



CIMVHR
Canadian Institute for Military
and Veteran Health Research

ICRSMV
L'Institut canadien de recherche sur
la santé des militaires et des vétérans

MVHR FORUM 2013 / FORUM RSMV 2013



The 4th annual Military and Veteran Health Research Forum/
Le 4e Forum annuel de Recherche sur la santé des militaires et des vétérans

FORUM ABSTRACTS
RÉSUMÉS SCIENTIFIQUES

Presented by CIMVHR
Présenté par l'ICRSMV

Dear Colleagues and Friends,

The Military and Veteran Health Research (MVHR) Forum is the premiere knowledge translation activity of the Canadian Institute for Military and Veteran Health Research (CIMVHR) and is the premiere event of its kind in North America. Our commitment to producing high impact research to enhance the mental, physical and social health and wellbeing of active military members, Veterans, and their families remains our first focus and finds a privileged platform at our annual forum.

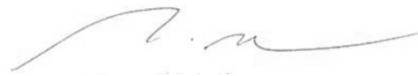
These Research Abstracts, from our fourth MVHR Forum, held in Edmonton, Alberta represent the work of over 125 researchers working in all areas of research specific to our beneficiary populations. Each presenter was selected through a peer-reviewed process by CIMVHR's College of Peer Reviewers. This body of work, developed by academics, government scientists, international scholars, health professionals, administrators and students represents the breadth of collaboration on military and Veteran health research within CIMVHR's network of over 450 researchers and 30 Partner Universities. The results point to best practices for clinical professionals and policy makers, and identify research directions for the future.

Our goal at CIMVHR is to create a Forum for knowledge translation, networking and research collaboration. We hope that these Research Abstracts will prove to be an excellent resource to help you access the most up to date Canadian research in this area, make these critical research connections, and better equip you with new knowledge that will serve the goal of improving the health and well-being of our Canadian military personnel, Veterans and their families.

Sincerely,



Alice Aiken, CD, PhD
Director
CIMVHR



Stéphanie Bélanger, PhD
Associate Director
CIMVHR



Très chers collègues et amis,

Le Forum de recherche sur la santé des militaires et des vétérans (RSMV) est la plus importante activité de traduction des connaissances de l'Institut canadien de recherche sur la santé des militaires et des vétérans (ICRSMV) et le plus important de ce genre en Amérique du Nord. Notre engagement à produire une recherche de haut niveau visant à améliorer la santé et le bien-être mental, physique et social des membres militaires actifs, des vétérans, ainsi que de leurs proches demeure notre priorité et trouve une plateforme privilégiée à notre forum annuel.

Les résumés scientifiques de notre quatrième forum RSMV tenu à Edmonton en Alberta sont le fruit du travail de 125 experts provenant de tous les domaines de recherche spécifiques à nos populations bénéficiaires. Chacune des propositions fut sélectionnée par un comité de révision par les pairs provenant du Collège des pairs de l'ICRSMV. Ce corpus, développé par des universitaires, des scientifiques gouvernementaux, des chercheurs internationaux, de professionnels de la santé, des administrateurs et des étudiants représente l'ensemble des collaborations de recherche sur la santé des militaires et des vétérans au sein du réseau de l'ICRSMV qui compte plus de 450 chercheurs et 30 universités partenaires. Les résultats permettent de développer de meilleures pratiques pour les cliniciens et les décideurs, et d'identifier les directions futures de la recherche.

Notre but à l'ICRSMV est de créer un forum de traduction des connaissances, de réseautage et de collaboration entre experts. Nous espérons que ces résumés scientifiques seront une ressource vous aidant à accéder aux plus récents développements dans ce domaine, à établir des connexions de recherche essentielles, et à acquérir des nouvelles connaissances qui nous permettront de réaliser notre but, l'amélioration de la santé et du bien-être du personnel militaire canadien, des vétérans et de leurs proches.

Très cordialement,



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1. Mental Health and Rehabilitation

1. PTSD and Substance Use Disorder Treatment Outcomes for Veterans and Members of the Canadian Forces

Arbour, S., Gavrysh, I. and Hambley, J. M.

Bellwood Health Services

Introduction: Soldiers returning from Iraq and Afghanistan frequently exhibit symptoms of Post Traumatic Stress Disorder (PTSD). Furthermore, individuals suffering from PTSD are more likely to report struggling with drugs and alcohol than non-affected military members. The present study evaluates the effectiveness of a 59-day residential treatment program for concurrent PTSD and substance use disorder (SUD) in Veterans and members of the Canadian Forces. In addition to PTSD and substance use outcomes, self-reported quality of life is also examined.

Methods: A total of 46 participants who completed a residential treatment program for concurrent PTSD and substance use disorder at Bellwood Health Services participated in the study. The program focuses on stabilization of trauma symptoms and establishing safety. Some of the components include trauma focused group therapy, cognitive behavior therapy, psychoeducation and symptom management. Participants completed a baseline questionnaire and a follow-up questionnaire six months post-treatment. The survey consisted of a measure of military-related trauma symptoms (PCL-M), a substance use measure, a life satisfaction scale and a measure of perceived difficulty with various life domains (BASIS-32).

Results: At follow-up, participants reported a significant reduction in alcohol consumption from an overall mean of 86 days in the six months before treatment to 22 days in the six months since leaving treatment. Reported drug use also decreased from an average of 84 days to an average of 16 days. A significant reduction in self-reported trauma symptoms was also observed. At baseline, average scores on the PCL-M were 67.3 compared to 50.4 at follow-up. In terms of quality of life, participants reported a 52% increase in life satisfaction. Participants reported significant improvements in perceived difficulty with relation to self/others, daily living, depression/anxiety and impulsive/addictive behavior. There were no significant changes on the psychosis subscale at post-treatment compared to pre-treatment scores.

Conclusions: The concurrent PTSD and substance use participants responded well to treatment and demon-

strated at six months follow-up, an overall reduction in PTSD symptoms and an overall decrease in alcohol and drug consumption. Scores on quality of life measures indicate an improvement such that clients appear to be more satisfied with various life facets and report less perceived difficulty with life domains. This study supports the notion that PTSD and SUD can successfully be treated together.

2. Refinement and Translation of an Instrument to Assess Mental Health Care Attitudes at the Beginning of the Military Career

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Defence Research and Development Canada, Toronto

Introduction: Negative attitudes towards mental healthcare can impede military members who suffer from mental disorders from pursuing suitable treatment in a timely manner. Hence, we need to identify and target these attitudes for change as early as possible in a member's career. In order to do so, there is a crucial need for a context-specific (i.e., to the Canadian Forces [CF] and recruits under training) instrument that assesses negative attitudes towards mental healthcare in a reliable and valid manner. The present work describes a series of studies leading to the refinement of both English and French versions of such an instrument, the CF Recruit Mental Health Service Use Questionnaire (RMHSUQ), developed on the basis of the Theory of Planned Behavior, with promising results.

Methods: Data collection for all four studies took place at the CF Leadership and Recruit School. Forty-one and 127 English-speaking participants completed Studies 1 and 2, respectively. Forty-nine and 60 French-speaking participants took part in Studies 3 and 4, respectively. Each sample of participants filled out slightly different versions of the RMHSUQ, as described below.

Results: Based upon the results of a pilot study, we revised the initial English version of the RMHSUQ; we distributed this updated version to participants in Study 1. Item analyses led to changes in five items that did not perform well as well as to the addition of 17 new items. Participants in Study 2 completed this newer version of the RMHSUQ. Even though the internal consistency reliability estimates were all adequate this time (i.e., greater than .70), factor and reliability analyses pointed to additional modifications, including the deletion of five items. Results of Study 3 generally supported those of Study 2 (with the exception of one problematic item), suggesting the translated RMHSUQ retained its original psychometric properties. After al-

tering the translated version of one item, we collected additional data in Study 4. These data showed a slightly different pattern of results, the implications of which we will discuss further in the paper.

Conclusions: The identification and measurement of mental healthcare attitudes, with behavioral change as the ultimate objective, necessitate a reliable and valid assessment tool, sensitive to the CF and recruit training contexts. These data begin to provide evidence for the psychometric qualities of the RMHSUQ, and next steps involve collecting additional data and taking a closer look at the factor structures of both its English and French versions.

3. Suicide in the Canadian Armed Forces – Incidence and Trends from 1995 to 2012

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University of Toronto; Department of National Defence

Introduction: The Directorate of Force Health Protection (DFHP) in the Department of National Defence maintains a retrospective epidemiological surveillance system that monitors completed suicide events in the Canadian Armed Forces (CAF). As the number of suicide events amongst women are low and amongst reservists are poorly reported, this presentation will describe suicide incidence and trends, focusing on regular force males for the years 1995-2012.

Methods: This presentation will describe crude suicide rates from 1995 to 2012, comparisons between the Canadian population and the CAF using standardized mortality ratios (SMRs), and suicide rates by deployment history using SMRs and direct standardization for regular force males.

Results: Between 1995 and 2012, there were no statistically significant increases in suicide rates. The number of regular force male suicides was generally lower than that expected based on Canadian male suicide rates. SMRs comparing CF suicide rates by deployment history to Canadian suicide rates demonstrated that the number of regular force male suicides was consistently less than that expected based on Canadian male suicide rates. Rate ratios indicated that those with a history of deployment were not at an increased risk of suicide compared to those who have never been deployed.

Conclusions: Suicide rates in the CF did not increase over time, and after age standardization, they were lower than those in the Canadian population. History of deployment was not a risk factor for suicide in the CF.

Small numbers may have limited the ability to detect statistical significance.

4. Operational Stressor-induced Cognitive Changes in Canadian Forces Troops

Cernak, I., Carleton, A., Zwaal, L. and Akbaryan, F.

University of Alberta

Introduction: The ability of military personnel to maintain operational readiness is in direct relationship with their resilience to withstand repeated operational stressors. Resilience and functional capacity could decline without any awareness of military personnel throughout their deployment and afterward, and increase the troops' susceptibility toward injuries and/or diseases. Physiotherapists and occupational therapists have been working with military throughout the world in times of war and peace as human performance experts and dedicated leaders. Their innovative programs and services help optimize soldiers' performance and readiness in-theater, garrison environments and in the community.

The purpose of this prospective longitudinal study is to establish multiple functional baselines of military personnel for screening purposes, i.e., to alert the individual soldier about his/her resilience decline and preempt related cognitive impairments.

Methods: We have selected 115 Canadian Forces combat troops with confirmed deployment schedule. Prior to their deployment, the participants have completed: the Self-administered Questionnaire (Demographic Form about present & past medical history and medications); the Traumatic Life Events (TLEQ); the Connor-Davidson Resilience Scale, SF-12 Health Survey; Post-traumatic Stress Disorder Checklist - Military Version; the Combat Exposure Scale and the computerized Cambridge Neuropsychological Test Automated Battery (CANTAB) containing 5 modules. All the tests other than the demographic form and TLEQ were repeated during the deployment and after the deployment.

Results: Changes in impulse control, emotional processing, and executive function showed the highest sensitivity toward operational stressors. As the result of this research, we are able to develop customized evidence-based rehabilitation treatment for military personnel prior, during and following deployment.

Conclusions: Our multiple assessment-system measuring resilience and cognitive/emotional status shows a great promise in supporting personnel exposed to high risk challenges of military service. Namely, by measuring susceptibility toward injury and/or illness caused by

exposure to environmental hazards, the targets for effective interventions and countermeasures to enhance stress resilience can be identified and customized for every individual soldier at risk.

5. Resilience Enhancement through Multiple Health Status Assessments

Cernak, I., Carleton, A., Zwaal, L. and Akbaryan, F.

University of Alberta

Brief Description: Resilience can be viewed as a defense mechanism, which enables people to thrive in the face of adversity. The ability of military personnel to maintain operational readiness is in direct relationship with their resilience to withstand repeated operational stressors. Accordingly, different resilience levels may correspondingly influence performance, professional success, response to and/or recovery from injury, and determine the likelihood of chronic health problems.

Lack of functional baselines established before the health decline occurs represents one of the main challenges in clinical applied research. Without knowing the pre-existing level of an individual's functional capability, the origin of his/her health problem cannot be clearly established and its progress reliably predicted. Hence, to define impairments of complex biological processes such as those underlying resilience, global performance, or mental health we need to know how basic physiological and mental functions of the individual have changed as a function of time, i.e., to "catch" the event that caused the health continuum to switch from "normal/healthy" to "pathological/ill"

Clinical Outcomes: The longitudinal prospective study involves 115 Canadian Forces combat troops with a confirmed deployment schedule. Before deployment, the participants completed: the Self-administered Questionnaire (Demographic Form about present & past medical history and medications), the Traumatic Life Events Questionnaire (TLEQ; previous exposure and response to traumatic events), the Connor-Davidson Resilience Scale, SF-12 Health Survey, Post-traumatic Stress Disorder Checklist - Military Version, the Combat Exposure Scale and the computerized Cambridge Neuropsychological Test Automated Battery containing 5 modules: Reaction Time, Spatial Recognition Memory (frontal integrity), Attention Switching Task (executive function), Stop Signal Task (impulsivity), and Emotion Recognition (emotion processing and empathy). Isometric Back Extension Endurance (Sorensen) Test is performed after the completion

of the cognitive tests to establish the individual's susceptibility toward low back pain. Saliva and urine samples are collected for biological measures. All the tests other than the demographic form and TLEQ were repeated during deployment and after deployment.

Patient Population: The participants include 115 volunteers from the Canadian Forces with confirmed involvement in the 2013/14 tour in Afghanistan.

Conclusions: The study provides: 1) Real-time input about the resilience level of every individual participant and his/her susceptibility toward performance decline or health impairment; 2) A biologically based system for health and performance prediction capable of measuring subtle (positive or negative) changes in resilience and performance, operational readiness, and need for pre-emptive intervention(s); and 3) Knowledge translation into high-risk civilian occupations.

6. Evaluating a Group Program for Veterans

Cox, D.W., Kivari, C.A., Westwood, M.J. and Hoover, S.M.

University of British Columbia

Introduction: Military-related trauma has been associated with several mental health concerns. While substantial research has investigated individual psychotherapy with military members and Veterans, there is a paucity investigating the impact of group approaches. This study investigates the immediate and prolonged benefits of the Veterans Transition Program (VTP); a multimodal group that is designed to reduce the effects of trauma via (a) peer support, (b) psychoeducation, (c) emotion regulation skills training, (d) re-enacting the traumatic event, (e) reducing barriers to care, and (f) identifying and working on future goals.

Methods: Approximately 20 Veterans completed an assessment of general mental health functioning (Outcome Questionnaire – 45; OQ – 45) just before, just following, and 3-months after completing the VTP. OQ – 45 scores will be evaluated for clinically meaningful change from pre, to post, to follow-up.

Results: Preliminary results suggest the VTP is effective for reducing emotional distress. Currently, follow-up data are being collected and will be presented.

Conclusions: These findings will build on previous data indicating the effectiveness of the VTP for Canadian Veterans. Further, they will add to our understanding of the potential prolonged benefits of the program.

7. Combat Related PTSD - Examining Treatment Outcomes in Multi-disciplinary Setting

Devlin, J., Sedge P., Joshi, V. and Lessard, S.

Operational Stress Injury Clinic, Fredericton, VAC; Horizon Health Network; Deployment Mental Health; CFHS, Operational Trauma and Stress Support Center CFB Gagetown

Introduction: The CF medical community has established nationwide Operational Trauma Stress Support Centres (OTSSC) and expanded mental health clinics where serving members from overseas conflicts can be assessed and treated by multi-disciplinary care teams. Few studies have addressed multi-disciplinary treatment outcomes and published recovery rates for military conflict related PTSD have been consistently disappointing. Early diagnosis and effective multi-disciplinary treatment should provide improved response/recovery rates with long term benefits for CF members' quality of life and employability.

Methods: The cohort consisted of 188 volunteer combat soldiers who returned from Kandahar in Dec 2010. Participants entered into the treatment group upon referral to the OTSSC at CFB Gagetown by their medical officer and following psychiatric or psychological diagnosis of a MH injury. Treatment followed CF and OTSSC standards and included a combination of psychotropic medication, evidence-based psychotherapy, addictions care, and psycho-social services as indicated. All participants were followed every 3 to 6 months for 18 months using validated measures of symptom severity and functional impairment including the PCL-S, the PHQ-9, the GAD-7, the AUDIT, the OQ-45, and the WEI.

Results: Preliminary results were presented at MVHR 2012 and included prevalence rates of mental health injuries and response and recovery rates associated with multi-disciplinary treatment at an OTSSC. Final results will be presented and will include the above variables after 18 months of follow-up along with their relationship with rates and types of traumatic exposure.

Conclusions: Conclusions in terms of treatment efficacy in a multidisciplinary treatment clinic will be presented. Additionally, challenges in research involving active duty soldiers will be discussed.

8. Affective and Behavioral Concerns in Children of Canadian Forces Veterans: The Importance of Educating Military Families

Duranceau, S., Fetzner, M. G. and Carleton, R. N.

University of Regina

Introduction: The severity of depression and post-traumatic stress disorder (PTSD) reported by military parents appears to predict affective and behavioral symptoms presented by their children. Veteran's symptoms also appear to hinder the relationship with their children; however, specific PTSD symptoms (i.e., re-experiencing, avoidance, numbing, hyperarousal) have not been examined in relation to affective and behavioral concerns about children. Indeed, affective and behavioral concerns about children and PTSD and depression symptoms may reflexively exacerbate one another, further disrupting family life.

Methods: A sample of 1238 Canadian Forces Veterans (95% = men) completed self-report measures assessing mental health (i.e., PTSD Checklist-Military version; Center for Epidemiological Studies-Depression Scale) and questions regarding familial concerns (i.e., concerns about child affect and behavior) as part of a mail-out survey. Independent samples t-tests were used to compare veterans with and without PTSD on their concerns about their children's affect and behavior. Logistic regressions were used to assess whether specific PTSD and depressive symptoms were predictive of veteran's concerns beyond the affect and behavior of their children.

Results: Veterans with PTSD had greater concerns over the unhappiness of their child ($p < .01$) and the behavior of their child ($p < .01$) than did Veterans without PTSD; moreover, avoidance, hyperarousal, and depression symptom severity were significantly related to both affective ($p = .02$, $p = .01$, and $p < .01$ respectively) and behavioral concerns ($p = .04$, $p = .01$, and $p = .01$ respectively) regarding the Veteran's children.

Conclusions: Lower avoidance and increased hyperarousal and depression reported by Veterans were associated with increased affective and behavioral concerns regarding their children. Avoidance symptoms may cause Veterans to disengage with their children, resulting in misidentification of affective and behavioral concerns. Increased hyperarousal symptoms and depression may foster a conflicting and unpredictable familial environment that disrupts child development and leads to affective and behavioral concerns about children. Alternatively, hyperarousal (e.g., irritability) and depression (e.g., loss of energy) symptoms may increase sensitivity to the familial environment, facilitating identification of affective and behavioral concerns regarding children. In either case, a Veteran's depression and PTSD symptoms may contribute to a familial environment conducive to the development of affective and behavioral concerns regarding children;

however, depression and PTSD symptoms may also alter a Veteran's ability to identify such concerns. Comprehensive results, implications, and future research are discussed.

9. The Role of the Military Family in the Rehabilitation and Reintegration of Ill and Injured Military Members

Dursun, S. and Coulthard, J.

Defence Research and Development Canada, Ottawa

Introduction: There is a limited amount of literature on the impact of injury/illness on military members' family relationships and, in turn, how these relationships impact recovery and rehabilitation. It has long been known that social support plays an important role as a protective factor for traumatic stress and associated psychopathology, but there are many unanswered questions about specific aspects of social support that may impact recovery following an injury/illness. The primary purpose of this study is to determine the impact of injury/illness on the members' family and the role of family support in the recovery and rehabilitation of the ill/injured military members.

Methods: Semi-structured, in-person interviews with 117 ill/injured Canadian Armed Forces (CAF) members in the Return to Work (RTW) program were conducted in 13 locations across Canada. The RTW program is a vocational rehabilitation program that aims to help restore the physical and mental health of ill/injured service members through reintegration into the workplace and the progressive resumption of regular duties. The questions assessed the mechanisms that promote successful recovery, as well as identified which factors impede the reintegration process for ill/injured CAF members. On average, the interviews were 1.5 hours in duration. Interviews were audio-recorded, transcribed, and subjected to a thematic analysis.

Results: The role of spouse/family was found to be critical in the initial recognition of the members' illness/injury and in motivating military members to seek help. Participants frequently acknowledged that their illness/injury has also had a negative effect on their spouses. In some instances, their illness/injury resulted in the dissolution of the relationship. Those who had been able to maintain their relationship recognized that they were fortunate to still be together. However, even though the relationship may have remained intact, it was often found to have undergone significant changes and required an adjustment on the part of both partners as they adapted to the new reality.

Conclusions: Spousal support was identified as having

a strong impact on the ability of the ill/injured service member to work towards getting better and greatly helped in facilitating their recovery. Given that spouses can also play a critical role in facilitating successful engagement in treatment, it is important that they have accurate information about illness and develop strategies for communicating any concerns with their military member spouse. Study findings provide important information for planning early intervention strategies that incorporate spouses of ill/injured service members and also inform future research.

10. Major Depressive Disorder: A Nationally-representative Comparison of Canadian Military Personnel and Civilians

Erickson, J., Kinley, D. J., Bolton, J., Enns, M., Zamorski M. A. and Sareen, J.

University of Manitoba, Directorate of Mental Health, Canadian Forces Health Services

Introduction: Major Depressive Disorder (MDD) is among the most common mental disorders in military personnel and the general population. Despite the high prevalence rate and considerable impairment associated with MDD, there is information lacking regarding the clinical characteristics of this disorder in the Canadian military and how this compares to the general population. The objective of this study was to use nationally-representative datasets to compare the prevalence, severity, comorbidity, and symptom profile of MDD in military personnel versus the general population.

Methods: We used the Canadian Community Health Survey (cycle 1.2) on Mental Health and Wellbeing: Canadian Forces Supplement (CCHS-CFS; n = 8, 441) and general population survey (n= 38, 492). The CCHS-CFS was conducted by Statistics Canada and the Department of National Defense in 2002 and samples regular and reserve members of the Canadian Forces. The general population survey was collected by Statistics Canada in 2002 and samples community-dwelling individuals. Past-year DSM-IV diagnoses of mental disorders were made using the Health Organization's (WHO) Composite Diagnostic Interview (CIDI). Analytic plan: We used a series of cross-tabs and logistic regression models to compare the demographic correlates, severity, impairment, comorbidity and symptom profiles of past-year MDD in military personnel vs civilians.

Results: The weighted prevalence of past-year MDD was significant higher among military personnel than the general population (6.8% versus 4.8%). Similar so-

ciodemographic correlates emerged among both samples, with the exception of age and marital status. Age was negatively correlated with MDD in the general population only, while being unmarried was associated with lower odds of MDD in the military only. There were no significant differences between military personnel and the general population with respect to length of depressive episodes, comorbidity, or degree of impairment. There were significant differences between samples in terms of the types of depressive symptoms endorsed. For example, military men with past-year MDD were at 2.7 higher odds (95% Confidence Interval 1.18-6.26) of having racing thoughts than men with past-year MDD in the general population, after adjusting for age, sex, marital status, and education.

Conclusions: Differences in the prevalence and symptom profile of MDD in military personnel suggest the need for targeted assessment efforts and intervention programs that address the unique needs of this population. The limitations of this study include its cross-sectional nature, which restricts the conclusions drawn but necessitates the need for future longitudinal research of MDD in the military and general population.

11. Occupational Outcomes after Diagnosis of a Deployment-related Mental Disorder in a Large Cohort of Canadian Armed Forces Personnel

*Garber, B. G., Zamorksi, M. A., Rusu, C. and Boulos D.**

Directorate of Mental Health; Canadian Forces Health Services

Introduction: An important minority of personnel will experience mild traumatic brain injury (MTBI) while deployed, and some will have persistent and potentially impairing “post-concussive” symptoms (PCS). PCS overlap substantially with symptoms of mental disorders, which are also common post-deployment. If persistent and impairing, MTBI-related symptoms and deficits could interfere with fitness for duty in the military. Data on occupational outcomes after military MTBI are, however, limited. The purpose of this study is to explore how MTBI and mental health problems contribute to occupational fitness.

Methods: CF members returning from overseas deployments complete an Enhanced Post-deployment Screening (EPDS) health questionnaire that assesses mental health, physical symptoms, and deployment-related traumatic brain injury using the Patient Health Questionnaire, the PTSD Checklist – Civilian version, and the Defense and Veterans Brain Injury TBI Screen-

ing Questionnaire) Data on MTBI, mental health, and physical symptoms will be linked with administrative data on medical employment limitations and medical releases. Survival analysis of occupational outcomes will be performed in those with and without MTBI, and Cox proportional hazard modeling will examine the unique contribution of TBI, after controlling for confounders such as co-morbid mental health problems.

Results: The Enhanced Post-Deployment Database has yielded 16,095 persons who had deployed in support of the mission in Afghanistan and had completed screening from January 2009 (when screening for MTBI was started) through July 2012. There were 854 cases (5.3%) who reported an MTBI during the deployment. Record linkage with occupational outcomes will be complete by July 2013.

Conclusions: This study will more completely define the public health impact of deployment related MTBI by examining the impact of this on long term health outcomes and occupational fitness of Canadian Armed Forces Members after controlling for other co-morbid conditions such as mental health problems.

12. Through Veterans' Eyes: Introducing a Digital Approach to Studying the Life Histories of Canadian First World War Veterans

Humphries, M., Comacchio, C. and Copp, T.

Memorial University of Newfoundland; Wilfrid Laurier University

Introduction: The First World War pension files of the Department of Veterans Affairs (VAC), which are largely unknown and unused, allow researchers to systematically access historical standardized demographic, economic, social, and medical data—both quantitative and qualitative—detailing the lives of ordinary Canadians, from every walk of life and background for approximately 120,000 Veterans from the age of 18 to death. They contain regular home visit reports, yearly household balance sheets, detailed household inventories, and voluminous medical records as well as the voices of Veterans and their families. In short, they record the lives of Canadians down to the smallest detail.

Methods: A research team from Memorial University and Wilfrid Laurier University will use these files to answer important historical questions pertaining to the experiences and outcomes of soldiers diagnosed with ‘shell shock’ and other disabilities attributable to service. More broadly, over the next four years we plan to use funding from a SSHRC Insight Grant (\$400,000) and our two universities (\$350,000) to develop pathways

for other scholars, analysts, and researchers to access the data in meaningful ways. Specifically, we will be developing an electronic database and index to the files that will provide secure and elegant access to an untapped wealth of data.

Results: This presentation will introduce the historical pension files, the types of data available, and discuss the ways that researchers in other disciplines may be able to use the files. Examples will be drawn from Dr. Humphries's research on shell shocked soldiers, looking at how the pension files and wartime service records allow us to track the life course of Veterans in detail over nearly a century. The goal is to introduce researchers from a variety of disciplines to the project and to seek input as to the types of data (and formats) that would be most of use to non-social scientists.

Conclusions: This project will generate important new knowledge of relevance to scholars, policy makers, and average Canadians. In understanding how Veterans and their families coped with pensioning and treatment regimes in the past, we can better adapt public policy for future generations of Veterans with PTSD and other illnesses attributable to military service.

13. Suicide in the Canadian Forces: A Closer Look

Jetly R., Zamorski, M. A. and Sedge, P.

Canadian Forces Health Services

Introduction: Few topics generate more discussion than the completed suicide of a military member or Veteran of combat missions. In 2009 the CF hosted an international expert panel on suicide prevention, specifically focusing on military organizations. A brief review of this panel's report and key recommendations will be presented.

Methods: Three pillars for CF suicide preventions were identified; excellence in mental health care, effective leadership and engaged members. As of April 2010 Canadian Forces Health Services have dispatched a team (typically a uniformed psychiatrist and medical officer) to conduct a detailed review of the events surrounding the completed suicide. These MPTSRs (Medical Professional Technical Suicide Review) involve a detailed file review and Interviews with health care providers, family, friends, police and superiors of the deceased. Lessons learned and recommendations are reported to the Surgeon General.

Results: The results of the 40 plus reviews completed to date will be presented along with other surveillance data. Has 10 years of war impacted the CF suicide rate?

What about deployment experience? How often is mental illness a factor? Are their typical precipitating stressors? Are military suicides notably different from civilian suicides? Are prevention attempts working?

Conclusions: Military organizations have the unique structure and ability to study all aspects of a suicide. Workplace stressors, health care, social factors can all be investigated in considerable detail. This detailed review will provide specific targets for suicide prevention.

14. Associations between Income and Mental Disorders in the Canadian Forces and the General Population

Klassen, K., Sareen, J., Ready, E., Afifi, T. and Cooper, J.

University of Manitoba

Introduction: Research shows that mental health problems are common among military personnel who have been deployed to a combat zone. Research has also identified a clear link between low income and mental health disorders. An understanding of the potential multiplicative effect of being deployed and experiencing low income in military personnel is key to developing policies and programs that may help reduce the incidence of mental disorders in this population.

Methods: This study will use the Canadian Community Health Survey Cycle 1.2 (CCHS-1.2) and corresponding Canadian Forces Supplement (CCHS-CFS) to investigate the income-mental disorder relationship in active regular and reserve force personnel and compare these relationships to the general population. Cross-tabulations will be used to examine the prevalence of mental disorders in income quartiles. Multiple logistic regressions will be used to assess the strength of the relationship between income (both personal and household) and low income (as measured by the Low Income Measure, established by Statistics Canada) with mental disorders (major depressive disorder, social phobia disorder, panic disorder, and panic attacks). PTSD, generalized anxiety disorder, and heavy alcohol use will also be assessed in the CF sample. Resultant odds ratios will be adjusted for sociodemographics as well as several military factors, including branch, rank and deployment-related traumatic events.

Results: Research in other samples (including U.S. military and Canadian Veteran samples) have shown that individuals in the lowest income bracket (regardless of scale) are at the greatest risk for mental disorders. Extrapolating from the existing research, it is hypothesized that a similar relationship will be found in the

Canadian Forces population, with those having the lowest income being at greatest risk for mental disorders. Furthermore, it is expected that military factors such as low rank and previous deployment will influence the relationship and will be associated with higher prevalence of mental disorders.

