (1.15,1.71)	1.11 (0.86,1.43)	1.46 (1.26,1.70)	Weak
Current smoker	1.36 (1.05,1.76)	0.87 (0.60,1.26)	1.15 (0.93,1.42)	Weak
Experience with the law (yes)	1.30 (1.03,1.65)	0.95 (0.69,1.30)	1.29 (1.07,1.55)	Weak
Parent of children (yes)	1.14 (0.91,1.42)	0.98 (0.74,1.28)	1.30 (1.09,1.54)	No assoc.

Each predictor (independent variable) is assessed separately while adjusting for the covariates of age, sex, Service, rank, and education.

Table 5. Complete cohort (n=10,210): Backwards stepwise multinomial logistic regression, odds ratios (95% CI) representing membership to the LD-HIF, HD-LIF, and HD-HIF levels of psychological distress/functional impairment, in comparison to the LD-LIF group (reference).

Variables selected in the final models (ordered by strength of association in the HD-HIF group)	High distress		Low distress	
	High impaired functioning (HD-HIF)	Low impaired functioning (HD-LIF)	High impaired functioning (LD-HIF)	Low impaired functioning ((LD-LIF)
Strength of Assoc.				
Model 1: Entire Cohort (n=10,210)				
Insomnia	18.53 (14.36,23.90)	5.74 (4.08,8.07)	3.72 (2.96,4.68)	Very strong
Resilience (low)	7.67 (6.09,9.65)	1.78 (1.26,2.52)	2.66 (2.21,3.21)	Strong
Physical health symptoms (11+)	7.16 (4.99,10.28)	0.82 (0.64,1.06)	3.18 (2.70,3.75)	Strong
AUDIT (high risk)	4.67 (3.21,6.80)	3.49 (2.15,5.65)	1.96 (1.38,2.78)	Strong
Pain (high)	3.36 (2.66,4.25)	1.07 (0.76,1.52)	2.82 (2.38,3.34)	Strong
Housing concerns (yes)	2.47 (1.79,3.41)	1.33 (0.86,2.05)	1.59 (1.22,2.08)	Moderate
Financial issues (yes)	2.38 (1.85,3.06)	1.48 (1.06,2.07)	1.78 (1.47,2.17)	Moderate
Family social strain (more strain)	1.98 (1.60,2.46)	1.02 (0.79,1.32)	1.36 (1.17,1.58)	Moderate
Family social support (less support)	1.96 (1.48,2.60)	1.56 (1.09,2.24)	1.47 (1.18,1.83)	Moderate
Friend social strain (more strain)	1.48 (1.06,2.07)	1.52 (1.03,2.25)	1.17 (0.90,1.52)	Moderate
Physical exercise (inactive)	1.45 (1.13,1.86)	0.96 (0.71,1.29)	1.20 (1.01,1.42)	Weak
Risky driving score (risky)	1.38 (1.11,1.73)	1.05 (0.81,1.38)	1.10 (0.93,1.30)	Weak
Friend social support (less support)	1.42 (1.13,1.78)	0.84 (0.62,1.13)	1.23 (1.05,1.46)	Weak
Sense of identity/belonging to the military (less)	1.35 (1.09,1.67)	1.14 (0.91,1.44)	1.21 (1.05,1.39)	Weak
Dr diagnoses (2+)	0.96 (0.76,1.21)	0.91 (0.70,1.18)	1.37 (1.17,1.60)	No assoc.
Model 2: Among Regular 2015 ADF (n=6,956)				
Insomnia	18.25 (13.15,25.33)	5.64 (3.66,8.70)	3.96 (2.98,5.27)	Very Strong
Resilience (low)	8.54 (6.35,11.48)	1.78 (1.15,2.75)	2.88 (2.29,3.63)	Strong
Physical health symptoms (11+)	6.03 (3.93,9.25)	0.73 (0.54,0.99)	2.85 (2.35,3.45)	Strong
AUDIT (high risk)	4.36 (2.54,7.48)	3.51 (1.75,7.06)	2.07 (1.28,3.34)	Strong
Pain (high)	3.06 (2.27,4.14)	0.92 (0.59,1.42)	2.49 (2.03,3.06)	Strong
Legal difficulties (yes)	2.78 (1.30,5.96)	1.26 (0.43,3.70)	2.09 (1.16,3.74)	Moderate
Family social strain (more strain)	2.19 (1.67,2.89)	1.04 (0.76,1.42)	1.43 (1.20,1.71)	Moderate
Housing concerns (yes)	2.16 (1.39,3.36)	1.43 (0.83,2.48)	1.52 (1.09,2.13)	Moderate
Financial issues (yes)	2.11 (1.50,2.97)	1.34 (0.87,2.06)	1.67 (1.31,2.13)	Moderate
Family social support (less support)	1.67 (1.15,2.43)	1.48 (0.93,2.34)	1.47 (1.12,1.92)	Moderate
Friend social support (less support)	1.25 (0.93,1.70)	0.86 (0.59,1.23)	1.42 (1.16,1.73)	No assoc.
Dr diagnoses (2+)	1.05 (0.78,1.42)	1.01 (0.74,1.38)	1.54 (1.28,1.86)	No assoc.
Model 3: Among Transitioned ADF (n=3,254)				
Insomnia	20.58 (13.50,31.38)	5.79 (3.30,10.16)	3.30 (2.23,4.89)	Very strong
Physical health symptoms (11+)	11.24 (5.71,22.12)	1.04 (0.67,1.62)	4.37 (3.19,5.98)	Very strong
Resilience (low)	7.46 (5.12,10.88)	1.81 (1.02,3.22)	2.48 (1.78,3.44)	Strong
AUDIT (high risk)	5.23 (3.05,8.96)	3.29 (1.67,6.49)	1.91 (1.14,3.19)	Strong
Pain (high)	4.47 (3.04,6.59)	1.46 (0.82,2.61)	3.95 (2.90,5.37)	Strong
Financial Issues (yes)	2.66 (1.77,3.98)	1.74 (1.00,3.03)	2.00 (1.42,2.81)	Moderate
Family social support (less support)	2.44 (1.54,3.85)	1.78 (0.97,3.25)	1.57 (1.07,2.32)	Moderate
Housing concerns (yes)	2.57 (1.54,4.26)	1.15 (0.55,2.42)	1.67 (1.07,2.62)	Moderate
Family social strain (more strain)	1.77 (1.25,2.49)	1.05 (0.68,1.62)	1.22 (0.93,1.59)	Moderate
Friend social support (less support)	1.64 (1.14,2.36)	0.77 (0.46,1.29)	1.00 (0.74,1.35)	Moderate

