ABSTRACTS
RÉSUMÉS

The 5th annual Military and Veteran Health Research Forum /
Le 5e Forum annuel de Recherche sur la santé des militaires et des vétérans

MVHR FORUM 2014 / FORUM RSMV 2014

FORUM•2014
FROM SCIENCE TO SERVICE ◦ DU SAVOIR AU SERVICE

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<u>Poster Presentations</u>

2. Physical Health and Rehabilitation

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Podium Presentations

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1. Mental Health and Rehabilitation

Podium Presentations

1A01: Further Evidence for the Factorial Validity of the CAF Recruit Mental Health Service Use Questionnaire

Blais, A. R., PhD, Fikretoglu, D., PhD

Defence Research and Development Canada

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. To do so, there is a crucial need for a context-specific (i.e., to the Canadian Armed Forces (CAF) and recruits under training) instrument that assesses negative attitudes towards mental healthcare in a reliable and valid manner. The present work describes a new study exploring the complete factor structure of the English version of the CAF Recruit Mental Health Service Use Questionnaire (RMHSUQ), developed on the basis of the Theory of Planned Behavior, with encouraging results consistent with our body of work.

Methods: Data collection took place at the CAF Leadership and Recruit School, where 308 English-speaking participants completed a revised 26-item paper-and-pencil version of the RMHSUQ, comprised of 6 theoretically-based subscales: Instrumental Attitudes (towards mental health service use; 4 items), Affective Attitudes (3 items), Perceived Norms (6 items), Perceived Control (3 items), Perceived Self-Efficacy (6 items), and Intention (to seek treatment; 4 items).

Results: We conducted a series of exploratory factor analyses on the entire series of survey items this time (previous work only explored the factor structures of sets of items), investigating a range of possible factor solutions, and the results pointed to the 6-factor model as being best, based upon theory, parsimony, ease of interpretation, and fit indices. Twenty-four out of the 26 RMHSUQ items had salient loadings (i.e., greater than .35) onto their a-priori hypothesized factor, with no sizable cross-loadings. The internal consistency reliability estimates associated with the 6 subscale scores ranged from .69 to .92. At this stage in the development of the RMHSUQ, its items (except for a couple) appear to have acceptable psychometric properties. Only minor revisions are needed to strenghten its factorial validity.

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 CAF and recruit training contexts. These data continue to provide evidence for the psychometric qualities of the RMHSUQ, including its factorial validity. Next steps involve replicating the results associated with the 6-factor model prior to moving to confirmatory factor analyses and more complex multivariate latent modeling.

1A02: The New Rules of Engagement: Male Veterans' Accounts of Why They Completed a Group Therapy Program

Shields, D., PhD (Cand)

University of British Columbia

Introduction: The Canadian Veterans Transition Program is a group program for Veterans who suffer from PTSD symptoms or depression that has an unusually high participant completion rate. Of the approximately 340 male Veterans who have entered the VTP, only two have dropped out before completion (a 99.4% completion rate). As this completion rate is unusually high, examining male Veterans' narratives about their reasons for engagement may hold keys to understanding how to develop other programs that engage male Veterans in therapy, and shed light on the unique ways that programs can be made more gender/culturally sensitive and relevant for male Veterans.

Methods: Using thematic analysis of Veterans' interview transcripts, focus groups and personal reflection writings, and using narrative methods to examine meaning change trajectories over a ten-day intensive residential program, this paper examines 13 Veterans' narratives about their program involvement through a gender socialization lens.

Results: Repeating themes across these thirteen cases highlight evolving relational constructions of meaning around personal trauma, treatment, and engagement within cultural frames of masculinity. Analysis suggested that Veterans engagement reflected a process of renegotiating their sense of failure related to their struggles by colonizing the therapy space with their own culturally safe and appropriate language and metaphors and establishing group cohesion as a respected "band of brothers". Once issues of dignity and respect had been addressed, Veterans engaged in treatment a statement of personal and group agency and as a symbolic gesture of toughness.

Conclusions: This presentation examines how male Veteran's accounts of why they completed a group-based trauma program, and the personal impact of that participation, reflect larger socio-cultural contexts and pressures of hegemonic masculinity. Males, who make up the majority of the military population, experience difficulties such as PTSD, substance abuse, increased aggression, relationship problems, depression, and suicide at proportionally higher rates than their female compatriots, and also have significantly lower usage rates for therapies, and higher relapse rates and drop-out rates when they do access treatment. Specific implications for "culturally safe" practice and program design for Male Veterans are discussed.

1A03: Association Between Combat Experiences and Post-Deployment Mental Health Problems Among CAF Members Deployed in Support of the Mission in Afghanistan

Watkins, K., MA, Sudom, K. A., PhD, Zamorski, M. A., MD

Department of National Defence

Introduction: It is important to investigate the differential effects of individual or groups of combat exposures on psychological well-being in order to identify potential at-risk exposed military members, and to forecast the mental health effects of future conflicts. There has been little research on how different sub-types of combat experiences have affected the mental health of Canadian Armed Forces (CAF) personnel who deployed in support of the mission in Afghanistan. The present study investigates the relative associations of several sub-types of combat exposure with a variety of post-deployment mental health problems among CAF personnel.

Methods: Participants were 15,832 CAF members who had deployed in support of the mission in Afghanistan, and who completed the Enhanced Post-deployment Screening (EPDS) questionnaire between 2009 and 2012. The EPDS process is conducted 90-180 days post-deployment. The survey included validated measures of common mental health problems and exposure to 30 different combat experiences. Based on a previous analysis (Sudom et al., in progress), combat exposure was assessed as both a total count and in four sub-categories: Dangerous Environment, Aftermath of Conflict, Active Combat, and Perceived Responsibility.

Results: Logistic regressions indicated that greater overall combat exposure was associated with increased odds of major depression, PTSD, suicidal ideation, and any mental health health problem. The Dangerous Environment, Aftemath of Conflict, and Perceived Responsibility subscales showed similar associations, with the strongest associations for Perceived Responsibility. Feelings of responsibility for the death of non-combatants and Canadian or ally personnel were, of the Perceived Responsibility category, the strongest predictors of mental health problems. Sustainment of an injury during deployment was also significantly associated with poor mental health outcomes. The Active Combat subscale, meanwhile, was not meaningfully associated with any psychological disorders.

Conclusions: Many of the combat stressors were found to be associated with post-deployment mental health problems. However, the more traditional experiences of active combat, such as calling in fire on the enemy, were not as strongly related to such difficulties. Rather, the perception of responsibility for the death of a civilian or ally appears to increase the risk of having a post-deployment mental health problem. The significant association of Dangerous Environment and Aftermath of Conflict with mental health problems suggest that future CAF non-combat operations that involve these experiences will still be associated with an elevated risk of these difficulties.

1A04: Out of the Shadows: Two Decades of Population Surveys of the Mental Health of CAF Veterans

Thompson, J., MD[1,2], Van Til, L., MSc[1], Macintosh, S., MA[1], Pedlar, D., PhD[1]

[1]Veterans Affairs Canada; [2]Queen's University

Introduction: Today's renaissance in the understanding and management of the mental health of Canada's military Veterans began with the increase in Canadian Armed Forces (CAF) operational tempo since 1990, particularly Canadian missions in the Persian Gulf, Balkans, Africa and Afghanistan. Awareness of mental health issues in military personnel and Veterans (former military personnel) coincided with national efforts to bring the mental health of all Canadians out of the shadows. As in other countries, unprecedented Canadian research is yielding a clearer picture of the mental health of the estimated 594,300 contemporary CAF Veterans living in the general population. This presentation summarizes population survey findings and the evolution of services.

Methods: Population studies in the 1990s focussed on Veterans receiving services from Veterans Affairs Canada (VAC clients). Studies since 2002 have included all Veterans living in the general Canadian population. Veterans were identified in the 2002-3 Canadian Community Health Survey (CCHS) using self-report Veteran identifier questions. The 2010 and 2013 Life After Service Studies objectively identified Veterans using administrative data linkage. The 2010 survey sampled CAF Regular Force Veterans who were released from service in 1998-2007. The 2013 survey sampled Regular Force Veterans released in 1998-2012 and Reserve Force Veterans released in 2003-12.

Results: The 1999 survey of VAC CAF clients was a wake-up call: 13-18% had probable PTSD and 28% had current depression. In the 2003 CCHS, the prevalence of mood and anxiety disorders was not significantly different for Reserve and Regular Force Veterans compared to the general population (7-8%). The 2010 LASS survey found that anxiety disoders were twice as prevalent in CAF Regular Force Veterans as in the general population (10% vs. 5%), however average mental health-related quality of life was not different. Results of the 2013 LASS survey are being analyzed and will be presented.

Conclusions: Findings of the 1990s studies of VAC clients supported significant renewal of mental health services for Canadian Veterans, including establishment of the national network of Operational Stress Injury Clinics. Findings from the 2010 LASS survey provided clearer insights into the mental health of both VAC clients and the majority of CAF Regular Force Veterans who were not VAC clients, supporting outreach efforts. Findings from the 2013 LASS survey for the first time shed light on the mental health of CAF Reserve Force Veterans and extend knowledge of Regular Force Veterans.

1C01: A Scoping Review of Mental Health Risks and Needs of Children Growing Up in Canadian Military Families

Cramm, H., PhD, Aiken, A., PhD, McColl, M. A., PhD

Queen's University

Introduction: From an American perspective, negative impacts of parental deployment on children's mental health such as increased anxiety, depression, risk of alcohol and drug use, and delinquency have been studied, along with strategies to improve resiliency and minimize risk. The research has also more recently considered the impacts on

children when serving military members return home with combat-related injuries or post-combat health consequences such as Post Traumatic Stress Disorder. Despite the availability of research on U.S. military families, very little is known about the mental health needs of the almost 65,000 children growing up in Canadian military families and the adequacy of current services to address these needs.

Methods: A scoping review was selected as the optimal method to synthesize the breadth and depth of knowledge on the topic. Using Arksey and O'Malley's structured approach, CINAHL, Medline, PsycInfo, Embase, and ERIC were searched to answer the research question, "What are the mental health issues and needs associated with children growing up in military families?" The final stage of a scoping review, consultation with a range of stakeholders, will enrich and refine the analysis of international peer-reviewed research literature, creating a Canadian perspective. In-depth qualitative interviews with participants will explore the mental health issues and needs experienced by children growing up in Canadian military families. Questions will explore strengths, challenges, child factors, family factors, military contexts, and access to mental health services.

Results: 220 peer-reviewed publications and government reports met the inclusion criteria for the study. Preliminary analysis suggests that the impact of parental deployment on the mental health of children is increasingly recognized. Strategies to develop resilience within military families are emphasized, and numerous local inititatives have emerged in an effort to tackle these complex issues. There appear to be mental health issues experienced among military children that can impact social, academic, and behavioural domains.

Conclusions: Within the military, at different levels of government and across broader Canadian society, there has been increasing attention to the impact of military life on families and children. There have been significant changes in the conditions of growing up in a military family over the past several decades, involving heightened involvement in combat and an increased tempo of deployment cycles, which can be disruptive and stressful to children growing up in military families.

C102: CAF Service-related Illnesses and the Family: Therapeutic Programs Targeting Children's Resilience

Hachey, K. K., PhD

Department of National Defence

Introduction: There are various stressors that can impact the health and wellbeing of children who are part of a military family (Coulthard, 2011; Skomorovsky & Bullock, 2014). One such stressor is being a child of a parent coping with a service-related illness or injury. The objective of the current study was to examine the perspective of both parents and subject matter experts (SMEs; e.g., Family Liaison Officer, Social Worker, etc.) regarding programs that are targeted to children's resilience in coping with a parent who has a service-related illness or injury.

Methods: A total of 14 parents took part in semi-structured interviews, while 22 SMEs participated in either focus groups or individual interviews. Parents were asked questions concerning their children's experience with their parent's service-related illness and with related Military Family Resource Centre (MFRC) or civilian programs. SMEs were asked questions regarding their base MFRC programs and their experiences with children using these programs. Interviews and focus groups were analyzed using thematic coding.

Results: Results revealed that there are varying levels of therapeutic care provided by the MFRCs included in the current study. SMEs noted that the inconsistency in program availability across MFRCs was a result of differences in needs across bases. The results from SMEs also showcased the novel programs which have been developed in the last couple of years to address children's resilience. Currently, programs are being updated and developed to address children's resilience when their military parent is coping with posttraumatic stress disorder. On the other hand, parents revealed their frustrations with the perceived disconnect between caring for the family and caring for the military member and the need for additional targeted programs for spouses.

Conclusions: This study shed light into the potential resilience-related resources available and needed for children who have a parent coping with a service-related illness. In particular, it provided a perspective from both parents and SMEs from select bases across Canada. Overall, the current study serves as a platform for future studies examining educational resilience programs provided by military family services.

C105: Prevalence of child abuse in Canadian Armed Forces Personnel and Canadian Civlians, 2012/2013

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[1]University of Manitoba; [2]Canadian Forces Health Services Group;

Introduction: Mental health problems in military personnel are prevalent in previously-deployed military personnel (Boulos & Zamorski, 2013). Combat is an important determinant of mental health (Zamorski & Boulos, 2014), but other factors such as child abuse also contribute (Sareen, et. al., 2013; Cabrera et al., 2007). Recently, it was found that Americans with military service over the past generation had significantly greater exposure to child abuse and other forms of child adversity than comparable civilians (Blosnich, et al., 2014). If this were confirmed in Canada, it could help explain the excess prevalence of depression, generalized anxiety disorder, and panic disorders seen in Canadian Armed Forces (CAF) personnel.

Methods: This study uses population-based survey data from the 2012 Canadian Community Health Survey: Mental Health (n=25,113) and the highly comparable 2013 Canadian Forces Mental Health Survey (n=8,165). In both surveys, the

frequency of six types of child abuse (defined as taking place before the age of 16) was assessed using items from the Childhood Experiences of Violence Questionnaire. Abuse was categorized into three categories: Physical abuse (slapped on the face, head or ears or hit or spanked with something hard; something thrown / pushed / grabbed / shoved; or kicked / bit / punched / choked / burned / attacked); sexual abuse (forced sexual experiences; or unwanted touching); and exposure to intimate partner violence. Using recommended cut-offs for the frequency of each event, the crude prevalence of each event and of categories of events (I.e., any physical abuse; any sexual abuse; any abuse) were compared in the two populations.

Results: Preliminary results show that CAF personnel were more likely than civilians to report having been slapped/spanked more than three times (39% vs. 22%), to have been thrown/pushed/grabbed/showed three or more times (17% vs. 11%), or to have ever been kicked/bit/punched/choked/burned/attacked (15% vs 10%). were also more likely to have witnessed intimate partner violence (10% vs. 8%).

Conclusions: CAF personnel have higher crude rates of certain types of child abuse, relative to Canadian civilians. Additional findings will be available at the time of the forum, including comparison of childhood sexual abuse prevalence rates, age-sex adjusted prevalence rates, rates in Regular vs. Reserve Force personnel deployed in support of the mission in Afghanistan, rates of the number of different types of abuse, and the results of regression models that adjust for additional potential sources of confounding, such as employment status.

1D01: The Occupational Impact of Deployment-related Mild Traumatic Brain Injury among CAF Personnel Deployed in Support of the Mission in Afghanistan, 2009-2011

Garber, B., MD, Rusu, C., MD, Zamorski, M. A., MD, Boulos, D., MSc

Canadian Forces Health Services Group

Introduction: Deployment-related mild Traumatic Brain Injury (mTBI) occurs in a minority of Canadian Armed Forces (CAF) members who served in Afghanistan. However, little is known about the long term consequences of mTBI on occupational outcomes. The objectives of this study are to 1) describe occupational outcomes in mTBI cases; and 2) determine the unique contribution of mTBI to occupational outcomes while controlling for other factors.

Methods: Retrospective cohort study of 13,455 CAF personnel deployed in support of the mission in Afghanistan. The primary outcome was developing a career-limiting medical employment limitation (CL-MEL) and the diagnoses responsible for CL-MEL were obtained from administrative data sources. The presence of mTBI and one or more of six common mental health problems (MHP's) were determined using self-report from Enhanced Post-deployment Screening questionnaires. Cox-regression analysis was used to obtain adjusted hazard ratios (aHRs) for the association between CL-

MEL and mTBI, MHPs, and demographic and military characteristics.

Results: Preliminary results show that during a median post-deployment follow-up period of 1249 days, 5.2% of the study population developed CL-MEL. Of the 650 individuals who reported mTBI during deployment, only 87 (13%) had CL-MEL at follow up. Deployment-related mTBI was independently associated with developing CL-MEL after adjustment for other covariates. aHRs for more severe mTBI, less severe mTBI, and non-mTBI injury were 2.4 (95% CI: 1.7-3.3), 2.0 (95% CI: 1.5-2.8) and 1.8 (95% CI: 1.5-2.2), respectively, relative to no injury. However, MHP's had the strongest effect of all factors analyzed (aHR for MHP 3.9, 95% CI 3.3-4.6, relative to no MHP). However, a neurological condition was identified as a direct contributor to CL-MEL in only 2 or 87 cases with CL-MEL.

Conclusions: While regression analysis identified deployment-related mTBI is an independent risk factor for developing CL-MEL, the absolute numbers directly attributable to mTBI were small and MHP had a far greater effect. These results suggest that the long-term effect of mTBI on occupational outcomes in this group is relatively small.

1D02: Molecular Mechanisms of Primary Blast-induced Mild Traumatic Brain Injury

Wang, Y., PhD, Sawyer, T. W., PhD, Weiss, T., Hennes, G., Nelson, P., Barnes, J.[1]

Defence Research and Development Canada

Introduction: Traumatic brain injury (TBI) has been a leading cause of morbidity and mortality in recent conflicts in Iraq and Afghanistan. However, the lack of understanding of the mechanism(s) underlying blast-induced TBI makes drug discovery for medical countermeasures difficult. Akt, also known as protein kinase B, is a protein kinase involved in brain development and neurodegeneration such as brain ischemia and stroke, Alzheimer's disease and brain trauma. In the present study, the effect of a simulated single pulse primary blast wave on the levels and activities of Akt and its downstream effector glycogen synthase kinase (GSK) in rat hippocampus were 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 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 1 day or 7 days before tissue samples were collected. Western blot analysis and confocal microscopy were used to assess neurodegeneration, microglia activation and changes in Akt and GSK expression at various sub-regions of the hippocampus.

Results: Results showed that phosphorylation of neurofilament H, an early marker of neurodegeneration, was dramatically increased in both sides of the hippocampus 1

day after blast exposure but returned to control values 7 days after blast. Western blot analysis showed that phosphorylation of Akt at serine 473 and GSK at serine 9 were greatly increased on the ipsilateral side of hippocampus 7 days after blast exposure, while little change was observed 1 day after. These findings were consistent with previous reports on other models of brain injury such as brain ischemia and stroke. Compared to phosphorylated Akt and GSK, changes in total protein levels of both kinases were not as dramatic, indicating that phosphorylation status is important in the progression of neuropathology after primary blast.

Conclusions: Our findings indicate that neurodegeneration occurs as early as 24 hours after primary blast, and it lasts for at least 7 days. Changes in the activities of Akt and GSK may provide a therapeutic target for developing medical countermeasures against primary blast-induced mild TBI. Future directions include detailed investigation of long term effects of primary blast-induced mild TBI and development of medical countermeasures based on the present findings.

2A01: A Randomized Controlled Trial of Consultation Methods to Support Implementation of Cognitive Processing Therapy for PTSD Across Canada: Fidelity Outcomes (Part 1)

Shields, N., PhD[1], Wiltsey-Stirman, S., PhD[2], Deloriea, J., PhD[3], Landy, M. MS[3], Belus, J., BA[3], Maslej, M., BA[3], Lane, J., BHSc[3], Monson, C.,PhD [3]

[1]Veterans Affairs Canada; [2] Boston University; [3]Ryerson University; [4]University of North Carolina

Introduction: Posttraumatic Stress Disorder (PTSD) is a serious mental health condition with substantial costs to individuals and society. Among military Veterans, the lifetime prevalence of PTSD has been estimated to be as high as 20%. Numerous research studies have demonstrated that short-term cognitive-behavioral psychotherapies, such as Cognitive Processing Therapy (CPT), lead to substantial and sustained improvements in PTSD symptoms. Despite known benefits, only a minority of clinicians provide these therapies. Moreover, few studies have examined the quality of the delivery of these therapies in practice. This study investigated the impact of three post-workshop follow-up conditions on CPT fidelity, clinician attitudes, and clinical outcomes. The current presentation will focus on clinician fidelity outcomes.

Methods: Clinicians who attended a workshop on CPT for PTSD were solicited and randomly assigned to one of three post-workshop consultation strategies: 1) group teleconsultation with review of session recordings and work samples, 2) group teleconsultation without review, and a no-consultation condition. Consultation conditions were 6-months in duration and all participants were required to engage at least 2 clients and upload session audio-recordings and work samples throughout the 6-month consultation period. Fidelity ratings (adherence and competence) of clinician audio-recordings were completed by graduate-level trained fidelity raters using the CPT Fidelity Measure.

Results: Three waves of clinician recruitment and random assignment to consultation condition were completed over a 12 month period (March 2012-13). A total of 146 clinicians were consented to the study and 135 were randomly assigned to one of the three consultation conditions. Approximately 61% of clinicians uploaded session recordings. Preliminary analyses of fidelity ratings of the first wave of clinicians (n = 23) indicate that approximately 26% obtained a satisfactory rating for CPT protocol competence. A further analysis of fidelity by condition will be presented.

Conclusions: Implications for evidence-based psychotherapy dissemination strategies will be discussed with a particular emphasis on the relative benefits of consultation strategies to enhance and sustain psychotherapy fidelity outcomes.

2A02: A Randomized Controlled Trial of Consultation Methods to Support Implementation of Cognitive Processing Therapy for PTSD across Canada: Client Outcomes (Part 2)

Monson, C. M., PhD[1], Shields, N., PhD[1], Deloriea, J., PhD[2,3], Landy, M., MA[1], Belus, J., BA[1], Maslej, M., BA[1], Lane, J., BA[1], Wiltsey-Stirman, S., PhD[1,4,5,6]

[1]Ryerson University; [2]Veterans Affairs Canada; [3]Operational Stress Injuries National Network; [4]US Veterans Affairs; [5]National Center for PTSD; [6]Women's Health Sciences Division

Introduction: Numerous studies demonstrate that cognitive-behavioral psychotherapies, such as cognitive processing therapy, lead to substantial and sustained improvements in PTSD symptoms (e.g., Resick et al., 2012). Nevertheless, only a minority of clients with PTSD receive these therapies in routine care. Workshops are insufficient to ensure skilled delivery of therapy and follow-up support is necessary. However, there has been little research to identify the most effective strategies for providing this support and their impact on client-level outcomes is unknown. With the number of Canadians returning from peacekeeping and combat missions with PTSD and other conditions commonly comorbid with PTSD (e.g., depression, anxiety, substance use), there has been a tremendous need to build capacity for clinicians across Canada to provide these evidence-based treatments for PTSD to Canadians Veterans.

Methods: This study examined the impact of 3 different post-workshop training strategies on patient PTSD outcomes. Clinicians from across Canada and in various settings (n=134) were randomized to either consultation with or without review of patient session recordings and work samples or no post-workshop consultation. Clinicians in all conditions had randomly selected sessions reviewed for fidelity.

Results: The blind has not been broken at the time of submission, but will be prior to the conference. However, preliminary results indicate that patients across all conditions had large pre-to-post treatment effects in self-reported PTSD symptoms.

Conclusions: These findings provide evidence of CPT effectiveness in routine care settings. Implications of these findings will be discussed in the context of system-level efforts to implement evidence-based psychotherapies.

2A03: A Randomized Controlled Trial of Consultation Methods to Support Implementation of Cognitive Processing Therapy for PTSD Across Canada: Developing a Model of Clinical Consultation (Part 3)

Landy, M. S. H., MA[1], McShane, K., PhD[1], Vezer, E., BA[1], Bance, S.[2], Wiltsey-Stirman, S., PhD[3,4], Shields, N., PhD[5], Monson, C. M., PhD[1]

[1]Ryerson University; [2]University of Toronto; [3]Veterans Affairs National Center for PTSD; [4]Boston University; [5]Veterans Affairs Canada

Introduction: Best practice in training clinicians to deliver evidence-based psychotherapies (EBPs) includes workshop attendance followed by post-workshop consultation. Although previous research highlights the importance of consultation, little is known about what makes for successful consultation, and no model of clinical consultation currently exists. The aim of this study is to develop a model of clinical consultation by examining the processes that occur during consultation.

Methods: Using data from a sample clinicians learning to deliver Cognitive Processing Therapy (CPT; Resick, Monson, & Chard, 2007), an EBP for Posttraumatic Stress Disorder (PTSD), post-workshop consultation calls will be transcribed and coded. Within the context of a realist framework, a paradigm frequently adopted by social scientists, consultant and clinician behaviours and interactions will be analyzed with an eye toward understanding the key elements and mechanisms of consultation.

Results: An overview of the study's aims and methodology will be presented, and preliminary findings will be discussed.

Conclusions: Not yet available

2A04: Accelerated Resolution Therapy (ART) for Treatment of Symptoms of PTSD between Civilian and Military Adults: United States and Initial Canadian Experience (Part A)

Kip, K. E., PhD[1], Clark, C. E., MSW, RSW[2], Rosenzweig, L., MS, LMFT[3]

[1]University of South Florida; [2]Carewest OSI Clinic; [3]Rosenzweig Center for Rapid Recovery

Introduction: First-line psychotherapies for adults with post-traumatic stress disorder (PTSD) were principally validated in civilian rather than military populations, and are relatively lengthy and yield variable rates of success. Our objective was to compare treatment of symptoms of post-traumatic stress disorder (PTSD) between civilian and military adults by use of Accelerated Resolution Therapy (ART), an emerging, brief exposure-based therapy (1-5 sessions). This includes recent treatment experience in the United States, as well as a description of the initial treatment experience with ART in Calgary, Alberta.

Methods: For the US experience, individual patient data were pooled from two recently-completed studies of ART. Treatment response for symptoms of PTSD was compared by civilian versus military status, and stratified by gender and participants with versus without sexual trauma. For the initial Canadian experience, pre- and post-treatment response among civilians and Veterans with previous refractory PTSD are currently being documented using the CROMIS 45-item outcome questionnaire (OQ) along with current clinical charting protocol.

Results: For the US experience, mean age was 40.1 vs. 42.0 years in civilians (n=70) vs. military participants (n=55), respectively. Females represented 85.7% of the civilian study vs. 16.4% in the military study (p<0.0001). Mean 17-item PCL (PTSD) scores before/after treatment with ART were 53.3/30.2 among civilians compared to 57.0/40.5 among military participants (p=0.25). Over follow-up, there was an apparent steeper reduction among civilians in Intrusive (p=0.01) and Numbing symptoms (p=0.02), but not in Arousal (p=0.93) or Avoidance (p=0.16) symptoms. Among females with sexual trauma, mean reductions on the PCL were substantial and similar between civilian (-22.5 $\pm$ 16.7) and military (-21.2 $\pm$ 12.7) participants (p=0.87). For the initial Canadian experience, large reductions in symptoms of PTSD and related psychological comorbidities are being observed in 5 treatments sessions or less, and often times, in just 1-2 treatment sessions.

Conclusions: In an average of <4 treatment sessions, treatment with ART appears to result in substantial, comparable reductions in symptoms of PTSD in civilian and military patients. This includes recent experience and empirical data from multiple studies conducted in the US, as well as initial clinic-based experience in Calgary, Alberta.

2A05: Accelerated Resolution Therapy (ART) for Treatment of Symptoms of PTSD between Civilian and Military Adults: United States and Initial Canadian Experience (Part B)

Kip, K. E., PhD[1], _Clark, C. E., MSW RSW[2]_, Rosenzweig, L., MS, LMFT[3]

[1]University of South Florida; [2]Carewest OSI Clinic; [3]Rosenzweig Center for Rapid Recovery

Introduction: This presentation is a continuation of the Accelerated Resolution Therapy (ART) for Treatment of Symptoms of PTSD between Civilian and Military Adults. Part B of this presentation focuses on the initial Canadian treatment experiences at the Carewest OSI Clinic in Calgary, Alberta utilizing ART an emerging, brief exposure-based therapy (1-5 sessions).

Our objective was to compare previous evidence-based treatment outcomes of PTSD symptoms in Veteran, RCMP and military adults by use of Accelerated Resolution Therapy (ART) who were previously treatment resistant.

Pre- and post-treatment response among specialized Carewest OSI clinical population (RCMP, military, and Veterans) with previous refractory PTSD are currently being documented using the CROMIS 45-item outcome

questionnaire (OQ) along with current clinical charting protocol.

Large reductions in symptoms of PTSD and related psychological comorbidities are being observed in 5 treatments sessions or less, and often times, in just 1-2 treatment sessions.

Through narrative reporting, clients and their partners are reporting significant reductions in PTSD symptoms as well as overall increase in quality and re-engagement of life.

Conclusions: In an average of <4 treatment sessions, treatment with ART appears to result in substantial, comparable reductions in symptoms of PTSD in our clinical population. These initial results at Calgary OSI Clinic in Canada appear to support the recent experience and empirical data from multiple studies conducted in the US.

2C01: Recent Suicide Ideation and Combat Exposure in CAF Members Deployed to Afghanistan Between 2009-2012

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Introduction: The dramatic increases in suicide rates seen in US military personnel over the past decade have not been seen in Canada, yet there is concern that widespread exposure to combat in Afghanistan will result in an increase in mental issues, including suicide. The role that combat exposure plays in this increase is uncertain, and the role of specific sub-types of combat exposure has received limited attention. Previous research done prior to the CAF's mission in Afghanistan concluded that combat exposure was associated with a significant but minor proportion of mental health outcomes (Sareen, 2008). We used data collected during Enhanced Post-deployment Screening for mental health problems to explore the association between different sub-types of combat exposure and suicidal ideation in a large cohort (N=16,193) who deployed in support of the mission in Afghanistan.

Methods: A logistic regression was performed to calculate the odds ratio of suicide ideation for each type of combat exposure while controlling for all other exposures, sex, age, regular versus reserve status, rank, years of service, military branch, marital status and education. Using the adjusted odds ratios, the population attributable fraction of suicide ideation was calculated for each significant exposure. Exposures of interest were identified through factor analysis: dangerous environment (reported by 79% of sample), aftermath of battle (66%), active combat (70%) and perceived responsibility (5%); and single exposure items experienced by more than 5% of the participants: being physically injured (8%) and experiencing a close call (10%).

Results: Suicide ideation was reported by 2% of the sample. Overall, 25.5% (4.6-41.8) of suicide ideation could be attributed to exposure to one or more aftermath of battle items, 10.1% (6.2-13.9) to exposure to one or more perceived responsibility items and 5.6% (1.2-9.8) to being physically injured. Suicide ideation was not significantly associated with exposure to dangerous environment, active combat, or experiencing a close call. This suggests that specific sub-types of combat exposure are differentially associated with specific mental health outcomes.

Conclusions: Only a portion of suicide ideation cases could be avoided if all combat exposure were removed. This suggests that factors other than combat exposure play a large role in suicide ideation in the population of military members who deployed. This finding is somewhat consistent with findings from the US and Canada showing at most a small correlation between deployment and suicide. It also indicates that different types of combat exposure contribute differentially to suicidal ideation.

2C02: Sleep Disturbances and Suicidal Ideation in a Sample of Treatment-seeking CAF Members and Veterans

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Introduction: This study examines the association between suicidal ideation and sleep disturbances in a sample of treatment-seeking Canadian Armed Forces (CAF) members and Veterans, after controlling for probable posttraumatic stress disorder (PTSD), major depressive disorder (MDD), generalized anxiety disorder (GAD), and alcohol use disorder (AUD).

Methods: Subjects included CAF members and Veterans seeking treatment at a hospital-based Operational Stress Injury Clinic (n = 404). Sleep disturbances and nightmares were measured using individual items on the PTSD Checklist - Military Version (PCL-M), while the suicidality item of the Patient Health Questionnaire (PHQ-9) was used as a stand-alone item to assess presence or absence of suicidal ideation.

Results: Regression analyses were used to determine the respective impact of (1) insomnia and (2) nightmares on suicidal ideation, while controlling for presence of probable PTSD, MDD, GAD, and AUD. We found that 86.9% of patients reported having problems falling or staying asleep and 67.9% of patients reported being bothered by nightmares related to military-specific traumatic events. Neither sleep disturbances nor nightmares significantly predicted suicidal ideation; instead, probable MDD emerged as the most significant predictor.

Conclusions: Findings of the current study indicate that screening for sleep disturbances and major depression as potentially modifiable conditions related to suicidal ideation among military members and Veterans may be beneficial in terms of promoting a path to recovery. For those individuals who report significant impairment as a result of their PTSD-related sleep disturbances, clinicians may consider including specific interventions for sleep disturbances or nightmares in the treatment plan in hopes of improving long-term

treatment outcomes and reducing the frequency and intensity of suicidal ideation.

2C03: Review of Guidelines for the Continuous Assessment of Suicidal Ideation

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Brief Description: This presentation will focus on a review of the current guidelines and recommendations regarding the assessment of suicidal ideation. The importance of continuous assessment of suicidal ideation throughout the course of patient care will be highlighted, with emphasis on the specific risk factors and life events that leave military personnel and Veterans vulnerable to increases in suicidal ideation.

Clinical Outcomes: Where appropriate, outcome data will be presented on specific assessment guidelines or tools, and strength of available evidence will be emphasized in the presentation of this review of clinical practice and empirical data.

Patient Population: This review of the current guidelines and recommendations regarding the assesment of suicidal ideation will focus, as possible by the published literature, on guidelines and recommendations that have been examined and practiced with military personnnel and Veterans.

Conclusions: Given the increased rate of both suicidal ideation and suicide among military personnel and Veterans in Canada and the United States, clinicians and the military community are looking for resources to support increased vigiance of suicidal ideation. It is anticipated that this review of the current guidelines and recommendations for asessing suicidal ideation will equip clinicians and the military community with these resources.

3A01: Summary of Findings from the Canadian Forces Supplement to the Canadian Community Health Survey, Cycle 1.2—Mental Health and Well-being

Bennett, R., MSc

Canadian Forces Health Services Group

Introduction: The Canadian Aumed Forces Supplement to the Canadian Community Health Survey, Cycle 1.2—Mental Health and Well-being was a large, representative survey of active Canadian military personnel conducted by Statistics Canada on behalf of the Department of National Defense in 2002. The methods of the 2002 survey are highly comparable to those of the 2013 CAF Mental Health Survey. This paper will review the methods and key findings of the 2002 survey.

Methods: Data collection took place monthly between May and December 2002. Consenting participants completed a computer-assisted personal interview with Statistics Canada personnel. A total of 5,155 Regular Force members were interviewed, yielding a response rate of 79.5%. For the Reserve Force the analogous numbers were 3,286 members interviewed and a response rate of 83.5%. The survey contained modules on socio-demographics, general health, mental disorders and alcohol dependence, health service use, disability, etc.

Results: 15.1% of the Regular Force members reported symptoms consistent with at least one of the five mental disorders covered in the survey (major depression, social phobia, PTSD, panic disorder, and general anxiety disorder) in the 12 months prior to the interview. The 12-month prevalence of any mental disorder was lower among Reserve Force members (12.7%). The most common mental disorder that Reg Force members faced was depression (7.6%). Alcohol dependence was the most commonly reported disorder among reservists, at 6.2%. Reporting of symptoms of a mental disorder was generally higher in lower ranks and women.

Of Reg Force members reporting symptoms consistent with at least one mental disorder, one-quarter (24.5%) had received some form of help for their problems, and found the help to be sufficient. An important proportion (35.0%) was classified as having symptoms consistent with at least one mental disorder and had neither received nor reported needing help.

Key findings from published studies using data from the 2002 survey will be presented. These results cover the factors associated with the prevalence of mental disorders, predictors of mental health service use, and delays in treatment seeking.

Conclusions: The results of the survey have helped the CAF to better understand the underlying reasons of mental distress among some of its members. Specifically: determining what factors lead to good mental health, how to address mental health issues in the CAF and the resources needed to support them. These results also provide a basis for comparison for results from the 2013 edition of the same survey.

3A02: The 2013 Canadian Forces Mental Health Survey: Overview of Methods

Zamorski, M. A., MD, Bennett, R., MSc

Canadian Forces Health Services Group

Introduction: The most recent complete and precise assessment of mental health in the Canadian Armed Forces (CAF) dates to 2002, in the form of the Canadian Forces Supplement to the Canadian Community Health Survey, Cycle 1.2-Mental Health and Well-being. In recognition of potential effects of the mission in Afghanistan and of mental health services renewal in the CAF, the CAF commissioned the 2013 Canadian Forces Mental Health Survey.

Methods: The primary objective of the survey was to provide an updated picture of mental health in the CAF with particular attention to the effects of the mission in Afghanistan and of mental health services renewal. The study population consisted of 67,776 Regular Force personnel plus 4,857 Reserve Force personnel, who were in service in early 2013. The Reserve Force sample consisted only of personnel who had deployed in support of the

mission in Afghanistan, whereas the Regular Force sample included both those who had (45%) and had not (55%) deployed in support of the mission. A random sample of personnel, stratified by rank (for the Reserve Force portion of the survey) and by rank and Afghanistan deployment status (for the Regular Force portion) was contacted by Statistics Canada. Individuals who consented underwent a computer-assisted personal interview with Statistics Canada personnel. 1480 Reserve Force personnel responded (response rate = 78.8%); 6,700 Regular Force personnel responded (response rate = 79.6%). The survey assessed five past-year mental disorders (major depressive disorder, PTSD, generalized anxiety disorder, panic disorder, alcohol dependence, and alcohol abuse), using a version of the Composite International Diagnostic Interview. Other modules assessed impacts of mental disorders (e.g., World Health Organization Disability Assessment Schedule, Two-week Disability), occupational risk and resilience factors (e.g., deployment, combat exposure, time away from home), non-occupational risk and resilience factors (child abuse, chronic medical problems), and use of services and supports (e.g., professional mental health services, exposure to mental health training).

Results: Seven papers with initial key findings of the survey will be presented as part of a symposium at MVHRF 2014.

Conclusions: The 2013 CAF Mental Health Survey will provide a much needed updated picture of mental health in the CAF. The availability of highly comparable mental health surveys from the CAF in 2002 and from civilians in 2002 and 2012 will helps situate the current state of mental health in the CAF in a historical and societal context.

3A03: Prevalence of Past-Year Mental Disorders in Canadian Armed Forces Regular Force Personnel, 2002 – 2013

Zamorski, M. A., MD[1], Bennett, R., MSc[1], Rusu, C., MD[2], Sareen, J., MD[2], Jetly, R., MD[1]

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Introduction: The past 12 years have seen the deployment of more than 40,000 Canadian Armed Forces (CAF) personnel in support of the mission in Afghanistan. A sizeable minority of those deployed has been diagnosed with mental disorders related to the mission (Boulos & Zamorski, 2013). Over the same period, the CAF has invested heavily in its mental health system. The net effect of these and other factors on mental disorders in CAF personnel is, however, unknown.

Methods: This study uses population-based survey data on Regular Forces personnel from the 2002 Canadian Community Health Survey, Cycle 1.2—Mental Health and Well-being (n ~ 5,200) and the highly comparable 2013 Canadian Forces Mental Health Survey (n ~ 6,700). In both surveys, past-year mental disorders were assessed using a version of the Composite International Diagnostic Interview, the most widely-used tool for precise and reliable assessment of mental disorders in surveys. 45% of those

surveyed in 2013 had had one or more deployments in support of the mission in Afghanistan.

Results: In 2013, 16.5% of personnel had past-year depression, PTSD, GAD, panic disorder, alcohol abuse, or alcohol dependence. The most prevalent past-year disorder in both 2002 and 2013 was major depressive disorder, which was seen in 8.0% of the Regular Force population at both time points. Past-year PTSD was the next most common disorder in 2013, affecting 5.3% of personnel. This is a significant increase from 2002, at which time only 2.8% had past-year PTSD. Past-year panic disorder also saw a significant increase in prevalence, from 2.0% to 3.4%. 4.7% of personnel met criteria for past-year generalized anxiety disorder (GAD) in 2013; changes in survey methods mean that 2013 rates for GAD are not comparable to rates in 2002. 2.5% of personnel had past-year alcohol dependence in 2013; an additional 2.0% had past-year alcohol abuse. As with GAD, rates for alcohol use disorders are not comparable to 2002.

Conclusions: Approximately one in six Regular Force personnel had at least one past-year mental disorder. Rates of past-year depression were stable over time. The increases in prevalence of PTSD and panic disorder are likely due to the effects of the mission in Afghanistan. At the symposium, additional findings (including age-sex adjusted prevalence rates and the results of logistic regression models) will be presented.

3A04: Mental Disorder Prevalence in CAF Regular Force and Reserve Force Personnel Deployed in Support of the Mission in Afghanistan: Comparison with Non-deployed Personnel

Boulos, D., MSc, Zamorski, M. A., MD

Canadian Forces Health Services Group

Introduction: More than 40,000 Canadian Armed Forces (CAF) personnel have deployed in support of its mission in Afghanistan over the period 2001 - 2013. This mission has been shown to have an impact on diagnosed mental disorders in CAF personnel, but it is unknown how this compares with those who did not deploy on this mission. Additionally, there has been concern that CAF Reserve Force personnel who deployed on this mission may have had a disproportionately higher risk of mental health problems relative to Regular Force personnel. The current study compares the prevalence of mental disorders in the Regular and Reserve Force personnel who deployed in-support of the mission in Afghanistan and additionally compares deployed and non-deployed Regular Force personal.

Methods: Data were obtained from the 2013 CAF Mental Health Survey, a survey of currently serving personnel. The primary outcomes were the presence of five past-year mental disorders (PTSD, depression, panic disorder, generalized anxiety disorder, and alcohol use disorders). Similar lifetime disorders were assessed as secondary outcomes. Logistic regressions assessed differences in the outcomes between deployed and non-deployed Regular

Forces personnel and between Regular and Reserve Force deployed personnel while controlling for a number of socio-demographic and military factors.

Results: Only preliminary findings are available at this time but more detailed results are expected to be presented. 16.2% of all survey respondents indicated having any past-year mental disorders, while 47.5% any lifetime disorders. Regular Force personnel who deployed in-support of the mission in Afghanistan were more likely to have any of the past-year mental disorders when compared with non-deployed Regular Forces individuals. However, deployed Reserve Force and deployed Regular Force personnel did not differ in their odds of having any of the past-year mental disorders.

Conclusions: Preliminary findings indicate that currently serving CAF personnel who deployed in-support of the mission in Afghanistan have a higher risk of mental disorder relative to non-deployers. The mental disorder risk for deployed Reserve Force personnel was comparable to that for deployed Regular Force personnel. These findings can potentially help to inform policy development as well as the delivery of programs and services.

