A Protocol For The Longitudinal Study of Psychological Resilience in the Australian Defence Force

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Introduction

In the last two decades there has been increasing attention directed at the analysis of psychological resilience. The number of modern-day veterans returning from Iraq and Afghanistan has sparked great interest in identifying mechanisms that can either erode or facilitate psychological resilience. In November 2009, the Australian Defence Force (ADF) in collaboration with the Australian Centre for Posttraumatic Mental Health (ACPMH) launched a longitudinal study of psychological resilience dubbed LASER (Longitudinal ADF Study Examining Resilience). The study is anticipated to inform psychological resilience training and mental health policy within the ADF.

The purpose of the present paper is four-fold. First, this paper will outline the operational definition of psychological resilience used by the ADF. Second, we describe previous findings on psychological resilience while examining how these findings are limited by cross-sectional design. Third, this paper will review previous resilience methodology and discuss the merits of a longitudinal methodology. Fourth, this paper will describe the LASER study protocol, key challenges and implemented solutions.

Operational definition of psychological resilience in the ADF

The definition of psychological resilience adopted by the ADF was developed by the Technical Cooperation Panel (TTCP) Technical Panel 13 (TP-13) and is "the sum total of psychological processes that permit individuals to maintain or return to previous levels of well-being and functioning in response to adversity."[1] TTCP is an organisation that provides a structure for contributing nations (Australia, New Zealand, Canada, United Stated and United Kingdom) to share information. TP-13 focuses on psychological health in the military context. While definitions of psychological resilience are often controversial, this definition has been chosen to reflect the goals of the five nations contributing to the panel: to identify the processes of psychological resilience so that those processes may be influenced during military training and service. The LASER study is one of the TP-13 inspired mental health initiatives.

While the TP-13 definition has been adopted because of its particular relevance to the research question with this population, there are strengths and limitations when compared to other definitions in the literature. It has the strength of expressing resilience as a response to adaptation to life stressors and other adverse events, not only to potentially traumatic events as some definitions imply.[2] The definition adopted for this study clearly defines resilience as a psychological process that takes place in the context of adversity rather than regarding it as a psychological trait. In this way it adopts a view of resilience as a trajectory[3]. It is also worth noting that this definition focuses on the recovery of prior levels of well-being, rather than the achievement of greater levels of well-being after adversity. While the latter would not be unwelcome, the scope of this study is of psycho-social factors that protect and maintain functioning and well-being.

Previous findings relating to psychological resilience

Outside the military context, the past 40 years have seen many and varied correlates of psychological resilience identified. For example, positive emotion,[4-6] coping flexibility,[7,8] dispositional hardiness,[9-11] and gratitude have all been considered.[12] In recent years, there has been considerable focus on factors that contribute to resilience in military populations. Studies in military populations have identified factors associated with adjustment to military life and psychological resilience. Adler and Dolan (2006)[13] found that higher 'military hardiness' (context-specific form of hardiness) was related to lower post-deployment depression when deployment stressor levels were high. According to Kobasa (1979)[11] and Maddi and Kobasa (1984)[14] a hardy person views potentially stressful situations as: (1) an opportunity for growth (challenging), (2) changeable (control),

and (3) interesting and meaningful (commitment). Adler and Dolan (2006)[13] suggested that the adaptive event appraisal associated with high military hardiness may underpin the association between military hardiness and psychological resilience. In another study, Florian, Mikulincer and Taubman (1995)[15] found that a self-reported commitment (a sub-component of hardiness) to training improved mental health in Israeli soldiers largely by reducing perceptions of threat.

The limitations of cross-sectional study design

The aforementioned studies identify factors associated with psychological resilience and well-being. However, these studies are limited in several ways by their cross-sectional design. Importantly, cross-sectional analyses cannot reveal important changes in mental health status. It is unclear whether psychological resilience is a trait (remaining relatively stable over time) or whether psychological resilience may be increased or decreased due to intra-individual or contextual changes, including targeted intervention (e.g., resilience training). A longitudinal methodology enables the analysis of dynamic individual-level and group-level change. It may be that individuals are not always psychologically resilient, but rather there is considerable movement in and out of resilient psychological states. Longitudinal analysis allows the identification of such movement and the discovery of factors that influence the changes.