Conclusions: This study has both practical and research implications. The results may indicate the need for more thorough screening procedures and prevention strategies in order to reduce the prevalence of mental health conditions in military personnel who are in lower income brackets. Early detection of those personnel who are at risk for mental health conditions as a result of poor financial circumstances may in turn have significant health and economic implications for the Canadian Forces. Further research investigating what factors may help in attenuating the potential negative outcomes associated with low income in the military may be warranted.

15. Neurofeedback Training in PTSD: Neurobiological Mechanisms and Treatment Implications

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Introduction: A brain-computer interface allows real-time information of brain activity to be fed-back to a user by means of scalp sensors in what is known as a closed 'neurofeedback' loop (NFB). This enables the user to learn to control the natural operation of electroencephalogram (EEG) rhythms, which are known to reflect synaptic activity across the cerebral cortex, and induce lasting changes in brain function. The dominant EEG rhythm (alpha) appears positively associated with the brain network involved in retrieving memories (dubbed the default-mode network), as evidenced by simultaneous EEG and functional MRI data. Since patients suffering from post-traumatic stress disorder (PTSD) have been found to exhibit an altered activation of the default-mode network, we hypothesize that by using neurofeedback one may lastingly reduce this imbalance (and psychiatric symptoms) by training the alpha EEG rhythm.

Methods: One session of alpha neurofeedback training at Pz was carried out in 21 patients with civilian PTSD. A resting functional resonance imaging scan was performed pre and post neurofeedback training. In addition, behavioural measures were obtained.

Results: Preliminary findings show that one session of alpha rhythm neurofeedback can enhance default mode network connectivity and decrease symptoms of anxiety in PTSD (n=21) related to civilian trauma.

Conclusions: Preliminary results suggest that alpha neurofeedback training may be a feasible adjunct treatment for PTSD. Future research will need to investigate the effects of multiple sessions of neurofeedback training. Moreover, future treatment and research directions in military PTSD will be discussed.

16. The Impact of Military Culture on Survival Mechanisms in Theater and During Post-deployment Transition: A Case Study Based on 31 Testimonies

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Introduction: This study will explore the influence of the military's unique combat-focused culture on coping mechanisms in order to identify which areas of readjustment are the most difficult. Significant distress caused by the drastic change in a soldier's physical, social and psychological environments during repatriation is particularly disruptive for members suffering from a tour-related mental illness. This study will unveil any correlations between symptoms of PTSD and combat survival traits enforced in the CAF culture, specifically reliving, detachment, anger, and hyper-alertness. If members attempt to face their transition challenges with the same survival tactics applied in theatre, the shared characteristics of these military culture traits with PTSD symptoms are expected to hinder repatriation.

Methods: A comprehensive literature review was used to identify any key relationships between military culture and PTSD symptoms. The findings from the literature review were tested against 31 testimonies of male combat-trade soldiers deployed to Afghanistan. The testimonies serve as first-hand evidence of the influences of military culture on coping mechanisms used in theatre and repatriation. The analysis of these testimonies focused on the specific discourses used to discuss survival in theatre, transition out of theatre and daily functioning in work, social, and family environments.

Results: It was found that certain cultural traits become engrained in soldiers' behaviours and thoughts while in the combat environment. These same traits follow them home causing reintegration issues when the soldier-specific behaviours are incongruent with the Canadian culture's understanding of normal behav-

our. The acknowledgement of their soldiering tendencies initiated a recognition and self-adjustment of their military culture habits back into civilian expectations. Only when they became aware of these changes in themselves were they able to see the discrepancies in relation to the civilian environment.

Conclusions: This study revealed the abundance of stress-related issues in members who were not necessarily diagnosed as having a stress injury, suggesting a greater prevalence than previous research suggests. According to the testimonial self-reports, the correlations between military culture's traits for survival in theatre and the similar PTSD symptoms ultimately decreased the member's ability to recognize their difficulties and cope with their adjustment into civilian society post-deployment. The abnormality of these reactive behaviours must be made apparent to the soldier so they can self-regulate their responses in accordance with society. Future research and post-deployment programs may focus on the cultural influences that cause these common readjustment difficulties in order to facilitate transition most effectively.

17. Resilience in Female Partners of CF Veterans Diagnosed with PTSD: Phase 3 of a Critical-ecological Analysis

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Introduction: This study is an extension of previous research undertaken by the researchers focusing on the experiences of female partners of male CF Veterans diagnosed with PTSD. Experiences of depression, loss of self, hyper-vigilance, and conscious accommodation complicated by ambiguous loss are key themes emerging from that study. Secondary analysis of the original data has yielded new insight on the relationship between these themes and the capacity of female partners supporting male CF Veterans diagnosed with PTSD to be resilient. A critical-ecological model of resilience has evolved from narratives developed through new interviews with eight additional female partners.

Methods: This phase of the qualitative study has been shaped by ecological and critical theory. Intensive interviews guided by a semi-structured interview guide have generated narratives of resilience that extend the analysis of key themes emerging from the first two phases to include broader social relations at the community and institutional levels and processes supporting personal and social change. Interviews were audio-

taped, transcribed and analysed using qualitative data analysis software (MAXQDA). Grounded theory methodology guided the analysis of the data.

Results: Analysis of the narratives generated through this phase of the study have facilitated an understanding of the pathways through which ideological forces, regulatory policies, community-level supports, as well as relational and individual processes interact to develop and maintain equilibrium for female partners of male CF Veterans diagnosed with PTSD. The interdependencies that exist between the family environments and broader systems as well as the ecological transitions occurring within the families and across their boundaries with other systems are key findings supporting the development of a critical-ecological model of resilience for military families affected by PTSD.

Conclusions: The critical-ecological model of resilience developed through this research is grounded within first-voice narratives of the experiences of female partners of male CF Veterans diagnosed with PTSD. It is an extension of previous research conducted by the researchers and builds upon the formative model of military family resilience developed by Norris and Dunn in 2005. The findings of this study and the resulting model have the potential to guide the development of educational programs and support services for family members of CF members and Veterans diagnosed with PTSD.

18. Sleep Disturbances and Suicidal Ideation in a Sample of Treatment-seeking Canadian Forces Members and Veterans

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Introduction: Objective: To examine the association between suicidal ideation and sleep disturbances in a sample of treatment-seeking Canadian Forces members and Veterans, after controlling for self-reported symptoms of posttraumatic stress disorder (PTSD), major depressive disorder (MDD), generalized anxiety disorder (GAD), and alcohol use disorder (AUD).

Methods: Canadian Forces members and Veterans seeking treatment at a hospital-based Operational Stress Injury Clinic (n = 404) completed the PRIME-MD Patient Health Questionnaire, the Alcohol Use Disorder Identification Test, and the PTSD Checklist - Military Version (PCL-M). Sleep disturbances were measured

using the insomnia item on the PCL-M. Regression analyses were used to determine the respective impact of (1) insomnia and (2) nightmares on suicidal ideation, while controlling for self-reported symptoms of PTSD, MDD, GAD, and AUD.

Results: Sleep-related disturbances were widely reported amongst the study population. Trouble falling or staying asleep and endorsement of nightmares were not significantly associated with suicidal ideation after accounting for presence of GAD and AUD, PTSD, and depressive symptom severity. Depressive symptom severity emerged as the most reliable predictor of suicidal ideation in both models ($t = 6.931$ and 6.885 ; $p < 0.001$), and PTSD symptom severity accounted for the majority of the variance in both of the regression analyses (R^2 change = 0.122 ; $p < 0.001$).

Conclusions: These findings support the importance of screening for sleep disturbances and related comorbidities as potentially modifiable conditions that are related to suicidal ideation among military members and Veterans.

19. PTSD in Military Veterans – A Scoping Review of the International Literature

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Introduction: As Canadian troops return from Afghanistan, there has been increasing awareness of mental health issues associated with deployment. Post-traumatic Stress Disorder (PTSD) has emerged as a key concern. The purpose of this article is to describe what is being done programmatically and therapeutically to treat PTSD in military personnel and Veterans returning from deployment.

Methods: This project involves a scoping review of peer-reviewed literature in order to identify the current state of psychological interventions for PTSD in military personal and Veterans. In light of the global explosion of expert opinion and research findings in this area, this study maps the extent of the existing literature in an international context.

Results: The results of this study show: 1) a comprehensive database of literature relevant to programmatic and therapeutic interventions for PTSD in military populations; 2) an identification of themes and research trends; and 3) an identification of the gaps in the existing literature that may be relevant for future study. This study builds on our scoping review that identified the current state of the literature on Veterans' health in Canada, concluding that the most fre-

quently studied area is treatment development for PTSD.

Conclusions: This study allows for a deeper understanding of the current state of the research on interventions for PTSD in military Veterans, as well as providing a comparison to the state of the Canadian research.

20. Correlates of Increased Severity of Postconcussive and Physical Symptoms: Findings from Post-Deployment Screenings of Canadian Armed Forces Personnel

Rusu, C., Garber, B. G. and Zamorski, M. A.

Canadian Forces Health Services

Introduction: Post-concussive syndrome remains a poorly understood entity with symptoms that overlap with many other conditions, especially mental health problems. Military personnel returning from a combat zone frequently report a variety of physical symptoms. Research on injured individuals who did not experience concussion has shown a substantial prevalence of central nervous system post-concussive symptoms, calling into question the specificity of these symptoms to concussion. However, research on the association of concussion with somatic symptoms in other organ systems (e.g. cardiovascular, gastrointestinal) is limited. The purpose of this study was to explore the specificity of post-concussive symptoms by examining the relationship between a broad range of physical symptoms and history of concussion following a combat deployment, controlling for mental health problems and other potential confounders.

Methods: Our study consisted of a cross-sectional survey of 16,988 CF personnel who completed post-deployment screening after return from a deployment in support of the mission in Afghanistan. Mental health problems and post-concussive symptoms were assessed using the Patient Health Questionnaire (PHQ) and the Patient Checklist for PTSD, Civilian Version (PCL-C). History of concussion during deployment was obtained using the DVBC 3 question screening tool. A post-concussive symptoms severity score (PCS) was constructed by summing up the post-concussive symptoms items ratings. Post-concussive symptoms included headache, dizziness, memory problems, and others. Similarly, a non-post-concussive symptoms severity (non-PCS) score was constructed by summing up the ratings for 10 non-post-concussive symptom items. Non-post-concussive symptoms included chest pain, digestive difficulties, joint pain, and others. Poisson regres-

sion models tested the independent association between the severity of PCS and non-PCS scores and both concussion and mental health problems.

Results: After adjusting for age, sex, rank and combat exposure, the Poisson regression models showed that concussion was equally associated with an increased PCS score and non-PCS Score (β [95% Wald CI] = 0.27 [0.21-0.32] vs 0.27 [0.20 – 0.33], respectively). Mental health problems were much more strongly associated with increased PCS and non-PCS Scores (β = 1.23 [1.19-1.26] vs 0.9 [0.86-0.94]), respectively.

Conclusions: The identical association of concussion with both PCS and non-PCS symptoms further calls into question the specificity of PCS for concussion. Moreover, the strong association of mental health problems with symptoms suggests that mental disorders, rather than concussion, are non-specifically driving both “post-concussive” symptoms and other physical symptoms in previously deployed military personnel.

21. Non-invasive Magnetoencephalography (MEG) for Objective Assessment of PTSD

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Canadian Armed Forces

Introduction: Current research in the neuropsychology and psychiatry literature using behavioural and clinical measures on PTSD show that people who have suffered from this condition experience a range of symptoms including difficulties with emotional (especially fear) processing, anxiety, memory, inhibition, language and attention. These social and cognitive functions that are often impaired depend largely on the frontal lobes of the brain and the many connections with deep grey matter and limbic system structures; the amygdalae and hippocampi are particularly implicated in PTSD. Magnetoencephalography (MEG) measures the brain’s magnetic signals and can be used to track on-going activity or task-related modulation of the brain signals. MEG is the only non-invasive neuroimaging technique that tells where and when in the brain processing activity is occurring. Thus, MEG has significant potential to not only expand our understanding of this complicated illness, but may provide us with a reliable biomarker for PTSD.

Methods: Twenty-two study participants with a diagnosis of combat related PTSD were recruited from CF Operational Trauma and Stress Support Centres and matched to a control group of healthy CF members. Each participant completed baseline screening

measures (PCL, AUDIT, PHQ-9, DVBIC, GAD 7, and the WASI). They then completed a series of five MEG protocols including: resting state network (RSN) recording; mental flexibility tasks; working memory tasks and image exposure; verbal attentional blink task; and emotional face go/no-go tasks. Following the MEG series, participants completed a shorter series of MRI scans (high resolution 3D anatomical, DTI, and RSN). In the analysis of the results, we are linking the MEG data with the high-resolution MRI scans in order to assess possible subtle structural changes in grey and white matter in the brain that relate to functional differences.

Results: Preliminary results will be presented at the conference. For example, prominent frontal activity (at around 300ms) was found in the attentional blink task, and earlier activations within the limbic network were investigated in the emotional go/no-go task.

Conclusions: Preliminary findings and observations on the value of these studies in PTSD will be presented at the conference.

22. Longitudinal Evaluation of the Stability of Psychological Resilience among Military Personnel: A Pilot Study

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Canadian Forces Health Services, Directorate of Mental Health

Introduction: In recent years, interest has grown in the concept of psychological resilience—that is, in the factors that allow some individuals to adapt and even thrive in the face of adverse circumstances. Research in this area is of particular importance for occupations involving routine exposure to trauma or critical events, through the identification of factors to target in training, education and intervention programs, as well as groups that may be at higher risk for development of mental health problems. Although research has attempted to determine the individual characteristics that provide or contribute to positive outcomes under stress, little is known about whether such characteristics are stable over time, or how stressful events can impact resilience in high-risk occupations such as the military. The purposes of this paper are 1) to briefly review the evidence on variations in resilience over time and 2) present the findings of a pilot longitudinal study of resilience in Canadian Armed Forces (CAF) personnel.

Methods: Subjects were 200 randomly-selected, currently-serving personnel who had completed the CAF

Recruit Health Questionnaire containing a number of different instruments assessing interpersonal and intrapersonal resilience factors. Half of the sample had been deployed in support of the mission in Afghanistan. Potential respondents were mailed a paper and pencil survey repeating all of the resilience measures as well as measures of mental well-being (specifically, the Patient Health Questionnaire and the Patient Checklist for PTSD, Civilian version). Non-respondents received two reminders to complete the survey.

Results: Thirty-eight individuals responded, and thirty-four gave permission to link their questionnaire to the earlier Recruit Health Questionnaire (final response rate = 17%). On average, seven years had elapsed between recruitment (Time 1) and the follow-up survey (Time 2). While there proved to be little change in resilience over time on average, there was considerable individual variation, with some individuals showing marked improvement in resilience and others showing marked deterioration. At both time points, individuals who had previously been deployed showed higher resilience than those who had never deployed. Resilience at Time 2 was a much stronger predictor of well-being than was resilience at Time 1.

Conclusions: This pilot study provides tantalizing evidence for a dynamic perspective on resilience. The low response rate means that the results need to be interpreted with caution, but certainly further work in this area is warranted in order to confirm these findings and identify the factors associated with changes in resilience.

23. Perceived Parent-Child Relationships in a Clinical Sample of Parents with Service-Related PTSD: The Role of Romantic Happiness

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Deer Lodge Operational Stress Injury Clinic

Introduction: Research suggests that post-traumatic stress reactions have an impact on family life. The purpose of this study was to examine the differential relations between PTSD symptoms and perceived quality of the parent-child relationship after controlling for the effects of depression, alcohol misuse, parent age, and number of children in a Canadian clinical sample of individuals with service-related PTSD symptoms. It was hypothesized that consistent with the previous research overall PTSD severity and the avoidance/numbing cluster would be negatively related to perceived quality of the parent-child relationship even after controlling for the covariates.

Methods: The participants were a convenience sample of 60 male still-serving or Veteran Canadian Forces (CF) or Royal Canadian Mounted Police (RCMP) members seeking assessment and/or treatment for an Operational Stress Injury (OSI). Bivariate correlations examining the relations between the PTSD total and cluster scores and the parent-child relationship variables were followed by theoretically-driven hierarchical multiple regression analyses to determine the unique associations between PTSD scores and parent-child relationship. For each regression, parent age and number of children were entered on the first step, followed by depression and alcohol misuse on the second step, romantic happiness on the third step, and total PTSD or the cluster score on the final step.

Results: With regard to the parent-child relationship variables, having higher total PTSD, re-experiencing, and avoidance/numbing symptoms was associated with lower Contact With Children. Parent-Child Relationship Quality was significantly and positively related to Romantic Happiness and Contact With Children. Hierarchical multiple regression analyses showed that depression severity accounted for a significant portion of variance in Contact With Children ($\beta = -.33, p < .05$). Romantic Happiness accounted for a significant portion of the variance in the Parent-Child Relationship Quality score ($\beta = .40, p < .01$). The full covariate set accounted for 14.5% of the variance in the Contact With Children score and 25.3% of the variance in the Parent-Child Relationship Quality score.

Conclusions: This study provides preliminary information regarding the family impacts of parental post-traumatic sequelae. Depression severity was a significant predictor of parent-child contact. Furthermore, higher levels of depression were associated with poorer quality of relationships with children and less romantic happiness. Given the symptom overlap between PTSD and depression and the reported increasing prevalence rates of PTSD and depression in Veterans, these preliminary findings highlight the need for further investigation into the phenomenology of service-related mental health injuries and the associated impact on families.

24. Sitting on a Gold Mine: The 2013 Canadian Armed Forces Cross-sectional Mental Health Survey Dataset

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Introduction: The most recent complete and detailed picture of mental health in the Canadian Armed Forces dates from 2002, in the form of the Canadian Forces Supplement to the Canadian Community Health Survey Cycle 1.2 – Mental Health and Well-being. That survey of 8,400 Regular and Reserve Force Personnel remains the most comprehensive and detailed mental health survey of a military population ever completed. However, much has changed in the CAF since 2002, notably the deployment of more than 40,000 personnel in support of the mission in Afghanistan and the wholesale renewal of the CAF's mental health system. The purpose of this paper is to describe the methods of the 2013 Canadian Armed Forces Cross-sectional Mental Health Survey in order to generate interest among researchers in analyzing the survey data.

Methods: The study population consists of 1) All currently serving CAF Regular Forces personnel and 2) All currently serving CAF Reserve Forces personnel who deployed in support of the mission in Afghanistan. A random sample of 9,193 Regular Forces personnel (stratified by rank and Afghanistan deployment status) and 2,246 Reserve Forces personnel (stratified by rank) were approached by Statistics Canada personnel to participate in a Computer-assisted Personal Interview. Survey content covered past-year and lifetime mental disorders (major depression, PTSD, panic disorder, generalized anxiety disorder, and alcohol dependence), impacts of mental disorders (functioning, absenteeism, presenteeism), mental health services use (and barriers to care), occupational factors (including deployments in support of the mission in Afghanistan), and a number of other domains. Most modules of this survey were also administered to the CAF population in 2002 and to the Canadian general population in 2002 and 2012, so rigorous comparisons over time and between military personnel and civilians will be possible.

Results: As of 14 May 2013, data collection is more than one-quarter complete; data collection will be completed by 31 August 2013. The dataset will be available to researchers in Statistics Canada Research Data Centres in early 2014.

Conclusions: The 2013 CAF Cross-sectional Mental Health Survey in and of itself presents a "gold mine" of information on military mental health. Data from earlier CAF and general population mental health surveys provide an unprecedented opportunity to put military mental health in a larger historical and population health context.

25. Risk Factors for Post-deployment Mental Health Problems in CAF Personnel Deployed in Support of the Mission in Afghanistan: Findings of Post-deployment Screenings, 2009 - 2012

Zamorski, M. A., Rusu, C. and Garber, B. G.

Canadian Forces Health Services

Introduction: Since 2002, the Canadian Armed Forces (CAF) has required Enhanced Post-deployment Screening for personnel returning from overseas missions. A broad range of pre-deployment, intra-deployment, and post-deployment risk factors for post-deployment mental health factors have been identified by research by other nations. However, the extent of post-deployment mental health problems (and their correlates) will depend on circumstances that vary from nation to nation. The purpose of this study is to identify risk factors for post-deployment mental health problems in Canadian Armed Forces Personnel.

Methods: Subjects were 16,988 CF personnel who completed post-deployment screening after return from deployment in support of the mission in Afghanistan. Screening took place on average 5 months after return and consisted of a detailed questionnaire and a 40 minute semi-structured interview with a mental health clinician. Mental health problems were assessed using the Patient Health Questionnaire and the PTSD Checklist – Civilian Version. Logistic regression was used to explore independent risk factors for one or more of six post-deployment mental health problems.

Results: Symptoms of one or more of mental health were seen in 10.0% of those screened, with the most prevalent conditions being major depression (3.2%), minor depression (3.2%) and PTSD (2.7%). Personnel with an independent increased risk for post-deployment mental health problems included women (adjusted odds ratio [aOR] = 1.33), those 35 to 44 years of age (aOR = 1.43), those with heavy combat exposure (aOR = 2.55 for third tertile vs. first tertile), past mental health care (aOR = 2.90), and those currently in mental health care (aOR = 12.14). Personnel with a decreased risk included Francophones (aOR = 0.66), Air Force personnel (aOR = 0.79), and those screened in the first 90 days after their return. Reservist status, deployment duration, and number of previous deployments had no relationship with mental health problems.

Conclusions: An important minority of personnel will disclose symptoms of mental health problems during post-deployment screening. Personnel with a past his-

tory of mental health care and combat exposed personnel were at significantly increased risk for mental health problems and hence represent groups that could be targeted in prevention and control efforts. In contrast to findings from elsewhere, no excess risk was identified in reservists, those with multiple deployments, or those with longer deployments, suggesting that the totality of the CAF's policies, programs, and services are working as they should to attenuate any increased vulnerability in these groups.

2. Physical Health and Rehabilitation

26. Associations between Excess Body Weight and Risk Factors for Cardiovascular Disease among Canadian Armed Forces Men and Women

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Introduction: Overweight and obesity are serious health concerns for the Canadian Armed Forces (CAF) because they increase risk for cardiovascular disease (CVD), cancer, and injuries, negatively affect the overall health of military personnel, and are associated with reduced operational readiness. Despite a culture of physical fitness in the CAF, excess body weight continues to be a major public health challenge in this population. This study examined the gender differences in anthropometry, blood pressure, and blood lipid profiles as risk factors for CVD.

Methods: Height, weight, waist circumference (WC), blood pressure (BP), and blood lipids were measured during routine periodic health assessments (PHAs) of 33,133 Regular Force CAF personnel between January 2010 and March 2013. Categories of calculated BMI and WC were used to determine the relationship between excess weight for height and central adiposity based on gender and age group. Linear regression was used to explore differences in mean BMI and proportions and binomial confidence intervals were calculated for risk categories of WC, BP, and total cholesterol (TC).

Results: In this sample of military personnel, mean BMI was significantly lower among women (26.6) compared to men (28.4; $p < 0.0001$). 32.6% of women were categorized as overweight (BMI 25-29.9) compared to 46.6% of men, with an additional 22.9% of women and 31.5% of men classified as obese (BMI ≥ 30).

Gender differences were also observed when comparing measures of central adiposity and BMI. Overall,

33.0% of women were categorized with high risk central obesity (WC ≥ 88 cm), compared to 25.0% of men (WC ≥ 102 cm). Among those classified as obese, 88.2% of women and 66.7% of the men were also categorized as having high risk WC. However, only 33.8% of women and 8.2% of men in the overweight group had high risk WC.

CAF men and women also displayed significantly different risk profiles of BP and TC. A total of 9.0% of women and 22.1% of men in this sample had BP readings within the range of Stage I or II hypertension (SBP ≥ 140 or DBP ≥ 90 mmHg), and 8.15% of women and 12.7% of men had high risk TC (TC > 6.1 mmol/L).

Conclusions: Gender differences in BMI, WC, and CVD risk profiles among CAF personnel suggest that gender-specific interventions may be required to address these public health challenges. Electronic PHA data is a valuable source of population-level health information and can be used to monitor health trends and disease risk in the Canadian military population.

27. Mechanisms of Blast-induced Cerebellar Dysfunction and Related Motor Deficits

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Introduction: Clinical manifestations of cerebellar dysfunction include perturbations to stance and gait, characterized by a loss of equilibrium, a wide-based stance, irregular steps, and lateral swinging as well as tremors, changes in speech such as slurred vocalization, and cerebellar mutism. While these symptoms are more prominent in patients with penetrating traumatic brain injury (TBI), similar symptoms have been observed in servicemen exposed to blast(s) in recent military actions. These accumulating clinical and experimental data suggest significant involvement of the cerebellum and related motor deficits in blast-induced neurotrauma (BINT). Indeed, impaired executive function, balance and coordination were among most frequent clinical symptoms in individuals with BINT.

Methods: Adult male C57BL/6 mice were exposed to mild-to-moderate intensity blast generated in laboratory conditions using a compressed gas-driven shock tube. This model uses strictly defined parameters of the shock waves (duration; velocity; total, dynamic, and static pressures; among others), and reproducibly generates neurological, anatomical, and molecular-level changes in mice in response to graded blast exposure. Mice were mounted in a supine position onto the

animal holder reproducing the most frequent operational scenario where the soldiers are facing with the incoming overpressure front in upright position. Since our research goals is to clarify pathological effects of primary blast, the animal's head is restrained to prevent blast-induced acceleration (i.e., tertiary blast effect) and additional blunt impact head injury. Neuropathological mechanisms at 7 and 14 days after exposure were analyzed using immunocytochemistry and silver staining methods.

Results: Blast exposure caused multifocal axonal injury. The most frequently involved pathways included the deep cerebellar white matter (arbor vitae) and peduncles, the corticospinal tract. Both the white matter of vermis and the cerebellar hemispheres showed pathological changes. Silver-positive axons and axonal swellings were seen in the cerebellar peduncles and in the corticospinal tract, especially at 14 days after exposure. Silver degeneration staining involved the internal capsule, the cerebral peduncles, and especially pyramidal fibers in the pons and medulla. Motor performance measured with a rotarod test was significantly reduced in blast-exposed animals.

Conclusions: Profound neuropathological changes were found in the cerebellum of mice exposed to blast. These changes developed in parallel with the neurological deficits including significant impairment of motor performance and fine motor control.

28. How Low Should You Go? Hemoglobin Values as a Predictor of Surgical Revision of Battlefield Extremity Injuries following Aeromedical Transfer

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Introduction: Prior to strategic aeromedical evacuation of wounded soldiers, flight surgeons are tasked with determining if a patient is sufficiently stabilized for movement by air. One important parameter in this decision is determining if the patient has a hemoglobin level sufficient to tolerate the hypoxic environment of the aircraft. Current policy mandates that a patient's hemoglobin level be greater than 80 g/L, however this is based on expert opinion and extrapolation from healthy people with normal physiology. The purpose of this retrospective cohort study was to determine if a worse outcome occurred, as defined by proximal revision of extremity wounds, when patients were aero-

medically evacuated with a hemoglobin level that was less than the standard 80 g/L.

Methods: A chart review was completed on all 90 Canadian soldiers that were wounded in Afghanistan and flown to Landstuhl Germany between 2009 and 2011. Hemoglobin levels following aeromedical transport were compared to the need for proximal surgical revision of extremity wounds using chi square analysis and logistic regression.

Results: Patients transported with a hemoglobin level of less than 80 g/L had an increased risk of requiring a surgical revision of their extremity wounds ($p=0.0163$). Hemoglobin values between 80 g/dL and 100 g/L also had an increased risk of surgical revision of extremity wounds ($P = 0.048$). Analysis by logistic regression shows that the probability of having a proximal revision of an extremity wound is significantly related to hemoglobin level at time of aeromedical transport ($p = 0.001$).

Conclusions: This study shows that a more conservative hemoglobin value will result in better outcomes. These findings do not appear to be better explained by injury severity, or routine management of amputation. Future prospective investigations may prove valuable in confirming what hemoglobin level is most protective for preventing further need for extremity surgical revision following strategic aeromedical evacuation.

29. Using Artificial Intelligence to Identify Group-Specific Movement Patterns

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Introduction: Previous research has provided evidence that groups of people with a similar movement pattern, called "functional groups", require group-specific footwear features to (a) improve comfort, (b) enhance performance, and (c) reduce the incidence of injuries. For instance, it has been shown that group-specific insoles significantly reduced movement-related injuries in a military population. To be able to accurately address the specific needs of functional groups, one must first identify the different groups by their movement patterns. Movement patterns can be described by complex kinematic data structures. Thus, standard analysis tools in biomechanics cannot be used to identify group-specific movement patterns. Recently, analysis tools using artificial intelligence-based algorithms (e.g. self-organizing maps; SOM) were introduced into biomechanics. These tools are designed to investigate

complex data structures. Therefore, the purposes of this study were (a) to use a SOM to identify groups with a specific movement pattern, and (b) to investigate whether these groups require specific footwear features to improve comfort.

Methods: Kinematic data of 88 healthy subjects during five over-ground running trials were collected by means of a 3D motion capture system. Using the kinematic data, the SOM was conducted to identify similar movement patterns. Individuals with a similar pattern were grouped together. To determine whether these groups require specific footwear features to improve comfort, the comfort preferences of each group were compared. For this purpose, the preferred shoe condition (out of three possible conditions: soft, medium, and hard midsole) was revealed for each subject or group, respectively.

Results: The SOM identified eight groups with group-specific movement patterns. It could be seen that the soft midsole was the most preferred shoe condition in two of the groups. The medium midsole was required for one of the groups. The remaining five functional groups mainly preferred both the soft and medium midsole. None of the groups preferred the hard midsole. The essential part of this finding is that several groups with group-specific movement patterns, which required specific footwear features to improve comfort, could be identified.

Conclusions: There exist groups of people such as groups of soldiers with specific needs regarding footwear. This study used a novel analysis approach to identify these functional groups by their movement patterns. Being able to identify functional groups is essential for future research aiming to find and analyse footwear features that can benefit these groups.

30. Soldier On: Part I – Helping Injured Soldiers of the Canadian Armed Forces to Accept their New Normal

Lagacé, G.

Joint Personnel Support Unit (Soldier On); Canadian Armed Forces

Brief Description: Soldier On is an integral component of the Department of National Defence's and Canadian Armed Forces' (CAF) commitment and priority towards the recovery, rehabilitation, and reintegration of serving and retired CAF members with a visible or non-visible injury. The program was created in 2006 to help injured CAF members to accept their new normal by empowering them to adopt an active and healthy life-

style through participation in recreational, sporting and other physically challenging activities.

