JMVFH

JOURNAL OF MILITARY, VETERAN AND FAMILY HEALTH

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EDITORIAL

RESEARCH

PERSPECTIVES

On the Cover

Top left: Maj. Regan Wickett, a member of the Royal Canadian Air Force, plays with children. *Photo by Emma Love Photography*

Top right: A member of the 5th Canadian Division is shown in October 2020. *Photo by Master Corporal Geneviève Lapointe*

Bottom left: L.S. Andrew Fitzpatrick conducts physical fitness training aboard HMCS Whitehorse on Apr. 23, 2020. *Photo by L.S. Sisi Xu/ MARPAC Imaging Services*

Bottom right: Veterans Cpl. (retd) Anne McNamara and Flying Officer (retd) Howard McNamara served in the Royal Canadian Air Force during the Second World War. Howard flew Spitfires over North Africa during the Italian Campaign, while Anne performed in morale-boosting military entertainment shows in North America and Europe. *Photo by Marie France L'Ecuyer*

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EDITORIAL

Census to capture vital information on military-connected families

Canada's 23rd national census was conducted earlier this month — May 11, 2021 — at households across the country. For the first time in its 170-year history, the census captured specific information about Veterans and their families that can fill significant gaps in existing data. It is not an overstatement to say this is a breakthrough. Canadian Armed Forces (CAF) Veterans have not been identified in the Canadian census since 1971. In the near future, exact counts of contemporary CAF Veterans will be available by location, housing type, family status, Indigenous status, and gender. The information gathered about Veteran families can be used to better inform policies and programs that serve this often-overlooked population. It can advance research to policy implementation through better understanding of the need for services of contemporary CAF Veterans and their families.

The census, conducted once every five years, is a snapshot of the country at a specific point in time. It is a vital tool for researchers because it provides a detailed and comprehensive statistical picture of the country's make-up and is the only source to consistently provide data on both small geographic areas and population groups across Canada.[1] Changes to the 2021 questionnaire emerged out of consultations with various communities — including military members, Veterans, and their families — who did not see themselves reflected in the questions in the 2016 census.

As of March 31, 2020, Veterans Affairs Canada (VAC) estimated the total number of Veterans in Canada to be 629,300, yet Veterans served by VAC account for only 19% of the Veteran population.[2] The majority of available data is frequently limited to Veterans released from service after 1998. Little is known about Second World War, Korean War, and NATO Veterans, as well as those who served in support of the Yugoslavian conflict in the 1990s, or the many who served in the CAF over the past 65 years.[3,4]

This one-time collection of information is expected to determine the total number of CAF members and Veterans living in Canada, backfilling known data gaps in historical administrative records and building a more complete picture of existing Veteran cohorts.[1] By including the question on the short-form version of the census, Statistics Canada anticipates it will reach the largest number of military and Veteran households — the short form is used to enumerate residents of collective dwellings, including military bases, hospitals, and seniors' residences, where many Veterans and military personnel are likely to reside. Also, the short-form questionnaire is used by those temporarily residing overseas, including CAF members and their families on deployment.[3]

According to Statistics Canada, the question on past and present military service was well received on a 2019 Census Test. The proportion of those self-identifying as Veterans — and the proportion of male and female CAF Veterans, as well as their average age — was within the range estimated by VAC using a data modelling approach.[1] This bodes well for potential 2021 responses, which could not come at a better time. The total number of VAC clients increased by 0.5% in 2019-20, and the organization is predicting an average of 1% total client growth over the next five years.[2] Accurate information is critical to meeting the unique needs of the military and Veteran population, especially in the areas of mental and physical health, transition from service, and family life.

We are excited to see how researchers will combine other new census information with military and Veteran data to form a robust and evergreen portrait of military families in Canada. In addition to the question about military service, the 2021 census will also, for the first time, gather data on transgender Canadians, members of Métis groups, educational attainment, and underemployment.

Sex, gender, and intersectionality data are currently limited for the military and Veteran population, and it is hoped the new census information can contribute to this conversation in a meaningful way. The potential for further insight into Métis military service is also intriguing. First Nations, Inuit, and Métis people are an important part of Canada's military history, but few data exist on this specific sub-population. Learning more about military service as it relates to sex, gender, and Indigeneity is key to developing policies, programs, and services that meet the needs of this increasingly diverse population.

New educational attainment and labour market information will shed light on challenges and opportunities for military families. It is widely known that postings can affect the steady employment of military spouses, so it will be interesting to see what new information can be obtained by answers to questions about underemployment, quality of employment, and reasons why individuals worked less than 49 weeks, or worked mostly part time, during the preceding year.

There will be opportunities for linkage of data on Veteran and military populations with other data holdings inside Statistics Canada while providing safeguards to protect privacy and confidentiality.

From a research perspective, the new questions on the 2021 census will offer a wealth of previously unavailable information about the quality of life of military members, Veterans, and their families. It will highlight what we have done well, and what we need to do better. Although census data are only one piece of the puzzle, they provide a solid foundation for growing the ever-evolving body of knowledge that allows us to continue improving the health and well-being of our beneficiary population. The Canadian Institute for Military and Veteran Health Research (CIMVHR), a key research stakeholder, will collaborate with its partners to help facilitate awareness, use of data, and knowledge translation to realize the potential of this unique opportunity to advance the well-being of military personnel, Veterans, and their families.

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RESEARCH

Pilot study: The effectiveness of physiotherapy-led screening for patients requiring an orthopedic intervention

Mallory Pike[a], Lucie Campagna-Wilson[a], Kim Sears[b], Robert Warren[a], Douglas Legay[c] and Daniel Trudel[a]

ABSTRACT

Introduction: In Canada, wait times for orthopedic surgery represent a significant delay in care for patients with musculoskeletal disorders. To improve access, new models of care involving physiotherapists to either diagnose, triage, and/or conservatively manage patients with musculoskeletal disorders are being implemented. The purpose of this study was to assess the effectiveness of physiotherapy-led screening of electronic medical records (EMR) using a locally developed screening tool to identify whether patients required orthopedic intervention or conservative management. **Methods:** The EMRs of 41 patients, referred to orthopedic surgery for any musculoskeletal disorder in an outpatient orthopedic clinic within a military primary health care centre in Halifax, Canada, were independently screened by two randomly assigned physiotherapists. The corresponding patients were subsequently seen by one orthopedic surgeon. The physiotherapists screened the EMRs using a screening tool and provided triage recommendations (orthopedic intervention, physiotherapy, physiatry, diagnostic investigations, or other intervention). Percentage of agreement and Fleiss' kappa were calculated to assess inter-rater agreement, and validity was determined by cross-tabulation. **Results:** The percentage of agreement for triage recommendations among physiotherapists was 78% and inter-rater agreement was moderate ($\kappa = 0.617$; 95% CI, 0.365-0.868, $p < 0.001$). Excluding recommendations for diagnostic investigations increased the percentage of agreement to 93.9% and resulted in a strong level of inter-rater agreement ($\kappa = 0.878$; 95% CI, 0.537-1.219). The screening tool was determined to have 64.0% sensitivity, 87.5% specificity, a positive predictive value of 88.9%, and a negative predictive value of 63.2%. **Discussion:** EMR screening may have a role in identifying patients that require orthopedic intervention; however, more research is needed.

Key words: Canada, Canadian Armed Forces, CAF, collaborative practice, consultation, gatekeeping, health service research, models of care, musculoskeletal diseases, orthopedics, physiotherapists, primary health care, referral, wait times

RÉSUMÉ

Introduction : Au Canada, les temps d'attente en chirurgie orthopédique entraînent un retard important des soins pour les patients ayant des troubles musculosquelettiques (MSQ). Afin d'améliorer l'accès, de nouveaux modèles de soins faisant appel à des physiothérapeutes pour diagnostiquer ou trier des patients atteints de troubles MSQ ou procéder à leur prise en charge prudente sont en voie d'être adoptés. La présente étude vise à évaluer l'efficacité du dépistage des patients effectué par des physiothérapeutes à partir de leurs dossiers médicaux électroniques (DMÉ) au moyen d'un outil de dépistage local pour repérer les patients qui ont besoin d'une intervention orthopédique ou d'une prise en charge prudente plutôt que d'une consultation en orthopédie. **Méthodologie :** Le DMÉ de 41 patients dirigés à la clinique militaire orthopédique ambulatoire d'un centre de soins de première ligne de Halifax, au Canada, en raison d'un trouble MSQ ont été répartis au hasard entre deux physiothérapeutes en vue d'un dépistage indépendant. Ces patients étaient ensuite envoyés en consultation auprès d'un seul chirurgien orthopédique. Les physiothérapeutes ont examiné le DMÉ au moyen de l'outil de dépistage et ont fourni des recommandations de triage (intervention orthopédique, physiothérapie, physiatrie, explorations diagnostiques ou autre intervention). Le calcul de l'apport en pourcentage et le kappa de Fleiss ont permis d'évaluer la concordance interévaluateur, et la tabulation croisée a été utilisée pour déterminer

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la validité. **Résultats :** L'accord en pourcentage des recommandations de triage chez les physiothérapeutes s'élevait à 78 %, et la concordance interévaluateur était modérée (k = 0,617, IC à 95 % : 0,365 à 0,868, p<0,001). L'exclusion des recommandations de procéder à des explorations diagnostiques accroissait l'accord en pourcentage à 93,9 % et assurait un degré élevé de concordance interévaluateur (k = 0,878, IC à 95 % : 0,537 à 1,219). Il a été établi que l'outil de dépistage avait une sensibilité de 64,0 %, une spécificité de 87,5 %, une valeur prédictive positive de 88,9 % et une valeur prédictive négative de 63,2 %. **Discussion :** Le dépistage à partir des DMÉ peut contribuer à déterminer les patients qui ont besoin d'une intervention orthopédique, mais d'autres recherches s'imposent.

Mots-clés : Canada, consultation, FAC, Forces armées canadiennes, maladies musculosquelettiques, modèles de soins, orientation, orthopédie, physiothérapeutes, pratique collaborative, protection, recherches sur les services de santé, soins de première ligne, temps d'attente

LAY SUMMARY

In Canada, patients can wait over a year to be seen by an orthopedic surgeon. To reduce wait times, physiotherapists have been employed in some practice areas to triage patients prior to being seen by an orthopedic surgeon. This study looked at different forms of triage by using physiotherapists to screen electronic medical records (EMR) to determine if patients needed orthopedic intervention or conservative management. To guide the physiotherapists, a screening tool was created. The study compared the recommendations of the physiotherapists with those of an orthopedic surgeon. The results showed that, most of the time, physiotherapists using the screening tool successfully identified whether a patient needed to see an orthopedic surgeon or could be treated with physiotherapy. This type of screening process may decrease wait times to see an orthopedic surgeon and improve access to physiotherapy or other treatments.

INTRODUCTION

Background

In Canada, the demand for orthopedic services has reached a critical point, where patients can wait up to 14.6 weeks from referral by their general practitioner to consultation with an orthopedic surgeon, and up to 24.5 weeks from orthopedic consultation to treatment.[1] Canada has significantly longer wait times than other countries, such as England and Sweden, where wait times for orthopedic services are 12 weeks and 10.7 weeks, respectively.[2] Despite an increasing number of orthopedic surgeons per capita each year in Canada, the demand for their services surpasses available resources, with demand increasing, on average, 17% over the past five years.[3,4] The impact of long wait times for orthopedic services can be significant for patients, negatively affecting health-related quality of life[5] and self-reported physical function.[6,7] Further contributing to the demand for orthopedic services is the high proportion of patients with musculoskeletal conditions referred to orthopedic surgery for whom conservative management may be more appropriate.[8]

Research indicates that 37% to 42.7% of patients referred to orthopedic surgery could be effectively managed within the primary care environment, either with physiotherapy or injections, rather than surgery.[9-11] The significant percentage of referrals to orthopedic surgery for these patients contributes to long wait times for orthopedic consultations and, ultimately, to longer wait times for orthopedic surgeries.[12] Reducing the number of consultations that do not result in orthopedic intervention may therefore reduce wait times for surgery, as well as improve access to conservative management earlier in the referral process for non-surgical patients.[12]

In the current health care environment, it is imperative that patients referred to an orthopedic surgeon be appropriate candidates in terms of their disease severity and potential to benefit from surgery, in order to mitigate the increasing demands on a limited resource. Several strategies implemented to reduce wait times for orthopedic surgery include the development of prioritization scores and need-based waiting lists.[13] However, one initiative that focuses on increasing capacity by expanding the roles of providers currently working in the health care system is the use of physiotherapy-led screening for patients referred to orthopedic surgery.[10,14,15] In this model of care, physiotherapists screen all patients referred to orthopedic surgery and conservatively manage non-surgical patients, thereby limiting the number of patients who see the orthopedic surgeon to those who require surgery.[12,14] This model of care can decrease wait times for orthopedic services, increase access to more appropriate conservative management for non-surgical patients, and reduce the costs of health care.[14-16]

Physiotherapists' scope of practice includes diagnosing musculoskeletal problems, with research demonstrating that physiotherapists have comparable or greater diagnostic accuracy than other health care providers.[17,18]

Furthermore, many musculoskeletal conditions are appropriately treated by physical rehabilitation, thus situating physiotherapists in an ideal position to perform orthopedic screening services.[10,19-21] Studies conducted internationally and in Canada on physiotherapy screening for orthopedic referrals have shown high levels of agreement between physiotherapists and orthopedic surgeons with respect to surgical candidacy and conservative management recommendations.[12,14,22,23] Previous research has shown that extended scope physiotherapists (i.e. physiotherapists whose scope of practice can include ordering diagnostic imaging and lab tests and referring patients to other specialists, depending on restrictions and jurisdiction) appropriately referred patients for surgical intervention in 89% of cases.[24,25] The prospective observational trial of physiotherapist-led screening by Oldmeadow et al.[10] showed that experienced physiotherapists identified the same management decisions for surgery, arthroscopy, physiotherapy, injections, or further imaging as an orthopedic surgeon in 74% cases. Inter-rater agreement between orthopedic surgeons and physiotherapists who received special training to identify patients appropriate for referral to the orthopedic surgeon was found to be 91.8% with an associated kappa statistic of 0.69, indicating good agreement.[22]

Comparable results were found in a prospective observational study where patients were first triaged by a physiotherapist, then evaluated by an orthopedic surgeon on the same day, finding 93.3% agreement between the physiotherapist and the orthopedic surgeon on whether patients were surgical, non-surgical, or required further investigations.[22] More recent research on the effectiveness of a physiotherapy-led outpatient clinic for the assessment and management of hip and knee osteoarthritis found that 93% of patients referred for orthopedic assessment by physiotherapists were recommended for surgery by an orthopedic surgeon.[9] The validation study by Desmeules et al.[26] demonstrated a high level of agreement between advanced practice physiotherapists and orthopedic surgeons on triage recommendations for either surgical or conservative management, with a raw percentage of agreement of 88% and kappa of 0.77, indicating good agreement.