3A05: Prevalence of Past-Year Depression, Generalized Anxiety Disorder, and Alcohol Abuse or Dependence in CAF Regular Force Personnel and Civilians, 2013

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Introduction: Relative to civilians, military personnel have both risk and protective factors for mental health problems. Military risk factors include exposure to potentially traumatic events on military operations. Potential protective factors include the use of resilience training and the well-resourced military mental health system. Previous research in the Canadian Armed Forces (CAF) showed an excess of past-year depression in military personnel relative to civilians. However, much has changed in the CAF since that time, notably the deployed of more than 40,000 personnel in support of the mission in Afghanistan and the wholesale renewal of its mental health system. The purpose of this study was to provide an updated comparison of the mental health of CAF Regular Force personnel and Canadian civilians by examining differences in the prevalence of past-year depression, generalized anxiety disorder (GAD) and alcohol abuse or dependence.

Methods: Data were from two cross-sectional population-based surveys conducted by Statistics Canada: the 2013 Canadian Forces Mental Health Survey (CFMHS; n=6,696 CAF Regular Force) and the 2012 Canadian Community Health Survey - Mental Health (CCHS-MH; n=25,113). Using highly comparable methods, these two mental health surveys provide a unique opportunity to compare of the mental health of military personnel and civilians. Depression, GAD and alcohol abuse or dependence were assessed using the

World Mental Health - Composite International Diagnostic Interview 3.0 (WMH-CIDI).

Results: Past-year prevalence rates of depression, GAD and alcohol abuse or dependence in CAF regular force personnel were 8%, 4.7%, and 4.5% respectively, while in the civilians the rates were 4.7%, 2.6%, and 3.2%, respectively. Regular Force personnel, relative to civilians, had higher crude rates of past-year depression, GAD, and alcohol abuse or dependence. Additional analyses, including age-sex adjusted prevalence rates and logistic regression models, will be presented at the Forum.

Conclusions: Depression, GAD and alcohol abuse or dependence are modestly prevalent in Canadian military personnel and civilians. However, significant prevalence differences were found in the two populations, with the past-year prevalence rates being higher in military personnel than in their civilian counterparts. For alcohol abuse and dependence, the difference in prevalence will likely disappear after adjustment for the excess of younger men in the CAF relative to civilians. However, prevalence differences in depression and GAD are likely to persist. Further research is required to understand what is driving the higher prevalence of these disorders in CAF personnel.

3A06: 12-month use of Mental Health Services by CAF Personnel - Preliminary Findings From the 2013 CAF Mental Health Survey

Fikretoglu, D., PhD, Liu, A., PhD

Defence Research and Development Canada

Introduction: A significant portion of individuals with a mental disorder fail to access mental health services. The 2002 Canadian Armed Forces (CAF) mental health survey revealed that failure to perceive a need was the single largest barrier to mental health service use (MHSU) among CAF members. Since then, the CAF has renewed its mental health system with the intent of overcoming that and other barriers to care. The study is to examine rates of MHSU and perceived need (PN) among CAF members a decade later.

Methods: Data were drawn from the 2013 CAF Mental Health Survey (n=8,165). In this survey, respondents were asked "During the past 12 months, have you seen, or talked on the telephone to, any of the following people about problems with your emotions, mental health or use of alcohol or drugs?" and were given a list of 5 professionals and 6 non-professionals. Those who indicated having seen one or more professionals (or non-professionals) were categorized having MHSU contact in the past year. Past-year PN was assessed with questions from the Perceived Need for Care Questionnaire (PNCQ). Descriptive statistics were used to examine rates of past year MHSU and PN. These were compared to past-year MHSU and PN in the 2002.

Results: Within the whole sample, n=2568 (32.1%) had some MHSU in the past year; n=1660 (20.9%) had MHSU with a professional and n=2394 (29.9%) had MHSU with a non-professional. These rates are significantly higher than those reported in 2002. Within the whole sample, 29.6% reported

PN for mental health services. Approximately, 14.1% had PN for information, 13.0% had PN for medication, 24.8 had PN for counseling, therapy, or help for problems with personal relationships, and 1.5% had PN for other unspecified services. The rates of PN for each of these types of services have increased from 2002 to 2013. Within each category of service, the percentage reporting their PN having being fully met has also increased considerably from 2002 to 2013.

Conclusions: Our prelimenary findings indicate that PN and MHSU have increased considerably since 2002; the fraction of CAF members reporting their PNs are fully met has also increased. Altogether, these results seem to suggest that the mental health system renewal that took place after 2002 may have led to significant improvements in MHSU access in CAF. We discuss these findings and future, more detailed planned analyses.

3E01: Potential Relationship between Executive Function and the Mental Health Component of Resilience in Deployed Military Population

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University of Alberta

Introduction: This study analyzes a potential link between executive function and mental health component of resilience.

Methods: In this study, a sub-set of data collected in the longitudinal, prospective study entitled "Resilience Enhancement in the Military through Multiple Health Status-REIM" was used to test a potential link between executive function and mental health component of resilience in the active military population. Military troops (n=128) were tested during the pre-deployment training and during deployment in Afghanistan. At both time points, the participants completed detailed questionnaires, including the Traumatic Life Event Questionnaire measuring types and extent of previous traumatic experiences; the Connor-Davidson Resilience Questionnaire measuring self-perceived resilience level and components of social and mental resilience; the SF-12 questionnaire on global health status establishing self-reported physical and mental composite scales; PCL-M measuring components of post-traumatic stress disorder; and the Combat Exposure Score identifying the intensity of accumulated combat exposure.

Cognitive performance including executive function was measured using the Cambridge Neuropsychological Test Automated Battery (CANTAB). The results of these questionnaires were compared with the performance measures of executive function as measured by the spatial working memory, attention-switching and stop signal tasks of the CANTAB. Prior to analysis, some data were logarithmically transformed to reduce skew in the distributions. Paired-sample T test for parametric data and Wilcoxon signed-ranks test for non-parametric data were conducted. Pearson correlation was used to examine relationships among variables. $P < .05$ was considered as significant cut-off point.

Results: The results indicated higher global resilience during deployment, identified through both self-reporting questionnaires and the cognitive performance tests. During pre-deployment training, significant correlation between impulse control, cognitive endurance and troubleshooting capability and mental resilience was found. Similar correlation between executive function and mental resilience was found during deployment. The self-perception of mental health and cognitive performance significantly differed between the pre-deployment and deployment time-points with significant statistical differences found between the two baselines.

Conclusions: The participants showed significantly improved cognitive performance and higher physical resilience during the deployment. However, the mental resilience components referring to social support and self-reliance showed a declining trend accompanied by increased anxiety and depression. Since resilience plays essential role in the life of military personnel, a better understanding of the connection between executive function and the mental health component of resilience is needed. Namely, if such a relationship exists, rehabilitation addressing low-level mental resilience might enhance cognitive performance, and vice versa: cognitive training of executive function could prevent mental health impairments.

3E02: The Army Study to Assess Risk and Resilience in Service Members (Army STARRS): Design and Early Results

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Introduction: Army STARRS is a multi-component epidemiological and neurobiological study designed to generate actionable, evidence-based recommendations to reduce U.S. Army suicides and increase basic knowledge about risk and resilience factors for suicidality. This presentation provides an overview of Army STARRS and the early results from two of its six components: the Historical Administrative Data Study (HADS) and the All Army Study (AAS).

Methods: The HADS is an analysis of 38 Army and Department of Defense administrative data systems containing records for all active duty soldiers serving during 2004–2009. We examined time trends and predictors of suicides and accident deaths in the subset of Regular Army soldiers (n=975,057).

The AAS is a representative cross-sectional survey of the Army, exclusive of soldiers in basic training. Participants completed self-administered questionnaires and were asked

to consent to linkage of their questionnaire responses and administrative records. We examined the prevalence and predictors of past 30-day mental disorders and lifetime suicide ideation, plans, and attempts among non-deployed Regular Army soldiers during 2011 Q2-4 (n=5,428).

Results: HADS analyses found that the suicide rate increased during 2004-2009 among never, currently, and previously deployed soldiers, whereas trends in the accident death rate were mixed. Sociodemographic and service-related predictors were similar for suicides and accident deaths. The rising suicide rate was not explained by time trends in the predictors or increased use of accession waivers.

AAS analyses found that 25.1% met criteria for a 30-day mental disorder, with 12.8% of cases reporting severe impairment and 76.6% reporting pre-enlistment age at onset for at least one disorder. Controlling for sociodemographic and service-related variables, severe impairment was most strongly predicted by disorders with a pre-enlistment onset. Population-attributable risk proportions (PARPs) of severe role impairment are 21.7% for pre-enlistment disorders, 24.3% for post-enlistment disorders, and 43.4% for all disorders.

Lifetime prevalence of suicide ideation, plans, and attempts were 13.9%, 5.3%, and 2.4%. Most cases (47.0-58.2%) had a pre-enlistment onset. Controlling for sociodemographic and service-related variables, post-enlistment suicide attempt was differentially predicted by mental disorders with pre- vs. post-enlistment onsets. PARPs of post-enlistment suicide attempts are 31.3% for pre-enlistment disorders, 41.2% for post-enlistment disorders, and 59.9% for all disorders.

Conclusions: Rising suicide rates among never-deployed soldiers suggest combat exposure is not the exclusive cause of increased Army suicides. The large proportions of soldiers reporting pre-enlistment onset of mental disorders and suicidal behaviors suggests that early-career screening and interventions might reduce these negative outcomes.

3E03: PTSD and Criminal Offending by CAF or Former CAF Members: Legal Decisions

Coté, I., MD

University of Toronto

Introduction: The impact of military service on criminal offending remains a subject of debate. Research has showed a complex relationship between PTSD and criminality in the military. Several factors have been involved in explaining this link including substance abuse and combat exposure. The objective of this study is to determine the attribution by the Courts of the role of PTSD in crimes committed by Canadian Armed Forces (CAF) or former CAF members. The function of the expert in the judicial decision process will also be examined.

Methods: Canadian judicial decisions involving CAF or former CAF members with PTSD were obtained through electronic searches of legal databases (CanLII, QuickLaw, SOQUIJ and Chief Military Judge). A search strategy was used by including the key terms (also in French) *military and PTSD;*

Canadian (Armed) Forces and PTSD; soldier and PTSD. A total of 55 cases in which 50 individuals were charged with criminal offences from 1999 to 2014 were located for inclusion in the study. Cases were analyzed using a 14-item coding sheet. Items queried included demographic information, nature of charges, expert testimony and court decisions.

Results: Twenty-two cases stemmed from Provincial Courts and Review Boards, Superior Courts and Appeal Courts; 33 from Courts Martial and the Court Martial Appeal Court. These spanned several stages in the judicial process: 13 reasons for judgment (with 7 stays of proceedings), 33 sentencing hearings, 7 appeals and 2 disposition hearings. PTSD was attributed to combat exposure and/or operational missions in 54% of the 50 CAF or former CAF members. The source of trauma was non-military related in 8% and not specified in 38% of individuals. Expert testimony was heard in 17 cases. The role of the expert included commenting on the causal relationship between PTSD and the criminal act, automatism, dissociation, malingering and risk of reoffending. PTSD was considered by the Court as a mental disorder in respect to a finding of non-criminal responsibility or as a mitigating factor at sentencing. PTSD was not given any weight when no connection between PTSD and the commission of the crime could be established.

Conclusions: Given that PTSD can be a central issue in criminal matters involving CAF or former CAF members, the causal factors leading to the development of this disorder and its relationship to the offending behavior should be reviewed in each case. Expert psychiatric evaluation and testimony has value to the court for adjudication and sentencing decisions in these complex cases.

4D02: "Absolutely Incapable of 'Carrying on'" – Attitudes of the Canadian Public Towards Suicides in the Canadian Military: 1914-2014

Barrett, M., PhD (Cand), English, A., PhD

Queen's University

Introduction: Suicide among Canadian serving military personnel and Veterans is a tragic event that is interpreted through the lens of the culture of the time. Canadians in different eras have perceived suicide among this group differently as our culture has changed. Some perceptions have remained relatively constant and others have changed significantly. The number and the details of suicides in this population is not well documented; however, a number of cases have come to public attention, especially those during or immediately after a major conflict in which Canada has been involved. This study will examine selected cases to document these perceptions.

Methods: This research will use primary and secondary sources to identify attitudes in Canada towards suicide among Canadian serving military personnel and Veterans since the First World War. It will then compare these attitudes to see which ones have remained relatively stable

and which ones have changed noticeably over time. Next, hypotheses will be presented to explain why certain attitudes have been more durable than others. Finally, implications for current efforts to de-stigmatize suicide will be proposed.

Results: Preliminary results suggest that there have been changes in the attitudes of the Canadian public towards suicides among Canadian serving military personnel and Veterans over the past 100 years. Some attitudes have remained relatively stable while others have changed markedly. It appears that attitudes that are more resistant to change are supported by durable beliefs and values, whereas those that have changed are not. It is hypothesized that efforts to de-stigmatize stable attitudes towards suicide in Canada's military and Veteran population will require more time, effort, and resources than those attitudes that are more susceptible to change.

Conclusions: De-stigmatizing suicide is an important factor in reducing its incidence. This research, by conducting an historical analysis of selected case studies of suicide among Canadian serving military personnel and Veterans between 1914 and 2014, attempts to identify those attitudes towards suicide in Canadian culture that have historically hindered de-stigmatization efforts. It aims to provide practitioners with data to assist them in deciding how to choose priorities in their efforts based on which attitudes have been most resistant to change over the past 100 years.

4D03: A Land of "Quiet Madness": Hessian Suicides During the American Revolution

Miller, J., Capt., (USA Ret)

University of Maine

Introduction: This project seeks to understand the tendency of Hessian accounts of the American Revolution to be more forthright about madness, specifically suicide.

Methods: The research method is primarily a historical or textual approach to the published and unpublished records of Hessians in North America. The exhaustive Riedesel family manuscripts elucidate madness, suicide and the role of spousal support in early modern North America.

Results: The records of Hessian sources in general indicate that Hessians called Canada and Continental America a land of "quiet madness." A combination of harsher environmental factors (specifically storms), quality of food, and republican politics all influenced a belief that the land and the people of North America were inherently dangerous. Suicide was often the only escape for soldiers separated from family and homeland. Baroness Frederika Riedesel's accompaniment of her husband created a memoir unencumbered by male stoicism and she was direct about her husband's depression in the wake of the defeat at Saratoga, his longings for death, and a progressive intensification of insomnia.

Baron Friedrich Riedesel's private papers from Three Rivers in Quebec illustrate how often his soldiers fell sick, went mad, and all his efforts to support his wife after the loss of her daughter Canada. The resulting melancholy nearly killed her and her daughter America before they could bury Canada. Her affliction of "aloof giddiness" combined with her continued utterance that she "was more dead than alive" at Saratoga illustrated that she also suffered mentally.

Conclusions: The quality of spousal support in relation to trauma is perhaps the best check to suicide in relation to PTSD or OSI. Understanding the role that colonial era "Good Wives" played in the treatment of sick has great potential for contemporary Veterans. Training family members that can intervene in the cases of "self stigma" that characterize most cases of Canadian soldier and Veteran suicides. Family members will always be able to reach soldiers in ways that are impossible for mental health professionals. The story of the Riedesel family struggling to hold themselves together in the wake of traumatic experiences can also serve as a historical example of how previous families have suffered and thrived.

4E01: An Opioid Reduction Program for Injured Workers

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Centre for Addiction and Mental Health

Brief Description: Over the past decade, rates of opioid prescription use for non-cancer pain has drastically increased. Frequently they are prescribed acutely for musculosketal or neuropathic pain, with maintenance on increasing doses due to inadequate response. Recent guidelines have challenged the principles of dose escalation of opioids, particularly above 200 morphine equivalents (MEQ), due to emerging evidence of addictions, rebound pain and sudden death. In response to the need for safe opioid reduction in at risk workers, the Medication and Substance Program was launched at Centre for Addiction and Mental Health in 2011. The MSP is a co-llaborative interdisciplinary team of physicians, pharmacists, occupational therapists, and social workers with expertise in opioid medication, management of pain and addiction, and mental health.

Clinical Outcomes: Both qualitative and quantitative outcome data, will be presented regarding our experience with 60 workers during the first 2.5 years of the program.

Patient Population: This is a unique and effective program that has been developed to support both assessment and treatment needs of injured workers approximately 8-10 years post injury using opioid medication for chronic pain due to injury.

Conclusions: The program has achieved significant reductions in opioid medication requirements and pain while improving mental health and functioning, including return to work rates. Team approaches to opioid reduction including pharmacological, behavioural and psychological will also be reviewed.

4E02: "The Psychiatrist in the Machine": Automated Diagnosis and Treatment Planning Using Smart Algorithms that Analyze Brain Electrical Activity Patterns

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Introduction: In the absence of quantifiable biomarkers to guide diagnosis and management. "best practice" psychiatric treatment guidelines devolve to "serial trial and error". This is highly inefficient. Only 37% of patients with major depressive disorder (MDD) remit with the first antidepressant medication. Nearly 70 % of patient with bipolar disorder (BD) are initially misdiagnosed. Unsuccessfully treated patients experience prolonged suffering, increased risk of suicide, poor work performance or absence from work.

Methods: Our McMaster University team has developed machine learning algorithms that can detect complex patterns in the electroencephalography (EEG) signal of an individual patient to determine psychiatric diagnosis and predict response to different forms of treatment.

Results: Our algorithms can predict response to SSRI medication (88% accuracy, n=22), clozapine (86% accuracy, n=37), transcranial magnetic stimulation (89% accuracy, n=38) or electroconvulsive therapy (ECT) (88% accuracy, n=11). Our software can also differentiate healthy (n=91), schizophrenic (n=40), depressed (n=64) and bipolar (n=12) subjects with 87% accuracy. We plan to extend our studies to other treatments (medication, CBT), other diagnoses (PTSD) and to determine the risk of suicide.

Conclusions: Our diagnostic and predictive algorithms can be used by a health care team to provide personalized psychiatric management advice with levels of accuracy that exceed those of the experienced psychiatrist. As the EEG data are easily uploaded for central analysis and wireless EEG headsets promise reliable, point of care data acquisition, our digital system can guide first provider management even in remote areas where psychiatric expertise is not readily available.

4E03: Deep Brain Stimulation for the Management of Treatment-refractory PTSD: Clinical Experience in Human Subjects and Implications for Veteran Mental Health

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University of Toronto

Introduction: There is an urgent need to develop novel treatments for post-traumatic stress disorder (PTSD). Though current strategies are effective for some patients, a large proportion remain symptomatic despite optimal care, and are susceptible to ongoing disease morbidity and to a recognized suicide risk. Deep Brain Stimulation (DBS) is a neurosurgical procedure that is a standard therapy for patients with refractory movement disorders, such as Parkinson's Disease. DBS offers an opportunity to directly influence key brain structures that drive and maintain pathological behaviours. Given it's promise in motor circuit conditions, DBS has been investigated in other circuit-based disorders, including psychiatric disease such as Major Depression. We have recently reported on the safety and efficacy of DBS in patients with refractory Anorexia Nervosa (AN), a population with known high levels of PTSD comorbidity. Here we report on our experience with DBS of emotion circuits in those patients with comorbid PTSD.

Methods: We conducted a phase 1 trial of DBS in 12 patients with refractory AN, of which 5 had a comorbid diagnosis of PTSD that was resistant to treatment. Outcome measures included mood and anxiety scales, improvements in affective regulation, and engagement in conventional treatments. Patients underwent surgery at Toronto Western Hospital, and were followed by a team of neurosurgeons and psychiatrists. Psychometric evaluations took place at 1, 3, 6, and 12-months after surgery, and functional neuroimaging with positron emission tomography (PET) was performed at 6 and 12-months post-operatively.

Results: DBS was well tolerated in this patient cohort, and was associated with few serious and non-serious adverse events. At 1-year after surgery, patients with comorbid PTSD reported significant reductions in mood and anxiety symptoms, reductions in trauma-associated anxiety, and improvements with PTSD-specific therapy. Cerebral metabolic imaging of this patient cohort demonstrated significant changes in glucose utilization in key brain structures critical for affective regulation, anxiety and mood.

Conclusions: This study demonstrates for the first time in humans, that a surgical procedure can lead to significant reductions in PTSD symptoms, in otherwise treatment-refractory patients. Our results demonstrate that DBS is safe in these patients, and further associated with sustained improvements in mood and anxiety, both in short- and long-term follow-up. Brain metabolic changes after DBS further showed that anxiety and PTSD-relevant circuitry are influenced by chronic stimulation. Taken together, these results suggest that DBS may hold promise as a novel, safe, and effective therapy for patients with refractory PTSD symptoms.

5A02: Dis-Location: Home, Belonging, and (Virtual) Identity at War in the 21st Century

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Royal Military College

Introduction: How did soldiers experience the ontological concepts of "home," "belonging," and "locatedness," and what was the impact on identity and mental health, during the Canadian mission in Kandahar? How were perceptions framed in light of modern information and communicative technologies (ICT) that inherently blur boundaries between the real and the imagined, through a term we call "virtual"? I propose that the physical, cognitive, psychological, and emotional steps that soldiers took (and will take in the near future) to establish temporary, virtual "homes" in sustained life-threatening environments and particularly how they

narrate those experiences to themselves, each other, and family partially underlies OSI and bespeaks an evolutionary maladaptation inasmuch as they signify an irreconcilable rift between a prehistorical concept of home and the exponential pace of change characteristic of modern (Western) culture that is constantly redefining it.

Methods: Quantitative and qualitative research, including interviews, email surveys, and follow-up telephone/email dialogs, will expose perceptions of dis-location. The target audience will include those from austere patrol bases (FOBs), Kandahar Airfield (KAF), and the Kandahar Provincial Reconstruction Team (KPRT). I recognize and will account for the reality that I am soliciting *memories* of perceived experiences, years after the fact.

Results: I will outline the theoretical context of my research, arguing that OSI is partly a consequence of self and shared *narratives* about home and belonging in an ICT-rich environment inherently in conflict with the deeper evolutionary history that produced it. I will argue that social media both alleviates and exacerbates feelings of hominess and belonging, begging questions about the role of the institution in managing the phenomenon.

Conclusions: My model fuses literary/cultural, environmental, and biological and cultural evolutionary discourses. My research should improve our understanding about how deployed troops narrate, and thus actually experience, dislocation by framing it in vastly richer and deeper temporal and spatial terms, which, in turn, might lead to an improved understanding of OSI, identify CAF institutional strengths and weaknesses when it comes to indoctrination and socialization, and inform Canadian society generally about why and how those who operate in sustained life-threating environments are subject to distinct evolutionary pressures.

5A03: Homelessness and Veterans Incarcerated in Provincial Correctional Facilities

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Introduction: There is limited research on incarcerated Veterans in Canada. Studies indicate that past incarceration is a risk factor for homelessness and homelessness is a risk factor for incarceration. A project on incarcerated Veterans received research ethics board approval by the Centre for Addiction and Mental Health and the Ontario Ministry of Community Safety and Correctional Services. The objectives of this study are to determine the characteristics and criminogenic risk factors of Veteran inmates using a convenience sample of inmates in five provincial detention centres from 2012 until 2015. The issue of homelessness is further being explored.

Methods: Data on sociodemographic variables, history of homelessness, length of service, rank, history of deployment, positive/negative aspects of military, reasons for leaving the military, adjustment to civilian life, and history of physical and mental health problems, are obtained through a semi-structured interview. Further history of psychiatric diagnoses, substance use, alcohol consumption and suicidal ideation reported on admission are identified through institutions' Health Care Records. Inmates' official offence history and LSI-OR (an assessment tool designed to predict criminal recidivism among offenders), if available are obtained through inmates' records.

Results: Twenty-four male inmates to date self-identified as having been in the military and consented to participate. Eighteen served in the Canadian Armed Forces or in the U.S. Armed Forces. Of those, 8 had past and/or current homelessness. Four had no fixed address and one had a shelter address prior to admission to jail. Three had been homeless more than once. Their mean age was 45.5 years. Almost all were supported through income assistance programs. Their level of education was mostly Grade 12 or higher. Their average length of service was 6 years. Six had prior incarcerations. Four had their first conviction during military or shortly after release from the military. Four were charged with violent offences. Most had a difficult transition from the military to civilian life. Almost all had mental health problems and experienced significant substance and alcohol use post-military. None reported homelessness as a negative outcome from the military.

Conclusions: At completion, this study will provide valuable information about the characteristics of incarcerated Veterans with a history of homelessness and on how they might differ from incarcerated inmates who have never been homeless. Since Veteran inmates are at risk for homelessness at re-entry in the community, discharge planning coordinated with partner agencies and services prior to release from jail will require careful needs assessment.

5C01: Families of the Fallen: Lessons Learned and Implications for Policy and Practice

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Introduction: Bereavement and trauma arising from sudden death remains an area of practice and epistomology that is supported by a limited evidence base. This is particularly true in relation to deaths occuring in combat. This qualitative study explored the grief and bereavement expereinces of family of origin following fatalities in Afghanistan. Building on a previous presentation of emerging findings, the results and data from the study reveal rich information to inform clinical practice and policy, and to support further inquiry. The study was completed as a partial requirement for a doctoral degree in Social Work.

Methods: This study drew on phenomenology and qualitative methods to uncover and explore the nature, depth and nuances of being bereaved during combat. The study focused on the Mission to Afghanistan and recruited only Canadian families of the fallen. Fifteen adult family members participated in in-depth interviews (6 mothers; 4 fathers; 5 adult siblings; no spouses chose to participate).

Participants self-identified in response to availability and snow ball sampling strategies. Non-reactive measures were used as well to help triangulate the data. Data were analysed using inductive and thematic processes informed by phenomenological data analysis methods.

Results: Findings cover three core areas. The first theme reveals how family members find and reconstruct meaning after the death. This included continuing bonds with the deceased; disruption and re-negotiation of Self in relation to the social context (military culture/public opinion and views), as well as attempts at preserving personhood of the deceased. The second theme discusses the role and functions of symbology and ritual following sudden death as well as limitations. The third theme discusses how trauma was intertwined with grief and how this could impede integration of the death into life narratives.

Conclusions: This presentation draws together findings and emphasizes the implications for clinical practice, including preventative practice now that the Mission is over. The findings also highlight information for establishing core competencies for undertaking practice in this clinical field. Finally, the data reveal rich information that can inform policy revision and enhancement.

6A01: How Do We Best Change Attitudes Towards Mental Health Services in Mental Health Education: Examining the Impact of Instructor Characteristics

Fikretoglu, D., PhD, Liu, A., PhD, Beatty, E. L., PhD

Defence Research and Development Canada

Introduction: The Road to Mental Readiness (R2MR) is a mental health education program delivered throughout the military career, starting at recruit training. One objective of R2MR is to change attitudes towards mental health service use. Attitude formation literature (e.g., The Elaboration Likelihood Model) suggests that source characteristics (e.g., perceived expertise of R2MR instructors) may influence the extent to which recruits change their attitudes towards mental health service use. R2MR is delivered either by clinicians, or by peer educators (former or active military personnel), or jointly by clinicians and peer educators. Each of these instructor types represents varying levels of subject matter (i.e., mental health) and military expertise. The purpose of this study was to explore whether instructor type (peer educator alone, clinician alone, and joint peer educator and clinician) would indeed influence attitudes towards mental health service use after exposure to R2MR.

Methods: Six incoming recruit platoons were assigned to one of the three experimental conditions (clinician, peer educator, joint delivery with clinician and peer educator). Attitudes towards mental health service use were assessed by the Canadian Armed Forces Recruit Mental Health Service Use Questionnaire (CAF-R-MHSUQ), a measure developed specifically for this population which has demonstrated excellent internal consistency reliability and factorial validity in extant research. Due to the clustered nature of the data, we used multivariable mixed linear modelling to assess whether scores on the subscales of CAF-R-MHSUQ would be influenced by instructor type.

Results: Approximately 308 recruits participated in this study. On three out of the eight subscales of the CAF-R-MHSUQ, there was a statistically significant difference between the clinician only and peer educator only instructor types. Specifically, the scores on these three subscales (Overall Attitudes, Affective Attitudes, and Overall Intention) were lower under the clinician only instructor type compared to the peer educator only instructor type. The differences were in the same direction (i.e., higher scores under peer educator) but did not reach statisticial significance on the remaining subscales.

Conclusions: Results from this study suggests that source characteristics may influence the uptake of the messages surrounding mental health service use in R2MR. These preliminary findings suggest that for recruits, military expertise may be more important than mental health expertise in establishing message credibility. We discuss current efforts to replicate and extend these findings and as well, practical ways in which messages around mental health service use can be standardized to have the same source characteristics in R2MR.

6A02: Optimizing Mental Health Training in the CAF: Dismantling Instructor Type and Instruction Method Effects

Fikretoglu, D., PhD, Beatty, E. L., PhD, Liu, A., PhD

Defence Research and Development Canada

Introduction: The Road to Mental Readiness (R2MR) is a mental health education program delivered throughout the military career, starting at recruit training. With recruits, R2MR is delivered in a Power Point presentation, during a 160-minute classroom session. R2MR has three key objectives: 1) teaching stress management skills, 2) teaching basic mental health literacy concepts, and 3) changing attitudes towards mental health service use. Prior research found that recruits had difficulty retaining and applying some important R2MR stress management skills concepts. This led to the development of two new versions R2MR, one with more technical detail and the other with less. The purpose of this study was to compare these two different versions of R2MR under three instructor types (peer educator alone, clinician alone, and joint peer educator and clinician), with the aim of identifying the conditions under which the retention of key R2MR concepts are optimized.

Methods: Incoming recruit platoons were assigned to one of the six experimental conditions (2 versions by 3 instructors). A knowledge retention test (i.e., quiz) was administered the day following the R2MR classroom session. On the quiz, item 4 assessed recruits' ability to remember and describe what the four R2MR stress management skills are; Items 9 and 10 together assessed recruits' ability to apply a difficult stress management skill (Self-Talk). Due to the clustered natured of the data, multivariable mixed linear modelling was used to assess whether performance on these three quiz items was influenced by R2MR version and instructor type.

Results: Approximately 308 recruits participated in this study. On items 9 and 10 combined (Self-Talk), results from the mixed linear modelling revealed that there was a significant effect for R2MR version and instructor type. Specifically, the less technical version of R2MR version and the clincian alone instructor type led to higher scores on these items assessing ability to apply Self-Talk. On item 4, results from the mixed linear modelling revealed that there was a significant effect for R2MR version; specifically, the less technical version once again led to higher scores on these items assessing ability to remember and describe the four R2MR stress management skills. All results remained the same after controlling for potential confounders, such as intelligence.

Conclusions: This study identified conditions under which the mental health training being delievered to CAF recruits can be optimized. We discuss the implications of these findings for military mental health education program formulation, delievery, and evaluation.

6A03: Military Moral Distress: Developing an Interdisciplinary Model of Moral Distress in Military Health Care Professionals

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Introduction: Military health care professionals (MHCP) may experience moral distress during international deployment. Moral distress is experienced when a HCP faces a moral dilemma, e.g., knows the morally correct course of action but is blocked from taking it, or where all available courses of action require something of moral significance be given up. While the literature indicates that moral distress often negatively impacts the mental health of the individual and the effectiveness of the organization, limited research has examined moral distress amongst MHCP. Many similar stressors and psychological health problems are present for both civilian and military HCP; however, the unique context of deployment necessitates further examination. This study explores the MHCP experience with moral distress by using Bradshaw's model (unpublished) of progression from the encounter with a moral dilemma to the impact on individuals and organizations.

Methods: The CIHR funded Ethics in Military Medicine Research Group (EMMRG) project identified ethical challenges for MHCP. This presentation draws on data from semi-structured interviews with 23 Canadian Armed Forces nurses, physicians, and medical technicians. Qualitative analysis using comparative techniques was utilized to identify patterns across interviews. Themes related to HCP experiences of moral distress were developed. Bradshaw's model of moral distress in MHCP was examined at all stages; from an MHCP encountering a moral dilemma to experiencing the resulting moral distress and the resolution process. Next, the model was assessed deductively as the EMMRG interview data was analysed. The outcome of the analysis outlines where the model is supported and where refinement is recommended.

Results: Moral distress is experienced by MHCP during international deployment, and is distinct from psychological distress; however, the process of identifying and resolving moral distress can have psychological impacts on MHCP. Our interview data supports indications in the literature of an association between moral distress and the potential for developing mental health issues such as PTSD, depression, and burnout. The EMMRG study results help validate and refine Bradshaw's model with the introduction of elements such as a separate resolution stage and a 'moral crisis-state' (which describes the impact of experiencing moral distress on mental health).

Conclusions: Moral distress has unique features for MHCP that impact psychological health. Further research examining how MHCP cope with moral distress and the impact on their mental health is encouraged. We propose a refined version of Bradshaw's model to improve understanding of these issues for MHCP.

6D01: Prevalence of Operational Stress Injury in the Ontario Provincial and Municipal Police Forces

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Introduction: The October, 2012, report "In the Line of Duty" by the Ontario Ombudsman into the handling of Operational Stress Injuries (OSI) by the OPP and other Ontario police forces recommended an epidemiological study of all its officers to establish the prevalence of OSI. The objective of this study, therefore, is to establish the current prevalence of Operational Stress Injuries (OSI) within the police forces of Ontario. This will also be compared to other groups such as serving members of the Canadian Armed Forces (CAF).

Methods: All (approximately 65,000) uniformed police officers in Ontario (Ontario Provincial Police (OPP) and municipal police), and operational civilian employees of Ontario police forces were contacted by e-mail and invited to complete an on-line survey. Data collected includes information on depression, anxiety, alcohol and substance abuse, and suicide potential. OSI is measured with the Post Traumatic Stress List (PCL) adopted for police. Potentially traumatizing events, the Police Stress Questionnaires (Operational and Organizational) and stigma measures are included. Populations will be analyzed according to their police service (OPP or municipal police force), formerly serving members by service and civilian employees by service.

Results: To date 10,117 individuals, representing more than 34 police detachments and the OPP, have completed the online survey. The population is 59% male and 41% female. 66% are currently serving officers, 31% are civilian employees within the police, and 3% are retired, almost half

(42%) of respondents are between 40-49 years old. 17% meet the criteria for OSI during their lifetime, 16% have been diagnosed with depression, and 11% report having seriously thought about ending their own life. 79% would report a physical disability to a supervisor but only 56% would report an mental illness. 66% thought that reporting a mental illness would harm their career.

Conclusions: Final data will be presented at the conference. It is expected that OSI rates amongst serving Officers and operational civilians will mirror those in the serving CAF, identified in the 2013 Canadian Forces Mental Health Survey.

6D02: The Relationship Between Cognitive Performance, Stress and Hormonal Changes in CAF Troops Before, During and After Deployment

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Introduction: Military personnel are exposed to a multitude of stressors during deployment, with their capacity to adapt and respond to stressful situations governed largely by the hypothalamic–pituitary–adrenal (HPA) axis, which is also a primary regulator of mood and emotional responses. This physiological response to stress includes over- or under-expression of hormones such as cortisol, testosterone, and dehydroepiandrosterone-sulfate (DHEA-S). Prolonged exposure to stressful environments can result in marked hormonal changes, which may manifest in cognitive decline and poor stress management. By assessing cognitive function and measuring stress related hormones before, during, and after deployment, it is possible to accurately identify hormonal changes in direct response to a stressful situation, and their effects on cognitive performance.

Methods: One hundred and sixteen Canadian Armed Forces combat troops participated in this study prior to deployment. On the morning of testing, each participant produced 3 x 2 ml whole saliva samples and completed the Post-Traumatic Stress Disorder - Military; PTSD-M) checklist, a demographic form detailing past & present medical history and medications, and the Cambridge Neuropsychological Test Automated Battery (CANTAB; a robust cognitive assessment featuring 5 assessment modules). Troops were also assessed by the same means midway through deployment, and upon return. Saliva samples were measured for cortisol, testosterone and DHEA-S levels by enzyme-linked immunosorbent assay (ELISA).

Results: In this study, we will examine the salivary expression of the stress-related hormones cortisol, testosterone, and DHEA-S, and their ratios to each other prior to, during, and upon return from deployment. We will also explore their relationships to cognitive performance, mood, memory and impulse control, and determine whether changes in hormone expression are correlated to poor stress management and decreased cognition.

Conclusions: The findings of this study will identify those troops with poor stress coping and increased expression of stress hormones, and the deleterious effects on cognition as a result. These troops may benefit from customised hormonal supplementation to correct hormonal imbalance, and potentially improve stress management, cognition, memory, and mood as a consequence.

6D03: Cortisol Levels and Subjective Stress During a North Pole Expedition

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Introduction: In April 2014, 35 Canadian business leaders, 12 Canadian soldiers and their guides embarked on a 125 kilometer ski expedition to the Magnetic North Pole, creating a unique opportunity to collect research data on stress. This study examines daily salivary cortisol levels as a biomarker stress response in conjunction with subjective stress measures such as journal keeping, during a ten-day physically demanding 24-hour sunlight arctic expedition environment. The benefits include an increased understanding of how opportunities for unique physical challenges can influence stress and coping of Veterans and civilians unaccustomed to this type of activity. These data may be valuable to understand unique experiences, like exploring remote areas, or even space, which are being investigated by military and civilian groups.

Methods: The project uses non-invasive biological data collected from saliva and participant diaries. A series of pre-tests were conducted online in order to ascertain participant demographic information, perceived stress, and stress management, along with a saliva sample to determine physiological baseline levels of cortisol. The daily expedition data collection consisted of physiological and psychological measures, including saliva samples, self-report stress level and stress management logs, sleep logs and hunger logs. Post-tests involved reassessing several of the self-report variables using the online fluid survey system.

The project sample size was 41 participants, including 12 (2 females) Canadian military Veterans, some of whom have experienced physical or psychological trauma, 24 (4 females) Canadian business leaders and 5 (1 female) guides who supported the expedition, representing a participation rate of 77%.

Results: In order to reduce variability due to the diurnal pattern of cortisol, saliva was collected in the afternoon each day. Individuals with post-traumatic stress disorder (PTSD) have been shown to have increased afternoon cortisol levels compared to traumatized individuals with no PTSD symptoms and healthy controls. Therefore, the cortisol levels in the military Veteran PTSD sample are expected to be higher than the civilian sample, while the civilian sample levels are expected to be higher for the non-PTSD military sample due to the novelty of the experience and lack of outdoor training for the civilians.

Conclusions: Cortisol is considered the main biomarker in stress research. This project expands understanding of the effects of a physically demanding 24-hour daylight stressful experience on salivary cortisol levels in conjunction with subjective stress measures from daily log books. This data is important in understanding subjective and biological reactions to remote averse environments.

6D04: RCT Evaluation of a Reconsolidation-based Treatment for Post Traumatic Stress Disorder

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Research and Recognition Project Inc. (USA)

Introduction: The Reconsolidation of Traumatic Memories (RTM) protocol is a brief, cost effective treatment for the intrusive and hypervigilant symptoms of PTSD. It has a history of 25 years of anecdotal and clinical reports. This is the first scientific evaluation of the method. Based upon the Reconsolidative theory of memory updating, the protocol briefly evokes the memory, quiets the subject and creates a series of neutral reconstructions that are overlaid onto the original memory. The study includes blood sample analysis to confirm diagnosis of PTSD and its alleviation through the analysis mRNA exons related to immune system regulation.

Methods: This is a 30 subject Randomized Controlled Trial (RCT) pre-pilot of the protocol. Subjects met three levels of diagnostic criteria: PSSI (cutoff 15), PCLM (Cutoff 36) and clinical observation. Clinical criteria require that subjects were unable to recount the traumatic incident without significant autonomic response so that the retelling is either difficult or impossible. The presence of nightmares (>2x per month) and flashbacks (>1x per month). All subjects were male with a previous diagnosis of PTSD from the VA. Exclusion criteria include pre-existing Axis I or Axis II Co-morbidities, lack of severe autonomic response, current substance abuse and the inability to sustain attention for the period of the treatment. Control subjects began treatment two weeks after intake. Post testing with PCL-M occurred at two weeks, and six weeks post and at each session physiological indicia were noted. A second blood sample was taken two weeks post.

Results: Clients receiving the treatment have all shown dramatic reductions in autonomic arousal that is maintained at six weeks post. Responses to the PCL-M were clinically (>10 Point reduction) and statistically significant (>20 point reduction) and are likewise maintained at six-weeks post. Typical responses to the treatment include increasing ability to recount the traumatic incident without significant autonomic response (by session three it is absent), increased levels of detail surrounding the traumatic incident, reframing of the event so that guilt and anger are often alleviated. The retelling moves from disjointed vignettes to coherent, detailed descriptions. The descriptions are subject to conscious control and do not overwhelm the client. mRNA analyses are still pending.

Conclusions: Results indicate that this is a highly effective intervention which merits further investigation with larger populations including both male and female Veterans.

6E02: Brief Coaching Skills for Spouses of OSI Veterans: A Post-traumatic Growth Approach

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Brief Description: Existing literature demonstrates that there is a strong negative impact on couples and families in which one member has recently returned from military deployment overseas. However, there is in fact interesting and substantial evidence that many couples can very successfully navigate through the challenges of family reintegration, as in the Canadian Armed Forces (CAF), where military members' perception of their spouses as supportive was strongly associated with high personal morale and strong organisational commitment (Dursun, 2006). For practitioners, family resilience is becoming synonymous with family strengths and generally implies the capacity of a family to successfully manage challenging life circumstances. The distinct advantage of the Solution-Focused Brief Coaching model in promoting Post-Traumatic Growth (PTG) is that it does not explore or seek to diagnose mental health symptoms. Instead, it is an effective psycho-educational intervention that can be developed and employed across a wide spectrum of practitioners with a minimal expenditure of resources. This PTG approach focuses primarily on the spouses of OSI Veterans, who are then encouraged to invite their partners to participate in the last of four, two-hour weekly seminars based on the identification of the couple's strengths and the amplification and strengthening of the couple relationship.

Clinical Outcomes: To date, there is substantial empirical support for attachment-based, emotion-focused therapy for couple distress. Johnson (2004) reports that 70-73% of couples recover from their relationship distress, and that 86-90% of distressed couples exhibit significant increases in relationship satisfaction, with the effects appearing stable over time (Halchuck, Makinen, & Johnson, 2010).

Patient Population: This presentation is based on our recent psycho-educational interventions at CFB Kingston working with family members, OSISS [Operational Stress Injury Social Support] peer supporters, and non-mental health staff. Our first PTG treatment group, revealed positive outcomes, including increased appreciation of the value (and fragility) of life and the importance of family.

Conclusions: Currently, there are no specific couples-based interventions for family integration after a wartime military deployment (Sayers, 2009) and little scientific research focusing on CAF members and their personal relationships (Dursun, 2006). However, it is suggested that reuniting couples involves enhancing their communication to help the

couple understand and appreciate each other's experiences and to re-establish intimacy (Sayers, 2011). The Solution-Focused Brief Coaching, Post-Traumatic Growth approach that we propose is highly beneficial in that it explores the desired goals, solutions and existing resources that nurture and build on the existing strengths within the couple relationship.

6E03: Veterans' Mental Health: How Much is it Going to Cost?

Barkel, E. K., MBA, Malanik, C., MA

Office of the Parliamentary Budget Officer

Brief Description: The Parliamentary Budget Officer (PBO) is undertaking proactive research to assess the fiscal impact of providing required mental health treatment to the Canadian Armed Forces (CAF) and Veterans populations. An operating principle of any budget office is to develop cost estimates in a policy neutral manner, meaning that the office must adopt the assumption that the given policy is successfully implemented as described by the government. In this case, the policy of interest is the Canadian Government's obligation to provide mental health care to Canadian Veterans.