Clinical Outcomes: Since its inception, Soldier On has helped more than 630 injured serving and retired CAF members access equipment, training and facilitated participation in a wide range of activities from alpine skiing to fishing to waterskiing to adventure expeditions. This re-introduction to an active lifestyle provides injured members with opportunities to develop new skills, build hope and confidence in their abilities, and to realize their full potential.

Soldier On is more than just sport. The sailors, soldiers, airmen and air women who have participated in Soldier On activities come from different walks of life and experiences, but they all have one common bond - their lives have changed. This esprit de corps is evident during the activities, around the hallways, common areas, bus rides and informal chats as they interact and share with peers who have undergone similar experience and injuries; some visibly injured, others silently suffering. They come from Newfoundland, British Columbia, Canada North and everywhere in between, and it doesn't take long to realize they have another common thread: a shared perseverance to go on, to honour sacrifice, and to Soldier On. Many injured members credit Soldier On with helping them to overcome their challenges and move forward in life.

Patient Population: Serving or retired CAF members who acquired a visible or non-visible injury while enrolled with the CAF.

Conclusions: Exposure to sport and training for competition, or for personal fulfillment, is an integral component of an injured soldier's recovery, rehabilitation and reintegration.

31. Soldier On: Part II – An Injured Soldier's Perspective on the Important Role Soldier On Plays in their Recovery, Rehabilitation and Reintegration.

Lagacé, G.

Joint Personnel Support Unit (Soldier On); Canadian Armed Forces

Brief Description: The road to recovery, rehabilitation and reintegration can be lonely and challenging for injured Canadian Armed Forces members with visible and non-visible injuries. Simple daily routines such as getting out of bed, getting dressed or leaving the house to go and get the mail can seem like insurmountable tasks. A program like Soldier On is more than just sport. It helps injured CAF soldiers to overcome these challenges by offering opportunities to meet other like-

minded injured peers, develop new skills, set new goals and build hope and confidence in their abilities. This re-introduction to an active lifestyle empowers injured soldiers to accept their new normal as a way to realize their potential and ultimately move forward in life.

Clinical Outcomes: The 630 sailors, soldiers, airmen and air women who have participated in Soldier On activities come from different walks of life and experiences, but they all have one common bond - their lives have changed. This esprit de corps is evident during the activities, around the hallways, common areas, bus rides and informal chats as they interact and share with peers who have undergone similar experience and injuries; some visibly injured, others silently suffering. They come from Newfoundland, British Columbia, Canada North and everywhere in between, and it doesn't take long to realize they have another common thread: a shared perseverance to go on, to honour sacrifice, and to Soldier On. Many injured members credit Soldier On with helping them to overcome their challenges and move forward in life.

Patient Population: Serving or retired CAF members who acquired a visible or non-visible injury while enrolled with the CAF.

Conclusions: The testimonial from an injured soldier re-inforces the importance of Soldier On in a soldier's recovery, rehabilitation and reintegration.

32. Knee Loading Biomechanics for Amputee Gait with a Backpack Load

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Ottawa Hospital Research Institute; University of Ottawa; Canadian Forces Health Services

Introduction: Backpack load carriage is a core requirement for active duty military personnel. A biomechanical knowledge gap exists in this area for service members who have sustained a transtibial amputation and are training to return to active duty. For unloaded gait, lower extremity amputees exhibit greater knee joint forces on their intact limb, potentially contributing to osteoarthritis or other overuse injuries. Since backpack loads are expected to further increase joint forces, the effect of this additional load requires further investigation. Study outcomes should provide a better understanding of the potential long term effects of load carriage on forces about the knee.

Methods: Ten male, K4 level, traumatic, transtibial amputees walked across level ground and ramp ascent/descent with and without a 24.5 kg backpack

load. Three-dimensional motion analysis data (Vicon), ground reaction forces (level ground), and FScan in-shoe plantar pressures were collected for 5 trials per condition. Knee forces and impulses were analyzed for level ground and impulses from in-shoe plantar pressures were analyzed for ramp ascent and descent. Forces and impulse analyses were normalized for pack weight.

Results: Compared to the no-pack condition, the weighted backpack produced significantly greater knee force and impulse components ($p < 0.001$), with the largest differences found for axial forces. For level walking without a backpack, 60% of participants had larger knee forces and impulses on the prosthetic limb, except for the maximum axial force that was greater for only 50% of participants. For the weighted backpack condition, similar results were found except that 70% had larger axial forces on their intact limb. People with larger intact limb loads without a backpack had much greater knee loads than the other participants when wearing the backpack. Impulses when descending the ramp were significantly greater with a backpack load.

Conclusions: Reducing intact limb load for the high-load population could reduce the risk of long-term musculoskeletal complications in trans-tibial amputees. Since more even loading between limbs reduced the knee total impulse (sum of all forces), appropriate prosthetic selection, fitting, and gait training could reduce knee loading during load carriage activities for the asymmetric limb loading population. Proper pre-load carriage biomechanical evaluations could potentially identify amputees at greater risk of injury due to asymmetrical knee loading patterns. For future research, knee kinetic analysis would be useful in measuring the impact of training and fatigue on knee loads in trans-tibial amputees carrying a backpack.

33. Well-Being of Canadian Armed Forces Veterans: Canadian Community Health Survey 2003

MacLean, M. B., Van Til, L., Kriger, D., Sweet, J., Poirier, A. and Pedlar, D.

Veterans Affairs Canada; Queen's University

Introduction: The 2003 Canadian Community Health Survey (CCHS) of the Canadian population included a series of questions to identify Veterans living in Canada. This survey is the sole source of demographic and well-being information representative of the entire population of Canadian Armed Forces (CAF) Veterans who did not serve in the two World Wars or the Korean

War. Conducted in collaboration with Statistics Canada, this study examines CAF Veteran well-being for a variety of indicators as compared to other Canadians.

Methods: The Canadian Community Health Survey 2003 represented a population of 26.6 million and included a total sample of 135,573 Canadians living in households and not serving in the military. This study included a sample of CAF Veterans ($n = 3,142$) and other Canadians ($n = 105,467$) as a comparison group. Veteran sub-groups included Regular and Reserve Forces, males and females, and varying age groups. Age-sex adjusted rates and confidence intervals were calculated for demographic characteristics and indicators of health, disability and determinants of health using the well-being conceptual framework developed by the Research Directorate.

Results: CAF Veterans were better off than Canadians for perceived mental health and for many determinants of health including income, education, extended health insurance and government home care coverage. CAF Veterans were similar to other Canadians in rates of having a partner, living in an urban area, and many areas of well-being including: self-perceived health, smoking, heavy drinking, perceived life stress, sense of community belonging, having a regular medical doctor and use of chiropractors and alternative health care providers. However, CAF Veterans had higher rates of separation/divorce, lower rates of life satisfaction, higher rates of disability and co-morbid physical and mental chronic conditions and higher use of health care.

Conclusions: CAF Veterans were similar to other Canadians in many areas of well-being. However, there were differences in some indicators as well as differences among sub-groups of the CAF Veteran population (Regular Force, Reserves, males, females and across age groups) highlighting the need for planning and policy that is sensitive to these differences.

34. A Virtual Reality Avatar Interaction (VRai) Platform for Military Rehabilitation Part I: Assessment and Treatment of Mild TBI

McFadyen, B. J., Hébert, L. J., Mercier, C., Jackson, P., Bouyer, L., Richards, C. L., Fecteau, S., Robitaille, N. and Larochelle, J.

Laval University

Introduction: Deciding when a soldier is ready to return to the rigors of training and combat is challenging

to Canadian Forces (CF) health care providers. For mild traumatic brain injury (mTBI), the number of incidents and their residual effects is considered underestimated and misdiagnosed. Recent research is showing that ecological multitasking reveals deficits not found through traditional testing. The objective of this stage of the VRai project is to show, in healthy subjects, the feasibility of immersive complex environments that will be used to develop more sensitive and ecological assessments of executive function deficits and improve decisions about safe return to duty of CF soldiers following mTBI.

Methods: Five healthy soldiers (18-35 years old) from the Valcartier Garrison are targeted. The VRai platform consists of a 12-camera motion capture (Vicon) system with a 3D virtual environment rendered to a head mounted display using the D-Flow software (Motek BV). Subjects are instrumented with 41 reflective markers used to drive a first person avatar (FPA). Also, a third person avatar (TPA) with preprogrammed movements will be used to physically interact with the subject. Virtual environments have been created to represent a village allowing navigation within 35 cubic meters. Basic scenes involving walking unobstructed and responding to visual stimuli will be used to contrast to behaviour in more complex scenes with the addition of obstacles to be stepped over and TPAs to circumvent. Ambient distractions and a military context (object/TPA threats) can be added to increase stress levels. For this feasibility phase, questionnaires of presence and cybersickness, as well as general feedback and motion analyses are quantified.

Results: At this point, technical feasibility in the ability to control a generic versatile FPA has been established. The FPA can mimic one's movement in real time allowing the soldiers to see their extremities and to navigate virtual environments from the avatar's perspective. The basic interaction concept for a TPA has also been established and is being further developed. In addition, basic environments have been created and cognitive tasks further developed. Subject data collection is beginning.

Conclusions: The innovative VRai platform has the potential to provide CF health care providers with more sensitive and reliable means of diagnosis, rehabilitation and return-to-duty decision making for their members with mTBI. The system continues to evolve and the first level of proof of principle will lead to more specific testing of persons with mTBI.

35. A Virtual Reality Avatar Interaction (VRai) Platform for Military Rehabilitation Part II: Assessment and Treatment of Kinesiophobia in Low Back Pain

Mercier, C., Hébert, L. J., McFadyen, B. J., Jackson, P., Bouyer, L., Robitaille, N. and Larochelle, J.

Laval University

Introduction: The rehabilitation of the injured soldier to promote the rapid recovery to their required level of operational readiness is a significant challenge. Low back pain (LBP) is the primary chronic complaint of approximately 20% of regular and 8% of reserve Canadian Forces (CF) members. Individuals with chronic pain often develop a pain-related fear of movement (kinesiophobia) that may become very difficult to treat resulting in a high level of disability. The objective of this stage of the VRai project is to show the feasibility of using avatars to provide experimentally-altered feedback about whole body movements in order to assess movement perception (Phase 1), and to decrease the fear of movement and improve movement performance in soldiers with chronic LBP with kinesiophobia (Phase 2).

Methods: Twenty-five soldiers (phase 1: 10 with LBP and 10 controls; phase 2: 5 with chronic LBP with kinesiophobia) from the Valcartier Garrison are targeted. The VRai platform is made up of a 12-camera motion capture (Vicon) system with a 2D virtual environment projected onto a wide screen using the D-Flow software (Motek BV). Subjects are instrumented with 41 reflective markers used to drive a first person avatar (FPA) controlled by their movements. When immersed in the virtual environment, participants will be asked to perform specific body movements that will be mimicked by the FPA in front of them. However, mimicked avatar movements will be either decreased or increased in amplitude. In Phase 1, this will be done to assess the accuracy in body movement perception. In Phase 2, altered feedback will be used to train soldiers to surpass fear or avoidance of movement. Changes in pain and kinesiophobia will be assessed in an uncontrolled proof-of-principle study.

Results: To date, technical feasibility in the ability to control generic versatile FPA has been established. The FPA can mimic one's movement in real time allowing participants to see their movements as if they were looking at themselves in a mirror. Movements at different joints can be scaled to provide augmented/decreased feedback to the subject. Phase 1 data collection is beginning.

Conclusions: The VRai platform has the potential to provide CF health care providers with innovative means to assess and rehabilitate military personal with injuries for which more traditional approaches are unsuccessful. The first level of proof of principle presented here will lead to new avenues for the rehabilitation of soldiers with LBP.

36. Biomechanical Response of the Facets Joints at the Cervical Spine under Various Moment Loading.

Mesfar, W. and Moglo, K.

King Saud University; Royal Military College of Canada

Introduction: Prevention, assessment and diagnostics of the cervical spine (CS) injuries require a deep understanding of its biomechanics while conducting the different possible motion. Experimental studies are unable to study specific biomechanical aspects and injury mechanisms of CS due to loading conditions variety, complexity of the joint and also to ethical issues. Finite element (FE) analysis represents a serious alternative through which human head and neck injury and biomechanics can be investigated. In this study, we aim to identify the effect of three different movements on the contact force (CF) at the facets joints. We hypothesize that CF varies with the loading type and with the facets joint location.

Methods: A 3D nonlinear head and neck complex FE model was developed based on an adult CT scan and MRI images. It consists of bony structures and their cartilage facet joints, the intervertebral discs and all the ligaments. A moment of 1.2 Nm was applied to the center of mass of the head (CMH) at the three different anatomical planes while T1 vertebra was fixed. The CF at each facet joint of the cervical spine was quantified. Only the results of the left facets joints CF will be discussed since the right facets CF can be deducted.

Results: The results indicate that a moment loading of 1.2Nm applied to the CMH, the highest CFs at the left facets joints were computed under the right axial rotation movement for five CS levels, C0-C1 and C2-C3 to C6-C7 reaching a maximum of 34N at C4-C5. However, the left lateral bending moment results a highest left facet joints CF for C1-C2 and C7-T1 reaching a maximum of 37N at C1-C2. Conversely, the three loading moment, left axial rotation, flexion and right lateral bending results no CF at the left facets joints from C2-C3 to C7-T1 levels.

Conclusions: The biomechanical response of the CS facets joints depends of the loading and performed motion by the head. This can be explained by the anat-

omy difference of the different vertebrae and the interconnection mechanism variability between the CS levels. The results of this study identify the critical and the safer movement for each CS facet joint since the CF can be an indication of the stress at these joints. Clinicians can use the found results to design rehabilitation exercises and establish a prevention program of cartilage degeneration at the CS facets joints for military and civilian populations.

37. Implementation and Validation of the “5As Framework of Obesity Management” in Primary Care Units from the Canadian Forces Health Services (5As – FORCES)

Sharma, A. M., Courchesne, M. E. C., Bilodeau, M., Rueda-Clausen, C. F., Bond, T. R. and Vallis, M.

University of Alberta; Canadian Forces Health Services, Ottawa; University of Alberta; Canadian Obesity Network; Dalhousie University

Introduction: Recent studies show that 48% and 23.5% of Canadians serving in the Forces are overweight or obese, respectively. Moreover, there has been a 3% increase in the prevalence of obesity in this population since 2004. There is evidence that obesity is “not effectively managed within our current health system”. The 5As of Obesity Management™ developed by the Canadian Obesity Network, is novel tool for obesity counseling and management in primary care settings. Initial pilot studies suggest that implementing this tool in primary care settings can increase the number and quality of interactions related to weight management in civil primary care settings. The utility of this tool in the Canadian Forces Health Services is currently being evaluated.

Methods: This on-going project will perform a five-stage cluster randomized clinical trial that includes 1) baseline evaluation of the characteristics of the interaction between HCP and patients [n=250], 2) randomly assigned educative intervention (using the 5As or placebo), 3) Recollection of feedback from tool users, 4) secondary evaluation of interactions between HCP and patients [n=500] 4 weeks later and 5) evaluation of effect on self-reported outcomes 12 months later.

Results: This study will provide important field test results required to fine-tune the 5As tool to the uniqueness of Canadian Forces Health Services and evaluate the usefulness of this model for active duty personnel, Veterans or families.

Conclusions: The 5As of Obesity Management™ constitute a novel tool to improve the management of obesi-

ty in primary care settings. This study will evaluate the usefulness of the tool and provide recommendations for adapting the tool to the specific needs of the Canadian Forces Health Services’ population. The rationale and methods described in this abstract are currently being implemented in a collaborative research initiative between the Canadian Obesity Network and the Canadian Forces Health Services to respond to the current obesity epidemic.

38. The FORCE Evaluation: A New Direction for Physical Fitness in the CAF

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Canadian Forces Morale and Welfare Services, Directorate of Fitness; Human Performance Research and Development.

Introduction: Given that Canadian Armed Forces (CAF) minimal physical fitness requirements were over 25 years old and likely did not reflect current operational realities, a revalidation of this standard was undertaken in 2010. Phases I and II of Project FORCE identified the nature and physiological demands of 6 tasks which were deemed to be essential and common to all CAF Personnel: These tasks are: Stretcher Carry, Casualty Extrication, Picket and Wire Carry, Picking and Digging, Sandbag Fortification and Escape to Cover – collectively operationalized as the Common Military Task Fitness Evaluation (CMTFE).

Methods: Given the logistically cumbersome nature of the CMTFE, Phase III was designed to assess whether simplified simulations (e.g., Sandbag Drag) and/or basic fitness components (e.g., push ups) could predict performance on the CMTFE. Following physiological and biomechanical analysis of the CMTFE, a battery of 13 potential field tests was designed. These tests were administered to a stratified sample of 665 CAF personnel who also completed the CMTFE, all to their safe maximal ability.

Results: Simple Pearson Moment Correlations were performed, relating the 13 field tests to the CMTFE. A statistically significant correlation above 0.67 was considered strong or high (Taylor 1990). Based on these correlations, a linear regression model was fitted using Intermittent Loaded Shuttles, 20 metre Rushes, Sandbag Lift and Sandbag Drag to predict each element of the CMTFE. Coefficients of determination ranged from 0.62 (Picking and Digging) to 0.78 (Sandbag Fortification). Standards on the field tests were extrapolated from standards on the CMTFE which had been

established by Subject Matter Experts. Considering potential organisational constraints related to test implementation, models containing less statistically significant field tests were also fitted. For example, the one including field tests requiring no equipment (other than a stopwatch) had a mean coefficient of determination of 0.56.

Conclusions: Three potential fitness tests were presented as options to the chain of command. In December of 2012, after having considered logistical and statistical implications, Armed Forces Council approved the field test comprised of Intermittent Loaded Shuttles, 20 metre Rushes, Sandbag Lift and Sandbag Drag as the new fitness evaluation for all CAF Personnel. Logistic and policy implications of this direction will be addressed as the test is currently being phased in prior to full implementation on 1 April 2014.

39. Defining Success and Satisfaction with Functional Abilities after Upper Limb Amputation

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University of Ottawa; Ottawa Hospital Rehabilitation Centre

Introduction: Approximately 41,000 people in the USA live with major upper limb amputations, 90% of which are traumatic. When compared to civilian trauma, the ratio of upper to lower limb amputations is significantly higher in combat. The primary goal of upper extremity amputee (UEA) rehabilitation is to improve function. Most UEA literature has focused on prosthesis use to improve function. However, the evidence linking UEA rehabilitation success to prosthesis use is conflicting. Traditionally, prosthesis non-use or passive use has been considered unsuccessful, but anecdotally many UEAs do not use a prosthesis or use one only for specific activities, yet still consider themselves successful. Therefore, we need to better understand how an UEA defines functional success in order to better meet these patients' rehabilitation needs.

Methods: Participants were identified through a chart review from the outpatient amputee clinic at a tertiary care rehabilitation hospital in Ottawa, Canada. Adults ≥ 2 years since an acquired, unilateral, traumatic upper extremity amputation at the transradial, elbow disarticulation, or transhumeral level were invited to participate. Semi-structured interviews were conducted. Data was analyzed using a qualitative, constant comparison approach. Theme saturation was achieved.

Results: Twelve UEAs participated. Satisfaction was not associated with prosthesis use. Prosthesis users and

non-users identified themselves as successful. Acceptance of a new physical reality and a strategy for maximizing independence were both essential to achieve satisfaction with functional abilities. Acceptance and independence also influenced each other in that some participants needed to achieve acceptance in order to become independent, and vice versa. Multiple factors contributed to the achievement of acceptance and independence. However, not all of these factors applied to every UEA.

Conclusions: This is the first study, to the authors' knowledge, that examines satisfaction with functional abilities without focusing solely on prosthesis use, enabling a broader understanding of rehabilitation success for UEAs. A model for the achievement of satisfaction with functional abilities is proposed that has two essential components: acceptance of the new physical reality, and a strategy for maximizing independence. For some UEAs, prosthesis use is required to achieve one or both of these components whereas for others a prosthesis plays no role. UEA rehabilitation programs need to offer services (such as psychology and occupational therapy) that address the two key components. Outcome measures that address the key components need to be developed in order to more effectively assess the success of our rehabilitation programs.

3. Social Health and Wellbeing

40. The Sense of Purpose, Worth Fighting For? A Case Study on Mission-related Factors Influencing Soldier Identity and Well-being

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Royal Military College of Canada

Introduction: This paper aims at analyzing the way in which Canadian Armed Forces (CAF) members in combat arms who testify of their experience relate as products of their training in which ethical indoctrination is embedded at all levels. It will explore the way in which the different missions, from humanitarian to combat, influence their soldier identity: how do they come to terms with the tensions lived between indoctrination and their own ethical justifications? Some contradictions have become apparent, and will be discussed, when the soldiers are unable to reconcile their lived experiences with the learned ethos, especially in the context of an asymmetric war where the enemy is often unidentifiable to a point where the soldiers could not differentiate between who to shoot and who to protect in a context where both the mission and the target are ambiguous.

Methods: The study of testimonies allows identifying and analysing the impact of war on soldiers' "identities," as opposed to "identity." In a world where all is fragmented, where ideologies are faded for having led to too many atrocities and where the truth is relative, the study of testimonies becomes the study of multiple identities: individual, social, national. In a collection of 77 testimonies, CAF members in combat arms who have been deployed in Ex-Yugoslavia and Afghanistan discussed their soldier identity while explaining how they try to come to terms with the ethical issues that were inherent to their mission.

Results: Testimonies show that due to the unpredictable nature of the action in a war theater, soldiers must comply with their training to behave in an automatic, almost emotionless manner in order to carry out their mission. The reality of their dangerous environment is what helps to suppress the normal 'civilian' responses to mourning, questioning, responding emotionally. If there seems to be a greater difficulty to apply the basic ethics principles in combat situations when these situations consist of intensive contact with the enemy, this tension is also exacerbated by the soldiers' level of education and number of exposures to war.

Conclusions: This proposal aims at examining how the CAF can optimize the mission-critical outcomes, while determining the extent of the organizational and individual forces, as CAF personnel face the challenges of transformations in military ethos in postmodern military warfare. It is hoped that results based on this Canadian study will have an impact on the research done in the broader military community of allies.

41. Alcohol Use and Mental Health in Canada's Army

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Introduction: Building on research presented at MVHR 2010 and MVHR 2011, this paper presents the results of an empirical study using survey methods into the relationship between alcohol use and mental health among 114 Canadian army snipers, an elite subset of the army.

Methods: All survey participants were male, non-commissioned personnel. Sniper participants completed the 10-item Alcohol Use Disorders Identification Test (AUDIT) and a number of other mental health measures. The findings from this study were interpreted in the broader context of alcohol use and mental

health in the Canadian Forces, using data from the 2008/2009 Health and Lifestyle Information Survey (HLIS).

Results: AUDIT scores from the two surveys revealed that alcohol consumption levels were higher in the sniper sample than the HLIS sample of non-commissioned army males, but alcohol dependence and harmful drinking levels in the sniper sample were lower. Contrary to other studies in this area, snipers who had been exposed to higher levels of combat reported less alcohol consumption than snipers with lower levels of combat exposure. Other results were more consistent with the prevailing literature. For example, snipers who scored higher on measures of depression and posttraumatic stress also reported higher levels of alcohol use.

Conclusions: Implications for training and performance management will be presented.

42. Office of the DND/CF Ombudsman's Systemic Review of the State of Modern Canadian Military Families

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Office of the Ombudsman for the Department of National Defence; Canadian Armed Forces

Introduction: In the wake of more than two decades of near-continuous operations in volatile mission areas around the globe, including over ten years of combat operations in Afghanistan, it is clear that the demands and strains imposed on modern Canadian military families have changed. As a result, the Ombudsman for the Department of National Defence (DND) and the Canadian Forces (CF) carried out a comprehensive review of contemporary military family life in 2012-2013. This involved examining the challenges specific to military families, as well as those common to most Canadians but more pronounced for military families, due to the realities of CF life.

Methods: Several methods were employed. The focal point was key stakeholder engagement. Ten CF bases providing a representative cross-section of geography, level of isolation, operational service and role, and operating language, were visited. At each location, three constituent groupings were systematically consulted: commanders, service-providers, and military families. This effort was augmented by robust peer-generated engagement, tapping into the silent majority of the military community. Institutional stakeholders were also interviewed, from national leadership to offices of

primary interest. Recent national and international academic research was incorporated, as was subject-specific comparative analysis of similar non-DND organizations and allied military forces.

Results: The results demonstrate that while raising a family in a military environment features noteworthy positives, it is often characterized by marked fluctuations in the quality and stability of family life. These fluctuations can occur from one location to another, one period of time to another, or both. The major causes are geographic relocations, operational deployments and routine personnel tempo, and they affect important aspects of regular family life, especially access to health care, spousal employment, housing, and child care and development. The result is too often frustration, fatigue, and financial, social or emotional stress.

Conclusions: The recent past has reinforced the interrelation between military families and the Canadian Forces' operational capability and sustainability. Owing to the growing complexity of military family life and the latent nature of the challenges that two decades of nearly non-stop operations have imposed on today's families, the institution must sustain its current commitment to its families, regardless of mounting external pressures. Moreover, it is imperative that the CF develop effective, inventive solutions to a number of core impediments which have become endemic to modern Canadian military life. In many cases these issues are having negative, and even corrosive, effects.

43. A New Resilience-based Family-centered (RBFC) Service Delivery Approach for Military Families

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Brief Description: The Resilience-Based Family Centered service delivery model is inspired by the Vision of the KMFRC to "create a supportive community of resilient military families". This approach intends to promote family resilience (coping, adapting and growing) using a series of family centered strategies (assessment, decision/goal making, planning, implementation and evaluation) and empowering families to be the primary agent of their resilience through the identification of risk and protective factors.

The theoretical model was developed in order to empower military families identify their resilience profile and capacity to improve their level of functioning. The approach was carefully designed with the concern of preserving the integrity and values associated with the

parameters for practice, the road to mental readiness, the foundation of a family-centered approach and a research-based approach to resilience.

Clinical Outcomes: The primary outcome sought from the use of the RBFC model is to increase coping, adapting and growth capacity of the family system.

Patient Population: The population targeted by the approach consists of military families within which the CF member is diagnosed or affected by an OSI. Thirty families were solicited and volunteered to participate to this program. From this sample eighteen CF members revealed having a medical condition related to a diagnosed OSI or derived from an OSI and twelve CF members disclosed being affected in some ways by their deployment(s) to a theater of operation such as Afghanistan. The length of their exposures to adverse situation varies. All families involved have children. All families are posted at CFB Kingston.

Conclusions: Providing intervention to a military family as the "client" using a family-centered approach presents a number of specific challenges. Similar to civilian families, these challenges seem to group under three categories: capacity, willingness and readiness. The management of these multi-dimensional ubiquitous challenges appear to be a significant contributing intervention factor allowing military "families" to engage in assessing their unique resilience profile.

Through the process of identifying their distinctive family-unit risk and protective factors, they begin to develop, monitor and evaluate their uniquely tailored strategies fostering family resilience.

44. The Effectiveness of the MyHealthCheckUp Wellness Program among Canadian Forces Military Personnel

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McGill University Health Centre, McGill Comprehensive Health Improvement Program and Research Institute

Introduction: Workplace wellness programs often engage healthy participants rather than those with problems that can benefit from positive lifestyle changes. The MyHealthCheckUp e-Health Program has been designed to engage individuals with health problems in the workplace and improve their health, at minimal cost, using a web-based approach. The web-based activity challenges have also been shown to increase participants' daily physical activity and thereby improve their risk factors for cardiovascular disease (CVD) and diabetes, reduce their stress levels and improve sleep

quality. We are now evaluating the impact of this program on the CVD risk factors and health behavior of Canadian Forces personnel.

Study Objectives: To determine if an onsite health screening can be used to engage individuals with health problems to participate in a physical activity challenge.

Methods: We recruited enlisted personnel interested in improving their health at the CFB Halifax, over a 1 week period starting on June 10, 2013. Participation was voluntary. After providing their informed consent, participants completed an onsite health risk assessment at the base. Measurements included height, weight, waist circumference, resting blood pressure, non-fasting blood lipids and glucose levels. Stress and sleep quality were measured using the Perceived Stress Scale (PSS 10), and the Insomnia Severity Index (ISI).

All participants were provided unlimited access to the website's educational materials to support behaviour change such as healthy eating, weight reduction, sleep improvement, etc. They were also invited to participate in a 10-week exercise challenge after being organized into teams based on their assigned units and provided with free pedometers to track their daily steps. Team progress was monitored online on a virtual course using Google maps.

Results: Among those completing the health screening (n=346), mean age was 40 years, 26% were female, 9.5% were smokers, and 62% were overweight (BMI \geq 27). Among screened individuals, 110 (32%) participated in the exercise challenge including women (23%), and officers (34%). Participants included those who could improve their health status due to being overweight (71%), smoking, (8.2%), poor sleep (ISI \geq 8, 33%) or above average mental stress (PSS \geq 13, 30%).

Conclusions: The MyHealthCheckUp onsite health screening has been shown to be an effective way to enrol enlisted personnel with health problems into a 10-week activity challenge. The effectiveness of the program to improve the health of CFB Halifax personnel remains to be determined.

45. The Health and Wellbeing of Canadian Armed Forces (CAF) Members: A Look at the CAF Sports Program

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Introduction: Physical fitness is an essential requirement for serving in the Canadian Armed Forces (CAF).

The CAF Sports Program is an avenue for military members to maintain these physical standards. Until recently, however, the relationship between physical fitness and the personal characteristics of program participants had not been studied. Thus, an online survey examining the CAF Sports Program was created. The purpose of this study was to explore the views of CAF Sports Program participants, focusing on reasons for participating, maintenance of physical fitness, general views, and the presence of integral personal characteristics among participants that are sought after by the CAF (e.g., leadership and unit cohesion). Non-participants were also surveyed to gain an understanding as to why they chose not to participate.

Methods: The study examined the impact of the CAF Sports Program on participants' health and its impact on the development of personal characteristics, in addition to how career intentions, health, and physical fitness compared to non-participants. A total of 2,108 respondents completed the survey, including 1,058 (50.2%) CAF Sports Program participants and 1,050 (49.8%) non-participants. The survey posed both open-ended and close-ended questions about a wide variety of topics. Over 600 respondents provided comments to the open-ended questions. Participants' and non-participants' responses to open-ended questions were analyzed using thematic coding and then were examined in comparison to the closed-ended questions.