There is limited research on other forms of physiotherapy-led screening, with the majority of available research focusing on the use of in-person, physiotherapy-led screening.[10,27] Most programs described previously involve an in-person physiotherapy triage assessment, possibly owing to the inaccessibility of a complete patient medical record. With the advancement of electronic medical records (EMR), there is an opportunity to use patient record review instead of in-person assessment for screening. This has the potential to save clinical time, as performing a review of the medical record requires significantly less time than conducting a complete physiotherapy assessment.

In an effort to decrease the number of referrals that do not result in orthopedic surgery, a local screening tool was developed in collaboration with physiotherapists, primary care clinicians, and a subject matter expert in orthopedic surgery within a military primary health care clinic. The screening tool consisted of: (1) inclusion and exclusion criteria for referrals, (2) conditions appropriate for surgical consult, and (3) appropriate diagnostic imaging required for each condition prior to consult.

Theoretical framework

Normalization process theory (NPT), as conceptualized by May et al.,[28] identifies factors that influence the integration of new programs, health techniques, and other complex interventions into everyday practice, from the early implementation stages to the point where the intervention becomes a normalized part of practice.[28,29] Two components of NPT were applied to this study: coherence and cognitive participation. Coherence refers to the ability of individuals to interpret and understand the intervention, whereas cognitive participation refers to the relational work done to develop and sustain a practice around a new intervention.[28] Physiotherapists participating in the screening of orthopedic referrals worked with the screening tool through didactic training, example exercises, and feedback to facilitate coherence and cognitive participation. Dynamic feedback during the training sessions enhanced understanding of the process by allowing the physiotherapists, or end users, to contribute their ideas to the concept of screening and using the screening tool. During the training, the physiotherapists found it difficult to strictly adhere to the screening tool because of their experience as practitioners. That is, they tended to want to apply clinical judgement to patient management decisions.

Differentiation is an element of coherence that seeks to understand how the objectives of one set of practices differs from another.[28] The physiotherapists had to differentiate between applying clinical judgement as they would in routine practice and formulating a decision based on a screening tool. Exploring this concept prompted further discussion and understanding of the objectives of generating consistency in decision outcomes and standardizing the decision-making process to enable physiotherapists of varying experience levels to consistently identify patients that require orthopedic intervention. Discussions about the potential implications for physiotherapy-led screening of EMRs as a new model of care within the centre facilitated the conceptualization of the broader implications of the study and enhanced support for cognitive participation.

Specific aims

There is extensive research to support physiotherapy-led screening of patients referred to orthopedic surgery; however, the majority of this research includes physiotherapists physically assessing patients to determine the appropriateness of orthopedic surgery. Therefore, the primary purpose of this study was to investigate the effectiveness of physiotherapy-led screening using a locally developed orthopedic screening tool and EMR review, to identify patients who should be referred to an orthopedic surgeon. The specific aims were to determine: (1) inter-rater agreement among physiotherapists in triage recommendations using a locally developed screening tool; (2) the validity of the screening tool by measuring its sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV); and (3) the demographic characteristics of patients in the study population.

METHODS

Study design

This was a prospective observational study using a time-framed sampling methodology, whereby the study sample was identified by Mar. 31, 2020, and consisted of patients scheduled for an orthopedic consultation for any musculoskeletal condition between Apr. 1 and May 30, 2020, within the military primary health care centre. The participant selection period was set to allow time for physiotherapists to screen files prior to the orthopedic consultation. Referrals were excluded if the patient was: (1) referred to orthopedic surgery by another specialist; (2) no longer a patient of the centre; or (3) scheduled after Mar. 21, 2020. The study was approved by the Queen's University Health Sciences and Affiliated Teaching Hospitals Research Ethics Board.

Setting

The military primary health care centre provides primary care and extended outpatient services including physiotherapy, diagnostic imaging, laboratory and pharmacy services, and some specialty services, including orthopedic surgery and physiatry. Primary health care providers include physicians, nurse practitioners, and physician assistants. The centre provides health care services to approximately 7,500 patients, ranging in age from 17 to 60 years, within Halifax, Nova Scotia, and surrounding areas.

Participants and procedure

The EMRs of patients scheduled to consult with an orthopedic surgeon within the specified timeframe and who met the eligibility criteria were selected for inclusion in the study. Patient outcomes were not affected, as patients were seen by the orthopedic surgeon as initially intended by the referring primary health care provider, and screening was performed by EMR review. Sample size calculations determined that a minimum of 28 participants would be required to detect problems in the pilot study, such as ambiguous eligibility criteria, misinterpretations of screening tool guidelines, and disagreement of treatment recommendations, with a prevalence of 10% (95% confidence).[30]

A screening tool and the concept of the process to identify orthopedic referrals was developed by physiotherapists proficient in the management of musculoskeletal injuries in collaboration with an orthopedic surgeon and a primary care physician using recent evidence from the literature and clinical experience.[12,14,22,26,31-35] Patients screened as requiring an orthopedic consultation must meet at least one inclusion criteria and none of the exclusion criteria.

Screening tool inclusion criteria included:

1. Patient's condition is not improving with rehabilitation, including an appropriate active treatment protocol that the patient has been compliant with, when treated by in-house Physical Rehabilitation services in the past six (6) months;
2. Patient's condition is listed in the *Specific conditions appropriate for surgical consult by orthopedic surgeon by body part* (Appendix A); and/or
3. Evidence of complete rupture of a structure as per diagnostic imaging;

Screening tool exclusion criteria included:

1. Patient has not received appropriate diagnostic imaging - refer to *Specific conditions appropriate for surgical consult by orthopedic surgeon by body part* (Appendix A) for specific imaging requirements;

2. Patient has a fracture; and/or
3. Patient's condition is more suited for an in-house physiatry referral (e.g. requires procedures such as prolotherapy or corticosteroid injection).

The physiotherapists performing the screening received didactic training and worked through several case examples to familiarize themselves with using the screening tool and increase inter-rater reliability. In total, six physiotherapists were involved in the screening, with two physiotherapists randomly selected each time to screen each file (conditions for Fleiss' κ). Randomization was performed using the rand function in Microsoft Excel. After the training, the physiotherapists were assigned patient EMRs to independently review using the screening tool to determine the appropriate treatment recommendation. Recommendations included: (1) orthopedic intervention, (2) physiotherapy, (3) physiatry, (4) diagnostic investigations, or (5) other intervention. Patients were screened prior to consultation with the orthopedic surgeon and assessed by the orthopedic surgeon as per routine practice. To determine the outcome of the orthopedic consultation, retrospective EMR review was performed after patients were seen by the orthopedic surgeon. The orthopedic surgeon was blinded to the triage recommendations of the physiotherapists.

The physiotherapists performing the screening had, on average, 13 years of clinical experience (range 2-17 y) and each held a Master of Science in Physical Rehabilitation. The orthopedic surgeon is board certified by the Royal College of Physicians and Surgeons of Canada, with over 30 years of experience in orthopedic surgery and is the Chief of Orthopedics at a local hospital with a subspecialty in sports medicine.

Statistical analysis

Inter-rater reliability, sensitivity, specificity, PPV, NPV, and descriptive statistics were calculated. Statistical analysis was performed using IBM SPSS, version 26.0 for Mac (IBM Corp., Armonk, NY). Demographic statistics and percentage of agreement were calculated using Microsoft Excel.

Screening tool inter-rater reliability

The first prerequisite to assess the integrity of the screening tool was inter-rater reliability, or the extent to which individuals collecting data record the same scores for the same phenomena. Low inter-rater reliability may influence clinical practice in a way that results in poorer patient outcomes.[36] The files of 41 patients scheduled to see the orthopedic surgeon were included. Fleiss's kappa was run to determine the level of agreement between the two randomly assigned physiotherapists who provided the triage recommendation (i.e. physiotherapy screening outcome).

Screening tool validity

The second prerequisite to ensure the integrity of the screening tool was confirming the construct validity. This refers to the degree to which a tool is able to measure the construct it is intended to measure[37] and is particularly important when study variables are difficult to measure quantitatively.[38] In order to determine the construct validity of the screening tool, the extent to which the physiotherapists' triage recommendations (orthopedic intervention, physiotherapy, physiatry, diagnostic investigations, or other intervention) reflected the orthopedic surgeon's clinical decisions (i.e. orthopedic consultation outcome), was assessed. All physiotherapy screening and orthopedic consultation outcomes were categorized as either orthopedic intervention (i.e. surgery, injection, referral to another specialist, or specialized brace prescription) or conservative management (i.e. physiotherapy, physiatry, diagnostic investigations, or other intervention). Cross-tabulation of the data was performed, allowing for the calculation of sensitivity, specificity, PPV, and NPV. In cases of disagreement between two physiotherapists on the recommended management plan, the recommendation of a third physiotherapist was used to determine the physiotherapy screening outcome.

RESULTS

Patient demographics are presented in Table 1. Referrals for knee (43.9%) and shoulder (19.5%) problems were the most common, followed by hip (12.2%), back (7.3%), ankle (4.9%), leg (4.9%), foot (2.4%), elbow (2.4%), and wrist (2.4%) problems. The majority of the patients seen (80.5%) were men; this is proportional to the population of the Canadian Armed Forces.[39] In total, 45 patients were scheduled to see an orthopedic surgeon within the participant selection period; one was excluded because of referral by an orthopedic surgeon, and three cancelled their appointments.

Inter-rater reliability

While assessing the inter-rater reliability of the screening tool, both percentage of agreement, the percentage of data for which the outcome is the same between the raters, and Fleiss' kappa were calculated. The kappa value range is from -1 to +1, with 0 corresponding to the amount of agreement to be expected from random chance and +1 representing perfect agreement between the raters.[36] Table 2 shows the percentage of agreement and Fleiss' kappa obtained when including all 41 files and when excluding 8 files with a screening recommendation of diagnostic imaging.

Screening tool validity

Tables 3 & 4 show the cross-tabulation of outcomes of either conservative management or orthopedic intervention as determined by physiotherapy screening and the orthopedic surgery consultation for all 41 cases and for 33 cases when excluding cases with a screening recommendation of diagnostic imaging. Table 5 shows the

Table 1. Demographic characteristics of study participants

	Group; no. of participants*									
	Total; n = 41	Knee; n = 18	Shoulder; n = 8	Hip; n = 5	Ankle; n = 2	Back; n = 3	Feet/foot; n = 1	Elbow; n = 1	Leg; n = 2	Wrist; n = 1
Sex										
Female	8	3	2	2	1	0	0	0	0	0
Male	33	15	6	3	1	3	1	1	2	1
Median age, y (range)	42 (24-58)	43 (25-56)	41 (33-56)	41 (28-58)	35 (33-37)	36 (24-41)	42	39	36 (25-47)	48

*Unless otherwise specified.

Table 2. Inter-rater reliability among physiotherapists on management recommendations

	All files; n = 41	Excluding files with diagnostic imaging recommendations; n = 33
Files screened, no. (%)		
Percent agreement	32 (78.0)	31 (93.9)
Fleiss kappa (95% CI)	0.617 (0.365-0.868); *p* < 0.001	0.878 (0.537-1.219); *p* < 0.001

Table 3. Physiotherapy screening and orthopedic consult outcome cross-tabulation for all patients

		Orthopedic consult outcome		Total
		Orthopedic intervention	Conservative management	
Physiotherapy screening outcome	Orthopedic intervention	16	2	18
	Conservative management	9	14	23
Total		25	16	41

Table 4. Physiotherapy screening and orthopedic consult outcome cross-tabulation excluding diagnostic investigations

		Orthopedic consult outcome		Total
		Orthopedic intervention	Conservative management	
Physiotherapy screening outcome	Orthopedic intervention	14	0	14
	Conservative management	7	12	19
Total		21	12	33

Table 5. Validity measures

	All files; n = 41	Excluding files with diagnostic investigation outcomes; n = 33
Number of files screened	41	33
Sensitivity	64.0%	66.7%
Specificity	87.5%	100%
Positive predictive value	88.9%	100%
Negative predictive value	60.9%	63.2%

specificity, sensitivity, PPV, and NPV; of note, all four measures of validity increased when diagnostic imaging cases were excluded.

DISCUSSION

Inter-rater reliability

The reliability of the screening tool as indicated by the raw percentage of agreement (78%) and kappa (0.617) between physiotherapists represents moderate agreement.[36] Interestingly, excluding cases where diagnostic investigations were selected by at least one physiotherapist increased the percentage of agreement to 93.9% and the kappa to 0.878, indicating strong agreement. The cases where disagreement was found with respect to diagnostic investigations involved conditions for which no clear instructions were provided in the screening tool. In order to address this issue, the screening tool should be modified to include recommendations for diagnostic imaging not previously indicated and adapted to reflect individual orthopedic surgeon diagnostic imaging requirements. Additionally, selecting diagnostic imaging as a recommendation did not necessarily preclude patients from proceeding with physiotherapy or orthopedic consultation. Therefore, the physiotherapists may have selected diagnostic investigations with the intent of also recommending physiotherapy or orthopedic consultation; however, they were permitted to select only one recommendation. Furthermore, diagnostic imaging requirements may be based on the preference of the orthopedic surgeon and determined after physical assessment and specified based on type of orthopedic intervention planned.

Validity

The results of the validity assessment of the screening tool cautiously support its use in triaging orthopedic referrals. The specificity of the tool, meaning the probability of the screening correctly identifying patients that do not require orthopedic intervention, was 87.5%, indicating it is highly probable that a patient requiring orthopedic intervention would be categorized as such. A sensitivity of 64.0% could be seen as problematic for screening patients referred to an orthopedic surgeon, as there is a 36.0% chance that a person requiring orthopedic intervention would be screened as not requiring orthopedic intervention and therefore not receive the most appropriate care. However, the intent of this screening tool is to identify patients that require diagnostic investigations, have not completed an active rehabilitation program, or would benefit from physiatry. Therefore, patients screened as not requiring orthopedic intervention are redirected to those services with the intent of direct booking with the orthopedic surgeon once investigations are completed or a conservative management protocol results in plateau.

PPV and NPV were calculated to assess the practical usefulness of the tool in a clinical setting. A PPV of 88.9% represents a high probability that a patient deemed to require orthopedic intervention after having their file screened by physiotherapy would actually require orthopedic intervention. Reducing false-positive outcomes has the potential of reducing overtreatment and unnecessary costs associated with health care,[34] in this case, orthopedic consults and interventions. An NPV of 60.9% indicates that a patient categorized as not requiring orthopedic intervention after screening by a physiotherapist does not require orthopedic intervention. A moderate NPV is acceptable in the context of care for non-serious, non-urgent, slowly evolving conditions.[40] This applies to most conditions for which patients are referred to the orthopedic surgeon within this military clinic, as patients requiring urgent orthopedic services are sent immediately to a civilian hospital for treatment.