The interpretation of this assumption has significant implications when developing a methodology to estimate the cost of providing mental health care to Canada's Veterans. In brief: to what standard of care is this obligation held?

Clinical Outcomes: Reports from the Veterans Ombudsman and the National Defence and CAF Ombudsman have brought attention to the volume of mental health cases in the serving and non-serving Veteran population. At present, no research exists to address the cost of treating this growing population, nor the impact of this growing cost on the resources of the organizations providing care.

Patient Population: The PBO estimated the cost of caring for Veterans with disabilities as part of the 2008 report on *Fiscal Impact of the Canadian Mission in Afghanistan.* This proposed report differs from the PBO's earlier analysis as it will provide an estimate that is not limited to cases arising from the Mission in Afghanistan.

The population of interest includes all military Veterans, including those who have left the CAF and are covered under provincial or territorial health insurance (e.g. OHIP). However, the absence of data for Veterans seeking help outside of Federal programs has been a significant obstacle in estimating the size of the Veterans' population affected by mental health issues. It is known that at least 12% of the Department of Veterans Affairs' clients have a mental health issue (Parent, 2013).

Conclusions: The aim of this research is to provide parliamentarians with financial analysis to inform their decision making with respect to the budgets and estimates concerning National Defence, Veterans Affairs, and well as Health Transfers.

6E04: Appraising Promising Mental Health Practices: Addressing the Gap Between Research and Policy

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Canadian Forces Health Services Group

Introduction: Research continuously proffers new evidence on potentially effective mental health interventions such as intravenous ketamine for chronic PTSD or treatment-resistant major depressive disorder, virtual reality exposure therapy for PTSD, or animal-assisted therapy for various mental illnesses.

Policymakers and clinicians who are responsible for determining whether or not to adopt promising practices are challenged with interpreting the reliability and relevance of the evidence to understand the true potential of any new intervention. Simply put, they must answer the question; "Will this heal or might it harm?"

Methods: In this study, clinical reviewers used appropriate, validated tools (AMSTAR, Downs and Black, AGREE) to conduct rapid, summative, critical appraisals of recent evidence on three potentially promising mental health interventions — intravenous ketamine, virtual reality exposure therapy, and animal-assisted therapy — for PTSD, major depressive disorder, and trauma. The purpose of the narrative appraisals was to provide Canadian military and Veteran clinical leaders with independent, third-party analyses to address three questions fundamental to evidence-informed decision-making: 1) Can I believe the research results? 2) What are the results? 3) Can I use these results to inform my decision-making?

Results: The research demonstrated the ability of rapid, narrative appraisal to highlight the strengths and limitations of emerging evidence, as well as to identify policy and practice implications associated with new interventions. The three reviews, which were prepared for Canadian Armed Forces and Veterans Affairs policymakers and clincians, were subsequently used to help inform decisions. The critical appraisal provided a valuable analysis that helped to determine next steps in the decision process, particularly when the quality and quantity of evidence was highly limited, as in the case of animal-assisted therapy.

Conclusions: Impartial, third-party critical appraisal of promising health interventions can serve as a strategic bridge between emerging research and health policy. Critical appraisal reveals both the strengths and weaknesses of the evidence, providing insight into what's known and what questions remain unanswered, and helping to define the potential benefits, harms, and challenges of adopting new interventions.

6F01: This is Your (New) Brain on Music: Implications of Personalized Playlists within Neurofeedback Protocols for Traumatized Veterans

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Introduction: Music long has been viewed as a life-enhancing medium used to regulate mood, facilitate cooperation, or to increase motivation. Recent research that explores the relationship between music and neurochemistry, however, points to the possible uses of music not only in conjunction *with* medicine, but *as* medicine: music can modulate brain chemistry and influence heart rate, pulse, blood pressure, body temperature, skin conductance, muscle tension, and hormones, including dopamine and cortisol. One study examining the effectiveness of music in reducing anxiety in pre-operative patients, for instance, found music to be more effective in relieving baseline anxiety than benzodiazepines (Bringham *et al*, 2009). Moreover, in a second study, cortisol levels were lower in post-operative patients when the music was *self-selected,* rather than selected by the experimenter (Leardi *et al,* 2007). One of the promising new areas of therapeutic treatment for military Veterans that utilizes music is EEG biofeedback ("neurofeedback"). Within this protocol, the patient's brainwave patterns are monitored while listening to music; when turbulent patterns are detected, the computer sends a message to the patient's brain by stopping the music, sending a clicking signal, and restarting the music, the culmination of which "resets" the brain. The sound used within this protocol, however, is "stock" music unfamiliar to the patient. What would happen if self-selected music associated with a traumatic episode gradually were introduced into the neurofeedback playlist? Would it be possible to "reset" the brain more directly vis-à-vis music and specific traumatic memories? In this presentation I explore how music may be systematically introduced into neurofeedback playlists to help rehabilitate Veterans suffering from PTSD.

Methods: This research is based on qualitative interviews with twenty retired Veterans. Four of these informants are in treatment at the Kingston Institute of Psychotherapy and Neurofeedback and using personalized playlists in their neurofeedback treatment sessions.

Results: The preliminary neurofeedback baseline readings, based on the NeurOptimal Neurofeedback system, indicate that specific music playlists associated with pleasure and trauma affected brain activity in a lessened- and heightened-stress response respectively.

Conclusions: Music has been an under-utilized resource in PTSD rehabilitation. Personalized music playlists could serve as an effective tool within individually-programmed neurofeedback protocols to either return patients to a reduced state of anxiety, or gradually return them to specific traumatic memories, ultimately "resetting" their brains and lessening their PTSD symptoms.

Poster Presentations

P101: Examining Intelligence as a Potential Confound to Resiliency Training

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Defence Research and Development Canada

Introduction: The Road to Mental Readiness (R2MR) is a mental health education program that is delivered throughout the Canadian Armed Forces (CAF), starting at recruit training. During recruit training R2MR takes the form of a classroom based 160-minute PowerPoint presentation. The three key objectives of R2MR are: 1) to teach recruits stress management skills, 2) to teach recruits basic mental health literacy concepts (e.g., definition of good and poor mental health), and 3) to change recruits' attitudes towards mental health service use. Prior research found that recruits had difficulty retaining and applying some important R2MR stress management skills concepts. Intelligence has a well-supported relationship with educational achievement. Given the classroom based instructional method, the role of intelligence was explored as a possible mediator of successful learning of the R2MR objectives.

Methods: This investigation took place during a study that will be described in more detail by Fikretoglu, Beatty and Liu. Six recruit platoons participated in the study. They completed a test the day following their R2MR course which covered the concepts and skills taught in the course. They also completed the Shipley 2 which is a brief intelligence measure that assessed fluid and crystalized intelligence.

Results: Approximately 308 recruits participated in this study. There was a consistent and reliable relationship between intelligence and different intervention outcomes including: knowledge of stress management skills, the ability to apply a difficult stress management skill, and overall performance. The intelligence profile of the study sample corresponded strongly to that of what would be expected from the general population. There was a stable pattern of individual differences in our sample where the bottom quartile of the intelligence measure did poorer than the top quartile.

Conclusions: Classroom based interventions with the recruit population would do well to consider the effects of intelligence when evaluating the success of the intervention. Educational modifications that would aid the most intelligent in the classroom would likely be a disadvantage to the least intelligent.

P102: Factors Associated with PTSD and PTSD Severity in Help-Seeking Members and Veterans of the CAF and RCMP

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Introduction: Only a small portion of individuals develop PSTD when exposed to a traumatic event. This number is higher in military and policing populations. The literature shows that there are several factors which may make some people more vulnerable to develop PTSD (e.g., childhood adversity). The aim of the current study is to determine if these predisposing factors are also vulnerabilities of those in a Canadian military/policing population and if there are any other factors (e.g., deployment or postings) which may make

members of the military/RCMP more vulnerable to developing PTSD. A secondary aim includes examining these vulnerability factors, in addition to others variables, and their association to severity of PTSD symptomatology.

Methods: All data was collected as part of routine data collection in an Operational Stress Injury Clinic. Current and former members of the Canadian Armed Forces and RCMP (n=489) were sampled. Fifty seven percent were active military, 36.6 % Veterans, and 6.3% RCMP. The average age was 42 years (SD=14.0) and 88.8% were male. Variables of interest included: age, gender, marital status, education, rank, length of service, history of child abuse, family and personal history of mental illness, number of deployments, psychiatric diagnoses, suicidal ideation, and presence of traumatic brain injury. A non-experimental correlational design was utilized. Analyses consisted of correlations examining the factors associated with a diagnosis of PTSD and the severity of PTSD.

Results: Preliminary results indicate that deployment and rank are associated with a diagnosis of PTSD. Moreover, whether a participant had deployed showed a moderate positive relationship to a diagnosis of PSTD and rank appeared to have small but negative association with a diagnosis of PTSD. Surprisingly, many of the factors previously identified in the literature as vulnerabilities did not appear to be associated with a diagnosis of PSTD in this sample. Several factors were associated with increased severity of PTSD symptoms including, self-reported symptoms of PTSD, depression, and anxiety at intake, level of impairment, age, and comorbid psychiatric diagnoses.

Conclusions: The implications of the above results will be discussed. Determining what factors are related to the development of PTSD and which are related to the severity of PTSD may be informative in the planning and implementation of post-deployment/re-posting screening and possible selection of members for secondary prevention programs post-deployment/posting. Additionally, these results may help in clinical decision-making regarding interventions (e.g., type, intensity, and length). Ultimately, understanding the variables related to diagnosis of PTSD and increased PTSD severity will allow us to provide better services to our clients

P103: Individualized Medicine: Pharmacogenetic Assessment and Clinical Treatment

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Centre for Addiction and Mental Health

Introduction: Mental health disorders (for example, depression, schizophrenia, post-traumatic stress, addictions) are commonly treated with psychiatric medications. However, trial and error prescribing of medication often results in non-response and/or side effects, leading to patient non-adherence or severe adverse effects. There is evidence that genetic factors play a role in drug response and side effects, and it is now known that Cytochrome P450 liver enzymes are responsible for metabolizing nearly half of all drugs. The IMPACT (Individualized Medicine: Pharmacogenetic Assessment & Clinical Treatment) research study is conducting pharmacogenetic (PGx) testing to identify the genetic variants that influence drug response and adverse effects, and delivering user-friendly PGx reports to help healthcare providers proactively select the most suitable medication(s) and dose to prescribe. It is expected that PGx testing carried out at the start of treatment, and for patients with problematic medication histories, will lead to more rapid clinical success with fewer side effects and complications.

Methods: Eligible participants that are starting/switching psychiatric medication(s) complete a short interview, basic metabolic measures (eg. weight) and provide a saliva/blood sample for analysis. Five drug metabolizing liver-enzymes are genotyped for response and side effects to 24 psychiatric medications. The information is provided to participants' clinicians in a user-friendly, colour-coded report. Patient outcomes are measured from follow-up surveys (after 4 and 8 weeks), and clinicians' satisfaction feedback is also requested.

Results: Over 2,000 participants have been genotyped. Preliminary clinician feedback results (n~170) show that approximately 80% of clinicians understood the report results, were satisfied by the information provided, and agree that genetic testing will become common standard in psychiatric drug treatment. IMPACT has identified approximately 8% of its participants as poor or ultrarapid metabolizers for 18 of 24 common psychiatric medications listed in the report. Approximately 60% of the clinicians indicated that the information in the PGx reports was helpful in further treatment decisions.

Conclusions: Pharmacogenetics, as a tool for personalized medicine, is feasible, understandable, and will help optimize psychiatric drug treatment. PGx testing has shown promising results in reducing the side effects and improving outcomes from psychiatric drug treatments. Studies have started investigating the economic impact of pharmacogenetic-based treatment in healthcare utilization, and the cost burden of inadequate psychiatric medication treatments. Our research aims to provide data and outcomes that will eventually lead to the approval of PGx testing by authorized agencies and become a standard of care in our healthcare system.

P104: Characteristics of Incarcerated Veterans in Provincial Correctional Facilities

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Introduction: There is limited research on incarcerated former military personnel in Canada. A project on this population received research ethics board approval by the Centre for Addiction and Mental Health and the Ontario Ministry of Community Safety and Correctional Services. The objectives of this study are to determine the characteristics and criminogenic risk factors of Veteran inmates and to identify whether those who deployed to war zones differ from those who did not, using a convenience sample of inmates in five provincial detention centres from 2012 until 2015.

Methods: Data on sociodemographic variables, length of service, rank, history of deployment, positive/negative aspects of military service, reasons for leaving the military, adjustment to civilian life, and history of physical and mental health problems, are obtained through a semi-structured interview. Further history of psychiatric diagnoses, substance use, alcohol consumption and suicidal ideation reported on admission are identified through institutions' Health Care Records. Inmates' official offence history and LSI-OR (Level of Service Inventory - Ontario Revision, an assessment tool designed to predict criminal recidivism among offenders), if available are obtained through inmates' records.

Results: Twenty-four male inmates to date self-identified as having been in the military and consented to participate. Their mean age was 44 years with an average of 6 years of military service. Fifty percent served in the Canadian Armed Forces and 25% in the United States Armed Forces. All except two had positive remarks to make about the military while 88% reported negative comments. Seventy-one percent had prior incarcerations; 25% were charged with homicide and related offences; 46% had life-time arrests for assault and 42% had convictions during military service. Twenty-nine percent had completed LSI-OR; of those 86% were in the high or very high risk category for recidivism. Twenty-one percent were suicidal on admission to jail. Seventy-one percent had been given a prior mental health diagnosis. Sixty-three percent had past and/or current substance use and 88% had past and/or current alcohol use. Fifty percent had been involved in war or operational missions; half of these inmates reported having Post-Traumatic Stress Disorder stemming from their deployment.

Conclusions: At completion, we expect this study to provide valuable information about the characteristics, criminogenic risk factors and mental health needs of incarcerated Veterans in comparison to the general Ontario inmate population. If identified, future care may be more appropriately tailored to Veteran inmates to reduce criminal recidivism.

P105: The Impact of Yoga on the Symptoms of Traumatic Operational Experience

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Introduction: The objective of this longitudinal study is to examine the efficacy of yoga in reducing symptoms associated with exposure to traumatic operational experience.

Methods: Participants (n=34; 7 females, 27 males) are military members and Veterans residing in Kingston or Trenton. Participants were randomly assigned to either a yoga group or a waiting list (control group). Participants in the yoga group completed 12 Mindful Resilience Yoga sessions (1 hour/week for 3 months), which cover the basics of yoga. Several measures were used: PCL-M for PTSD symptoms, Beck Depression Inventory-II, Pittsburgh Sleep Index Questionnaire, State-Trait Anger Scale, West Haven-Yale Multidimensional Pain Inventory, Anxiety Sensitivity Index-3, the Combat Exposure subscale of the Deployment Risk and Resilience Inventory, and the Traumatic Life Events Questionnaire.

Results: Participants filled out the questionnaires in January, and 19 completed them in April. Follow-ups will continue at 6, 9, and 12 months.

Conclusions: Recruitment of participants is on-going for a second round of Yoga sessions planned for the fall 2014 and winter 2015. Preliminary results will be presented.

P106: Using Cut-off Criteria to Segregate and Characterize Rats with a Post-traumatic Stress Disorder-like Phenotype

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Introduction: Various animal models have been proposed for the study of stress-related pathologies such as post-traumatic stress disorder (PTSD). However, few are able to represent the multitude of symptoms and maladaptive stress responses that characterize PTSD. With only 10-30% of traumatized individuals developing the disorder, it is important to also consider such variability in stress-resiliency within animal models. We found that a similar proportion of rats undergoing fear conditioning fails to extinguish conditioned responses and also displays increased anxiety-like behavior.

Methods: Male Sprague-Dawley rats (n=24) underwent a classical fear-conditioning paradigm (auditory tones + footshocks), followed by extinction training and recall (auditory tones only). Blood corticosterone levels were measured at baseline prior to conditioning. Cutoff criteria for performance during late-stage extinction was set at >70% freezing (extinction-impaired) and <30% freezing (extinction-intact). Two weeks after extinction, animals performed behavioural tasks to measure the persistence of fear memory, locomotor activity and anxiety.

Results: Twenty five percent of animals met criteria for the extinction-impaired phenotype. Fifty percent were extinction-intact. When re-tested for recall two weeks after fear conditioning, extinction-impaired rats continued to display high freezing scores. In addition, these animals displayed longer latency to eat in the novelty-suppressed feeding test and spent less time exploring the open arms of

an elevated plus maze. Blood samples collected prior to fear conditioning revealed that extinction-impaired animals had lower plasma corticosterone levels at baseline than extinction-intact counterparts.

Conclusions: Rats presenting an extinction-impaired phenotype display maladaptive stress responses and behavioural abnormalities representative of those observed in PTSD-like states. This model may be useful for future research to develop treatments for PTSD.

P107: Beneficial Changes in Personality as a Result of Biocybernaut 7 Days of Alpha Brain Wave Training

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Biocybernaut Institute of Canada

Introduction: The study was conducted to determine if alpha brain-wave neurofeedback training can have positive psychological results by reducing anxiety and other psychopathology often caused by trauma and extreme stress.

The cohort participated in alpha brain-wave neurofeedback training for 76 minutes (day 1) to 120 or more minutes (days 5-7) daily for 7 days. Electroencephalogram (EEG) electrodes were attached to the head with conductive gel according to the 10-20 International Electrode Placement System. During training, participants were seated in a comfortable armchair within a soundproof and lightproof room. Brain-wave signals were amplified for processing by analog-to-digital converters and polygraphs, then filtered to the pure delta, theta, alpha, beta, and gamma broad-bands as well as subbands of these primary frequency bands of the EEG. For repeated 2-minute epochs, trainees sat with their eyes closed in the dark listening to their feedback tones as the amplitude of the filtered alpha brain-wave EEG signals controlled the amplitude (loudness) of the tones. Then a "ding" sounded and the tones stopped. For 8 seconds, a monitor lit up with dimly illuminated, static numbers, indicating the cumulative energy of their alpha brain waves over the last 2 minute epoch, after which the illuminated scores turned off and the feedback tones resumed and the process was repeated.

Methods: Participants: 40 adult volunteers were recruited from the aboriginal population (First Nations, Métis, and Inuit) of Canada. The cohort ranged in age from 25 to 60 years and included males and females. To determine the effectiveness of this training, four psychological tests (Minnesota Multi-Phasic Personality Inventory, and the trait forms of the Multiple Affect Adjective Check List, Clyde Mood Scale, and Profile of Mood States) were administered prior to commencing training and on the seventh day upon completion of the training. EEG data was also compiled throughout the training and analyzed as a factor of the training process.

Results: Post-intervention data showed very positive results with reduction of psychopathology when compared to the data from testing prior to the training. Analysis of this data showed improvement in several areas of psychopathology and with all four of the tests instruments.

Conclusions: Suitably Intensive Alpha brain-wave neurofeedback training daily for 7 days does have positive psychological results in adult male and female Canadian aboriginals as measured by data from four psychological tests on the participants.

P108: A Leader Centric Approach to Canadian Armed Forces Soldier Support

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Department of National Defence

Introduction: Individuals, families, medical professionals and leaders all have responsibilities in the CAF Soldier support system. The current system places a greater onus of responsibility on medical professionals and less responsibility on first level leaders. A shift in focus is required to enhance the system. This research contends that the CAF should adopt a leader-centric approach to soldier support.

Methods: A detailed analysis of the current challenges leaders face in fulfilling their soldier support responsibilities was conducted. Interviews with Senior CAF leaders assisted in identifying these challenges and potential areas for improvement. A comparison between the UK Royal Marine formal peer support (Trauma Risk Management) Program and the Canadian, Operational Stress Injury Social Support system was conducted along with a review of different education programs such as Road to Mental Readiness, the US Army 360 Degree Program along with the USAF Special Forces Defender's Edge program. The analysis of the above research led to the proposal of a leader-centric approach to soldier support.

Results: Two gaps in support were apparent. A gap was identified at the start of the mental health continuum where prevention is a priority. This gap can be addressed by leaders becoming primary agents of education and prevention for the CAF mental health. Specifically, leaders should take ownership of resilience training and formal peer support programs. Empowered and informed NCOs should be the primary agent to implement these progams in order to maximize effectiveness. A second gap was identified in the middle of the continuum where recognition of mental health issues is a priority. This gap can be filled by a leadership focus on reducing stigma and barriers to care. Leaders need to embrace the fighting spirit entrenched in their subordinates and foster a resilient philosophy throughout the CAF.

Conclusions: Additional analysis is recommended to determine how there can be greater engagement by first level leaders into both the CAF education/prevention and peer support systems. Elements of programs offered in the UK and the US militaries may be useful to examine for implementation in the CAF. Today's leaders must embrace more nontraditional approaches to soldier support to develop new ways of thinking about their soldiers mental health and wellbeing. Leaders have taken great strides increasing awareness and understanding for mental health issues in the CAF; however comprehension alone will not

enhance the soldier support system. Leaders must lead the way in knowing their soldiers and promoting their wellbeing.

P109: Care for the Caregivers: A Program Developed by the Mental Health Team for the Role 3 Clinicians

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Brief Description: Based on the needs of the 250 staff serving at the Role 3 in Kandahar in 2010, a Care for the Caregivers program was developed by the Mental Health Team. The goals of this program included the prevention of caregivers' impairment, along with providing concrete ways to prevent clinician burnout and compassion fatigue. A committee met once a month, where each department had a representative attending the meeting. Our program included a 90-minutes psycho-educative session on Compassion Fatigue with the aim of educating providers on this specific problem, along with providing them concrete ways to prevent it. At the end of the mission, we also offered a 60-minute debrief session supporting caregivers to express their accomplishments and positive experiences along with the difficult events they may have encountered during their mission.

Clinical Outcomes: This program was developed based on anecdotal observations of the mental health providers serving at the Role 3 in 2010. In order to better understand the reality of caregivers, research in this area, along with evidence-based practice programs are needed to meet their specific challenges.

Patient Population: The targeted audience was the staff serving at the Role 3 Multinational Medical Unit in Kandahar, Afghanistan: doctors, nurses, medical technicians, physiotherapy, dental, surgeons, mental health professionals.

Conclusions: The leadership in place embraced the program and made it mandatory for all Role 3 staff to attend the session on Compassion Fatigue. That lecture became a mandatory component for all staff arriving at the Role 3. As this point in time, I am not sure if that program is still in place or not at the Role 3. Practicing as a Social Worker can be both a rewarding and challenging experience simultaneously. It is well known that mental health providers are at risk of developing helper's impairment, such as burnout, compassion fatigue and / or other related mental health difficulties. In light of our experience serving at the Role 3 Kandahar hospital, we realized that all caregivers are exposed to helpers risk for impairment. In order to better understand the reality of deployed caregivers, research in this area, along with evidence-based practice programs are needed to meet their specific challenges.

P110: Using the Virtual Reality Avatar Interaction (VRai) Platform in Military Personnel with and Without Mild Traumatic Brain Injury

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Introduction: Making decisions about return to action following mild traumatic brain injury (mTBI) can be difficult. Recent evidence shows that ecologically-based multitasking reveals continuing executive dysfunction not easily exposed by more traditional cognitive testing. As context is very important for such assessments, we have developed a virtual reality platform introducing first and third person avatars (FPA and TPA) in the common military task of patrolling. Having shown technical feasibility, our present aim is to assess the ability of soldiers with and without mTBI to be present within, and acclimatize to, the VRai platform. In addition, we are beginning to explore the ability of this platform to distinguish performance between soldiers with and without mTBI.

Methods: To date, 11 soldiers from the Valcartier Garrison (5 controls and 6 with mTBI) have volunteered. The VRai platform consists of a motion capture system (Vicon) with a 3D virtual environment (VE) rendered (Softimage/Blender) to a head mounted display (Sensics) using commercial software (Vizard). The VE represents a Middle-East village. The FPA reproduces the subject's movement. TPAs use preprogrammed movements triggered by the FPA's movement. Physical complexity of the patrolling task is graded from walking unobstructed to interacting with static and moving TPAs. Additional multitasking complexity is graded from no additional task to responding to civilian dressed persons presented in building windows previously declared as hostile (2/20 or 4/20) or non-hostile. Subjects carry a simulated C7 rifle with a two-way switch and are required to respond as quickly as possible (up for hostile, down for non-hostile) while maintaining their normal patrolling walking speed. Presence and cybersickness are measured, along with errors for the cognitive task and speed, fluidity and obstacle clearance for walking.

Results: Both groups reported moderate to strong presence scores (Cntl=5.75/7 mTBI=5.84/7) with high scores for enjoyment. Simulator sickness (scored 0 to 3) was low for both groups (Cntl=0.33 TBI=0.55). Across conditions, the control group walked slower with less fluidity and appeared to commit fewer errors than the mTBI group (suggesting a different prioritization of tasks between groups). Obstacle clearance was not different between groups.

Conclusions: The VRai platform provides a means to immerse soldiers, both with and without mTBI, into a military context with negligible effects. Preliminary results of subjects' performance suggest that this platform could be useful in helping to reveal residual deficits following mTBI in order to help make decisions about return to action. Collection and VE refinement continue.

P111: Separating the Soldier from the War: The Psychological Effects of Physical Activity on Veterans with Post-Traumatic Stress Disorder – A Research Proposal

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Introduction: This investigation will aim to examine the potential benefits of physical activity on combat-related post-traumatic stress disorder (PTSD) in 5-15 Canadian Armed Forces personnel. Though little research has been conducted on the application of physical activity on combat-related PTSD specifically, physical activity as a method of treatment has been shown to have positive effects on various aspects of mental-health.

Methods: Using the Social Model of Disability and the Self-Determination Theory as the relevant theoretical lenses, this study will be of a mixed-method, longitudinal design. Both quantitative and qualitative data collection will be involved. The Short Screening Scale for PTSD, as well as the World Health Organization Quality of Life questionnaire (WHOQOL-BREF), will provide the quantitative basis for the study. These tools will be administered pre- and post-physical activity intervention in order to assess changes in psychological functioning. One-way ANOVA testing will be employed to assess pre- and post-test differences on the quantitative measures. Using a case study approach, qualitative data will be collected over the course of the intervention through non-structured group discussions, and will aid in understanding the lived experiences of PTSD within the target population. A qualitative thematic analysis will be undertaken on the transcribed data. The results will be discussed within the context of the research.

Participants: Approximately 5-15 members of the Canadian Armed Forces will be recruited for the study. Participants will be aged 18-80 years, and no exclusion criteria based on gender, ability, religious affiliation, or ethnicity will occur. Additionally, participants will be welcome from all branches of the military, so long as they have experienced an identifiable length of deployment.

Results: An analysis of the results is expected to be completed by June, 2015.

Conclusions: This study will enhance our understanding of the role of physical activity on psych-ological well-being within the military population. It is expected that important theoretical and clinical strides for the treatment of combat-related PTSD will stem from this study. Conclusions are expected to be available by August, 2015.

P112: Neuroendocrine Alterations and Mental Health Symptoms in Afghanistan-Deployed CAF Personnel

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Introduction: War-zone exposure to psychological trauma predisposes deployed military personnel to a variety of mental health problems, including PTSD. Development of this debilitating condition following high-risk combat missions is associated with other mental disorders, poor physical health, and impaired occupational / social functioning. PTSD has been characterized as a failure to extinguish normal reactions following a traumatic experience, which may be linked to pathogenic dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis and sustained activation of the sympathetic nervous system (SNS). Studies evaluating psychophysiological reactivity, hormonal receptor binding, and pharmacological challenge provide evidence of altered glucocorticoid and catecholamine responses in traumatized individuals; in particular, low cortisol but high dehydroepiandrosterone, and raised circulating epinephrine (Epi) and norepinephrine (NE) levels in those at risk for PTSD. We hypothesized that, relative to non-deployed military controls, a significant minority of war-zone deployed soldiers would manifest greater risk of PTSD in association with distinct neuroendocrine profiles.

Methods: This cross-sectional cohort study investigated neuroendocrine hormone levels and self-reported symptoms of PTSD in two groups Canadian Armed Forces (CAF) members (Regular Force and Reserve): (1) those recently retuned (≤18 m) from tour in Afghanistan ("deployed"; n=88) and those with no prior war-zone exposure ("non-deployed"; n=17). Resting (basal) blood samples were collected from all volunteers by direct phlebotomy at 0800h, serum/plasma was immediately processed and frozen for subsequent analysis of glucocorticoids (cortisol, DHEA-S) and catecholamines (Epi, NE). Multivariate analysis was used to assess the relationships between these HPA- and SNS-derived hormones and PTSD symptom severity measured using the Military Posttraumatic Checklist (PCL-M). Group differences were assessed by unpaired t-tests or Mann-Whitney U with p <0.05 as significant.

Results: Recent war-zone deployment was associated with distinct neuroendocrine profiles, including increased concentrations of NE, EPI, and DHEA-S, but decreased cortisol levels, relative to non-deployed soldiers. Among recently deployed soldiers, those found to be at risk for PTSD (i.e., PCL-M ≥28) showed markedly elevated NE, EPI, DHEA-S values, but consitently lower cortisol levels. Furthermore, combat exposure was strongly related to higher NE, EPI, DHEA-S in association with greater PCL-M scores. The results suggest increased neuroendocrine activation and autonomic reactivity in deployed soldiers with combat exposure.

Conclusions: The data provides a greater understanding of the psychobiological basis of stress disorders and are consistent with the hypothesis that attenuated HPA function (hypocortisolism) and sustained SNS activity (hyperarousal) contribute to PTSD vulnerability in military personnel after war-zone deployment.

P113: Illness Beliefs in Veterans with Post Traumatic Stress Disorder

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Introduction: An important way to optimize PTSD treatment for Veterans is to understand their illness beliefs. According to Leventhal's Self-Regulation Model, illness beliefs are categorized within five dimensions: illness identity, causal explanations, perceived control, perceived course, and daily consequences (Leventhal et al., 1992). Investigation of these beliefs can expand our understanding of patients' healthcare decisions and outcomes (Spoont et al., 2005). Clinicians who evalute their patient's conceptions about their trauma may be better able to educate and support them (Eisenman et al., 2008). This pilot study aims to map out illness beliefs held by Veterans with PTSD.

Methods: Participants were Veterans of the Canadian Armed Forces who were diagnosed with PTSD caused by a deployment-related event and are in partial remission. Eight participants completed a PTSD version of the Illness Perception Questionnaire (IPQ), a quantitative measure of illness beliefs. An inventory of PTSD symptoms, the Post-Traumatic Stress Disorder Checklist (PCL-5), was also completed. Next, a focus group discussion was held and focused on Leventhal's five dimensions of illness beliefs: identity, cause, control, course and consequences. Content analysis will be performed on the transcription of the group discussion.

Results: Preliminary results from the IPQ outline the Veterans' illness beliefs. In terms of illness identity, 3 Veterans (37.5%) did not associate the DSM-5 risk-taking symptom to their PTSD. Four Veterans (50%) pointed to "stress or trauma over which they had no control" as one of the causes of their PTSD. The same proportion blamed "other people's behavior that they could not control". Six Veterans (75%) thought that their PTSD would be permanent. All 8 Veterans reported a negative impact on their ability to work, the way they see themselves, and their relationships with other people. Five participants (62.5%) claimed to have "a little control" over their PTSD.

Conclusions: This pilot study represents a step towards understanding PTSD illness beliefs in Veterans. Addressing these beliefs in intervention is important, as they impact self-appraisal, symptom severity, and self-medication (Koss, Figueredo, & Prince, 2002; Spoont et al., 2005). Future studies should evaluate gender differences in these beliefs, as male and female Veterans often experience differing traumas. Ultimately, future research should investigate the relationship between PTSD illness beliefs and treatment preferences, adherence and outcomes, as links were found in other mental illness (Brown et al., 2005; Sullivan et al., 2003). These lay models may be beneficial for conceptualizing PTSD and intervening efficiently in clinical practice with Veterans.

P114: Military Masculinity, Movies and the DSM: A Narrative Exploration of a Veterans Institutionally (En)gendered Trauma

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Introduction: During consultations regarding revisions to the PTSD classification in DSM 5, some military leaders expressed concern that the word "disorder" may make Veterans' with symptoms reluctant to ask for help. Despite a recognition of the linkage between military masculine gender norms, language, and male help-seeking behaviour, the way that conflicting masculine norms and psychiatric discourses of "disorder" play out in the experience of traumatized male Veterans remains largely unarticulated.

Methods: This paper seeks to contextualize discussions about men and trauma; to examine and make explicit the masculine gender role norms of stoicism and agency across three domains of popular culture, psychiatric discourse, and a Veteran's personal trauma narrative. To articulate this conceptual argument, I interrogate three narrative sources for repeating themes: (1) the first seven minutes of a popular warrior genre movie, *300*; (2) the diagnostic category for Post-Traumatic Stress Disorder in the Diagnostic and Statistical Manual (DSM versions IV and V); and (3) the trauma narrative of Jack, an Afghanistan Veteran.

Results: Repeating themes across these three case examples illustrate how masculine role discourses, embedded in cultural institutions like Hollywood and psychiatric diagnostic language, colonize and complicate the personal trauma stories of affected male Veterans, and may inadvertently contribute to their isolation and their suffering, increase their suicide risk, and complicate their recovery. Through exploration of these repeating themes, I argue that any representation of men's trauma within a singular narrative of disorder "of the individual", situated "within the individual", misses key aspects, and potentially drivers of the male experience of trauma and recovery.

Conclusions: Having been steeped in a culture that glorifies unaffected masculinity, and which actively rejects images of male "weakness", this research suggests that there may be little room for many male Veterans to develop a healthy self-definition that includes their own experience of trauma symptoms. Against this cultural backdrop, affected Veterans may become complicit with the dominant masculine norms; put on the mask of silent stoicism, and hide personal struggles from their families, close friends, colleagues and health professionals lest they be shamed. Implications for male Veterans' treatment access and engagement are discussed from individual, peer, societal, institutional and cultural perspectives.

2. Physical Health and Rehabilitation

Podium Presentations

1D04: An Interdisciplinary Approach to Mild Traumatic Brain Injury (mTBI) Assessment and Treatment: From Injury to Return to Duty

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Brief Description: Prior to 2013, a standardized interdisciplinary program for the care of Canadian Armed Forces (CAF) members posted to the 3rd Canadian Support Division Group (3CSDB) who sustained mild traumatic brain injuries (mTBI) did not exist. Mild traumatic brain injuries secondary to work related injuries and sports are common at the 3CSDB. With the support of local chain of command, the Physical Rehabilitation Department -1 Field Ambulance developed a program employing an interdisciplinary team that includes primary care, physiotherapy, occupational therapy, vestibular specialist and Regional Adapted Fitness Specialist (RAFS). The goal of the program is to ensure appropriate care from the acute mTBI to return to full duties.

Clinical Outcomes: The purpose of this presentation is to introduce the standardized assessment and treatment processes used by each profession in the interdisciplinary team. These processes include primary care assessment, physiotherapy assessment (including central vs. peripheral vestibular dysfunction), Brain Bootcamp developed by occupational therapy, and Symptom-Limited Activities for Military (SLAM) developed by the Regional Adapted Fitness Specialist. Local challenges and potential solutions will be discussed.

Clinical measures utilized include the SCAT-3, Y-Balance test, Biodex Balance SD assisted assessment of mCTSIB, Eight Second Head Movement Test, Montreal Cognitive Assessment (MoCA), Rivermead Post Concussion Symptoms Questionnaire and the Military Concussion Readiness Inventory (MCRI).

Patient Population: Demographic data will be presented on a number of serving CAF patients with mTBI from the 3CSDB including their mechanism of injury, time to recovery, interventions required, (e.g. vestibular specialist referral/cognitive rehabilitation training), as well as outcome measures specific to each professions.

Conclusions: A validation of the 3CSDB mTBI program should be completed in order to evalutate the benefits of this program and thereby determines if the program should be generalized to other CAF healthcare facilities in the future.

Future Research: In conjuction with the Glenrose Rehabilitation Hospital (Edmonton), a vestibular group has been created to research the use of the Computer-Assisted Rehabilitation Environment (CAREN) unit for the treatment of vestibular dysfunctions with CAF members who have sustained a mTBI. CAREN assessement and treatment could include habituation to conflicting stimuli (vestibular-visual mismatch), training higher-level static and dynamic balance tasks by manipulating somato-sensory and visual input, as well as training functional tasks such as weapons targeting while in motion, helicopter flight, processing of visual stimuli or performing cognitive tasks while maintaining balance.

2D01: A New Treatment Protocol for Chronic Low Back Pain using the Computer Assisted Rehabilitation Environment

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Introduction: Low back pain (LBP) is a significant burden for the Canadian Armed Forces (CAF), and a major cause of attrition and medical release. The CAF takes an active approach to rehabilitating its members with LBP, but some patients do not progress through a graded physical rehabilitation program due to ongoing pain and perceived disability. The Computer Assisted Rehabilitation Environment (CAREN) is a virtual reality system that allows physical challenge with the distraction of a game-like environment, which may help members with chronic LBP overcome fear of movement and assist with progression of recovery. The goal of this research was to design and implement a protocol on the CAREN for treatment of LBP, and to report on the feasibility of implementing the CAREN treatment protocol.

Methods: Subjects were recruited through CFB Edmonton at time of entry to the Spinal Fitness Program. Inclusion criteria included LBP for a minimum of 12 weeks; pain ≥ 3/10 on the P4 Pain Rating Scale; Oswestry Disability Index ≥ 12; and Tampa Scale of Kinesiophobia (TSK) ≥ 25. Subjects were block randomized to a control group, high frequency CAREN intervention (10 sessions over 2 weeks), or low frequency CAREN intervention (10 sessions over 5 weeks). A CAREN treatment protocol was designed on the basis of improving core dynamic stabilization. Data on performance was tracked for each CAREN application.

Results: Of 27 subjects screened, 23 were eligible, and 11 consented to participate. Baseline demographics were: average age 37 (range 23-49), gender (10 males, 1 female), average pain level 18/40; ODI 17/100; TSK 42/68. Four subjects underwent the high frequency CAREN protocol; 4 underwent low frequency; 3 entered control. The CAREN protocol utilized five applications focusing on dynamic stabilization of the core and trunk range of motion with standardized progression criteria. All subjects that were assigned to the CAREN groups completed all 10 treatment sessions. Trends of improved performance were found for all 5 applications, with subjects showing faster performance, less errors, and tolerating greater platform perturbations.

Conclusions: The CAREN treatment protocol shows promise to improve trunk movement and stability in chronic LBP, was feasible to implement and was tolerable in the chosen LBP population. Effectiveness of this standardized treatment

protocol and implications on functional outcome will be addressed in future study.

2D02: Low Back Pain Prognostic Factors and Healthcare Seeking in the CAF

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Introduction: In the Canadian Armed Forces, low back pain (LBP) can have a significant impact on operational readiness. LBP is one of the most common reasons for referral to musculoskeletal care in the Canadian military, but the rate of re-referral (return for more treatment) is unknown. With healthcare seeking for musculoskeletal care rising over the past five years relative to other health services, and healthcare freely and easily accessible for all military personnel, it is important to investigate factors that may contribute to high usage of the military healthcare system.

Methods: We used a historical cohort design. 356 patients with recurrent or chronic non-specific LBP were identified during the study period (May 2007 to December 2012). We linked data from clinical outcome records for participants of a back rehabilitation class with administrative data from military electronic health records. We conducted an exploratory analysis to identify the associations of _a priori_ chosen prognostic factors and musculoskeletal healthcare seeking, and measured our outcome in two ways: time to first re-referral to musculoskeletal care, expressed as hazard ratios (HR), and total rate of repeated re-referrals, expressed as incidence rate ratios (IRR).

Results: 51.4% of patients had at least one re-referral during the follow up period, with over 20% of the sample re-referred to musculoskeletal services for LBP within six months following discharge. We identified six statistically significant factors associated with time to re-referral: Fear of movement/(re)injury (HR 1.05; 95% CI 1.02-1.07), planning to receive or currently receiving a Veterans Affairs pension (HR 2.29; 95% CI 1.45-3.61 and HR 1.75; 95% CI 1.06-2.89 respectively), a concurrent diagnosis of post-traumatic stress disorder (HR 1.72; 95% CI 1.01-2.93), and previous high use of musculoskeletal services (HR 1.64; 95% CI 1.14-2.38). These prognostic factors, as well as history of LBP (IRR 2.06; 95% CI 1.03-4.10) and permanent category duty status (IRR 1.79; 95% CI 1.16-2.76), were associated with the rate of re-referrals following discharge from rehabilitation.

Conclusions: This study found that a proportion of members of the Canadian Armed Forces recurrently seek care for recurrent and chronic LBP. The biopsychosocial prognostic factors identified highlight the association between the wider determinants of health and healthcare seeking for LBP in this population. Further research on these prognostic factors, and on ways to address the delivery of care at both the clinical and policy levels, could lead to more efficient management of LBP and use of resources.

2D03: Comparing Objective Biomechanical and Neuromuscular Measures to a Clinical Battery of Tests

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Introduction: Low back pain represents a heterogeneous group of conditions, with various anatomical and functional deficits. Research has focused on developing clinical classifications to better tailor management. One subgroup has been identified as those with "spinal instability". Since spinal stability is achieved through interaction of active, passive, and neural subsystems, a deficit in one requires compensation from the others to maintain stability and prevent injury/pain. Knowing the relationship between clinical tests that assess passive components and objective measures of muscle strength and activation patterns could improve our understanding of the underlying deficits to inform clinical management decisions during low back injury (LBI) recovery. The purpose of this study was to determine whether there were differences in trunk muscle activation patterns in those recovered from a LBI between groups classified as unstable or not. Surface electromyograms (EMG) from a comprehensive set of trunk muscles sites during a controlled dynamic task were compared between the groups based on whether they were positive or negative for spinal instability using the Modified Hicks's standardized clinical assessment.

Methods: 32 LBI participants recruited from the military hospital at CFB Halifax, within 4-12 weeks of injury, who were deemed recovered from their injury (low pain and disability scores) participated in this cross-sectional comparative study. In session one, demographic, clinical assessments (instability, pain and function) and occupational activity level were recorded. During session two, abdominal and back extensor strength (torque in Nm) and surface EMG signals from a comprehensive set of trunk muscles were recorded during a standardized dynamic lift-and-replace task. Participants were classified in the unstable group based on a modified Hicks's protocol. Amplitude and temporal EMG patterns were compared between groups using two (group/muscle) factor ANOVAs.

Results: The only significant differences between groups for non-EMG measures were higher occupational activity level, flexion and extension torques in the unstable group. Significant group by muscle interaction effects were found for the back (amplitudes) and abdominal (temporal) EMG patterns. Post hoc findings showed fewer between-muscle differences in the unstable group for abdominals and back sites.

Conclusions: The unstable group utilized a strategy for increased active stiffness through synergistic co-activation and altered responses to the right lateral flexor moment that were not explained by muscle strength only and indicate a "bracing" strategy. These findings are consistent with the

hypothesis that passive stiffness decreases are compensated by the neuromuscular system. Furthermore they provide initial evidence linking clinical tests for instability to objective physiologically-based measures.