Results: Overall, CAF Sports Program participants stressed the importance of having the CAF Sports Program. Participants reported that sports allowed them to maintain their physical fitness and enabled them to assume a leadership role outside the rank structure. Participants also indicated a multitude of reasons for joining, such as the love of sports and being part of an environment that understands the requirements of being a CAF member. Non-participants listed being too busy and wishing to do exercise on their own time as reasons for not participating in the program.

Conclusions: This study sheds light on the potential physical and personal development benefits of a sports program. Most importantly, the views provided a rich context to the quantitative survey results. Participants supported the further development and maintenance of the CAF Sports Program for the health, wellbeing, and personal development of CAF members.

46. L'éthique au cœur des enjeux de la santé du monde militaire

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Brève description: Il s'agit d'une réflexion philosophique sur le lien entre l'éthique et la santé sur laquelle pourra, le cas échéant, se greffer une recherche de nature scientifique. L'idée de base étant que les problèmes éthiques peuvent avoir un impact sur la santé des militaires et des personnes qui les entourent. Les questions relatives à l'énonciation de la vérité seront privilégiées, car elles sont représentatives des enjeux éthiques en général. La vérité étant le fondement de toute cohérence logique, son énonciation – ou sa négation – par les chefs politiques et militaires peut avoir, selon nous, des conséquences sur l'équilibre mental et même physique des militaires et de leurs familles.

Résultats: Le lien entre le leadership et l'éthique se résume habituellement en philosophie à la notion de confiance. C'est le cas chez Kant, mais aussi chez des écrivains militaires comme le major-général Penny dans *La fonction de général et l'art de l'amirauté*. Mais, selon M. Hunt, de l'Ethics in Military Research Group de l'Université McGill, ce sujet commence tout juste à intéresser les chercheurs en éthique médicale appliquée et rien n'est encore publié.

Population: Tous les militaires et leurs familles sont directement concernés par la question. L'énonciation de la vérité à tous les niveaux a, selon moi, un impact direct sur la confiance qui règne dans le milieu militaire pris comme un tout. Il n'est pas encore question, à cette étape de la recherche, de cibler un sous-groupe précis autre que celui des militaires et de leurs proches. Il s'agit plutôt ici de définir un nouveau domaine de recherche et de procéder à ce que Wittgenstein appelait une « élucidation conceptuelle ». Ce qui est le propre de la philosophie depuis son commencement.

Conclusions: La première conclusion concerne l'adéquation ou l'inadéquation entre le discours officiel des autorités politiques et militaires et la réalité vécue par les militaires sur le terrain. Cet aspect renvoie à la transparence du discours en matière de défense. Ceci amène à remettre en question le dogme ancien du secret qui règne encore assez largement au sein de cette profession. La deuxième conclusion est, qu'avant d'aller plus loin, il faut aussi établir de manière rigoureuse le lien entre vérité et santé tout court. Une prochaine étape consistant, pour l'avenir, à construire des outils capables de mesurer précisément ce lien. Pour y arriver, spécialistes des sciences de la santé, de la psychologie et de l'éthique devront toutefois coopérer.

47. PTSD and the Family Experience

Linford, C. and Linford, K.

Canadian Armed Forces

Brief Description: Post-Traumatic Stress Disorder is a hot topic in society these days on many levels. To assist with bringing clarity and understanding of the broad and significant impact of this injury, I have written a book entitled: "Warrior Rising- A Soldier's Journey to PTSD and Back". It is my story of trauma experienced on military deployments and how they led me to a PTSD Diagnosis. I also detail my 2 year recovery post deployment to Afghanistan speaking candidly and honestly of our dynamic family journey. My wife Kathryn and I present our struggle to live with PTSD in the household including the significant impact of depression, anger and anxiety on the family unit. We share our struggles as a family as we tried to keep it all together.

Clinical Outcomes: My family experience with PTSD is not research but through reading my book and hearing first hand our experiences managing the symptoms of PTSD, the CIMVHR audience will appreciate the frank and honest commentary regarding specific coping strategies and techniques that actually worked for my family from an anecdotal perspective. Thus far the outcomes have been very positive but PTSD requires persistent daily management.

Patient Population: My book *Warrior Rising* and the presentation of my family struggle with PTSD is geared directly towards the CF Veteran who has not yet come forward and asked for help from either the CF Health system, or Veterans Affairs Canada. It is well known that many injured vets will not come forward for years or perhaps ever, given the perceived stigma that somehow this injury is a form of weakness.

Conclusions: The presentation my wife Kathryn and I do is about hope. We considered ourselves and our relationship in desperate chaos not that long ago and we managed to learn to be honest with the injury, recognize its power and submit to the proven clinical processes that would help us beat the odds and survive PTSD. It is through open discussions including those who have been affected by PTSD and their families along with the clinical professionals that will eventually eliminate the tendency for Veterans to wait years to step forward and ask for help battling this injury and its impact on the family.

48. Supporting Families of the Ill, Injured and Fallen - Family Liaison Officers

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Brief Description: The Family Liaison Officer position was put in place in 2009 to support families of the ill, injured and fallen. Today, 33 Family Liaison Officers are employed by Military Family Resource Centres in Canada. The Family Liaison Officer is available to help families cope with all phases of the CF member's recovery, rehabilitation and reintegration, whether he or she is returning to service or transitioning through the release process. Family Liaison Officers also provide tailored assistance to the families of the fallen, including professional counselling and referrals to appropriate civilian resources.

Clinical Outcomes: Family Liaison Officers have advocated on behalf of families, provided counselling and crisis intervention, made referrals to relevant service providers, delivered specialized mental health programs, and provided education and awareness briefings. For families caring for an ill CF member, child care has also been made available for respite purposes and attendance at medical appointments related to the member's recovery. Presenting issues have been tracked to determine training and support needs. As a result, three different specialized programs have been developed and tested in three separate communities to help children deal with their parent's illness or injury.

Patient Population: The Family Liaison Officer is embedded in each Integrated Personnel Support Centre, connecting them with the Military Family Resource Centres to ensure that the widest variety of support is offered to families of CF personnel who are coping with an illness, injury or special need. More than 3,000 families have been served by Family Liaison Officers to date. The majority of families served presented with issues concerning anxiety, depression, grief and loss, OSI, PTSD, relationship/marriage difficulties and transition/adaptation difficulties.

Conclusions: Family Liaison Officers have identified that the largest barrier to providing support to families of the ill, injured and fallen is the lack of community services and specialized support services. Client demand consistently exceeds services that are available, especially for those living in isolated areas. And within the CF community, there still exists a lack of coordination between those service providers that serve the

member and those that serve the family, resulting in disjointed family support. Concerted efforts must be made to ensure all support services are leveraged in order to achieve optimal outcomes.

49. Correlates of Job-Related Burnout in CAF Instructors and Support Staff

McCreary, D. R.

Defence Research and Development Canada

Introduction: The concept of burnout has a long history in occupational health psychology, where it is used to describe the prolonged emotional and interpersonal response to chronic job stressors (e.g., high workload, time pressure, lack of resources, lack of control). There are three components to burnout: emotional exhaustion, cynicism, and poor professional efficacy. It is important to note that job-related burnout is not an expression of job dissatisfaction. Similarly, emotional exhaustion is not the same as depression; while they are correlated, they are conceptually and empirically separate.

Research on burnout has shown that, on a personal level, higher levels of job-related burnout are associated with more symptoms of depression, anxiety and substance abuse; a greater degree of physical exhaustion and related adverse effects (e.g., headaches, weight loss); and poor sleep quality and self-esteem. Job-related burnout also is correlated with higher levels of work-life and marital conflict. Furthermore, people working in certain occupations are at higher risk for burnout and its correlated adverse health issues. Researchers have shown teachers/instructors are one of these at-risk groups. In the CAF, instructors are recruited from the regular and reserve forces and posted to a training institution, typically for a period of three years. Discussions with school staff suggest that instructors may come to the school already experiencing burnout, and that the stressors associated with the job (high workload and time pressure, lack of resources, and lack of control) mean that there is no time for recovery.

Methods: This talk will describe the findings from four large studies examining burnout in CAF instructors and support staff in two large schools: one in the Maritimes and one in Quebec.

Results: The findings consistently show that a large percentage of the staff at these schools are experiencing moderate to severe burnout, and that one's level of burnout is associated with more symptoms of depression, anxiety symptoms, and sleep disturbance, as well as greater levels of work-life conflict.

Conclusions: Job-related burnout is a significant issue among CAF personnel posted to training institutions.

50. Workplace Health Issues among Military and Civilian Staff Working in the Canadian High Arctic

McCreary, D. R. and Sullivan-Kwantes, W.

Defence Research and Development Canada

Introduction: Canadian Forces Station (CFS) Alert is the most northern, permanently inhabited place in the world. It is located at 82.5000° N, 62.3167° W, approximately 700km from the geographic North Pole. With the exception of a few weeks per year, the Station is in either 24-hour light (Spring/Summer) or dark (Fall/Winter). CFS Alert is made up of a combination of military and civilian personnel whose posting lengths vary from 4 (Environment Canada) to 6 (military) to 12 months (civilian contractors). With a staff of approximately 75, it is heavily augmented during summer construction and the annual replenishment of major supplies (e.g., fuel). Previous research on physical and psychological health and well-being among people posted to isolated, confined and extreme environments such as this has focused mostly on those working in Antarctica. Findings from those studies have shown elevated levels of sleep problems, depressive and other psychological symptoms, as well as significant interpersonal stressors. However, CFS Alert is different from Antarctic stations in some ways (e.g., more easily accessible during winters) yet similar in others (e.g., isolated and confined, with long periods of 24-hr light or dark).

Methods: We conducted semi-structured interviews with male and female, military and civilian staff in January (n = 13) and August (n = 20) 2011, when contingent strength was normal. Interviews included discussion on the positive and negative aspects of work, interpersonal relationships, and leadership or management roles and responsibilities.

Results: Interviewees reported a number of positive aspects of working at CFS Alert (e.g., doing good work in a challenging environment) and some negative aspects (e.g., close quarters). Overall, there was a good sense of morale and cohesion. Participants felt that sleep and mood had changed little since arriving. Interpersonal conflicts were rare, but tension could emerge for a wide variety of reasons (e.g., romantic relationships, manager/employee disagreements). Most agreed that leadership was crucial to the health and well-being of those working in an isolated, confined, and extreme environment such as CFS Alert, and many noted that they had been affected by both good and

bad leadership. There were no striking differences between those interviewed in Winter and Summer, military/civilian, or male/female participants.

Conclusions: These findings demonstrated that perceived changes in physical and psychological health (e.g., sleep, mood), as well as interpersonal issues and the role of leadership helped promote positive health and social interaction among those posted to CFS Alert.

51. The Fog and Frame of Military Medicine: Causes of Military Healthcare Workers' Ethical Dilemmas

Okhowat, A., Williams-Jones, B. and Hunt, M.*

University of Montreal; McGill University

Introduction: Canadian Armed Forces (CAF) healthcare professionals (HCPs) are regularly exposed to a variety of ethical challenges, during training, in garrison or on deployment. Notable examples include issues related to standards of care, dual loyalty, and resource allocation. These issues have clear implications for the delivery of high quality patient care and can also have significant, deleterious effects on HCPs and their teams, such as increased worker turnover, psychological trauma, and decreased operational effectiveness. Though studies have investigated the typology of and normative responses to these conflicts, few have analyzed how their etiologies are related to formal and informal classification systems used at individual and organizational levels.

Methods: This study used Interpretive Description (ID) as a heuristic tool to conduct a thematic investigation into expressed ethical dilemmas and situations, using preliminary transcripts of semi-structured qualitative interviews with Canadian military physicians as a starting point. Participants were solicited via email through their command chain and snowball sampling and volunteered to reflect on their experiences during a one to two hour interview. Audio recordings were transcribed and subsequently thematically labeled to focus on themes of interest using qualitative analysis software.

Results: Canadian military HCPs' ethical challenges were primarily related to modifiable factors that can be rectified through programmatic and institutional modifications. Specifically, issues arose relating to conflicting codes of ethics, inflexible inclusionary standards for treatments, resource constraints, unclear decision-making criteria and inadequate consultation procedures.

Conclusions: Our study aims to raise awareness of the important ethical challenges facing physicians who

work in areas of disaster or conflict and to encourage the development of coherent policies and ethical codes that can guide HCPs in harmonizing their various roles and responsibilities. In so doing, we aim to mitigate adverse effects by contributing to the development of effective training tools for ethical decision-making, thereby promoting positive adaptive responses to these experiences, improved patient care, and continued operational effectiveness.

4. Novel Health Technologies

52. Big Data Meets Privacy: An Overview of a De-Identification Maturity Model for Benchmarking and Improving De-identification Practices

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Introduction: Vast amounts of data are being generated, collected and linked from multiple sources. The “Big Data” age has presented opportunities to organizations to use this data for secondary purposes such as the implementation of cutting edge research programs. However, much debate among citizens and privacy advocates has and continues to take place around the subject of Big Data. Do organizations have more information than they need? How can the data be used? Is there any business value to the data? What risks exist with the data? Does the data need to be protected and how should it be protected?

Methods: Data custodians and privacy professionals are now faced with the challenge of ensuring that responsible privacy and security protocols are in place to allow the ethical use of an unprecedented amount of sensitive, private data. A practical approach to protecting this information is the use of anonymization or data de-identification.

As they implement de-identification practices, guidance on best practices and knowing what other organizations are doing can be valuable. In this session we will present the de-identification maturity model, which describes the five levels of de-identification practices that organizations typically go through.

Results: We will present a real-world example in the form of a case study where the De-Identification Maturity Model was applied to benchmark the de-identification practices of this organization and to identify a roadmap to improve de-identification practices.

Conclusions: The De-Identification Maturity Model is a viable, formal framework to evaluate the maturity of de-identification services within an organization. It is

used as a measurement tool and it enables the enterprise to implement a fact-based improvement strategy.

53. The Effect of C-Peptide on Mouse Model of Hemorrhagic Shock and Resuscitation-induced Lung Injury

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Canadian Forces Health Services; Department of National Defence; University of Western Ontario; London Health Sciences Center; Lawson Health Research Institute

Introduction: Wounded soldiers in battlefield with hemorrhagic shock and resuscitation (HS/R) are at risk for multiple organ failure (MOF) which is associated with high mortality. It is believed that HS/R-induced MOF is attributed to ischemia/reperfusion and exaggerated systemic inflammatory response. Insulin connecting peptide (c-peptide) is a 31-amino acid peptide that makes up a short segment of the proinsulin molecule. It has been reported that c-peptide promotes arteriolar dilation, prevents PMN-endothelial cell interaction and attenuates ischemia/reperfusion-induced myocardial injury. The aim of this study is to assess the effects of c-peptide on HS/R-induced lung injury and potential mechanism(s).

Methods: Mouse model of HS/R was induced by blood withdrawal and reduction of the mean arterial blood pressure (MAP) to 30 mmHg in 15 min. The MAP was kept at 30 mmHg for another 60 minutes. The mice were resuscitated with 1.5 volume of Ringer’s Lactate (RL) in 10 min followed by transfusion of red blood cells (RBC) derived from the shed blood diluted with 1 volume of RL with or without c-peptide. The sham mice underwent same surgical procedures without blood withdrawal and resuscitation. The mice with HS/R were assessed for gut permeability (circulating FD-4 and LPS), systemic inflammatory mediator HMGB1 and acute lung inflammation (lung MPO and pulmonary protein leakage).

Results: Mice with HS/R results in increased gut permeability as indicated by increase in circulating FD-4. The gut dysfunction further led to bacteria translocation into circulating system (circulating levels of LPS increased) and exaggerated systemic inflammation response as indicated by increased circulating levels of HMGB1 and caused acute lung inflammation (increase in lung MPO and pulmonary protein leakage). Resuscitation the shocked mice with c-peptide prevented the HS/R-induced gut dysfunction and systemic inflamma-

tory response which attenuated the HS/R-induced acute lung inflammation.

Conclusions: C-peptide plays beneficial roles in the HS/R-induced gut dysfunction and systemic inflammatory response and prevents the HS/R-induced acute lung inflammation.

54. Safety, Tolerability and Efficacy of Non-invasive Brain Stimulation for Treatment of Post-concussion Symptoms

Koski, L., Kolivakis, T., Yu, C., Chen, J. K., Delaney, S. and Ptito, A.

McGill University Health Centre

Introduction: Most cases of mild traumatic brain injury (mTBI) recover within 3-12 months; however, 15-25% have persistent post-concussive symptoms (PCS), including not only somatic complaints such as headaches, but also depression and cognitive deficits that interfere with activities of daily living. Interventions focus on pharmacotherapy, cognitive rehabilitation and patient education - with little success - and few standards for treatment and management of mTBI. Repetitive transcranial magnetic stimulation (rTMS) is effective in treating depression. We tested the hypothesis that rTMS over the left dorsolateral prefrontal cortex (DLPFC) would be safe, tolerable, and efficacious for alleviating post-concussive symptoms, including depression, after mTBI.

Methods: Fifteen eligible patients with mTBI and post-concussive symptoms at least 6 months post-injury gave informed consent to undergo 20 sessions of rTMS, with comprehensive clinical assessments at baseline, post-intervention, and 3-month follow-up. rTMS was delivered in 20 5-s trains of 10-Hz stimulation at 110% of threshold, with an intertrain interval of 25 sec. Primary outcomes were tolerability, safety (side effects), and efficacy as measured with the PCS Scale questionnaire. Secondary outcomes included Cognitive Symptoms Questionnaire, neuropsychological test performance, and task-associated activity in the DLPFC as assessed with functional magnetic resonance imaging and a working memory task (n=8).

Results: Twelve patients completed all 20 sessions. Three withdrew after a few sessions due to worsening symptoms or for an unrelated event. Stimulation intensity was increased gradually across sessions and all subjects were tolerating the protocol by the 6th session. Common reported side-effects among completers were increased headache (n=3), more sleep disturbance (n=3), less sleep disturbance (n=3), and better

mental focus (n=3). On average, PCS Scale scores declined by 14.6 points ($p = 0.009$). Pre-rTMS fMRI results did not show significant task-related activation peaks in the DLPFC. Robust activation peaks were detected in this area following rTMS intervention. Analysis of other outcomes is in progress.

Conclusions: rTMS is safe and is tolerable at effective intensity levels by the end of the first week of intervention in 86% of patients with mTBI. Significant reductions in post-concussion symptoms were seen after intervention. Functional MRI results indicated an increase in task-related activation following rTMS. These promising results will be investigated further in a randomized sham-stimulation controlled study, to rule in/out placebo effects as a cause of the efficacy of this intervention.

55. Evaluating the Impact of a Worksite Health Promotion Program: The MyHealthCheckUp Study

Lowensteyn, I., Sounan, C., Lavoie-Tremblay, M., Da Costa, D., Dancausse, S., Grover, S. A., Grover, S., Marchand, S. and Rempel, P.*

McGill University Health Centre, McGill Comprehensive Health Improvement Program and Research Institute

Methods: Employees at the McGill University Health Centre were recruited to participate in hospital-based teams that competed against each other in an 8-week PA challenge. Approximately 50 employees volunteered at each site. Participants were provided a free pedometer and encouraged to walk at least 10,000 steps daily and/or engage in the recreational physical activities of their choice. They also received access to the MyHealthCheckUp (MHC) website where they could monitor their individual progress as well as that of their team on a Google map course across North America.

At baseline and following the PA challenge, we measured risk factors for CVD and diabetes, sleep quality (Insomnia Severity Index), stress (Perceived Stress Scale), and fatigue (general fatigue subscale of the Multidimensional Fatigue Inventory). Each participant's risk of developing diabetes and CVD (Cardiovascular Age Risk Profile) was also calculated and shared with the employee.

Results: 309 employees agreed to participate in the MHC Wellness Challenge. The daily average PA for each participant was the equivalent of 12,857 steps over the 8 weeks of the challenge. Among the 238 employees (77%) who were re-evaluated after completing the challenge, there was a significant improvement in sleep

(7.7 vs. 5.8; $p < 0.0001$), fatigue (11.7 vs. 10.4; $p < 0.0001$), and stress (14.0 vs. 12.7; $p < 0.0001$). The results were particularly significant for employees who were poor sleepers or had above average stress or high fatigue at baseline. Among employees who had hypertension at baseline ($n=31$) there was a significant reduction in blood pressure (141/91 vs. 133/86; $p < 0.01$). Among those who were sedentary at baseline ($n=60$) there was a significant increase in weekly PA (132 vs. 622 METs; $p < 0.0001$) and a 19% reduction in 10-year CVD risk (1.26% vs. 1.02%; $p < 0.01$) due to significant decreases in total cholesterol, LDL cholesterol, and blood pressure. These positive results were observed despite the absence of prizes or other incentives.

Conclusions: This workplace wellness challenge proved to be engaging with excellent adherence rates and multiple positive health outcomes. Workplace PA challenges can improve CVD and diabetes risk factors while also providing numerous psychosocial benefits.

56. The Minds the Matter- A First of Its Kind

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Brief Description: Developed within a CBT based approach, The Mind's The Matter (TMTM) is an innovative mental health resource for military families with a family member dealing with an operational stress injury (OSI). TMTM is a web based tool with different scenarios and decision points for children and spouses and contains 8 different episodes. The learning tools allow the user to understand what are good and less than optimal coping strategies, and then provide resources, tools and organizations to contact if the user has further questions.

Clinical Outcomes: Using a psychometric data assessment tool, embedded within TMTM and developed by The Royal Ottawa Health Care Group, results have consistently revealed that users who complete the program feel empowered to prevent, overcome, and better adapt to the life challenges associated with OSIs. They develop the capacity to employ the techniques being taught to change the ways they think, feel, and act.

Patient Population: Within the CAF there over 45,000 Regular Force and over 12,000 Reserve Force members, with a total of 55,000 children. Veterans Affairs Canada (VAC) reports that there are approximately 20,000 Veterans pensioned for a psychiatric condition,

many of whom are married with children. The population that TMTM could reach is unmeasurable as not all Veterans are linked with VAC and not all CAF members with an OSI have identified themselves. This program may also be applicable to the general public where parent(s) may be having a psychological issue. TMTM was intentionally made not to be military specific, therefore easily transferable.

Conclusions: There is a large gap in services specific to family members across Canada and accessing services, due to the nature of life in the CAF, may, at times, be difficult. Access to a web-based tool, such as TMTM, increases the dissemination of information and access to services. Reception of the episodes specific to children was so positive that spousal episodes were developed and next, due to the changing profile of a soldier/Veteran, parental episodes are in development. In addition to the web functionality of TMTM staff at MFRCs use pieces of the curriculum as content for children and youth programming.

57. Acinetobacter Baumannii Secretes a Snake Venom Reprolysin-like Protease that Attenuates Human Blood Coagulation

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University of Ontario Institute of Technology; Centennial College

Introduction: *Acinetobacter baumannii* is a leading cause of infection of Canadian soldiers in combat war zones, due in part to high levels of antimicrobial resistance. Although antimicrobial resistance remains the most prominent reason for studying *A. baumannii*, in recent years, attempts have begun to understand the pathogen's virulence repertoire. *A. baumannii* ATCC 19606 and ATCC 17978 are both secreted protease negative; however, some clinical isolates of *A. baumannii* have been shown to secrete a protease which may contribute to virulence. Here we identify and characterize a new *A. baumannii* protease which contributes to virulence by attenuating the human coagulation system.

Methods: Sixteen *A. baumannii* clinical isolates from Canadian Hospitals were assessed for their ability to interact with the coagulation system. Eleven of sixteen isolates interacted with the coagulation system and a common secreted protein of Mr 60kDa was confirmed upon SDS-PAGE. The protein was identified as a reprolysin-like protease by mass spectrometry. The protease gene was "knocked out" and protein purified

to assess its effect on coagulation using: Prothrombin time (PT) and activated Partial Thromboplastin time (aPTT) clotting assays, Factor V (FV) clotting assays and immunoblotting and fibrinogen cleavage / SDS-PAGE.

Results: A common secreted 64.3kDa zinc-binding metallopeptidase with the characteristic HExxGHxxGxxH active site of the snake venom reprolysin-like peptidases family M12B was identified in eleven of sixteen Canadian hospital clinical isolates of *A. baumannii*. *Acinetobacter* secreted metalloprotease A (AspA) significantly shortened PT times. AspA significantly increased the time required for clot formation with aPTT assays. AspA was also capable of dose-dependent proteolytic cleavage and inactivation of FV in human plasma by microplate coagulation assay and immunoblotting and bovine fibrinogen by SDS-PAGE.

Conclusions: This research describes a novel secreted protease AspA of *A. baumannii* that enhances or diminishes the coagulation system in human plasma. The protease cleaves and inactivates human FV and bovine fibrinogen; however, it remains unclear what other coagulation factors are affected. This is the first protease described from *A. baumannii* which interacts with the human coagulation system and it remains unclear how important coagulation factor modification is during human infection with *A. baumannii*. Increased understanding of *A. baumannii* virulence factors will lead to development of new diagnostics, treatments, drug design, and vaccines to improve clinical outcomes of Canadian soldiers in combat war zones.

58. A Comparison of Two Medical Training Modalities for CF Medical Technicians: Live Tissue Training and High Fidelity Patient Simulator

Savage, E., Bjarnason, S., Vartanian, O., Peng, H. and Tenn, C.

Canadian Forces Health Services

Introduction: Prior to deploying on combat operations, Canadian Armed Forces (CAF) Medical Technicians (Med Tech) must first prove that they are capable of managing multi-system trauma on the battlefield using the principles of Tactical Combat Casualty Care (TCCC), accomplished during the Tactical Medicine (TACMED) course which uses Live Tissue Training. Despite increasing evidence in support of High Fidelity Patient Simulators (HFPS) within the medical community, there is nothing that directly compares LTT with HFPS in a pre-hospital combat casualty care environment. Recently, the Canadian Forces Health Services and DRDC (Suffield

and Toronto) completed a pilot study to directly compare Live Tissue (LT) and HFPS as training tools for advanced TCCC procedures.

Methods: 20 CF Med Techs naïve to TACMED was assigned to either one of two training modalities: LT or HFPS. Study participants underwent training on five life-saving procedures exclusively on the training model they were assigned, and were tested on that modality in a controlled operating room setting. Next, half of the Med Techs crossed modalities and all proceeded to the field and underwent the same skill assessment in a simulated combat environment. A comparison between the two training modalities was carried out through analysis of the various data sets collected (interview and survey of the study participants, performance evaluations, cognitive psychological measures, and bio-monitoring endpoints).

Results: Participants showed a significant preference for LT training for managing battlefield injuries on all but tourniquet application ($p < 0.05$). Analysis of success on the overall pass rate shows that switching from LT to SIM resulted in significantly more people failing needle decompression and arterial wound packing in the field. Step performance was not significantly worse in the LT to SIM in both needle decompression and arterial wound packing while SIM to LT was worse in surgical cricothyrotomy. Though not statistically significant, overall step performance was worse going from the OR to the field for all skills except management of hypovolemic shock. Psychological tests reveal significant differences between groups on mood and fatigue scales following training and testing days.

Conclusions: The results from this very small pilot study did not demonstrate skill transfer between modalities. It appears that each may have strengths in providing TCCC training, however LTT is still the overall preferred modality of Med Techs. A larger study may demonstrate statistical significance between environments and performance of advanced skills sets.

59. Effect of Primary Single Pulse Shock Wave Exposure in Rodents

Sawyer, T. W., Wang, Y., Ritzel, D. V., Nelson, P., Weiss, T., Barnes, J. and Hennes, G.

Defence Research and Development Canada, Suffield; Dyn-FX Consulting Ltd.

Introduction: Simulation of the primary portion of a free-field point blast in the laboratory is most frequently obtained through the use of a shock tube. This device usually takes the form of a straight pipe divided

into a driver section charged with high pressure gas, and separated from the low pressure section by a diaphragm. Although simple to use, the waveforms generated in conventional shock tubes are often not representative of a free-field explosive blast and grossly alter the profile of the shockwave. As part of the DRDC Blast Injury Program, a conventional shock tube has been modified so as to preclude anomalous wave reverberations in order to tailor the waveform and impart a single-pulse insult. Using this "Advanced Blast Simulator" (ABS) the effects of single pulse shock waves are examined in rodents.

Methods: Male Sprague Dawley rats were anaesthetized prior to being placed into a restraint enabling head-only exposure in a specially engineered ABS. The animals were exposed to sham, 15, 20, 25 and 30 psi single pulse shock wave insults, with concussive or acceleration/deceleration forces being minimized. Animals were examined at one or seven days post-exposure for changes in brain function utilizing a host of biochemical and molecular endpoints.

Results: Molecular and biochemical endpoints of brain function were assessed in different parts of the brain. Generally subtle differences in GFAP and NFH were noted at 25 and 30 psi. CNPase activity was not significantly affected with little or no differences in activity at either one or seven days post exposure. GS activity was inhibited at 30 psi at one day post-exposure, but generally recovered by seven days. AChE activity was significantly inhibited in all brain regions at one day after treatment. No obvious differences were noted between right and left hippocampus or cortex.

Conclusions: Head-only exposure of rats to a simulated primary single pulse blast wave resulted in subtle differences in a number of molecular and biochemical endpoints. Biochemical endpoints seemed to be more sensitive than molecular endpoints such as GFAP and NFH. This type of exposure wave produces more subtle brain damage than other systems that utilize whole body exposure, or that include substantial concussive and/or whiplash forces. We believe that this type of insult may play a major role in the development of mild traumatic brain injury, where symptoms are often delayed and cause-effect relationships are very poorly understood.

5. Occupational Health

60. Occupational Outcomes after Diagnosis of a Deployment-related Mental Disorder in a Large Cohort of Canadian Armed Forces Personnel

Boulos, D. and Zamorski, M. A.

Department of National Defence

Introduction: An important minority of deployed personnel will be diagnosed with a deployment-related mental disorder (DRMD). Mental disorders can interfere with stringent military health and fitness standards, and concerns about career impact are a common barrier to care-seeking. The Canadian Forces (CF) has invested heavily in mental health over the past decade and has implemented forward-thinking fitness standards. However, data on how DRMD's affect occupational fitness is limited. The current study investigates occupational outcomes among a cohort of individuals who returned from deployment in support of the mission in Afghanistan.

Methods: The study population consisted of all 30,513 CF personnel who deployed in support of the mission in Afghanistan from 2001 - 2008. Mental disorder diagnoses and deployment attribution were abstracted from medical records of a weighted stratified random sample of 2,014 personnel. Lack of fitness for ongoing military service, defined by career-limiting medical employment limitations that are expected to eventually lead to a release from military service, was determined using administrative data. Cox proportional hazards regression assessed the independent effect of mental disorder diagnoses on risk of developing these employment limitations.