Limitations

For this study, the orthopedic surgeon was considered as the reference standard and it is therefore possible that the surgeon decided on surgery as the management plan in certain cases because it was unclear if the patient had completed an active treatment protocol in physiotherapy, relying instead on subjective reports from the patient. This could explain the disagreement and therefore impact sensitivity and NPV. The inclusion of a second orthopedic surgeon into the protocol to independently diagnose the patient would have partly addressed this issue; however, because of feasibility constraints, this was not possible. For the 41 files included, physiotherapists did not once select "other intervention" as a management recommendation, whereas the orthopedic surgeon recommended this outcome for three patients for whom the surgeon believed no intervention was required. For those three cases, the physiotherapists recommended physiotherapy, suggesting physiotherapists may be more inclined to recommend an active treatment approach, regardless of whether the patient's condition appears to be resolving on its own. The small sample size of this pilot study did not allow for calculation of level of agreement per body part. It would, however, be important in future research to determine whether the inter-rater reliability of this screening tool varies depending on anatomy. Future research in this area should ideally include at least two orthopedic surgeons and a larger sample size to further evaluate the effectiveness of physiotherapy-led screening of EMRs for patients referred to orthopedic surgery.

Conclusion

The results of this pilot study support the use of physiotherapy-led screening of EMRs to determine whether patients would benefit from conservative management or orthopedic intervention, provided that patients who receive conservative management are monitored to ensure they access orthopedic services if warranted. Training on the use of the screening tool to promote standardized application and consistency of treatment recommendations should also be taken into consideration. To improve the use of screening, further clarification on when to recommend diagnostic investigations is required. EMR screening by physiotherapists is a promising strategy in identifying musculoskeletal disorders that would be more appropriately managed with conservative treatment rather than orthopedic intervention; however, further research in this area is required.

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COMPETING INTERESTS

The authors have nothing to disclose.

CONTRIBUTORS

Mallory Pike helped select the research questions, data set, conceive the study design, and conducted the literature search, collected data, analyzed the results, and drafted the manuscript. Lucie Campagna-Wilson collected data, helped analyze results, collected data and edited and revised the manuscript. Authors Kim Sears, Robert Warren and Douglas Legay helped conceive the design of the study and edited and revised the manuscript. Daniel Trudel helped select the research question, data set, and conceive the study design as well as edited and revised the manuscript. All authors approved the final version submitted for publication.

ETHICS APPROVAL

This study was approved by the Queen's University Health Sciences and Affiliated Teaching Hospitals Research Ethics Board.

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PEER REVIEW

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APPENDIX A

Table A1. Inclusion/exclusion criteria for orthopedic consult

Inclusion Criteria — Appropriate for Referral	Exclusion Criteria — Not Appropriate for Referral
Patient's condition is not improving with rehabilitation, including an appropriate active treatment protocol that the patient has been compliant with; when treated by in-house Phys Rehab services in the past six (6) months;	Patient has not received appropriate diagnostic imaging (DI) - refer to *Specific conditions appropriate for surgical consult by orthopaedic surgeon by body part* (Appendix C) for specific imaging requirements;
Patient's condition is listed in the *Specific conditions appropriate for surgical consult by orthopaedic surgeon by body part* (Appendix C);	Patient is being referred to fracture clinic. In this case the patient is not applicable for ReMAP and should be sent directly to the fracture clinic, no screening necessary;
Evidence of complete rupture of a structure;	Patient's condition is more suited for an in-house Physiatry referral (e.g. requires procedures such as prolotherapy or corticosteroid injection).
Follow-up from previous consult (e.g. hardware removal, post-op follow up)	

Table A2. Specific conditions appropriate for surgical consult by orthopaedic surgeon by body part

Shoulder	
Basic DI required	X-ray AP, axillary, and Y views
GH dislocation	
First dislocation for overhead athlete or patient with overhead work requirements	
First dislocation with recurring episodes of subluxation and pain	MRA required
Dislocation with glenoid damage more than 2-5 mm	if bone loss CT with 3D reconstruction required
Recurrent dislocation with prior repair	if bone loss CT with 3D reconstruction required
Supraspinatus/general rotator cuff	
Calcific tendonitis, bursitis/tendonitis, chronic tendinopathy without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months, NSAIDs ± injection	
Acute injury, patient over 35 y/o and presence of mechanism of injury (urgent referral)	MRI required
Grade 1 or 2 tear with limited function and without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months	MRI required
Grade 3 tear	MRI required
OA	
Moderate to severe OA with limited ROM	
OA with adequate ROM but unresponsive to active rehabilitation protocol after 3-6 months, NSAIDs ± injection	
Other	
AC joint injury without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months, NSAIDs ± injection	X-ray AC joint view required
Labral tear without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months and NSAIDs	MRA required
Frozen shoulder: • In frozen and thawing phases without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months and NSAIDs • In freezing phase consider urgent referral for cortisone injection	

(*Continued*)

Table A2. (Continued)

Elbow	
Basic DI required	X-ray AP, lateral, and oblique views
Tendinopathy or grade 1 or 2 tear without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months, NSAIDs ± injection	MRI required
Instability (dislocation or recurrent subluxation)	MRI required for recurrent injury
Loose body with limited function and ROM	
Olecranon bursitis or spur without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months and NSAIDs	
OA with limited function and ROM without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months and NSAIDs	
Wrist and Hand	
Basic DI required	X-ray AP, lateral, and oblique views
Scaphoid fracture not healing properly after 4 months	Scaphoid and fist views required
Tendinopathy or grade 1 or 2 tears (ECU, De Quervain) without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months and NSAIDs ± injection	
OA with limited function and ROM without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months and NSAIDs	
Conditions to refer directly to plastic surgeon	
Chronic carpal tunnel syndrome without significant change to recorded outcome measures with conservative management after 3 months	
Trigger finger affecting function	
Dupuytren's contracture affecting function	
Hip and pelvis	
Basic DI required	X-ray AP pelvis, frog leg, and Dunn views
Intraarticular: femoro-acetabular impingement (FAI) or labral tear without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months and NSAIDs	MRA required
Periarticular: • trochanteric bursitis, muscle strain, tendinopathy or grade 1 or 2 tendon tear (adductor, hamstring, RF, sartorius) without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months and NSAIDs • acute hamstring tear from ischium (urgent referral)	MRI required
SI joint injury without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months and NSAIDs	X-ray Lx spine and SI jt required no frog leg or Dunn views required
OA with limited function and ROM without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months and NSAIDs	no frog leg or Dunn views required

(*Continued*)

Table A2. (Continued)

Knee	
Basic DI required	X-ray standing AP and lateral views
Tendinopathy or grade 1 or 2 tendon tear (patellar tendon, quadriceps, ITB) or PFS without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months and NSAIDs	X-ray skyline view required if PFS
Grade 1 or 2 ACL, PCL, LCL, MCL sprain or meniscus tear without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months and NSAIDs	MRI required
Grade 3 ACL, LCL, MCL sprain	MRI required
Acute meniscus tear causing knee locking, catching, spasm and/or major effusion (urgent referral)	MRI required (if possible)
Patella dislocation or recurrent subluxation without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months and NSAIDs	X-ray skyline view required
OA with limited function and ROM without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months and NSAIDs	X-ray flexed knee view required X-ray skyline view required if patellofemoral OA
Ankle and Foot	
Basic DI required	X-ray ankle AP, lateral, and oblique views
Tendinopathy or grade 1 or 2 tendon tear (tibialis posterior, tibialis anterior, peroneal tendons) without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months and NSAIDs	
Grade 3 tear of tendon or ligament with instability (ATFL, CFL, deltoid ligaments)	MRI required
OA with limited function and ROM without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months and NSAIDs	
Arch problems, Morton's neuroma, metatarsalgia without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months and NSAIDs	X-ray foot required
Bony deformity not managed by 3-6 month trial of orthotics	X-ray foot required
Spine - cervical and lumbar	
Basic DI required	X-ray AP, lateral, and oblique views
Pain and likely partial/full disc herniation with radiculopathy (including weakness and numbness)	MRI or CT required
Radiating pain to extremities without significant change to recorded outcome measures with active rehabilitation protocol after 3-6 months and NSAIDs	

RESEARCH

The prevalence rate of smoking among Veterans: A forgotten epidemic

Salome K. Mshigeni[a], Champagne Moore[a] and Nicole L. Arkadie[b]

ABSTRACT

Introduction: The prevalence of smoking is documented in the general population; however, few studies have explored the prevalence of smoking among U.S. Veterans. Smoking is a risk factor for many chronic diseases, increasing the risk of heart disease, cancer, and other illnesses. Three out of 10 U.S. Veterans use tobacco, a much higher rate than non-Veterans across all age groups. This study describes the significant health burden of cigarette smoking among U.S. Veterans. **Methods:** This study used secondary data from the 2017 California Health Interview Survey to estimate the prevalence of smoking among Veterans and non-Veterans. Descriptive statistics and Pearson's chi-square cross-tabulation tests were conducted to identify differences between Veterans and the general population. **Results:** A significant relationship between smokers who consumed 100 or more cigarettes in their lifetime and Veteran status was found, meaning a greater proportion of smokers were Veterans. **Discussion:** Although the prevalence of smoking among California residents has declined in recent years, public health professionals have opportunities to further intervene using evidence-based practices to assist the Veteran population with smoking cessation. This study proposed four evidence-based clinical practice models, cognitive behavioral therapy, cognitive processing, mindfulness-based stress reduction, and biofeedback, to treat nicotine dependence in conjunction with the traditional 3A cessation model — ask, advise, and refer. It is also recommended that Veterans seek individual or group therapy services that utilize cognitive behavioral therapy to promote smoking cessation. Clinicians have a responsibility to address smoking with Veterans, assist them in quitting, and provide them with referrals to smoking cessation programs that work best for this population.

Key words: cigarettes, non-Veterans, prevalence rate of smoking, smoking, smoking cessation, U.S. Veterans, Veterans

RÉSUMÉ

Introduction : La prévalence du tabagisme est attestée dans la population générale, mais peu de données portent sur les vétérans américains. Le tabagisme est un facteur de risque de nombreuses maladies chroniques, intensifiant le risque de cardiopathies, de cancers et d'autres maladies. Trois vétérans américains sur dix consomment des produits du tabac à un taux beaucoup plus élevé que les non-vétérans de tous les groupes d'âge. La présente étude expose le risque important que représente la consommation de cigarettes chez les vétérans américains. **Méthodologie :** La présente étude fait appel à des données secondaires tirées de la *California Health Interview Survey* (enquête par entrevue sur la santé de la Californie) de 2017 pour évaluer la prévalence de tabagisme chez les vétérans et les non-vétérans. Les chercheurs ont procédé à des statistiques descriptives et des tests de tabulation croisée par chi carré de Pearson pour démontrer les disparités entre les vétérans et la population générale. **Résultats :** Il y avait une relation significative entre les fumeurs qui avaient consommé au moins 100 cigarettes au cours de leur vie et le statut de vétéran, et donc une plus forte proportion de fumeurs vétérans que non-vétérans. **Discussion :** Même si la prévalence du tabagisme chez les résidents de la Californie a diminué ces dernières années, les professionnels de la santé publique ont des possibilités d'intervenir davantage par des pratiques fondées sur des données probantes pour aider la population de vétérans dans ses efforts d'abandon du tabagisme. La présente étude a proposé quatre modèles de pratique clinique fondés sur des données probantes – la thérapie cognitivo-comportementale, le traitement cognitif, la réduction du stress fondée sur la pleine conscience et la rétroaction biologique (*biofeedback*) – afin de traiter la dépendance à la nicotine, conjointement avec le modèle de cessation habituel (demander, conseiller et organiser le suivi). Il a également été recommandé que les vétérans obtiennent des services de thérapie individuelle ou de groupe axés sur la thérapie cognitivo-comportementale pour appuyer l'abandon

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du tabac. Les cliniciens ont l'importante responsabilité de parler de tabagisme, de favoriser l'abandon du tabac et d'orienter leurs patients vers les programmes d'abandon du tabagisme qui fonctionnent le mieux dans cette population.

Mots-clés : abandon du tabagisme, cigarettes, non-vétérans, prévalence du tabagisme, tabagisme, vétérans, vétérans américains

LAY SUMMARY

The purpose of this study was to learn more about the smoking habits of U.S. Veterans compared with the rest of the population and to find the best ways to help Veterans quit smoking. This study found that Veterans tend to smoke more than the general population and that some groups of Veterans smoke more than others. When helping Veterans to quit smoking, health care providers should use approaches that are based on evidence, such as cognitive behavioral therapy, cognitive processing therapy, mindfulness-based stress reduction, and biofeedback in addition to the traditional 3A cessation model (ask, advise, refer).

INTRODUCTION

The prevalence of smoking is well documented in the U.S. general population; however, not much is known about cigarette smoking among U.S. Veterans. Smoking is a known risk factor in at least 30% of deaths from cancer and nearly 80% of all cases of chronic obstructive pulmonary disease, which can lead to premature deaths.[1] According to the National Cancer Institute (NIH), smoking is a key risk factor for many chronic diseases when combined with other unhealthy conditions such as elevated cholesterol, high blood pressure, and obesity.[2] Smoking also increases the risk of heart disease and cancer as well as other serious diseases.[2] Furthermore, tobacco use in the military has been linked to poor training performance, early discharge, and poor health.[3] Cigarette smoking is the leading causes of preventable morbidity and mortality in the United States, with one-third of smokers addicted to nicotine.[4,5]Overall, Veterans experiencing health disparities face system-wide barriers to accessing needed smoking cessation services.

Three out of 10 U.S. Veterans use tobacco, a much higher rate than non-Veterans across all age groups, and numbers are higher among active-duty service members.[1,6] Further, research suggests that cigarette smoking is associated with certain socioeconomic factors (e.g. the uninsured are 60.1% more likely and those living in poverty 53.7% more likely to smoke than the general population). Within Veteran subgroups, tobacco use was higher among Veterans who were Hispanic, aged 18-25 years, non-high school graduates, living in poverty, without health insurance, and experiencing serious psychological distress.[6] Hence, evidence-based interventions for specific groups of Veterans should be used to successfully address nicotine dependency. Data from the 2017 California Health Interview Survey (CHIS), the nation's largest state health survey and a critical source of data on Californians, was used. Demographic characteristics were compared between Veterans and non-Veterans in relation to their smoking patterns to identify disparities. Evidence-based strategies to reduce the gaps between Veteran subgroups, while addressing their needs, are provided.