2D04: An Investigation of the Role of Optic Flow in Gait Biomechanics in the Computer Assisted Rehabilitation Environment (CAREN), and a CAREN Based Intervention to Improve Slope Walking Following Lower Limb Amputation

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Introduction: There are differences in gait biomechanics when walking on a treadmill versus normal ground which call to question the transfer-of-training from the rehabilitation environment to the real world. The primary distinction between the two environments is that optic flow is present when walking in the real world and absent when walking on a treadmill. Experiment 1 addresses this question by examining treadmill walking with and without optic flow in able-bodied (AB) individuals, using the CAREN system. Experiment 2 evaluates a gait training protocol for slope walking in individuals with lower limb amputation (LLA). CAREN provides a controlled environment ideal for implementing gait-training protocols for individuals with LLA. Overall mobility, particularly in slope walking situations requiring larger ranges-of-motion and forces compared to walking over level ground, may be challenged.

Methods: Experiment 1: n=31 AB individuals. Each exposed to a 6 minute acclimation period on the CAREN, and then a 36 minute testing period. Conditions provided various combinations of congruent optic flow versus stationary visual scene and level walking versus walking at fixed grades between ±10°. Experiment 2: n = 6 LLA to date. Participants' ability to negotiate slopes between ±10° is assessed on days 1 and 8, with 20 minute training sessions provided on days 2-7. Outcomes in both experiments: centre of pressure (COP); symptoms of simulator-induced sickness (SIS); full-body motion-capture gait biomechanics, with Goal Equivalent Manifold (GEM), angular momentum, and temporal and spatial kinematics and kinetics being the primary measures of interest.

Results: No participant has shown symptoms of SIS. In AB participants there were no changes in COP excursion following 12 minutes of CAREN exposure, but significantly greater variability of COP following 42 minutes of walking, suggesting some decrement of postural stability following prolonged CAREN exposure. This is likely due to fatigue and no different from COP variation found following 42 minutes of normal walking. Optic flow has no affect on gait biomechanics. Data analysis in Experiment 2 has not yet been completed; improvements to walking ability and

confidence in slope negotiation has been noticeable in all 6 participants to date.

Conclusions: There are no detrimental effects of CAREN exposure, and the presence of optic flow does not affect gait biomechanics in and of itself. CAREN can be used safely for physical rehabilitation. Slope walking therapy protocols will likely lead to significant improvements in gait biomechanics and increased confidence in Canadian Armed Forces members with LLA.

2D05: A Randomized Trial of Ankle Mobilizations and Exercise in CAF Members with Lateral Ankle Sprain

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Introduction: Limited dorsiflexion is a common impairment following lateral ankle sprain (LAS) that may; cause difficulty with kneeling and running, increase recurrence risk, and lead to chronic ankle instability. In CAF 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 dorsiflexion. Manual ankle mobilizations applied following LAS have demonstrated rapid improvements in dorsiflexion, but research into their clinical effectiveness is limited. A pilot study was completed to determine the feasibility of performing a randomized trial in a clinical CAF setting that investigated the value of adding manual ankle mobilizations to a rehabilitation program to improve dorsiflexion in CAF members with LAS.

Methods: Twenty eligible CAF members reporting to a Physiotherapist within 7 days of an acute, incomplete LAS followed a standardized comprehensive rehabilitation program. Ten were randomized to a mobilization group who also received manual ankle mobilizations, while the other ten received a sham. At baseline, 2 & 12 week follow ups, a Physiotherapist blinded to allocation group administered the Bent Knee Dorsi Flexion test. Secondary outcome measures included the Visual Analogue Scale for pain, the Lower Extremity Functional Scale, the Foot & Ankle Disability Index, the number of days until full return to work and number of recurrences. Independent-T/Mann-Whitney-U tests were used to analyze the differences between groups. Mixed ANOVA for repeated measures explored interactions between groups & time.

Results: There were no significant differences in mean dorsiflexion between the mobilization (95.2 ± 47.5mm) & sham groups (94.7 ± 36.9mm) at 2 weeks (p=0.84). There was a significant interaction between dorsiflexion & time at 2 weeks (p<0.001), but not between groups (p=0.460). The mean differences in all outcomes of both groups between baseline & 2 weeks exceeded their minimal clinically important differences. Despite not reaching statistical significance, the magnitude of change in dorsiflexion and

self-reported function was larger in the mobilization group at 2 and 12 weeks.

Conclusions: The burden of LAS to the CAF warrants research into determining the most effective management strategies. The challenges of providing health care during deployment demand that Physiotherapists prioritize clinical efficiency. The results of this pilot study suggest that a full scale randomized trial is feasible in a clinical CAF setting and warranted to determine the value of adding manual ankle mobilizations to a rehabilitation program to improve limited dorsiflexion following LAS.

3D01: Preparing Combat Medical Technicians for the Battlefield: A Survey of their Perspectives: Preliminary Results

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Introduction: During conflict in Afghanistan, predeployment training for combat medical technicians (medics) evolved significantly. Two different approaches were used; in the early years of the conflict, medics were trained using didactic lectures and simulation. During the later years, medics were sent on a well-developed formal course involving simulation, tactical scenarios and live tissue training prior to deployment. We performed a retrospective survey of medics who received deployed during this period to analyze their perspectives on how different training modalities prepared them for their tasks on the battlefield. We focused on medics who deployed at least twice to Afghanistan during this period, and were trained using both approaches to predeployment training.

Methods: Canadian military personnel, deployed to Afghanistan between 2006 and 2011, were surveyed retrospectively regarding their experience with combat casualty care and pre-deployment training. Respondents were queried regarding their need to perform life-saving skills, and their opinions regarding their preparedness for actual combat casualty care based upon their respective pre-deployment training regimen.

Results: Thirty-eight surveys were returned. Of those deployed on earlier rotations, the majority had either only simulation training (13) or no specific training (10). Those deployed in later rotos reported primarily training with both types of training (26) or only LTT (7). Differences in perceptions of training modality on preparedness for combat care as well as the ability to perform life-saving skills are shown in Table 1. Of 17 respondents who had been deployed on both early and late rotos, the majority of individuals felt that the later training was more worthwhile (15/17). In addition, all but one of those individuals felt that LTT training should definitely be added to inanimate simulation.

Conclusions: Amongst Canadian military personnel with actual experience in combat casualty care, Live Tissue training is not only perceived as helpful, but it is considered essential in preparation prior to deployment. Many of these individuals had experience with only simulation prior to active duty, and they agreed that Live Tissue Training is superior preparation for actual live saving skills in the field.

3D04: Ride 2 Recovery's Project HERO: The Therapy that Works

Springer, B. COL (US Army Ret), PhD

Ride 2 Recovery Project HERO

Brief Description: Ride 2 Recovery's Project HERO (Healing Exercise Rehab Opportunity) programs, located at U.S. military hospitals, Warrior Transition Units, and VAs help wounded, ill, and injured service members and Veterans heal physically and psychologically through cycling with hand cycles, recumbents, tandems, and traditional road bikes as part of their rehabilitation. Ride 2 Recovery (R2R) specializes in adapting and building custom bikes so that almost anyone can ride. Adaptive cycling has proven to be a powerful therapeutic catalyst in the recovery process and an activity that they can do for the rest of their lives. Participants rebuild strength and conditioning, while concurrently mitigating the effects of PTS (post traumatic stress) and traumatic brain injuries. Cycling is less stressful on joints than other activities and has been shown to reduce the risk of diabetes and cancer, aid in weight control, improve function and gait, decrease pain, increase aerobic capacity and improve psychological well-being. One of the major goals for cyclists in the Project HERO programs is to participate in one or more of the seven long-distance R2R Challenge rides each year, which range from 350-530 miles over a five to seven day period. The Challenges not only build confidence, strength, mobility and endurance, but also promote peer-to-peer counseling and create a social network where service members and Veterans enjoy a continuous support system of those with similar injuries and symptoms who understand what they are experiencing.

Clinical Outcomes: 1) 400 Project HERO evaluations have been collected to date and include questions such as this: Based on the condition you were originally referred to the Project HERO program for, on a scale of 1-5, to what extent has the cycling program helped you: In your ability to perform normal day to day activities? Recover from your injuries or condition? Improve your general health and fitness? With pain reduction? Improve your sleep? 2) Health Expo metrics are collected before each Challenge. 3) Post-Challenge surveys are collected after each Challenge: Many claim that cycling decreased their PTS symptoms. Several have also stated that R2R saved their lives because they were considering suicide.

Patient Population: R2R is geared toward all wounded, ill and injured service members, Veterans and their families, to include special initiatives for women and couples.

Conclusions: R2R's Project HERO makes a difference in the lives of service members and Veterans by providing a rehabilitative cycling experience that will impact their lives forever.

4A01: Early Results from a New Initiative on the Health and Healthcare of CAF Veterans in Ontario

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Introduction: Following a career in the Canadian Armed Forces (CAF), Veterans must transition to the public healthcare system for the majority of their healthcare needs. In Canada, population-based research describing the health and healthcare utilization of Veterans in comparison with the general population does not yet exist and we lack an understanding of the health of Veterans and how the unique exposures of service may alter access to and use of the healthcare system. In collaboration with the Canadian Institute for Military and Veteran Health Research, we have identified, for the first time, a population-based method of studying the health of Canadian Veterans who reside in Ontario.

Methods: This is a retrospective cohort study of military Veterans using administrative healthcare data in Ontario from the Institute for Clinical Evaluative Sciences (ICES). ICES contains both provincial and national datasets linked by encrypted Ontario Health Insurance Plan number (OHIP) on Ontario resident's encounters with the healthcare system. Veterans, defined as released CAF members and retired RCMP officers will be identified using codes housed at the Ministry of Health and Long Term Care within the Registered Persons Database. The cohort will be comprised of Veterans who re-entered the Canadian public healthcare system in Ontario and provided documentation of a service history. A random age- and- sex matched cohort will be identified for comparison. Datasets with information on hospitalizations, surgical and non-surgical interventions, type and frequency of physician visits, home care use, long-term care placement, and outpatient rehabilitation will be linked. ICES algorithms will be used to identify the incidence of diabetes, cardiovascular disease, cancer, and chronic obstructive pulmonary disorder. Demographic characteristics (e.g. socioeconomic status, region of residence), disease prevalence and healthcare utilization will be described, along with measures of error. Comparisons of the measures of disease prevalence and healthcare utilization will be made between the general population and the cohort of Veterans using appropriate multivariate statistical models to adjust for potential confounders.

Results: This will be the first population-based description of the health and healthcare utilization of Canadian military Veterans. We plan to present data describing the demographics, disease prevalence and usual healthcare utilization patterns following discharge from the CAF.

Conclusions: Studying the health and health service use of Canadian Veterans will identify potential long-term outcomes associated with a career in the military service, gaps in the provision of care, and targets for the improvement of health outcomes. Creation of this resource will allow purposeful, population-based research to answer questions related to Veteran health in the future.

4A02: The Health of Vietnam Veterans, 1988-2009

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Introduction: New Zealand Veterans are entitled to health services from Veterans Affairs New Zealand, providing that they apply for support and the condition is a result of their service. Part of the evidence for causation will be epidemiological, however the application and selection process for military service results in healthier individuals than the general population, the 'healthy soldier effect', which confounds any comparison with the general population. This study examines the morbidity of an older group of New Zealand Veterans in the light of the healthy soldier effect.

Methods: A cohort study of Vietnam Veterans serving between June 1964 and December 1972 with follow up to 2009. The New Zealand Ministry of Health provided the principal diagnosis, coded to ICD-9 CMA categories, leading to inpatient treatment, medical procedure or external cause (hospital activity) in New Zealand public hospitals between 1988 and 2009. Standardised Hospitalisation Ratios (SHRs) and 95% confidence intervals (95% CIs) were calculated for each diagnosis underlying the hospital activity.

Results: The 'all causes' SHR was 1.18 (95%CI 1.16-1.20), a significant increase over the general male population rate during the period. The largest increase was in alcohol related mental disorders, SHR 1.90, 95% CI 1.51-2.29, but all the major causes of morbidity, cardiac respiratory and cerebrovascular, also showed significant increases. The only significant decrease was for for schizophrenia and related disorders, SHR 0.48, 95% CI 0.28-0.69. Of the other disorders potentially detectable at recruitment there was a 50% non significant increase in anxiety and in 'other' nervous disorders, however affective disorders were reduced.

Conclusions: The overall 18% increase in hospital activity does not support a healthy soldier effect. Some chronic conditions detectable at recruitment, psychological conditions, showed an altered pattern of presentation in this group. Although some conditions can be explained by smoking and alcohol, others such as ostoarthritis, may be service related. Others such as diabetes and joint injuries may be related to lifestyle factors adopted in service. Some other associations, for example rheumatoid arthritis, deserve further investigation. New Zealand Veterans do not have a separate 'general practice' health care system and treatment providers need to be aware of this different pattern of presentation.

4A03: Toronto PROPPR Experience: Lessons Learned on the Logistic of a Complex Clinical Trial

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Introduction: Haemorrhage remains a leading (and most preventable) cause of death in civilian and military trauma. Massively bleeding patients are often coagulopathic, resulting in uncontrollable bleeding and death. Retrospective studies suggest that mortality is reduced by hemostatic resuscitation with 1:1:1 ratio of platelets, plasma and red blood cells (RBC). The Pragmatic, Randomized Optimal Platelets and Plasma Ratio (PROPPR) was the first trial to study the benefit of hemostatic resuscitation. The present analysis explores the major logistic challenges in conducting this complex trial in Canada.

Methods: PROPPR was a phase III multicenter controlled trial studying efficacy and safety of transfusing plasma, platelets, RBC in 1:1:1 versus 1:1:2 ratios. It included civilian patients with substantial bleeding expected to require massive transfusion. Twelve institutions across the USA and Canada participated in PROPPR. Toronto was the only Canadian Centre. PROPPR was jointly sponsored by the USA (NHLBI; US Army) and Canadian governments (CIHR; Defence Research and Development Canada).

Results: Over 14 months (September 2012 – November 2013), Toronto screened 762 trauma patients and enrolled 26. The first major challenge was informed consent. Following community consultation and Health Canada approval, the Institutional Research Ethics Board allowed exception from informed consent, permitting interventions on hospital admission. Letters of notification were provided to substitute decision makers or patients themselves. The second challenge was uninterrupted research coverage by 14 Research Assistants (RAs). RAs were instrumental in screening, enrolling, collecting repeated blood samples for investigational assays, performing thromboelastogram and collecting data including times of individual product administration and protocol deviations. RAs provided over 10,080 hours of coverage, performed over 200 thromboelastogram assays and helped with compliance of all protocol steps. The third challenge was establishing a process of communication between the Trauma Room, Operating Room (OR), Critical Care (CC) and Blood Bank, to guarantee uninterrupted supply of blood products for the trial. Blood Bank was promptly notified of newly enrolled patients, sequentially prepared coolers containing thawed labelled plasma, RBC and platelets that were transported to the bedside. Transfusions followed rigorous protocols and continuous documentation, which was later verified by the Coordinating Center in Houston. Overall, full enrolment (680 patients) was reached faster than expected.

Conclusions: There are many logistic challenges in complex trials such as PROPPR. In Toronto, informed consent, research coverage and continuous availability of blood products were the most significant ones. Supervision, coordination and group effort allowed Toronto to surpass the logistical challenges and adhere to complex study protocols.

4A04: The FORCE Fitness Profile: Integrating Operational and Physical Fitness for Optimal Assessment and Reporting

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Canadian Forces Morale and Welfare Services

Introduction: The Canadian Armed Forces (CAF) recently implemented the FORCE Evaluation (Fitness for Operational Requirements of CAF Employment), a field expedient fitness test designed to represent the physical demands of completing common military tasks. These military tasks are predominantly focused on material handling and load carriage and may not reflect the overall physical fitness of personnel. The intent of the FORCE fitness profile was to capture in a single graph, a score representing one's operational fitness based on their performance on the FORCE test components and health-related physical fitness score derived from their abdominal circumference (AC) and cardio-respiratory fitness (CRF).

Methods: The development of the fitness profile consisted of 3 main steps. Firstly, a comprehensive literature review was conducted to determine whether CRF and AC could be used as independent predictors of mortality and morbidity from chronic disease and to identify appropriate age and gender cut-offs. Secondly, the validity of predicting CRF from various components of the FORCE Evaluation was statistically determined. Finally, pilot testing of the fitness profile was performed on a sample of CAF personnel in order to ascertain the feasibility and perceived usefulness of the measure.

Results: Regression analyses from a stratified sample of personnel showed that FORCE test results (combined with age, gender and AC) were a strong predictor of CRF as measured by a graded exercise test (R^2: 0.94, N:23). Using published relative risk ratios for CRF to predict mortality and morbidity from chronic diseases (Kodama et al 2009), cut-offs were selected for low fitness and high fitness by gender and 10-yr age category. AC classifications were based on international guidelines. Age and/or gender-specific scores were attributed to CRF predictions and AC. The weighted sum of the CRF and AC scores yielded the General Physical Fitness Score (X axis). Results from over 25,000 FORCE evaluations were then used to develop age and gender-based scoring tables for each test component. The sum of the component scores represents the Operational Fitness Score (Y axis). Results and lessons learned from pilot testing of the fitness profile at 4 CAF locations (N: 600) will be presented.

Conclusions:. The fitness profile provides a simple way to illustrate the fitness level of CAF members compared to their peers of similar age and gender and determine fitness levels for groups or the entire CAF. Results can be monitored over time and used to reward positive changes in overall health and fitness.

5D01: Several Years of Physiotherapy Research in the CAF: To Better Serve Military, Veterans, and their Families

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Brief Description: For the past 20 years, the Canadian Armed Forces (CAF) has experienced a steady incline in injuries and health related problems among its soldiers. Due to the increased operational tempo, an aging soldier population, and the changing nature of the CAF mission; non-battle-related injuries has had a profound effect on the CAFs combat readiness capability. As observed and reported by several NATO armies, including the CAF, non-battle-related injuries have been described as the "the hidden epidemic", plaguing modern armies and slowing combat related effectiveness. The aim of this presentation is to show how physiotherapy research can help to: 1) identifying risk factors and causes of injuries for tailored prevention strategies; 2) sharing information to facilitate integrated approaches for positive clinical outcomes; 3) developing integrated performance measurement strategies; and 4) improving assessment and treatment of CAF members.

Clinical Outcomes: Examples of research conducted with CAF military personnel in the past 14 years will be presented with an emphasis on how this research has helped to change and improve the physiotherapy/physical rehabilitation care provided to our CAF personnel. The focus will be on research results that had an impact on the prevention and management of musculoskeletal injuries, the development of clinical standards and guidelines for the optimal management of those conditions, and the implementation of a new wellness model of practice. Some examples will include: physiotherapy and rehabilitation clinical application for clinical program surveillance, physical demands related to the weighted load marches, neck/shoulder exercises for the mitigation of neck pain in military aircrew, interactive virtual reality real-time avatar for military rehabilitation of traumatic brain injury and chronic low back pain with kinesiphobia, and the optimization of the management of ankle sprains by CAF physiotherapists.

Patient Population: CAF personnel of all trades, ages, and gender.

Conclusions: Considering the number of qualified researchers and experts in Canada from various universities that could be involved in research with our military and Veterans, it is imperative that we work closely together and cohesively on all fronts towards the research priorities that have been identified by the CAF, Veterans, and by those we serve: the CAF members. Suitably tailored research should incorporate a greater focus on the determinants of health for particular population of CAF military and Veteran personnel. Once this goal has been reached, not only will CAF members and Veterans be better served but also the wider Canadian population will similarly benefit.

5D02: High-performance Amputee Rehabilitation: A CAF Best Practice Clinical Review

Godsell, P. Capt., BSc, Besemann, M., LCol., MD

Canadian Forces Health Services Group

Brief Description: Canadian Armed Forces (CAF) members who sustain traumatic injuries have high expectations for their recovery and rehabilitation. They are often referred to as tactical athletes, thus, when injured they expect the same intensity of their physical rehabilitation as they apply to their training. As such, in 2008 the CAF Physical Rehabilitation Program was established. A challenging rehabilitation environment is fostered by a hybrid civilian-military rehabilitation team in order to meet high-performance fitness and return-to-work objectives. This presentation will highlight clinical best practices and lessons-learned in high-performance amputee rehabilitation within the CAF. Evidence-based physiotherapy considerations to mitigate secondary physical conditions or complications associated with long-term prosthetic use in lower-limb amputees will also be reviewed.

Clinical Outcomes: Prosthetic-related data analysis as well as CHAMP and/or CAREN related data.

Patient Population: Ill and injured CAF military personnel.

Conclusions: Based on the World Health Organization (WHO) framework for health and disability, the International Classification of Functioning, Disability and Health, more commonly known as ICF, the CAF Physical Rehabilitation Program has gained substantial insight into high level amputee rehabilitation. These insights are helping to maximize function and clinical outcomes with our injured CAF personnel and it is suggested that they could be applied to select patients in civilian populations, with similar clinical profiles.

5D03: Amputees Helping Amputees: A National Charity's Service to Canada

Valley, K., Auzina, A., BA, Forbes, Brian N., LLB

The War Amps

Brief Description: An overview of The War Amps assistance then and now, and a look forward, will be presented, illustrating how a national charity is making a difference in the lives of those who have served our country. The Association has demonstrated the ability to meet the changing needs of amputee Veterans and serving personnel and the societal changes surrounding global conflicts.

Recognizing the need for peer support following the First World War, Canada's amputee Veterans started The Amputations Association of the Great War. As the ill and injured started returning to Canada on the hospital ships and trains during the Second World War, the Association was well-suited to provide the much needed peer support and guidance to the new amputee Veterans. Working together, and changing the name to The War Amputations of Canada, they actively sought to bring about changes to Veterans pension and benefits systems to assist all Veterans, and more specifically those with severe disabilities.

Clinical Outcomes: From the time of amputation until the end of life, The War Amps supports the amputee through education, peer support, benefits policy guidance, new prosthetic technology trials, continuing education funding

through our Prosthetics Education Program for prosthetic and orthotic professionals, case management, advocating for benefits, commemoration and more. The War Amps carries out this work in many ways, including through industry training events, accompanying injured CAF personnel to specialized rehabilitation centres, facilitating peer inter-action, and providing training sessions to VAC and DND staff.

Patient Population: The War Amps continues this work today, using our many years of experience with amputation and prosthetics to advocate for improvements in all areas that impact seriously disabled Veterans. Amputation impacts everyone – the amputee and their support system (friends and family), health care providers, researchers, employers, funding sources, etc.

Through formalized partnerships with the Canadian Armed Forces Health Services Group and Veterans Affairs Canada, we assist Canada's amputee Veterans and serving personnel through all stages of life at the individual, and systemic, levels.

Conclusions: The needs of the amputee are complex throughout their life course. Frequent interaction and assessment from time of injury to end of life are crucial elements in meeting their needs and adapting the health care system to extend their mobility, independence and contributions to the workforce without sacrificing the rest of their physical and mental health.

6C01: The Link Between Subtypes of Combat Exposure and Physical Symptoms: The Moderating Effect of Mental Health

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Introduction: Mental health (MH) is inseparably tied to physical health (PH). While there is widespread concern that exposure to combat in Afghanistan can result in MH problems, PH can also be negatively affected by combat. Burdensome PH problems are certainly common in Veteran populations. The nature of the link between combat and PH and the role of MH in this relationship are incompletely understood, as is the role of different subtypes of combat experiences in PH. The study objective was to examine the moderating effect of MH on the relationship between combat exposure and PH as measured by physical symptom burden. Furthermore, we examined the differential effect of MH on the link between different combat exposure and PH.

Methods: This study used data collected during Enhanced Post-deployment Screening from CAF members (n=16,193) three to six months after return from deployment in support of the mission in Afghanistan. Combat exposure and physical injuries were assessed using a 30-item combat exposure scale developed by the US Army and the Brief Traumatic Brain Injury Screen, respectively. Categories of combat exposure included: dangerous environment, aftermath of conflict, and active combat; and dichotomous exposures to perceived responsibility (such as feeling responsible for a

death), and physical injuries. The presence of one or more of six common mental health problems was assessed using the Patient Health Questionnaire, as was physical symptom burden (using the PHQ 15 scale). Negative binomial regression models were performed to explore the role of MH and combat exposure on PH. Interaction terms between MH and the categories of combat exposure were tested to assess the moderating effect of MH.

Results: Dangerous environment, aftermath of conflict, perceived responsibility, traumatic brain injury (TBI) and other physical injury were independently linked to PH after controlling for demographic and military variables. Active combat was not independently linked to PH. Significant interactions were found between MH and TBI and between MH and other injury, such that a stronger relationship between injuries and PH was seen in the presence of a MH problem.

Conclusions: CAF members who had certain types of combat exposure had poorer PH. Furthermore, MH problems magnified the negative effects of these exposures on PH. Proposed explanations for this moderation, including variation perception, coping or co-morbidities in participants reporting MH conditions, should be explored in future research.

6C02: Trauma Exposure is Associated with Increased Proinflammatory Activity: A Transdiagnostic Meta-analysis

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Introduction: Heightened systemic inflammatory activity has previously been described among trauma survivors, particularly in relation to different types of posttraumatic mental health symptoms. Such immune disruptions have been suggested as one potential mechanism for increased risk of developing chronic medical and psychiatric health problems observed among traumatized populations. A growing understanding of the pathophysiology of chronic disease states has implicated inflammation as one potential mechanism underlying both physical and psychiatric disorders. Although diagnosis-specific reseach (e.g. focusing on depression or psychosis) has provided evidence for inflammatory dysregulation in certain clinical populations, to our knowledge this is the first meta-analyses to test the overall impact of trauma exposure from a transdiagnostic perspective.

Methods: Using random effects meta-analyses, we tested the relationship between trauma exposure and pro-inflammatory biomarker concentrations, including C-Reactive Protein (CRP), Fibrinogen, Interleukin (IL)-1β, IL-2, IL-6, IL-8, and Tumor Necrosis Factor (TNF)-α across 36 independent samples with a total of 14,991 participants. We included all studies with sufficient data to calculate the effect of trauma exposure on log-transformed biomarkers, including psych-

iatric and medical samples as well as population-based research. Meta-regression models were used to test the variance associated with study quality and psychiatric symptomatology.

Results: Trauma exposure was associated with increased CRP, IL-1β, IL-6, and TNF-α (mean rs = .2455, .3067, .2890, and .2998 respectively). No significant relationships were noted with Fibrinogen, IL-2, or IL-8. Psychiatric symptoms predicted larger effect sizes for IL-1β and IL-6 (β = 1.0175 and .3568, respectively), while methodological risk of bias was positively associated with effect sizes for IL-6 (β = .3812).

Conclusions: We found evidence of increased pro-inflammatory activity across multiple populations and diagnoses. Overall, studies with psychiatric samples showed larger effect sizes, but no diagnostic specificity was noted, although the overall small number of studies with any one diagnostic group precludes definitive conclusions regarding potential group differences. These findings underscore the importance of routine assessment and reporting of trauma history in health research, particularly in immunological research. Our results are consistent with a transdiagnostic model of posttraumatic inflammatory outcomes, but more research is needed to fully test such a model.

6C03: Neuromuscular Training for Soldiers who Sustained an Ankle Sprain is Leading to Important Improvements of their Functional Capacity

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Introduction: Lateral Ankle Sprains (LAS) are among the most common musculoskeletal injuries sustained by military personnel in the Canadian Armed Forces (CAF). An investigation of injuries from the US Army even reported that soldiers were 6 times more likely to sustain LAS if they had sustained one in the previous 5 years before attending military training. In order to address the hidden impact of LAS, the Valcartier physiotherapy clinic developed and implemented a tailored neuromuscular training program (NTP) that includes strengthening and motor control exercises. This was done in accordance with best clinical practices using the CAF evidence-based practice model. The aim of the current study was to verify the change in the level of functioning of the soldiers who participated in the NTP.

Methods: A convenience sample was used from CAF soldiers entering the program. The following measures were taken at baseline and after the completion of the program: the Star Excursion Balance Test and the Foot & Ankle Disability Index (FADI). Descriptive statistics were calculated (mean, SD, and ranges), and t-tests were used to verify differences pre-post NTP. The effect size was also calculated to assess the clinical relevance of changes measured after the completion of the

program. Participants were also asked to assess their global rating of change (GRC), which was used to estimate the minimal clinically important difference in the outcomes.

Results: Twenty-four males (mean age: 30.1 ± 8.4) participated on average in 15.4 ± 6.3 sessions of the NTP within 6.4 ± 2.1 weeks. All clinical outcomes significantly improved (p< 0.002). Seventy-five percent of the participants reported a significant improvement as determined with the GRC (cut-off > 4 out of 7) but the change in their function (FADI sport 27.1%) was not significantly better than the participants who said that they were not improved (FADI sport 15.1%). The effect sizes calculated for the FADI were moderate to large in participants who reported an improvement (0.6 to 1.1), and weak to fair (0.3-0.5) in those who mentioned that they were not better after the NTP.

Conclusions: Current findings suggest that the NTP improved dynamic control and functional capacity in a large majority of participants in a way that was perceived as clinically important. These findings are very encouraging and may warrant further investigation in order to determine the value of implementing such a program in other CAF physiotherapy clinics.

6C04: High-performance Lifestyles for Service Members with Physical Disabilities: A Review of Psychosocial Factors Related to Participation

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Queen's University

Introduction: Disability risks as a result of combat injury are growing exponentially, including an increase in the number of physical impairments experienced (Bell et al., 2008; Brittain & Green, 2012). To aid in recovery, and encourage a return to high-performance activity, many rehabilitation facilities are using sport as a form of therapy (Messinger, 2009). This sport model of rehabilitation has led to injured service members being labeled as tactical athletes (Batts & Andrews, 2011). The prevalence of the sport model, the increase in tactical athletes, and decisions made pertaining to high-performance activities have resulted in questions regarding injured service members' experiences as well as the psychosocial determinants of their activity choices. The purpose of the current research was to conduct a literature review examining psychosocial constructs associated with: (a) motivation; (b) benefits; (c) challenges; and (d) drawbacks of a high-performance lifestyle post-injury.

Methods: A literature review was conducted of research in the field of injured service members and Veterans, sport, and high-performance activity, with a specific focus on studies examining psychosocial factors influencing participation or participation outcomes.

Results: The analysis revealed important concepts for each of the four topics. First, motivation to engage in high-performance activity was characterized by career, identity, trauma, perceptions, and comparison of the self to others. Constructs related to Self-Determination Theory were also identified as key motivators. Second, benefits to

participation included currently recognized benefits of Paralympic participation, changing perceptions, self-identity, and possibilities. However, challenges emerged when aiming to return to a high-performance lifestyle and were encompassed by barriers related to overcoming injury. Finally, research also identified both personal and societal problems that may result from the level of drive required to return to high-performance activities post-injury.

Conclusions: The current findings highlight constructs that should be examined in future research in order to develop an evidence-base for interventions promoting high-performance lifestyles to service members post-injury.

Poster Presentations

P115: An Occupationally-based National Competency Model to Inform the Profession of Occupational Therapy within Canadian Forces Health Services

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Brief Description: Repatriated Canadian Armed Force (CAF) soldiers have high-level aspirations for recovery and elevated expectations for rehabilitation professionals, placing importance on a meaningful and speedy return-to-work (Besemann, 2011). Soldiers' voiced needs and the CAF's pledge to "Care For Our Own" (National Defence, 2013) have lead Canadian Armed Forces Health Services Group (CFHSG) to develop state of the art rehabilitation programs incorporating the profession of occupational therapy (OT). The Canadian profession of OT has been accessed externally by the CAF over the past decades Friedland, 2012; Brown & Hollis, 2013) and no recent CAF-OT platform on potential roles and responsibilities has been developed. Current literature on OT within a military context depicts professional competencies foremost in the area of deployment. There remains scant literature on the full range of knowledge and skills of OT within the Canadian military context to inform the development of national CAF-OT platform. The primary purpose of this presentation is to describe the process and results of an international task force comprised of expert occupational therapists in the field of military physical health and rehabilitation (TF-OT).

Clinical Outcomes: By way of a virtual communication medium, international OT's (n=8; Australia, Canada, UK, US) employed in the civilian and military sectors participated in a four-phase, mixed-methods Delphi study. TF-OT's reviewed case studies depicting ill and/or injured military personnel. Case studies were CAF-context specific, incorporating elements of CF H Svcs Gp's inter-professional healthcare structure. An occupational therapy perspective in a military context considers the relationship between what a soldier needs to do or is expected to do (e.g., work, sport, self-care), their current capacity and the various natural, manmade, or organizational contexts that can facilitate or challenge

participation. TF-OTs independently responded to questions targeted at gathering knowledge on how an occupational therapy perspective can be used to approach CAF-injured soldiers. Results were ranked using a 7-point adjectival scale by the primary TF-OTs, then re-distributed to members for review and to ensure consensus. Median scores were calculated to determine competency importance. Phase results were merged, generating a cohesive, evidence-informed competency model.

Patient Population: Ill and injured CAF military personnel.

Conclusions: This collaborative group process generated a conceptual competency framework for CAF-OT guidance development. A context-specific, occupationally-based platform provides a firm bedrock upon which future CAF-occupational therapy standards and guidelines can be built and measured (Molineux, 2004).

P116: A Survey of the Musculoskeletal Trouble within the CH-146 Griffon Helicopter Aircrew Community

Chafe, G. S., Capt., MSc

Canadian Forces Health Services Group

Introduction: Neck and low back musculoskeletal trouble (defined as an ache, pain numbness or discomfort) in the rotary wing community has been a concern for more than a decade. Previous studies linked the presence of neck trouble with the use of night vision goggles (NVG), mission length, stature, and vibration among other factors.

Methods: A survey was distributed online to CH-146 Griffon helicopter pilots and flight engineers. The goal was to determine possible mitigating targets to reduce the occurrence of musculoskeletal trouble. This survey assessed body postures, flight experience, equipment interactions and the occurrence of trouble throughout the entire body.

Results: Neck and lower back trouble were found to be most prevalent within the CH-146 Griffon aircrew community, with shoulder and upper back trouble also being reported frequently. Preliminary results show statistically significant links between NVG hours and neck trouble, whereas total military flying hours were linked with low back trouble. It is however believed that multiple factors are involved.

Conclusions: The survey demonstrated potential targets to reduce neck trouble such as better helmet fit procedures as an example. Survey results have enabled the development of mitigation strategies to reduce neck and low back trouble within the CH-146 aircrew community.

P117: A Retrospective Review of a Successful Inter-professional Mild Traumatic Brain Injury Intervention Including Computer Assisted Rehabilitation Environment (CAREN)

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Canadian Forces Health Services Group

Brief Description: One in twenty-six Canadians live with an acquired traumatic brain injury. Many are unaware that they

are living with a non-visible debilitating disability. One in five sports-related injuries is a head injury. A case study of a twenty-eight year old Canadian Armed Forces (CAF) member who sustained a mild traumatic brain injury while playing hockey will be presented. After an initial intervention of conventional medical management lasting over six months, an inter-professional team approach was introduced. This approach allowed for more comprehensive, functional and meaningful short and long term outcome goals to be established. Improvements in this patient's subjective and objective findings were noted with the onset of the inter-professional approach. However, significant functional improvement was observed in this patient upon the addition of the CAREN system. The CAREN system allows a client to become part of his or her simulated environment, to interact with this environment and to modify it through body movement. It initiates conflicting sensory demands which reproduces realistic situations in a safe and clinician-controlled environment

Clinical Outcomes: Evidence-based clinical outcome measures administrated included: CAREN, DGI, BESS, Y-Balance test, FSST, PCSS, SCAT3 and the timed ten meter walk test.

Patient Population: Ill and injured CAF military personnel.

Conclusions: The use of the CAREN was a catalyst to this patient's functional improvement. The CAREN was a key modality used in the vestibular rehabilitation of this patient, which assisted in improving his functional balance, disequilibrium, photosensitivity, and motion sensitivity. A tremendous impact on functional mobility, gait and re-integration into society was achieved through a collaborative inter-professional team and the use of leading edge technology.

P118: Going Places: Does the 2-minute Walk Test Predict the 6-minute Walk Test in Lower Extremity Amputees?

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Introduction: Assessing a patient's ability to walk distances required for community ambulation (at least 300m) is important in amputee rehabilitation. During the two-minute walk test, most amputees cannot walk 300m. Thus, the six-minute walk test may be preferred but it has not been fully validated in this population. This study: 1) examined the convergent and discriminative validity of the six-minute walk test and 2) assessed whether the two-minute test could predict the results of the six-minute test.

Methods: 86 patients with unilateral or bilateral amputations at the syme, trans-tibial, knee disarticulation or trans-femoral level completed the six-minute walk test, two-minute walk test, Timed Up and Go test, Locomotor Capabilities Index version 5, Houghton scale, and Activity-Specific Balance Confidence scale.

Results: The six-minute walk test correlated strongly with the other tests (R^2= 0.36-0.9), demonstrating convergent validity. It demonstrated discriminative validity with respect to age, etiology of amputation, and K-level (p<0.0001). The two-minute test was highly predictive of the six-minute test distance (R^2= 0.91).

Conclusion: The six-minute walk test is a valid measure of amputee ambulation. However, the results suggest that it may not be necessary, since the two-minute walk test strongly predicts the six-minute walk test. Clinicians can save time by using the shorter test.

P119: Computation-based Predictions of Kinematics and Kinetics of the Cervical Spine under Antero-posterior Load Application

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Introduction: Investigation of the biomechanics of the head and neck (HN) complex is fundamental to understanding mechanisms of injury and impairment associated to this multi-joint structure. In this study we use our validated finite element (FE) model of the HN complex to differentiate the contributions of active muscle forces and passive tissues to injury mechanisms, and to predict resulting effects on the kinematics and kinetics of weight-bearing structures of the HN with the application of external loads along the sagittal plane of motion.

Methods: Our validated 3D nonlinear HN complex FE model, previously developed, was used. Two loading scenarios were simulated in presence of 40N head weight applied to its center of mass. Anterior force of 100N was applied to the center of the frontal bone, and a posterior force of 360N was applied to occipital bone center. The first thoracic vertebra was fixed while the cervical vertebrae and the head were free to translate but not to rotate. The net muscle moments required to balance applied forces, the contact forces at the facet joints and the relative intervertebral translation of the HN in all the anatomical directions were computed.

Results: The highest net muscle moment along the sagittal plane was predicted at the head and then at C2 vertebra reaching 24.8N.m and 13.6N.m, respectively, under 360N posterior force and 5.6N.m and 3.65N.m, under 100N anterior force. Under 360N posterior force, the inter-vertebral HN translation reached a maximum of 6.2mm posterior at C0-C1,followed by 1.5mm anterior at C3-C4, i.e. C4 translates posteriorly on C3. Under 100N anterior force, the maximum anterior intervertebral translation is computed at C1-C2 and then at C0-C1, reaching 4.4mm and 1.1mm, respectively. A maximum contact force of 272N was computed at C0-C1 level, and 105N at C2-C3 level under 360N posterior and 100N anterior forces, respectively.

Conclusions: Computation-based simulation can be used to establish the relationship between the kinematics and the kinetics of the HN under an antero-posterior forces while the

muscles are activated. Higher net muscle moments of force at C0-C1 level, under conditions of external load application along the sagittal plane, are associated to increases in intervertebral translation and to higher magnitudes of contact force. The current study provides valuable information on the response of the cervical spine under quasi-static anterior-posterior loading when the head and neck flexion-extension motion was restrained which is representative of the use of head mounted loads for military environments.

P120: Incidence and Prevalence of HIV Infection in the Canadian Armed Regular Forces, 2012-2013

Hawes, R. A., PhD, Whitehead, J., MD, Tepper, M., MD, Ma, J., PharmD

Canadian Forces Health Services Group

Introduction: Human Immunodeficiency Virus (HIV) is a chronic and transmissible disease of public health importance to the civilian and military sectors. Currently, the rate of infection among Canadian Armed Forces (CAF) personnel is monitored by passive surveillance. Our objective was to use available databases to evaluate the number of CAF personnel of Regular Forces who were newly diagnosed with HIV and/or who were living with HIV in 2012 and 2013.

Methods: Using an extract of 1.4 million records from the Canadian Armed Forces Health Information System (CFHIS) database, we identified 23 cases among active Regular Force personnel with at least one diagnosis of HIV between 2010 and 2013 (ICD-10 codes B20-B24, Z21).

An independent review of the 3.3 million records from the pharmacy claims database (PCD) identified 28 cases of active Regular Force personnel that were prescribed medication suggestive of HIV suppression therapy between 2008 and 2013.

Between the two databases, a total of 31 cases were identified. The medical chart of each case was reviewed, and the date of initial HIV diagnosis, medication history, and demographic information were recorded. False-positive cases of HIV due to incorrect diagnoses or HIV chemoprophylaxis were documented and removed from the study.

The incidence density, prevalence rate and positive predictive value of CFHIS and PCD for HIV infection were calculated, along with estimates of variance and alternative models to account for underreporting of HIV status.

Results: Of the 31 unique cases reviewed, 25 were confirmed HIV cases. The positive predictive value was 95.7% for the CFHIS database and 82.1% for the PCD database.

There were 3 new diagnoses of HIV in active CAF members of the Regular Force reported in 2012 (4.6 per 100,000) and 5 in 2013 (7.8 per 100,000). A total of 20 active CAF members were living with HIV in 2012 (30.9 per 100,000) and 23 in 2013 (36.0 per 100,000).

Based on population estimates of 26% underreporting of HIV, it is possible that 25 (38.7 per 100,000) and 29 (45.4 per 100,000) prevalent cases remained in CAF in 2012 and 2013, respectively.

Conclusions: The estimated prevalence rate of HIV infection in CAF corresponds with that of the United States Armed Forces (13 to 56 per 100,000). In accordance with recommendations from the Joint United Nations Program on HIV/AIDS and US Preventive Services Task Force, the current CAF approach of HIV counseling and voluntary risk-based testing should be maintained.

P121: A Collaborative American-Canadian Military Healthcare Intervention: A Case Study on the first Canadian Armed Forces Member to Experience the Intrepid Dynamic Exo-Skeletal Orthosis (IDEO)

Johnson, A., Capt., MSc, Ferguson, J., CPO, Owens, J., BS, Strube, W., DPT

Canadian Forces Health Services Group

Brief Description: This is a case study of the first Canadian soldier to receive an Intrepid Dynamic Exoskeletal Orthosis (IDEO) brace (a custom energy-storing ankle-foot orthosis) received from the Centre for the Intrepid at Brooke Army Medical Center (BAMC) in San Antonio, Texas. The soldier was injured in 2010 in an IED blast in Afghanistan which resulted in single lower limb salvage. Four years later, he received Secretarial Designation from the U.S. military to receive this unique and leading edge intervention as a case trial. During a short period of rehabilitation at BAMC, his function rapidly progressed from being barely able to walk across the road in 30 seconds without the IDEO brace to running 13.7 metres in 10 seconds within 1 day of wearing the brace.

Clinical Outcomes: Fitness for Operational Requirements for Canadian Armed Forces Employment, forced weight-loaded march, Comprehensive High-level Mobility Predictor (CHAMP) Test, 4-Square Step Test, Timed Stair Ascent, Sit-to-Stand, 20 meter shuttle run, Visual Analogue Pain Scale (VAS), Lower Extremity Functional Scale (LEFS), Short Musculoskeletal Function Assessment (SMFA), Veteran's Rand 12 item health survey (VR-12), Patient Specific Functional Scale (PSFS).

Patient Population: Ill and injured CAF military personnel. Some patients with limb salvage experience significant pain and decreased function with the salvaged limb, to the point where they may decide to have the residual (injured) limb amputed in hopes of reducing chronic pain and attaining greater function with a prosthesis. This IDEO brace may be an option to allow such patients to keep their limb, improve their function and quality of life.