Cross-sectional studies often require participants to retrospectively report on behaviours or emotional states considered to be related to psychological resilience. The validity of retrospective scales is problematic when participants are required to remember their behaviour or psychological state prior to discrete points in time (e.g., "prior to enlistment…"). Bernard et al. (1984)[16] describe the over and under -reporting of behaviour inherent in retrospective information in several areas of enquiry (e.g., child care, health care, communication and social studies). Retrospective reports that aim to measure psychological resilience are likely to be especially inaccurate. Such measures require participants to compare their level of functioning prior to, and after, a stressful or traumatic event. There is much evidence of mood-related bias in retrospective reports of prior exposure to traumatic events[17] and prior levels of symptoms.[18]

Moreover, retrospective reporting means that respondents are likely to confuse recovery and resilience trajectories. Bonnano, (2004, 2005)[19, 3] proposed that the recovery trajectory, characterised by major and long-term disruptions in emotional and physical well-being, is distinct from the resilience trajectory. In the resilient trajectory, individuals are able to acknowledge the presence of stress and experience short and mild disruptions in emotional and physical functioning (e.g., sleeplessness, difficulty concentrating and difficulty achieving positive states). Retrospective self-report measures of psychological resilience are unlikely to be sensitive enough to detect divergent trajectories in participant responses. Thus important differences in variables associated with trajectories are likely to be missed. Longitudinal methodologies overcome these problems because individuals make repeated judgements about their well-being over shorter time frames. These multiple time-sequenced reports allow an individual's functional trajectory to be tracked and categorised.

Finally, cross-sectional designs are unable to inform on the aetiology of psychological resilience. Little is known about whether these factors represent protective, risk or vulnerability factors, or simply co-occur. Only a longitudinal methodology allows causal pathways to be examined.[20]

Previous longitudinal investigations of psychological resilience in the military

The work of Maguen et al., (2008)[21] is a notable attempt at the examination of psychological resilience. Maguen et al., (2008)[21] studied Air Force medical personnel prior to deployment to Iraq and followed-up these personnel during and after deployment. Resilience as measured by the Connor and Davidson Resilience Scale was not found to predict PTSD when life stressors, previous traumatic events, and positive military experiences were included in the model. Psychological resilience was found to negatively predict a negative effect. A limitation of this study, acknowledged by the authors, is that Air Force medical personnel may not be representative of all military personnel. Furthermore, the authors did not investigate the predictors of psychological resilience as part of their analysis.

Importantly, no studies currently examine the interaction between pre-military factors and military service in the emergence of psychological resilience. As Schnurr, Rosenberg and Friedman (1993)[22] point out, a problem with attempting to address the issue of military service on psychological outcomes is that appointment to the military is not random nor are the jobs personally assigned. Consequentially, events are not experienced randomly. In order to control for this, most military studies conducted collect baseline information from currently serving members and measure pre-military variables retrospectively (e.g., "Prior to joining the military…") for use as covariates in their analysis of post-military

outcomes (e.g., the Millennium Cohort Study).[23, 24] In these studies, pre-enlistment information is attained solely through retrospective self-report measures that cannot exclude intervening military experiences relevant to the study hypotheses.

There are a range of challenges identified in the literature that have been associated with conducting longitudinal research generally and in the military context specifically. These include: participant tracking in a mobile population, survey fatigue, motivational biases, and concern about asking about traumatic events. It is critical that in the development of a protocol for longitudinal research in the military context such challenges are carefully considered.

The current longitudinal study of resilience in military personnel

To date, there are no comprehensive longitudinal studies focusing on a multi-dimensional investigation of psychological resilience in the military; rather, studies often attend to psychological dysfunction as a consequence of military service.[25,26] The LASER study makes two important contributions. First, it is a comprehensive longitudinal study of military psychological resilience, rather than dysfunction. Second, the study will examine the interaction between pre-military factors and military service in the development of psychological resilience. This paper will outline the development of the study protocol, highlighting the challenges associated with such research and the manner in which these issues have been addressed.

Method:

a. Participants

Participants enter the study via a phased enrolment strategy. The primary sampling frame is full-time general enlistees with surnames between L – Z and all appointed officers entering the Australian Navy, Army, and Air Force between November 2009 and December 2012. There are no additional exclusion criteria. The number of expected new study participants each year is estimated to be 1,200. The study has been approved by the Australian Defence Human Research Ethics Committee.

b. Study design

The LASER study has a longitudinal panel design.[20] The same cases in multiple cohorts will be followed up over five waves of data collection. Cohorts are defined by the month and year of enlistment. Wave one occurs at enlistment to measure pre-enlistment factors. Most examinations of mental health in military members have been concerned with the impact of military service over the course of service, rather than also measuring pre-enlistment factors and exploring their interaction with service. Many questions remain regarding pre-potentially traumatic event factors that contribute to psychological resilience and the unique consequence of military service more generally on the well-being of personnel, both beneficial and detrimental.

Wave two data is collected at the end of initial training for general enlistees and officers for which training does not exceed 12 months. For officers where initial training exceeds 12-months (e.g., Australian Defence Force Academy) Wave two data is collected at 12 months. The intention is to capture variability in coping styles and mental health outcomes after an arduous and demanding training period and adjustment to military life. Waves Three to Five occur annually after the completion of Wave Two and aim to examine coping styles after exposure to potentially traumatic events. Figure 1 illustrates the data collection timing for all the different personnel groups.