Study purpose

The purpose of this study was to add knowledge to the existing body of literature on the importance of addressing smoking among U.S. Veterans and to provide implications for clinical practice by recommending the use of an integrated treatment approach to improve smoking cessation in this population. This study aimed to draw attention to a forgotten epidemic by comparing the prevalence of smoking among Veteran and non-Veteran subgroups. In addition, it was proposed to implement the use of evidence-based clinical practice models of cognitive behavioral therapy (CBT), cognitive processing therapy (CPT), mindfulness-based stress reduction (MBSR), and biofeedback interventions for healthcare professionals to incorporate in smoking cessation efforts, in conjunction with the traditional 3A cessation model: ask, advise, refer. The traditional practice has been effective in reducing cigarette smoking in the United States through utilization of Quitline services.[7] The authors also sought to highlight the impact of smoking on the overall health and well-being of U.S. Veterans, in comparison to non-Veterans, and provide recommendations for cessation interventions and future studies.

Literature review

Reducing health disparities and attaining health equity is an overarching goal of the Healthy People 2020 initiative, which is supported by many public health agencies.[8,9] Previous studies have found out that 48% of non-Veterans reported cigarette use compared with 74% of Veterans.[10] Additional studies found that Veterans deployed to Iraq and Afghanistan had higher rates of smoking (45% higher than the general population), which suggests that service members exposed to combat were at a higher risk of smoking than the general population.[3,10] Furthermore, many service members claim they started smoking tobacco after they joined the military as a means to relieve stress, alleviate boredom, and calm down.[11]

The same study suggested that mental health disorders related to combat played a role in cigarette smoking.[11] Another study of post-9/11 deployed Veterans found that current tobacco use and dependence was associated with the clustering of current posttraumatic stress disorder (PTSD), depressive disorders, and clinically significant pain.[12] Additional studies suggested there was a correlation between smoking and PTSD, as exposure to trauma resulting in PTSD doubled the risk of smoking for these Veterans.[12]

The prevalence of smoking-related health conditions is high among Veterans. Yet, data on various methods of tobacco use among Veterans is limited, except for cigarette use. A five-year national survey on drug use found that 29.2% of U.S. Veterans reported current use of tobacco, with 7% using multiple products.[6] Veterans are more likely to report poor health and experience multiple chronic health conditions than non-Veterans.[11] Veteran patients who smoke have more financial difficulties and greater medical and psychiatric comorbidities than non-smoking Veterans.[13] These disparities highlight the need to incorporate a more integrated treatment approach to aid Veterans in smoking cessation.

Although Veterans are interested in cessation programs, there is a lack of recent data on their reasons for wanting to quit, perceived barriers to effective cessation treatment, and treatment preferences.[10] A study involving U.S. Veterans who served in Iraq and Afghanistan reported that they identified smoking as part of military culture.[10] There is a need to change existing cessation programs to include consideration of the stressors of deployment, combat exposure, depression, PTSD symptoms, and alcohol consumption as they relate to cigarette smoking among Veterans.[3] Behavioural, situational, and environmental triggers make it difficult for many Veterans to quit smoking.[10] Cessation classes with flexible scheduling, free nicotine replacement therapy options, and peer support would be most effective and desirable for Veterans.[10] Additionally, interventions that include the implementation of tobacco-free policies at military institutions and Veterans Affairs medical facilities would be beneficial.

METHODS

This study used secondary data from the 2017 CHIS that was collected monthly on a wide range of health topics through a random-digit dial telephone survey system. The dataset provides a representative sample of the diverse population of California. Institutionalized persons were excluded owing to lack of phone access. CHIS data has been shown to be valid and reliable, when compared with other state surveys, and has been approved as exempt research by the institutional review board.

Descriptive analysis was conducted on key variables to describe the sample. The variables of interest were categorical or ordinal in nature. The dataset had a complex survey design with sample weighting that helped to estimate the effect of sampling error due to non-random sampling procedures. Replicate weights were created by the CHIS to account for sampling design and were applied to this dataset using the *xi svy* command in Stata, version 16. A jackknife variance estimation procedure was used to estimate the standard errors given the sample design.[14] Descriptive statistics of the variables of interest were assessed using this procedure, and standard errors of the estimate (SEE) are provided. All demographic and smoking variables were compared between the Veteran and non-Veteran populations using Pearson's chi-square cross-tabulations. However, within the design effect framework using sample weights and variance estimation procedures, all cross-tabulations are reported using the Pearson design-based *F*-statistic to assess the statistical significance of the test. The data was entered into IBM SPSS, version 26.0 (IBM Corp., Armonk, NY) and analysis was conducted in Stata.[15,16] The alpha level was set at .05.

RESULTS

The overall sample consisted of 21,055 participants. Veteran status was categorized into two groups: those who said "yes" they were Veterans and those who said "no." There was no further inquiry into their current Veteran status (i.e., whether they were active-duty or retired service members). Cross-tabulations using Pearson's chi-square were conducted to examine the relationship between demographic variables and Veteran status, with the goal of identifying smoking-related disparities. Sample and population percentages based on weighted sampling were evaluated and are reported in Table 1. Due to the use of sample weights, the Pearson cross-tabulation uses a design-based *F*-statistic that is reported rather than the uncorrected chi-square value. The relationship between

Table 1. Frequencies and percentage of the sample and population estimates for demographic variables between Veterans and non-Veterans

Variables	Non-Veterans				Veterans				*p*-value
	N	Sample %	Pop. %	SE	N	Sample %	Pop. %	SE	
Gender									< 0.001
Female	11551	61.5	54.3	0.3	197	8.7	11.7	1.9	
Male	7237	38.5	45.8	0.3	2070	91.3	88.3	1.9	
Age, y									< 0.001
18-25	1965	10.5	15.6	0.3	33	1.5	3.8	2.7	
26-29	759	4.0	7.3	0.4	45	2.00	4.8	1.1	
30-34	1029	5.5	10.6	0.2	58	2.6	8.7	2.2	
35-39	1025	5.5	8.1	0.3	33	1.5	4.4	1.2	
40-44	1101	5.9	9.3	0.3	55	2.4	4.9	1.5	
45-49	1225	6.5	8.7	0.3	61	2.7	3.6	0.9	
50-54	1653	8.8	8.9	0.2	100	4.4	5.4	1.2	
55-59	1806	9.6	7.3	0.4	129	5.7	6.3	1.7	
60-64	2015	10.7	8.7	0.4	192	8.5	13.2	2.5	
65-69	2074	11.00	6.1	0.3	368	16.2	11.3	1.7	
70-74	1472	7.8	3.6	0.2	361	15.9	10.9	1.6	
75-79	1147	6.1	2.8	0.3	278	12.3	7.1	1.2	
80-84	824	4.4	1.8	0.2	269	11.9	8.9	1.5	
≥85	693	3.7	1.4	0.1	285	12.6	6.7	1.00	
Race									< 0.001
Single race	2249	12.00	16.1	0.8	91	4.0	7.9	1.9	
AI/AN	420	2.2	2.2	0.3	57	2.5	1.9	0.5	
Asian	2721	14.5	16.1	0.3	156	6.9	5.1	1.2	
African American	997	5.3	6.5	0.3	127	5.6	6.5	1.1	
White	11878	63.2	56.4	0.7	1771	78.1	75.7	2.3	
More than one	523	2.8	2.8	0.2	65	2.9	3.00	0.9	
Poverty									0.002
0-99% FPL	3338	17.8	18.3	0.8	155	6.8	7.7	1.5	
100-199% FPL	3580	19.1	19.1	0.7	316	13.9	14.7	3.0	
200-299% FPL	2387	12.7	13.4	0.8	312	13.8	13.5	2.1	
300% FPL	9483	50.5	49.3	0.9	1484	65.5	64.1	3.2	
Employment status									< 0.001
Full-time	7980	42.5	55.0	0.9	576	25.4	41.7	3.4	
Part-time	1668	8.9	9.6	0.7	137	6.0	5.9	2.1	
Other employed	53	0.3	0.3	0.1	7.0	0.3	0.2	0.2	
Looking for work	757	4.0	5.5	0.5	35	1.5	2.8	0.9	
Not looking	8330	44.3	29.6	0.9	1512	66.7	49.4	3.7	
Psychological distress in past year									0.16
No	17234	92.9	91.9	0.4	2102	94.6	93.3	0.9	
Yes	1459	7.8	8.2	0.4	121	5.4	6.7	0.9	

(*Continued*)

Table 1. (Continued)

Variables	Non-Veterans				Veterans				*p*-value
	N	Sample %	Pop. %	SE	N	Sample %	Pop. %	SE	
Psychological distress in past month									0.89
No	17943	96	96.1	0.4	2146	96.5	96.0	0.9	
Yes	750	4.0	3.9	0.4	77	3.5	4.0	0.9	
Currently insured									<0.001
No	1270	6.8	9.9	0.7	37	1.6	2.0	0.8	
Yes	17518	93.2	90.1	0.7	2230	98.4	98.0	0.8	

Note: The *p*-value is the result of the Pearson's design-based *F*-statistic test.

FPL = federal poverty level; AI = American Indian; AN = Alaskan Native.

gender and Veteran status was significant ($F_{1,78} = 192.72$; $p < 0.001$). The proportion of non-Veteran participants who were female was greater (54.3% [SEE .3%]) than the proportion of Veterans who were female (11.7% [SEE 1.9%]). Conversely, the proportion of male Veteran participants (88.3% [SEE 1.9%]) was greater than the proportion of non-Veteran male participants (45.8% [SEE 0.3%]). There was a significant relationship between Veteran status and age ($F_{5.94, 462.98} = 12.45$; $p < 0.001$). The proportion of non-Veteran participants aged 18-25 years (15.6% [SEE 0.3%]) was greater than Veteran participants aged 18-25 years (3.8% [SEE 2.7%]).

Conversely, the proportion of Veteran participants aged 70-74 years (10.9% [SE 1.6%]) was greater than participants in this age range who were not Veterans (3.6% [SEE 0.2%]). Similarly, the proportion of Veteran participants aged 80-84 years (8.9% [SEE 1.5%]) was greater than participants in this age range who were not Veterans (1.8% [SEE 0.2%]). Results in Table 1 revealed a significant relationship between race and Veteran status ($F_{4.34, 338.64} = 11.94$; $p < 0.001$). The proportion of Veteran participants who were White (75.7% [SEE 2.3%]) was greater than the proportion of non-Veterans who were White (56.4% [SEE 0.7%]).

Conversely, the proportion of non-Veteran participants who were Asian (16.1% [SEE .3%]) was greater than the proportion of Asian Veteran participants (5.1% [SEE 1.2%]). The proportion of non-Veteran participants who reported being a single other race (16.1% [SEE .8%]) was greater than that of Veteran participants (7.9% [SEE 1.9%]).

Cross-tabulations also revealed a significant relationship between poverty level and Veteran status ($F_{2.66, 207.80} = 7.55$; $p = 0.002$). The proportion of Veteran participants earning 300% above the federal poverty level (64.1% [SEE 3.2%]) was greater than that of non-Veteran participants (49.3% [SEE .9%]). Conversely, the proportion of non-Veteran participants earning 0% to 99% of the federal poverty level (18.3% [SEE .8%]) was greater than Veteran participants earning 0% to 99% of the federal poverty level (7.7% [SEE 1.5%]). Additionally, there was a significant relationship between employment status and Veteran status. Cross-tabulations using design-based *F*-statistics revealed the proportion of Veteran participants who reported being unemployed and not looking for work (49.4% [SEE 3.7%]) was greater than the proportion of non-Veteran participants who reported the same (29.6% [SEE 0.9%]; $F_{3.12, 243.15} = 10.11$, $p < 0.001$). Conversely, the proportion of non-Veteran participants who reported being full-time employed (55.0% [SEE 0.9%]) was greater than the proportion of non-Veteran participants who reported full-time employment (41.7% [SEE 3.4%]).

Lastly, a significant relationship was found between current insurance status and Veteran status ($F_{1,78} = 20.21$; $p < 0.001$), with 98% of the Veterans reporting "yes" to having insurance. . The proportion of non-Veteran participants who reported having no insurance (9.9% [SEE 0.7%]) was greater than that of Veteran participants (2.0% [SEE 0.8%]), implying that Veterans are more likely to have health coverage than non-Veterans. There was no significant relationship found between Veteran status and psychological distress in the last year or psychological distress in the past month.

A series of Pearson's cross-tabulations using design-based *F*-statistics were used to evaluate the relationship between Veteran status and dependent variables related to smoking habits (Table 2). There was a significant relationship found between smoking over 100 cigarettes in a lifetime and Veteran status ($F_{1,78} = 35.90$; $p < 0.001$). The proportion of Veteran participants who smoked more than 100 cigarettes in a lifetime (53.6% [SEE 4.0%]) was greater than that of non-Veteran

Table 2. Frequencies and percentage of the sample and population estimates for smoking variables between Veterans and non-Veterans

Variables	Non-Veteran				Veteran				*p*-value
	N	Sample %	Pop. %	SE	N	Sample %	Pop. %	SE	
Current smoker									0.158
No	16718	89.0	88.4	0.6	1986	87.6	85.2	2.5	
Yes	2070	11.0	11.7	0.6	281	12.4	14.8	2.5	
Smoked ≥100 in lifetime									< 0.001
No	12124	64.5	68.0	1.0	939	41.4	46.5	4.0	
Yes	6664	35.5	32.0	1.0	1328	58.6	53.6	4.0	
Frequency of cigarette smoking									0.329
Not at all	4594	68.90	63.6	1.5	1047	78.8	72.4	4.5	
Some days	661	9.9	13.9	1.5	62	4.7	10.4	4.7	
Every day	1409	21.1	22.5	1.6	219	16.5	17.3	3.2	
No. of cigarettes smoked per day in 30 days									0.338
None	20	3.0	5.0	2.6	1	1.6	0.9	1.5	
1	141	21.3	26.7	5.2	9	14.5	56.4	23.3	
2	139	21.0	22.0	3.9	12	19.4	11.0	8.4	
3	113	17.1	15.2	3.1	12	19.4	11.6	6.1	
4	63	9.5	6.8	2.1	5	8.1	4.8	4.6	
5	81	12.3	9.6	2.3	6	9.7	5.6	6.9	
6-10	73	11.0	8.5	2.5	13	21.0	6.1	4.9	
≥11	31	4.7	6.1	2.1	4	6.5	3.6	4.6	

Note: The *p*-value is the result of the Pearson's design-based *F*-statistic test.

participants (35.5% [SEE 1.0%]). There was no significant relationship found between Veteran status and current smoker status, frequency of cigarette smoking, and number of cigarettes smoked per day ($p > 0.05$ for all).