Conclusions: This case study demonstrates that injured and ill military populations have the potential to safely recover to high levels of function and physical activity with the appropriate equipment, rehabilitation, medical supervision and guidance.

P122: Gender-based Differences in Headache, Fatigue, and Depression Severity, Following a Mild or Moderate Traumatic Brain Injury

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Introduction: Headache and fatigue are two of the most common complaints in patients following mild or moderate traumatic brain injury (TBI). Although some patients with TBI recover to their previous level of functioning, others suffer from long term debilitating symptoms. The purpose of this study was to investigate if there were sex related differences in headache, fatigue and depression severity measures.

Methods: A convenience sample of civilian patients who were at least 6-months post-TBI, attending a tertiary outpatient head injury clinic in Toronto, Ontario, were recruited. Participants' demographic, injury and general health information were collected. The Rivermead Post Concussion Symptoms Questionnaire (RPQ), Fatigue Severity Scale (FSS), and Patient Health Questionnaire-9 (PHQ-9) were also collected. Participants who endorsed having headaches on the RPQ also completed a Headache Specific History and the Migraine Disability Assessment Tool (MIDAS). Headache pain was assessed using the MIDAS. Descriptive statistics were calculated.

Results: 148 civilian patients were recruited to the study (52% [n=76] male, 48% [n=72] female; mean age 44 years [range 18-79]; mean time post-injury 32 [range 6-336] months). Both sexes indicated high levels of headache (mean MIDAS score of 112.7±110.6 for females and 90.3±114.1 for males; ≥21 indicates severe disability), fatigue (mean FSS score of 51.6±9.0 for females and 46.1±13.1 for males; ≥36 suggests the presence of fatigue), and depression (mean PHQ-9 score of 14.4±6.1 for females and 14.0±6.3 for males; ≥12 indicates major depression). Headache ($t(98) = -0.999$, $p = 0.320$) and depression ($t(117) = -3.19$, $p = 0.750$) were comparable between sexes. Only FSS scores were significantly different between the sexes ($t(117) = -2.67$, $p = 0.009$). Headache pain was ranked on a Likert scale where zero indicated 'no pain at all' and 10 'indicated pain as bad as it could be'. Headache pain was also statistically comparable between sexes (mean score of 6.90±1.91 for females and 6.36±1.84 for males; $t(86) = -1.34$, $p = 0.186$).

Conclusions: In this population of civilian individuals with mild or moderate TBI who were at least six months post-injury, both men and women report high and statically comparable scores on measures of depression, headache and headache pain.

Both men and women reported high levels of fatigue, with females reporting significantly higher scores on the FSS than males.

P123: Canadian Armed Forces Occupational Therapists: An Occupational Therapy Approach to Ill and/or Injured Military Personnel

Brown, H., OT., Reg., (Ont), PhD (Student), Jones, C., MSc.OT (Cand)

Canadian Forces Health Services Group

Brief Description: Canadian Armed Forces (CAF) military personnel experience both mental health and physical injury. The reverberating effects of illness and injury have deep effects on a person's ability to participate in everyday military work activities. The Canadian Forces Health Services Group (CF H Svcs Gp) has begun integrating the occupational therapy profession to assist with ill and/or injured military personnel in the domain of return to military work. Although literature on the role of occupational therapy in a military setting has been produced (Smith-Forbes et al., 2013), there remains a dearth of research that elucidates the thinking process used by occupational therapists (OTs) to solve military clinical problem.

The purpose of this poster is to provide a rich description of how an occupational therapy clinical reasoning repertoire could theoretically be utilized by a CAF occupational therapist (CAF-OT) to assist with assessing an ill or injured military member.

The authors analyzed three case studies depicting ill and/or injured CAF members by way of Mattingly and Fleming (1994) three-track, narrative reasoning and in light of an occupational therapy perspective (Hocking, 2011; Rogers, 2004). This dialectical method was used to elicit information about the clinical reasoning process of providing OT care to ill and injured members. Core questions guiding dialogue: e.g., what is the nature of occupational diagnosis, need and issues in ill and/and injured military personnel? What are the cultural dimensions of occupational analysis in CAF?

Clinical Outcome: Preliminary data found a context specific clinical reasoning repertoire used by a CAF-OT. Results were aligned with other scholarly work (e.g., Mattingly, 1991; Robert, 1996). A possible clinical reasoning approach within the military population was defined (e.g., procedural reasoning of physical participation problems, pragmatic reasoning to account for organizational contextual factors such as equipment availability and prescribed work limitations).

Conclusion: Scholars in the profession of occupational therapy are pushing OTs to take serious their clinical reasoning processes (Robertson, 2012). The idea of detailing the clinical reasoning processes within a specialized area of care for OT (such as CAF) is pivotal as it summarizes the need for occupational therapy and identifies the entity for which OTs can be held professionally responsible (Rogers, 2004, p. 18).

P124: Occupational Therapists: Current Roles Within Canadian Forces Health Services at Canadian Forces Base Edmonton

Jones, C., MScOT (Cand), Brown, H., OT., Reg. (Ont)., PhD (Student)

Canadian Forces Health Services Group

Brief Description: Canadian Armed Forces (CAF) military personnel experience illnesses and injuries that impact a member's ability to participate in everyday military work activities. Inabilities to participate in these mandatory activities can negatively affect an individual's identity, self-efficacy, self-esteem, social and family health as well as their unit's moral, productivity, stigma, and safety. The CAF's occupational therapists (CAF-OTs) have the responsibility to assess, treat, and educate ill and injured military personnel to facilitate their participation in everyday military work as well as self-care and leisure occupations; thus enabling them to be fit, employable, and deployable while enhancing overall well-being. CAF-OT roles evolved independently and co-dependently with the CAF's Physical Rehabilitation Department. Due to a limited number of CAF-OTs, there remains a lack of understanding of their current role. This presentation aims to provide an update on the occupational therapy programs, assessments, and interventions currently being utilizes at CAF Base (CFB) Edmonton.

Clinical Outcomes: Utilizing an occupational perspective (Hocking, 2012; Molineux, 2004; Townsend & Polatajko, 2007), CAF-OTs analyze barriers and facilitators of the CAF member's natural and built environment, military work activities (e.g., occupation), and physical and mental health factors. CAF-OTs conduct validated and standardized assessments in a variety of settings such as military fitness centers, CAF medical clinics, and within the military member's workplace or home. As part of an inter-disciplinary team, CAF-OTs identify the military member's occupational barriers and execute interventions that address these challenges individually or in group sessions. Occupational barriers could include attitudes, pain, weather, a poor fitting ruck sack, etc. or other factors that reduce participation and functioning in military activities. Interventions utilized target a variety of desired CAF and personnel outcomes such as return to military work, re-engagement in leisure activities, and community reintegration.

Conclusions: Defining OT services within the CAF, producing outcome measures, and educating CAF members are ongoing actions that will increase awareness of the roles of CAF-OTs. By presenting examples of how occupational therapy continues to work within the Physical Rehabilitation Department, a better understanding of the frameworks, assessment, and interventions that may be utilized by a CAF-OT will be attained by healthcare professionals, CAF members, and policy makers. CAF-OT's have become an integral part to the inter-disciplinary teams within Canadian Forces Health Services Group. Their unique skill set, education, and perspective of rehabilitation will continue to improve the lives of serving members within the CAF.

P125: An Injured Soldier's Ski Journey to the Magnetic North Pole

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[1]The Ottawa Hospital Rehabilitation Centre; [2] Canadian Forces Health Services Group

Brief Description: This report presents a Veteran injured in Afghanistan, and his successful completion of a ski expedition to the magnetic North Pole. He traveled with fellow wounded soldiers, successful business entrepreneurs, Canadian Olympic gold medalists, arctic explorers, a rehabilitation team, and guides. The expedition was organized by the True Patriot Love Foundation. Through this expedition they aimed to increase public awareness of the needs of Canadian Soldiers, Veterans and their families, and raise funds to purchase equipment for the treatment of Post Traumatic Stress Disorder.

Clinical Outcomes: The soldier team included eleven soldiers dealing with various physical and mental injuries. This presentation focuses on the journey of one particular Veteran. The patient first presented at the Ottawa Rehabilitation Centre in 2011 with a short transfemoral amputation consisting of 50% grafted tissue, and the loss of his left elbow. Prosthetic treatment included: a custom silicone interface on the residual limb linked via suction and mechanical lock to a custom carbon fiber frame socket, a C-Leg microprocessor knee, and a carbon composite prosthetic foot. The patient expressed interest in participating in skiing. The initial prosthetic design was adapted for skiing by including a Bartlett Tendon Universal Knee and Active Ankle. For the purpose of the expedition, the patient was also equipped with a sit ski with stabilizing outriggers, modified ski poles, and a tandem ski tether. Prior to beginning the 100km expedition, a three-day training period was undertaken in the arctic conditions of Resolute Bay Nunavut.

Patient Population: Ill and injured CAF military personnel.

Conclusions: The military-civilian team successfully co-mpleted the 100km expedition to the Magnetic North Pole in the Canadian Arctic. The patient used a combination of sit ski double poling in tandem with a ski partner and independent skiing on his prosthetic leg, to complete the expedition. The adversity faced by this particular individual in his re-habilitation, and his ultimate success at completing this physical and psychological challenge as part of a cohesive team, provides a positive motivation for other wounded soldiers in their own personal physical rehabilitation goals.

P126: Community Based Multidisciplinary Pain Clinic for the Canadian Forces: A Pilot Project

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Brief Description: Pain, mental health issues and addiction have been recognized recently as top priorities in addressing issues affecting Canadian Armed Forces (CAF) personnel. Organized multidisciplinary programs (MDP) addressing those needs are sparse. A community-based CAF MDP in the York region (city of Vaughan) is being developed in the fall of 2014, employing medical and allied health professionals of many disciplines, directed by a senior physician, expert in chronic pain diagnosis and management. After initial assessment for a) pain and b) addiction risk, individuals will be classified as suffering from an uncomplicated pain problem or a complex one (requiring multidisciplinary approach). Care maps will direct care accordingly.

Clinical Outcomes: Electronic Medical Record templates are being customized, will use validated instruments, and will include the following outcomes: pain ratings (Numeric Rating Scale and Visual Analogue Scale); body pain areas (marked in body diagrams); activity, mood and sleep interference due to pain (measured by the Brief Pain Inventory –BPI); risk of opioid abuse (measured by the Opioid Risk Tool -ORT-); and medication intake (recording medications received, as well as detailed opioid dose converted in Morphine Equivalent Dose –MED-). Such metrics will be collected at first visit and periodically at 3, 6 and 12 months of follow up.

Patient Population: The approach is geared to the "soldier's culture" and is "holistic" addressing medical, emotional, mental, physical, and psychosocial needs of the CAF members (both serving military, as well as Veterans) who present with pain complaints. Given the prevalent coexistence of pain, mental health issues (PTSD, mood and/or anxiety disorder) and addiction, the MDP will offer both diagnosis and management across all spheres.

Conclusions: MDPs have been shown to be effective in patients with chronic pain. We hypothesize that a "custom made" community multidisciplinary program for the CAF geared to the "soldier psyche and culture" will also be more effective than regular care in increasing functionality and quality of life.

P127: Sleep Dysfunction and Disability Outcomes after Head Injury Among Ontario Workers: Sex differences

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[1]University of Toronto; [2]Toronto Western Hospital; [3]Youthdale Child and Adolescent Sleep Clinic; [4]University of Southern Denmark; [5]University Health Network Canada

Introduction: Although sex differences have been documented with respect to perceived sleep quality, to date no study has examined sex differences in sleep dysfunction after brain injury. This study investigated sex differences in sleep dysfunction and associations with disability outcomes with respect to work, family, and social life among workers with head injury.

Methods: This was a cross-sectional study of outpatients assessed for work related mild to moderate traumatic brain injury. Sleep functioning was assessed by standardized scales, in accordance with the International Classification of Sleep Disorders (ICSD); insomnia was assessed by The Insomnia Severity Index (ISI) and daytime sleepiness by the Epworth Sleepiness Scale (ESS). Disability was evaluated by the Sheehan Disability Scale and its subscales.

Results: Fifty-two male and 32 female injured workers being assessed for head injury, participated in the study. Their mean age was 45±10.5 and median time since injury was 531 days. Sixty-eight percent of males and 72% of females reported moderate to severe insomnia interfering with their daytime performance. One or more sleep disorders were reported by every worker: irregular sleep phase in 67%, restless legs in 50%, sleep apnea in 68%, and excessive daytime sleepiness in 44% of our population. In males, a significant association was found between outcome of interest insomnia total score and all subscales of the Sheehan Disability Scale total scores for work, social life and family life (r=0.52, p<0.0001; r=0.51, p=0.0002; r=0.49, p=0.0002; r=0.51, p=0.0001). In females, the associations between insomnia and Sheehan Disability Scale scores were as follows: r=0.51, p=0.003; r=0.49, p=0.001; r=0.48, p=0.005; and r=0.17, p=0.35, respectively.

Conclusions: Insomnia among Ontario workers with head injury is associated with poor disability outcomes. Men were found to report more negative associations of insomnia affecting all areas disability measured. In females, insomnia was associated with lower scores in work and social life but was not associated with disability in relation to family life. These results suggest that differential sensitivity to negative effects of insomnia, particularly family responsibilities that could underlie sex-specific disability patterns.

P128: Understanding the Biology of Stress: Hemostasis Profiling Under Exercise Stress

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Introduction: Various forms of stress experienced in military operations may negatively impact soldiers' well-being and performance. Recent studies have shown increased risks for cardiovascular diseases (CVD) in military personnel, as a result of stress and psychological trauma. However, the underlying mechanisms remain unclear. Physical stress provides an easily manipulated experimental model to investigate the interactions between stress-induced neuroendocrine and hemostatic changes. The objective of this study was to characterize blood coagulation and fibrinolysis during a high-intensity interval training (HIIT) using two viscoelastic point-of-care systems.

Methods: Citrated whole blood was collected from healthy male volunteers before, immediately after and 60-min after an acute HIIT, and at rest after six sessions of HIIT. Blood was analyzed using rotational thromboelastometry (ROTEM®) and thromboelastography (TEG®) and key parameters were obtained to evaluate coagulation and fibrinolysis profiles.

One-way repeated ANOVA and t tests were conducted to analyze the effects of acute and repeated HIIT on hemostasis.

Results: ROTEM INTEM and EXTEM assays showed that relative to baseline, clot formation time (CFT) decreased significantly ($p<0.001$), and maximal clot firmness (MCF) and initial rate of fibrin polymerization (α angle) increased significantly ($p<0.001$, $p≤0.001$) immediately after HIIT. Additionally, the ROTEM INTEM assay showed that clotting time (CT) decreased significantly immediately after ($p<0.001$) and 60 min after HIIT ($p<0.001$). Fibrinolysis (LI30) did not change significantly at any time points.

Similarly, TEG assay showed a significant reduction in time to initial clot formation (R) immediately after ($p<0.001$) and 60 min after HIIT ($p<0.001$). Time to a specific level of clot strength (K) decreased ($p=0.003$) and rapidity of fibrinogen deposition (α) increased ($p=0.01$) significantly 60 min after HIIT. Maximum amplitude (MA) of clot and rate of clot lysis (LY30) were not significantly altered at any time points.

Both ROTEM and TEG showed no significant differences in blood coagulation and fibrinolysis at rest after six sessions of HIIT.

Conclusions: This study will allow us to better understand the link between stress and CVD risk, and define the usefulness of hemostatic biomarkers in identifying stress reactions. Further analyses will be conducted to examine correlations in changes between hemostasis and stress hormones to reveal the effects of the human stress response on the cardiovascular system and subsequent clinical implications for military populations exposed to operational stressors.

P129: Two Minutes to Evaluate Low Back Function in Military Personnel: The Development of the mPILE Test

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Introduction: Low back pain (LBP) is highly prevalent in Canadian Armed Forces (CAF) personnel, and testing their back function is challenging as many available evaluations to the clinician have limited metrological properties. The Progressive Isoinertial Lifting Evaluation (PILE) was introduced as a standardized protocol to assess back function in LBP patients. The PILE has been reported as valid, having a high test-retest reliability, and being responsive to change for civilians with LBP. Our objectives were: 1) to modify the PILE test to obtain a new outcome measure specific to the CAF personnel, 2) to test a first series of CAF personnel with LBP to assess the feasibility of the new test, and to 3) gather preliminary data.

Methods: CAF personnel predominantly lift 20 kilograms in the field and the nature of their occupations often involves body displacement during lifts. The PILE test was modified accordingly to be more representative of required tasks. The new *military PILE* (mPILE) requires participants to lift 6 sets of 5 repetitions (sets are: 3, 5, 10, 15, 20 and 25 kilograms) under similar bodily displacement as required for the CAF FORCE test. Participants have 30 seconds for each of 5 lifts and 3 minutes and 30 seconds for the entire task, and sandbags are used instead of milk crates. Measurements taken with the mPILE are: maximal heart rate, finger oximetry, rate of perceived exertion (6-20 scale), time at every stage and total completion time.

Results: Preliminary results on 11 male CAF personnel presenting with LBP resulted in mean (SD) age of 37 (9) years, maximal heart rate 133 (29) beats per minutes, and rate of perceived exertion 15 (2) on 20 points. Mean (SD) of total completion time was 92 (25) seconds. Concurrent validity with the Oswertry Disability Index and the Edgren side step revealed a Pearsons' r=-0.53, and r=-0.79, respectively. Retest was performed on 9 participants, with a mean elapsed time of 11 weeks in between testing.

Conclusions: The mPILE has distinct advantages over the PILE (usage of sandbags, standardized weights, and bodily displacements), and it addresses many limitations that the traditional PILE test has for the CAF. The mPILE is a quick test that was shown to be clinically feasible for the assessment of CAF personnel with LBP. These preliminary results are promising, and more data on a larger scale needs to be collected and analyzed in order to draw a definitive conclusion, and to verify the metrological qualities of this new test.

P130: Investigating Risk Factors Associated with Chronic Physical and Mental Health Conditions of Veterans in Canada

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Introduction: To understand key risk factors that are associated with specific chronic physical and mental health conditions that impact mortality and morbidity of Veterans in Canada. These chronic conditions include pain, diabetes, gastrointestinal diseases (ulcers, bowel disorders), respiratory (asthma, COPD, emphysema, bronchitis), cardiovascular (stroke conditions, heart disease, high-blood pressure), musculoskeletal (arthritis, back problems) and mental illness (anxiety, mood disorders, depression and post-traumatic stress disorder (PTSD)).

Methods: Using regression analysis on cross-sectional data from the *Survey on Transition to Civilian Life* (STCL) which was conducted by Veterans Affairs Canada in 2010-11. Key risk categories, identified from economic theory and public health risk framework included educational attainment, military career characteristics (rank, branch), behavioural characteristics, deployment outside Canada, income and demographic characteristics. Econometric analysis included ordinary-least squared regression, probit and negative binomial regressions. In addition, various diagnostic tests were conducted to ensure the robustness of the results.

Results: The preliminary results stress the role of income as a major risk factor of chronic health conditions with low-

income Veterans facing the highest risk across four chronic physical health conditions and mental health condition. The results also show that in the military setting, Veterans from the land forces face the highest risk for more than half of the chronic conditions investigated including mental health. Other factors included being deployed outside Canada, gender and obesity Statistical significance was set at the 5% level.

Conclusions: Given the risk factors, there may be a need to provide the lowest-income bracket Veterans with additional mental health support and that programs on prevention of chronic diseases be targeted specifically to the lowest-income Veterans. Additional research may be required to understand the reasons why land force Veterans and those that were deployed outside Canada face higher risks for chronic conditions.

P131: Assessing the Perception of Trunk Movements in Military Subjects with Chronic Non-specific Low Back Pain using a Virtual Mirror

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Introduction: Chronic pain is often associated with body perception disturbances, but the underlying mechanisms are not well understood. The objective of this study was to assess the perception of trunk movements in military subjects with chronic non-specific low back pain (CNSLBP) as compared to healthy military control (HC) subjects, using a virtual mirror providing modified visual feedback.

Methods: The virtual mirror was developed by integrating systems for motion capture and virtual reality. Subjects performed a trunk flexion task while sitting and standing in front of a large screen displaying their virtual mirror-image (avatar) in real-time. Required flexion angles were pseudo-randomized (15, 25, or 35 degrees). Avatar movements were scaled to appear bigger (105%-125%), identical (100%), or smaller (75%-95%) than the subject's actual movements. After each trial, subjects had to decide whether the avatar's movements were "bigger" or "smaller" than their own movements (two-alternative forced-choice paradigm). 126 trials were pseudo-randomized across 6 blocks, a higher number of trials being allocated to more difficult scaling factors. For each subject, a psychophysical curve was fitted to the data and 2 metrics were derived: the point of subjective equivalence (PSE, the scaling level at which there is a 50% chance of responding "bigger") and the just noticeable difference (JND). In addition, virtual reality immersion (Presence Questionnaire), and trunk kinematics were assessed.

Results: Preliminary immersion and psychophysical data from 10 military subjects with CNSLBP (aged 33 ± 10 years, all male, pain intensity 2.5 ± 1.3 out of 10, Oswestry

Disability Index 13% ± 5%, Tampa Kinesiophobia Scale 42 ± 5) and 10 HC military subjects (aged 28 ± 5 years, all male, pain-free) were analyzed. Average ratings for the responsiveness of the avatar (1=not at all, 7 = perfect) were 6.3 ± 0.7 (CNSLBP) and 5.8 ± 0.4 (HC), indicating high levels of immersion. Average PSEs were 103% ± 4% (CNSLBP) and 102% ± 6% (HC), indicating that on average subjects slightly overestimated their own movements. Average JNDs were 7% ± 3% (CNSLBP, n=9) and 7% ± 2% (HC), indicating that on average the sensitivity to detect a difference between actual and virtual-image movements was comparable between groups.

Conclusions: In conclusion, body perceptions in military subjects with CNSLBP, as assessed by a virtual mirror, seem to be similar to healthy military subjects. Additional analyses, including trunk kinematics, will be performed when more subjects have been enrolled (target: n = 20 per group, age-matched).

P132: Able-bodied and Transtibial Amputee Walking Strategies for Maintaining Stable Gait within a Multi-terrain Virtual Environment

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Introduction: The key challenge of bipedal walking is to actively balance the body over the base of support while sustaining forward momentum and maintaining upright posture. For amputees, maintaining stable gait poses additional challenges due to the loss of lower limb musculature and proprioception. Understanding gait biomechanics as applied to walking stability is necessary for developing quantifiable metrics for rehabilitation assessment. Therefore, the purpose of this research was to investigate how able-bodied and unilateral transtibial amputees maintain stable gait while walking over various stability-challenging terrains in the CAREN-Extended virtual environment.

Methods: Twelve able-bodied and twelve individuals with unilateral transtibial amputation walked in a park-like virtual environment with level, rolling hills, simulated rocky terrain, side-to-side translations, uphill, downhill, and cross (transverse) slope scenarios. Participants completed three walking trials at a self-paced speed. A maximum of 30 gait cycles for each walking condition were used for analysis. Walking stability was quantified by examining step parameters and gait variability. Step parameters included walking speed, step length, step width, step time, and foot clearance. Gait variability measures included mean of standard deviations for speed, step length, step width, step time, and foot clearance, and root-mean-square of trunk acceleration.

Results: For stability-challenging walking conditions, able-bodied and transtibial amputee participants walked with a

more cautious, but more variable gait pattern. Able-bodied and amputee participants reduced walking velocity, increased step width, and increased foot clearance. Additionally, all participants exhibited larger trunk accelerations for non-level conditions, which were accompanied by increased step variability. Overall, able-bodied and transtibial amputee participants adopted similar strategies to maintain stable gait, but amputee participants were more variable than the able-bodied group.

Conclusion: This study examined how able-bodied and transtibial amputee populations maintain stable gait for various terrains, within the CAREN-Extended virtual environment. Evaluation of step parameters and gait variability demonstrated able-bodied and high functioning transtibial amputees used similar approaches to maintain stable gait. Variability outcome measures were most sensitive to changes in walking conditions and changes between groups. Larger trunk accelerations may compromise stable gait by increasing step pattern variability to compensate for poorer trunk control, potentially leading to "difficult to recover" situations. These results demonstrated the importance of measuring gait variability and trunk motion when quantitatively assessing people with a transtibial amputation.

P133: Military Family Physician Satisfaction with Family Medicine Residency Training

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[1]Queen's University; [2]Canadian Forces Health Services Group

Introduction: In Canada, Military Family Medicine practitioners are trained in non-military university medical schools and family medicine residency programs. In most cases, there is no formal differentiation between the curricula delivered to military and civilian residents. Currently, there is little evidence available on the necessary content of a tailored residency program for those that will be serving in the military. The purpose of this study is to understand the level of satisfaction of medical officers currently serving in the Canadian Military forces with the training they have received, and to learn about gaps that may exist. The results of this study will inform not only the pilot military family residency program at Queen's University but also will provide reference for similar residency programs in other educational institutions.

Methods: The objective of this study is to measure the overall satisfaction of military family physicians with the family residency training that they have received, and to identify gaps between family medicine residency education/training and the needs of military settings.

The design consists of an online survey that was distributed to all currently serving Regular Force military family physicians within the Canadian Armed Forces. The survey was reviewed by the office of the Surgeon General for relevance and acceptability. Demographic information and length of training in various specializations is collected, as well as ratings of satisfaction with training using a 5-point Likert scale. Survey data will be analyzed using descriptive statistics. Eighty-two participants have completed the survey.

Results: Outcome measures consist of satisfaction with residency training of currently serving military family physicians. The analysis is ongoing.

Conclusions: Results of this study will provide insight and guidance to Canadian family medicine residency programs who accept military trainees. It will also serve to further the development of a tailored military program at Queen's University.

3. Social Health and Wellbeing

Podium Presentations

1C03: Adult Attachment and Spousal Reactions to Separation and Reunion Phases of a Military Deployment

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Introduction: Overseas deployments not only affect the physical and mental well-being of military personnel, their absences also profoundly affect family members who remain at home. While some work internal and external to the Canadian Armed Forces has focused on how civilian spouses generally cope with the deployment experience, little research has identified specific individual differences that predict how civilian spouses adjust to the various phases of a deployment. Attachment theory has contributed a great deal to the understanding of relationship processes and is the theoretical framework for this research. I will be presenting the most notable findings from a cross-sectional component of a three-year project in collaboration with Director General Military Personnel Research and Analysis (DGMPRA), Queen's University, and the Royal Military College of Canada. Specifically, I will highlight the role of attachment anxiety in predicting: 1) how one group of civilian spouses were functioning following a military partner's overseas deployment (Separation Group), and 2) how well another group of civilian spouses adjusted to their military partner's return (Reunion Group).

Methods: Our separation group consisted of 87 civilian spouses who were mostly in the Canadian Army and deployed to Afghanistan. Spouses were sent a survey after their partners had been deployed which included measures such as attachment anxiety and avoidance, relationship quality, and well-being. Our reunion group consisted of 68 civilian spouses whose partners had recently returned from a deployment in Afghanistan and who were mostly in the Canadian Army. Spouses were sent surveys after their partners had returned home that assessed their attachment anxiety and avoidance, how well the reunion had lived up to their expectations, relationship quality, and general well-being.

Results: We consitently found that attachment anxiety predicted a number of adverse outcomes with the separation and reunion groups. For example, attachment anxiety predicted less adaptive coping and lowered relationship quality for the separation and reunion groups. Attachment anxiety also predicted the extent to which spouses felt the reunion did not live up to their original expectations. Lastly, expectations not being met mediated the relationship between anxiety and some negative outcomes for the reunion group.

Conclusions: Theoretically, these results highlight the relevance of attachment processes during major life transitions (i.e. periods of high stress). These results may have practical implications such as helping to identify civilian spouses at risk for experiencing difficulty with their military partners' separation and return from deployment, and ensuring couples have the resources they need to assist them. Making every effort to ensure that the needs of civilian spouses and their military partners are continually met will assist senior leaders in reaffirming that the welfare of military families remains a top priority in the CAF.

1C04: The Impact of Military Life Related Stressors on Children from Military Families

Bullock, A., MA, Skomorovsky, A., PhD

Department of National Defence

Introduction: Children in military families experience various stressors associated with military life, such as parental deployments and frequent relocations. U.S based results indicate that military-life stressors negatively impact children of military personnel, including their psychological wellbeing, quality of child-parent relationships, social development, physical health, and academic functioning. However, there is a limited understanding of how military-life stressors affect children of Canadian Armed Forces (CAF) families. Thus, this study examined the stressors and risk factors that influence the well-being and adjustment of children from CAF families from the children's perspectives.

Methods: Focus groups were conducted across Canada with a sample of 85 children, aged 8-13 years (42 girls; 38 boys; 5 not indicated) from Canadian Regular Force families. The majority experienced 1-5 parental deployments, some experienced more than 5, and others experienced no parental deployments. Most children relocated at least once. Questions elicited the stressors that children faced including deployment and relocation, the impact of deployment and relocation on their well-being, routines and family functioning, and the factors that exacerbated the impact of military life on their wellbeing and adjustment. Interviews were transcribed verbatim and coded thematically using MAXQDA qualitative software.

Results: Findings revealed that deployment and relocation were the main military-life stressors. The primary stressors of deployment were lack of parental support, concerns about the deployed parents' safety, and lack of knowledge about what was happening with the deployed parent. Deployment also negatively affected children's psychological and physical health, peer interactions, and school performance. Children reported increase responsibilities at home, reduce social activities, and greater conflict with siblings and parents. The main stressors of relocation were losing friends, fear of not making new ones, and being mistreated at a new school. There was no consensus on whether relocation was a negative or positive experience. Further, more frequent and lengthier deployments, experiencing additional responsibilities at home, having an introverted personality, and being less aware of how long the family will reside at a current location were risk factors that affected children's outcomes.

Conclusions: Findings from this research suggest that it is important for parents, teachers, and other adults interacting with children to be aware of the impact of deployment and relocation on the wellbeing and adjustment of children from military families. Since children's wellbeing impacts the wellness of the whole military family, it is crucial to further investigate what factors can enhance children's resiliency in the face of the stressors associated with military life.

3C01: Understanding the Unique Relationships between Burnout Dimensions and Indices of Personal and Organizational Well-Being

Donald R. McCreary, D. R., PhD

Defence Research and Development Canada

Introduction: Burnout is often used in our general lexicon as a synonym for exhaustion. However, in the area of occupational health psychology, burnout is a multidimensional construct comprised of three factors: emotional exhaustion, cynicism, and lack of professional efficacy. Thus, when considering job-related burnout, one needs to consider the role that all three factors play in any causal or correlational association with indices of personal and organizational well-being. Research I presented at the 2013 MVHRF showed that a large number of instructors and support at two Canadian Armed Forces training schools reported moderate to high levels of overall burnout. These burnout indices were significantly correlated with many facets of well-being. However, there is very little understanding about which aspects of burnout are most strongly and consistently associated with adverse personal and organizational well-being. The analyses presented here help address that gap.

Methods: A total of 652 instructors and support staff from all eight schools at the Canadian Army's Combat Training Centre participated in one of two surveys, conducted one year apart. Most of the participants were male (94%), military (96%), and instructors (80%). They completed the Maslach Burnout Inventory – General Scale (MBI-GS), which is the most commonly used tool to assess burnout. In addition, the respondents also completed several measures of personal and organizational well-being: Patient Health Questionnaire Depression and Anxiety scales, the Pittsburgh Sleep Quality Inventory, as well as Spector's Job Satisfaction Scale, Myers

and Allen's Job Commitment Scale, and the Utrecht Work Engagement Scale by Schaufeli & Bakker.

Results: A series of multiple linear regression analyses were conducted, using the three subscales of the MBI-GS as predictors and the indices of individual and organizational well-being as the criteria. Findings showed that, contrary to our lay use of the word "burnout", it is not just exhaustion that drives the adverse effects of burnout: all three burnout dimensions revealed unique associations with most of the dependent variables in this study. While exhaustion seemed to be the strongest predictor of the personal health indices, cyncism and lack of professional efficacy seemed to play a stronger role in job satisfaction, commitment, and engagement.

Conclusions: Based on these findings, researchers examining burnout in the CAF context should focus on the role of all three aspects of burnout. Cyncism is especially important, as previous research has shown that CAF levels of cynicism are higher than those for Canadian at risk populations for burnout.

3C02: Institutionalizing Mental Health and Resilience Training in the CAF

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Canadian Forces Health Services Group

Brief Description: In order to prepare CAF personnel for the demands of military service, we have developed and implemented the Road to Mental Readiness program. R2MR encompasses the entire package of resilience and mental health training that is embedded throughout CAF members careers, including the deployment cycle. It is designed to ensure that the appropriate training is provided to mentally prepare CAF members and their families for the challenges they may encounter from Basic Training, throughout leadership courses as they progress during their careers, and at key points before and after they deploy on military operations.

Clinical Outcomes: The overall goal of all R2MR training is to improve short-term performance and well being, while mitigating any negative longer-term mental health problems for CAF personnel and their families. This is accomplished by teaching CAF personnel information about mental health, including early identification of signs and symptoms of mental illness, the importance of peer and leadership support, appropriate leader actions, barriers to seeking mental health care and available mental health resources. In addition, resilience skills including tactical breathing, mental rehearsal, goal setting, and self talk are taught, mentored and cued to improve the ability of CAF members and their families to manage both operational and non-operational sources of stress. Evaluation of R2MR training over a period of six years has demonstrated increased understanding of mental health and coping strategies that can be used on deployment, increased confidence in ability to identify members at risk for mental health issues and connect them with appropriate resources, decreased stigma toward those seeking care, and increased understanding of common transition and reintegration challenges and why they occur.

Patient Population: The training has been adapted to all rank levels and environments in the CAF, tailored to both the career and deployment cycles, and has also been adapted to meet the identified needs of family members and DND civilian managers. The R2MR content has also been tailored for specific high risk occupations within the CAF and for Canadian police services in collaboration with the Mental Health Commission of Canada.

Conclusions: A centralized, coordinated, culturally appropriate and evidence based approach to mental health education and training can be effective in increasing mental health literacy, decreasing stigma and other barriers to care in a military population. Partnership and collaboration with operational leadership is essential in ensuring that the program meets the needs of the target audience and has user acceptability and validity.

3C03: La forteresse intérieure stoïcienne et la santé des militaires

Imbeault, M. PhD

Collège militaire royal de Saint-Jean

Brève description: Cette recherche porte sur la philosophie stoïcienne, plus précisément sur la notion de « forteresse intérieure » développée notamment par Épictète, Sénèque et l'empereur Marc-Aurèle pour caractériser le lieu où peut se réfugier celui qui doit affronter des épreuves sur lesquelles il n'a pas de contrôle. Du point de vue militaire, cette approche a été étudiée de nos jours par le contre-amiral Jim Stockdale, suite à son internement comme prisonnier de guerre au Viêt-Nam pendant sept ans. Torturé et brutalisé à plusieurs reprises, Stockdale a soutenu que c'était grâce à la philosophie stoïcienne qu'il avait pu survivre.

Résultats: L'étude des stoïciens et l'exemple fourni par Stockdale sont deux façons d'illustrer la notion de « forteresse intérieure » et des moyens de la construire. En effet, cette forteresse n'est pas donnée, mais doit plutôt être cultivée ou forgée, comme le caractère (thèse de Stockdale). Mais on peut aussi examiner les témoignages des soldats revenus de missions afin d'évaluer jusqu'à quel point le stoïcisme peut s'avérer utile – voire nécessaire – pour faire face aux épreuves de la vie militaire. La philosophie est toutefois une activité d'élucidation conceptuelle. C'est donc en ce sens que les témoignages peuvent contribuer aux résultats.

Population: La population visée est l'ensemble de la profession des armes contemporaine, compte tenu de l'instabilité et de l'incertitude qui caractérisent le contexte militaire en développement sous nos yeux. Nous poursuivons ici une recherche entamée l'an dernier et qui nous avait amené à établir un lien entre l'éthique et la santé. Nous cherchons maintenant une éthique capable de fournir aux militaires des outils philosophiques leur permettant de se prémunir contre les épreuves inévitables que les missions ne

manqueront pas de leurs infliger. À ce titre, l'approche stoïcienne nous semble un bon point de départ méthodologique.

Conclusions: Le courage est au centre de ma recherche, avec les figures emblématiques d'Épictète, Sénèque, Marc-Aurèle et Stockdale, illustrations vivantes des bienfaits du stoïcisme. La maxime la plus connue d'Épictète prend la forme du souhait suivant : « Que la force me soit donnée de supporter ce qui ne peut être changé et le courage de changer ce qui peut l'être mais aussi la sagesse de distinguer l'un de l'autre. » Courage donc mais aussi compréhension du monde et de soi-même. Voici, en un mot, les fondements de la forteresse intérieure dont je voudrais développer le sens dans mon intervention.

4C01: Bold Indifference: Medical Evidence and the Veteran Review and Appeal Board

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The authors are Veterans conducting independent research and are not associated with a university, research centre, or government department

Introduction: The social health of wounded, ill, or injured Veterans and their families is directly affected by access to benefits and services provided by Veteran Affairs Canada . The Veterans Review and Appeal Board (VRAB) is the gateway to many of these benefits. VRAB's role is to weigh evidence to support or deny Veterans' disability claims. VRAB has been criticized by Veterans, and in 2013; two government bodies expressed concern over legal aspects of VRAB decisions. A dearth of information and informed comment exists concerning the *value* VRAB places on medical evidence. The paper examines how VRAB *values* medical evidence by examining VRABs use of medical opinion, testimony, and documentation in its decision-making.

Methods: VRAB decisions and dissents have been analyzed as a means to determine VRAB *valued* medical input in its decision-making. The source data included any and all VRAB decisions at the review, appeal and/or reconsideration levels that contain dissents January 2004 to May 2013 inclusive. A total of 59 cases were examined. Content analysis complemented grounded theory. Content analysis of VRAB decisions allowed for reconstruction of the situations and preserved the context of the text thereby allowing the development of accurate inferences. Inferences were com-pared to themes developed by grounded theory. The arguments given are based on matching inferences and themes found.

Results: Broadly, the results did not favour Veterans. Findings indicate VRAB inconsistently applied evidentiary rules. Despite well-defined regulations, guides, and law, the requirements for medical evidence by VRAB Board Members vary widely. In many cases, medical evidence, documented and testimony, is ignored or discounted. For example, clinicians that over explain or offer "opinion" concerning eligibility potentially disadvantage their patients. The inability to consistently weigh medical evidence potentially undermines the social health of Veterans and their families.

Conclusions: The findings indicate that VRAB was inconsistent in its application of rules, regulations, and law when considering medical evidence presented to the board potentially undermining the social health of Veterans and their families. Until VRAB practices are amended, clinicians must be made aware of the problem. Furthermore, strict adherence to the rules of medical evidence and over-whelming documented research may be clinicians only recourse to ensure Veterans and their families have access to benefits and services.

4C02: Battle of the Bulge: How Strengthening the Forces' Weight Wellness Lifestyle Program Helps Fight Obesity in the CAF

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Canadian Forces Health Services Group

Introduction: Obesity is prevalent in the Canadian Armed Forces (CAF); approximately 20% of CAF members are both obese and have an increased waist circumference; this presumed increased body fat negatively impacts the overall health and well-being of Canadian troops, and potentially reduces operational readiness. In response to this problem, strengthening the Forces launched the Weight Wellness Lifestyle Program (WW) in 2010. WW is a voluntary primary prevention course aimed at individuals who are ready to make significant lifestyle changes to lose weight or maintain a healthy weight. WW is designed to be delivered as weekly two-to-three-hour sessions over an eight-week schedule. The objectives of the current study were to assess WW's effectiveness for improving knowledge of healthy weight management practices; increasing physical activity; improving vegetable and fruit intake; and achieving weight loss among program participants. The current study used data collected as part of an extensive mixed-method program evaluation of WW.

Methods: Individuals who enrolled in WW from October 2011 to September 2012 were invited to participate in this study. Study participants were asked to complete a questionnaire at their first and last WW session. Both questionnaires collected data on demographics, dietary and physical activity behaviours, knowledge of healthy weight management, anthropometric measures, and self-perceived overall health. Data from both questionnaires were linked and paired by individual participant. Missing values were multiply imputed. Paired t-tests and univariate regression models were used to test for significant changes in health indicators of interest, from baseline to follow-up. Multiple linear regression and stepwise model selection techniques were used to identify the strongest predictors of positive program outcomes.

Results: Data were available for 297 participants from 45 WW courses at 24 different CAF bases/wings. On average, WW participants lost 2.33 kg (95% CI: 1.94 kg, 2.72 kg) and reduced their body mass index (BMI) by 0.81 kg/m^2 (95% CI: 0.67 kg/m^2, 0.95 kg/m^2). Baseline waist circumference and

the addition of a fitness component to WW were the best predictors of weight loss and BMI reduction. On average, WW participants also significantly increased their knowledge of healthy weight management, physical activity level, and daily intake of vegetables and fruits.

Conclusions: Upon completion of WW, participants reported significant improvements in their knowledge of healthy weight management, physical activity level, vegetable and fruit intake, and body weight. These results support the use of WW as a key component of the development of a CAF-wide weight management strategy.

4C03: Demystifying the Elusive "Culture of Fitness": Assessing Social and Policy Determinants of Physical Activity Behaviour Across the CAF

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Introduction: It is generally accepted that the health and physical fitness of sailors, soldiers, airmen and airwomen are essential and critical components of operational readiness. The Canadian Armed Forces (CAF), as well as most modern other militaries, provide state of the art fitness programs, facilities, and benchmarks to their personnel. Despite these services, approx. 1/3 of CAF personnel report being inactive.

Methods: The Lifegain Wellness Culture Survey was adapted in collaboration with the original author and completed by a stratified sample of nearly 4000 CAF personnel across 27 bases/wings in Canada (including Navy, Army and Air Force personnel). This survey contains 33 questions and is designed to assess 5 validated dimensions of fitness culture. They include: i. Shared Fitness Values (commonly held beliefs about fitness), ii. Cultural Norms (expected and accepted behaviours within the unit); iii. Peer Support (both social and resource-based support from coworkers or friends/family);iv. Cultural Touch Points (policies, resources and leadership), and v. Social Climate (general work atmosphere).

Results: Scores for the 5 dimensions were calculated for each of the 27 locations as well as being aggregated to the national level. Dimension scores ranged from 3.35/5 (cultural norms) to 3.83/5 (peer support). In general expectations relating to fitness are well understood by personnel, with over 75% of respondents stating that they agree or strongly agree with the statement that "In my unit, it is normal and expected to be physically active". Most respondents also felt that resources were being used appropriately, with nearly 60% having a positive reaction to the statement "The use of time, base facilities, money and other resources demonstrates our organisation's commitment to the fitness of our personnel". Finally, half of respondents agreed or strongly agreed that their commanding officer is a fitness role model. Binomial logistic regression analyses show that these individuals have nearly 20% higher odds of being active (based on self-report) when compared to those who feel their commanding officer is not a fitness role model (βex: 1.187; p:0.02).

Conclusions: It is important for fitness personnel, military leadership and health promotion personnel to consider environmental determinants of physical activity (be they of a social, policy or physical nature) in military personnel. Distinct differences have been noted across environments and even particular locations, indicating that many of these determinants would be best addressed at the local level.