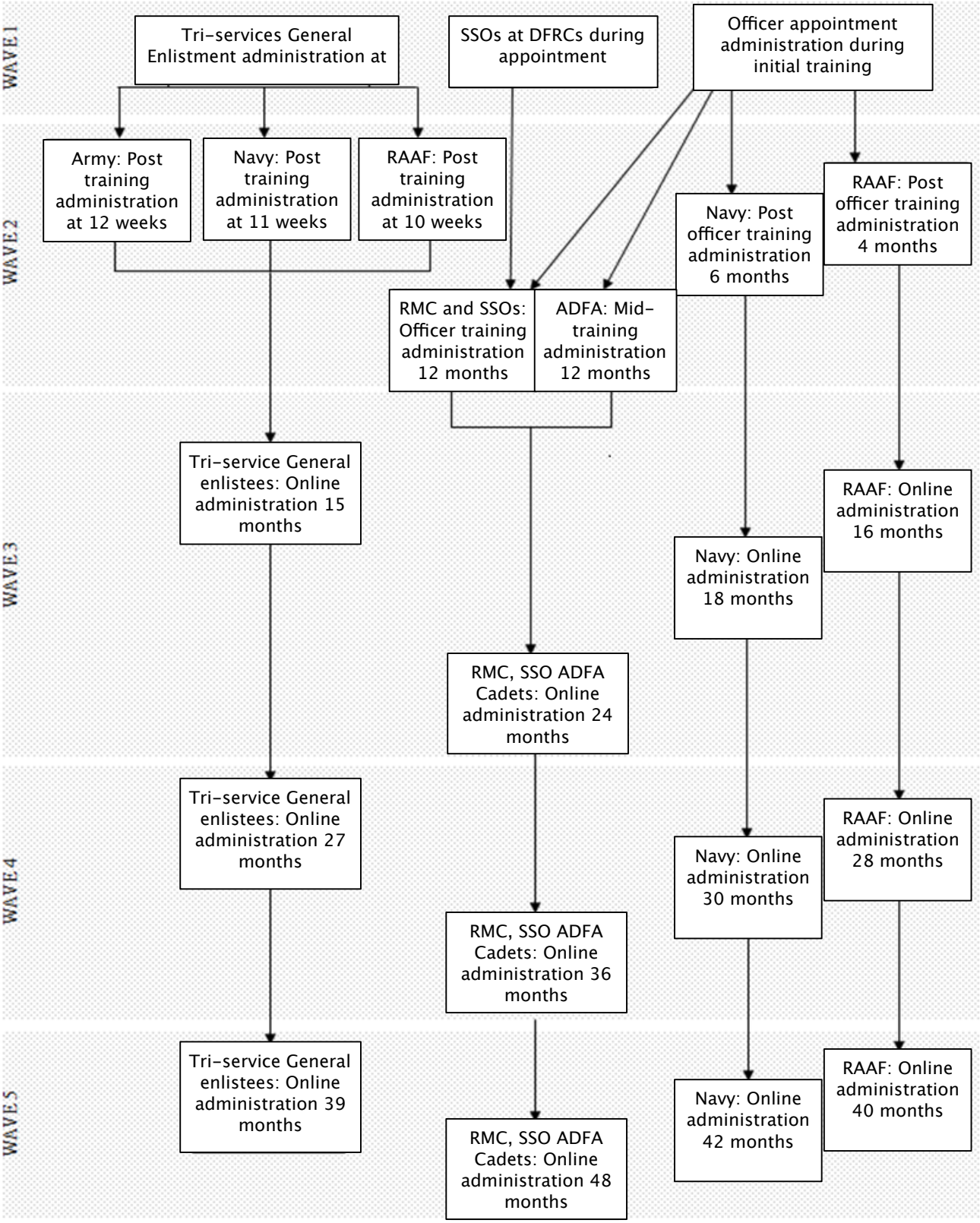
c. Analytic procedure

To make the most of the longitudinal methodology it is important that the most suitable analysis is applied. In order to achieve this, the analysis aims to discriminate between trajectories identified by Bonanno (2004)[19]. Bonanno (2004)[19] identified the presence of four distinct trajectories emerging after trauma or significantly adverse events: (1) the resilience trajectory is characterised by a mild loss of functioning (e.g., disturbed sleep) followed by a quick return to prior levels of well-being, (2) delayed trajectories are characterised by no initial change in functioning followed by an increase in dysfunction over time, (3) chronic trajectories are typified by a consistent loss of functioning over time, and (4) recovery trajectories reflect a loss of initial functioning resulting in dysfunction followed by a gradual improvement in functioning. Latent growth curve modelling this complex analysis allows the identification and analysis of changes that are both linear and non-linear in fashion. Moreover, this style of analysis will allow the identification of variables that predict the type of trajectory (e.g. resilience trajectory) that a person may experience following adversity.

d. Data collection and the challenges of data collection in a military population

Wave One data for general enlistees is collected differently from appointed officers. General enlistee questionnaires are posted to residences

Figure 1: Illustration of the data collection time points for the different ADF personnel groups.



with enlistment paperwork or provided on the day of enlistment at one of 12 Defence Force Recruiting Centres (DFRCs) Australia-wide and are collected by DFRC civilian administrative staff during the monthly enlistment cycle. Appointed officers are given their questionnaire within the first weeks of training by civilian research staff. Research staff visit the officer training establishment and administer questionnaires in either a classroom setting or by distributing them for later return to a designated place on the base within 24 hours. Administration differences relate to the capacity of training establishments to offer face-to-face time.