Results: An estimated 13.5% of the population was diagnosed by the CF with an Afghanistan-related mental disorder (ARMD) diagnosis over a median period of follow-up of 1364 days; an additional 5.5% had a mental disorder diagnosis unrelated to this mission. Preliminary results indicate that 48% of those with an ARMD developed career-limiting medical employment limitations over a median of 1528 days of post-deployment follow-up. In comparison, 33% of those with a mental disorder diagnosis that was not Afghanistan-related and 12.7% of those without a mental disorder diagnosis developed such limitations, over 1930 and 1898 days of follow-up, respectively. After a decade of follow-up, the predicted cumulative incidence of such limitations approaches 70% among those with an ARMD compared with 40% among those with a mental disorder diagnosis unrelated to the Afghanistan mis-

sion and 20% among those without a mental disorder diagnosis. Proportional hazards modelling indicated that individuals with an ARMD were associated with a marked increase in risk of developing limitations (almost five-fold higher than those without a mental disorder diagnosis) while those with a mental disorder having other attributions had an elevated risk as well.

Conclusions: A large fraction of those with an ARMD will ultimately develop career-limiting medical employment limitations, even in the face of improvements in mental health care and forward-thinking fitness standards.

61. A Novel Military Population Health Surveillance and Research Initiative: The Canadian Forces Health Examinations and Record Outcomes (CF-HERO) Database

*Hawes, R. A., Bogaert, L. and Whitehead, J.**

Canadian Forces Health Service; Department of National Defence

Introduction: A systematic evaluation of the health profile of the Canadian Forces requires a multilevel and life-course perspective on health inputs and outcomes. The recent implementation of an electronic health records, along with advancements in epidemiological analysis and data processing, present substantial opportunities to improve the health and operational readiness of Canada's military personnel.

We present herein the origin, development and application of a novel health surveillance initiative to facilitate the next generation of military population health research.

Methods: The Canadian Forces Health Examinations and Record Outcomes (CF-HERO) database integrates diagnostic, disposition and routine medical examination data from the CF Health Information System (CFHIS), deployment-related information from the Canadian Forces Taskings, Plans & Operations (CFTPO) database, mortality and suicide data from the CF Mortality Registry, and demographic and occupational information from the Human Resources Management System (HRMS).

These data streams are uploaded at weekly, monthly and quarterly intervals, and use an automated suite of data cleaning algorithms to process more than 40 million records. A longitudinal health record is constructed for each Regular and Reserve Force member in the CF, allowing for career transitions between the military and civilian sectors. The inclusion of human resource data permits the computation of more precise

measures of person-days or months of exposure to occupational hazards associated with military service.

Results: Evidence-based health policy, outbreak investigations and health services research all depend on the accurate enumeration of who, what, where and when. Modern epidemiological investigations must therefore account for the numerous transitions in rank, occupation, unit, base and deployment status that distinguish the career of military personnel from their civilian counterparts. Example analyses relevant to mental health, injury surveillance, communicable diseases and primary care will be discussed.

Conclusions: The CF-HERO database provides a unique platform to monitor individual-level health trajectories, while simultaneously providing population-level metrics in support of health policy decisions. The presentation will conclude with a request for audience input regarding potential avenues for population health research in the Canadian Forces.

62. Pre-military Mental Health Predictors of Post-concussive Symptoms in Canadian Military Personnel Returning from Overseas Deployment

*Lee, J. E. C., Garber, B. G. and Zamorski, M. A.**

Canadian Forces Health Services, Directorate of Mental Health

Introduction: Previous work has revealed strong relationships between mental health and traumatic brain injury (TBI) outcomes, such as post-concussive symptoms, after military deployment. However, little research has used a longitudinal design to identify pre-military characteristics that may act as risk factors for such outcomes.

Methods: Based on health data collected during basic training and upon routine post-deployment screening, the current study examined the relationship between pre-military mental health and post-concussive symptoms among Canadian military personnel returning from deployment in Afghanistan (N = 1926). Mental health problems and post-concussive symptoms were assessed using the Patient Health Questionnaire and the Patient Checklist for PTSD, Civilian version. TBI was assessed using the Defense and Veterans Brain Injury Center screening questionnaire. A sequential logistic regression analysis was performed with demographic covariates in step 1, pre-military mental health symptoms in step 2, combat and TBI events experienced on deployment in step 3, and post-deployment mental health symptoms in step 4 as predictors of post-

concussive symptoms (reporting three or more symptoms).

Results: While pre-military mental health symptoms were stronger predictors of post-concussive symptom reporting than combat or TBI events experienced on deployment after step 3, none of these variables reached significance after post-deployment mental health symptoms were added to the model. In this final model, post-concussive symptom reporting was strongly associated with post-deployment depression, post-traumatic stress disorder and summarization symptoms.

Conclusions: These findings suggest that the linkage between pre-military mental health and post-deployment post-concussive symptoms is mediated by post-deployment mental health problems. That is, pre-deployment mental health problems lead to an increased risk for post-deployment mental health problems which in turn facilitate post-concussive symptoms. This provides additional evidence of the central role that mental health plays in the expression of post-concussive symptoms, and it reinforces the need to carefully assess mental health in those with post-concussive symptoms.

63. Longitudinal Analysis of Psychological Resilience and Mental Health in Canadian Military Personnel Returning from Overseas Deployment

*Lee, J. E. C., Sudom, K. A. and Zamorski, M. A.**

Canadian Forces Health Services, Directorate of Mental Health

Introduction: The relationship between exposure to combat stressors and poorer post-deployment health is well documented. Still, some individuals are more psychologically resilient to such outcomes than others. Researchers have sought to identify the factors that contribute to resilience in order to inform resilience-building interventions. The present study assessed the criterion validity of a model of psychological resilience composed of various intrapersonal and interpersonal variables for predicting mental health among Canadian Forces (CF) members returning from overseas deployment.

Methods: Participants included 1,584 male CF members who were deployed in support of the mission in Afghanistan between 2008 and 2010. Data on combat experiences and mental health collected through routine post-deployment screening were linked with historical data on the intrapersonal and interpersonal variables from the model. The direct and moderating ef-

fects of these variables were assessed using multiple linear regression analyses.

Results: Analyses revealed direct effects of only some intrapersonal and interpersonal resilience variables and provided limited support for moderating effects. Specifically, results emphasize the protective nature of conscientiousness, emotional stability and positive social interactions. However, other variables demonstrated unexpected negative associations with post-deployment mental health (e.g., positive affect and affectionate social support).

Conclusions: Ultimately, results highlight the complexities of resilience, the limitations of previous cross-sectional research on resilience, and potential targets for resilience-building interventions. Additional longitudinal research on the stability of resilience is recommended to build a better understanding of how resilience processes may change over time and contribute to mental health after adverse experiences.

64. Investigating the Effects of Exposure to a Shared Traumatic Event in a Group of Mental Health Employees

McKinnon, M., Rhind, S., Chaimowitz, G., Nazarov, A., Di Battista, A., Lanius, R., Moulden, H., Mamak, M., Parlar, M., Oremus, C. and Furimski, I.

McMaster University; University of Western Ontario

Introduction: There is an increasing awareness among researchers, physicians, and policy-makers of the importance of understanding the impact of traumatic events on individuals exposed to trauma. Over half of the population will be exposed to a psychologically traumatic event at some point in their life, with approximately 10-20% developing posttraumatic stress disorder (PTSD). PTSD has an extensive burden on our society. Past research has shown that individuals with PTSD report disruptions in multiple domains including family relationships, vocational achievement, and personal health. Rates of workplace violence in Canada have seen a steady rise, with over 300,000 incidents occurring annually and the largest proportion (over one-third of all violent incidents) occurring in the healthcare sector. The effects of workplace violence on the psychological well-being of employees has seldom been reported.

Methods: Our primary aim was to investigate the psychological consequences of exposure to a shared traumatic event, a violent workplace homicide, on a group of mental health employees. The secondary aim was to explore the mediating effects of social support and

specific biological mechanisms on the psychological health of the trauma-exposed individuals. Forty mental health employees were followed for 6 months, with monthly assessments measuring trauma symptomatology, social support levels, workplace performance, neurocognitive function, and biological markers.

Results: We predict that increased exposure/proximity to the traumatic event will be associated with higher trauma symptomatology. In addition, we predict that increased trauma symptomatology will be associated with impaired neurocognitive function and disrupted work performance. Social support levels and specific biological mechanisms are hypothesized to play a mediating role in these relationships. Data collection is ongoing and we will present our findings at the conference.

Conclusions: The outcome of this investigation will provide comprehensive, prospective analysis into the immediate and long-term consequences of observing graphic workplace violence. The results will also facilitate enhanced understanding of the interaction between cognitive and emotional processes, social support, and trauma exposure.

65. Quantifying Performance Standards of the Common and Essential Tasks Required of the Canadian Armed Forces. Phase II Project FORCE

Reilly, T., Blacklock, R., Newton, P. and Olinek, S.

Canadian Forces Morale and Welfare Services

Introduction: Phase II of Project FORCE, the new fitness standard for the Canadian Armed Forces (CAF), began with 13 potential tasks. The research team investigated potential scenarios and performance standards for each task in order to simulate and quantify their physiological demands. This involved CAF Subject Matter Experts and large scale re-enactments of each task. The most demanding physical components formed the basis of the minimum physical fitness evaluation for all CAF personnel.

Methods: Operational scenarios developed with the following tasks were recreated in the field at operational pace as defined by Subject Matter Experts: (1) Lift and carry Jerri cans of water/fuel, (2) Perform Sentry/Foot patrol duties, (3) Sandbagging (for flood relief and 3-walled protective shelter), (4) Escape to cover under fire, (5) Erect pickets and affix wire, (6) Extract casualty from vehicle and drag to safety, (7) Carry casualty on stretcher and load onto back of truck/helicopter, (8) Navigate stairs with casualty, (9) Dig ablation facilities, (10) Clear rubble to rescue a cas-

ualty. Scenario time-span ranged from 3 minutes up to 4 hours to ensure realism. Following pilot research with civilian or military participants, tasks were (1) concentrated to the most demanding elements, (2) combined to reduce redundancy, or (3) eliminated due to very low demands. Tasks with predominantly strength demands were measured using a calibrated load cell. Aerobic and anaerobic tasks were further investigated with the Jaeger Oxycon Mobile analyzer. Participants performing each task (N=16) were stratified by mass, height and gender.

Results: The most demanding muscular strength components were identified in the casualty evacuation tasks (drag 82kg, lift 48kg, carry 40kg). Escape to cover under fire (68 sec simulation 25.5-37.6ml/kg/min) and Lift and carry Jerri cans of water/fuel (18.8 ± 6.1 ml/kg/min) were determined to primarily require anaerobic metabolism. The more aerobic demands were concentrated components of Dig ablation facilities (1.8L/min for 18mins), load carriage during Erect pickets and affix wire ($16.8-20.8 \pm 5.1$ ml/kg/min for 23 minutes) and the lifting component of Sandbag fortification (1.35 ± 0.2 L /min for 15 minutes).

Conclusions: The physiological demands (strength, anaerobic, aerobic) that could limit successful operational performance were captured in order to be simulated in a gym environment. Phase III of Project FORCE will determine the most suitable fitness tests that best predict successful performance of the qualified common CAF tasks.

66. 4 Years Later: Successful Implementation of a Client-Reported Mental Health Outcomes Management System for VAC's Operational Stress Injury Network

Ross, D. F.

Operational Stress Injury National Network; Veterans Affairs Canada

Brief Description: OSINN recently implemented a client reported outcome management information system (CROMIS) for its Operational Stress Injury Clinic (OSIC) network. CROMIS uses a U.S. Web software (OQ-Analyst), housed in a Canadian server, that currently supports repeated administration of the OQ-45.2 and PCL questionnaires.

The PCL-M is an industry standard measure of PTSD equivalents. The OQ 45.2 is used both to facilitate clinical performance monitoring in mental health care systems and to provide feedback to therapists on whether patients are staying on track toward positive treatment

outcomes. When used clinically as a 'real-time' progress tracking system, multiple R.C.T.s have demonstrated significant improvement in the clinical outcomes of clients, particularly those most vulnerable to deterioration and/or premature termination.

Its "readiness for dissemination" has been established by the U.S. National Registry of Evidence-based Programs and Practices (NREPP) as 3.9 out of a possible 4. The CROMIS system was developed through a 4-year collaboration with network OSICs, their provincial host agencies, various branches of VAC and other Federal Government stakeholders.

The presentation will highlight lessons learned and key decisions made during design and implementation, and describe how CROMIS will be used to support management, clinical practice and research applications.

Clinical Outcomes: Scope of implementation: The system has been implemented across the 10 clinics in the O.S.I. network, and is currently being adapted for use within the OSISS peer support network.

Uptake/refusal rate. While OSIC clients are not required to use the system, their participation is solicited, based upon informed consent. At the time of preparation of this abstract, client acceptance exceeded 90%.

Number of users/administrations. Current data will be provided at the time of presentation.

Patient Population: The CROMIS system currently is in use with VAC, CF and RCMP clientele within the OSIC Network.

Conclusions: A Canadian client-reported mental health outcomes management information system, rooted in the Best Practices literature has been successfully implemented, thanks to the combined efforts of Federal (VAC) and Provincial host healthcare agencies. As a result, OSIC client self-reported mental health outcomes can be consistently, uniformly and routinely monitored and managed for the first time, at both the individual and aggregate (service, clinic, network) level.

6. Transition from Military to Civilian Life

67. Group Therapy with Military Veterans: Lessons Learned from 15 Years of the Veterans Transition Program

Black, T. G. and Laidler, T.

University of Victoria; Veterans Transition Network

Brief Description: This presentation will focus on clinical considerations for conducting group therapy with military Veterans. Due to their unique experiences as members of the Canadian Forces, military Veterans

require special consideration when working in the context of group therapy. Action-based interventions, clearly laid out rules of engagement, predictability and awareness of intragroup issues related to branch, trade, rank, and deployment histories must all be managed skillfully to make the most of the group therapeutic context.

Clinical Outcomes: The Veterans Transition Program has been evolving into its current 10-day residential format for over 15 years in the province of British Columbia and recently across the country. The VTP has one of the highest retention and treatment completion rates of any clinical intervention with a Veteran population and the presentation will focus on key aspects of group process and facilitation that have made the VTP so successful in this regard.

Patient Population: The VTP is a group-based program that delivers "Transition-Focused Treatment" to former and transitioning members of the Canadian military who are struggling to succeed in their transition to civilian life. The program is not suitable for individuals who cannot for any reason be pro-active group members and/or who are currently in a state of acute crisis or psychosis.

Conclusions: Group therapy can be one of the most effective methods for addressing transition issues for transitioning and former members of the Canadian military. Provided that contextual and military cultural factors are integrated into the planning, facilitation, and ongoing management of the group environment, group approaches can provide complementary treatment options to remedy the profound isolation, lack of meaning and powerlessness that many transitioning Veterans experience.

68. Exploring Veteran Community Reintegration: A Scoping Review of the Literature and Occupational Analysis

Brown, H. V. and Shaw, L.

Western University

Introduction: Overseas conflict has increased the number of Veterans seeking treatment for operational stress injuries, such as posttraumatic stress and mild traumatic brain injury. Consequently, Veterans are at risk of social problems as they reintegrate back into their communities (e.g., struggle to engage in the caring of children and maintaining paid or unpaid work). Veteran community reintegration (VCR)—the process of transitioning from military roles to civilian community roles—is, therefore, a priority for stakeholders, such

as rehabilitation professionals, Veterans' advocates, and the Canadian government. Literature regarding VCR tends to be based on medical and psychological perspectives. Limited literature examines VCR using an occupational perspective defined as occupations that Veterans engage in to occupy themselves. Yet we know that reintegration dramatically influences everyday occupational life, such as driving, sleep, and work. This paper has two purposes. Firstly, to present a scoping study and synthesis of theoretical perspectives used in VCR literature. Secondly, this paper will provide an alternative way of understanding the needs of Veterans that draws on knowledge from occupational science.

Methods: Arksey and O'Malley's (2005) and Levac et al.'s (2010) scoping study frameworks were utilized to retrieve and select evidence and grey literature. Six electronic databases (MEDLINE, EMBASE, PsycINFO, CINAHL, CARRIER, Scopus) and several countries Veterans Affairs departments' websites, government documents, and programs were searched. Five stages of Arksey and O'Malley's review process were used to select and chart extracted data. An integrative analysis identified the frequency and realm of theoretical perspectives used in VCR literature. Lastly, theories from occupational science were utilized to analyze the literature to provide an occupation perspective.

Results: Following data selection N=143/532 articles and 17 grey literature documents were included for relevancy screening. Five dominant perspectives were found: biopsychosocial, social, holistic, medical, and recovery. These perspectives point to strategies that focus on the person and do not readily address the situated nature of reintegration and transitioning into a new way of life.

Conclusions: Concepts and critical theoretical perspectives from occupational science such as occupational transitions, occupational possibilities and occupational justice may offer additional insights into the ways Veterans navigate and negotiate new community expectations. Moreover this knowledge will broaden the consideration of the social, political, and cultural influences on adaptation and the reestablishment of an occupational identity. Occupational science can provide a missing piece in VCR research and be useful in identifying strategies and practicalities of how Veterans can reintegrate into community life.

69. The use of the Progressive Goal Attainment Program (PGAP™) for Reducing Disability and Improving Activities of Daily Living (ADL) and Quality of Life for Community Dwelling Veterans with Persistent Pain

Franz, M.

Veterans Affairs Canada

Brief Description: In the community, many Veterans receiving financial benefits from Veterans Affairs Canada (VAC) have failed to successfully reintegrate into the civilian world and be actively engaged in meaningful employment, family, or leisure roles. Often these roles are disrupted because of persistent pain, which is the main barrier to re-establishment and cause of disability. PGAP™ ("The Progressive Goal Attainment Program") is a structured 10-week cognitive behavioural intervention for reducing disability associated with chronic pain and is used to increase participation in family, social and occupational roles. The structure of the PGAP™ includes a video, workbook, activity log, walking program, and techniques to help overcome psychological obstacles to activity involvement (such as fear of re-injury, catastrophic thinking).

Clinical Outcomes: The evidence gathered in a critical review of this intervention supports the use of the PGAP™ for Veterans with chronic pain. A large systematic review by William, et al. (2012) concluded that cognitive behavioural therapies, such as PGAP can result in improvements in outcomes such as disability, pain and quality of life.

Patient Population:

- Patient/Client Group: Adults, community, chronic pain
 - Intervention: PGAP, Cognitive Behavioural Therapy
 - Comparison: Symptom focused approach (e.g. strengthening, exercise, massage, TENS) or no intervention
 - Outcome(s): Quality of Life, Activities of Daily Living, Reduced Disability, Treatment Outcomes
- Inclusion Criteria**
- Studies that investigated the use of a CBT to address pain lasting >3 mo.
 - Studies in English
 - Studies that reported on outcomes (disability reduction, Q of L, improvement in function/ADL)
- Exclusion Criteria**
- Studies that focused on a specific type of pain such as headache or cancer or those with acute or sub-acute pain (< 3 mo.)
 - When participants were in a hospital (acute) setting or were not between ages of 18-64

- Studies that reported on specific interventions such as biofeedback or hypnosis on their own
- Studies that used internet based approaches

Conclusions: The evidence/literature supports PGAP™ for Veterans with pain. PGAP™ is an intervention to reduce disability associated with persistent pain and to increase participation in family, social and occupational roles, particularly if the Veteran has not engaged in any treatment to date.

Key points for future research include examination of the specific components of PGAP™/cognitive behavioural therapies to determine how essential techniques and practices, used solely or in combination, help clients engage in meaningful life roles and how this engagement relates to improved perception of quality of life.

70. New Findings from the Life After Service Studies

Pedlar, D., Thompson, J. M., MacLean, M. B. and Van Til, L.

Veterans Affairs Canada

Introduction: The Life After Service Studies (LASS) is a program of population research to better understand the transition from military to civilian life and ultimately improve the health of Veterans in Canada. Military to civilian transition is an important but not well researched event in the life course of military Veterans in Canada and internationally. Military personnel transitioning from military service to civilian life undergo a complex, multifaceted process with variable, institutional, health, psychological and community dimensions. This presentation will synthesize findings from LASS.

Methods: LASS is a collaboration between Veterans Affairs Canada, the Department of National Defence and Statistics Canada. The LASS conceptual framework includes core concepts of health, disability, determinants of health, recovery, lifecourse, and the roles of Veterans, their families, the community as well as public and private agencies. This review includes published and unpublished findings from the 2010 LASS Income Study, the 2010 Survey on Transition to Civilian Life (STCL), and the results of focus groups used in design of LASS 2013.

Results: The majority (62%) of Canadian Armed Forces (CAF) Regular Force Veterans who released during 1998-2007 had an easy transition. Regression analyses of STCL found that difficult adjustment was independently associated with army branch, members who had a rank below officer or those who had a medical,

involuntary or mid-career release. Descriptive analysis of SF-12 findings from STCL found that compared to adjusted Canadian averages, the Physical Component Summary was low and Mental Component Summary was not different. The Income Study showed that income declined the year after transition but six years after transition, income exceeded pre-release levels. In STCL 2010 regression analysis found that suicide ideation was independently associated with physical health, mental health and marital status.

Conclusions: The LASS program of research is providing an unprecedented picture of the factors that influence the well-being of CAF Veterans in transition. While much has been learned from these rich data sets, ongoing analysis is continuing to provide evidence for both programs and policies that affect populations and service providers and clinicians working with individuals and Veterans transitioning to civilian life. The longitudinal nature of LASS will provide needed clarity about factors that influence Veteran well being across the life course.

71. The Meaning of Homelessness and Migration among Homeless Aboriginal Veterans

Ray, S. L., Jensen, E. and Lavallee, L.

Western University; York University; Ryerson University

Introduction: There is limited knowledge about the experience of homelessness and migration among Aboriginal Veterans. Approximately 10 percent of the participants in the first national Canadian study on homeless Veterans identified themselves as Aboriginal Veterans who have migrated back and forth between their home communities and large urban settings. The role of “place” is a vital component of most Indigenous identities.

Methods: The objectives of this pilot project were three fold: 1) To understand the meaning of homelessness among Aboriginal Veterans; 2) To understand the meaning of urban-rural/remote circular migration among homeless Aboriginal Veterans, and 3). To test the feasibility of a Traditional Indigenous Sharing Circle with the Anishnaabe Symbol-Based Reflection as a method for data collection. A descriptive interpretative methodology was utilized to address the three objectives with a purposive sample of nine homeless Aboriginal Veterans in London, Toronto, Calgary, and Victoria. Individual interviews were conducted, audio taped, transcribed verbatim and data analysis began with the first completed interview. It was not possible to conduct the Traditional Indigenous Sharing Circle because

of the transient nature of the population. As analysis of successive transcripts proceeded, common themes among the various descriptions were noted. Data analysis proceeded until understanding of the experience of homelessness and migration among homeless Aboriginal Veterans were attained.

Results: Three major themes were identified:

1. Cultural unraveling from Aboriginal roots. All were either adopted or fostered out at a young age. All expressed strong feelings of displacement, loss, lack of belonging, lack of support and connection from their Aboriginal families/culture.

2. Running away in search of where to belong. The majority were physically beaten, emotionally abused, living in poverty and ran away from their adopted homes. All the participants joined the military at a young age as way to escape from their homes or were encouraged to join by their adopted family.

3. Searching for home and family. After being discharged /leaving the military, all the participants fell into the same pattern of moving across the county, adopting a nomadic lifestyle. Some occasionally migrated back and forth to their home reserve and some searched for their biological family/culture.

Conclusions: All the participants were part of “Sixties Scoop” whereby an estimated 20,000 Aboriginal children during the 1960s until the 1980s were fostered or adopted out to primarily white middle-class families. Policies, programs and resources will need to address the consequences of the “Sixties Scoop” among those affected homeless Aboriginal Veterans.

72. Activity Limitations in Canadian Armed Forces Veterans: 2010 Survey on Transition to Civilian Life

Thompson, J. M., Pranger, T., Sweet, J., Van Til, L., Poirier, A., McColl, M. A., MacLean, M. B., Besemann, M., Shubaly, C. and Pedlar, D.

Veterans Affairs Canada; Queen's University; Canadian Armed Forces; Dalhousie University

Introduction: In Canada and internationally Veterans are provided compensation, health and rehabilitation services and other supports to mitigate disability related to health conditions connected to military service. The 2010 Survey on Transition to Civilian Life was the first comprehensive national survey of health, disability and determinants of health of CAF Regular Force Veterans, for the first time allowing study of prevalence rates and correlates of disability in Canadian Armed Forces (CAF) Veterans including those not receiving benefits from Veterans Affairs Canada (VAC).

Methods: STCL used a nationally representative sample of 3,154 former CAF Regular Force Veterans who were released during 1998-2007. Socioeconomic/military characteristics and health/determinants of health indicators were obtained through either administrative database linkage or self-report in a computer-assisted telephone survey. Self-reported disability measures included participation and activity limitation (PAL) in various settings and need for assistance with instrumental activities of daily living (IADL). Associations of activity limitation with population characteristics and health indicators are being explored using descriptive statistics and regression modelling.

Results: Prevalence rates in Veterans of both PAL (56.1%, 95% confidence interval = 54.3-57.9%) and needing assistance with at least one ADL (17.1%, CI = 16.0-18.2%) were higher than in the Canadian population in the 2008 Canadian Community Health Survey after adjusting for age-sex differences (PAL 27.7%, CI = 27.2-28.3%; ADL need 5.3%, CI = 4.8-5.8%). Activity limitation prevalence was highest in those with older age, physical and mental health conditions, higher non-commissioned ranks, 3 or more deployments, 10-19 years of service, medical release, lower income, lower education, high stress, low social support, or widowed/separated/divorced marital status. PAL and ADL prevalence rates increased with number of health conditions to peak in those with both 3 or more physical and 1 or more mental health conditions (PAL 95.3%, ADL need 54.9%). (Regression results will be available.)

Conclusions: Activity limitations were more prevalent in Regular Force Veterans 2-12 years after release from service than in the general Canadian population. This cross-sectional study provides a useful point-in-time snapshot of disability experiences among Canadian Veterans. While it is not possible to draw conclusions about causes, the study identified subgroups of Veterans with higher activity limitation rates, and multidimensional factors associated with activity limitation. The findings support policies and programs mitigating disability in the Veteran population and will be of value to service providers and clinicians working with individual Veterans.

73. Successful Transitions - Creating a Future of Strength & Hope for Soldiers and Families

Williams, B. H.

Pacific Institute

Brief Description: Working closely with leaders with disabilities in British Columbia and Alberta, the Pacific

Institute designed and developed a new program known as Discovering the Power in Me- Creating a Future of Strength & Hope (DPM). The target populations include: persons with disabilities, family members, and continuous care providers. The 12 module, two day program delivered in small group settings with peer co-facilitators has been implemented in military and civilian settings in Canada, US, Ireland, and Australia. Academic research (UBC, U of Toronto, and U of Western Sydney) and program evaluations have been presented at two global conferences – International Forum on Disability Management (Los Angeles), and Interdependence 2012 (Vancouver).

Brief Description: The Pacific Institute has developed world class curriculum for over 42 years drawing upon the cognitive psychology and social learning research works of global thought leaders (Bandura, Seligman, Latham, et al) and translating them into lay language for ease of assimilation and implementation by target audiences in 60 countries around the world.

Clinical Outcomes: Each program implementation includes pre, post, and 3 or 6 months post quantitative/qualitative evaluations which often include measures of: locus of control, self-esteem, self-efficacy, community integration, resiliency, quality of life, transition to employment, etc. Early results will be presented with a focus on support outcomes for persons with visible and invisible disabilities (PTSD & TBI), their families, and continuous care-providers and successful transitions to community and employment.

Patient Population: The program is geared toward and includes persons with disabilities, family members, and continuous care-providers. Participants learn life skills, self-management techniques, and cognitive skills to assist them in designing and moving toward their futures. The program has been delivered in English and French languages and works best in sample size groups ranging from 10-22.

Conclusions: Based on the positive and encouraging quantitative and qualitative findings to date, I will be making recommendations for future research focused on optimal means of enhancing and sustaining early results in community integration, family supports, and successful transition to civilian employment.

7. Evolving Treatment Programs and Clinical Practices

74. The Effect of Training on Memory for Routes: An fMRI Study

Beatty, E. L., Muller-Gass, A., Wojtarowicz, D., Jobidon, M. and Vartanian, O.

Defence Research and Development Canada, Toronto

Introduction: Navigation—the process of planning, controlling or monitoring movement along a route—is an important task for members of the Canadian Forces (CF). CF Members commonly execute multiple tasks while navigating – which can result in impaired performance due to divided attention. We examined the relative efficacy of two training regimens in improving memory for routes, with an aim toward developing behavioural mnemonic aids for navigation. We also tested route memory under different levels of cognitive overload to investigate potential impairment as a function of multitasking. Outcome measures were collected in the functional magnetic resonance imaging (fMRI) scanner to assess the contribution of neural structures that underlie route memory—such as the hippocampus and the parahippocampal gyrus—to superior performance.

Methods: Members of the CF (N = 24) were presented with maps of CF Bases from across Canada. Each map included a major route and three landmarks. Participants memorized the maps under one of two conditions. Half were instructed to memorize the route while the other half were instructed to memorize the landmarks. Participants completed measures of fluid intelligence. Participants were tested the next day to determine their ability to distinguish between the studied maps and new maps under conditions of high cognitive load (HCL) and low cognitive load (LCL) while in the fMRI scanner.

Results: Firstly, we intend to quantify the effects of cognitive fatigue in the form of cognitive overload on navigation performance (i.e., route recognition). Secondly, we will test the effectiveness of training as a fatigue countermeasure for reducing the deleterious impact of cognitive overloading on navigation performance. Thirdly, we will test the degree to which fluid intelligence predicts success on this task under conditions of cognitive overload. Initial results indicate HCL conditions resulted in slower response times than LCL conditions. An interaction between cognitive load and training condition revealed that under HCL those who studied the route performed at chance while those

that studied landmarks were significantly better than chance. The fMRI data analysis is ongoing.