DISCUSSION

Although the prevalence of smoking among California residents has declined to 11.3% over the past few years,[17] public health professionals have opportunities to further reduce existing disparities among some subgroups of Veterans who continue to smoke. This study compared smoking-related characteristics between Veteran and non-Veteran populations in California, and found disparities with respect to age, gender, race, poverty level, insurance status, and employment status. Hence, there is a need for state and community partners to explore new approaches to address these disparities. However, it must be noted that smoking habits among Californians may differ significantly those of other Americans or citizens of other developed countries.

Despite the availability of statewide smoking cessation programs (e.g. the California Smokers Helpline), disparities in access and treatment still exist, and specific approaches are needed to successfully improve smoking cessation efforts. Although we found no significant relationship between Veteran status and psychological distress, this study encourages the use of smoking cessation interventions for people who have comorbidities, specifically mental health conditions and chronic pain. Face-to-face interactions, as well as telephone-based smoking cessation approaches that tackle other health-related factors, are effective strategies to reduce health disparities.[18]

To alleviate financial disparities that may indirectly affect Veteran health, (e.g., unemployment.) non–health care interventions may be needed. These interventions should include government-led strategies and policies that would discourage the use of tobacco among this vulnerable population. In 2019, Veterans Affairs initiated the VHA Directive 1085, a policy that requires all health care facilities to be completely smoke-free.[19] Other government agencies have since followed their lead. If more policies to prevent tobacco use among Veterans were to be established and enforced, smoking rates among Veterans would fall. Lower rates of smoking among Veterans with co-morbidities will result in lower health care costs.

Limitations

This study had several limitations. First, CHIS data comes from a telephone-based survey and some people may not have access to either a landline or cell phone. Second, the data excludes institutionalized individuals (e.g. those in prison or nursing home facilities), and this may have caused prevalence rates to be underestimated.[1] Third, the data is self-reported, which is subject to recall bias, as 36% of participants were between 65 and 85 years of age. Further, the general assumption is that the longer one lives, the more cigarettes one would have smoked in their lifetime. However, the authors propose that more studies be conducted that explore a correlation between one's age and the number of cigarettes smoked in a lifetime. Fifth, this study did not explore gender differences among Veteran smokers, which could be a potential limitation. A recent study conducted by Danan et al. found that a greater proportion of women Veterans smoked and smoked more cigarettes than non-Veteran women.[20] Although disparities between study groups may introduce bias, this was not explored in depth and is a recommendation for future research. Finally, this study used secondary data that did not ask the number of cigarette packs smoked per year. Instead, participants were asked if they smoked more than 100 cigarettes in their lifetime, a question that could be a less reliable metric for health care professionals.

Implications for practice

Smoking is the leading cause of preventable death in the U.S., killing nearly 500,000 Americans annually.[21-24] This study found a significant relationship between smoking more than 100 cigarettes in a lifetime and Veteran status. Literature suggests Veterans diagnosed with PTSD are more likely to smoke.[12] Additionally, depression and pain have been associated with higher levels of smoking, with 60% of individuals with major depression being lifetime smokers.[12] Current smoking cessation programs do not address the mental health needs of Veterans, which is a contributing factor to health disparities. Addressing the smoking behaviours of Veterans using smoking cessation programs alone has not been effective.[25] Smoking cessation programs for Veterans must first address symptoms of depression, PTSD, chronic pain, and psychological issues that impact overall health.

The use of evidence-based clinical interventions that have been found to be successful in treating individuals who have experienced trauma is recommended. We recommend the practice models of CBT, CPT, MBSR, or biofeedback to treat Veterans' symptoms of PTSD, depression, and chronic pain.[26,27] CBT has been highly successful in reducing symptoms of depression and PTSD and in assisting individuals manage pain.[26-28] CPT has been successful in treating PTSD and depression among Veterans.[29] MBSR has been effective in reducing stress levels, decreasing anxiety, increasing tolerance levels and positive affect, providing greater emotional awareness, and increasing self-compassion and self-care.[30-32]

We recommend Veterans seek individual or group therapy services that utilize CBT as a therapeutic intervention to promote smoking cessation. CBT is a psychotherapy intervention technique that addresses cognitive distortions by focusing on changing maladaptive cognitive thought processes that cause psychological and emotional distress.[27] Veterans who can restructure their negative and fearful belief systems and cognitive processes would be more able to effectively manage daily stressors and emotional distress, thus decreasing their dependence on tobacco.

It is also recommended Veterans use CPT to address depression, PTSD, or other trauma-related symptoms. CPT is a psychotherapy intervention that focuses on cognitive restructuring.[29] Effectively dealing with and reducing traumatic symptoms would decrease Veterans' need or desire to use smoking as a coping tool.

Additionally, it is recommended Veterans use MBSR as an intervention to assist in reducing overall stress levels, depression and anxiety levels, and increase tolerance levels and self-awareness. MBSR is a mindfulness-based therapeutic intervention that teaches individuals to be present in the moment by paying attention to oneself without judgement.[33,34] The use of MBSR as an intervention will assist Veterans in managing stress levels and symptoms of psychological distress, thus reducing dependence on cigarettes as a coping mechanism.

Lastly, it is recommended that Veterans seek biofeedback treatment, a non-pharmacologic intervention that is most often used to treat chronic pain.[35] Biofeedback has been found to be an effective, evidenced-based approach for individuals with chronic pain, PTSD, and severe depression.[35] Biofeedback decreases an individual's stress responses to muscle tension, pain, and helps individuals recognize, understand, and manage mental, emotional, and physical stress responses.[35] People who experience chronic pain have reported using smoking as a coping mechanism.[36] Pain, along with PTSD and depressive symptoms, can be barriers to smoking cessation. The use of the aforementioned evidence-based clinical practice models would help Veterans decrease their dependence on smoking by addressing underlying issues of PTSD, depression, and chronic pain. It is recommended that Veterans attend biofeedback, CPT, MBSR, and CBT sessions, and that Veterans have access more community-based outpatient clinics where they could easily access and seek treatment for nicotine dependency.

In addition to behavioural therapy strategies, the use of proactive smoking cessation interventions and outreach programs traditionally used to help individuals quit smoking, are recommended. For example, each state has a Quitline resource for smokers. Health care professionals are always encouraged to connect their patients with this service. the The Agency for Healthcare Research and Quality recommends health care professionals use an evidence-based method to assess for cigarette smoking, the 3As (ask, advise, refer), and send Veteran patients to Quitlines.[37] This approach has been proven to work for providers and patients, and it can be implemented in less than 90 seconds. Quit clinic resources include over-the-phone or face-to-face counselling sessions and, if needed, medication assistance programs (e.g., gum, patches, or lozenges).[37]

Conclusion

Tobacco kills up to half of its users prematurely.[24] The prevalence of smoking among U.S. Veterans remains high in comparison with the general population. In this study, male Veterans smoked more than their non-Veteran male counterparts and male Veterans were also more likely to smoke than female Veterans. Additionally, a significant relationship was found between Veteran status and smoking more than 100 cigarettes in a lifetime. Overall, these findings demonstrate the burden of smoking among Veteran subgroups, bringing to light an ongoing epidemic.

The use of tobacco products by U.S. Veterans as a strategy for dealing with psychological distress is an area of research that needs to be further explored. Awareness and use of specific evidence-based approaches to address the psychological and physiological needs of Veterans would help decrease smoking dependence. Public health professionals should be aware of the possibility that Veterans may self-medicate with nicotine, as this could impact the efficacy of smoking cessation efforts.

Clinicians have a responsibility to address nicotine dependence, assist in the quitting process, and refer Veteran patients to a smoking cessation program that works best for them. Future studies need to explore the prevalence of smoking among Veteran subgroups and include information on the number of study participants who participated in a smoking cessation program. It is hoped these findings will stimulate a much-needed discussion on how to effectively address disparities related to cigarette smoking for our current and retired Veterans.

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COMPETING INTERESTS

The authors have nothing to disclose.

CONTRIBUTORS

All authors conceived, designed, researched, and drafted the manuscript and approved the final version submitted for publication.

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This study was approved by the California State University San Bernardino Institutional Review Board (IRB-FY2020-170), San Bernardino, California, USA.

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RESEARCH

The voice of the consumer: A survey of consumer priorities to inform knowledge translation among Veterans who use mobility assistive technology

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ABSTRACT

Introduction: Mobility is an important facilitator of community participation and independence. Over 23.9 million Americans use mobility assistive technology (AT) of some kind. Each year, the U.S. Department of Veterans Affairs (VA) provides over 85,000 wheelchairs, scooters, or mobility device components to Veterans. The purpose of this survey was to (1) identify gaps in skills training and knowledge of laws, standards, clinical practice guidelines, and emerging technologies among consumers of mobility AT; (2) identify consumers' preferred information sources; and (3) function as a pilot study to develop a framework for effective research dissemination and knowledge translation to be applied to future work in this area. **Methods:** An online survey assessed participant priorities, awareness of mobility AT, and awareness of mobility AT knowledge sources. Open-ended comments were also collected. Gaps in consumer knowledge and awareness were identified. A k-means clustering algorithm was used to categorize participants according to their responses and characteristics. **Results:** A total of 100 participants, including 82 Veterans living in the United States, completed this survey. The average age of participants was 50.99 (SD 13.89) years, and the majority had been using their mobility AT device for six or more years. The largest knowledge and awareness gaps were identified in the areas of new technologies, AT assessment tools, and clinical practice guidelines. Word-of-mouth and Internet sources were selected as the most important sources of AT information by the largest number of participants. Consumers of mobility AT were classified into four groups, based on how they obtain information on new technologies, what types of information they would like to receive, what type of device they used, and what type of impairment they had. **Discussion:** This survey demonstrated gaps in consumer knowledge with respect to new mobility AT and identified new opportunities for knowledge translation, particularly in Veteran populations. Results suggest the importance of updating dissemination and knowledge translation practices to reflect consumer preferences.

Key words: assistive technology, disability, information dissemination, knowledge translation, mobility, rehabilitation, U.S., Veteran, wheelchair

RÉSUMÉ

Introduction : La mobilité est importante pour favoriser l'autonomie et la participation à la communauté. Plus de 23,9 millions d'Américains ont besoin d'une technologie d'assistance fonctionnelle (TA), et plus de 85 000 vétérans reçoivent un fauteuil roulant, un triporteur ou un dispositif apparenté chaque année. Le présent sondage visait à déceler les lacunes des consommateurs de TA en matière de formation et de connaissance des lois, de normes, de directives cliniques et de technologies émergentes, à établir les sources d'information favorites et à faire office d'étude pilote pour préparer un cadre de diffusion efficace de la recherche et de l'application du savoir en vue des futurs travaux. **Méthodologie :** Les chercheurs ont distribué un sondage en ligne aux participants pour évaluer leurs priorités, leur éveil et leurs sources de connaissances sur les TA. Ils ont également sollicité des commentaires ouverts. Ils ont établi les lacunes des consommateurs en matière d'éveil et de connaissances et utilisé un algorithme de groupement en k-moyennes pour classer les participants d'après leurs réponses et leurs caractéristiques. **Résultats :** Au total, 100 participants, y compris

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82 vétérans habitant aux États-Unis, ont rempli le sondage. Ils avaient un âge moyen de 50,99 ans (ÉT 13,89), et la majorité d'entre eux utilisaient leur TA depuis au moins six ans. Les principales lacunes en matière d'éveil et de connaissances se situaient dans les connaissances des nouvelles technologies, les outils d'évaluation des TA et les directives cliniques. La majorité des participants considéraient le bouche-à-oreille et Internet comme les principales sources d'information sur les TA. Les consommateurs de TA étaient classés en quatre groupes distincts d'après la façon dont ils obtenaient de l'information sur les nouvelles technologies, le type d'information qu'ils souhaiteraient recevoir, l'utilisation des TA et le type d'incapacité. **Discussion :** Le présent sondage a démontré les lacunes en matière de connaissances des consommateurs sur les nouvelles TA et décelé de nouvelles occasions d'application du savoir, notamment auprès des populations de vétérans. D'après les résultats, il est important de mettre à jour les pratiques de diffusion et d'application du savoir pour refléter les préférences des consommateurs.

Mots-clés : application des connaissances, diffusion de l'information, États-Unis, fauteuil roulant, incapacité, mobilité, réadaptation, technologie d'assistance, vétéran(e)

LAY SUMMARY

Mobility assistive technology (AT) can improve the lives of people with disabilities by helping them get around in their communities. Today, over 23.9 million Americans use a wheelchair or assistive device, and over 85,000 wheelchairs, scooters, or other mobility devices are provided to Veterans each year. In order to find out how people learn about AT to improve efforts to disseminate information about AT, a survey of people who use mobility AT was conducted. The majority of people who completed the survey were Veterans (82%). It was determined that these people most often learned about AT through other users and/or from Veterans and the Internet, and that some people wish to receive information in other ways. Researchers can use these findings to better reach the people who could benefit from the new mobility AT they are creating.

INTRODUCTION

When a person with a mobility impairment is able to access mobility assistive technology (AT), their ability to interact meaningfully with their environment, participate in their community, and live as independently as possible is improved. Mobility AT use is prevalent among Americans with disabilities, with a total of 5.5 million Americans using a wheelchair, and 18.4 million Americans using other mobility assistive devices such as canes, walkers, or crutches.[1] Within the Veteran population, over 85,000 wheelchairs, scooters, other mobility aids are provided to Veterans each year.[2,3] Among women Veterans, mobility/independence is the most prevalent concern following a diagnosis of injury or disease.[4] In order to keep up with the demand for mobility AT, and to increase user satisfaction, it is imperative to identify and utilize knowledge dissemination processes that are effective in reaching potential users.

Most evidence on the effectiveness of knowledge dissemination comes from studies involving physicians and in fields other than rehabilitation.[5] A recent literature review, conducted to identify future directions for mobility AT research, noted that involving the consumer in research and development decisions is an important factor in ensuring the user is satisfied with a device.[6] Likewise, studies have shown that involving AT consumers in the development of new technologies minimizes device abandonment.[7] Three manuscripts describing results of surveys of providers and consumers of mobility AT were previously published and described how such results can inform research priorities and address gaps in the provision of AT.[8-10] Providers and consumers identified the need for research in four areas: advanced wheelchair design, robotics and intelligent systems, human machine interfaces, and smart device applications.[9,10] A disparity between provider and consumer experiences regarding knowledge of new products was identified. While providers believed information on new products was easy to find, consumers actually demonstrated gaps in knowledge of new products, and they expressed a desire to be included in the development and distribution of mobility AT. Mobility AT providers and consumers both agreed there was a lack of training on the use and maintenance of their equipment.[9,10]

To address this knowledge and training gap, the authors developed and administered a survey to determine how consumers learn about emerging technology and to assess their knowledge of emerging technology, laws and standards, AT assessment tools, and clinical practice guidelines related to persons with disabilities. The overall aim of this pilot study was to identify specific gaps in consumer knowledge about mobility AT, particularly in Veteran populations, illustrate consumer preferences regarding information sources through a novel use of cluster analyses, and ultimately develop a data-driven dissemination and knowledge translation strategy that could be applied to future work involving larger cohorts.