Because DFRC staff are responsible for questionnaire administration, a comprehensive communication plan is required (e.g., monthly telephone and e-mail contact, Christmas cards, and annual face-to-face meetings). High performing centres are provided with positive feedback. Centres with return rates lower than 80% are contacted to discuss improvements.

Wave Two data collection is conducted in a classroom setting by trained civilian administrators. The 45-60 minute survey administration process within the training continuum is co-ordinated through the Chief Officers and Chief Instructors of each training establishment. Administrators allow: 10-15 minutes to outline the study purpose and address potential completion issues (e.g., confidentiality, privacy, withdrawal, data handling, and reporting); 20-30 minutes to complete; and 5-10 minutes for debriefing and questions.

Waves Three, Four and Five data collection is conducted using the on-line surveying tool, Opinio (version 6.3.3). The survey link is sent to home or work email accounts which participants follow to the survey. Data is sent to an Oracle database (version 9i). Participants who request it, or do not have an e-mail address listed, are sent a paper survey.

Participants are required to generate a unique identification number on the front page of each survey that allows for data-matching across the waves. This number is made up of: (1) the first letter of their surname, (2) their date of birth, and (3) the first three letters of their mother's maiden name. Participant names are thus avoided.

Challenge 1: Participant tracking in a mobile population

False attrition, where non-response is attributable to the failure to receive a survey, is problematic in longitudinal surveys, and particularly so with a very mobile military population. Military members continually move through posting cycles and deployments causing major contact problems for longitudinal studies. To combat these issues, annual e-mail and post-cards sent immediately prior to the posting cycle will request that participants update the contact details on their personnel records. Similar longitudinal military studies have ensured up-to-date contact information and maintained interest in the study.[24] Deployed personnel with limited internet access have the option to complete a paper survey with a reply paid envelope to facilitate return. Telephone contact with participants will be used to verify contact details and ensure receipt of the survey.

Challenge 2: Dealing with survey fatigue in the military

Survey fatigue is an issue of significance in the present study. Longitudinal research of this nature requires respondents to complete surveys several times. Porter, Whitcomb and Weizter (2004)[27] report that non-response is still likely even when participants have agreed to take part in the series of surveys. Atrostic et al., (2001)[28] found that refusal rates increased with subsequent interviews, although the pattern tapered off after the first few interviews. Drop-out and recruitment rates, particularly in military studies addressing potentially sensitive issues vary, but are generally below 50%. A drop-out rate of 34% (primarily due to drop out from training) was reported by Martin et al. (2006).[29] Johnsen, Eid and Laberg (1998)[30] reported a 47% drop-out rate over a series of four follow-up surveys. The drop-out rate was in part attributed to practical implementation issues related to duty rotations.

Initial recruitment rates in military studies of mental health issues reported in the literature also vary and rarely recruit a majority of the initial target population. Ryan et al. (2007)[24] report an initial participation rate of 36%. In Army basic training personnel, Martin et al., (2006)[29] had a participation rate of 45%. Riolli, Savicki and Spain (2010)[31] obtained an initial participation rate of 43.7% in a population of United States Army personnel deployed to Baghdad. In the LASER study Wave one initial recruitment rates range between 60-75% for general enlistees and 85-90% for officer appointees. Wave two response rates for general enlistees improved to approximately 90-95%, but declined for officer appointees to 80-85%. Wave three response rates are quite low and initial figures indicate response rates of between 19-23%. The decline in response rates at Wave three is likely to be due to the lack of face-to-face administration of the LASER survey at this time point.

While there has not yet been an exploration of the presence of systematic bias in the early lower response rate, in order to improve Wave three response rates, a small study was conducted by the LASER team. Twenty-nine ADF members were given the LASER survey to complete and then asked to indicate which, of five options, would be most likely to encourage him/her to complete future surveys similar to the one just completed. The options included: 'I have the time', 'there is an incentive', 'I receive a copy of the results', 'I have no concerns about my privacy', 'I know how my data will be used' and 'other, please specify'. Eleven participants (22.4%) reported that an incentive would be most likely to encourage their completion of the survey, closely followed by eight participants (16.3%) reporting that having the time was most important (supporting the use of face-to-face classroom administration), and six participants indicated that knowing how the data would be used would most encourage them. Interestingly, only a single member (3.4%) indicated that addressing privacy concerns would encourage their completion of the survey; this may have been because respondents were satisfied with the privacy information already delivered.