Conclusions: Currently, CF members selected for deployment do not study geographical maps of their destinations before departure. Therefore, this new information must be accumulated upon arrival in a distracting environment. If one of our training regimens proves superior in consolidating memory for routes, it will warrant further study toward potentially training CF members on memorizing geographical maps prior to deployment, thereby reducing the burden during the early phases of deployment.

75. Six Common Military Task Familiarization in Canadian Armed Forces Lower Extremity Amputees

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Canadian Forces Health Services & Personnel Support Programs Directorate of Fitness Human Performance Research Team

Brief Description: Replacing the 30-year-old Canadian Forces EXPRES Test, the FORCE Evaluation has been scientifically validated and developed specifically for the Canadian Armed Forces (CAF) by the Personnel Support Programs (PSP) Directorate of Fitness. Rather than testing fitness with the traditional push-ups, sit-ups, grip tests and endurance runs, the FORCE Program evaluates members' ability to execute tasks that are directly linked to true-to-life physical challenges faced on military operations.

There are six common military tasks forming the new Minimum Physical Fitness Standard for Universality of Service (UoS). They are essential, physically demanding tasks anyone in the CAF is expected to be able to perform. These tasks are derived from real operational scenarios, identified and described by military subject matter experts, which have been analyzed in terms of physical demands by the PSP Directorate of Fitness Human Performance Research Team (DFit).

In alignment with CAF priorities to facilitate, whenever possible, the re-integration of CAF members to full duties, a familiarization pilot trial involving five CAF members with lower extremity amputation was conducted in the National Capital Region (NCR) 28 March 2013. A collaborative and coordinated approach was adopted, involving interprofessional team players from Canadian Forces Health Services, DFit, The War Amps and Joint Personnel Support Unit. Findings and recommendations for future interventions will be presented.

Clinical Outcomes:

1. Six Common Military Tasks: Escape to Cover, Vehicle Extrication, Stretcher Carry, Picking and Digging, Picket and Wire Carry, and Sandbag Fortification.
2. Comprehensive High-Activity Mobility Predictor (CHAMP)
3. Prosthesis Evaluation Questionnaire (PEQ)
4. Tampa Scale for Kinesiophobia (TSK)
5. The Activities-specific Balance Confidence Scale (ABC)
6. Combat Camera Familiarization Video
7. Dartfish data collected by the PSP Directorate of Fitness Human Performance Research Team for future movement analysis.

Patient Population: All CAF members must meet Universality of Service (UoS) physical and stress factors including the requirements of being physically fit, employable and deployable. N = 5 volunteer prosthetically fitted CAF members: three above knee amputees & two below knee amputees residing within a morning's driving distance to the NCR.

Conclusions: This familiarization initiative raised important issues for consideration in the development of future guideline and policy documents surrounding the delivery of the Six Common Military Task training and testing for CAF amputees. It is imperative that all CAF members and researchers be familiar with the new Minimum Physical Fitness Standard for UoS as they pertain to ill and injured CAF members wishing to remain in service.

76. Individual Success through Empowering Peers (iSTEP): A Resiliency Program for Children who have a Parent with an Operational Stress Injury

Gillespie, H. and Popik, J.

Military Family Resource Centre, Edmonton

Brief Description: Military service members returning home with combat related physical and/or psychological injuries can leave families and children vulnerable to a variety of issues—like behavior challenges, increased caregiver burden, vicarious traumatization and mental health difficulties. As a result, an intervention program was developed, (iSTEP) and is now offered across Canada, at Military Family Resource Centres. Specifically, this 10-week program focuses on building resiliency and developing peer support for children and youth who have a parent dealing with an Operational Stress Injury. Children are supported in learning ways to cope with the unique stressors of the parental injury

by using a variety of modalities, such as drama, art, mindfulness exercises, and online blogging.

Clinical Outcomes: Since 2010, program evaluation has included a pre and post questionnaire completed by both parents and participants. The evaluation measures overall effectiveness of the program sessions in the following areas: increased knowledge and understanding of OSI's, development of problem solving skills, resiliency and support networks. Further development of outcome measures and program evaluation will be formally completed, through the completion of Helena's PhD thesis at the University of Calgary.

Patient Population: Program is open to children ages 6-16 years old who have a parent that has identified with an OSI, either military or Veteran. There is no requirement for a diagnosis. Three modules have been developed for the various age groups (6-8 yrs. 9-12 yrs and 13-16 yrs). Intake is completed by a trained iSTEP facilitator. Exclusion criteria: The parent has not yet formally recognized the OSI within the family, the child presents with a serious mental health concern requiring immediate one-one intervention. The program is not designed as treatment for specific mental health diagnosis for children.

Conclusions: iSTEP program is unique to military families as it has been developed to address the gap of specialized support services for families of the ill and injured. Future research is required to determine the effectiveness of the program and strengthen the quality of this service for military families. Educating other community mental health providers working with the Veteran population is essential to reducing barriers for families seeking support for dealing with the impact of service related injuries. Since the national launch of iSTEP in March 2013 in Ottawa, sixty mental health professionals from Military Family Resource Centre's have been trained in facilitating the program, which will allow for an annual review of the program's ability to be adapted to other military communities.

77. Novel Highly Portable Blood Salvage Technique for Blood Conservation in Trauma and Other Clinical Procedures

Gourlay, T.

University of Strathclyde

Introduction: A new haemoconcentration device that utilises a novel concentration modality has been developed through collaboration between the University of Strathclyde and the medical device manufacturer Brightwake Ltd (Nottingham, UK). This device was de-

veloped in response to an expressed need for a versatile, portable and effective haemoconcentrator with a small clinical footprint. The HemoSep™ device that emerged from this collaboration meets these demands and has been tested in the clinical cardiac surgical setting. New developments of this technology renders it suitable for major trauma applications, where it's portability, simplicity and small footprint are of real importance. In this present study the effectiveness of the HemoSep™ haemoconcentrator was evaluated in terms of its performance characteristics and effectiveness in processing blood salvaged during open-heart surgery for subsequent re-transfusion.

Methods: The HemoSep™ device consists of a blood bag with a concentration compartment, and an agitator that accelerates the concentration process. In this regard the device can be considered to be passive in nature, in contrast to alternative technologies that rely on centrifuge and pumping technologies for blood processing. Although not yet employed in the trauma setting, HemoSep™ was employed to concentrate blood by removing the fluid component of blood left in the heart/lung machine at the end of open-heart surgical procedures. In this study 102 patients were prospectively randomised into two patient groups, group 1 (n=50) in which no blood processing was deployed and group 2 (n=52) in which the HemoSep device was employed as a haemoconcentrator.

Results: In this study the mean volume of blood processed was 775+/-125ml. The efficacy of the device was confirmed by the percentage increase in hematocrit over the processing period from 21% - 39%. There was an increase in all blood cell species associated with the use of the HemoSep™ device. Serum albumin and Factor VII increased more than 3 fold at termination of processing when compared to baseline levels. Patients receiving processed blood had significantly less need for allogenic transfusion and were associated with lower levels of post-operative bleeding.

Conclusions: The HemoSep™ device functions as designed without technical failure and offers a complementary technique in blood management. Although not yet trialled in the trauma setting, the simplicity, small footprint and portability of the HemoSep™ device suggest that it will lend itself very well to this application. Future investigations with HemoSep™ will include such alternative applications for the technology, including its deployment in orthopaedic and emergency procedures.

78. A New Active Treatment to Ensure that CF Members Reach the Highest Possible Operational Level of Physical Function after an Injury: The Reactivation Program (RAP)

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Canadian Forces Health Services, Centre for Interdisciplinary Research in Rehabilitation and Social Integration; Laval University

Introduction: During their rehabilitation, CF members typically recover to perform activities of daily living, and the vast majority quickly returns to their pre-injury status. However, this is insufficient in some high training units, as their soldiers still require significant rehabilitation and conditioning to achieve unit functionality. Overuse, military training injuries, and re-injury commonly develop due to a member's rehab/fitness level being below military operational requirements. The Reactivation Program (RAP) designed at CFB Petawawa was created to fill this gap and offer a continuum of care to safely return the injured soldier back to their regular operational unit fitness training.

Methods: The RAP, coordinated by a Physiotherapist (PT) assisted by a Physical Exercise Specialist (PES) and a Physiotherapy Assistant (PTA), runs 5 days a week with 3 sessions each morning. For each eligible participant, a DND PT completes a detailed assessment, and impairments are identified. To be admitted, a series of criteria addressing pain, tolerance to exercises, inflammation and joint motion as well as personal motivation must be met. The sessions are loaded with patients of similar pathology whenever possible. The program ranges between 4 and 16 weeks based on members initial fitness status and discharge goals, and it includes a variety of exercises such as running, ruck-sack march, low-impact cardio, spin class, core stability and balance training, and resistance/agility/flexibility, and pool training.

Results: From 2009 to 2012, 333 CF members participated to the RAP. A total of 265 (79.6%) CF members successfully completed the program (fit for full duties) while 17 (5.1%) were non-compliant, and 52 (15.6%) no longer met criteria. At follow-up for these 4 years, for a response rate of 57 to 100% (3 months) and 42.6 to 100% (12 months), the number of re-injury/new injury at 3 and 12 months was 0-7/1-8 and 1-2/2-10, respectively. For the 2012 cohort (n=108), the successful soldiers (82.4%) have shown statistical improvement of the following clinical outcome measures ($p < 0.001$ for all; $p < 0.05$ for chin ups)(pre/post): Sorensens test (87.4/114.0), push ups (24.0/29.4), wall squats

(87.3sec/123.2sec), chin ups (4.4/6.1), right (41.9/54.4) and left (42.5/54.0) calf raise, right (54.3/78.7) and left (53.7/80.0) side plank, and 1 Km pace (362.1sec/313.3sec).

Conclusions: The RAP was designed to ensure that CF members reach the highest possible deployable/operational level after an injury. The program met this objective and moreover, the number of re-injury of the soldiers who participated to the RAP was very low.

79. Solution-focused Conversations: Promoting Resiliency, Recovery and Post-Traumatic Growth

Irwin, T., Warner, R., Castel, B. and Darte, M.

Canadian Armed Forces Base, Kingston

Brief Description: Historically, there have been three generally accepted outcomes of Post-traumatic Stress disorders: death – frequently with alcohol and/or substance abuse as significant contributing factors; partial recovery with impairments; and full recovery - a return to baseline situation. There is now an increasing recognition of a fourth outcome: Post-Traumatic Growth (PTG) where individuals experience a positive transformation in their life as an end result of their struggle with adversity. Tedeschi and Calhoun (1996) have identified five important growth factors instrumental in providing improved situations among sufferers: an improvement in relationships; an increase in appreciation of life; a new sense and awareness of increased strength; a re-evaluation of possible new career directions; and, a rediscovery of spiritual understanding. Solution-focused conversations are uniquely effective in helping individuals identify and build upon these areas of growth since the focus is upon strengths, potential and the future rather than trauma, disorder and the past.

Clinical Outcomes: Most recent references: Solution-Focused Brief Therapy; A Handbook of Evidence-Based Practice (2012). Franklin, Trepper, Gingerich, McCollum, editors (2012). Oxford University Press. The Posttraumatic Growth Inventory: Measuring the Positive Legacy of Trauma. Tedeschi & Calhoun. (1996). Journal of Traumatic Stress, 9, 455-471. Trauma, Recover, and Growth; Positive Psychological Perspectives on Positive Traumatic Growth. Joseph, S., Linley, A. (2008). John Wiley. Comprehensive Soldier Fitness and the Future of Psychology. American Psychologist (2011), Vol. 66, No 1. To date the largest testing of PTG is the Comprehensive Soldier Fitness program - the largest workplace wellness intervention ever undertaken

ing involving over 1 million military personnel (<http://csf.army.mil>).

Patient Population: The focus of this presentation is on our more recent psycho-educational interventions at CFB Kingston working with family members, Operational Stress Injury Social Support (OSISS) peer supporters and other non-mental health staff. This work, including conducting the first PTG treatment group, has revealed positive outcomes. The two most common changes noticed were increased appreciation of the value (and fragility) of life and the importance of family.

Conclusions: The clinical outcomes of solution-focused conversations have been positive. A distinct advantage of the solution-focused conversation model in promoting PTG is that it does not explore or seek to diagnose mental health symptoms – the domain of medical professionals and psychotherapists – and is therefore a highly effective and safe skill that can be developed and employed across a wide spectrum of helpers with a relatively minimal expenditure of resources.

80. Evaluating the Implementation of a Community-based Veterans Outreach and Early Intervention Program

Nissly, J., Campbell, S. and Adamson, T. G.

University of Southern California

Introduction: During the process of reintegration into civilian life, Veterans must simultaneously navigate new bureaucracies, adjust to civilian culture, and transition back into home environments while learning to cope with any service-related psychological and physical challenges they may be experiencing. Outside the Wire, implemented in 2011, is an outreach and early intervention program designed to reach Veterans and their families where they are, offering mental health care and linkage to other needed services as they adjust and transition back to civilian life. This presentation will discuss the formative evaluation of Outside the Wire, summarizing its findings and their implications.

Methods: A mixed-methods formative evaluation was undertaken to develop an understanding of: 1) the program's implementation process, 2) the individuals receiving services and their particular needs, 3) program outputs and early participant outcomes, and 4) key stakeholder perceptions. Program-level data were tracked for 1256 service members, Veterans and family members served through educational briefings, distribution of referral materials, and provision of mental

health services. Individual-level data, including psychosocial history, mental health screens, and areas of concern, were collected for 64 Veterans and family members who participated in behavioral health counseling. MHI-5 (Berwick et al., 1991) and CAGE (Ewing, 1984) screening tools were completed for those agreeing to participate in ongoing counseling.

Results: Of the 341 distinct program encounters for which data were tracked, 287 (71%) were for mental health services. More than half (55%) of the individuals receiving services had been referred by word-of-mouth from a previous OTW service recipient. The most commonly-reported areas of concern during counseling intake (n=64) were: emotional health (n=58; 91%), social/family/relationships (n=38; 59%), school (n=26; 41%), and employment (n=24; 38%). Baseline MHI-5 scores (n=33) indicated that 55% (n=18) of the individuals involved in ongoing counseling were in the distress range. Over one-third (n=11) of those completing the CAGE screen (n=30) met criteria suggesting the presence of an alcohol problem. Post-service screening data are pending collection.

Conclusions: Evaluation findings are being used to further refine program implementation and inform areas for development of additional services, as well as to suggest additional data that should be collected in the future. Findings speak to the occurrence of the adjustment issues for which additional support may be beneficial and support the necessity of programs such as OTW in reaching community-dwelling Veterans. Additional, summative evaluation is needed to more directly address participant outcomes.

81. Cervico-vestibular Physiotherapy in the Treatment of Individuals with Persistent Symptoms following Sport Related Concussion: A Randomized Controlled Trial

Schneider, K. J., Meeuwisse, W. H., Nettel-Aguirre, A., Barlow, K., Boyd, L., Kang, J. and Emery, C. A.

University of Calgary; University of British Columbia Hospital; University of British Columbia

Introduction: Concussion is a common injury in sport. Most individuals recover in 7-10 days but some have persistent symptoms affecting their daily activities and sport participation. There is a paucity of evidence evaluating the efficacy of treatment following concussion.

The objective of this study was to determine if a combination of vestibular rehabilitation and orthopaedic physiotherapy decreased the time until medical clearance to return to play in individuals with prolonged

post-concussion symptoms of dizziness, neck pain and/or headaches when compared with a control group of rest, education and graded exertion.

Methods: Thirty-one participants (12-30 years) who attended the University of Calgary Sport Medicine Centre for a sport related concussion and had persistent symptoms of dizziness, neck pain and/or headaches were included in this study. Participants were randomly allocated to a treatment group (i.e., multimodal physiotherapy including vestibular rehabilitation, manual therapy, neuromotor and sensorimotor retraining exercises) or a control group (i.e., rest followed by gradual exertion). Participants in both groups were seen by the study treating physiotherapist once weekly for eight weeks or until the time of medical clearance. The primary outcome of interest was time of medical clearance to return to sport. A sport medicine physician who was blinded to treatment group determined time to medical clearance.

Results: One of 14 subjects (7.1%) in the control group and 11 of 15 subjects (73.3%) in the treatment group were medically cleared to return to sport at eight weeks. The participants in the treatment group were 10.27 (95% Confidence Interval; 1.51, 69.55) times more likely to be medically cleared to return to sport before eight weeks than the participants in the control group ($p < 0.001$).

Conclusions: Participants who received multimodal physiotherapy treatment were more likely to achieve medical clearance before eight weeks when compared with rest in individuals with persistent symptoms following an SRC.

82. Treatment for Depression following Traumatic Brain Injury: Patient and Caregiver Preferences

Topolovec-Vranic, J., Michalak, A., Ennis, N., Johnson, P., Ouchterlony, D., Cusimano, M. D., Bhalerao, S. and Masanic, C.

St. Michael's Hospital; University of Toronto; Toronto Rehabilitation Institute, University Health Network

Introduction: Depression is a frequently reported mental health concern for Veterans with TBI. Family caregivers of TBI survivors are also at an increased risk for depression. Unfortunately, many TBI survivors and their family members do not receive adequate mental health treatment. Internet delivered interventions for depression have been shown to be effective in the general population. However, no technology-based tool currently exists to meet the specific needs of patients with TBI and their family caregivers. A series of

workshops were held to determine how a technology-based intervention could be adapted for this population.

Methods: Thirty-five civilian patients and caregivers who had experienced depression following their own or their loved one's injury attended one of four half-day workshops at a large tertiary trauma center. Each session was audio-recorded and transcribed. Each workshop began with a presentation about depression, depression after TBI and therapies for depression, including those delivered via the internet. Workshop discussions focused on the barriers to accessing traditional mental healthcare for persons with TBI, assessments of existing online mental healthcare tools, and the specific needs that should be considered in tailoring a technology-delivered mental health intervention for survivors of TBI.

Results: In addition to common barriers such as geographic distance and long wait times, patients with TBI experience difficulties with anxiety associated with motor vehicles, accessing insurance and disclosure that act to further deter them from accessing conventional mental healthcare. Patients with TBI also experience loss of skill sets and cognitive impairments that hinder their ability to participate in and benefit from both conventional therapies and existing online mental healthcare tools. Factors such as fatigue, reduced attention and cognitive capacity, reduced visual acuity and difficulty reading and writing are important to consider in developing a technology-delivered intervention for patients with TBI.

Conclusions: The recommendations made by patients and their caregivers will help to inform future developments in mental health treatment for both civilians and Veterans with TBI and their families. The design and content of such therapies will need to be tailored to accommodate the various neurocognitive and physical impairments that patients struggle with following TBI.

8. Poster Presentations

83. Creating 'Presence' During Military Separations: The Role of Communications Technology in the Social Well-being of Military Members and their Families

Atwood, K.

University of Calgary

Introduction: Although numerous psychological studies of family resilience exist, few studies focus on the everyday lived experiences of military personnel and their families during separation. Multiple technologies exist

that families and military members can use to stay in touch during such separations, and regular communications can contribute to family stability and resilience during deployment. The purpose of this study is to explore the effects of communications technology on military members' abilities to create a sense of presence with their families that enables them to maintain intimacy and connection while on operations away from home.

Methods: Qualitative interviews were conducted with military service personnel, their families, and persons employed in social services capacities (e.g., workers at Military Family Resource Centres). Hour-long interviews focused on participants' access to and use of communications technology and the effort they put into maintaining a sense of connectedness during separations due to military service, as well as the value they derived from being able to communicate while apart. Preliminary findings will be related from the first phase of the project incorporating interviews with 19 participants, including military members, MFRC staff, spouses, and children. Additional results from ongoing recruitment throughout the summer of 2013 may also be incorporated.

Results: Regular and reliable access to communications technology (mainly telephone and email) enables families to maintain certain forms of closeness that are supportive, but they must put some effort into managing these connections. Despite this additional effort, families generally report communication as valuable; members note some difficulties with 'switching gears' from an operational focus to a focus on family life. Participants reported a number of creative methods of staying in touch and this creativity was a source of pride and strength for families and members. Finally, participants reported considerable variation in their ability to access particular technologies, based on their branch of service, their trade or position, the nature of the separation, and individual factors. This was problematic since there was often a lack of recognition around external factors affecting access, leading to unfair comparisons when families sought social support from each other.

Conclusions: Although the research is preliminary, initial findings suggest that educating families on the aspects of military service that may affect communications may be useful in helping them manage their expectations. As well, encouraging families to consider ahead of time how they will communicate during separations can help them cultivate creativity and maintain a sense of presence-at-a-distance.

84. Surgical and Medical Mentorship in Afghanistan: How are Military Surgical and Medical Mentors Perceived by Afghani Physicians?

Beckett, A., Fowler, R., Adikhari, N., Harlyluck, L. and Tien, H.

Canadian Forces Health Services; Canadian Field Hospital, Petawawa; University of Toronto

Introduction: Much has been written about the experiences of first world physicians mentoring in low resource environments in the developed world. However, not much is known about what mentees think about their first world mentors.

We had the opportunity to explore this question in an Afghan Army Hospital, which we believe is the first time this has been studied.

Methods: We created a culturally appropriate 19-question 5-point Likert score survey translated into the local Afghan language. The survey questions were based on domains of Royal College of Physicians and Surgeons of Canada's, Can MEDS criteria.

Results: The survey response rate was 85% (34/40). The respondents consisted of 13 physicians and 21 Afghan nurses and other health care professionals. Overall, most of the Afghan health care workers felt that working with first world mentors was a positive experience (3.97/5). However, respondents indicated that first world mentors were reliant on medical technology for diagnosis (4.5/5) and failed to consider limited resources available in Afghanistan.

Conclusions: The overall impression of ANA health care providers was that first world mentors are perceived as appropriate and helpful. Can MEDS can be used as technique to evaluate mentors in low resource environments.

85. JPSU Return to Work Trial - CFB Edmonton

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Canadian Forces Health Services

Brief Description: The Joint Personnel Support Unit (JPSU) includes a Support Section which aids members with Return to Work (RTW). Currently, national JPSU RTW rates are <5%. A lack of coordinated care has led to an incomplete RTW plan that does not respect all the necessary aspects and variables that affect a successful RTW.

A coordinated RTW trial was designed using the World Health Organization's (WHO) International Classification of Functioning, Disability and Health (ICF). Practic-

es of the past included CFHS primary care personnel providing a diagnosis and physiotherapy and mental health treated body structure and function with a goal to affect activities. An interprofessional approach to deal with environmental barriers and personal factors related to participation (return to work) did not exist. A standardized RTW exercise program allowing the members to adapt their involved tissues to the forces necessary to ensure a successful RTW was also lacking. A new interprofessional process has evolved in Edmonton, known as the Return to Force (RTFORCE) Program involving the following key partners from JPSU RTW, CFHS and Personnel Support Program (PSP): (1) JPSU Support Section, (2) Case Management (CM), (3) Occupational Therapy (OT), (4) Physiotherapy (PT), (5) Regional Adaptive Fitness Specialist (RAFS).

Clinical Outcomes: Each member of the team uses specific inclusion and exclusion criteria to select the appropriate members for involvement in the RTW trial. OT, PT and RAFS have baseline test/retest measures that include: (1) Occupational Disability Index (ODI), (2) SF-36 Health Survey, (3) Workplace Expectations Scale, (4) Canadian Measure of Occupational Performance and Engagement (CMOP-E), (5) Fear of Daily Activities Survey, (6) P4 Pain Scale, (7) Selective Functional Movement Assessment (SFMA), (8) Rockport Walk Test, (9) Grip Test. The overall outcome measure is the successful completion of the Fitness for Operational Requirements of Canadian Armed Forces (CAF) Employment (FORCE) test and successful RTW.

Patient Population: CAF personnel attached to JPSU Support Section who are attempting RTW to a CAF trade. Inclusion/exclusion criteria established at each selection level (Unit/CM/PT/OT/RAFS).

Conclusions: This initiative raises important recommendations for the improvement of existing local practices and the development of future guidelines and policies surrounding the delivery of RTW services to CAF members. A second trial, based upon findings identified in Trial 1 are currently being applied and being monitored for effectiveness. The goal is to be able to create a program that can be shared with other bases and act as a national CAF template for RTW.

86. Lower Back Injuries in Personnel Deployed to Afghanistan: Diagnostic and Prognostic Considerations

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Department of National Defence, Canadian Forces Health Services

Introduction: Early detection of poor short-term prognosis is essential to maintaining effective fighting forces in an operational theatre. In the general population, derangement syndrome and centralization as described by Robin McKenzie are frequently observed and often associated with a good prognosis. Limited data exist, however, on the characteristics of lumbar spine disorders for deployed personnel. This population is exposed to higher loading factors than the general population and consequently, their injury profile may differ significantly. Therefore, the goals of the present study were to evaluate the profile of lumbar spine disorders in deployed personnel and to assess the usefulness of centralization to predict the ability of injured personnel to remain in theatre. It was hypothesized that, if centralization is a good outcome predictor, no centralizer will be repatriated.

Methods: The design of the study was deliberately pragmatic in order to reflect clinical reality of deployed therapists. Data of seventy-four consecutive patients referred to the physiotherapy department of the Role 3 Hospital in Kandahar, Afghanistan, were collected prospectively. Patients with or without lower extremity symptoms and neurological findings received a standard McKenzie assessment and were classified into diagnostic subgroups. Information on pain intensity, functional status (Roland-Morris Disability Questionnaire), neurological findings, centralization, directional preference, presence of acute deformity and pain below the knee was analyzed to determine usefulness as outcome predictors for repatriation.

Results: Derangement syndrome was diagnosed in 52 (70.3%) patients. Seven patients (9.5%) were classified as irreducible derangements. Centralization was observed in 50 (67.6%) patients. Although the majority of patients centralized their pain with extension, a considerably larger portion than observed in the general population responded favorably to flexion procedures (32.7% vs 7.0%). Eleven (14.9%) patients were repatriated. Pain levels and disability scores were significantly higher in repatriated patients (7.4/10 and 14.9/24 vs 5.6/10 and 9.8/24). Centralization and directional preference only occurred in one repatriation.

Conclusions: While the injury profile of deployed personnel is comparable to that of the general population, the proportion of flexion responders is considerably higher in the present study. Although no information with respect to potential causes of back disorders was gathered, it is conceivable that the heavy loads deployed soldiers are exposed to may increase loading of posterior elements and lead to different stress profiles

than those observed in the general population. Both, directional preference and centralization were useful outcome predictors to identify those patients who were able to complete their tour of duty.

87. Comparing Treatment Outcomes among Military and Civilian Substance Users Who Completed Residential Addiction Treatment

Gavrysh, I., Arbour, S. and Hambley, J. M.*

Bellwood Health Services

Introduction: Research has revealed that substance abuse problems are not uncommon in the military. Evidence suggests that although drug use in military members has been on the decline, alcohol abuse continues to be comparable to that of the general population (Bray et al., 2010; Ramchand et al., 2011). Unique work-related stressors as well as social norms surrounding drinking might be facilitators of alcohol consumption. Given the distinctive occupational and cultural features of the military, it may of interest to examine the manner in which military members respond to addiction treatment. The purpose of the present study is to compare addiction treatment outcomes among military members and civilians attending the same treatment program. If significant differences in outcome are observed, such that military members do not report the same levels of substance use and quality of life improvement, then it is important to explore the implication that military members with addiction have unique treatment needs.

Methods: Participants included 64 members of the Canadian Forces and Veterans Affairs Canada and 360 civilians (N=424) who attended the same residential addiction treatment at Bellwood Health Services. Clients indicated their patterns of substance use and quality of life using the Behaviour and Symptom Identification Checklist (BASIS-32; Eisen, Dill & Brob, 1994) during their first week in treatment and at 6-months post-treatment.

Results: Overall, participants reported significant reductions in alcohol and drug use as well as significant improvements in quality of life at post-treatment. Both military and non-military participants reported comparable reductions in drinking days and number of drinks per day. In terms of drug consumption, military participants reported significantly less drug use both at pre and post-treatment. In terms of quality of life, non-military participants reported greater perceived difficulty with relation to self/others, daily living and impulsive/addictive behavior compared to military partici-

pants. There were no differences between the two groups in terms of depression/anxiety and psychosis.

Conclusions: The treatment program had an overall positive impact on participants' substance use and quality of life. Substance use characteristics of the two groups are consistent with the previous findings that members of the military experience lower rates of drug abuse and comparable rates of alcohol abuse as the civilian population. The current study demonstrates that upon successful integration into the general therapeutic community, a comprehensive holistic treatment program can successfully treat substance use disorder in members of the Canadian Forces and Veterans Affairs.

88. Low Back Pain in the Canadian Armed Forces: The Association of Pain-related Fear and Healthcare Utilization at Canadian Forces Base Halifax

Glover, S., Hayden, J., Harman, K. and Flowerdew, G.

Dalhousie University

Introduction: Low back pain (LBP) is the most prevalent form of musculoskeletal pain and is now the leading cause of disability internationally. It is a significant socioeconomic issue that appears to be increasing despite vast improvements in diagnostic techniques and choice of interventions. In the Canadian Armed Forces, LBP has a considerable impact on operational readiness due to a decreased ability of its members to exercise, failed annual fitness tests, modified duty status, inability to deploy, and medical releases.

Psychosocial factors are identified as important predictors of poor outcome with LBP interventions, and in the progression to chronic pain. One focus of research is the fear-avoidance model and its influence on LBP outcomes. The fear-avoidance model posits that fear of movement/re-injury leads to hypervigilance and avoidance behaviour, which may act as a barrier to one's recovery. Pain-related fear has been found to be associated with greater perceived disability, more frequent recurrence of care seeking, and increased duration of presenting symptoms in working populations. Additionally, it has been shown to be predictive of subsequent modified duty status among military personnel in other nations. Despite the growing amount of research supporting this model, many clinicians often do not address patients' beliefs during assessment or treatment.

Methods: The primary objective of this study is to investigate whether pain-related fear is associated with healthcare seeking in Canadian Armed Forces members

with recurrent or chronic LBP. The second objective is to explore the relationship between known prognostic factors and the extent of healthcare utilization in this population. Examples of these are previous history of LBP, previous treatment for LBP, level of disability, educational status, history of leg pain, compensation issues, and job description. The sample consists of 371 members from Canadian Forces Base Halifax who attended a physiotherapy-led Low Back Rehabilitation Program from 2007-2012.

We will use proportional hazards analysis to compare time to re-referral to rehabilitative services between participants with high and low fear of (re)injury, with and without adjustment for known prognostic factors. We will also use negative binomial regression to examine the relationship between fear of movement/(re)injury, other known prognostic factors and number of healthcare visits (physiotherapy and/or chiropractic) over the follow up period.