All backward stepwise models adjusted for the covariates of age, sex, Service, and rank. Education level was removed as it caused quasi-complete separation. However, this did not change the variables selected for the final model.

In Model 1 there were 2,353 excluded due to combinations of missing data on all explanatory variables.

In Model 2 there were 1,496 excluded due to combinations of missing data on all explanatory variables.

In Model 3 there were 857 excluded due to combinations of missing data on all explanatory variables.

Model 1 variables in order removed: Gambling, Obese, Child, Smoking, Experience with the law, In relationship, Death in family, Legal difficulties, Transition status.

Model 2 variables in order removed: Smoking, Gambling, Risky driving, Child, Experience with the law, Obese, In relationship, Death in family.

Model 3 variables in order removed: Child, Gambling, Experience with the law, Obese, Death in family, Smoking, In relationship, Legal difficulties, Dr Diagnoses, Social strain (friends), Inactivity, Sense of identity, Risky driving.

Figure 1: Strength of association (Cramer's V) for pairwise comparisons of all categorical variables.

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Craig Hansen: Conceptualization, Methodology, Formal analysis, Writing - Original Draft, Supervision

Alexander McFarlane: Conceptualization, Methodology, Investigation, Writing - Original Draft

Marie Iannos: Project administration, Writing - Original Draft

Nicole Sadler: Conceptualization, Writing - Original Draft

Helen Benassi: Conceptualization, Writing - Original Draft

Ellie Lawrence-Wood: Conceptualization, Investigation, Writing - Original Draft

Stephanie Hodson: Conceptualization, Writing - Original Draft

Amelia Searle: Investigation, Writing - Original Draft

Miranda Van Hooff: Conceptualization, Methodology, Investigation, Writing - Original Draft, Funding acquisition, Supervision

Author Contributions based on the following table:

Conceptualization	Ideas; formulation or evolution of overarching research goals and aims
Methodology	Development or design of methodology; creation of models
Software	Programming, software development; designing computer programs; implementation of the computer code and supporting algorithms; testing of existing code components
Validation	Verification, whether as a part of the activity or separate, of the overall replication/ reproducibility of results/experiments and other research outputs
Formal analysis	Application of statistical, mathematical, computational, or other formal techniques to analyze or synthesize study data
Investigation	Conducting a research and investigation process, specifically performing the experiments, or data/evidence collection
Resources	Provision of study materials, reagents, materials, patients, laboratory samples, animals, instrumentation, computing resources, or other analysis tools
Data Curation	Management activities to annotate (produce metadata), scrub data and maintain research data (including software code, where it is necessary for interpreting the data itself) for initial use and later reuse
Writing - Original Draft	Preparation, creation and/or presentation of the published work, specifically writing the initial draft (including substantive translation)
Writing - Review & Editing	Preparation, creation and/or presentation of the published work by those from the original research group, specifically critical review, commentary or revision – including pre-or postpublication stages
Visualization	Preparation, creation and/or presentation of the published work, specifically visualization/ data presentation
Supervision	Oversight and leadership responsibility for the research activity planning and execution, including mentorship external to the core team
Project administration	Management and coordination responsibility for the research activity planning and execution
Funding acquisition	Acquisition of the financial support for the project leading to this publication

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