Based on the above pilot study, strategies to improve recruitment have targeted incentives and the time required to complete the study. Our findings suggest that the time needed to complete the survey was likely to be a barrier to survey completion and this is consistent with the work of Sosdian and Sharp (1980)[32] and Sharp and Frankel (1983)[33] who concluded that survey length is the largest contributor to survey fatigue. In response, the timing of all LASER survey is limited to 30 minutes and this is promoted on survey materials and by administrators. Respondents are also informed that they are "on-duty" while completing the survey. Moreover, to manage repeated survey demand, the optimal data collection time points were identified so that unnecessary participant contact is avoided. The optimal time points are as follows: (1) at recruitment; (2) at completion, or the 12-months mark, of initial training; (3) annually, after completion of training. Participants are also provided with wallet size membership cards to remind them of their involvement in the study.

The provision of incentives to study participants is an area of debate within the ADF and is highlighted as potentially valuable for the retention of study participants. The attrition rate is monitored, and the sample at each wave is profiled against the total population of new ADF members. It is important to note, however, that the target sample for the study is effectively 50% of the total new ADF recruit population. With this in mind, the key factor in assessing the ongoing rigour of the study will revolve around confirming that the study sample remains relatively representative of the Wave two sample.

A further issue for survey fatigues is that multiple surveys may operate in the military space at any one time. ADF personnel are required to undergo health screens, complete organisational surveys and evaluation of training and services. Different agencies will often administer overlapping surveys without coordination. Asiu, Antons and Fultz, (1998)34 used focus groups to determine U.S. Air Force Academy students' attitudes toward surveys. Students reported their frustration with the number of surveys being conducted. A content analysis of student definitions of the term over-surveyed revealed that students felt over-surveyed because of the frequency and perceived irrelevance of the surveys. Thus, the relevance as well as frequency of surveys appears to be of critical importance.

To reduce survey fatigue attributable to over-surveying, a review of ADF surveys currently being administered was undertaken. Another longitudinal study was found to be sampling from the same population as the intended psychological resilience longitudinal survey. In response, the two studies negotiated to divide the ADF population. The current study targets those with a surname beginning with a letter from L-Z. Preliminary data analysis of the other survey indicated no significant differences due to alphabetical categorisation. Second, to ensure the perceived relevance of the study, the importance of the study is communicated to study participants via survey administrators, telephone follow-ups and letters from the Chiefs of Service .

A further organisational-level strategy to assist with minimising potential survey fatigue among ADF members is the requirement that all proposed surveys are presented to the Australian Defence Human Ethic Committee for approval. This committee reviews the scientific merit of any proposed study and is intended to provide central oversight of research activity; however, the extent to which it achieves this goal depends on compliance. Other organisational strategies implemented to manage and coordinate research in the ADF will further support the LASER study.

e. Measures used and the challenges of self-report measurement

The substantial investment of Government resources in this longitudinal study requires stringent decisions on the measures used. Scale inclusion was based on: (1) quality of measures: empirical

research demonstrating validity of scales; (2) brevity: survey duration could not exceed 30 minutes; (3) comparability: scales that allow direct comparisons with other military and civilian populations; (4) ease of completion: scales that can be self-administered and (5) acceptability: face validity to the military population.

Six domains are assessed. The first domain includes scales that address psychological well-being and personal psychological resilience. This domain includes measures of psychological resilience, the experience of traumatic symptoms (both prior to enlistment and during enlistment) and general psychological distress. The second domain addresses physical health status through self-reported measures of global health and self-reports of specific symptom experiences. The third domain addresses exposure to potentially traumatic events (e.g. sexual assault, physical violence) and stressful life events (e.g. financial difficulties, relationship problems). The potentially traumatic events checklist was included for the first time in the second wave with the time reference "ever in your lifetime". The time reference for the stressful life events checklist was "prior to enlistment" at Wave 2. These data provide baseline information about potentially important variables in future vulnerability. In Waves Three, Four and Five the time reference for these questions was from the present time to the exact date of the last survey (pre-populated into the survey as a specific date). The fourth domain aims to measure coping and adjustment styles. This domain includes the comprehensive measurement of problem-focused, avoidant, and emotion-focused coping. Moreover, coping through substance use (i.e., alcohol and tobacco use) is also targeted. The fifth domain is an assessment of psychosocial functioning. Because social support is considered central to coping, attention to this area has been addressed through the inclusion of scales examining interpersonal relationship quality, social capital, quality of lifeand social identification. The final domain measures access to mental health service providers and barriers to service providers including stigma.