Results: This study is in the data analysis phase. The results will be presented in November.

Conclusions: This research will address a gap in the literature of musculoskeletal conditions and health service utilization in the Canadian military population.

89. Low Load Cervical/Shoulder Exercise Program for RCAF Helicopter Aircrew - A Novel Standardized Protocol to Reduce Neck Pain, Impairments and Functional Limitations

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Introduction: Neck pain in military aircrew is recognized as a significant cause of functional limitation and restriction. In modern air forces, a prevalence of neck pain in the range of 57% to 84% has been reported in helicopter aircrew, and preventive strategies have started to be investigated for this population. Ang et al. have conducted a randomized clinical trial (RCT) in which they have shown that the use of a supervised neck/shoulder exercise regimen was effective in reducing neck pain cases in air force helicopter pilots of the Swedish armed forces. Based on Ang's protocol, the

purpose of this study is to evaluate the efficacy of functional and low load cervical/shoulder exercise program on neck pain, impairments and functional limitations in RCAF helicopter aircrew using a single-blind RCT design.

Methods: Air force helicopter pilots and flight engineers recruited at CFB Valcartier and Gagetown will be randomly assigned to one of two groups: one group (Exercise group) will receive an 8-week neck/shoulder exercise regimen based on Ang et al. (n=34), and the second group (Control group) will continue their normal physical training (n=34). Primary outcome, evaluated at baseline, 6- and 12-months, will be the prevalence of neck pain cases. Secondary outcomes include self-reported neck pain related disability, neck muscles strength and endurance, and cervicothoracic active mobility. Logistic regression will be used to examine the effect of group on change in the prevalence of neck-pain cases at 6- and 12-months, while a mixed-model ANOVA will be used to analyze the effects of the exercise regimen on the secondary outcomes.

Results: The scientific rationale with regard to what we expect from such a new training approach to reduce the prevalence of neck pain cases will be presented, as well as the characteristics of the protocol including preliminary data showing psychometric qualities. With specific standardized low load cervical/shoulder training, RCAF aircrew may be able to modify the recruitment pattern and motor control of deep and superficial neck/shoulder muscles activity. This should lead to a reduction of self-reported neck functional limitations and restriction associated to changes of both neck muscle strength and endurance.

Conclusions: This project will lead to the validation of a specific neuromuscular training exercise protocol and its impact on neck pain and health status in RCAF aircrew. Results of this study may help to implement realistic specific prevention strategies and lead to a healthier and more effective operational aviation community.

90. Exploring Alternate Treatments for Complex Regional Pain Syndrome

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Brief Description: Complex Regional Pain Syndrome (CRPS) is a complex pain condition characterized by autonomic, sensory and vasomotor symptoms, which appear regionally. The scientific literature recommends the use of Graded Motor Imagery (GMI) as the only

successful treatment for CRPS. However, not all patients respond to GMI.

fMRI research around the pathophysiology and treatment of Complex Regional Pain Syndrome (CRPS) has demonstrated neuroplastic changes in the central nervous system (CNS) particularly the somatosensory areas as well as changes in the limbic system and amygdale regions. (Maihofner C. , Handwerker, Neundorfer, & Birklein, 2003; Pleger, et al., 2006; de Mos, Sturkenboom, & Huygen, 2009)

Our clinicians have observed that activities that do not require conscious thought such as shuffling cards or skipping are successful at creating pain free movement once patients have achieved some laterality recognition as part of GMI but still are experiencing significant pain and dysfunction. These automatic motor skills belong to procedural memory, which are believed to be largely found in the cerebellum. They are resistant to extinction. Exploring the use of procedural memory which recalls skills or habits within non-conscious memory (Lundy-Ekman, 2007; Van Opstal, Gevers, Osman, & Verguts, 2010; Reed, McLeod, & Dienes, 2010) may be another viable treatment. A virtual reality system can stimulate reaching as a reflexive non-conscious task. A pilot case study was done looking at use of the virtual reality system to stimulate reaching as a reflexive non-conscious task to promote non-painful movement and remodeling of the negative neuroplastic changes.

Clinical Outcomes: The focus of treatment in CRPS is to remodel the neuroplastic CNS changes and restore function. This pilot used two-point discrimination, the Numerical Pain Rating Scale, the Disabilities of the Arm Shoulder and Hand outcome tool, body schema maps and laterality recognition scores in order to demonstrate that remodeling was occurring and function was improving. Results demonstrated improvement in pain, function and body maps.

Patient Population: This presentation will present the results of a treatment case study pilot for CRPS patients. The patient had a diagnosis of upper extremity CRPS-1 with no known comorbidities. The patient is an adult female in their late forties.

Conclusions: The results of the initial pilot were promising enough to merit exploring the following research question: "Will procedural memory tasks performed in a virtual reality environment reorganize the neuroplastic changes that have occurred in the CNS thus reducing symptoms and disability in adults with CRPS?"

91. User Evaluation Trial of Lower Limb Prosthetic Devices

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Canadian Forces Environmental Medicine Establishment; Canadian Forces Health Services, Directorate Medical Policy; Canadian Forces Morale and Welfare Services – Personnel Support Programs, Directorate of Fitness, Human Performance Research Team

Introduction: This trial aims to evaluate the potential benefits to CAF (Canadian Armed Forces) amputees that may be offered by two new lower limb prosthetic devices (Ottobock Genium X3 and iWalk BiOM). Military amputees commonly demonstrate a high level of motivation for return to demanding physical activities and vocations. This trial aims to assess whether these more technologically advanced prostheses could enhance the abilities of these CAF members to pursue these goals.

Methods: Six participants will be selected from a pool of CAF members with lower limb amputations as identified by the CF Physical Rehabilitation Program. This is a crossover, user evaluation trial with the independent variable being the prosthetic device (Genium X3 or iWalk). The primary outcome measure will be the participant's physical fitness results as measured by challenging the CAF Common Military Task Fitness Evaluation (CMTFE). Secondly, this study will assess, through performance and preference testing, participant's mobility, balance, perceived energy expenditure, comfort, ease of use, and overall satisfaction.

Results: Trial date is set for 8-12 September 2013. Analysis of results is expected to be completed by October 2013.

Conclusions: Conclusions are expected to be available by early November 2013.

92. Effects of 12 Weeks of DFit.ca Fitness Training on the Performance of CAF Personnel on the FORCE Evaluation and the Common Military Tasks Fitness Evaluation

Laframboise, J. and Stockbrugger, B.

Canadian Forces Morale and Welfare Services

Introduction: December 2012, Armed Forces Council accepted the FORCE evaluation (FE) as the new annual physical fitness evaluation and the new Common Military Task Fitness Evaluation (CMTFE) to assess the physical fitness requirements for Universality of Service. The CMTFE includes the following task simula-

tions: stretcher carry, casualty extrication, picket and wire carry, picking and digging, sandbag fortification and escape to cover. The FE includes: intermittent loaded shuttles, 20-metre rushes, sandbag lift and sandbag drag.

With the adoption of a fitness standard, it is important to demonstrate that the required fitness is achievable through training. Therefore, concurrent to the development of the new FE and CMTFE, a new online self-directed fitness training website, DFit.ca, was developed to provide operationally relevant fitness training to all CAF members. In addition, one of the main purposes of DFit.ca is to provide training programs which will prepare CAF members for successful completion of the new FE and the new CMTFE. It is important to show the leadership that using a training tool such as DFit.ca can be used as one approach to meet the 'duty to accommodate' requirement as set out by the Canadian Human Rights Act (CHRA) (1982).

Methods: Twenty-two CAF members (9 males, 13 females, mean age=44, SD=7) self-identified as either not participating in regular fitness training or being concerned with passing the requirements of the new FE. In order to obtain a true baseline score the participants were asked to perform the CMTFE and the FE three times each prior to beginning the 12 weeks of DFit.ca training. Performance was also evaluated with the FE during weeks 4 and 8 of training. Upon completion of the 12th week of training, performance will be retested again with the FE and the CMTFE. Fitness training was generated with DFit.ca by selecting a 'Domestic' Operation and 5 days/week program option including sports.

Results: This project will be completed September 2013. Pilot research revealed trends towards improvements in performance after 4 weeks of training using a similar DFit.ca program. It is anticipated that greater changes in performance will occur after 12 weeks of training.

Conclusions: The results of this project will be used to guide members in their preparation for meeting the fitness standard. Furthermore, it seeks to demonstrate that the DFit.ca programming can provide the training support required for CAF members to meet U of S and achieve higher levels of operational fitness.

93. Acute and Brief Combined Treatment Intervention following Mild Traumatic Brain Injury

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Brief Description: Studies have demonstrated that some soldiers and Veterans with mild traumatic brain injury (mTBI) have prolonged post-concussive symptoms (PCS) periods. For soldiers or civilians, the effects of a TBI linger in about 15% of cases. The aim of the study was to assess the outcome of mTBI patients who have benefited from an acute and brief intervention that contains information, reassurance, compensatory techniques and restorative training specifically for sleep impairments, anxiety-stress, attention and memory difficulties. A sleep medication (amytriptiline) or a psychostimulant (methylphenidate) were also administered as needed.

Clinical Outcomes: Symptoms assessment was performed using the Rivermead Post-Concussion Questionnaire. Outcome measures include the Extended Glasgow Outcome Scale (GOS-E): an ordinal rating of global outcome. Scores of 0 or 1 correspond to good recovery and scores of 2 or 3 indicate moderate disability (independent but physically or cognitively disabled). Another outcome variable considered was discharge destination (home without or with outpatient rehabilitation and referral to psychiatry/psychology). Finally, the number of days before returning to work was also collected.

The acute interventions had a significant success rate. A significant decrease of headaches, dizziness, noise sensitivity, fatigue, memory and concentration problems and slowness was reported ($p < 0.05$). At the end of the program, the GOS-E was assessed at 0 for 55% of the sample, 1 for 39% of the sample and 2 for 6% of the sample. Ninety-one percent were transferred to their home, 4% to a rehabilitation center and 5% to a psychiatric facility. The mean number of days (\pm SD) subjects were in the program was 57.88 ± 44.89 .

Patient Population: A total of 258 patients diagnosed with mTBI who presented with cognitive, psychological or physical PCS were referred to the ambulatory outpatient clinic from the emergency department. The average age (\pm SD) at time of trauma was 38.16 (SD 15.19). The initial GCS score was 13 for 5% of the sample, 14 for 24% of the sample and 15 for 71% of the sample.

Conclusions: To conclude, results of this exploratory study on an acute and brief integrative treatment show that it would be useful, affordable and within easy reach to a restricted treating team or health care provider who work in military field facilities. These interventions would help soldiers recover by decreasing the PCS symptoms, improving outcome and reduce the delay of redeployment.

94. Pilot Study on Perceptions of Risks and Testing for Sexually Transmitted Infections (STIs) in the Canadian Armed Forces

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Director General Military Personnel Research and Analysis, Department of National Defence; Directorate of Force Health Protection

Introduction: Sexually transmitted infections (STIs) present a significant health burden in the military environment (Korzeniewski, 2012). Prevention of STIs is challenging, though approaches such as secondary prevention in the primary care setting (e.g., screening) have demonstrable effectiveness (Sarbu, 2012). The civilian literature has identified barriers to prevention, both for health care providers (e.g., lack of time to counsel patients; Mark et al., 2008) and for patients (e.g., STI-related stigma; Goldenberg et al., 2008). The aim of this study was to identify whether barriers exist to the secondary prevention of STIs in the Canadian military context.

Methods: Semi-structured interviews were conducted with health care providers (n = 12) and Canadian Armed Forces (CAF) personnel (n = 9) at a CAF base. Health care providers included physicians, nurses, preventive medicine technicians, and physician's assistants. Personnel included males under the age of 30 only, because this age group is at greater risk of STIs. The questions assessed perceptions of risk factors and secondary prevention practices for STIs in the CAF. Interviews were audio-recorded, transcribed, and subjected to a thematic analysis to identify factors that might be used to target prevention efforts.

Results: Among health care providers, STIs were perceived as a greater problem in the CAF, compared with the general population. Unique risk factors, such as travel away from home and the young demographic, were identified. The providers noted some challenges with the environment for patient communication at their particular base, such as limited space for counseling related to STI care. The military personnel also perceived STIs as a problem in the CAF, though they felt the base's health services allowed for convenient screening. Although some acknowledged a stigma attached to STIs, it was not a substantial barrier to prevention for them.

Conclusions: Results suggest that health care providers and CAF personnel at this base view STIs as a health problem in the CAF. Minor barriers to secondary prevention were identified. However, these were specific

to the base under study. Among military personnel, the benefits and importance of screening were emphasized more than barriers to prevention. While results show no systematic challenges to the secondary prevention of STIs at this base, the recognition of unique STI risk factors underscores the value of primary prevention. Additional research is needed to determine whether these observations apply to other CAF bases.

95. The Impact of Post-Diagnosis Group Psychoeducation on the Understanding of Symptoms of Operationally-Related PTSD, Depression and Anxiety in the Canadian Armed Forces

Leslie, M. and Heber, A.

Canadian Forces Health Services

Introduction: This qualitative study was designed to identify new learning regarding the specific symptoms and behaviours commonly associated with Posttraumatic Stress Disorder, Anxiety and Depression as a result of military operations.

Mental health issues have gradually become more widely understood across the Canadian Forces landscape and education programs have been a valuable tool in the dissemination of information and available resources. Most often these educational programs take place prior to and immediately following operations.

Methods: The 3 Day Operational Stress Injury Group is a general knowledge program which provides basic psycho-educational information regarding the specific symptoms and behaviours associated with operational stress injuries. For this study, three groups were held at CF HSVC (Ottawa) between April 2013 and August 2013. There were six participants in each group (3 female and 15 male), all of whom had been diagnosed with an operationally related mental health injury (PTSD, Anxiety, Depression). One participant requested that their information not be included in the study.

At the outset and at the ending of the group, the 18 participants were provided anonymous questionnaires (created by the authors) primarily designed to measure their understanding of their own diagnoses, treatment options and factors in recovery.

Results: We predicted an increase in this understanding at the end of group which is consistent with the research on psycho-education for mental health. Preliminary statistical analysis indicated two significant findings. Specifically, participants increased their knowledge of their diagnoses, realizing that many of their day to day behaviours were in fact symptoms and attempts to manage their distress (e.g. avoidance of

crowds or social situations were commonly expressed, or believing they just had family problems). Secondly, many participants recognized that they had been suffering much longer than they had initially understood prior to participation.

Conclusions: Implications of these findings for future psycho-education for patients and research are discussed.

96. Finite Element Analysis of the Loading Rate Effects on the Cervical Spinal Load-Partitioning Changes under Impact Conditions for Injury Assessment

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Introduction: Human cervical spine is a vulnerable structure subject to injuries caused by different types of extreme movements and accidents such as motor vehicle crashes and aviator ejection. The cervical spine functions as a complex mechanism that responds to sudden loading in a unique manner, due to intricate structure features and kinematics. As a consequence, apparent minor trauma that occurs during impact can result in extensive injuries to the zygapophyseal joints, ligaments, and discs. Numerous hypotheses have been proposed to explain the mechanism of injury in whiplash, including pressure on nerve root ganglia, stretching of facet capsules, or damage to facet articular cartilage. However, the pathological mechanism of various pain syndrome associated with whiplash remain a contentious area of debate. The current study aimed to investigate the loading rate effects on the C2-C3 motion segment load-sharing and to identify which spinal structure is at risk of failure using Finite Element (FE) analysis.

Methods: A 3D nonlinear FE model of the segment C2-C3 was developed using a 39 year old adult male CT and MRI images. The model which includes vertebrae (cortical and cancellous, and endplates bones), disc (annulus and nucleus), and major cervical ligaments has been validated against experimental data. Elastic, hyper-elastic and visco-elastic material properties were used to model bones, annulus, and ligaments respectively. The nucleus was modeled as fluid-filled cavity structure with uniform pressure. 0.6mm axial displacement at two different rates of 0.02m/s and 2m/s, and 2.5° flexion/extension rotation at 0.4°/ms and 4°/ms along with 60N compressive preload were applied at C2 while C3 was completely fixed. Contact pressure (CP) in the articular facets and von Mises stress in the annulus, and ligaments as well as intra-

discal pressure (IDP) in the nucleus were analyzed for all cases.

Results: Higher rate substantially increased von Mises stress in the annulus, endplates, and ligaments as well as IDP in the nucleus and CP in the articular facets. Left articular facet experienced higher CP for both rates and under all loading scenarios. Stress was mainly concentrated in the ligament-bone attachment expect for ligamentum flavum and capsular ligaments where maximum stress was located at middle region.

Conclusions: The loading rate significantly affects the structural behavior of the motion segment. Sagittal rotations during sudden deceleration and rear/front impact conditions increase the IDP and the CP and generate high stress in the disc, ligaments, and endplates. The endplates and articular facets represent potential sites of bone fracture.

97. Effects of Fatigue Induced by 24-hour Total Sleep Deprivation on Multi-tasking: An fMRI Study

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Introduction: Recent sleep survey results have linked increased use of technology with delayed bedtimes and disturbed sleep, particularly in young populations (generations Y and Z). Increased technology use demands an ability to multitask, placing an additional burden on our increasingly sleep-deprived society. This underlines the need for research on the effects of sleep deprivation on multi-tasking. For Canadian Forces members, fatigue-induced decrements in performance constitute an important operational hazard. The aim of this study was to examine the behavioural and neural effects of short-term (24-hour) total sleep deprivation on the ability of participants to switch between two tasks.

Methods: Members of the Canadian Forces (N=13) were scanned twice in the functional magnetic resonance imaging (fMRI) scanner: once in the morning after a normal night of sleep (6 to 8 hours of sleep), and once in the morning following 24 hours of sleep deprivation. The order of treatment was counterbalanced across participants. The participants completed a contextual task switching exercise involving two tasks (numerosity and digit value). Task switching was cued by an auditory stimulus. The experimental factors used for analysis were sleep (normal versus sleep deprived [SD]), task (numerosity versus digit value) and switch

(non-switching versus switching). The main outcome measure was reaction time.

Results: The behavioural results showed main effects of sleep ($p = 0.03$) and switch ($p = 0.000005$), with no significant interaction. The switch cost (i.e., increase in reaction time) for the normal sleep session was similar to the SD session. The fMRI results showed increased recruitment of areas associated with working memory (WM) and attention when the participants were sleep deprived. In addition, increased recruitment of areas associated with WM and negative emotion was observed when participants were engaged in the switching task versus non-switching.

Conclusions: As expected, the results indicated that reaction times were longer when participants were sleep deprived, and also when they were required to switch between tasks. At the brain level, greater demands on WM were observed as a function of both sleep deprivation and task switching. The prospects of using behavioural interventions that improve WM capacity as a countermeasure against performance decrements are discussed. Such fatigue countermeasures will help to protect active duty personnel from fatigue-induced operational hazards.

98. Canada's Veterans; Missed Opportunities

Pielsticker, P.

Ryerson University

Introduction: Veteran's programs and subsequently veterans' health are a matter of public policy. By understanding Veteran's in this context it is possible to understand the factors that inform the general social conception of the Veteran. This research will look at history of Veteran's programs from a historical policy perspective. This paper will show that Veterans' programs are primarily concerned with limiting expenditure in Veterans' programs. In a historical sense there is every indication that this is unlikely to be successful.

Veterans' policy is informed by concepts such as social credit, economic conditions and international politics. Since professional armies have been conceived, governments have struggled with the question of how to accommodate those who have done violence on behalf of the state. This is not a new problem. There have been a variety of schemes within Canadian history using Veterans as settlers, to generous education grants for retraining to civilian life. Desmond Morton, Peter Neary and Jack Granatstein have all argued that Canadian Veterans have been treated poorly at various points in history for specific reasons. Veterans have

several historic precedents as agents of social and economic change through government policy. Currently Veterans in Canada receive generous support from government programs only when injured mentally or physically, which is informed by a policy of limiting inputs. This ultimately results in less than desirable outputs.

Methods: Quantitative research will be conducted to demonstrate that spending on Veterans has not been reflective of the demand for services. Qualitative research will show the nuances of how Veterans are currently conceived and make an effort to move beyond the descriptive.

Results: Quantitatively from 1960-2010 there is a weak but inverse relationship in the funding between Veterans Affairs and the number of service personnel in Canada ($p = -0.13$). In short the more people in uniform, there is on average less money for Veterans. Qualitatively Veterans are primarily conceived of as victimized which as a matter of policy is the only legitimate way they can claim support from the state.

Conclusions: Canadian Veterans of recent conflicts are currently subject to programs that focus on limiting inputs. This policy will likely result in sub-optimal results for the individual Veteran, and a prolonged period of grievance which will result in long term expense significantly greater than an initially generous project would have incurred in the first place.

99. Occupational Exposure to Atmospheric Emissions Produced During Live Gun Firing

Quémerais, B.

University of Alberta

Introduction: A pilot study was performed in Quebec in 2006 and 2007 to estimate occupational exposure of soldiers to atmospheric emissions produced during live gun firing.

Methods: For this project three different weapons were tested; the C3 105 mm howitzer, the M777 155 mm howitzer, and the Carl Gustav 84 mm anti-tank. Only area samples were collected for safety reasons, which were collected from 8 to 22 m distance from the weapons. Samples were collected for total concentration using filter cassettes and for size distribution using a Marple personal cascade impactor. Detailed analysis of particles was performed using Scanning Electron Microscopy.

Results: Results showed that concentrations of total particulates were 1.25 mg/m³, 4.02 mg/m³ and 32.1 mg/m³ for the 105 mm howitzer, the 155 mm howitzer

er, and the Carl Gustav anti-tank respectively. Scanning Electron Microscopy of particles collected on the cascade impactor showed that most of the particles were smaller than 2 μm . In one case a significant amount of ultrafine particles (<100 nm) were found on the last stage of the impactor. Chemical analysis confirmed that collected particles mostly originated from combustion products.

Conclusions: Although concentrations observed were low, it is estimated soldiers are exposed to higher concentration since we did not collect area samples. Further investigations are needed to better determine soldiers' exposure to particles during live gun firing, particularly the importance of ultrafine particles which are associated to adverse health effects from long term exposure.

100. Mental Illness In the Face of War and Socio-political Conflict: Understanding Hope in Palestinian and Israeli Mothers of Mentally Ill Patients

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University of Alberta

Introduction: Mental illness has become a common health problem worldwide. It often creates a tremendous burden both on patients and their families. The burden may be greatly intensified in areas of war and socio-political conflict such as the Middle-East where it may also be associated with severe lack of hope for the future (Madianos, 2012). Yet, a sense of hope has been shown to be crucial in mental illness, especially in the recovery journey (Schrank, 2012). Since mothers are the major caregivers in these families (Wancata, 2008), it is necessary to better understand the factors which influence hope among those mothers involved in this unique conflict. Its uniqueness stems not only from its history but also from its perceived and real inequalities. Different perceptions of asymmetry between the parties create different realities (Rouhana & Bar-Tal, 1998). It is therefore reasonable to assume that hope may be differently experienced by Palestinian or Israeli mothers. Experiences of hope among burdened mothers of mentally ill patient living in war and conflict area have not been previously studied. A study exploring the experiences and meanings of hope among Palestinian and Israeli mothers of mentally ill patients is currently in progress.

Methods: Narrative is particularly relevant to health and illness, as it provides a rich understanding of meaning and experiences (Frank, 1996). The focus of narrative methodology is both on individual's experi-

ence and the social and cultural contexts within which individual's experiences are constituted, shaped, expressed, and enacted. For these reasons, narrative research will be appropriate to discover the complex concept of hope among mothers in these contexts. Data collection for this study will include the use of interview conversations to develop a contextually-bound story, research journal and audit trail. This triangulation will increase credibility, dependability and confirmability of the study. In this study, slope analysis may be initially used as a screening analysis to understand hope patterns. It will be followed by thematic and structural analysis. This current presentation will include the first stage of the project that will provide the background to the study.

Results: The results of the systematic literature review will be presented.

Conclusions: It is anticipated that study will enhance our understanding of hope in Palestinian and Israeli mothers and will facilitate better interventions in mental health in war and socio-political conflict areas.

101. Administration of the FORCE Evaluation with Full Fighting Order and Battle Load

*Reilly, T., Blacklock, R. * and Saucier, S.*

Canadian Forces Morale and Welfare Services

Introduction: The Directorate of Fitness - Human Performance Research and Development team was asked to investigate the feasibility of administering the FORCE Evaluation while wearing Personal Protective Equipment (PPE). The FORCE Evaluation has the potential to be adapted (provided the minimum standard is achieved) for specialist groups who desire a more demanding evaluation to better reflect their job specific demands.

Methods: The 20m Rushes, Sandbag Lift, and Intermittent Loaded Shuttles were performed on three occasions by 15 CAF participants at CFB Kingston (Ethics 2012-043 A4), and a performance effect (as measured by time to completion) was assessed across three conditions of dress:

I. Wearing PT gear

II. Wearing Full Fighting Order (FFO) defined as 15kgs

III. Wearing Battle Load (BL) defined as 24.5kgs

Following an initial familiarization session, participants were divided into 3 groups. Each group participated in a different condition on each day (PT, FFO, BL) to neutralize the effect of learning from the effect of the condition. Paired one-sided T-Tests were calculated for all

three components of the FORCE Evaluation to compare performance across the 3 conditions.

Results: Subjects were 14 Males and 1 Female, average mass was 85.5kg (SD 11kg). Performance on the 3 components of the FORCE Evaluation were average or above when compared with the general CAF population (Project FORCE - Phase III).

Performance across the 3 conditions (PT, FFO, BL) were found to be significantly different ($P < 0.01$) for all 3 components of the FORCE Evaluation. The 20m Rushes was the most effected by the PPE demonstrating an 18% and 30% decrease in performance with FFO and BL respectively, compared to the PT gear condition.

Conclusions: This data provides some preliminary evidence for the impact of PPE on FORCE Evaluation performance. The component most affected by the addition of external load was the 20m Rushes, followed by the Sandbag Lift and then Intermittent Loaded Shuttles. Additional research is required with a larger more robust sample size to make sound inferences on the CAF population.

102. An Obstacle/Confidence Course Design which Reflects the Current Operational and Training Demands of the Canadian Army

*Reilly, T., Driscoll, C., Olinek, S. and Gagnon P.**

Canadian Forces Morale and Welfare Services

Introduction: Confidence/Obstacle Courses (C/OC) are a commonality on Military and specifically Canadian Army (CA) bases. The real value of training with C/OC relative to performing current Army duties is unclear and has been questioned by the Land Force Doctrine and Training System. The purpose of this study was to: 1) scientifically validate the C/OC of the Army to ensure that they are operationally relevant and represent the demands of current operations and training; and 2) provide recommendations for future training, practice, and design of C/OC.

Methods: A review of the C/OC present on 12 Army bases and training centers was performed. The physical and functional demands of the obstacle types were compared to various tasks regularly performed by the CA. Members of a recruit course (N=49) completed a C/OC and provided before/after confidence ratings. A working group was established with subject matter experts (SMEs) in order to: 1) develop a gold standard C/OC and 2) develop a physical training strategy for C/OC; both which reflect current operational and training demands of the Army.

Results: Across all the obstacles examined (n = 266), the most common functional demands elicited were climbing, balancing and jumping. The most common physiological demands elicited by the different obstacle types were agility, lower body power and upper body power. Lifting and carrying, both highly represented in common Army tasks, were not elicited by any obstacle types. The most common correlates of lack of confidence were: skill, fitness, and anthropometry. Working group discussions with SMEs identified that future courses should be: usable in all weather conditions; versatile enough to be traversed by an individual, a team of two people, or a section; focused on functional / operational training; focused on confidence elements more than physical elements.

Conclusion: The relevance of current C/OC can be increased by traversing obstacles while wearing fighting order (24.5kg), or incorporating objects such as jerry cans, and the tactical traversing of obstacles at the section level (e.g. laying down cover fire). The working groups yielded guidelines which were used to create a "Gold Standard" course which demonstrates an increased focus on confidence, teamwork, and skill components that cannot be easily trained using other means currently available to the Canadian Army. Its design has been optimized based upon representing the range and frequency of demands elicited by Army tasks.

103. The Physical Demands of Conducting Operations in the Urban Environment

Reilly, T., Olinek, S. and Driscoll, C.

Canadian Forces Morale and Welfare Services

Introduction: Current Canadian Army exercises are often conducted in "built up areas" to simulate fighting in an urban environment. The CA was interested in the physical demands of a generic field simulation of urban operations tasks which all Army members should be physically capable of performing. These findings have the potential to be incorporated into future fitness assessment tools.

Methods: Observations of relevant training in an urban environment and a working group of Subject Matter Experts (SMEs) led to the development of an Urban Operations Field Simulation (UOFS) which involved materials handling and the tactical extrication of a casualty from the third story of a building. Participants, (20 male soldiers), were divided into teams of 4 and completed 3 trials of the UOFS. Teams were paced by an Urban Operations training instructor. Participants wore

the equivalent to full fighting order (24.5 kg). The metabolic demands of the UOFS were measured on each team leader using a portable metabolic analyzer and all participants wore heart rate monitors. Following the simulation, a video and report were delivered to the SMEs for verification of the simulation. After the metabolic demands of the UOFS were determined, a generic and skill free physical fitness test of urban operations demands was developed and piloted.

Results: The 20 participants of the UOFS represented various ranks/positions; average age was 31 yrs (20 to 39 yrs), average height: 179 cm (169 to 189 cm) and average mass: 91 kg (82 to 101 kg). The mean duration of the UOFS was 5min 15sec (3min 15sec to 7min 35sec). All Team Leaders demonstrated RER values >1.0 at differing points of the UOFS indicating a significant anaerobic demand. The average VO₂ demand for Team Leaders was 25.74 ± 3.86 ml/kg/min (23.01 to 27.98 ml/kg/min), average RER was 0.95 ± 0.09 (0.89 to 1.14) and, average HR was 173 ± 7.5 bpm (162 to 179 bpm). The total distance of the UOFS trial was 249 m including 57 m of stretcher carry and 25 m of casualty drag.

Conclusions: Urban operations are a reality of present day Canadian Army operations and training. These operations are physically demanding as demonstrated by the results obtained in the research. These findings are valuable should the Canadian Army be interested in comparing the demands specific to the Army and the new Common Military Task Fitness Evaluation, or FORCE Evaluation.