METHODS

The survey (see Appendix 1) was developed by AT experts at the Human Engineering Research Laboratories (HERL). The survey was designed as a follow-up to earlier studies on consumer and provider priorities in mobility AT. Survey items were selected to represent a number of well-known and lesser-known guidelines and technologies. Questions were developed based on results of an earlier survey on the needs of mobility AT consumers, with the goal of identifying consumer knowledge gaps and opportunities for future study.[8-10] This pilot study was approved by the University of Pittsburgh Institutional Review Board. This survey was administered using the Research Electronic Data Capture (REDCap) system, (Vanderbilt University, Nashville, TN) a secure, web-based software system.

Participants were recruited in person and with flyers, through established contacts and listservs at athletic events; advocacy meetings, and meetings of Veteran service organizations for Veterans and civilians with disabilities; Veteran support groups; health care agencies; hospitals; clinics; government organizations; and universities. Researchers used targeted advertising on social media platforms, in magazines and newsletters, on the radio, and on the HERL website. Referral sampling was used for recruitment; participants were encouraged to distribute recruitment materials to their own networks. On flyers and in advertisements, potential participants were directed to access the survey online, or contact the study coordinator if accessibility was an issue.

In order to meet inclusion criteria for the study, participants must have been 18 years of age or older, a citizen of the U.S., and a user of mobility AT. There were no specific exclusion criteria. Participants were required to complete an online informed consent document prior to accessing the survey.

The survey homepage provided brief instructions on completing the survey. Question formats in the survey were forced-choice questions, with open-ended “other” selections; Likert rating scales; yes or no questions; and purely open-ended questions. Participants were encouraged to respond to questions based on their own opinions. The survey collected basic demographics, information about diagnoses leading to mobility impairment, and prior use of mobility AT.

Participants were asked what information sources they used to find information on mobility AT, and they were able to provide open-ended responses to these questions. They were also asked to identify which source they felt was most important for learning about new mobility AT.

Consumer priorities regarding awareness of and skill in using mobility AT were elicited. Participants were also asked to rate how important it is for their provider to have knowledge of new AT. To determine the skill level of manual wheelchair (MWC) and power wheelchair (PWC) users, a list of PWC and MWC skills was presented to users of these devices. Participants were asked if they could complete each skill and, if yes, whether they had difficulty with it. In order to gauge consumer awareness of new or emerging technologies, laws and standards, clinical practice guidelines, and clinical assessment tools, many of which were developed at HERL, participants were presented with examples and asked whether they were aware of each. Participants were also asked if they had used a variety of mobility AT devices developed at HERL. To conclude the survey, participants were asked to identify types of mobility AT about which they needed more information. Respondents were then presented an open-ended section that allowed them to add additional thoughts or opinions.

Statistical analysis

Frequency counts, proportions (percentage of total responses), means, ranges, and standard deviations were used to report descriptive statistics for multiple-choice items. For open-ended sections and questions, responses were categorized and counted. Gaps in MWC and PWC users’ skills and consumer knowledge and awareness of mobility AT, laws and standards, clinical practice guidelines, and assessment tools were defined as minimal (≤25% unable to execute skill or knowledgeable about the item), moderate (26%-74% unable to execute skill or knowledgeable about the item), and large (≥75% unable to execute skill or knowledgeable about the item).

A k-means clustering algorithm using IBM SPSS Modeler version 18.1 (IBM Corp., Armonk, NY) was used to classify survey respondents according to their responses to survey questions such as “Where do you find information on assistive technology?” and “Do you feel that you need more information/education on any of these mobility technologies?” as inputs into the model. The k-means algorithm uses a partitioning (i.e. non-hierarchical) solution to identify similar groups of consumers (clusters) based on selected characteristics by calculating distances from a cluster center, and those with similar distances are clustered together. Multiple cluster solutions were randomly selected, and four clusters were found to best fit the data, according to cluster size and predictor importance. For example, a five-cluster solution resulted in clusters containing the following proportion of respondents: 57% (cluster 1), 1% (cluster 2), 13% (cluster 3), 1% (cluster 4), and 28% (cluster 5); whereas a 4-cluster solution resulted in the following distribution: 46% (cluster 1), 11% (cluster 2), 14% (cluster 3), and 29% (cluster 4). The five-cluster solution identified two segments (2 and 4) in which the respondent size was too small to provide meaningful results. Once the clusters were identified according to the four-cluster solution, frequency counts and analyses were performed on each cluster according to the differentiating variables and demographics not included in the model. These counts were used to create a profile of each cluster, delineated by which information source the respondent preferred.

RESULTS

Data from the first 100 survey participants were included in the analysis. Figure 1 depicts the inclusion and exclusion process.

Table 1 details the demographic characteristics of participants. The average age of respondents was 50.99 (SD 13.89; range 18-82) years, and they lived in 27 different states. The majority were male (n = 74). A total of 82 were Veterans, 79 of whom received their assistive devices through the U.S. Department of Veterans Affairs (VA).

Diagnoses of the participants are detailed in Table 2. Spinal cord injury (SCI) was the largest diagnostic group comprising 46 participants. Of those, 26 (57%) reported paraplegia, and 20 (43%) reported tetraplegia. When asked about the completeness of their SCI, 31 participants (67%) reported their injury as complete, while 15 (33%) reported an incomplete SCI.

When asked to rate the importance of personal knowledge of mobility AT, provider knowledge of mobility AT, and skill in using their mobility AT device, the majority of participants felt each was important or critical (see Table 3). Of the 100 participants, 49 reported being MWC users, while 28 reported being PWC or scooter users. The majority of participants (63) were mobility AT users for six years or more (Table 4). When asked to record their ability to perform various wheelchair skills,

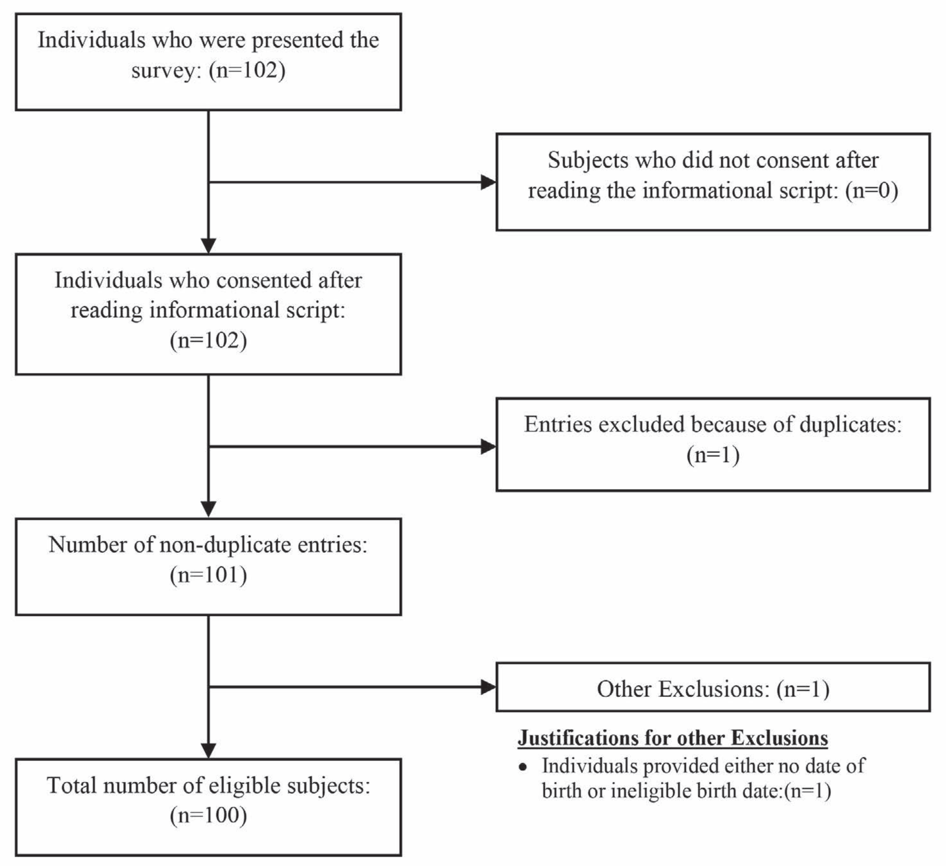


Figure 1. Exclusion flowchart

Table 1. Participant demographics (N = 100)

	No. of respondents
Race	
Asian	3
Black or African American	14
Native Hawaiian or other Pacific Islander	1
Prefer not to answer	1
Two or more races	11
White/Caucasian	67
Other	3
Ethnicity	
Hispanic or Latino	11
Not Hispanic or Latino	85
Prefer not to answer	4
Gender	
Female	24
Male	74
Non-binary/third gender	1
Other: "human"	1
Highest level of education	
Associate's degree	34
Bachelor's degree	21
Doctorate-level degree (MD, DO, PhD, etc.)	4
High school diploma or equivalent (GED)	24
Master's degree	17
Employment status	
Employed full-time (≥40 h/wk)	14
Employed part-time (<39 h/wk)	6
Retired	45
Self-employed	3
Student	8
Unable to work	14
Unemployed and currently looking for work	3
Unemployed and not currently looking for work	7
Household income, US$	
<$15,000	10
$15,000-$24,999	11
$25,000-$49,999	14
$50,000-$74,999	17
$75,000-$100,000	16
>$100,000	13
I don't know	9
I prefer not to answer	10
Community setting	19
Rural (country)	40
Suburban	41
Urban (city)	
Veteran or currently serving?	
No	18
Yes	82
Do you receive assistive devices through VA?	
No	3
Yes	79

GED = general education diploma; VA = Veterans Affairs.

the majority of MWC users could complete every wheelchair skill, and the skill with which participants reported the most difficulty was getting themselves and their MWC down a flight of stairs using the handrail (detailed responses in Table 5). Of the 28 participants who reported using a PWC or scooter, the only skill with which more than two participants reported difficulty was operating the battery charger for their PWC or scooter (8 participants; 29%). Maneuverability was also an issue for some, with 7 participants (25%) responding that they had difficulty driving their PWC or scooter around a corner while moving backwards.

Awareness

In order to get a better understanding of consumer awareness, a ranking system was created for identifying the severity of participants' gaps in awareness of new mobility AT, laws and standards, clinical practice guidelines, and assessment tools. Table 6 outlines participant awareness of and experience with using new and emerging technology and identifies gaps in awareness among participants and the level of gap. Notably, the highest levels of awareness and use of new technologies were reported for the Natural-Fit Handrim, the Surge Handrim, the Programmable Power Wheelchair Joystick, and the VARILITE Cushion. Consumers also reported which types of AT they needed more information on. Results are outlined in Table 7.

The same gap ranking system was used to better illustrate the gaps in participant awareness of laws and standards, clinical practice guidelines, and AT assessment

Table 2. Participant diagnoses (N = 100)

	No. of respondents
ALS	1
Cerebral palsy	2
Ehlers Danlos syndrome	2
General debility	1
Huntington's disease	1
Leukodystrophy	1
Lower extremity amputation or congenital limb loss	12
Multiple hereditary exostoses	1
Multiple sclerosis	15
Muscular dystrophy	4
Osteo/rheumatoid arthritis	4
Osteogenesis imperfecta	2
Peripheral neuropathies	5
Spina bifida	–
Spinal cord injury/transverse myelitis	47
Tetraplegia or quadriplegia (C1-C8), (%)	20 (42.6)
Paraplegia (T1 and below), (%)	26 (55.3)
Complete, (%)	15 (31.9)
Incomplete, (%)	31 (66.0)
Stroke	2
Traumatic brain injury	11
Upper extremity amputation or congenital limb loss	—
Visual impairment	2
Was your injury traumatic or non-traumatic?	
Traumatic	56
Non-traumatic	8
Not applicable	36

Note:Participants could choose more than one diagnosis.

ALS = amyotrophic lateral sclerosis.

tools related to persons with disabilities (Table 8). Notably, of the laws and standards, the *Americans with Disabilities Act* (ADA) accessibility guidelines were the most familiar to participants, with 91 noting awareness. The majority of participants were unaware of all AT assessment tools and clinical practice guidelines. The most familiar guideline was "Bladder Management for Adults with Spinal Cord Injury," with 48 participants reporting awareness, 29 of whom listed SCI/transverse myelitis as their primary diagnosis.

Knowledge sources and importance

Table 9 details the information sources selected by participants. When asked to report sources used to find information on AT, the majority of participants selected family/friends using AT, events, physical therapists (PTs) or occupational therapists (OTs), and Internet sources.

When presented specific examples of Internet-based, non-social media sources, participants most frequently used the open-ended option to report a Google search. Of the social media sources presented, Facebook was the most used site. The National Disabled Veterans Winter Sports Clinic was the most popular event, selected by the majority of participants. *PN Magazine* was the most popular magazine choice. Interestingly, only three conferences were selected by more than one participant: The Paralyzed Veterans of America (PVA) Summit, Rehabilitation Engineering and Assistive Technology Society of North America Conference (RESNA), and the International Seating Symposium (ISS). In open-ended responses, 32 participants noted additional sources, which were recategorized and grouped. For example, many participants wrote in word-of-mouth-related sources, such as other Veterans, peers, and acquaintances, and these were grouped under word-of-mouth sources.

Responses to an open-ended question asking which information source participants felt was most important

Table 3. Importance of consumer and doctor knowledge of assistive technology (AT) and personal skill using AT (N = 100)

"How important is it for you to . . ."	No. of respondents			
	Critical	Important	Minor importance	Not important
Know about new AT?	42	49	7	2
Know your doctor or healthcare provider is aware of new AT?	58	29	11	2
Be skilled at using their own personal assistive device?	79	20	1	—

Table 4. Primary assistive mobility device and length of time using device (N = 100)

	No. of respondents
What assistive mobility device do you use most of the time?	
Assistive device (cane, crutch, walker)	16
Lower extremity orthosis	1
Lower extremity prosthesis	4
Manual wheelchair	51
Power wheelchair	23
Scooter	5
How long have you been using this device?	
≤1 year	2
2-5 years	35
6-10 years	18
11-15 years	14
> 15 years	31

to learning about AT, were categorized into nine groups: clinicians, events, Internet sources, magazines, manufacturers, research studies, social media sources, suppliers, and word-of-mouth sources. These results are detailed in Table 10. The word-of-mouth group included friends, family, peers, other Veterans, and people generally and was identified as the most important source of information by the largest number of participants.

Consumer groups

Four groups (clusters) of consumers of mobility AT were identified, delineated by variables regarding their preference of information source (Figure 2).