4C04: A Web-based Self-help Resource for Trauma Survivors: Evaluation of *PTSD Coach Online*

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U.S. Department of Veterans Affairs

Introduction: To expand upon the success of the *PTSD Coach* mobile app, VA's National Center for PTSD developed *PTSD Coach Online,* a self-help resource consisting of 17 tools that aim to alleviate stress, improve well-being, and increase stress managements skills. Although similar to the mobile app., *PTSD Coach Online* is accessible to users on a desktop platform (rather than smartphone), and includes a broader range of stress-management tools. Availability of online self-help interventions has increased in recent years, yet research into efficacy and usability of these resources is scarce.

Methods: We conducted an evaluation of *PTSD Coach Online* among a nationally-representative sample of military and non-military adults (n=1200) with current stress and interest in using an online self-help resource. Respondents were stratified into three groups using a PTSD screen: no probable PTSD, subclinical PTSD, and probable PTSD. The goal was to assess usefulness and usability of *PTSD Coach Online*, including pre-post analyses to examine whether distress and perceived ability to manage stress change after use of tools. Relationships of demographic and mental health variables to change outcomes and intentions for continued use of tool for distress management are also assessed.

Results: Each of the 17 tools of *PTSD Coach Online* were selected by users, indicating the value of offerings for users. Furthermore, the primary tool chosen was significantly associated with level of PTSD symptoms such that those with Probable PTSD gravitated toward two cognitive skills and the mindfulness tool; whereas those with No PTSD were more likely to choose "Form good sleep habits" or the general relaxation tools. The follow up study suggests use of *PTSD Coach Online* is associated with decreased PTSD symptoms and an increased sense of mastery among users.

Conclusions: Based upon the success of the *PTSD Coach* mobile app, we created a desktop version to offer a wider array of tools. This evaluation highlights a positive usability experience and preliminary findings suggest that *PTSD Coach Online* is a valuable resource for trauma survivors in regard to PTSD symptom management and coping skill development. Whether users have previously been through PTSD treatment and need a "booster" or have upsetting symptoms that do not reach a clinical level of PTSD, *PTSD Coach Online* is intended to offer a viable self-help resource to alleviate stress, improve well-being, and increase stress management.

4D01: Military Suicide: Counselling Survivors

Leenaars, A., PhD, Blais, M. L., CD

Canadian Association for Suicide Prevention

Brief Description: War is friction. Suicide is an all too frequent response (Leenaars, 2013a, *Suicide among the armed forces.* Amityville, NY: Baywood). It has been known since the American Civil War that suicide is an aftershock of war. What about our current Canadian Armed Forces? There is a paucity of Canadian data; we will present what is known and then turn to survivorship. Every soldier and Veteran is a survivor of these war deaths. Michael Blais, a Veteran, will provide some words on suicides in the Canadian military. The families, friends, and "buddies" are indirect victims of the traumatizing experience. They are survivors. What can we do to help? We present some directions on postvention; research shows that there are diverse ways to help.

Clinical Outcomes: There is an important difference in providing counselling to survivors than the ordinary use of counselling. In grieving, the essential focus is not the death but the survivor's emotional state of mind – the reality that one's hero killed himself/herself. What are these factors? Military factors? Although research is lacking with military survivors there are general evidence-based guidelines. We will explore what can be done (Leenaars, 2013b, *Military suicide: Counseling survivors.* In K. Doka & A. Tucci [Eds.] *Improving care for Veterans.* Washington, DC: Hospice Foundation of America). There are, however, green (military) barriers or walls. The main obstacle to help-seeking is the negative attitude toward doing so (stigma). How can we overcome stigma? Despite a lack of studies in the military, research shows that survivors can be helped, and are most positive about counselling.

Patient Population: A survivor is a spouse, parent, "buddy", an endless list of a soldier or Veteran who died by suicide.

Conclusions: At the end of the presentation, the audience should have a better understanding of military suicide, should be able to understand the aftershocks better, and know better what we can do for the survivors. Our approach must be guided by a reframing of our therapists' call to action: Don't give up the fight!

5A01: Correlates of Veteran Status in a Canadian Sample of Homeless People with Severe and Persistent Mental Illness

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Introduction: Many Veterans at risk for homelessness also suffer from severe mental health problems. It is therefore important to better understand the relationship between homelessness, mental illness, service use, and Veteran status. The aim of this study is to identify correlates of Veteran status among housing, mental health, and service use variables in a Canadian sample of homeless people with severe and persistent mental illness.

Methods: The data were obtained from At Home/Chez Soi, a Canadian multisite demonstration project. The participants constitute a volunteer sample of 2,298 homeless or precariously housed individuals suffering from severe and persistent mental health problems. Of this sample, we retained 99 individuals who self-identified as Veterans, as well as a matched comparison group of 297 non-Veterans. Data were gathered at baseline, from Fall 2009 to Summer 2011 and were analysed using logistic regression.

Results: Both the Veteran and non-Veteran groups were found to be generally similar, although Veterans attended school longer, and were more likely to have been victims of a robbery in the six months prior to enrollment in the study, as compared to the comparison group.

Conclusions: The main results suggest that apart from some demographic differences, the two groups are mostly similar. Veterans are not overrepresented in this sample of homeless people suffering from mental illness as compared with the general population.

5C02: A Community of Support: Families of Fallen Military Members

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Defence Research and Development Canada

Introduction: Families who have suffered the loss of a loved one often experience a difficult transition. While they may have access to various avenues of support, such as family, friends or even professionals, many bereaved individuals also express a need to connect with others who have shared a similar experience. The Canadian Armed Forces (CAF) have established a complementary program, Helping Our Peers by Providing Empathy (HOPE), which aims to provide social support assistance to families that are affected by the loss of a service member by matching them with trained peer volunteers, who have themselves lost a service member in their family.

Methods: An exploratory qualitative research study was conducted to examine experiences and challenges that bereaved military families face and to identify their sources of support. Semistructured interviews were conducted across Canada with 39 individuals who had lost a military family member, including those who receive support from the HOPE program and trained HOPE volunteers. Participants were asked about their perceptions and experiences of the HOPE program, about the impact of the program on their wellbeing, and about their broader experiences with the CAF.

Results: The power of peer support was found to have a significant benefit on the participants, with the vast majority noting that the connections that they had formed through HOPE served as a positive influence in their grief journey. The shared experiences and formation of a community of support for bereaved family members had a significant impact on participants and often facilitated feelings of hope

as the trained volunteers acted as positive role models to help others through their grief and recovery.

Conclusions: This study helped identify the needs of bereaved military families and examined whether they are being served by the organization and, if not, identified areas where greater support could be provided. The findings will enable a more appropriate targeting and delivery of support services, inform senior leaders of the effectiveness of the HOPE program, and generate recommendations for improvement to the program.

Poster Presentations

P134 Exploring the Camouflaged Costs of Concussion/Mild Traumatic Brain Injury (mTBI)

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Introduction: Mild traumatic brain injury can be followed by post-concussion symptoms such as headaches, memory problems, dizziness, irritability, poor concentration, and fatigue which in turn can influence social, leisure and work activities. Despite the growing public health problem of concussion/mild traumatic brain injury little is know about the economic costs of services that patients receive between the time post injury and before their first specialty clinic visit. Identifying the types, frequency and patterns of formal and informal services obtained can help shed light on the camouflaged ecomonic costs of this widespread injury.

Methods: This retrospective study used data from 145 self-reported questionnaires completed by patients attending a Level 1 tertiary care outpatient head injury clinic in a large Canadian city between July 2013 and January 2014. The questionnaire consisted of 40 items completed in the waiting room prior to the clinic visit, by the patient alone and/or with the assistance of a friend or relative who accompanied them. Variables explored included type and frequency of formal and informal care during the time between injury and first specialty clinic care visit. Patterns and costs of services were the main outcomes of interest.

Results: The mean age of patients in this study was 42.4 years (SD 18, range16-87) with 58.8% male. The activities patients were engaged in when injured included trans-portation (pedestrian, MVA, bike) 47%, falls 29%, sports 8%, violence 6% and unknown 10%. The average time between injury and first specialty clinic visit was 8.15 months (SD 11.9, range 0-75 months).

Among patients who visited the Emergency Department 40% did so two times or more with a max. of 10 visits. Of those who visited Family Practice 59% of patients did so twice or more with a max. of 72 visits

Conclusions: A total of 3304 formal and informal service encounters (mean=23, SD=45.8, range 0-307) occurred between the time post injury and the first specialty clinic visit. Formal and informal services for the "in-between" time

for the study sample was an estimated one million dollars. Practice implications speak to the need for reliable triage tools to enhance timely and appropriate service delivery. With regard to policy, teasing apart the camouflaged costs of concussion/mTBI must be undertaken in order to uncover the true costs to the health care system and the less known "out-of pocket costs" to the patients and employers.

P135: Mothers in Armed Conflicts

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University of Alberta

Introduction: Armed conflicts (AC) still exists in many parts of the world and has major physical and psychological effects on both individuals and societies. It is well known that participating in armed conflicts impacts duty personnel and their families by interrupting everyday life. The WHO (2005) suggests that women, children, and youth living in armed conflict zones are especially vulnerable. Women, in their role as mothers, are symbolic reproducers of community. As such, they often become the targets of armed conflicts aimed at destroying the very fabric of society (Eriksson & Baaz, 2009). Being a mother is unconditional, and motherhood is seen as the traditional institution that successfully transforms girls into women (Zraly et al. 2013), as pivotal personal, social, development and biological changes occur in their children's lives (Smith 1999). Considering that mothers have this close relationship with their children, their own health and quality of life during AC should be of major concern. The purpose of this work was to review the literature about mothers in AC zones.

Methods: Three electronic databases (Medline, Scopus and Web of Science) and the internet were searched using the terms armed conflict(s), conflict zones, mothers or caregivers. Additionally, reference lists of all relevant identified papers were hand searched. The purpose was to identify peer reviewed journal articles where mothers in AC were a key focus.

Results: Few articles exist specifically on this topic, but where they do both negative effects (distress and PTSD symptoms) as well as several emerging positive insights (empowerment, dignity, peace activities) were identified. This review found that while wars is very disruptive and interferes with normal life, there is still evidence that women in their role as "mother" do not give up, but rather promote continuity of life. For example, women give birth to more children after war, and engage in peace promoting activities as well as anti-war activities.

Conclusions: The main concerns identified in this review are related to vulnerable mothers and lack of safety and security in their children. Children are our hope for the future, thus mothers' role in protecting, caring, loving and supporting children from the negative effects of armed conflict is most important. More research is needed to determine the specific needs of mothers during and after AC.

P136: The Impact of Canadian Military Parents' PTSD on the Developing Child: A Literature Review of the Social, Emotional, and Behavioural Outcomes in School-age Children

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University of Calgary

Introduction: Military families experience significant life events such as frequent moves, parental deployment, reintegration, and operational injuries in returning members. Due to the stress of serving in unpredictable and volatile settings, Canadian military personnel have been found to have lower life satisfaction, negative self-perceived mental health, higher rates of alcohol dependence, and higher rates of major depression than the general population. While likely impacting their ability to serve to their capacity, such experiences are also likely to affect their post-combat adjustment and family relations. With the end of Canada's military involvement in Afghanistan and personnel having returned home, attention needs to focus on the negative side effects of serving in combat situations (e.g., posttraumatic stress, suicide) currently being experienced by our returning Veterans and their families. In particular, the impact of reintegration for these Veterans and their families warrants critical examination.

The purpose of this critical literature review is to summarize the empirical evidence for social, emotional, and behavioural outcomes in school-age children with a Veteran military parent diagnosed with posttraumatic stress disorder (PTSD). Using this literature review, a model is constructed to guide future research as it pertains to the context of the child's primary environments (e.g., school, home) and critical relationships (e.g., parent-child, child-sibling, child-teacher).

Methods: Literature for this review was collected in a systematic manner using several electronic databases. The search was limited to peer-reviewed articles published between 2004 and 2014 and must have included a sample with a military parent experiencing PTSD and a school-age child (i.e., ages 5-18).

Results: Very little research has been conducted in the past decade examining the impact of PTSD or distress symptoms in returning service members on their school-age children. The resulting review found support for increased externalizing problems (e.g., attention and behavioural problems) and internalizing problems (e.g., depression, anxiety). Further, it is notable that none of the extant literature explores the effect of PTSD on Canadian military families and their children.

Conclusions: More empirical study is needed to ensure military Veterans' families are supported in coping with posttraumatic stress symptoms and its concomitant effects on parenting. In particular, this review instigates several important questions to address in future research: (1) What are the effects on children and adolescents who live with a Canadian military parent with PTSD?; and (2) What social and familial characteristics might act as protective factors for children and adolescents who live with a Canadian military parent who has PTSD?

P137: Sexual Functioning in Military Personnel: Preliminary Estimates and Predictors

Wilcox, S. L., PhD, Redmond, S., BA, and Hassan, A., EdD

University of Southern California

Introduction: While the military is a young and vigorous force, service members and Veterans may experience sexual functioning problems (SFPs) as a result of military service. Sexual functioning can be impaired by physical, psychological, and social factors and can impact quality of life (QOL) and happiness. This study aims to estimate rates and correlates of SFPs in male military personnel across demographic and psychosocial characteristics, examine the QOL concomitants, and evaluate barriers for treatment seeking.

Methods: This exploratory cross-sectional study was conducted using data from a larger nation-wide study conducted between October 2013 and November 2013. This sample consists of 367 male active duty service members and recent Veterans (military personnel) age 40 or younger. Erectile dysfunction (ED) was determined using the IIEF-5, sexual dysfunction (SD) was determined using the ASEX-M, and QOL was determined using the WHOQOL-BREF.

Results: SFPs were associated with various demographic, physical, and psychosocial risk factors. The rates of SD and ED were 8.45% and 33.24%, respectively, for male military personnel aged 21-40. Those who were 36-40, non-married, non-white, and of lower educational attainment reported the highest rates of SFPs. Male Veterans with poor physicaland psychosocial health presented the greatest risk for ED and SD. SFPs were associated with reduced quality of life and lower happiness, and barriers for treatment were generally related to social barriers.

Conclusions: SFPs in young male military personnel are an important public health concern that can severely impact quality of life and happiness.

4. Occupational Health

Podium Presentations

3B01: "After the Barrage of Epidemics" – Preventive Medicine and the Lessons of Public Health for the CAF

Engen, R., PhD

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Introduction: In the eighteenth century it was not uncommon for seven soldiers to die of infectious disease on campaign for each one who died of battle wounds. Today, we tend to believe that our healthcare knowledge is sufficiently advanced that such medical disasters are part of the distant past. But if the proper preventive medicine and public health practices are not rigorously adhered to, our armed forces can become just as vulnerable to infectious disease as were

themilitary forces of the eighteenth century, with serious consequences for readiness, operational effectiveness, and long-term health. This study will examine historical and recent Canadian operations to document the importance of force health protection.

Methods: This research uses primary and secondary sources to study the Canadian Army's preventive medical policies and practices during the Second World War, when rigorous measures for force health protection were in place. These will be compared and contrasted with more recent force health protection practices during peacekeeping operations in East Timor in 2000.

Results: Preliminary results suggest that the Canadian Army during the Second World War was fully cognizant of and committed to preventive medical practices and force health protection. Excellent results were achieved in minimizing preventable disease casualties through rigorous vaccination, hygiene, and sanitation. But the "lessons learned" for force health protection are easily forgotten and recent Canadian military deployments such as East Timor have suffered unsustainable levels of infectious disease casualties (in excess of 50% of force strength) because of breakdowns in health protection. The operational consequences, as well as issues of public health protection for returned soldiers and families, are immense.

Conclusions: Preventive medical practices are key to force health protection, particularly during overseas deployment. But this is fundamentally an issue of command and leadership rather than simply one of medicine. Modern medical technology and knowledge of proper disease prevention practices have almost no value without the willingness on the part of all levels of command to implement and oversee the application of that technology and knowledge. Insufficient attention paid to force health protection issues at any level can be disastrous. This research, by conducting an historical analysis of past "best practices," aims to provide practitioners and leaders with information that will assist in helping prioritize health protection policies.

3B02: Biomechanics of Military Load Carriage: The Effects of Walking Speed on Dynamic Gait Stability

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Introduction: Load carriage is recognized as a primary occupational factor leading to musculoskeletal as well as slip, trip, and fall injuries. Therefore, assessing gait stability during loaded walking is critical to understanding injury risk. In military load carriage settings, walking may be performed at different speeds depending on operational or training requirements. However, despite the fact that walking speed has been shown to significantly affect dynamic gait stability during unloaded walking, no research has looked at the effects of walking speed on dynamic stability during load carriage. Thus, the purpose of this investigation was to assess the influence of walking speed on lower extremity dynamic stability during military load carriage.

Methods: 10 male particpants were fitted with a military-issue backpack weighing 32.5 kg. Following familiarization and warm-up, participants performed 3 randomized treadmill walking trials of 100 strides at 1.26 ms^{-1}, 1.53 ms^{-1}, and 1.80 ms^{-1}, representing reported relaxed to forced march walking speeds in military settings. Lower extremity kinematics were captured using a three-dimensional motion capture system, and joint angles of the ankle, knee, and hip were calculated using standard techniques. Local dynamic stability was then calculated for each joint at each speed using maximum finite-time Lyapunov exponents (λ_{max}). Two-way repeated-measures analysis of variance was used to discern differences across speeds and joints ($\alpha = 0.05$), and was followed by Bonferroni-corrected post-hoc tests.

Results: A significant main effect was found for walking speed (F=4.708, p=0.045). Post-hoc comparisons revealed that slow walking speed was significantly less stable than medium speed (p<0.05). There was also a significant main effect of lower extremity joint on λ_{max} (F=17.247, p=0.001). Post-hoc comparisons showed that the knee joint was significantly less stable than the ankle and hip (p<0.01), which were not different from each other. No interaction effect was noted between walking speed and lower extremity joint (F=3.204, p=0.099).

Conclusions: The reduced lower extremity joint dynamic stability at slow speeds agrees with previous research stating that slow walking may not be the most dynamically stable, and may suggest that humans could encounter difficulties in controlling backpack momentum and modulating their gait stability at these slow speeds. The relative instability of the knee joint in comparison to the ankle and hip necessitates further investigation, especially since there are a high number of kneeinjuries in military personnel.

3B03: Use of Interferon-gamma Release Assays as Confirmatory Test for Tuberculin Skin Test-positive Patients in the CAF

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Introduction: Interferon Gamma Release Assays (IGRAs) are considered a supplement to confirm tuberculin skin tests (TST) for the diagnosis of latent tuberculosis infection (LTBI). The impact of the recent introduction of IGRAs in the LTBI screening program of the Canadian Armed Forces (CAF) is being investigated.

Methods: This retrospective study compares the TST positivity in the CAF during 18 months before and after the implementation of IGRA. The study analyzes the agreement between TST and IGRA and the impact of IGRA on treatment in the 18 months post-IGRA period.

Results: Of the total 13,499 TSTs included in this study, 102 were positive in the pre-IGRA and 113 were positive in the post-IGRA period. In the post-IGRA period, 54 had IGRA tests

with 17 positive and 37 negative (TST-IGRA agreement of 31.5%). TST positivity was significantly increased in the post-deployment group from 0.97% in the pre-IGRA to 1.88% in the post-IGRA period. In all other groups, the difference was not significant. Proportion of TST positive cases receiving isoniazid chemoprophylaxis was significantly reduced by 41.1% in the post-IGRA period.

Conclusions: Frequency of TST positive cases was significantly higher in the post-IGRA period compared with the pre-IGRA period, possibly due to the changing role of the CAF from that of battle to mentoring. The data indicates that the agreement in positive results between TST and IGRA is poor at 26.6%. Isoniazid prescriptions were significantly reduced after the implementation of IGRA suggesting that the use of IGRA prevents much unnecessary use of the antibiotic.

4B01: Work Environment and Mental Disorders in the Canadian General Population

Wang, J. L., PhD

University of Calgary

Introduction: Research has shown that work environment factors affect the risk of developing depressive and anxiety disorders in civilian populations. This presentation describes the occupational health models that have been used in this area and relevant results. Multi-variate risk prediction algorithms for the purpose of early identification will be presented.

Methods: Cross-secitonal and longitudinal data were used to examine the associations between workplace psychosocial factors and depressive/anxiety disorders in the general population. Workplace psychosocial factors were measured based on the models of demand-control, effort-reward imbalance and work-family conflicts. Depressive and anxiety disroders were assessed using the Composite International Diagnostic Interview (CIDI). The datasets included the Canadian National Population Health Survey (n = 17926), the Canadian Community Health Survey – Mental Health and Wellbeing (n = 36984), and the Population-based longitudinal study on work and health conducted in Alberta (n = 4300).

Results: High levels of work stress, effort-reward imbalance and work-family conflicts were associated with increased risk of depressive and anxiety disorders. Gender differences were observed in the associations. Major depression was strongly associated with lowered productivity (presenteeism). Changes from high work stress to low level of work stress is associated with a decreased risk of major depression. The interveniton strategies that address mental health problems in workpalces were reviewed.

Conclusions: Negative work environment can increase the risk of mental health problems in employees. Various interventional strategies have been proposed. However, rigorously designed studies are needed to provide definitive evidence about the effectiveness of the interventions. Other innovative strategies should be explored and tested.

4B02: Peer Influence in Emotion Regulation in the Emergency Services Context

Bérubé, N., PhD

Royal Military College of Canada

Introduction: There is limited knowledge on how peers directly influence each other's emotion regulation in close work relationships comporting intense emotional situations, such as emergency services. To address this shortcoming, this research seeks to identify how the emotional responses of first responders to emergency calls are influenced by their peers.

Methods: In-depth, semi-structured interviews were conducted with 15 full-time firefighters. Full-time firefighters live and work together on long shifts and thus, the opportunity for emotional influence among peers is likely to be strong. Respondents belonged to nine different units that provided continuous emergency service. The sample included 14 men (one woman), aged 25 – 46 (mean age = 34). They had been full-time firefighters for 3 – 22 years (mean tenure = 12 years). The respondents were asked to describe situations that they had found emotionally memorable, and to describe the types of emotions they felt before, during and after these situations. Finally, they were asked to describe the process they used to manage their emotions during and after the call, including the influence of peers in this process. From the content analysis of responses, the events described by respondents were of two types: traumatic events and service calls. The descriptions of emotions and how management of emotional responses was influenced by peers were analyzed for emergent themes.

Results: The situations that evoked the strongest emotional responses were those that included loss of life or severe trauma. Emotions reported most often included despair, feelings of powerlessness, anger and disappointment. Peers influenced the management of emotions evoked from traumatic events by empathizing, distracting, commiserating, and engaging in closure rituals. Events that evoked feelings of frustration were most often service calls. Here, respondents largely reported that peers influenced their emotional responses through commiserating or humour. The emotional tone of their experiences was more vividly evoked in the way that respondents described the emergency call and the peer influence. Examples will be provided during the presentation.

Conclusions: Emotion management is crucial to the performance and safety of emergency workers, particularly during traumatic emergency calls. Long-term, emotion management is a factor in individual well-being.

Identifying the major categories if emotions evoked from various types of emergency calls and how peers within a close-knit group of emergency workers influence each other's emotion regulation constitutes a primary step in understanding emotional response management in such contexts.

4B03: Prognostic Factors for Medical Release from Service after Diagnosis of a Mental Disorder in a Large Cohort of Canadian Armed Forces Personnel

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Canadian Forces Health Services Group

Introduction: An important minority of deployed personnel will be diagnosed with a mental disorder. Mental disorders can interfere with stringent military health and fitness standards, potentially leading to medical release. Concern over the career-impact of such diagnoses is a common barrier to care-seeking. The Canadian Armed Forces (CAF) invested heavily in mental health care over the past decade. However, little is known about prognostic factors for adverse occupational outcomes among individuals diagnosed with mental disorders. The current study investigates potential risk factors for medical release among a cohort of individuals diagnosed with a mental disorder and who deployed in-support of the CAFs mission in Afghanistan. It is hypothesized that diagnosis timing, its service-relationship and the latency to diagnosis each play a prognostic role on medical release in this cohort.

Methods: The study population consisted of 30,513 CAF personnel who deployed in-support of the mission in Afghanistan from 2001-2008. Mental disorder diagnosis information was abstracted from medical records of a weighted stratified random sample (n=2014). Release from military service was determined for 508 individuals with a mental disorder diagnosis using administrative data. Cox proportional hazards regression assessed the independent effect of diagnosis timing (median-split), its service-relationship and the latency to diagnosis (tertile-split) on medical release risk, controlling for socio-demographic, military and diagnostic characteristics.

Results: An estimated 17.5% of the cohort had a mental disorder diagnosis after their Afghanistan-related deployment and 21.3% of these individuals medically released over a median follow-up of 1267 days. Medical release risk was higher among individuals with less recent diagnoses (HR, 1.83 [95% CI, 1.04-3.21]); It was higher for individuals with a 21 month or longer latency to diagnosis, relative to a 8 to 21 month latency, (HR, 2.52 [95% CI, 1.30-4.87]) – at 5 years of follow-up, 28% of those with a latency < 8 months medically released compared to 20% with a 8 to 21 month latency and 46% with a 21 months or longer latency. There was no difference in medical release risk by diagnosis service relationship. Medical release risk varied significantly by diagnosis mix, illness severity, rank category and occupation category.

Conclusions: A large fraction of individuals with a mental disorder diagnosis will ultimately medically release from service. However, our results suggest that past mental health care improvements have had some positive impact. While we identified some factors that impact the probability of medical release, delay to care seeking is a potentially modifiable one.

4B04: Contextual Influences on Tobacco Use in the CAF: Population Health Evidence from the Canadian Forces Health Information System

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Introduction: Patterns of tobacco use in the Canadian Armed Forces (CAF) reflect the background rate in the general Canadian population, with substantial variation across demographic, sociocultural, and geographic strata. Given the preventable and predictable impact of smoking on cardiovascular disease, operational readiness and health care resources in the CAF, it is prudent to identify the personal and contextual factors that enable or impede smoking cessation initiatives.

We present herein the first detailed examination of tobacco use among CAF personnel, units, ships, squadrons, bases and wings using periodic health assessment data from the Canadian Armed Forces Health Information System (CFHIS).

Methods: From a population health database of 186,000 primary care and dental records we extracted current tobacco use among active CAF Regular Force personnel between January 2012 and January 2014. The proportion of current smokers was computed for each unit, squadron, ship and base in the CAF, adjusted for the number of person-years.

Mixed-effects Poisson growth curve models were used to estimate the uptake, period prevalence and transition rate of tobacco use at each level, after controlling for individual-level demographic and occupational covariates. The partitioning of residual variance provides a measure of both organizational risk and opportunity for area-level health interventions.

Results: The prevalence of current tobacco use among CAF Regular Force personnel was 22.2% in 2014, representing a 0.8% decline from the previous year.

After adjusting for differences in population composition, we observed considerable variation in the prevalence of tobacco use at the individual, unit/squadron, and base levels. Male CAF personnel were 34% more likely, and CAF officers 64.5% less likely to smoke. Moreover, a ten-fold difference in the prevalence of smoking was observed between the lowest (4.8%) and highest (48.1%) ranking units and squadrons. Within the Royal Canadian Navy (RCN), the prevalence of tobacco use on ships ranged from 22.6% to 33.3%.

Canadian Army (CA) bases reported significantly higher overall tobacco use and lower rates of smoking cessation when compared to CAF bases or wings with a higher proportion of Royal Canadian Air Force (RCAF) personnel. RCAF personnel were also more likely to quit smoking during the previous year than CA or RCN personnel.

Conclusions: Contextual variation in tobacco use among CAF personnel was prominent, and could reflect cultural or occupational norms amenable to targeted heath promotion campaigns. The CFHIS database provides a unique platform

to monitor individual-level health trajectories, whilst providing population-level metrics in support of health policy decisions.

5B01: Monitoring of Noise-induced Hearing Loss Among CAF Personnel

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Brief Description: Noise-induced hearing loss (NIHL) is a known occupational risk among military personnel. Hearing impairment can negatively impact combat readiness, effectiveness, and survivability, and is related to aspects of ill health and results in poor quality of life. Although NIHL is entirely preventable, many barriers to hearing conservation exist within the military context. Hearing-related disabilities are the most commonly compensated occupational injuries among CAF personnel and Veterans, accounting for more than $140M spent annually by Veterans Affairs Canada. For these reasons, hearing impairment continues to be a priority area of occupational health and safety within DND. Audiometric testing detects minute deterioration of hearing that can be linked to noise exposures. In the CAF, personnel undergo regular hearing tests and since 2011 audiometric data has been captured digitally.

Clinical Outcomes: After a successful pilot study in 2010, automated audiometer use was implemented across the country. Individually, audiometric data are used for clinical diagnoses and to determine fitness for hearing-critical occupations. Collectively, the data describe the hearing profile of the entire CAF and identify high-risk subgroups of the population.

Longitudinal audiometric data will be linked to patient data within the Canadian Forces Health Information System and other DND databases. These data linkages allow for complex modeling of hearing threshold changes over time and hearing loss trajectories by gender, comorbidities, years of service, trade, unit, deployment history, and other occupational exposures.

Patient Population: All active CAF members undergo mandatory audiometric testing at recruitment and during periodic health assessments, as well as at other points throughout their careers (e.g. pre- and post deployments and job promotions).

Prior to the digital collection of audiometric data, it was not possible to monitor and report the overall number of active CAF personnel experiencing hearing loss or the severity of loss. The electronic capture of these data allows for regular monitoring and more complex longitudinal analysis.

Conclusions: Population-level audiometric data is monitored to determine the epidemiology of service-related hearing loss. Future studies will link audiometric data to other data sources to examine the role that military /occupational exposures play in the progression of hearing loss, and the different trajectories of loss by subgroups. These data

linkages will generate the information needed to develop targeted prevention approaches and will be used to support ongoing hearing conservation efforts. Longitudinal analysis will provide estimates of future burden of hearing loss among CAF members and Veterans and play an important role in the planning of heathcare resource allocation.

5B02: Audio-visual Messaging During Command and Control Operations: Help or Hindrance?

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Defence Research and Development Canada

Introduction: This research explored strategies to resolve the problem of auditory overload during military command and control operations. Auditory overload refers to a situation where radio operations are tasked with monitoring, transcribing, responding to and relaying strategic information delivered simultaneously over two or more audio networks or channels. Audio channels may be associated with different levels of command or units within a battle space. The benefit of audio-visual messaging was investigated.

Methods: Twenty-four normal-hearing participants, half male (aged 26-41 years) and half female (aged 19-48) years were tasked with understanding triads of different simultaneous messages presented by two males (left and right ears, respectively) and a female (right or left ear) over a communication headset. Sixteen participants were members of the Canadian Armed Forces and eight were civilians. Each completed the task under twelve listening conditions defined by combinations of the background (quiet vs playback of the noise heard within a Bison land vehicle driven along a highway), the ear assignment of the female talker (left or right), and the availability of supplementary text (none, randomly but equally likely across the three talkers, or associated with one of the three talkers). Participants responded only to those messages which began with a pre-assigned call sign (the target messages). These occurred during 27 of 78 triads presented within each condition, nine randomly from each of the three talkers.

Results: Male and female participants performed similarly, as did military members and civilians. The overall percentage correct was 78%. Background noise did not interfere with speech understanding for the 5 dB speech-to-noise ratio used nor did the gender of the talker. There was a 12% right ear advantage for understanding single messages. The right ear was also better at disentangling two simultaneous messages. Importantly, the percentage correct was higher when each of three talkers were accompanied by text. The gain was 10-26%, depending on the talker. Improvements due to supplementary text did not result in inattention to unaccompanied messages.

Conclusions: Participants had relatively little difficulty distinguishing among triads of messages delivered over the right and left earphones of a communications headset. The observed right ear advantage suggests that higher priority messages should be sent to the dominant right ear. Male and female talkers were equally distinguishable.

The noise background did not interfere with speech understanding, as long as the speech level exceeded the noise. Supplementary text aided speech understanding.

5B03: Hearing Conservation on the Battlefield: An Analysis of Weapon Noise Exposure

Nakashima, A., MASc, Farinaccio, R., MEng

Defence Research and Development Canada

Introduction: Noise-induced hearing loss from exposure to weapon noise is a well-known problem. Despite ongoing research on hearing damage risk criteria and numerous revisions to standards for noise measurement, current Canadian Armed Forces (CAF) hearing conservation guide-lines for weapon noise are based on data from the 1970s. A recent analysis of the CAF training manual has resulted in updated guidelines for the use of hearing protection. A revision of the exposure limits in terms of the number of rounds that can be fired for each weapon is not possible with the limited amount of data that is currently available.

Methods: We are collecting noise data on current CAF weapon systems following the relevant American National Standards (ANSI) for measurement of impulse noise. Our measurements will include the use of commercially available suppressors. The data will be analyzed using two methods of hearing damage risk criteria for impulse noise: the equivalent energy referenced to an 8-hour exposure period (Leq, 8 hr) and the auditory hazard assessment algorithm for humans (AHAAH). In addition to standard microphone measurements, an acoustic test fixture (acoustic manikin with ear simulators) will be used to record the head-related transfer functions of the noise and measure the performance of selected hearing protection devices.

Results: To date, we have collected noise data from the C7 and C8 rifles with several commercial suppressors, and the 12-gauge weapon with different munitions. Our preliminary analysis indicates that at a distance of 2 meters, the peak level for the C7 is about 162 dB (unsuppressed) and 13 to 22 dB lower when various suppressors are used. Further measurements planned for the summer and fall of 2014 will include a broader range of weapons and the hearing response using the acoustic test fixture. The data will be analyzed using the hearing damage risk criteria mentioned.

Conclusions: The results of this work will be recommended for use in a future revision of the hearing conservation section of the CAF training manual. The weapon suppressor measurements will provide input to current North Atlantic Treaty Organization (NATO) activity on the standardization of suppressor evaluation. The noise recordings and hearing response analysis will be used for future research on the auditory performance of soldiers, including speech communication in battlefield noise.

5B04: Fatigue after Traumatic Brain Injury. An occupational performance perspective: Preliminary results

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Introduction: Fatigue is among the most frequently reported symptoms after traumatic brain injury (TBI), interfering with functioning and resulting in inability to perform occupational duties. While most physiology-based models of fatigue and performance list sleep as a component critical to modulation of performance, this relationship has not yet been studied in the TBI population. The aim of this study was to test a three-process model - sleep, fatigue, and activity participation in Ontario workers with TBI.

Methods: A cross-sectional study of workers with mild to moderate TBI, seen for assessment at the Toronto Rehabilitation Institute's Worker's Safety and Insurance Board Clinic, was performed. Eighty-four Ontario workers (62% males, 38% females) completed the Fatigue Severity Scale (FSS), Patient's Health Questionnaire (PHQ-9), Insomnia Severity Scale (ISS), and the Toronto Hospital Alertness Test (THAT). Activity participation was evaluated by the Sheehan Disability Scale. Frequency distributions and Pearson correlation coefficients were obtained with data analysis.

Results: Forty-eight % of our sample performed shift work at the time of their injury. Fatigue requiring further evaluation was found in 79%, depression in 98%, impaired alertness in 68%, and clinical insomnia in 85% of the participants. A strong association was found between the outcome of interest-fatigue and insomnia (r=0.43, p<0.0001), depression (r=0.55, p<0.0001), and alertness (r=-0.60, p<0.0001) total scores. A strong positive relationship was observed between fatigue and total disability (r=0.55, p<0.0001) and the work disability subscale (r=0.40, p=0.0004).

Conclusions: Our results highlight the relationship between sleep and fatigue as they relate to performance. Fatigue was strongly associated with depression, insomnia and disability. A strong negative association between fatigue and alertness may suggest workers' inability to perform duties requiring sustained attention. Future research on the effects of circadian displacement due to shift work as a determinant of post-morbid fatigue, alertness and performance is warranted.

Poster Presentations

P138: Close Out Occupational and Environmental Health Risk Assessment for Kabul, Afghanistan

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Canadian Forces Health Services Group

Introduction: The Deployable Health Hazards Assessment Team (DHHAT) completed a technical assistance visit (TAV) 13-123, Op Attention, to Kabul, Afghanistan from 20 Jan to 4 Feb 2014. The purpose of this TAV was to complete a close out occupational and environmental health risk assessment at selected Canadian Armed Forces (CAF) locations. Particulate Matter (PM) and Crystalline Silica were previously

identified in 2011 as being the compounds of potential health concern, and sampling for these compounds were replicated for TAV 13-123. PM samples were compared to United States Environmental Protection Agency (US EPA) guidelines for Air Quality Index (AQI), and crystalline silica was compared to the American Conference of Governmental Industrial Hygienists (ACGIH) standards.

Methods: The DHHAT team collected a total of 90 air samples from two CAF locations, Camp Phoenix and Camp Eggers. There were 18 samples collected for both $PM_{2.5}$ and PM_{10} using US EPA IO 2.3 (modified). Crystalline silica had 54 samples collected where NIOSH analytical method 7500 was utilized.

Results: The samples collected for $PM_{2.5}$ had levels ranging from 110 to 290 $\mu g/m^3$, and the PM_{10} samples had levels that ranged from 170 to 490 $\mu g/m^3$. Of the 54 samples collected for crystalline silica, all results were below their respective health-based standard.

Conclusions: All three forms of crystalline silica were found to be very low while PM was screened to be of potential concern at both Camp Phoenix and Camp Eggers. The preliminary analyses of TAV 13-123 results indicate sampled levels were consistent with the results from previous air sampling conducted in Kabul, Afghanistan during 2011. PM levels equated to a US EPA AQI category of *unhealthy for sensitive groups* through to *hazardous*.

P140: Adverse Effects with the Use of an Immunomodulating Therapy in Military Personnel and Potential Impact on Deployability

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Canadian Forces Health Services Group

Introduction: Immunomodulating drugs are used to treat various conditions, including inflammatory bowel disease, rheumatic illnesses and organ transplants. These medications carry a risk of side effects including increased risk of infection, which can impact on the ability of Canadian Armed Forces (CAF) members to safely deploy in austere environments. The Canadian Forces Medical Service assigns Medical Employment Limitations (MELs) to military personnel with chronic medical conditions who have been prescribed immunomodulating drugs, to prevent these individuals from being tasked to environments that may worsen their health and/or jeopardize the success of the military mission. Unfortunately, there is often limited information available in the medical literature that is specific to the military patient population that can assist in making these decisions.

Methods: A review of the CAF pharmacy Claims Database was undertaken in November 2013 to identify users of azathioprine. Electronic health records of these users were then reviewed to determine if any adverse effects were documented during the course of therapy. The CFHIS database was then cross referenced for any adverse effects that were linked to the use of these medications over the two year study period.

Results: A total of 63 azathioprine users were identified. Azathioprine was most commonly used to manage gastrointestinal conditions. Adverse events were uncommonly documented.

Conclusions: Through this review, an approach has been developed to assign of MELs to serving personnel on immunomodulating drugs. In future, this process could be adapted to validate MELs assigned in other therapeutic areas.

P141: Determining Nanoparticle Inhalation Exposure in the Posthetics Laboratory at Walter Reed National Military Medical Center

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Introduction: The increase of wounded warriors has dramatically amplified the need for prosthetics. During the four steps of the prostheses manufacturing processes (lamination, plasterization, thermoforming and grinding), particle matter is generated. Particle matter from these manufacturing processes are hazardous to human health and suspicion exists that nano-sized aerosols generated during the process will increase this hazard.

Methods: A gravimetric and direct reading research study was designed to measure submicron particle size distributions in the Walter Reed National Military Medical Center (WRNMMC) prosthetics laboratory. The gravimetric reading consisted of a weight-based measurement, and direct reading used a particle count procedure.

Results: Weight analyses did not detect any dust, but X-ray diffraction revealed the presence of quartz, tridymite and cristobalite. Unimodal aerosols using number concentrations of each process were obtained from a handheld optical particle counter (OPC) combined with a condensation particle counter (CPC). For particle sizes from 0.3 to 10μm, no difference was identified between lamination and thermoforming (p=0.189). For nanoparticles, two groups emerged, namely, lamination and plasterization (p=1), as well as, grinding and thermoforming, which generated many more nanoparticles (p=1). Plasterization generated the largest particle number concentration for particles between 5 and 10 μm. Grinding and thermoforming generated most of the smaller particle number concentrations, and lamination was the least productive of particle number concentration overall.

Conclusions: Although all results were below occupational exposure levels, increase in particle numbers demonstrated additional exposures during prostheses manufacturing processes and that exposition need to be deal with in order to prevent future over exposition of worker to nanoparticle.

P142: Diving Medicine Research at DRDC Toronto Research Centre: The Development of a Diagnostic Assay Kit for DCS using Microarray Hybridization

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[1]Defence Research and Development Canada; [2]Ontario Cancer Institute Genomics Centre; [3]Canadian Forces Health Services Group

Introduction: Decompression sickness (DCS) may occur in compressed gas diving when the pressure of tissue-stored inert gas becomes supersaturated, resulting in the growth of bubbles in blood (venous gas emboli (VGE); decompression stress). VGE can mechanically obstruct smaller vessels, halting blood flow and oxygen transport to tissues and damaging vascular endothelial cells leading to ischemia/reperfusion, anoxic cell death, and immunoin-flammatory responses in white blood cells (WBCs). The symptoms of DCS often lead to diagnostic uncertainty. When DCS is suspected, diving operations are terminated to prepare for hyperbaric oxygen treatment (HBOT) for the victim. Evacuation to HBOT in diverse theatres of operations such as Canada's Arctic is costly and problematic. To alleviate uncertainty in diagnosis, microarray hybridization (MH) of genomic expression in WBCs is being used to identify bio-markers for the potential development of a diagnostic assay kit for DCS. During Trimix table validation dives, we noted that oxygen decompression overwhelmed and masked the effects of decompression stress on genomic expression in WBCs in a dose-dependent manner. To escape the effects of oxygen decompression, dry chamber air dives were conducted at 45 metres-sea-water for 30 minutes followed by air decompression

Methods: Venipuncture blood samples were withdrawn from clearance divers 30 minutes before the dive (Pre) and post-dive at 15 min (P15), 75 min, 3 hours, 5 hours, 8 hours, 17 hours, and 24 hours. After purification of mRNA in WBCs, Agilent® two-colour MH was used to examine global genomic expression at each post-dive time and analyzed for "biologically significant" differences compared to Pre using GeneSpring®.

Results: Of the 831 genes with biologically significant expressions at P15, 29% of the genes accounted for nucleus activity, transcription, and mRNA splicing and 71% for protein translation and processing. Sixty minutes later (P75), 665 of the P15 genes (80%) were virtually non-expressive. The expressions of the remaining 20% (166) genes did not appreciably change for the next eight hours.

Conclusions: The pattern of genomic expression at P15 represents a well-known transient immediate-early (IE) response seen in all organisms following acute immune-oinflammatory challenge. Clearly, the immune systems in clearance divers responded to decompression stress. However, because most DCS cases present between 60-300 minutes following a dive, the IE genes may not be ideal bio-marker candidates for DCS. The remaining 166 biologically significant genes are being statistically analyzed. One atmosphere control samples also await MH.