104. Characterization of Adrenergic and Glucocorticoid Receptors in Peripheral Blood Leukocyte Subsets using Image Cytometry – Application to Traumatic Stress Research

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Introduction: Developing valid and reliable biomarkers of major psychiatric disorders is key to improving diagnosis and treatment. Research using various biomolecular and neuroimaging techniques has shown stress-

related conditions are associated with abnormalities of neuroendocrine, sympathetic nervous system function and receptor pharmacology. In particular, posttraumatic stress disorder (PTSD) is linked to attenuated hypothalamic-pituitary-adrenal axis function (hypocortisolism) and sustained sympathetic-adrenal-medullary activity (hyperarousal), with alterations of adrenoceptor (AR) and glucocorticoid receptor (GCR) expression on target tissues. The nature of such receptor dysregulation remains poorly understood and traditional radioligand binding assays are inadequate to clearly identify cell-specific receptor variations. We developed a novel method to quantify β_2 -AR and GCR distribution and reactivity in leukocyte subsets using multispectral imaging cytometry (IC).

Methods: IC offers the ability to rapidly acquire images from large populations of circulating cells, enabling statistically robust cellular discrimination. This is achieved using image analysis parameters that quantify size, shape, location, co-localization, and fluorescence intensity of the cell. Cell-surface β_2 -AR and intracellular GCR staining was performed on heparinized whole-blood samples obtained from a cohort of healthy human donors. Simultaneous detection of cellular localization and distribution of β_2 -ARs and GCRs was determined in lymphocytes, monocytes and granulocytes, using saturating concentrations of anti-CD14-PE, β_2 -AR primary antibody with FITC-conjugated secondary antibody, GCR-FITC, and DAPI nuclear stain. Cells were further challenged with epinephrine and dexamethasone in vitro and GCR nuclear translocation was determined for specific T cell subsets; T helper (Th), CD4+FoxP3+ T regulatory and Th17 cells. Samples were acquired on an ImageStreamX Mark II and analyzed with IDEAS software.

Results: Our analysis using IC revealed that it is possible to clearly distinguish changes in β_2 -AR and GCR receptor expression and colocalization within the cell. Our findings demonstrate relative differences in receptor density between major leukocyte and lymphocyte subsets in human immune cells. Moreover, image-based measurement showed the interaction of dexamethasone with cytosolic GCRs induces translocation of the GC-GCR complex to the nucleus and mitochondria.

Conclusions: IC is a promising technique for evaluation of adrenergic and glucocorticoid receptors in peripheral blood leukocyte subsets. Relative to contemporary receptor binding assays, assessment of β_2 -AR and GCR using IC combines sensitive multispectral imaging with high-content assays for detection of subtle biological

responses in rare cell populations. This technique offers an attractive alternative to current methods to assess neuroendocrine receptor expression and function and will facilitate application of clinically useful biomarkers for establishing diagnosis or treatment of various mental health disorders.

105. Preliminary Results of a Randomized Trial of Ankle Mobilizations & Exercise on Lateral Ankle Sprains

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Introduction: Limited ankle dorsiflexion is a common impairment following lateral ankle sprain (LAS) that may cause difficulty with walking, kneeling and running, increase the risk of recurrence, and lead to chronic ankle instability. In CF members, this may result in restricted training, repatriation, or if persistent, premature release. The risk of these detrimental consequences must be minimized by determining effective interventions to improve limited ankle dorsiflexion post LAS, especially over the long term.

Methods: Eligible CF members reporting to a Physiotherapist within 7 days of an acute, incomplete LAS, followed a standardized comprehensive rehabilitation program while being randomized to either an experimental ankle mobilization group or control sham group. At baseline and 2, 8 & 12 week follow ups a Physiotherapist blinded to allocation group administered our primary outcome measure the Bent Knee Dorsi Flexion test. Secondary outcomes measures included the Visual Analogue Scale for pain, the Lower Extremity Functional Scale and the Foot & Ankle Disability Index for lower extremity function, the number of days until full return to work and number of LAS recurrences.

Results: To date we have reached our established sample size of 10 control (9 males, 1 female, 33.4±5.8 years) and 10 experimental (9 males & 1 female, 34.9±10.9 years) subjects, and have completed a preliminary analysis of 2 week data. At 2 weeks follow up subjects in both groups have demonstrated clinically significant differences in ankle mobility, pain and lower extremity function, however, no statistically significant differences were demonstrated between groups in mean ankle mobility (95.2 ± 47.5mm/Exp vs 94.7 ± 36.9mm/Ctl, p=0.842) or pain (-6.4 ± 12.7mm/Exp vs -3.6 ± 6.4mm/Ctl, p=0.905). However, statistically significant differences were reported between groups for mean lower extremity function (59.0±13.7/Exp vs

71.0±6.8/Ctl, p=0.035). Secondary analysis of 8 and 12 week data on the primary and secondary outcome measures remains in progress.

Conclusions: These preliminary results suggest that early physiotherapy demonstrates clinically relevant differences in ankle mobility, pain and lower extremity function. However in the short term following LAS, ankle mobilizations may not be necessary to improve limited ankle dorsiflexion in CF members. This supports previous findings in the literature, and reinforces the design of our study protocol to include prolonged follow ups. The proposed study contributes to the literature through longer follow ups, functional outcome measures and a pragmatic randomized controlled trial methodology in CF members.

106. Integrating Robotics into the Rehabilitation Protocol Post Catastrophic Injury

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Brief Description: Aim2Walk's Protocol Program is an individualized treatment plan that integrates cutting-edge rehabilitation technology with unique functional training techniques. Current research into most rehabilitation technologies does not include the effect of using the technologies in conjunction with active training techniques. Our program has successfully integrated technology with active, functional training to provide an intensive rehabilitation experience, and, to date, more effective outcomes than using technology or functional training alone.

The main obstacles in this process are: 1) New technologies are often not supported by mainstream healthcare practices until they've been proven in isolated clinical studies, and 2) The process of integrating technology with active, functional training, is easier said than done. The active portion of this process needs to be designed to specifically compliment the functional goal of the technology. This means every piece of technology should have its own customized program used in conjunction with the actual technology.

Clinical Outcomes: Lokomat Assessment Tools: L-Force (isokinetic strength testing), L-Stiff (spasticity testing) Pablo Assessment Tools: Upper extremity ROM, Grip strength Tymo Assessment Tools: Balance and weight shift analysis for upper or lower extremities Amadeo Assessment Tools: Hand intrinsic strength testing Condition-specific Quality of Life (QOL) measures Neuro-

Care Stimulation Assessment: Sensation and Muscle Contraction values

Patient Population: The Program is geared towards: (1) Individuals with mobility restrictions and/or upper extremity paralysis from traumatic or degenerative neurological injuries/conditions or catastrophic orthopedic injuries and (2) Individuals experiencing any movement based disorder or limitation, whether it be due to injury or the natural aging process.

Conditions include, but are not limited to: Traumatic Brain Injury, Stroke, Parkinsons Disease, Dementia, Spinal Cord Injury and Severe Orthopedic Injuries (multiple fractures, amputations, etc).

Conclusions: Our rehabilitation program has been in place since 2011 (2.5 years) and the only program modifications occur when new equipment is added to the clinic's roster. As we are an outpatient setting, our client base is mostly a chronic population. The literature indicates that therapy in the chronic stages of neurological injuries/conditions is much less effective than therapy in the acute stages for recovering function due to neuroplasticity. Our intense therapy program, integrating technology with functional rehabilitation, has shown that functional recovery occurs in all conditions (acute or chronic) given appropriate guidance and intensity of training. We recommend future research of rehabilitation technologies looks at integrating the technology into intensive therapy as opposed to utilizing the technology on its own, in both acute and chronic populations.

107. Dynamic Stability of Able-bodied Individuals and Transtibial Amputees while Walking in a Virtual Environment

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Introduction: The ability to quantify dynamic stability may influence health-care decisions for people with mobility-related disabilities. A common method to quantify stability during walking is by calculating the margin of stability (MOS), which examines the centre of mass (COM) in relation to the base of support (BOS). The purpose of this research is to investigate walking stability for able-bodied (AB) and transtibial amputees (TT) while walking in the CAREN-Extended virtual environment. Walking conditions included level, uphill,

downhill, cross (transverse) slopes, rolling hills, rocky, and side-to-side translations.

Methods: Five AB and five TT individuals completed three walking trials at a constant treadmill speed. The margin of stability (MOS) was calculated as the distance between the BOS boundary (defined by a foot marker) and the extrapolated COM in the medial-lateral (ML) and the anterior-posterior (AP) directions during stance. Stability margins were calculated for 20 steps for each limb and each walking condition. Differences in stability margin mean and variability were examined between limbs, between AB and TT groups, and each walking condition was compared to level treadmill walking.

Results: AB and TT MOS were similar for both ML and AP directions and each walking activity, but the MOS variability was larger for TT. AB and TT also exhibited larger ML MOS on their non-dominant or prosthetic limbs. MOS was greater when walking downhill and down-cross-slope (limb at the bottom of the slope), and MOS was smaller when walking uphill and up-cross-slope (limb at the top of the slope) compared to level treadmill walking. MOS variability was larger for up-cross slope, rolling hills, rocky, side-to-side translations, and up-cross slope, particularly for the TT group.

Conclusions: Based on the MOS measure, all study participants employed a similar strategy to maintain stability for various walking conditions. MOS was larger (less stable) for the prosthetic or non-dominant limb, and when walking downhill or down-cross-slope. MOS was smaller when walking uphill or up-cross-slope, which suggests an increase in stability. However, walking uphill or up-cross-slop is considered more challenging than level walking and it is possible this difference could be attributed to posture changes (increased trunk lean), instead of stability changes. These findings demonstrated the potential for clinical decision errors when interpreting MOS across walking conditions. Furthermore, MOS variability provided useful information on the step-to-step changes, and revealed TT made more corrective steps than AB to obtain similar MOS.

108. Noise Induced Hearing Loss in Canadian Armed Forces Aircrew

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Introduction: There have been claims from CAF aircrew that some are not able to hear auditory alerts while

flying. It is possible that missing the alerts may be due to progressive hearing loss. A further problem may arise from the use of personal earplugs, which may interfere with the ability to distinguish the alerts. The aim of this study is to identify the prevalence and audiometric profile of hearing loss in CAF aircrew. This study will include a study of hearing loss trends by age group and by type of aircraft to include helicopter, multi-engine and jets. The objective is to get a better understanding of the range and type of hearing loss in CAF aircrew which can then be used to determine the best type of integrated hearing protective devices to address the problem.

Methods: The participants include 156 CF aircrew members from various squadrons across Canada. Data collected includes a questionnaire on the various risk factors for acquiring a hearing loss and hearing test results of each subject, from the initial to the most current. Hearing thresholds (dB HL) from 0.5 kHz to 8 kHz will be collected for each ear. Participants will be grouped by age and then by type of aircraft (helicopters, jets or multi-engine). A repeated measures analysis of variance (ANOVA) and post hoc pairwise comparisons of levels of significant factors will be applied to the data obtained for seven test frequencies to assess the effect of aircraft, time of measurement, ear and test frequency. Finally, through correlational analyses, the relationship between hearing thresholds and responses to the questionnaire will be examined to determine risk factors for developing a hearing loss.

Results: Preliminary results show a decline in hearing levels, particularly at high frequencies with a noticeable change at 6kHz with the left ear being worse than the right. An impaired frequency range can disturb understanding of speech communication, particularly auditory alerts. Mean hearing thresholds by age group will be compared in the final results for jets, helicopters and multi-engine pilots.

Conclusions: This study will provide new information on the current hearing status of CAF aircrew, and will help to identify hearing loss trends common to type of aircraft flown, number of flying hours, age and correlations with type of auditory equipment and hearing protection currently being used in the aircraft. Furthermore, the results will aid the researchers to make recommendations regarding the procurement of new audio equipment and hearing protection.

109. Assessment of Cognitive Functions in Rats Exposed to a Primary Blast Insult

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Defence Research and Development Canada, Suffield

Introduction: It is becoming evident that a significant proportion of soldiers returning from Afghanistan that have been exposed to blast, suffer mild traumatic brain injury (mTBI). Symptoms of this type of injury include headaches, dizziness and lack of motor coordination, memory loss, sleep difficulties, aggression and depression. Although, previous reports have shown a correlation between blast exposure and cognitive problems, very few studies employ blast simulation where the insult is a clean shock wave without accompanying acceleration/deceleration or blunt force trauma. The aim of this study was to evaluate the behavioural changes over time due to a clean "primary" blast insult.

Methods: Rats were trained on different behavioural tasks prior to exposure to a single shock wave pressure. On the day of exposure, animals were individually anaesthetized and placed into a restraint that was inserted into a custom designed shock tube capable of simulating a clean blast insult. Single pulse shock waves at pressures of 0, 15 or 20 psi were used. Following exposure, rats were assessed for several days for cognitive changes using the Morris Water Maze and motor problems using the Rotarod test. Physiological and activity data was collected from a subset of animals via telemetry. Data was collected from the telemetry transmitter before, during the blast exposure, and for several days post-exposure.

Results: Morris Water Maze testing demonstrated significant impairments in both spatial learning and working memory as measured by the longer latencies to find the platform and this persisted for several days in the blast-exposed rats. This impairment was more evident in the 20 psi group of animals. Rotarod testing showed a significant effect of blast exposure on motor coordination for several days only in the 20 psi group. Preliminary telemetric data showed that exposure to a single blast resulted in alterations in the rat's sleep stages.

Conclusions: This study is believed to be amongst the first to show that neurotrauma induced from a clean primary blast wave may result in cognitive deficits in short-term learning and memory and impaired performance on motor tasks in rats. In addition, the sleep disturbances could be correlated with the cognitive deficits observed in the exposed animals. In humans, the persistence and long-term implications of blast-related mTBI symptoms are unknown. However, they can significantly affect the individual's standard of life (work, school and relationships), and therefore should

not be minimized. More research is needed to better understand blast-induced brain injuries.

110. Would Patients with Traumatic Brain Injury use Technology-based Mental Health Treatment Programs?

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Introduction: Mental health disorders are a frequently reported concern for Veterans and civilians who have sustained a traumatic brain injury (TBI). Although most patients with mild or moderate TBI recover to their previous level of functioning, some are at an increased risk for developing depression and other mental health concerns such as anxiety and post-traumatic stress disorder. Recently, technologies such as computers, cell phones, and video teleconferences have been used to deliver mental health care to patients. The purpose of this research study was to examine attitudes towards technology-based approaches to mental health care of patients who has sustained a TBI.

Methods: A convenience sample of 637 civilian patients attending St. Michael's Hospital's Head Injury Clinic in Toronto, Canada participated in the study. Patient demographics, injury information, and attitudes towards using technology for mental health information/treatment were collected. Participants also completed the Patient Health Questionnaire-9 (PHQ-9), a screening tool for depression.

Results: Of the 637 patients who completed the survey over a 31 month period (mean age 41 years; mean time since injury of 16 months), 43% scored ≥ 12 on the PHQ-9 (indicative of major depression in this population), and 44% reported receiving treatment for a mental health condition. The majority (79%) reported accessing the computer and/or Internet at least once per day. An overwhelming 87% reported they would be willing to use a computer program as an aid to their mental health care; however the willingness to do so was negatively correlated with the degree of depression ($p < 0.01$). Generally, respondents indicated that they felt very comfortable using the computer to access specific mental health information (32%), complete exercises as an aid to regular mental health treatment (35%), receive personal feedback on exercises (30%), and receive personal feedback from a counselor (32%). Again, level of comfort with each of these activities decreased with increasing levels of depression ($p < 0.01$).

Conclusions: This survey-based study suggests that patients with mild to moderate TBI were highly receptive to using technology-based approaches as adjuncts to traditional forms of mental health care. Moreover, a subset of patients indicated that they would be comfortable with using such approaches as their main form of mental health treatment. The findings also suggest, however, that willingness to use technology-based approaches may be influenced by the patient's severity of depression.

111. The Relationship between a Clinical Test Battery and Comprehensive Trunk Muscle Activation Patterns to Predict Recurrence of Low Back Pain

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Introduction: Altered muscle activation patterns during functional tasks in those deemed recovered from a low back injury (LBI) have shown promise to predict who will experience a recurrent LBI using comprehensive electromyographic (EMG) analysis. The re-injury group also had a higher percentage of those with clinical instability. This project will examine relationships between these altered neuromuscular patterns and clinical tests that could then be used as a screening tool, discharge criteria, or direction for future treatment. The overall goal is to develop a battery of clinical tests that could accurately predict risk of recurrent LBI.

Methods: We will recruit 104 participants (70 within 12 weeks of an episodic LBI and 34 asymptomatic) from CFB Halifax. We will examine relationships between EMG patterns from 24 bilateral abdominal and back sites during standardized lift-and-replace tasks to findings from selected clinical tests including i) instability, and aberrant motion tests, ii) a functional test battery and iii) standard lumbar range of motion. At one-year, follow-up re-injury statistics will be collected. Prediction models for recurrent episodes will be developed from the clinical and EMG tests using regression models to determine the best predictive model.

Results: Results from this study will provide objective physiologically and biomechanically based information on the status of participants early after injury and determine whether more easily administered clinical tests can provide similar information of recovery and risk of injury. Preliminary data on 27 LBI participants found that EMG patterns were different between those

with clinical instability in the LBI group versus those without instability. Furthermore, of those with clinical instability 75% re-injured whereas of those without clinical instability only 37% re-injured after one year. Of the total number that re-injured within a year, 46% had a clinical instability and only 14% had a clinical instability in the no re-injured group. Determining the best combination of factors to predict recurrence is the main goal of this project.

Conclusions: In summary, the outcomes of this research could form the basis of a screening tool to determine who requires treatment for an episodic LBI, and can guide treatment decisions. It could also be used as discharge criteria from treatment, thereby determining if someone is ready to return to normal duties. A battery of tests such as this could significantly reduce recurrences of LBP which would decrease overall health care costs.

112. Changes in the Expression of Neuronal and Astrocytic Markers in Rat Hippocampus after Primary Blast Induced Traumatic Brain Injury

Wang, Y., Sawyer, T. W., Hennes, G., Weiss, T., Nelson, P. and Barnes, J.

Defence Research and Development Canada, Suffield

Introduction: Neurodegeneration and active astrogliosis have been considered hallmarks of traumatic brain injury (TBI). However, the susceptibility of various brain regions differs depending on the model of TBI employed. This study examined the regional differences in neurodegeneration and astrogliosis in rat hippocampus exposed to primary blast.

Methods: Male Sprague-Dawley (SD) rats (350 – 400 g) were anaesthetized with 3% isoflurane for 3 min in a closed induction chamber. A helium driven shock tube was used to create a 25 psi shock wave pressure. This exposure system has been developed so that simulated single pulse “primary” blast exposures are accomplished with minimal concussive and whiplash effects. After exposure, rats were closely observed for either 2 weeks or 4 weeks before being sacrificed. At the end of each observation period, animals were euthanized and immediately perfused transcardially with 0.1 M phosphate-buffer saline (PBS, pH 7.4) followed by 10% ultra-pure methanol free formaldehyde. Coronal sections (30 μ M thickness) of the entire brain were prepared and stained with antibodies against the axonal marker Neurofilament H (NFH) and the astrocyte marker glial fibrillary acidic protein (GFAP). Confocal images of both sides of the hippocampus were acquired and processed

using a stitching module so that the entire structure of the hippocampus could be viewed and analysed. After the stitching, four different structurally relevant regions (CA1, CA2, CA3 and dentate gyrus, 500 x 300 μ m from each region) were quantified for fluorescent intensity and compared with control animals.

Results: Results showed that the most susceptible site to primary blast is the CA3 region within the hippocampus, where the average fluorescence intensities for both NFH and GFAP were dramatically decreased 2 weeks after blast exposure. However, these decreases were largely recovered to control levels 4 weeks after exposure. In addition, GFAP fluorescent intensity was also decreased in CA1 and dentate gyrus 2 weeks after exposure. No other changes in NFH and GFAP staining were observed for the time points observed. Further research is on-going to investigate shorter term changes in staining patterns of these markers.

Conclusions: Our findings are in contrast to most published literature where increases in GFAP staining were observed. However, most published studies use complex blast waves and whole body exposure, as opposed to the single pulse blast wave exposures used in this laboratory. Further studies are needed to investigate the differences between primary and complex blast exposures.

113. Involvement of the Cyclic AMP Pathway in Primary Blast-induced Traumatic Brain Injury in the Rat

Wang, Y., Sawyer, T. W., Weiss, T., Nelson, P., Hennes, G. and Barnes, J.

Defence Research and Development Canada, Suffield

Introduction: Traumatic brain injury (TBI) has been a leading cause of morbidity and mortality in recent conflicts in Iraq and Afghanistan. However, the mechanisms of blast-induced TBI are not known, although inflammation in various regions of the brain has been considered as one of the most important initiating forces of brain damage. Cyclic adenosine monophosphate (cAMP) is an important second messenger that is involved in many inflammatory responses in various organs of the body, including the brain. In the present study, the effect of a simulated single pulse primary blast wave on the levels of phosphodiesterase (PDE) isoforms in rat hippocampus was investigated.

Methods: Male Sprague-Dawley (SD) rats (350 – 400 g) were anaesthetized with 3% isoflurane for 3 min in a closed induction chamber. A helium driven shock tube was used at various shock wave pressures (15 – 30 psi).

This system has been developed so that simulated single pulse “primary blast” exposures are accomplished with only minimal concussive and whiplash effects. After exposure, rats were closely observed for either 1 day or 7 days before being sacrificed. For western blot analysis, both sides of the hippocampus were dissected in dissection buffer and homogenized, and then stored at -80°C until further analysis. For immunohistochemistry, rats were perfused and post fixed with 10% formaldehyde. PDE isoform expression was detected using antibodies against specific isoforms.

Results: Results showed that PDE isoform expression was differentially regulated by blast exposure on both sides of the hippocampus. Notably, PDE1B expression was dramatically and pressure dependently decreased on both sides of the hippocampus 7 days after blast. In contrast, PDE8A was increased on both sides of the head, while PDE4B was increased only on the side of the brain contralateral to the exposure.

Conclusions: Changes in the levels of PDE isoforms may contribute to the inflammatory responses observed after primary blast exposure. Therapies targeting these isoforms may help to protect the brain against blast-induced TBI.

114. Building the Foundation for High-Quality Health Care: Tools, Organization, and Culture

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Introduction: The quality of decisions made for each patient rests on the foundation of information used to make them. This foundation is inherently unstable when built upon the human mind which often is distracted, forgetful, and overwhelmed by the rapid pace of change. In contrast, informatics tools can reliably and thoroughly define and capture relevant patient information to shore up this foundation and enhance the quality of decisions. Integrating such tools poses a challenge to health care, however. This project explores how one exemplary primary care practice combines tools, organization, and culture to advance the reliability and quality of care.

Methods: A case study approach was used to explore the informatics systems, organization, and culture of a primary care practice in New England. The PCP was selected because of its longstanding commitment to the thorough integration of information tools into routine practice, and to cultivating a high reliability, learning organization. The study relied on various sources of data that were collected during successive site visits.

These data sources include: direct observations, discussions with clinical and office staff, meeting attendance, practice documents, and a “collective mindfulness” questionnaire.

Results: The PCP uses informatics tools to (1) triage patients, (2) to identify and collect a range of patient data, and (3) to match patient-specific positive findings with relevant diagnostic and management options. Together, provider and patient investigate which option is most suitable. This enhances reliability and builds a foundation for high-quality care by reducing dependence on the (unreliable) human mind for key tasks. The information system is integrated in a tightly-coupled human system for managing patients, patient information, and workflow. This is supported by a reliability-seeking organizational culture, nurtured through leadership statements, daily meetings, and a process improvement protocol.

Conclusions: The PCP illustrates tangible steps that can be taken to build a firm foundation of care – a foundation based on defining and reliably capturing relevant inputs to clinical decisions. While information tools are central for this, a well-designed human organization also is critical for integrating these tools into the daily routine. Further, the development of a reliability-seeking culture supports the workflow, enables early detection and containment of problems, and the refinement and improvement of systems. Committed and deliberate effort among leaders in health care is central for building the foundation necessary for high-quality care.

115. Brain Bootcamp: The Role of Group Functional Cognitive Rehabilitation within a Comprehensive Interprofessional Mild Traumatic Brain Injury (mTBI) Program

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Canadian Forces Health Services

Brief Description: The Canadian Armed Forces (CAF) model for treatment of mild traumatic brain injuries (mTBI) does not identify a role for the physical rehabilitation team for this physical injury (Canadian Forces Health Services Advisory Panel on Management of Mild Traumatic Brain Injury in Military Operational Settings, 2008). This approach does not emphasize the importance of appropriate timing of patient education, monitoring during return to work and physical activity, and functional cognitive rehabilitation therapy (CRT). In recognition of these observations, the Physical Rehabilitation Department at CFB Edmonton created an inter-

professional concussion program that includes primary care, occupational therapy, physical therapy, and Regional Adaptive Fitness Specialist.

The CRT component, titled “Brain Bootcamp,” was created within occupational therapy services. Goals include facilitating a safe return to physical training and work, improving executive cognitive functioning (ECF), decreasing concussive symptoms, as well as encouraging the use of external memory aids. The members were provided with the knowledge to utilize neuroplasticity through cognitive exercise and to prevent future head trauma. Evidence suggests that CRT is as or more efficient in a group setting compared to individual therapy for those who have sustained a concussion or traumatic brain injury (TBI).

Clinical Outcomes: After the 12 session group course, members demonstrated an increase in ECF, a decrease in post-concussive symptoms, an increase in utilization of external memory aids, and increased coping abilities related to their injuries and mental health. This was measured with the Montreal Cognitive Assessment (MoCA), Rivermead Post Concussion Symptom Questionnaire, External Aids Utilization Survey, course evaluation, as well as members’ testimonials. Plans are in place to measure these outcomes again at six months post therapy.

Patient Population: The regular CAF service members included in this case study had sustained an mTBI at least three months prior or had sustained a moderate to severe TBI and were looking to further develop ECF. Members had completed high school education, independent with transfers, socially appropriate, and able to sit for at least 30 minutes to attend the course.

Conclusions: Populations with ECF impairments due to axis I mental health diagnosis, early dementia, stroke, learning disabilities, and substance use disorders, can also benefit from CRT. This has future implications in return to work strategies within the CAF, the use of the Computer Assisted Rehabilitation Environment (CAREN), the co-occurring conditions dilemma, and the life-long well-being of injured CAF members.

116. Trauma Relapse Prevention Group (TRPG): A Program Overview and Analysis of Preliminary Outcome Data for CF Veterans

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Whelan Associates - Private Practice

Brief Description: The Trauma Relapse Prevention Group (TRPG) program was developed for military Veterans experiencing refractory PTSD and comorbidities

following prior treatment. It is a manualized, 8-week, developmentally-focused intervention addressing chronic PTSD, concurrent issues (e.g., depression, chronic anger, substance abuse), social isolation, and includes a 2-day spousal component. This outpatient intervention focusses on cognitive and emotional processing of index events across the lifespan aimed at expanding the capacity for emotional tolerance and challenging long-held schemas about self and the world. Program co-leaders emphasize psychological safety, experiential education, emotional awareness/expression, and relational repair to help participants in rebuilding relationships affected by psychological injury. A long-term maintenance option is available to group participants.

Clinical Outcomes: All participants completed the Post-traumatic Checklist (PCL-C), Brief Symptom Inventory (BSI), and the Quality of Life Inventory (QOLI) at baseline, six months, and 12 months follow-up; additional data at 3-years post-treatment were also analyzed (n=7). Results of analysis (N=30) for the PCL-C, BSI, and QOLI, indicated improvements across the three domains. The program had a 94% retention rate.

Patient Population: This program is open to Canadian Forces and RCMP Veterans who have had prior treatment experience for an operationally-related psychological injury. Participants are selected based on results of psychological assessments and an established OSI diagnosis, absence of psychosis, no recent active suicidality, English speaking, stable accommodations, a commitment to abstinence from substance use and mood-altering medications on program days, and trauma-focused treatment goals.

Conclusions: The results provide preliminary support for the program’s developmental and relational focus and its emphasis on integration of emotional-somatic-cognitive functioning with active support from other Veterans. The strong level of group cohesion among these previously isolated Veterans points to the importance of interpersonal connection among traumatized Veterans making the transition to civilian life. The group format provides an opportunity within a ‘military sensitive environment’ to directly address mistrust-betrayal, shame, social isolation, and the loss of identity among Veterans. The high retention rate, promising clinical outcomes, and comments by participants provides support for the TRPG program as a well-tolerated and cost-effective treatment format. The program’s inclusion of monthly follow-up sessions allows for maintenance of treatment gains and group cohesion outside of the treatment setting.

117. The Protective Effect of Marital Satisfaction on Post-Deployment Family Reintegration

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Introduction: The post-deployment period is critical for military personnel who are readjusting to the family unit; this is especially true for National Guard members. This study examined the influence of self-reported symptoms of depression, anxiety, and post-traumatic stress on reintegration into the family unit, and the protective role of marital satisfaction. We hypothesized that high levels of marital satisfaction would protect against the negative effects associated with post-deployment mental health on family reintegration. This is particularly important given that the health and wellbeing of military personnel is strongly influenced and related to their relationships with those around them, including romantic relationships.

Methods: Data from this study came from a unit of approximately 300 Army NGM in an aviation battalion who recently returned from a one-year deployment to Iraq. From the unit, 145 members volunteered to complete the baseline assessment (participation rate of approximately 50%). Data are presented from 114 service members who reported being married or in a serious intimate relationship. Variables of interest included

marital satisfaction, family reintegration challenges, anxiety, depression, and posttraumatic stress. Linear and ordinary least squares regression models were used to test hypotheses.

Results: While the overall percentage of respondents meeting the criteria for clinical diagnosis of mental health conditions was low, the influence of marital satisfaction on improved reintegration was significant. There was a significant interaction between mental health symptoms and marital satisfaction on family reintegration challenges. That is, those with greater levels of marital satisfaction reported fewer family reintegration challenges.

Conclusions: Our findings indicate the importance of considering marital satisfaction when predicting how military personnel will adjust to post-deployment reintegration into the family unit. These findings highlight the importance of early intervention and prevention to maintain strong and positive social relationships, especially with the spouse/partner. Results have implications for the health of service members and military families after a combat deployment. Strengthening intimate partnerships prior to deployment, providing on-going nurturing of these partnerships during deployment, and increasing awareness and access to support services post-deployment can lead to successful family reintegration and coping activation following deployment.

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