In addition to information sources, the clusters differed in terms of income, education, length of mobility AT use, injury/diagnosis, age, and military status. Due to the small sample sizes of clusters 2 and 3, only differences between clusters 1 and 4 are reported. The most evident differences between clusters 1 and 4 occur in the

Table 5. Power and manual wheelchair skills ability (N = 100)

	No. (%) of respondents				Gap level
	No	Yes, with difficulty	Yes	Not applicable	
Manual wheelchair skills; n = 49					
Can you perform a 30 second wheelie balancing a manual wheelchair on its rear wheels?	15 (31)	5 (10)	28 (57)	1 (2)	Moderate
When using a manual wheelchair, can you get yourself and the wheelchair down a short flight of stairs using the handrail?	22 (45)	5 (10)	17 (35)	5 (10)	Moderate
With your manual wheelchair, are you able to climb up a 4-inch curb?	17 (35)	10 (20)	21 (43)	1 (2)	Moderate
Are you able to get yourself up from the ground into your manual wheelchair, for example, after a fall?	8 (16)	8 (16)	31 (63)	2 (4)	Minimal
Can you open a hinged door, move your manual chair through it, close it behind you, and then comeback through the other way?	—	1 (2)	48 (98)	—	No gap
Power wheelchair skills; n = 28					
When driving your power wheelchair/scooter, are you able to drive the wheelchair/scooter around a corner while moving backwards?	1 (4)	7 (25)	2 (71)	—	Minimal
When driving your power wheelchair/scooter, are you able to avoid moving obstacles?	1 (4)	2 (7)	25 (89)	—	Minimal
When driving your power wheelchair/scooter, can you turn around in a small space, like an elevator, so that it is facing in the opposite direction?	2 (7)	5 (18)	21 (75)	—	Minimal
Are you able to operate the battery charger for your power wheelchair/scooter?	8 (29)	2 (7)	17 (61)	1 (4)	Moderate
Are you able to operate your body positioning options on your power wheelchair?	—	—	20 (71)	8 (29)	No Gap

Table 6. Knowledge of new technology (N = 100)

"Are you aware of the following, if so have you used it?"	No. of respondents				Gap level
	Yes, have used	Yes, have not used	Yes, not specified	No	
Pathlock	—	—	11	89	Large
MEBot	4	42	—	54	Moderate
Game Cycle	8	19	1	72	Moderate
SmartWheel	5	33	—	62	Moderate
Natural-Fit Handrim	31	41	—	28	Minimal
Virtual Seating Coach	2	26	—	72	Moderate
Surge Handrim	17	44	—	39	Minimal
Programmable Power Wheelchair Joystick	28	26	—	46	Minimal
Glide Suspension Fork	6	22	—	72	Moderate
VARILITE Cushion	28	29	—	43	Minimal
E-scale	1	7	—	92	Large
PneuChair and PneuScooter	2	23	—	75	Large
Strong Arm	—	—	26	74	Moderate

Table 7. AT information desired (N = 100)

	No. of respondents
Manual wheelchair	58
Power wheelchair	40
Scooter	21
Lower extremity prosthetic	17
Lower extremity orthotic	12
Other assistive device	25
I do not feel that I need any additional information	22

Note: Participants could choose more than one response.

categories of 1) diagnosis: 35% SCI in cluster 1, compared with 59% SCI in cluster 4; 2) length of time using mobility AT: 43% of respondents in cluster 1 have been using their devices 2-5 years, compared with cluster 4, in which 41% of respondents have been using their devices for over 15 years; 3) Veteran status: 94% of cluster 1 and 65% of cluster 4 are Veterans; and 4) employment: 8.7% of respondents in cluster 1 and 20% of respondents in cluster 4 report being unable to work.

DISCUSSION

This exploratory study adds to the existing literature on mobility AT by providing a preliminary model for knowledge translation. Understanding the gaps in consumer knowledge and training, as well as how consumer preferences on accessing information about mobility AT differ based on factors such as age, diagnosis, and length of time using their device, will inform future dissemination strategies. The statistical methods used to identify consumer preferences in information delivery among like users is novel in AT research and can be applied to future studies involving larger cohorts, allowing for an improved understanding of the mobility AT consumer. Because the study sample was primarily composed of Veterans, particularly those who receive services through the VA medical system in the U.S., findings of this pilot study are directly applicable to Veteran populations.

By identifying currently present awareness and training gaps within the reported sample, dissemination and knowledge translation efforts can be focused on ensuring they are rolled out in the most effective ways. The results demonstrated minimal gaps with respect to both MWC and PWC skills. However, some gaps were identified that illustrate a need for improved training. For example, that 29% of PWC users struggled with operating their device's battery charger is evidence that PWC users require additional training in operating their charger and that research is needed to develop chargers that are easier to use or alternative power sources. Compared with PWC users, MWC users had larger gaps in advanced wheelchair skills. In order to learn many of these skills, MWC users must have sufficient training. In previous studies, group training was found to improve an individual's ability to complete these advanced skills.[11,12] This training can be effective when delivered both in person and online.[13] The findings of the survey suggest

Table 8. Awareness laws and standards, AT assessment tools, clinical practice guidelines (N = 100)

	No. of respondents		
"Are you aware of the following . . ."	No	Yes	Gap level
Laws and standards			
Americans with Disabilities Act Accessibility Guidelines (ADAAG)	9	91	Minimal
Air Carrier Access Act (14 CFR 382)	41	59	Moderate
International Organization for Standardization- (ISO/TC 173)	64	36	Moderate
AT assessment tools			
Functioning Everyday with a Wheelchair (FEW)	71	29	Moderate
Functional Mobility Assessment (FMA)	69	31	Moderate
Power Mobility Clinical Driving Assessment Tool (PMCDA)	79	21	Large
Power Mobility Screening Tool (PMST)	82	18	Large
Transfer Assessment Instrument (TAI)	52	48	Moderate
Clinical practice guidelines			
Guidelines for Spina Bifida Health Care Services Throughout the Lifespan	91	9	Large
Early Acute Management in Adults with Spinal Cord Injury: A clinical Practice Guideline for Health-Care Providers	79	21	Large
Prevention of Venous Thromboembolism in Individuals with Spinal Cord Injury	73	27	Moderate
Sexuality and Reproductive Health in Adults with Spinal Cord Injury	68	32	Moderate
Bladder Management for Adults with Spinal Cord Injury	57	43	Moderate
Preservation of Upper Limb Function Following Spinal Cord Injury	66	34	Moderate
Respiratory Management Following Spinal Cord Injury	78	22	Large
Acute Management of Autonomic Dysreflexia	72	28	Moderate
Pressure Ulcer Prevention and Treatment Following Spinal Cord Injury, 2nd Edition	65	35	Moderate
Outcomes Following Traumatic Spinal Cord Injury	74	26	Moderate
Neurogenic Bowel Management in Adults with Spinal Cord Injury	65	35	Moderate

that information about training opportunities could be delivered to MWC users through PTs and OTs, at events, or through family and friends.

While the gaps found in MWC and PWC skills were small, there were much more notable gaps with respect to knowledge of laws, standards and clinical practice guidelines relevant to persons with disabilities. While a large majority of participants were aware of the ADA accessibility guidelines, few were aware of the International Organization of Standardization (ISO), which develops standards for AT and disability-related products and services to ensure quality and safety.[14] A lack of knowledge of these standards could impede an individual's ability to advocate for themselves, particularly with regard to the durability and safety of mobility products. The lack of awareness of clinical practice guidelines can present similar challenges with respect to receipt of appropriate medical care.

The gaps identified in participant awareness of emerging technologies are particularly important to AT researchers. These gaps represent opportunities to improve research dissemination and knowledge translation in AT in order to improve awareness. Present gaps may limit an individual's ability to access technologies that could improve community participation.

The identification of consumer clusters present in the data provides a framework for improving dissemination of research and knowledge translation in order to close the identified gaps in consumer knowledge and awareness. While exploratory in nature, the analyses yielded clusters with unique characteristics. Reporting characteristics of each cluster and better understanding

Table 9. Information sources (N = 100)

Source	Specific source selected; no. of respondents
Internet	51
Disabled-World website	3
Google	20
Human Engineering Research Laboratories (HERL) website	8
Manufacturer specific website	6
Reeves Foundation website	2
SpinLife website	17
UnitedSpinal website	11
WheelchairNet.org	4
Wheelchair-Guide website	1
World Health Organization (WHO) website	1
Wikipedia	9
Other	5
Social Media	44
AOL	1
Facebook	37
Inspire and condition-specific blogs	1
Instagram	3
Reddit	1
Twitter	6
YouTube	35
Events	64
Abilities expos	6
Adaptive sports	28
Local disability fairs	10
MedTrade Conference	—
National Council on Disability	3
National Disabled Veterans Winter Sports Clinic	56
National Veterans Wheelchair Games	28
Other	4
Paralympics	1
Television	5
Newspapers	5
Newsletters	9
Amputee Coalition of America newsletter	—
Easter Seals affiliate newsletter	—
HERL newsletter	2
Other newsletter	1
PVA Chapter newsletter	3
United Cerebral Palsy newsletter	1
Magazines	31
Ability Magazine	6
Aging Well Magazine	1
American Legion Magazine	3
Disabled American Veterans Magazine	7
Exceptional Parent Magazine	1
InMotion Magazine	1
Momentum Magazine	3
MS Magazine	1
New Mobility Magazine	13
PN Magazine	21
PVA Magazine	1
Quest (MDA) Magazine	1
Sports N Spokes Magazine	15
The Spin Magazine	1
VFW Magazine	1
Physicians	24
PTs or OTs	54
Conferences	9
Annual African American Conference on Disabilities	—
Association of Academic Physiatrists (AAP) Conference	—
American Academy of Physical Medicine and Rehabilitation (AAPMR) Conference	—
Association of Military Surgeons of the United States (AMSUS) Conference	—
American Occupational Therapy Association (AOTA) Conference	—-
Association for Rural Independent Living (APRIL) Conference	1
American Physical Therapy Association (APTA) Conference	—
Academy of Spinal Cord Injury Professionals (ASCIP) Conference	—
American Spinal Injury Association (ASIA) Conference	1
International Seating Symposium (ISS)	3
National Registry of Rehabilitation Technology Suppliers (NRRTS) Conference	—
National Self Advocacy Conference	2

(*Continued*)

Table 9. (Continued)

Source	Specific source selected; no. of respondents
National Seating and Mobility (NSM) Conference	—
Paralyzed Veterans of American (PVA) Summit	3
Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) Conference	3
Research studies	20
Family/friends using AT	66
Other	28
AT suppliers	1
Clinicians	5
Disability organizations	2
Other Veterans	16
Peers	9
Work in industry	1

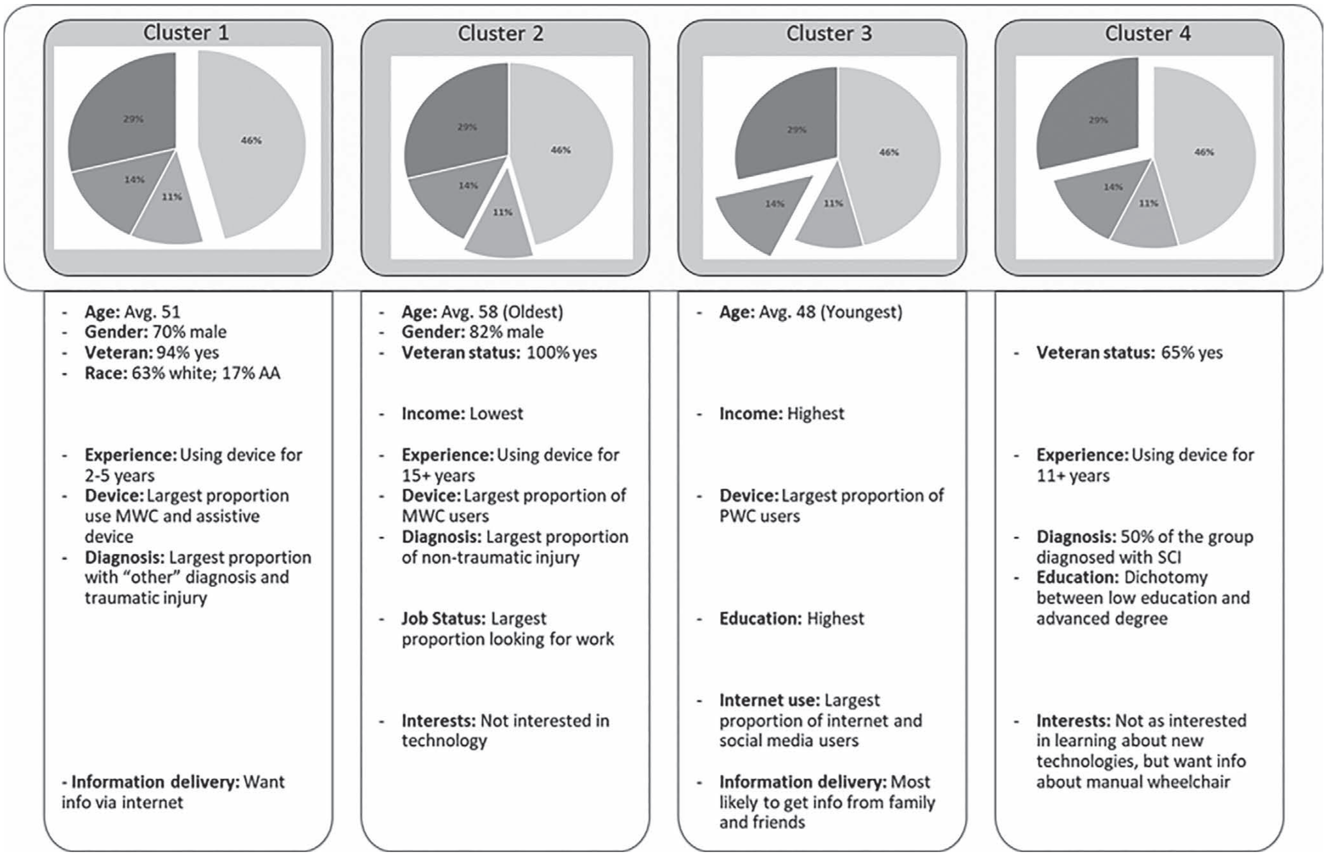
Notes: Participants could choose more than one. Participants who selected an information source category could select more than one specific example of each source.

their corresponding information preferences will allow AT providers and researchers to efficiently allocate dissemination efforts in order to reach more targeted populations. For example, in order to target mobility AT users categorized into cluster 1, the largest cluster composed mostly of male Veterans using their devices

Table 10. Most important information source (N = 100)

Source	No. of respondents
Clinicians	17
Conferences and events	7
Internet	16
Magazines	5
Manufacturers	1
Research studies	3
Social media	5
Suppliers	2
Word of mouth	48
No response	3

Note: Participants could choose more than one response.