Outcome measures assess self-reported psychological well-being and personal psychological resilience. In the Kessler-10 Psychological Distress scale (K10),[35] respondents indicate the frequency of the 10 most common psychological distress symptoms in the previous four weeks and receive a total score ranging from 10 to 50. Cut-offs from the 2001 Victorian Population Health Survey[36] are used to determine risk of anxiety or depressive disorders. Scores groupings are: below 19 (no current risk); between 20 and 24 (mild risk); between 25 and 29 (moderate risk); and above 30 (significant risk). The internal consistency and validity of the K10 has been demonstrated in Australian populations.[37,38] Four additional items assess the impact of symptoms on everyday functioning. These items have been used in Australian population health surveys such as the New South Wales Population Health Survey 2008 (HOIST).[39]

To screen for symptoms of Posttraumatic Stress Disorder (PTSD), a four-item form of the Post-traumatic Check List–Civilian Version (PCL-C)[40] was used. These items were the most informative for assessing PTSD symptoms in the re-experiencing, avoidance and hyper-arousal dimensions.[41] Psychological resilience was measured with the brief Connor Davidson Resiliency Scale (CD-RISC2). Vaishnavi, Connor and Davidson, (2007)[42] demonstrated that the CD-RISC2 has good test-retest reliability for people who showed no clinical change in symptoms of General Anxiety Disorder and PTSD (intra-class correlation =86.5%).

Indirect measures of psychological functioning gauge somatic symptoms (from the Patient Health Inventory (PHQ)[43] and sleep impairment (Sleep Impairment Index (SII)).[44] Smith and Trinder (2001)[45] found that the SII correlated well with other measures presumed to measure insomnia and demonstrated high accuracy in discriminating between control and insomnia populations. Table 1 lists the measurement schedule and includes information about the scale source, number of scale items and time of scale presentation.

Challenge 3: Motivational biases

Motivational biases, such as social desirability and impression management, are central issues for consideration in all sensitive self-report research, as these biases contribute to measurement error. Studies comparing different assessment conditions and tools find that enhanced perceptions of anonymity, privacy and credibility cause an increase in accuracy of assessment.[46-48] Occurrences of motivational biases are particularly of concern when behaviours are stigmatised or undesirable, rather than normative or desirable and when sensitive information is required.[49,50]

The stigmatised nature of mental illness is well recognised in military contexts[50,51] and thus motivational biases should be expected in mental health research. Durant, Carey and Schroeder (2002)[47] demonstrated that the social desirability and impression of the management of questions could be determined by assessing 'question threat'. Question threat refers to the degree a question

Table 1: Measurement construct, scale source and brief development information, number of items per scale and the survey wave (W) of inclusion.

Measure	Source and scale development information	No. of items	W1	W2	W3	W4	W5
Connor and Davidson 2-item resilience measure (CDRISC-2)	Vaishnavi S, Connor K, Davidson JRT: An abbreviated version of the Connor-Davidson Resilience Scale (CD-RISC), the CD-RISC2: Psychometric properties and applications in psychopharmacological trials. Psychiatry Res 2007; 152: 293–297.	2 items	✓	✓	✓	✓	✓
Psychological distress (K10)	Kessler RC, Andrews G, Colpe LJ, et al.: Short screening to monitor population prevalence and trends in non-specific psychological distress. Psychol Med 2002; 32: 959-976.	10 items	✓	✓	✓	✓	✓
Impact on functioning	Adapted from Slade T, Johnson A, Browne MAO, Andrews G, Whiteford, H: 2007 National Survey of Mental Health, Aust NZ J Psychiatry 2009; 4: 594-605.	4 items	✓	✓	✓	✓	✓
Global self-rated health measure	Sargent-Cox K, Anstey KJ., Luszcz MA. Patterns of longitudinal change in older adults self-rated health: The effect of the reference point. Health Psych, 2010; 29:143-152.	1 item	✓	✓	✓	✓	✓
Somatic symptoms from Patient Health Questionnaire	Adapted from: Broadbent E, Petrie KJ, Main J, Weinman J. The brief illness perception questionnaire. J Psychosom Res 2006; 60:631-637.	11 items	✓	✓	✓	✓	✓
Sleep impairment index (SII)	Adapted from Morin CM, Stone J, McDonald K, et al.: Psychological management of insomnia: A clinical replication series with 100 patients. Behav Ther 1994; 25: 291-309.	6 items	✓	✓	✓	✓	✓
Traumatic stress symptoms (PCL-C)	Adapted from Weathers FW, Litz BT, Herman DS, et al.: The PTSD Checklist (PCL): Reliability, validity, and diagnostic utility. Presented at the Annual Meeting of International Society for Traumatic Stress Studies, San Antonio, TX, 1993.	4 items	✓	✓	✓	✓	✓
Self-efficacy	No reference: developed for use in the military setting.	7 items	✓	✓	✓	✓	✓
Mild traumatic brain injury prior to enlistment	Scale based on the Diagnostic Criteria for Mild Traumatic Brain Injury by the American Congress of Rehabilitation Medicine (ACRM). Ontario Neurotrauma Foundation, Guidelines for mTBI and Persistent Symptoms.	2 items		✓			
Perceived stigma and barriers to care	Adapted from the ADF Mental Health Prevalence and Wellbeing Study: http://www.defence.gov.au/health/DMH/i-MHRP.htm	5 items	✓	✓	✓	✓	✓
Life satisfaction	Adapted from the Household Income and Labour Dynamics in Australia Study: http://www.melbourneinstitute.com/hilda/	1 item			✓	✓	✓
Tobacco smoking	Adapted from Borland, Cancer Council Victoria, available from: http://www.cancervic.org.au/about-our-research/researchers/prof-ron-borland.html	1 item	✓	✓	✓	✓	✓
Alcohol consumption (AUDIT-C)	Bush K, Kivlahan DR, McDonell MB, Fihn SD, Bradley KA The AUDIT alcohol consumption questions (AUDIT-C): An effective brief screening test for problem drinking. Ambulatory Care Quality Improvement Project (ACQUIP). Alcohol Use Disorders Identification Test. Arch Intern Med 1998; 158:1789-95.	3 items	✓	Officers only	✓	✓	✓
Dimensions of anger scale	Forbes D, Hawthorne G, Elliott P, McHugh T, Biddle D, Creamer M, et al. A concise measure of anger in combat-related posttraumatic stress disorder. J Traumatic Stress. 2004; 17:249-56.	7 items	✓	✓	✓	✓	✓
Personality index (TIPI)	Gosling SD, Rentfrow PJ, Swann WB Jr. A very brief measure of the big-five personality domains. J Res Pers; 37: 504-528.	10 items	✓				
Supportive and negative interactions scale: partner, family, friends	Adapted from Schuster TL, Kessler RC, Aseltine RH Jr. Supportive interactions, negative interactions, and depressed mood. Am J Community Psychol. 1990; 18: 423-438.	12 items	✓	✓	✓	✓	✓