P143: Biomechanics of Military Load Carriage: The Effects of Prolonged Walking on Movement Kinematics

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Introduction: Load carriage walking tasks performed by military personnel for extended periods of time are thought to hamper performance as well as increase musculoskeletal injury risk. While the effects of different load configurations and equipment have been tested on acute biomechanical and physiological responses, few investigations have assessed the influence of these factors over a prolonged period of time. The purpose of this investigation was to assess whether lower extremity and trunk kinematics, heart rate, and subjective exertion ratings are altered due to the performance of prolonged load carriage walking.

Methods: Seventeen healthy male participants performed 60 min of treadmill walking at a speed of 1.53 ms^{-1} while carrying a military-issue backpack weighing 32.5 kg. Five participants had extensive familiarity with task demands through current military service or recreational hiking, while the remainder had intermediate experience with seasonal hiking. Kinematic data of the lower extremity were measured using a 9-camera Vicon motion capture system, and three-dimensional joint angles for the ankle, knee, hip, and trunk were calculated using standard techniques. Differences in sagittal-plane kinematic waveforms obtained during the initial and final phases of the task were assessed using principal component analysis. Changes in heart rate, rated perceived exertion, and body discomfort were also analyzed.

Results: The only kinematic change observed across the one hour of walking was that the foot became slightly more dorsiflexed throughout the gait cycle. Perceived exertion as well as neck and shoulder discomfort were rated higher at the end of the walking protocol.

Conclusions: Although changes in rated perceived exertion and discomfort were small, these alterations were still observed in an ideal setting with military issue equipment designed to improve soldiers' comfort during exhaustive tasks. Therefore, backpacks currently used by soldiers could benefit from further development and design modifications to reduce shoulder and neck discomfort.

P144: Heavy Load Carriage Effects on Soldier Metabolism and Physiology

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Introduction: Military personnel face a key challenge while conducting dismounted operations, an excessive physical load during approach marches and patrols. These loads often exceed 50% of the soldier's body weight and impact the soldier's mobility, combat readiness and mission effectiveness. The burden also increases the risk of acute and

chronic musculoskeletal injuries. Although many studies on load carriage have been conducted, there is a lack of standardised physiological protocols. Better correlations between performance metrics and fitness parameters are needed to validate the efficiency of human performance augmentation systems (e.g. exoskeleton) designed to help soldiers carry heavy load. This study examines the physiological performance to exhaustion of 10 Canadian Armed Forces soldiers carrying a 54-kg load under two different protocols. Firstly, participants walked up a 16% gradient paved slope under three marching speeds of 95%, 104% and 110% of their estimated VO_2max (constant intensity test). Secondly, a novel experimental protocol was implemented where the participants climbed stairs at a cadence that increased over time.

Methods: Participants were selected using various standard tests: 20m shuttle run, leg press, loaded squat and Stepmill VO_2max. Each test condition was repeated three times with a 24 hour recovery period between repetitions. Participants wore their standard uniform and boots. They were equipped with Mio ALPHA watches to record their heart rate, step length and rates were measured with Garmin foot pedometers. Time, distance and cause of exhaustion were recorded as key performance metrics. All sensors used, including GPS for location and altimeter for elevation, were Bluetooth/ANT+ compatible, recorded data was captured with mini iPad tablets and the Wahoo Fitness application.

Results: The normalized average specific energy expenditure was used as the load carriage performance metric. It was estimated by analysing and consolidating the heart rate data of the nine test conditions. Since the tests were conducted up to exhaustion, the concept of the critical marching speed was explored.

Conclusions: The best correlation for the energy expenditure performance metric was obtained with the loaded climbing stairs VO_2max data which could be considered as a complementary fitness ranking parameter for soldiers. Further testing is planned to validate and refine the proposed protocol and the physiological load carriage performance metric.

P145: Early Detection of Operational Stress Injuries

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Introduction: Soldiers exposed to traumatic events may experience various operational stress injuries (OSIs) such as Post-Traumatic Stress Disorder (PTSD), depression, and anxiety disorder, among others. Early diagnosis of OSIs is crucial for timely intervention. By measuring the changes in resilience of soldiers through correlations between low-back endurance (Sorensen) test, various cognitive tests and biological metabolites such as dehydroepiandrosterone (DHEA), dehydroepiandrosterone sulfate (DHEA-S) and salivary immunoglobulin A (S-IgA) in saliva, we seek to develop a predictive tool for OSIs.

Methods: Before and during deployment to Afghanistan, 113 soldiers were tested for their physical and cognitive ability. Physical tests included Sorenson's Test – a back extension endurance test. Cognitive function was measured using the Cambridge Neuropsychological Test Automated Battery (CANTAB). Self-reported information about mental health status included the Connor-Davidson Resilience, PCL-M, and the SF-12 questionnaires. Salivary biological indicators of stress coping were measured using multiplex ELISA assays.

Results: The biological metabolite data indicates an increase in DHEA from 128.8 (pre- deployment) to 145.2 pg/mL (during deployment). S-IgA have decreased from 146.5 mg/s before the deployment to 113.3 mg/s after the deployment. Preliminary data suggests decrease in physical performance as the average time for the Sorensen's test dropped from 156 (pre- deployment) to 124 seconds (post – deployment). In terms of cognitive performance, attention switching skills, impulse control, and spatial working memory of soldiers improved during deployment. Furthermore, slight improvement in emotion recognition had been seen during deployment. Nevertheless, based on the self-reported information, the soldiers' mental health status declined during the deployment.

Conclusions: DHEA is an androgen secreted by the zona reticularis of the adrenal cortex and is a precursor for sex steroids. DHEA influences certain brain functions by modulating neurotransmitter receptors such as GABA-A or NMDA receptors. Its involvement in the pathophysiology of cognitive decline and mood disorders was reported, and its increase in acute psychosocial stress observed. In our study, the deployment-related stress incrased DHEA concentration in saliva of soldiers. S-IgA reduces bacterial adherence to mouth surfaces, which is one of the first steps that may lead to infection; it also supports bacterial aggregation that prevents bacteria from propagating and adhering to mouth surfaces thereby increasing the elimination of infectious agents. Deployment-induced stress decreased immune system resistence. The biological changes appears parallel with the mental health decline. Preliminary data suggest the usefulness of a predictive tool consisting of biological, cognitive, and self-reported information for early ident-ification of soldiers at risk for OSIs.

P146: Assessments Used by the Canadian Association of Occupational Therapists' Military and Veterans Affairs Networking Group (MAVAN): A Compilation of Current Assessments and their Psychometric Properties

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Introduction: Currently the use of assessments by Canadian Occupational Therapists working with clients through military and Veteran's affairs is highly varied. To date, there is

no compilation of assessments that includes the psychometric properties of these assessments. Using evidence-based evaluation tools when working with clients is a main priority in the field of occupational therapy and healthcare at large. Thus, there is an evident need for a literature review and best-practice guidelines with regards to assessments in this area of practice

Methods: Occupational Therapists nation-wide were polled regarding the specific assessments used in their practice with military and Veteran populations and a comprehensive list was compiled. Assessments were grouped into categories based on area of practice and a literature review of all standardized assessments was conducted through a search of the following databases: Medline, Pubmed, CINAHL and EMBASE.

Results: Assessments were categorized into the following groups of varying themes: chronic pain, roles/leisure/goals, functional scales, cognition, general health, mental health, functional capacity evaluations, and physical assessments. Preliminary findings indicate that assessments used by Occupational Therapists in this field have varying levels of strength in psychometric properties. Further analysis is required to determine the best-practice recommendations for these practice contexts.

Conclusions: Assessments used by Occupational Therapists across Canada with military and Veteran populations reflect the diverse and multi-factorial challenges these clients face. In addition, these results demonstrate that the large scope of the Occupational Therapy profession is necessary and appropriate to address the psychological, physical, and functional needs of this population.

5. Novel Health Technologies

Podium Presentations

1B01: A Primer for Primary Care Physicians Treating PTSD: A Case-based Online Education Tool

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Brief Description: In his groundbreaking 1978 research on the prevalence of mental disorders in the US population, Darrel Regier found that only one-fifth of those with mental illness were seen by specialty mental health providers, while three-fifths were treated by general practitioners. He called primary care the "De Facto Mental Health Services System". Today, primary care practitioners continue to treat most people with mental health problems in both the military and civilian world. Because of this reality, the Mood Disorders Society of Canada asked the authors to create an online course to educate family physicians on the treatment of PTSD. In order to make it user-friendly for their target audience, the authors designed the course around two cases that would typically present to a family doctor's office: a young woman who has physical complaints and then

discloses a history of childhood sexual abuse; and a military Veteran who presents with complaints of poor sleep.

Clinical Outcomes: The two cases are used to illustrate best practices including: making the diagnosis, principles of trauma-informed care, risk factors for PTSD, common comorbidities, and evidence-based pharmacologic and psychotherapeutic treatment. The course also includes testimonials by several people with lived experience of PTSD, who speak about their experiences receiving care. The course is being accredited by the College of Family Physicians of Canada. Pre- and post-test questions are used to measure learning during the course. Learning outcomes will be presented.

Patient Population: The course is designed as a learning tool for family physicians working in the community. However, information in the course would be applicable to the practice of family medicine within the military setting, and for non-medical mental health clinicians.

Conclusions: With the increased use of technology for continuing education, and geographic challenges for disseminating skills-based clinical teaching, dynamic online learning tools have become increasingly popular. This course illustrates an example of how online education can assist family physicians to increase their knowledge and skills in treating patients with PTSD. Segments of the course will be shown to illustrate its composition and design. Audience participation will be encouraged.

1B02: The CAF's Disease and Injury Surveillance System

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Brief Description: There is an operational requirement to monitor the care being provided early in deployments and also on humanitarian missions. This function is now being provided by a new standalone version of the Disease and Injury Surveillance System ("DISS V3").

While CFHIS can meet the requirements for some aspects of deployment health surveillance: (1) it requires DWAN connectivity, which can take multiple weeks to establish; (2) it cannot capture non-CAF member data, which is a severe shortcoming in humanitarian mission settings (e.g. DART) where the majority of patients are not CAF members (i.e. foreign nationals).

The DISS V3 standalone interface is stored on a ruggedized laptop. The interface is identical to the DWAN-based interface, but because it does not require any connectivity, it is capable of capturing health information from day 1 of any mission. Once DWAN connectivity is established, data can routinely be exported and sent to DFHP Epidemiology Ottawa for analysis and dissemination.

The DISS V3 standalone interface is currently being tested as part of the Exercise "MAPLE ORZEL" as well as other NATO Reassurance measures to promote Euro-Atlantic security and stability.

Clinical Outcomes: As the operation of the DISS V3 during MAPLE ORZEL and the NATO Reassurance mission is a testing exercise, the primary outcome of interest is the identification and resolution of any outstanding program bugs that may compromise the system's usability. Secondary, and more long-term outcomes, include: (1) Improved data quality/diagnostic accuracy at point of medical contact, while on deployment (by using ICD-10 coding) to provide situational awareness to headquarters; (2) Improved ease of reporting to other entities (MedSitRep, EPINATO); (3) Early identification of any aberrant health patterns (including outbreaks) while on deployment; (4) Collecting complete clinical data that can be used to help in future operational health services planning.

Patient Population: This system is geared to serving CAF members, but is also used to record visit information, including diagnosis and disposition, for non-CAF military and foreign nationals receiving medical care from CAF Health Services personnel.

Conclusions: The CAF DISS V3 standalone will allow for improved health monitoring and response while on deployment in areas with low connectivity and will provide decision-makers with accurate and standardized medical intelligence with which to optimally plan future missions and deployments.

1B03: Near Term Solution to Address Aircrew Neck Pain

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Introduction: Aircrew neck pain poses a substantial challenge to the Canadian Armed Forces (CAF). Preliminary data from a recent study conducted by Defense Research and Development Canada indicates that nearly 60% of CAF Griffon aircrew report neck pain; where nearly 100 aircrew members have been grounded or benched as a result of neck pain. The purpose of this project was to develop and evaluate a near-term solution to help address aircrew neck pain.

Methods: The project is being completed in two stages; development (completed) and evaluation (underway). The objective of the development stage was to understand the root-cause of neck pain, and design and produce a prototype device to alleviate it in the near term. The design process was initiated by gathering information and feedback from aircrew to determine their general operations, requirements, and user needs. These data were combined with knowledge in the literature, and basic biomechanical analysis to synthesize functional design requirements. Using these requirements the team brainstormed design concepts, and then split into two groups to design specific elements. The team reintegrated solutions into a common prototype for evaluation. In the evaluation stage, twelve participants are completing vigilance and endurance tasks in two different postures (seated-pilot, and prone- flight engineer), while in each of three different head/helmet system configurations.

Participants will be tested while wearing: a standard helmet and simulated NVGs; a standard helmet, simulated NVGs and applying the existing counter-measure; and standard helmet, simulated NVGs and the new prototype counter-measure. The vigilance test will require participants to complete a visual inspection of a wide area, requiring them to move through a typical range of neck postures. Speed and accuracy of gaze will be measured. The endurance test will require participants to sustain select postures until volitional fatigue, where time to fatigue will be measured. Participants will also be asked to provide feedback in the form of perceived exertion, measured using a Borg CR-10 scale.

Results: The research team has completed the design of a near term engineering based solution. Illustrations of the prototype will be provided during the presentation; however, the current patent filing process does not permits us to share images at this time.

Conclusions: This project has resulted in the development of a near term engineering based solution to help address aircrew neck strain. Results from the evaluation portion of the study will demonstrate the potential effectiveness of this new countermeasure approach.

1B04: Standardized Assessment of Static Neck Strength Capacity for Representative In-flight Head Postures of CAF Helicopter Aircrew

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Introduction: The capacity of the human neck to generate static moments of force is key in maintaining the stability of the cervical spine (c-spine) under various conditions of dynamic external load application. Compared to the lower c-spine (T_1), the upper c-spine (C_0-C_1) has a decreased capacity to generate moments, and is therefore more susceptible to injury, as forces that exceed this maximal capacity will be borne by passive tissues (ligaments and vertebrae). Deviations in head posture from neutral will modify the balance of muscle moments, increasing the risk of upper c-spine injury.

The aim of this study was to quantify the effects of seven postures, typically held by helicopter aircrew during in-flight, on the static strength capacity of the upper and lower c-spine of Canadian Armed Forces (CAF) helicopter aircrew.

Methods: Seven postures were identified by measuring head-neck-torso angles, relative to self-selected neutral, of a CAF helicopter pilot seated in a Bell-412 helicopter:

1) Left 20˚ rotation, 20˚ flexion, 2) 0˚ rotation, 0˚ flexion; 3 and 4) left and right 45˚ rotation, respectively, 0˚ flexion; 5) left 45˚ rotation, 20˚ flexion; 6) 0˚ rotation, 10˚ extension; 7) right 45˚ rotation, 10˚ extension.

Two male CAF CH-146 helicopter pilots (36 and 49 years old) performed one maximal voluntary isometric muscle effort (MVIE) in the seven head-on-neck postures. MVIEs were measured using a custom-modified Multi-Cervical Unit

(2048Hz; BTE Technologies). Absolute peak external force (N) was measured using a thin-beam strain gauge load cell. Anatomical landmarks were digitized to establish reference points at C_0-C_1 and T_1 (30Hz; Optotrak). Resultant peak moments (M_{peak}, Nm) were calculated as the cross product of the external force and the distance from the load cell to the anatomical reference points.

Results: Normalized T_1 M_{peak} relative to neutral (posture 2) was 0.85, 1.00, 0.87, 0.92, 0.53, 0.63, and 0.40 (postures 1-7, respectively). Magnitude of M_{peak} generated at C_0-C_1 was 41% compared to T_1. Head postures 3 and 5 elicited differential C_0-C_1 vs. T_1 M_{peak} ratios of 47% vs. 34% and 44% vs. 26% (pilot 1 vs. 2, respectively).

Conclusions: Head postures that combine sagittal head flexion or extension with axial rotation decrease the moment-generating capacity and increase the vulnerability of the upper c-spine to injury. Static neck strength assessment in representative in-flight postures may help to identify pilots who may be at risk of developing flight-related neck pain, and identify postures that may increase the risk of injury.

1D03: Hair Follicle: A New Diagnostic Tool for Traumatic Brain Injury

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Introduction: Traumatic brain injury (TBI) is a generalized term that describes brain injuries caused by mechanical impact to the cranium. With the wide adoption of explosive-dependent weaponry, blast-induced neurotrauma (BINT)-induced TBI has become a significant medical issue for military personnel. Given the accessibility issues with the traditional biomarker systems such as blood and brain, a robust and more accessible one is in demand for effective TBI research and diagnosis. Here we hypothesize that the mammalian hair follicles house well-established molecular signatures for TBI. The present study thus explores the potential of mammalian hair follicle as a biomarker and pathology study system by investigating gene expression profile in rat hair follicle after exposure to traumatic conditions.

Methods: The prolonged effect post initial trauma often leads to damages on a cellular and/or subcellular level, triggering profound consequences (or secondary injury). Secondary injuries are driven by gene expressions that are involved in signal transduction and the corresponding downstream cellular events. Therefore, high throughput gene expression screening is a desirable approach of investigating such molecular complexity and the potential biomarker, as proven by previous studies. Thus present study utilized microarray and multiple bioinformatics analyses as the main methodology.

An Advanced Blast Simulator (ABS) was developed to generate shock waves simulating traumatic conditions on brains of rats (8 in total). Microarray analysis was performed on hair follicles to identify the gene expression profiles responsive shock waves. Gene ontology term enrichment, gene set enrichment analysis (GSEA) and sub-network enrichment analysis (SNEA) were used to investigate molecular complexity of simulated blast responses.

Results: A variety of TBI sensitive biological pathways were enriched in rat hair follicles when experiencing shock wave generated by a helium-driven advanced blast simulator. In fact, most of the blast pathways observed in rat hair follicles have been proposed in brain or blood upon TBI. Enrichment analyses showed that genes with altered expression levels were involved in signal transduction including Ca^{2+} transport-dependent signaling, toll-like receptor (TLR) signaling and mitogen activated protein kinase (MAPK) signaling cascades. Genes linked to inflammatory responses and synaptic central nervous system (CNS) responses were also differentially expressed.

Conclusions: Given that the pathways enriched in rat hair follicles during traumatic conditions have been proposed as TBI responses in brain and blood, our study demonstrated that hair follicle has similar TBI responsive molecular signatures. Therefore, we propose that hair follicle as a potentially viable system for TBI diagnosis.

2B01: Comparing the Effect of Normal Saline (NS) and Lactate Ringers (LR) with Erythropoietin (EPO) on Microcirculation Perfusion, Tissue Bioenergetics and Gut Integrity of the Small Intestine in a Rat Model of Hemorrhagic Shock and Resuscitation (HS/R)

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Introduction: EPO has acute hemodynamic and anti-inflammatory effects in addition to its erythropoietic action. We tested the hypothesis that EPO given at the time of resuscitation with NS or LR will improve capillary perfusion, oxygenation and gut integrity in a HS/R rat model.

Methods: The muscular layer of ileum of anesthetized rats was prepared for intravital microscopy. The rats were hemorrhaged 30ml/kg over 10 min via arterial catheter and uncontrolled mean arterial blood pressure for 50 minutes, then randomized to one of 4 resuscitation groups (n=6/group): NS, NS+EPO, LR, and LR+EPO. Intravenous EPO (1,000U/Kg) was given at the start of 3 times the volume of shed blood NS or RL. Baseline, end of shock and end of resuscitation images of capillary perfusion, RBC flow scores and NADH fluorescence were recorded for analysis. Gut integrity and bacteria translocation were measured at the end of HS/R.

Results: After shock, all groups had decreased perfused capillary density and increase NADH fluorescence. Post resuscitation all groups had a higher perfused capillary

density and RBC flow scores with improved tissue bioenergetics. Compared within the same group with or without EPO only the NS vs. NS+EPO were significantly different with all three end-points: (a) Perfused capillary density (NS+EPO vs. NS, 22.9±0.6 Cap/mm vs. 20.2±1.0 Cap/mm, P<0.01; LR+EPO vs. LR, 23.1±0.3 Cap/mm vs. 22.0±0.7 Cap/mm, P>0.05); (b) RBC Flow Scores (NS+EPO vs. NS, 2.1±0.2 vs. 1.3±0.2, P<0.01; LR+EPO vs. LR, 2.0±0.1 vs. 1.7±0.1, P>0.05) (c) NADH Florescence (NS+EPO vs. NS, 54.5±0.3 FU vs. 59.7±0.8 FU, P<0.01; LR+EPO vs. LR, 57.7±1.1 FU vs. 58.3±0.7 FU).

Similarly, only the NS vs. NS+EPO resuscitated groups had a significant improvement in gut permeability to 4,000 kD FITC-conjugated dextran (FD-4) and portal vein endotoxin level as compared to LR vs. LR+EPO: (a) FD-4 (NS+EPO vs. NS, 1.35±0.23μ/ml vs. 2.58±0.48μh/ml. P<0.05; LR+EPO vs. LR, 1.31±0.29 vs. 1.24±0.20, P>0.05) (b) Endotoxin level (NS+EPO vs. NS, 0.00±0.00 vs. 0.475±0.26 ρg/ml, P<0.05; LR+EPO vs. LR, 0.00±0.00 vs. 0.28±0.23 ρg/ml, P>0.05)

Conclusions: In this acute HS/R rat model, only the NS+EPO group have the most significant improvement in microcirculatory flow, tissue bioenergetics and gut integrity as compared to NS resuscitated group. The effect of LR+EPO was not significantly different with LR only resuscitation group. This observation suggests LR can be used as a stand-alone for acute fluid resuscitation without the addition to EPO.

2B02: Discovery of CpaA: A New Protease from *Acinetobacter Baumannii* that Deregulates Human Blood Coagulation

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Introduction: *Acinetobacter baumannii (A. baumannii)* is a leading cause of infection of Canadian soldiers in war zones and displays high antibiotic resistance. *A. baumannii* causes blood, lung, urinary tract, and soft tissue infections. Mechanisms of antimicrobial resistance in *A. baumannii* remain well studied but little is known about secreted virulence factors that contribute to infection. Coagulation stops blood loss upon injury and generates a fibrin barrier that limits pathogen spread and transmission. This is the first research to examine secreted factors from *A. baumannii* on coagulation as a virulence mechanism. This research describes the discovery of CpaA (coagulation targeting metallo-endopeptidase of *Acinetobacter baumannii*): a previously uncharacterized secreted zinc-dependent protease that impacts coagulation.

Methods: Sixteen *A. baumannii* clinical isolates from Canadian Hospitals were assessed for their ability to impact coagulation. Cell-free secretions of eleven of sixteen isolates impacted coagulation and a secreted protein of Mr 60kDa from each strain was confirmed by SDS-PAGE. The purified protein was sequenced by mass spectrometry and used 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 purified bovine fibrinogen.

Results: A secreted 64.3kDa zinc-binding metallopeptidase was purified from the medium of a clinical isolate of *A. baumannii*. CpaA had a conserved active site xxHExxHxxGxxH with 77% identity with snake venom reprolysin M12B peptidases and human pappalysin-1. The CpaA gene was present in twelve of sixteen *A. baumannii* clinical isolates. Cell-free secretions and purified CpaA added to human plasma shortened PT times (p<0.05) but increased aPTT times (p<0.001). Purified CpaA inactivated FV in human plasma and cleavage of FV from 330kDa to 150kDa was confirmed by immunoblotting. Purified CpaA cleaved the Aα chain of bovine fibrinogen.

Conclusions: This research outlines the discovery of CpaA: a new zinc-dependent protease secreted from *A.baumannii* that inhibits the common and contact activation pathways and activates the tissue factor pathway. The CpaA gene was highly prevalent in the clinical isolates tested. Purified CpaA cleaved and inactivated FV in plasma and hydrolyzed the Aα chain of bovine fibrinogen but it is unclear if other coagulation factors are affected. CpaA is the first protease described from *A. baumannii* which targets and interacts with coagulation but it remains unknown if coagulation factor modification drives infection. Knowledge of *A. baumannii* virulence factors will lead to novel diagnostics, treatments, drugs, and vaccines to improve outcomes of Canadian soldiers in war zones.

2B03: Transfected Mesenchymal Cells as a Prophylactic Biomedical Countermeasure to Venezuelan Equine Encephalitis Virus Exposure

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Introduction: Direct administration of neutralizing antibodies is an effective, but short-lived, approach for immediate protection against a biological threat. This study is the first demonstration of extended, single-dose passive immunity using mesenchymal stromal cell (MSC)-mediated gene therapy. Venezuelan equine encephalitis virus (VEEV) affects humans and equines, and is an effective bio-warfare agent when aerosolized. No licensed vaccine or antiviral currently exists to combat VEEV infection in humans. We previously developed a humanized, VEEV-neutralizing antibody (anti-VEEV) that fully protects mice when administered within 24 hours of lethal exposure to VEEV. To expand the protective window of this antibody, we examined whether human MSCs, engineered with a transgene encoding the VEEV-neutralizing antibody, could provide a renewable source of antibody protection *in vivo*.

Methods: Human umbilical cord perivascular cells (HUCPVCs) were used as the MSC source. A recombinant adenovirus encoding anti-VEEV facilitated high-efficiency gene transfer to HUCPVCs. Functional ELISAs, using live VEEV antigen, were used to generate *in vitro* and serological profiles of anti-VEEV expression. Modified HUCPVCs or purified anti-VEEV were administered intramuscularly to athymic mice. Pre-treated mice were challenged by intranasal exposure to the highly virulent VEEV strain Trinidad donkey. Clinical signs of infection were scored blind.

Results: *In vitro*, modified HUCPVCs secreted therapeutically relevant quantities of anti-VEEV antibody. Within 24 hours, mice receiving an intra-muscular dose of 2.5 million modified HUCPVCs exceeded serum titers of mice receiving a protective dose of purified anti-VEEV. The anti-VEEV antibody has a half-life of 3.7 days in mice, limiting protection to 2 or 3 days after administration. In contrast, transplanted HUCPVCs continuously increased serum titers up to day 10, when the purified antibody was depleted, and extended putative protective titers until at least day 21. At 109 days post-transplant, 10% of mice still had circulating anti-VEEV antibody. *In vivo* optical imaging confirmed survival of bioluminescent HUCPVCs 123 days after intra-muscular administration. Strikingly, a single dose of HUCPVCs modified with the anti-VEEV transgene conferred both rapid and prolonged immune protection against VEEV. Pre-treating mice with modified HUCPVCs 24 hours or 10 days before infection protected against 20 times the lethal dose of VEEV, but such pre-treatment with the purified antibody was ineffective.

Conclusions: This study identifies the HUCPVC gene therapy system as a novel platform technology for immediate and sustained passive immunity against a known bio-threat. Such HUCPVC-mediated gene therapy could provide a broad-spectrum solution for stealth delivery of countermeasures for both military and civilian deployment.

2B04: Development of a Monoclonal Antibody Cocktail (ZMapp) Against Ebola Virus Infection

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Introduction: Ebola virus (EBOV) causes severe hemorrhagic fever in humans and non-human primates (NHPs) with no treatments commercially available. A panel of 8 murine monoclonal antibodies (mAbs) against EBOV GP was previously generated and characterized. All mAbs have been shown to be protective in rodents. More importantly, a cocktail of 3 mAbs (1H3, 2G4 and 4G7, "ZMAb") rescues NHPs when delivered 24 or 48 hours after lethal challenge. To facilitate clinical acceptance, the mAbs comprising ZMAb have been chimerized (cZMAb) with human constant regions, and expressed in the Nicotiana benthamiana-based Rapid Antibody Manufacturing Platform (RAMP). The protective efficacy of cZMAb will be investigated and new optimized cocktail will be identified by combining cZMAb and MB-003 (mAb cocktail comprising c13C6, c6D8 and c13F6, manufactured via RAMP, which protects NHPs; Mapp/USMARIID).

Methods: Protective efficacy of these chimerized mAbs was evaluated in mouse, guinea pig and NHP models against lethal EBOV challenge. Survival, clinical parameters (temperature, CBC counts, blood biochemistry), viremia and immune response will be monitored.

Results: Evaluation of protective efficacy of the chimerized ZMAb (cZMAb) in mice demonstrated that cZMAb is as effective as ZMAb. To explore whether the efficacy of cZMAb can be further improved, combinations of the individual cZMAb antibodies and the mAbs comprising MB-003 were tested in guinea pigs and two optimized cocktails were identified. In rhesus macaques, 100% protection (6 of 6) was observed with one cocktail (c13C6, c2G4, 4G7) and 83% protection with the other (c13C6, c1H3, 4G7) when dosing (50 mg/kg total mAb) was initiated 72 hours after a highly lethal EBOV challenge (4000 $TCID_{50}$). In the group with 100% survival, only one NHP showed signs of sickness at 8 dpi and recovered after the third and final dose at 9 dpi. This animal's viremia reached 1.4×10^5 GEQ/ml. No escape mutants were detected in the dead animal. Most of the NHPs had detectable viremia 3 dpi, the first day of mAb treatment, suggesting that this cocktail may be effective as a therapeutic as opposed to a post-exposure prophylactic.

Conclusions: These results are very promising and NHP experiments with initiation of treatment at later time points (4, 5 dpi) are ongoing with the optimized (c13C6, c2G4, and c4G7, "ZMapp") cocktail.

2B05: Efficacy of a Broad-spectrum Drug (DEF201) Against Ebola, Marburg and Lassa Virus Infections in Mice and Guinea Pigs

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Introduction: Recombinant human adenovirus serotype 5 expressing interferon-alpha (DEF201) has previously been developed for use as a broad-spectrum drug, primarily against viral pathogens. A single intranasal (IN) admin-istration of DEF201 has previously been shown to confer protection against Severe acute respiratory syndrome, Pox vaccinia virus, Yellow fever virus, Pichinde virus, Rift valley fever virus, Western equine encephalitis virus, Venezuelan equine encephalitis virus, and Punta Toro virus. Additionally, DEF201 has recently been shown to demonstrate efficacy against Streptococcus pneumoniae infections in mice, high-lighting its utility as a promising prophylactic and therapeutic candidate against a wide range of pathogens. The present study aims to expand the utility of DEF201 to Ebola virus (EBOV), Marburg virus (MARV), strain Angola, in addition to Lassa virus (LASV), strain Josiah, an old world arenavirus.

Methods: The protective efficacy of DEF201 against EBOV, MARV and LASV challenge was evaluated in the mice and guinea pig models. Survival and weight change will be monitored.

Results: In the EBOV studies, mice were each treated with 1 x 10^7 infectious particles (IFU) of DEF201 either intramuscularly (IM) or IN, 30 minutes after a uniformly lethal challenge. Complete protection was observed without observable clinical symptoms or weight loss. Guinea pigs were each administered 2 x 10^8 IFU DEF201 IM, at 24 hours after challenge. While survival was not observed, the mean time to death (MTD) was significantly extended in the DEF201 (MTD: 10.33±1.03 days) compared to mock treated animals (MTD: 7.17±0.75 days, p=0.0008). For MARV and LASV studies, mouse or guinea pig-adapted virus variants that are lethal to their respective animal models were previously developed in our laboratory. Mice were each treated with 1 x 10^7 IFU of DEF201 IM or IN, at 30 minutes before or after a uniformly lethal challenge. Guinea pigs were each administered 2 x 10^8 IFU DEF201 IM, at 24 hours before or after challenge. Survival, weight change and clinical signs were monitored for 28 days after infection, and data will be presented.

Conclusions: These results indicate DEF201 is effective against filovirus and arenavirus infection in rodents. Further studies will be needed to assess the protective efficacy of DEF201 in nonhuman primates.

3D03: Athena: A Big Data Platform for Real-time Stimulation and Response Monitoring and its Application to Tactical Training

McGregor, C., PhD[1], Bonnis, B.[2], Stanfield, B., BIT[2], Stanfield, M.[2]

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Introduction: Serious games are being used increasingly for tactical training. Currently, they lack tactile stimulation beyond controller vibration. In addition, physiological monitoring of trainees during that training is limited to disconnected short burst monitoring and is not integrated with the serious game data. We present a Big Data approach for real-time stimulation and response monitoring that integrates serious game data including data from a multi-sensory garment known as ARAIG (As Real As It Gets) together with physiological data in real time. We demonstrate that within the context of tactical training.

Methods: We have created a Big Data platform, known as Athena, for real-time stimulation and response monitoring. Data relating to cues provided to trainees from the serious game together with the trainees' interaction within the serious game are acquired and processed in real-time. In addition, various physiological data streams such as heart rate, respiration rate and blood oxygen are acquired and integrated with the serious game integration to support advanced analytics on the trainees' experience. The Athena platform extends McGregor's prior work where she created

the Artemis platform which is a Big Data platform for concurrent multi-patient and multi-stream temporal analysis in real time for prospective clinical management and retrospective clinical research. Clinical research studies are demonstrating the potential of Artemis for earlier condition onset detection and advanced real-time complex event classification.

Results: Our initial results will demonstrate the capacity of the Athena platform to process the data at the rate at which it has been generated for both data relating to game interactions and the physiological data. We will further demonstrate early work on analytic models reporting on the trainees' experience using such techniques as heart rate variability analysis and respiration analytics.

Conclusions: Big data techniques have been demonstrated to be a positively disruptive innovation force within critical care enabling earlier onset detection of various conditions and advanced event classification for other conditions. Applying Big Data techniques to improve the analytics of the trainees experience together with advanced tactile and audio stimulation to improve the immersive experience for the trainee has the potential to significantly change the face of tactical training. These new approaches to training also have the potential to create new advanced analytics to detect physiological changes that may provide information of the stress impact of the training activity on the trainee and also the risks for the onset of conditions such as post-traumatic stress disorder (PTSD).

4E04: Canine Assisted Interventions and PTSD among Canadian Veterans

Gillett, J., PhD

McMaster University

Introduction: Psychiatric service dogs (PSDs) and emotional support dogs are being used increasingly in managing the mental health challenges of living with post-traumatic stress disorder among Veterans. However, the evidence of effectiveness of service dogs in treating mental and emotional health is less definitive. This presentation assesses current research on the effectiveness of psychiatric service dogs as a health care intervention for military Veterans experiencing post-traumatic stress disorder (PTSD). While the main area of concentration is studies of psychiatric service dogs, and Veterans and PTSD, the analysis examines evidence within the broader research context of animal assisted therapy (AAT) and mental health and well-being broadly. The strength of relevant research concerning PSDs, Veterans, and PTSD, is outlined directing potential future studies in this area in Canada.

Methods: Methods used for this literature review included searching pertinent databases including Google Scholar, PubMed, PyschMed, Web of Knowledge, and the Social Science Citation Index. For the initial search, terms were limited specifically to psychiatric service dogs, Veterans and posttraumatic stress disorders. A wide search was conducted on a broader range of terms at the intersection of mental

health, animal assisted therapy, Veterans and the military. Scholarly works that address psychiatric service dogs, Veterans and post-traumatic stress disorder specifically are the main focus of the analysis. A wide range of documents was considered including peer-reviewed articles and books, abstracts, government documents, and dissertations.

Results: The analysis identifies and analyzes in-depth several emergent and salient themes in research on PSD and PTSD among Veterans. The themes are: Benefits (biomedical; psychological; emotional/mental; social); Safety Concerns; Cost Effectiveness; PSD as a Treatment; Training, Placement and Regulation; and Challenges. With the limited research on this specific topic, each theme there is reference to broader literature on AAT and mental health that attends to effectiveness, broadly defined.

Conclusions: The most prevalant theme across the research in this area is the need for more empirical evidence with regards to canine interventions with Veterans living with PTSD. Potential areas for future research include studies of effectiveness, international comparative analysis, and analysis of the training and placement of PSD and emotional support dogs in Canada.

5E01: Canadian Armed Forces Decontamination and Treatment of CBRN Casualties

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Canadian Forces Health Services Group

Brief Description: Chemical, biological, radiological and nuclear (CBRN) agents are a threat to Canadians and to the Canadian Armed Forces (CAF). State actors could potentially target CAF Operations, and non-state actors could target Canadians at home and abroad. In addition to the commonly listed CBR agents, Chemical Agents of Opportunity for Terrorism (CAOT) including toxic industrial chemicals (TICs) and materials (TIMs) are a threat. CAOTs are produced and transported in large quantities within Canada.

The purpose of this presentation and discussion is to introduce concepts and methods of Health Service Support to CAF Operations in a CBR threat environment, including decontamination, diagnostics, medical prophylaxis and treatments, and specific medical countermeasures (Med CM). This will give a perspective on the CAF requirements and challenges associated with Med CM.

This session will not provide an intelligence assessment of the CBRN threat, or discuss CBRN agents in depth.

Clinical Outcomes: The outcome measures are reduced morbidity and mortality and maintenance of operational effectiveness. However, in the absence of CBRN incidents the outcomes are measured using surrogates during training exercises. These include through-put rate and effectiveness of decontamination, and administration of medical countermeasures within the treatment window.

Patient Population: Primary population - serving Canadian Armed Forces personnel.

Ssecondary population - civilian poplution in situations where the CAF is providing support during emergencies to other Canadian and/or International government agencies.

Conclusions: Development and maintenance of CAF capabilities to combat known and unknown CBRN threats is achieved through medical countermeasure reasearch and development. Engaging the larger CBRN research community, including academia, provides opportunity to highlight research and development opportunities to improve CAF CBRN response capabilities.

5E02: Pre-symptomatic Screening for Identification of Diagnostic Host-response Biomarkers of Infection

Christopher, M., PhD, Bader, D., MSc, Chan, N., PhD, Fisher, G., BSc, Hayward, S., PhD, McLaws, L., MLT, Schnell, G., RLAT

Defence Research Development Canada

Introduction: The first indication of an asymmetric threat event may be when the index case(s) succumb(s) to the threat, thus emphasizing the importance of recognition, diagnosis and treatment. The Innate Immune System is the first line of defence against a variety of challenges, including infection by pathogens, initiating a cascade of signaling events within the body prior to the onset of symptoms. DRDC Suffield Research Centre is probing this early host defence response to determine whether it could be utilized for presumptive identification of an exposure/infection event, since earlier diagnosis can result in earlier treatment initiation, thus potentially improving clinical outcomes.

Methods: Two human surrogate systems, mice and human peripheral blood mononuclear cells (PBMCs), were infected *in vivo* and *in vitro*, respectively, with *B. anthracis* Sterne, *F. tularensis* Live Vaccine Strain and influenza A virus. Samples were collected at various time points early in infection, prior to symptom development, and subjected to microarray, cytokine and agent analyses (culture, PCR). For mouse studies, exposure via the inhalation route was used to mimic the most likely route of infection for humans. Blood samples were analyzed since the long term goal is to develop rapid tests for specific host response biomarkers.

Results: Microarray analysis identified a number of genes that were up-regulated by each agent, in mice and in human PBMCs, indicating mRNAs that have increased transcription rates and/or increased stability following infection. Comparison of microarray results from human and mouse demonstrated that there was some overlap between up-regulated genes in both study systems. Although, *in vitro* PBMC studies do not reflect a system-wide response, they have potential value for narrowing down the selection of genes for futher study in mouse models as they may be reflective of what may happen in humans *in vivo*.

Conclusions: These studies provide knowledge about host responses that could be exploited in the future for determining new assay targets which could indicate early exposure to biological agents, potentially increasing survivability due to an expanded treatment window resulting from earlier diagnosis. The focus of future studies will be on

evaluating the identified host-derived disease responsive targets detectable in both animal models and humans, for potential usefulness as diagnostic biomarkers. Sensitivity (simulants) and specificity (other infectious agents) studies will be conducted to determine the usefulness of the biomarkers identified to date, and to determine whether collaboration with industrial partners should be pursued.

5E03: Development and Evaluation of an Intravenous Medical Countermeasure for the Treatment of Nerve Agent Exposure

Mikler J. R., PhD, Stewart C., MSc, Bohnert, S. MSc, Weatherby, K., Hill, I., MD, Vair, C., MSc

Defence Research and Development Canada

Introduction: The threat of chemical weapons and in particular organophosphorous nerve agents continues to be a concern for Canadian Military Personnel and civilians. Canada is among the world leaders in the development of the most effective medical and non-medical counter-measures as evident by the development of Reactive Skin Decontaminant Lotion (RSDL) and the wet-dry HI-6 dimethanesulphonate/atropine sulfate autoinjector. However low volatility nerve agents (LVA) such as VX present a unique toxicological problem as the exposure of LVA on the skin can be effectively absorbed into the layers of the skin creating a slow release depot. The immediate use of RSDL can effectively prevent any absorption of LVA and therefore prevent any further toxicity however due to the extremely potent toxicity of nerve agents only a few microliters of LVA need to be absorbed by the skin to result in lethality and therefore may not be readily detected.

Methods: To effectively treat casualties, antidotes HI-6 and atropine will have to be administered for hours and possibly days to counteract the slow release of LVA from skin depots. Currently for pesticide poisonings which present a similar long term toxic exposure, intravenous pralidoxime and atropine are utilized. However there are no intravenous forms of HI-6 for similar treatment of casualties dermally exposed to LVA. DRDC Suffield, CAF Operational Medicine and international and national partners conducted a series of studies to evaluate the effectives of an intravenous HI-6 formulation. Pharmacokinetic analysis was carried out in suitable animal models along with an optimal therapeutic dose study.

Results: These efforts lead to a technical demonstration of intravenous HI-6 being utilized in a model of topical VX exposure where civilian and CAF medical teams initiated and maintained therapy of the casualties. In addition to treatment being solely based upon observable clinical symptoms a newly developed cholinesterase monitor was utilized to provide real-time analysis of blood cholinesterase activity. Cholinesterase activity provided significant insight into the level of LVA circulatory absorption, effectiveness of the therapy and requirement for additional HI-6 therapy.

Conclusions: The results of these studies support the requirement for prolonged and optimized HI-6 therapy for treatment of nerve agent exposure.

5E04: Development of Broad-spectrum Medical Countermeasures Against Viral Biothreats

Wu, J., PhD, Wong, J., MS, Nagata, L., PhD

Defence Research and Development of Canada

Introduction: The rise in number of emerging and re-emerging viral pathogens, such as highly pathogenic avian influenza virus, Middle East Respiratory Syndrome coronavirus, and viral hemorrhagic fever viruses, makes one-drug-one-bug approach for development of medical countermeasures inadequate to protect Canadian Armed Forces from viral biothreats. This underscores importance of developing drugs with broad-spectrum activities against several classes of viruses. This approach could significantly reduce the cost of drug development and simplify treatment protocols.

Methods: In this presentation, we will report three approaches we used to develop broad-spectrum antiviral drugs. The first is to mimic host innate immune response, in which numerous antiviral proteins are produced to provide immediate, broad spectrum responses against viral infection. The second approach is to mitigate cytokine storm with novel therapeutics. Cytokine storm, caused by many deadly viral agents, is characterized by high and uncontrolled overproduction of pro-inflammatory cytokines, leading to severe pathological conditions. Cytokine storm is one of the primary causes of high case fatality rates associated with viral infections. Treating cytokine storm with novel therapeutics is one of the key cornerstones which can dramatically reduce mortality and improve clinical outcomes. The third approach we are using for developing broad-spectrum antivirals is blocking common pathways used by many viruses for pathogenesis.