Supportive and negative interactions scale: instructor, superior staff, peers	As above.	16 items		✓			
Social identification with ADF membership	Adapted from Cameron JE. A three factor model of social identity. Self and Identity. 2004; 3:239-262.	6 items		✓	✓	✓	✓
Community participation	Adapted from Berry H, Shipley, M. Longing to Belong: Social Capital and Mental Health in an Australian Coastal Community. 2007. The Australian National University: Canberra. Scale shortened on the basis of collaboration with scale author.	9 items			✓	✓	✓
Use of social networking sites	No reference: developed for use in the military setting.	7 items			✓	✓	✓
Sense of morale in the smallest work/ training group membership	From the Australian Defence Attitudes Survey, 2008.	1 item		✓	✓	✓	✓
Mate support scale	Developed in collaboration with United States Army research advisors	4 items	✓	✓	✓	✓	✓
Coping strategies	Adapted from Carver, CS. You want to measure coping but your protocol's too long: Consider the Brief COPE. Int J Behav Med. 1997; 4: 92-100.	24 items	✓	✓	✓	✓	✓
Location and length of deployment	Adapted from the ADF Mental Health Prevalence and Wellbeing Study: http://www.defence.gov.au/health/DMH/i-MHRP.htm	1 item			✓	✓	✓
Access to professional support services	Adapted from the ADF Mental Health Prevalence and Wellbeing Study: http://www.defence.gov.au/health/DMH/i-MHRP.htm	2 items			✓	✓	✓
Mental health literacy items	Developed in collaboration with United States Army research advisors.	12 items		✓	✓	✓	✓
Thought control questionnaire	Wells A, Davies MI. The thought control questionnaire: A measure of individual differences in the control of unwanted thoughts. Behaviour Research and Therapy. 1994; 32: 871-878.	8 items		✓	✓	✓	✓
Ruminative response scale	Adapted from Treynor W, Gonzalez G, Nolen-Hoeksema S. Rumination Reconsidered: A Psychometric Analysis. Cognit Ther Res. 2003; 27:247-259.	5 items	✓	✓	✓	✓	✓
Flexible coping scale.	Developed in collaboration with United States Army research advisors	6 items	✓	✓	✓	✓	✓
Stressful events checklist	Developed on the basis of piloting within Australian military populations.	8 events		✓	✓	✓	✓
Potentially traumatic events checklist	As above	18 events		✓	✓	✓	✓
Participants response to survey completion	Scotti et al. How much is enough? Reducing response to research participation questionnaires to their essential elements. Presented at Conference on Innovations in Trauma Research Methods; Chicago, November 2008.	3 items	✓	✓	✓	✓	✓

makes the participant uneasy while responding to the question.[47] Thus, LASER items were piloted to assess perceived threat. Interviews were conducted with 38 LASER survey respondents (Navy n=18, Army n=9, Air Force n=11) recruited from the Defence Force Recruitment Centre in Brisbane, Australia. Survey respondents felt that responses that reflected inadequate mental health or potentially negative behaviours would reflect poorly on them as military enlistees or would impact their career progression if the information were to be made available beyond the research. Thus, concerns clearly go beyond impression management in response to researchers and include the impact of research on their career and livelihood.

The pilot data and interviews assisted in the resolution of motivational bias issues in three ways. First, the pilot data and interview determine sensitive items that are particularly vulnerable to bias responding. This information will assist during data analysis when it may be necessary to apply statistical adjustment. For example, as a result of the pilot study items regarding coping with stress, psychological distress, pro-social behaviour and alcohol consumption were flagged for potential data quality concerns. Second, the questionnaire items were modified in response to participant concerns. Items flagged as particularly sensitive to motivational biases and less critical to the study objectives were removed. For example, the focus of this research on psychological resilience meant that the suicidal ideation items could be justifiably removed. Suicidal ideation is an outcome of poor coping processes and these poor coping processes could be detected using scales less sensitive to motivational biases. Third, to create a greater degree of anonymity, longitudinal data are linked via a unique identification code, rather than the participants' personal identifying details. Participants generate their unique code in accordance with a systematic pattern that is reproduced on every survey and consent form. This procedure allows the decoupling of the survey data from identifying information. Participants are informed of this to increase confidence about privacy and confidentiality. In addition, less stigmatised measures of psychological distress (e.g., somatic symptomatology, sleep impairment) were adopted to supplement more threatening measures.

Challenge 4: Concern about the risk of asking about prior trauma

Concerns about asking sensitive questions also emerged from key military research stakeholders. Debate regarding the risk of distress and re-traumatisation of participants occurred regarding a checklist of the traumatic events used in the study. While sensitive questions may spark concern, they often provide a fuller picture of the factors contributing to the variables of interest, as is the case in the present study.[49] The measurement of potentially traumatic exposure is central to the study of psychological resilience.[52-57]

Military stakeholders identified two areas of concern about the sensitive items: (1) the re-traumatisation of participants and (2) the effect of the items on respondent dropout. The first issue was addressed by reviewing the literature on participant reactions to traumatic events checklists. The review found no evidence of re-traumatisation or severe distress in survey respondents. Cromer et al., (2006)[58] demonstrated that while sensitive questions may be uncomfortable for a minority of participants, these participants still view them as useful. Moreover, the LASER survey items were again piloted with 12 military personnel. Of the twelve participants interviewed by psychologists after completing the survey, none reported distress. Participant distress continues to be monitored by a 3-item version of the 14-item Response to Research Participation Questionnaire (RRPQ)[59,60] developed by Scotti et al. (2008)[61] to routinely evaluate the impact of research participation. These questions assess the level of distress experienced as a consequence of completing the questions, whether completing the survey was worthwhile and whether the respondents clearly understood the voluntary nature of the survey.

To address the second concern, a further pilot study asked 22 survey participants whether they would be discouraged from participating in a similar study in the future after completing the current survey including traumatic life events scales. All interviewees indicated that they would consider participating in similar studies in the future. Military stakeholders were given a briefing detailing the results of the pilot study and a review of the literature as well as an outline of the mitigation measures in place for the care of participants.

Practical implications of the LASER study for the ADF

The LASER study is now within its third wave of data collection and analyses are beginning to reveal some important practical implications for the ADF. First, a key contribution of the LASER study is to identify personnel entering the service that may be at higher risk of developing psychological distress. For example, personnel entering the service with a certain number of recent traumatic events which may be flagged as a potentially at- risk sub-population. This may be useful for selection purposes, but perhaps be more useful as a targeted psychological resilience

training for those recruits highlighted early. Second, the study will assist in the development of resilience training content. At present, resilience training within the ADF is largely based on empirically supported techniques used within the civilian population. It is possible that military personnel require a different diversity of techniques targeted to address the unique challenges of the military environment. Third, LASER will determine the unique impact of military service on personnel when pre-military factors (e.g. pre-military trauma exposure) are controlled. This will allow a unique and more precise insight into how military training and service impacts personnel resilience.

Concluding remarks

The Longitudinal ADF Study Examining Resilience (LASER) has been designed to investigate how personnel cope with the range of challenging circumstances and potentially traumatic events common to military service. This issue has great relevance to military agencies around the world and clarifying the optimal methodology to index trajectories, predictors, and moderators is essential. Inadequate recruitment, excessive attrition, and unrepresentative sampling are just a few of the major issues confronting attempts to accurately index the impact of deployment on personnel. It is important to obtain indices of personnel at the commencement of enlistment lest any inferences concerning risk are confounded by service-related factors, even if they occur prior to actual deployment. Developing a broader dialogue on longitudinal methodologies between military agencies is essential if advances are to be made in (a) comparing data between agencies, and (b) facilitating more effective approaches to addressing the key question of resilience.

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