Results: We completed proof-of-concept study on interferon alpha, a major antiviral protein produced during host innate immune response, as a candidate for broad spectrum antiviral. We tested interferon alpha for post-exposure protection using western equine encephalitis virus as a model pathogen. Ongoing efforts are directed at developing and evaluating a panel of cytokine storm-targeting drug candidates for their efficacy against dengue, Ebola and avian influenza viruses. These drugs are highly effective weapons for treating cytokine storm and can be broadly efficacious in improving therapeutic outcomes against hemorrhagic fevers and pandemic respiratory viruses. In collaboration with University of Alberta, we are testing a new class of viral inhibitors which block the common infection process used by many viral agents such as hemorrhagic fever viruses, encephalitic viruses, influenza virus, and pox virus.

Conclusions: Our presentation will demonstrate the feasibility of developing broad spectrum antivirals as a tactical medical countermeasures for Canadian Armed Forces.

6E01: OSI Connect: One Year Later

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Royal Ottawa Operational Stress Injury Clinic

Brief Description: OSI Connect is a mobile application that was initially conceptualized to act as a repository of Canadian OSI information that would be easily accessible to Veterans of the OSI Network of clinics. The app quickly evolved into a larger project to inform not only the Veteran population but also family members and community providers, such as family physicians. OSI Connect is available in English and French and was completed in five months and as one client said, OSI Connect can be used by the Veteran who can't leave his basement or by a soldier from a mountain top in Afghanistan.

Clinical Outcomes: As of May 2014, 1500 downloads of OSI Connect have occurred, with minimal advertising. Clients have taken ownership of the app and are creating their own communication strategies to spread the word across the country. New resources have been added, at client's suggestions, and we are considering the addition of more content, such as yoga videos, etc. The app has also garnered interest from a variety of first responders groups who have expressed interest in adapting OSI Connect to meet their specific needs. The most unexpected finding is that OSI Connect has been downloaded internationally in destinations such as Australia, Russia, Dominican Republic and Venezuela. Canada, United States and the United Kingdom are the three leading countries with downloads.

Patient Population: The average age of a client at the Ottawa OSI Clinic is currently 47 and we are seeing younger and more technologically adept clients seeking service. Also, very timely and accessible information can be invaluable to family member when someone they love is struggling with mental health issues. Providing mental health services is no longer feasible within the walls of a defined clinical space, therefore, we must increase our reach in order to effectively communicate our key messages of hope, timeliness of services and the right information at the right time.

Conclusions: Canadian content was limited therefore collaboration with Afterdeployment.org was struck for the purposes of borrowing some content to ensure we met our project timelines. Throughout the development of the app and the Public Service Announcements clients of the OSI Clinic at The Royal were engaged in the process. Other partnerships are highlighted in the Resources tab of the app. OSI Connect has enhanced our capability to reach out to clients in multiple ways and has become much more than the repository for which it was originally envisioned.

Poster Presentations

P147: Pharmacokinetics of the Oxime HI-6 in Non-human Models

Bohnert, S., MSc, Mikler, J. R., PhD, Stewart, C., MSc, Vair, C., MSc, Hill, I., Weatherby, K.

Defence Research and Development Canada

Introduction: Chemical warfare agents including organophosphorus nerve agents (NA) continue to be a significant threat to both military and civilian populations. The current Canadian Armed Forces (CAF) treatment of NA poisoning includes administration of the oxime HI-6 in combination with atropine contained in an autoinjector, with a benzodiazepine also being administered. Although auto-injector administration is an effective treatment for NA poisoning, there is a need for supplementary treatment such as a continuous infusion of HI-6 to help sustain and maintain therapeutic levels of oxime following initial treatment. In the present study, the pharmacokinetics of two HI-6 salts (HI-6 2Cl and HI-6 DMS) is examined in two different non-human models under varying administration conditions to aid in the licensure of HI-6 as a continuous infusion product.

Methods: The present experiment aimed to determine and compare the pharmacokinetic parameters of HI-6 in two animal models (Hartley guinea pigs and domestic swine) under various conditions including: direct comparison of salts (HI-6 2Cl compared to HI-6 DMS), comparison of routes of administration (intramuscular compared to intravenous), comparison of effect of anaesthetic, comparison of different concentrations of HI-6 and determination of the effect of atropine sulphate co-administration. Serial plasma samples were collected and HI-6 levels were quantified using a HPLC method. Calculated pharmacokinetic parameters were used to determine and evaluate an infusion rate of HI-6 to attain a target plasma concentration.

Results: In all studies comparing the pharmacokinetics of HI-6 2Cl and HI-6 DMS directly as well as those examining different doses of each salt a significant difference was reported for absorption parameteres. Intravenous and intramuscular injections of both HI-6 2Cl and HI-6 DMS were similar. A significant difference was reported when comparing adminsitration of HI-6 in an anaesthetized and non-anaesthetized model. Co-adminsitration of HI-6 with atropine sulphate did not have a significant effect on the calculated pharmacokinetics of HI-6.

Conclusions: The calculated pharmacokinetic parameters for both HI-6 2Cl and HI-6 DMS were accurate for the determination of an infusion rate of HI-6 to reach and maintain a target plasma concentration. Pharmacokinetic parameters were found to be similar to reported human clincial trial data. Our findings indicate that both non human models examined in these studies represent viable models for HI-6 pharmacokinetic studies but also for efficacy studies whose results could be translated for human use in the event of nerve agent poisoning requiring sustained treatement.

P148: A Novel Approach to Removing Inhaled Insoluble Radioactive Particles from the Lung

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Introduction: During a radiological or nuclear emergency, emergcy workers, first responders and the public may become contaminated by radionuclides via inhalation. Depending on the emergency scenario, inhaled radiactive particles may or may not be soluble in the lungs. Use of decorporating agents to remove soluble inhaled radioactive particles has been an accepted method of treatment, but efficiency of decorporation needs improvement. Lung lavage, on the other hand, is the currently recommended method for removing insoluble inhaled radioactive particles, but this method is not practical during mass casualty emergencies. This project seeks to test alternative methods for removing insoluble particles from the lung.

Methods: Based on a review of the literature, certain drugs already approved for other indications, have been identified as having the potential to be effective in removing insoluble particles from the lung. These include supertonic saline, pulmonary surfactants, mucolytics and statins.

This project will use animals to test the efficacy of these drugs. Animals will be exposed to a mixture of insoluble radioactive particles, actinide oxides, via inhalation. One group of animals will receive either the currently used decorporating agent, DTPA, or a new decorporating agent, HOPO. Decorporating agents will be encapsulated in polymeric nanoparticles and administered via nose inhalation. The other group of animals will receive the test drugs. The efficacy of the treatments will be assessed by measuring the retention and excretion of radionuclides in controls and treated animals.

Results: It is expecetd that the test drugs will be effective in removing insoluble inhaled radioactive particles from the lungs. This project will generate knowledge that will inform future development of drugs for removing insoluble particles from the lung, and may identify specific drugs that have potential for being re-purposed as decorporating agents. Re-purposing drugs significantly shortens the regulatory pathway and reduces development costs.

Conclusions: Certain drugs have the potential for being re-purposed to remove insoluble inhaled radioactive particles from the lung. Depending on the outcomes generated by this project, a future project may follow to advance development in this area. This project has a timeline of three years, starting April 2014.

P149: Persons Partnered with Assistance Dogs: Implications Arising from Canadian Newspaper Coverage

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[1]University of Calgary; [2]McMaster University

Introduction: The well-known image of a guide dog (e.g., German Shepherd or Labrador Retriever with a U-shaped harness) does not represent the diversity of assistance dog breeds. Unfamiliarity with this diversity can result in stigmatization for persons partnered with assistance dogs. This tension is not eased by the inconsistent standards within dog training organizations. Furthermore, accessibility laws and the terminology used to describe assistance dogs vary between provinces in Canada, which creates further confusion for people partnered with assistance dogs and the general public in understanding their rights. Accordingly, the purpose of this paper is to identify issues of accessibility for persons partnered with assistance dogs as represented in Canadian news media.

Methods: Against this backdrop, we undertook a systematic search and analysis of Canadian English-language newspaper articles. We searched the Proquest database, *Canadian Newsstand Complete*, using the following terms: ("service dog" or "guide dog" or "service animal" or "assistance dog" or "seeing eye dog" or "hearing dog") and "owner*". This strategy returned 597 full-text articles. Of these, 75 were published in the following 9 newspapers: *The Globe and Mail, The National Post, The Montreal Gazette, The Vancouver Sun, The Province, The Calgary Herald, The Toronto Star, The Winnipeg Free Press, The Edmonton Journal*.

Results: Three of the authors independently reviewed this corpus to gain familiarity with the dataset. Through this initial reading, we identified discriminatory practices in privately-owned and public spaces as a barrier to accessibility for persons partnered with assistance dogs. Therefore, we made discriminatory practices the focus of subsequent analyses. More specifically, we catalogued the sector in which discrimination allegedly occurred, and the nature or prohibited grounds for alleged discrimination (e.g., disability for persons partnered with assistance dogs, as compared to cultural/religious freedom for shop-keepers or taxi-drivers who object to the presence of a dog in their midst).

Conclusions: The results from our study suggest that while the health benefits of assistance dogs are increasingly recognized, challenges exist in implementation that will require investment in public awareness and readiness to negotiate contested values. These results could feed into design of community outreach programs and integration of human rights considerations for policies relating to persons partnered with assistance dogs. Our research also highlights a need for further research on assistance dog partnerships, particularly in community settings.

P150: Working to Protect our Forces: Developing a Medical Countermeasure for Ricin Exposure

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Introduction: Ricin is a high consequence biological threat agent that is a relevant threat to both the armed forces and civilian populations and there have been numerous incidents of both planned conventional warfare use and of terrorist usage. Symptoms of ricin poisoning are non-specific and "flu-like" but severe cases can result in respiratory distress or organ failure and it can cause death within 1.5 to 3 days

following exposure. As there are currently no approved vaccines or therapeutics for ricin intoxication, medical management is highly reliant on aggressive supportive care which will undoubtedly present a high clinical, logistical, and economic burden should there be a mass casualty exposure. Defence Research and Development Canada – Suffield Research Centre sought to fill this capability gap by developing an anti-ricin therapeutic.

Methods: Anti-ricin specific antibodies were developed and modifications were made to produce an anti-ricin antibody that is >95% human. This antibody has been characterized by a number of analytical methods for affinity, specificity, etc. and was tested in an *in vitro* assay for ricin neutralizing properties. This antibody has also been analyzed for its ability to combat ricin poisoning in *in vivo* small animals studies when given prior to or following ricin challenge.

Results: This humanized anti-ricin monoclonal antibody (hD9) binds tightly to ricin and is effective both as a pre-exposure therapy and as a post-exposure treatment for ricin intoxication in an *in vivo* small animal model. This anti-ricin antibody requires a lower dose and has an expanded treatment window compared to published antibody anti-ricin therapies.

Conclusions: Defence Research and Development Canada – Suffield Research Centre is now working diligently with its national and international partners to complete the manufacturing, and safety and efficacy data regulatory requirements to be able to gain approval from Health Canada for the use of this antibody as a medical countermeasure in the event of ricin exposure.

P151: Development of Two Therapeutic Strategies for Direct Inactivation of Organophosphorous Nerve Agents *In Vivo*: Antibody and Butyrylcholinesterase-based Bioscavengers

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Introduction: Canada lacks an effective broad-spectrum treatment for 'organophosphorus nerve agent' (NA) exposure. The fielded treatment regimen does not offer complete protection against all NAs, nor against potential novel and emerging threats. Current small molecule therapies (HI-6, atropine and diazepam) must be administered within minutes for maximal efficacy and do not prevent the distribution of NAs into susceptible organs; nor do they inactivate NA toxicity but function to dampen nervous system over-stimulation. Resultantly, although they do increase survival, they do not eliminate the toxic effects. Severe end-organ toxicity including brain damage remain a realistic outcome despite using current treatments. The development of an antidote which specifically binds and sequesters NAs; inhibiting them from reaching their physiologic targets; and provides broad-spectrum protection against all NAs would help to meet Canada's defence and

security need to defeat the CBRNE terrorist threat. DRDC Suffield Research Centre is developing two classes of next generation NA bioscavengers: recombinant antibodies (Abs) and recombinant butyrylcholinesterase (BuChE). Monoclonal Abs are one class of important new therapeutic proteins which represent the most rapidly growing class of human therapeutics. The objective is to develop Abs to a wide range of NAs, providing broad spectrum protection against a range of NAs over conventional treatment options. Furthermore, there is potential for prophylactic use of Abs since their mechanism of action is specific to NAs, eliminating undesirable side effects which occur with conventional prophylactic therapies. To date, development of 'next generation' therapies for treating NA exposure have focused on the use of BuChE, a naturally occurring plasma enzyme which binds to NAs. There is currently no readily available source of BuChE as the cost of production has been prohibitive due to the low production yield compared to high costs. The objective is to develop an economical source of BuChE for NA antidote development.

Methods: Using recombinant DNA technology, nerve agent-specific antibodies are being developed that would specifically bind and neutralize freely circulating nerve agents *in vivo*, preventing them from reaching their physiologic target tissues. The production of recombinant human BuChE in plants is being developed to secure an economical source of the endogenous nerve agent scavenging protein BuChE.

Results: An overview of current progress on both the NA-specific antibody and recombinant BuChE development efforts will be provided.

Conclusions: The development of two different classes of therapies specifically designed to target and inactivate NAs as they circulate throughout the body would significantly improve treatment NA treatment capabilities.

P152: Effectiveness and Safety of Videoconference Psychotherapy for Posttraumatic Stress Disorder (PTSD): A Systematic Review and Meta-analysis

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Introduction: Lifetime incidence of PTSD is estimated to be 7-9% in the general population and as much as 30% among military Veterans. There are effective treatments for PTSD but trained providers tend to be located in urban centres while those who want the treatment may live a significant distance away. Videoconference technology has been identified as a promising means to increase access to treatment. However, many therapists remain concerned about effectiveness and safety of treatment when conducted at-a-distance.

Methods: A systematic review of randomized controlled trials (RCTs) of videoconference psychotherapy for PTSD is being conducted to address questions about symptom

reduction, therapeutic alliance, treatment adherence, treatment completion and frequency of adverse events when compared to in-person treatment. RCTs published in English will be identified by searching the Cochrane Library, PubMed (National Library of Medicine), Embase (Ovid) PsycINFO (ProQuest), PILOTS (ProQuest), EMBASE (Ovid) and CINAHL (EbscoHost) from inception to June 2014. Unpublished trials will be identified by searching World Health Organization and U.S. National Institutes of Health Clinical Trials Registries as well as conference abstracts of the American Telemedicine Association and the International Society for Traumatic Stress Studies for the past three years. Two reviewers will independently review citations and extract data. A detailed protocol for this review has been published on PROSPERO (Registration number: CRD42013005347).

Results: Citation selection will be reported using a PRISMA flow diagram. The internal validity of selected RCTs will be evaluated using the Cochrane Collaboration Risk of Bias tool. A formal meta-analysis will be reported if the extracted data are sufficiently statistically and clinically homogeneous.

Conclusions: Rigorous evidence of the effectiveness and safety of videoconference psychotherapy for PTSD is a required step in the dissemination and adoption of this mode of therapy among trained providers.

6. Transition from Military to Civilian Life

Podium Presentations

1E01: Trends in the Veteran Transition Experience (LASS 2010 and 2013)

Macintosh, S., MA, Van Til, L., MSc, Thompson, J., MD, MacLean, M. B., MA, Pedlar, D., PhD

Veterans Affairs Canada

Introduction: "Life After Service Studies" (LASS) program of research is designed to help us better understand the transition from military to civilian life and ultimately improve the health of Veterans in Canada. LASS 2013 builds on the earlier studies from 2010: the survey of health and well-being, and the record linkage for pre- and post-release income trends.

This presentation will share findings from both the 2010 and 2013 studies and discuss trends in the Regular Force Veteran's transition experience.

Methods: For the income studies, Statistics Canada linked together DND records to the general family tax records. For the 2010 study, records were linked for Regular Force Veterans who released from 1998 to 2007; for the 2013 study, records were linked for Regular Force Veterans who released from 1998 to 2011. The 2011 survey sampled Regular Force Veterans released in 1998 to 2007, while the 2013 survey sampled Regular Force Veterans released in 1998 to 2012.

Results: In both surveys, most were adjusting well to civilian life. High rates of adjustment are consistent with the findings that Veterans are less likely to report low income than other Canadians. Similar to the 2010 findings, the 2013 survey found that Regular Force Veterans had higher rates of chronic health conditions than other Canadians, but were less likely to have a sense of community belonging than other Canadians. In both studies, the Regular Force Veterans, on average, experienced a decrease in income post release and the rates of ever experiencing low income were similar.

Conclusions: Descriptive findings from both LASS 2010 and 2013 yield valuable insights into the socioeconomics, military characteristics, health, disability and well-being of Regular Force Veterans. This comparison of findings from the two studies will reveal trends in the transition experience for these Veterans.

1E02: Pre and Post-Release Income: 2013 Life After Service Studies

MacLean, M. B., MA[1], Campbell, L., BPR[1], Van Til, L.,MSc[1], Poirier, A.[1], Sweet, J., MSc[1], McKinnon, K.[1], Pedlar, D., PhD[1], Sudom, K., PhD[2], Dursun, S., PhD[2], Herron, M., LCol[2]

[1] Veterans Affairs Canada; [2] Department of National Defence

Introduction: This study is part of the "Life After Service Studies" program of research, studying the income of Veterans who released between 1997 and 2011. This report describes income trends pre- and post- release, for both Regular and Reserve Force Veterans, including receipt of Employment Insurance and Social Assistance and prevalence of low income.

Methods: Statistics Canada linked together DND records for 51,990 Regular Force Veterans released between January 1, 1998 to December 31, 2011 and 18,781 Reserve Force Veterans released between January 1, 2003 and December 31, 2011 to the general family tax records from 1997 to 2011 and produced aggregate tables.

Results: The 2010 Income Study examined family income using Statistics Canada's low income measure (LIM) and described trends and differences in income between sub-populations of Veterans. The study found that although Veterans experience a decline in income after release, VAC programs reach some of the groups with the largest declines. Of the small number of Veterans who experience low income, most are not VAC clients.

The 2013 Pre- and Post-Release Income study conducted a similar examination, but this time for both Regular and Reserve Force Veterans. The results of this latest income research will be presented.

Conclusions: This study includes important information on the trends in income pre and post release, the sources of income, and low income for a large population of Canadian Armed Forces Veterans, including clients and non-clients. It covers four more years of income data for Regular Force Veterans than the 2010 Income Study and also includes Primary Reserves. The overall linkage rate was quite high ensuring a representative population for studying income.

1E03: Reserve Force Veterans and their Transition to Civilian Life (LASS 2013)

Van Til, L. MSc[1], MacLean, M. B., MA[1], Thompson, J., MD[1], Sudom, K., PhD[2], Dursun, S., MA[2], Herron, M., LCol[2], Macintosh, S., MA[1], Campbell, L., BPR[1], Poirier, A.[1], Sweet, J.,MSc[1], McKinnon, K.[1], Pedlar, D., PhD[1]

[1] Veterans Affairs Canada; [2] Department of National Defence

Introduction: "Life After Service Studies" (LASS) program of research is designed to help us better understand the transition from military to civilian life and ultimately improve the health of Veterans in Canada. LASS partners are Veterans Affairs Canada, the Department of National Defence, and Statistics Canada. LASS 2010 studied the health and well-being of former Regular Force personnel who released from service during 1998-2007. LASS 2013 expands the populations studied to include former Primary Reserve personnel who released from service during 2003-2012. This presentation reviews the Reserve Force findings from LASS 2013.

Methods: For the income study, Statistics Canada linked together family tax records from 1997 to 2011 with DND records for 16,925 Reserve Force Veterans released between January 1, 2003 and December 31, 2011 and 47,950 Regular Force Veterans released between January 1, 1998 to December 31, 2011. The 2013 survey sampled 1,527 Reserve Force Veterans released in 2003-2012 and 2,611 Regular Force Veterans released in 1998-2012.

Results: The Primary Reserve Force augments, sustains and supports deployed forces in domestic and international operations. The 2013 Life After Service Studies examined income, health, disability and well-being of Veterans of the Primary Reserve. In general, findings from both the income study and survey showed that Reserve Class C Veterans look similar to Regular Force Veterans, while Reserve Class A/B Veterans resemble the Canadian public. Prevalences of chronic conditions (including arthritis, hearing problems, obesity, pain, depression and anxiety) and activity limitations for Reserve Class C Veterans were higher than for Canadians, while prevalances for Reserve Class A/B Veterans were similar to Canadians. Rates of low income for Reserve and Regular Force Veterans were less than that of Canadians. Reserve Force Veteran income increased post release.

Conclusions: The first descriptive findings from LASS 2013 yield valuable insights into the socioeconomics, military characteristics, health, disability and well-being of both Primary Reserve and Regular Force Veterans. These findings will be a resource for examination of programs and benefits to ultimately improve the health of Veterans in Canada.

1E04: Group Interpersonal Psychotherapy addressing the Transition to Civilian Life for CAF Veterans with OSI's

Auger, E., MD, Turgeon, M. H., MD, Patry, S., MD

Clinique TSO du CHUQ

Brief Description: Interpersonal Psychotherapy (IPT) is a well-recognized treatment of major depressive disorder. IPT has been developed in group and individual formats. It is brief and focus-oriented. It revolves around four different types of focus including role transition. Military personnel with operational stress injuries (OSI) are frequently confronted with the task of leaving the military environment and adjusting to civilian life. At our OSI clinic, it has become quite clear that this role transition can be an important factor in the recovery of patients with an OSI in the process of readjusting to civilian life.

Clinical Outcomes: PHQ-9 at every session and PCL-M (beginning, mid-treatment and end of treatment)

Patient Population: Canadian Armed Forces Veterans or military personnel in the process of leaving the Armed forces with Operational Stress Injuries

Conclusions: A pilot 16-sessions IPT group therapy has been tested with the assumptions that this form of therapy in group format could have a beneficial effect on depressive symptoms pertaining to this role transition and could indirectly ameliorate PTSD symptoms. 6 patients started this first therapy, 5 of them completed the 16 sessions. For completers, mean PHQ-9 scores was at 16.8 (moderate to severe depressive symptoms) at session 1 and 9.8 (mild depressive symptoms) at session 16. For posttraumatic symptoms, Mean PCL-M scores went from 63.2 at session 1 to 55.8 at session 16 (2 patients had a drop of more than 10 points at the PCL-M). We are planning a second group therapy early in 2015. We would like to increase the number of participants to 8 and the number of sessions to 18.

1E05: Gender and the Transition from Military to Civilian Life: A Review and Analysis of the Literature

Eichler, M., PhD

Mount Saint Vincent University

Introduction: Gender remains an underexplored area of inquiry into Veterans' transition from military to civilian life – both in Canada and elsewhere – but one that is growing in importance in view of the changing gender make-up of militaries across the globe. That gender is a key variable affecting the success of Veterans' reintegration into society is increasingly evident. In part, female and male Veterans face similar challenges upon their return from a war zone and/or their release from the military. However, some aspects of the transition are gender-specific and related to societal gender norms or gendered military culture.

Methods: The presentation will offer a critical review of gender-informed studies conducted on Veterans' reintegration. It will examine relevant studies that exist internationally, in particular from the United States, Australia, and the UK. It will include both studies that employ gender as a variable (with a focus on sex differences) and studies that employ gender as an analytical category (with a focus on gender norms).

Results: The results of the study will allow for 1) an assessment of the potential ways in which sex differences and gender norms influence Veterans' transition from military to civilian life, including Veterans' health; 2)

identification of the key themes and gaps in existing studies; and 3) preliminary recommendations for a gender-sensitive research program on Veterans' reintegration in Canada.

Conclusions: While most studies apply a narrow view of gender as a variable (focusing on sex differences), some – mostly feminist-informed – studies have taken a broader view and explored the significance of social constructions of gender to the experiences of male and female Veterans. While Veterans' policies and programs often assume the male soldier as the norm, it is significant that gender-blind policies may overlook t h e needs of both male and female Veterans. Recognizing the importance of social constructions of gender may well be essential to improving outcomes for Veterans, military families, and society at large.

1E06: The Outward Bound Canada Veterans' Program

Harper, N. J., PhD, D'Astous M.,Cpl., Norris, J., PhD

Outward Bound Canada

Brief Description: Outward Bound Canada (OBC) Veteran's courses use a standardized format comprised of a seven-day wilderness expedition with up to nine participants and three instructors. The courses utilize an intensive group setting, which enables peer mentoring and the sharing of deployment and post-deployment issues in a structured and physically and emotionally safe environment. While the courses are intentionally designed for, and delivered to Veterans, they remain guided by the same core educational framework as all OBC courses. The courses are physically and emotionally committing and participants are involved in all details of the program such as route planning, finding and navigation, record keeping, cooking, group leadership, equipment management etc. There is no rank on course. Course activities include hiking and backpacking, rock and ice climbing, skimountaineering, alpine climbing and whitewater canoeing along with a broad range of experiential activities commonly used by OBC to support positive personal and group development outcomes. Courses are designed to purposely mirror and reframe selected military experiences and offer opportunities for participants to reflect on and discuss their deployment experiences, transition challenges and the impact these have on their lives.

Clinical Outcomes: A mixed-methods evaluation of Veterans' courses run by OBC assessed learning outcomes and identified subjective meaning of course experiences for participating Veterans. Results from the Outward Bound Outcomes Instrument show significant positive increases from pre-course to six-weeks post-course (N = 50) on nine psycho-social constructs. Findings from participant interviews illustrate the value OBC courses hold for Veterans: as decompression from stressful operational environments, as a catalyst to seek further treatment for stress related injuries, as an adjunct to such treatment, and as a way to reconnect with their CAF 'family'.

Patient Population: Priority is given to Veterans who have been injured or experienced significant personal impacts related to their operational deployments or who are dealing with transition challenges after release from the CAF. The program is however, open to all members of the CAF both currently serving and retired.

Conclusions: Outcomes from survey research supported OBC's efforts to meet their educational objectives with Veterans as students although qualitative understandings presented broader health and social benefits. These findings reinforce the need for 'transition' courses in relationship to the social and health-related issues faced by CAF Veterans and the lack of services addressing the needs of this population.

2E01: Coming Home, Coming to Terms: Transitions to Civilian Life of Traumatized Warriors

Prince, M., PhD, Moss, P., PhD

University of Victoria

Introduction: For the weary warrior returning to civilian life is a vexing issue of public policy-making around the world. Coming home is equated with culturally anticipated processes of overcoming challenges, making adjustments, and getting on with one's life. Families, too, are implicated in this discourse of soldiering on: they are asked, indeed expected, to stay brave in the face of awkward reunions or setbacks in transitions, to conquer their own anxieties and fears about the returning Veteran, and to monitor the state of mental health the Veteran displays.

Methods: We are interested in how combatants themselves, individually and in various forms collectively, struggle for recognition, treatment, and support for war-related neuroses. The central research question in this paper is: after discharge into civilian life, where and how do Veterans with ill bodies seek help and understanding? Our data come from the written words of Veterans themselves in relation to memoirs, diaries, and poems; in the testimonies and transcripts of military courts or tribunals; in reports by military psychiatrists and health professionals; and in the anguished utterances of parents and partners as reported in media stories.

Results: *Coming home*, we maintain, involves the (re)cultivation of the civilian self and the care of the psychologically wounded Veteran by the Veterans themselves, by some peers and by family members, and either civilian or military psychiatrists or mental health-care workers associated with recovery, addiction, and support centers. A politics of claims making and social change is a formative part in *coming to terms* by Veterans in their struggles for recognition of wounds and distress as a result of combat. In these struggles, a series of relationships are activated and issues are contested in military, state, and political institutions.

Conclusions: The psychologically wounded Veteran is a major figure in contemporary society. Despite new methods in psychiatric training, popularity of counseling, and transformations in psychiatric care, the matter of coming home and coming to terms with transitions remains a major

concern. Part of the return and transitioning for the soldier is a collage of normative images or discourses on who a weary warrior is and the role of the family in the soldier's demilitarized life. Weary warriors can be viewed as minds, bodies, and souls seeking some surety within a changeable set of power and knowledge relations.

2E02: Trends in International Veteran Population Health Studies

Thompson, J. M., MD, Pedlar, D., PhD, Campbell, L., BPR

Veterans Affairs Canada

Introduction: There has been unprecedented expansion in military Veterans' health research around the world since the first Persian Gulf War in 1990-91, particularly since 2000 in connection with the more recent Iraq and Afghanistan wars. A committee of research executives from Veterans administrations in Canada, the United States, Australia and New Zealand identified the importance of networking among researchers and knowledge users to facilitate sharing of findings and solutions to common research problems, and leverage the potential value of using common research methodologies to facilitate comparisons among nations. This report was compiled to foster communication and collaboration among these Veterans administrations and researchers.

Methods: With input from its international counterparts, the VAC Research Directorate gathered in one document major post-deployment and military Veteran population health and well-being research studies underway in Canada, the United States, Australia and New Zealand. The report included 54 studies which were initiated after 2000 and were in design, active data collection, ongoing data analysis or reporting. Studies that were initiated after 2000 but are no longer active or being subjected to additional analysis were not included. Cross-sectional, longitudinal, retrospective and prospective studies were included.

Results: Trends included: increasing use of sophisticated data linkage to leverage information stored by various agencies and supplement self-reported data; use of objective clinical data and biological sampling including genomics; use of Veteran identifier questions in general population surveys to enable comparisons with non-Veterans; longitudinal rather than cross-sectional studies; studies across the life course; and longitudinal collaboration across the life course by researchers in Defence and Veterans' administration organizations.

Conclusions: The impressive range of studies signals unprecedented new knowledge about the health and well-being of military Veterans. The report highlights opportunities including standardization of measures and methodologies to enable comparisons across eras, populations and nations; pooling of data across nations to increase the statistical power for rarer outcomes; and identification of new studies that should be undertaken in the future.

2E03: National Veterans Project: Addressing Homelessness among CAF Veterans

Forchuk, C., PhD, Richardson, J., MBA

Western University

Introduction: Underlying processes that contribute to homelessness among Canadian Veterans are multifactorial and typically involve a combination of physical and/or mental health challenges, addiction and other psychosocial factors that interfere with successful transition to civilian life. Experiences such as operational stress injury and/or isolation from family compound these issues leading to increased vulnerability to a variety of social problems, including living in unstable/inadequate housing or experiencing absolute homelessness. This multi-site study examines the importance of key principles for addressing homelessness among Canadian Armed Forces Veterans, including: Housing First, housing with support, peer support, provision of services separate from the general shelter/homeless population, promoting self-respect, providing structure and providing a transition process to housing while addressing co-occurring mental illness, addiction and trauma.

Methods: Local community organizations across 4 Canadian sites (Calgary, London, Toronto, Victoria) collaborated with federal partners including HRSDC and Veterans Affairs Canada (VAC) to provide housing with support to Veterans experiencing homelessness. Program evaluation included formative and summative components using a mixed methods approach. Structured interviews were conducted with Veterans at multiple time points over a period of 15 months. Focus groups were carried out in three cycles with Veterans, staff, and stakeholders at each site.

Results: Quantitative findings (n=63) reveal a pattern of chronic homelessness occurring over many years following release from active service. Participants served a mean of 8.1 years (range 0.17-38 years, SD 8.8) with 39.7% reporting overseas deployments. Time since release from the CAF averaged 28.4 years (range 1-58 years, SD 13.6) with first episode of homelessness occurring 9.8 years ago (range 0-47, SD 10.5). Greater than one-half of participants offered fair to poor ratings of physical health, mood and wellbeing. Satisfaction with family, social relationships and quality of life were similarly poor. Qualitative analysis validated key principles for addressing homelessness among Veterans and supported Housing First and Harm Reduction philosophies. A continued need for innovative strategies to engage Veterans in housing related services was evident with strong agreement in the value of peer support.

Conclusions: Creative, flexible approaches that balance safety, security and structure while at the same time promoting self-respect, personal choice, harm reduction and autonomy are essential to providing meaningful service to this population. Establishing strong interagency partnerships and strengthening pathways that promote information sharing and collaborative case management across sectors

are integral to improving housing stability and reducing the risk of homelessness among Veterans.

2E04: Adapting to "Being a Nobody": Psycho-social Insights into UK Veterans' Transition Experiences. A Qualitative Study

Winterton, M., PhD[1], Martindale, R. J. J., PhD[1], Connaboy, C., PhD[2]

[1]Edinburgh Napier University, (UK); [2]University of Houston, (USA)

Introduction: In the UK and elsewhere there is limited understanding of the long-term processes of adaptation to civilian lives. More is known about those with problematic outcomes, for example, those who end up homeless or in the criminal justice system or in the care of welfare or healthcare agencies. But what about the majority of Veterans for whom the process of transition to the civilian realm is less dramatic or whose problems remain hidden from view? This majority experience remains largely unexplored, and particularly so from a sociological perspective. Yet integration to civilian lives, or transformation to a civilian self, has to be understood as sociologically and psychologically negotiated over time.

Methods: A small qualitative study was designed to explore the experiences of Veterans' transitions to civilian lives. In the UK, a flyer was launched on a number of social media sites used by Veterans, asking for volunteers who had been UK Veterans for at least ten years, and who had experienced deployment. From this ten participants agreed to take part in semi-structured telephone interviews, which lasted generally an hour or more. Qualitative research is designed to capture participants' own understandings of their experiences, and the interview structure enabled the researchers to probe some issues in greater depth and also pursue emergent areas that seemed important to the participant. An inductive analytical approach was employed, which allowed insights from the diverse knowledge base of the researchers to emerge (a sociologist, a psychologist and an academic who is a UK Veteran). The approach is entirely appropriate for an exploratory study.

Results: The diverse sample revealed common perceptions of being very unprepared for civilian lives at the time of leaving. Narratives also revealed patterns of instability for a number of years post-service, and health and/or social problems were experienced at numerous points in the transition trajectory. Positive outcomes were generally attributed to luck and/or informal support. The significance of a military identity for integration was clear. Most participants still didn't see themselves as civilians, and success, setbacks and assistance were linked to the maintenance of an 'ex-military' identity. The loss and re-building of status over time was also a common part of Veteran s' experiences.

Conclusions: Understanding the psycho-social dynamics of integration from the perspective of the 'hidden majority' reveals real points of disruption to successful civilian transitions. Such insight opens up spaces to think creatively about adequate support in the future.

2E05: War is Hell, Civilian Life is Worse: The Traumatizing Loss of Purpose in Transition

Rose, S., PhD (Cand), Alice, A., PhD, Burfoot, A., PhD

Queen's University

Introduction: The concept of moral injury is gaining traction in recent academic literature on the mental health of combat Veterans. Psychologist Brett Litz (2009) defines moral injury as, "perpetrating, failing to prevent, bearing witness to, or learning about acts that transgress deeply held moral beliefs and expectations." Building on the concept of moral injury sociologically, this research considers the civilian cultural barriers to successful moral reintegration. Beyond perceived acts of transgression in combat, Veterans can be morally injured by a loss of identity and sense of purpose in transition to civilian life. The goal of this research is to apply a sociological conception of morality in order to qualitatively demonstrate the specific social conditions associated with successful and unsuccessful transitions.

Methods: This research employs semi-structured qualitative in-depth interviews with 25 Canadian male combat Veterans of Afghanistan. The interviews inquire into the individual's experiences in training, on deployment, in transition, and their current situation. Following the interviews, a thematic analysis is conducted to understand how individuals reintegrate into a civilian occupation and what social barriers they face in the transition.

Results: Preliminary results demonstrate that Veterans experience moral traumas beyond the emotions of guilt and shame, as emphasized by the psychological concept of moral injury. Individuals who experience a difficult transition into civilian life frequently report the traumatizing loss of social integration and moral regulation, which was provided to them by the military. The difficulties associated with this loss of integration and regulation is a major contributor to suicidal ideation. Veterans who experience a smooth transition frequently report the presence of strong social support and a meaningful occupation to come back to.

Conclusions: This research concludes that Veterans experience traumas beyond the battlefield. That is, although combat presents its own set of traumas, several individuals report that the most traumatizing aspect of their experience is transitioning from military to civilian life. This research demonstrates how the relative lack of morally integrative and regulative social forces in civilian life contribute to the existential trauma Veterans may experience. This research also suggests that exclusive focus on operational stress injuries, such as Post-traumatic stress disorder, may limit the mental health community's ability to understand the traumatizing events Veterans experience in transition. Future research should consider the existential component of Veterans' experiences in transition, particularly related to their ability to regain a sense of purpose in civilian life.

3D02: Getting Ahead of the Curve: An Assessment of Human Performance Enhancement

von Hlatky, S. PhD[1,2], Breede, H. C., Maj., PhD[2,3]

[1]Queen's University; [2]Centre for International and Defence Policy; [3]Royal Military College of Canada

Introduction: The end of Canada's military commitment in Afghanistan this past March has brought greater attention to the country's involvement in military interventions and the use of force more broadly. The role of emerging military technologies, including human performance enhancement (HPE), is central to these discussions. This paper has two goals. The first is to study how HPE impacts a soldier's ability to reintegrate into society when the fighting is over while the second goal is to provide a basis for informed policy in the future regarding HPE and soldiers.

Methods: The literature on civil-military connections provides an appropriate framework to test how HPE affects solders during and after combat. The research method consists of interviewing members of the Canadian Armed Forces (CAF) with combat experience in Afghanistan, selecting participants on the basis of their exposure (experimental group) or non-exposure (control group) to HPE. This exploration will give us an understanding of the state of HPE in the Canadian Armed Forces today. It will serve as the foundation upon which the second part of this paper will be built. The second part of the paper catalogues Canadian policies on HPE throughout the Afghanistan war (2001-2014). Here we draw a distinction between invasive and non-invasive HPE, to assess which type of HPE has been favored both in policy and in practice.

Results: Our preliminary findings demonstrate that, from a military standpoint, HPE can be combined with robotics and automated drones to improve combat effectiveness and force protection, however, invasive HPE have been more prominent in their use because they can be integrated more quickly and cheaply.

Conclusions: The paper concludes by addressing the ethical and legal ramifications of these emerging technologies, both domestically and internationally. Indeed, the long-term consequences of these enhancements are not fully understood or discussed. In sum, this paper seeks to set a research agenda that moves beyond the science and technology of HPE and explores both the health and policy implications of such enhancements, using a multidisciplinary framework.

6F02: How Stories Change the Brain

Salverson, J., PhD[1,2]

[1]Queen's University; [2]Royal Military College

Introduction: What futures do Veterans imagine? Creative drama and storytelling may contribute to how combatants and their families anticipate living their lives. Trauma survivors in male culture have few narrative options for re-telling their testimonies (Smith and Sparks, 2014). Disability magazines portray survivors as being committed to battle, heroic and active. To the extent that these narratives reinforce, rely and actively cultivate a particular model of masculinity they may hinder the transformative potential of disability. This has implications for military culture. Storytelling has the potential for transforming lives not in the sense of triumph, but moving through shame and being allowed to become a new person, whose self is not continually referencing what researchers call 'heroic masculinity'. Trauma has a direct impact on the structure of the brain and can leave survivors with a shame or fear-based understanding of themselves, relationships and the world around them. The co-creation of a coherent narrative is essential in the journey towards healing. Engaging with stories and play could expand how Veterans and their families make sense of their experiences and allow them to move from chaos or rigidity in their thoughts, feelings and behaviour to more flexible and creative functioning.

Methods: I apply Catherine Malabou's work on brain plasticity as it impacts "a paralysis of touching," applied arts in health research and Dr. Sian Phillips writing on narrative psychology to my experience leading two projects: a drama workshop in September, 2014 for front line responders (RCMP, paramedics, police) at the War Horse Symposium in Alberta; a Queen's drama class performing the stories of combatants at the 2011 MVHR Forum.

Results: Research now shows that healing from trauma involves right brain to right brain experiences such as empathy and "felt" understanding rather than therapies that rely on logic, behaviour or cognitive modification. This has implications for how we deliver mental health support to individuals and families. Neuropsychological evidence supports a right hemispheric bias for emotional and attentional processing in humans. (Schore 2012, Phillips 2013).

Conclusions: The co-creation of a narrative involves empathy, joint attention, attunement, co-regulation of affect, facial and nonverbal expressions, all of which engage right brain functioning and allow for a regulation of the central nervous system. Drama and creative play is an under-utilized resource that promotes the engagement of right brain functions. Creative arts workshops could provide a healing tool for Veterans and families to live with trauma and create new neural pathways and narratives.

Poster Presentations

P153: A Group Program for Veterans' Transition: A 12-Month Follow-up Evaluation

Cox, D. W. PhD, Kivari, C. K., MA[1], Lutz, K., MA

University of British Columbia

Introduction: While group approaches to facilitating Veteran's transition have grown in popularity, few studies have evaluated the effectiveness of such groups. Further, among studies that have evaluated group effectiveness, even

fewer have continued evaluation 12-months after program completion.

Methods: Presently, we evaluated changes in psychiatric symptoms (e.g., PTSD, depression) and the reported life quality of Canadian Veterans just before, just after, 3-months, and 12-months following participation in a multimodal group designed to facilitate transition to civilian life via (a) peer support, (b) psychoeducation, (c) emotion regulation skills training, (d) re-enacting traumatic events, (e) reducing barriers to care, and (f) identifying and working on future goals.

Results: Previous evaluations of post- and 3-month follow-ups of Veterans participating in this program have indicated that the program reduces psychiatric symptoms and improves life quality. Currently, 12-month follow-up data are being collected and will be presented.

Conclusions: These data are the first to evaluate this program's effectiveness 12-months post program and will facilitate understanding the value of group programs for aiding transition to civilian life.

P154: Data Collection Methods, Life After Service Studies 2013

Poirier, A., McKinnon, K.

Veterans Affairs Canada

Introduction: "Life After Service Studies" (LASS) program of research is designed to enhance better understanding of the transition from military to civilian life and ultimately improve the health of Veterans in Canada. LASS partners are Veterans Affairs Canada, the Department of National Defence /Canadian Armed Forces, and Statistics Canada. LASS 2013 builds on the earlier studies from 2010, by including

Veterans of the Primary Reserve in two major studies: the Survey of Health and Well-being, and the record linkage for pre- and post-release income trends.

Methods: There were two major studies: the Survey of Health and Well-Being and the Pre- and Post-Release Income study. For the survey, three Veteran subgroups were studied: Regular Force released 1998 – 2012, Primary Reserve (Class A/B & C released 2003 – 2013). LASS 2013 survey was a computer-assisted telephone interview survey conducted by Statistics Canada in March 2013 with a representative sample of Veterans from the Regular and Reserve Forces, as described above. For the income study, pre- and post-release income was examined using data linkage. Statistics Canada linked together records on military releases, Veterans Affairs Canada client status and tax files for Veterans from the Regular and Reserve Forces, as described above.

Results: The overall Canadian Armed Forces Veteran population is estimated at 600,000, 314,000 of whom are Regular Force Veterans and 280,000 of whom are Reserve Force Veterans. Data covered the period from 1998 to 2012 (Regular Force) or 2003 to 2012 (Reserve Force). The study sample was 56,129 Regular Force Veterans and 29,068 Reserve Force Veterans. The survey achieved a 70% response rate, and 90% agreed to share their data with VAC and DND. For income study, the latest year of income data available was 2011, and the linkage rate for any given year was 92%. Aggregate tables were produced from this linkage.

Conclusions: The above-noted survey and data linkage resulted in two reports, including information on health, disability and determinants of health to inform and generate recommendations and best practices for all departments.

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