Cluster 1

- **Age:** Avg. 51
- **Gender:** 70% male
- **Veteran:** 94% yes
- **Race:** 63% white; 17% AA
- **Experience:** Using device for 2-5 years
- **Device:** Largest proportion use MWC and assistive device
- **Diagnosis:** Largest proportion with "other" diagnosis and traumatic injury
- **Information delivery:** Want info via internet

Cluster 2

- **Age:** Avg. 58 (Oldest)
- **Gender:** 82% male
- **Veteran status:** 100% yes
- **Income:** Lowest
- **Experience:** Using device for 15+ years
- **Device:** Largest proportion of MWC users
- **Diagnosis:** Largest proportion of non-traumatic injury
- **Job Status:** Largest proportion looking for work
- **Interests:** Not interested in technology

Cluster 3

- **Age:** Avg. 48 (Youngest)
- **Income:** Highest
- **Device:** Largest proportion of PWC users
- **Education:** Highest
- **Internet use:** Largest proportion of internet and social media users
- **Information delivery:** Most likely to get info from family and friends

Cluster 4

- **Veteran status:** 65% yes
- **Experience:** Using device for 11+ years
- **Diagnosis:** 50% of the group diagnosed with SCI
- **Education:** Dichotomy between low education and advanced degree
- **Interests:** Not as interested in learning about new technologies, but want info about manual wheelchair

Figure 2. Cluster description infographic

for 2 to 5 years, researchers should focus dissemination efforts on events. Researchers can expect to reach this demographic by attending more conferences, local disability fairs, and similar events. In order to fill gaps in technology awareness and use, researchers should also provide opportunities for event attendees to trial technologies whenever possible.

Similar dissemination methods that increase face-to-face communication among AT users would also help to target cluster 4, the second largest cluster, which is diverse in terms of education and Veteran status, of whom 50% report an SCI diagnosis and 70% report using their mobility AT device for 11 or more years. While this cluster is not greatly interested in learning about new technologies, they did desire information on MWCs. Members of this cluster were most likely to receive information from family and friends, emphasizing the need for dissemination methods that utilize interpersonal communication, such as events like the National Veterans Wheelchair Games and the National Disabled Veterans Winter Sports Clinic. In contrast to clusters 1 and 4, cluster 3 prefers social media and the Internet as information sources. Researchers looking to target this cluster, composed of mostly young PWC users of less than one year, should increase their efforts to target websites and advertise online. Finally, other dissemination methods can be utilized to reach members of cluster 2, which is composed entirely of Veterans, the majority of whom are male, have used their device for longer than 15 years, are the highest users of MWCs, the oldest, and report the lowest income. To target this population, researchers should focus on dissemination methods that are accessible to PTs and OTs, as this cluster is most likely to receive information on AT from them. Learning how clinicians like PTs and OTs learn about and prefer to receive information about emerging technology can help researchers better tailor information dissemination efforts to this population.

Similar to the cluster analyses, the open-ended question in the survey regarding the most important source of information on AT can inform future dissemination and knowledge translation efforts. Across all clusters, participants were most likely to regard word-of-mouth sources, like friends and family, peers, other Veterans, and acquaintances, as the most important source for learning about new AT. This finding shows that, in order to reach as many members of the disability community as possible, AT researchers and providers should try to facilitate conversations about laws and standards, clinical guidelines, and AT innovations across Veteran and disability communities. This can be accomplished by increased event presence to make attendees aware of and excited about new innovations and standards and increased social media presence to encourage connections between internet-savvy individuals. Participant preferences regarding which mobility technologies they would like to learn more about can likewise guide outreach strategies and improve response to consumer priorities.

Some limitations to this study should be noted. First, since the survey was conducted in an online format, over-sampling of technologically savvy individuals is possible. In order to mitigate the possibility of sample bias, alternate methods of survey completion were allowed. Second, multiple choice questions may have resulted in underreporting of information, such as information about where individuals access information about AT; in order to minimize the chance that participants may not report a source of information, open-ended response sections were included after each set of sources. Third, because of the selected sampling method, certain groups may have been over-represented. For example, the most frequently selected event, The National Disabled Veterans Winter Sports Clinic, was also a recruiting source for participants, and higher use of wheelchairs than prostheses may have been due to under-representation of amputees in the sample. Likewise, oversampling of the Veteran population limits the generalizability of the study findings. Veteran populations may have different preferences and experiences with mobility AT than the civilian population, and a larger survey is currently being conducted. The authors are aiming to recruit a larger, more diverse group in order to overcome these biases. Fourth, the small size of the sample meant some comparisons and statistical analyses could not be performed. For example, differences could exist between civilians and Veteran populations that were unable to be contrasted. This limits the ability to extrapolate these findings to the general population. While sample size was relatively small, this pilot study was intended to explore methods that could be used in future work with larger samples. The previously mentioned ongoing study uses the methodology discussed in this study. Finally, a few participants noted difficulty understanding some of the questions. In order to make the survey as clear as possible, the team developing the survey will continue to update its content in response to participant comments.

The findings in this pilot study support a need for more robust, data-driven knowledge translation. There are clear gaps in consumer knowledge and experience, but these gaps can be narrowed by using information from this pilot study to target specific groups with more effective dissemination methods.

Conclusion

This survey of mobility AT consumers can be used to provide an effective model for research dissemination and knowledge translation, especially for Veterans. The results of this survey also reveal that it is important for consumers to be skilled in using their AT device, and for both consumers and providers to be aware of new technologies. Increasing conversations about laws and standards, clinical practice guidelines, and AT innovations should be goals of dissemination and translation efforts. Based on this study's findings, Internet sources accessed via search engine, social media platforms, events, and providers should be the focus of efforts to increase awareness. Developing an online community to increase word-of-mouth about AT devices may effectively increase Veteran awareness of new technologies and developments. It is important that researchers find ways to bridge knowledge and training gaps to provide consumers with the best care and AT options.

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COMPETING INTERESTS

The authors have nothing to disclose.

CONTRIBUTORS

All authors conceived and designed the study, drafted or revised the work critically, agreed upon the final version to be published, and agree to be accountable for the accuracy and integrity of the work. James Joseph and Rory A. Cooper were responsible for data acquisition. Eleanor Quinby, Gina McKernan, Brad E. Dicianno, and Rory A. Cooper analyzed and interpreted the data.

ETHICS APPROVAL

This pilot study was approved by the Institutional Review Boards of the University of Pittsburgh (STUDY19090116) and Veterans Affairs Pittsburgh Healthcare System (Pro00001830), Pittsburgh, PA, USA.

INFORMED CONSENT

Informed consent was received from participants.

REGISTRY AND REGISTRATION NO. OF THE STUDY/TRIAL

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A consumer assessment of women who use wheelchairs

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ABSTRACT

Introduction: Women who use wheelchairs express concerns with current devices that are male-centric and do not address their needs. As women attain more representation in both civilian and military sectors, it is imperative their needs are met to the same degree as those of men. The following assessment analyzes qualitative feedback from groups of women who use wheelchairs or scooters. Information collected may inform a roadmap to address assistive technology needs for women. **Methods**: Twenty-four women, recruited from two sporting events for Veterans with disabilities, were asked to fill out a survey and partake in a focus group designed to elicit participants' opinions on pros, cons, and areas of need with respect to mobility devices and related services. Demographic data and survey outcomes were analyzed quantitatively, while common themes were identified from the literature and participant perspectives. **Results**: Survey results indicate a need to customize wheelchair technology to the needs of female users. Focus group data identified four major themes women commonly experience when using assistive technology and related services — usability, service delivery, well-being, and design. Participants raised concerns with customizability, delivery methodology, and empowerment. **Discussion**: Female wheelchair users described several necessary improvements related to usability, services, quality of life, and innovation that could address gender disparities. Information from this study can be used to influence further research and design.

Key words: Veteran, women, wheelchair, health equity, assistive technology, mobility aid, female, mobility, U.S.

RÉSUMÉ

Introduction : Les femmes qui utilisent un fauteuil roulant sont préoccupées par les modèles actuels, qui sont conçus pour les hommes et ne répondent pas aux besoins propres aux femmes. Puisque la place des femmes est de plus en plus importante dans les secteurs civil et militaire, il est impératif de respecter des normes aussi élevées que chez les hommes pour répondre à leurs besoins. L'analyse suivante évalue les commentaires qualitatifs de groupes d'utilisatrices d'aides à la mobilité. L'information recueillie peut servir de guide quant aux besoins des femmes en matière de technologie d'assistance. **Méthodologie :** Vingt-quatre femmes, recrutées lors de deux événements sportifs pour les vétérans ayant des incapacités, ont été invitées à remplir un sondage et à participer à un groupe de travail au cours duquel elles ont exprimé les pour, les contre et les lacunes de leur aide à la mobilité et des services qui s'y rattachent. Les chercheurs ont analysé les données démographiques et les résultats du sondage d'après la fréquence et le pourcentage des réponses et ont dégagé les grands thèmes à partir des publications antérieures et des points de vue des participantes. **Résultats :** Selon les résultats de l'étude, il est nécessaire d'améliorer la technologie des fauteuils roulants pour qu'elle soit mieux adaptée aux besoins des femmes. Les données tirées des groupes de travail ont fait ressortir quatre grands problèmes qu'affrontent souvent les femmes à l'égard de leur technologie d'assistance et des services qui s'y rattachent : l'ergonomie, la prestation des services, le bien-être et la conception. Les participants ont soulevé des préoccupations à l'égard des possibilités d'adaptation, de la méthodologie de prestation et de l'autonomisation. **Discussion :** Les utilisatrices d'un fauteuil roulant décrivent plusieurs améliorations nécessaires à l'ergonomie, aux services, à la qualité de vie et aux innovations des

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technologies d'assistance pour tenir compte des différences entre les sexes. L'information tirée de la présente étude peut être utilisée pour influencer d'autres recherches sur le sujet et la conception des modèles.

Mots-clés : aide à la mobilité, équité en santé, fauteuil roulant, femmes, mobilité, sexe féminin, États-Unis, technologie d'assistance, vétérane

LAY SUMMARY

Female Veterans and female athletes with disabilities express concerns with mobility devices that are male-centric and do not address their unique needs. It is important that the needs of women are given the same attention as those of men. The following study asked groups of women who use wheelchairs or scooters, including Veterans and athletes, about their experiences. Twenty-four women, recruited from two sporting events for Veterans with disabilities, were asked to fill out a survey and participate in a focus group where they would discuss their views on mobility aids and related services. There were four major themes women often mentioned when they talked about using their mobility aids: usability (how they like using it), service delivery (how they get help with it), well-being (how they feel), and design (how it looks and works). Participants were concerned about the ability to adjust their device to their needs, how people obtained a device, and how they felt about using the device. Female wheelchair and scooter users recommended several changes to mobility aids that would improve the devices and improve the lives of women who use them.

INTRODUCTION

Almost 4 million Americans require mobility aids (i.e. manual and power wheelchairs, prosthetics, etc.) to enhance independent living and perform activities of daily living (ADLs).[1] Use of a mobility aid, particularly a wheelchair, was found to significantly improve the user's confidence when they received proper training.[2] This indicates that individuals live more comfortably and independently when provided with mobility aids that address their needs.[2,3]

Inequity experienced by female patients and clients is increasingly being recognized.[4,5] Mobility aids that meet the needs of women as well as men are needed, especially since women tend to live longer and may rely on assistive technology for aging-related conditions for longer than their male conterparts.[1,6] Additionally, advancements in modern medicine are helping people with traumatic injuries, such as spinal cord injury and disease (SCI/D), limb loss, and traumatic brain injury (TBI), live longer.[7] For instance, of the over 300,000 women deployed to Iraq and Afghanistan as part of the Global War on Terrorism, 1,000 have been wounded.[7] The U.S. Department of Veterans Affairs (VA) predicts the number of women Veterans served by the VA health care system will increase to 15.9% by 2040.[8,9]

With an increasing need for accommodation, it is imperative that women using mobility aids are involved in the design and development of these devices as well as services provided for this technology.[10,11] If fitted with the wrong wheelchair, or given little training, women are likely to view their living situation with more frustration and negativity than men.[12] Women are almost 20% more likely to reject a prosthetic than men and are likely to report that gender differences are over-generalized as primarily focused on aesthetics.[10-12] Women with physical disabilities report higher rates of depression than their male counterparts because of the stigma associated with not only their gender, but also their disability.[13] Depression and stigma are problematic, as they reduce social participation and, therefore, independent living.[14]

To ensure that appropriate interventions are available to target populations, an assessment of the needs and wants of potential stakeholders must be undertaken.[2,13] Researchers and clinicians should use consumer assessments of women who use mobility aids to address the needs of this population and develop a theoretical roadmap for design and development of technologies that will improve their quality of life and enhance their ability to live independently.[2,15] Previous research used this approach to identify research needs in rehabilitation technology as well as assistive technology-related education and resources.[2,15]

The purpose of this study was to identify the needs of mobility aid users from a sample of female users, as well as to identify the pros and cons of the current standard of care and potential areas for improvement. The authors anticipate that the information collected from these surveys and focus groups can inform a roadmap for enhancing mobility aid accommodations for women.

METHODS

The study was approved by the VA Pittsburgh Healthcare System Institutional Review Board, and all participants provided informed consent. Women who were 18 years of age or older and used a wheelchair or scooter for daily mobility (≥4 hours a day) were recruited from the 2019 National Disabled Veterans Winter Sports Clinic and the 2019 National Veterans Wheelchair Games.

Protocol

Participants were asked to complete questionnaires to obtain information about demographic characteristics and experiences with and preferences for assistive technology. The demographics questionnaire asked about the participant's diagnosis, housing, education, occupation, health insurance, income, and difficulties with pain and ADLs. The assistive technology questionnaire asked about mobility aid use, device satisfaction, and personal customization. Additionally, participant opinions and preferences related to selection and adoption of assistive technology, and important factors when choosing mobility aids were assessed using 7-point Likert scales.

Participants were then asked questions related to their mobility aids in a semi-structured focus group composed of one to eight participants and one to two researchers to facilitate the conversation. Researchers asked prepared questions such as, "What challenges or problems have you encountered in using your current wheelchair or scooter?" and "If you could design your perfect wheelchair or scooter, what features would it have?" Additionally, researchers asked for participants' opinions and experiences related to how wheelchair and mobility-related assistive technology aided or impeded ADLs, work, transportation, child care, and pregnancy, as needed to guide the conversation. Participants were encouraged to discuss other mobility-related topics of interest. Focus groups lasted 20 to 60 minutes.

Analysis

Audio was recorded during the discussion and transcribed for analysis. Descriptive and survey data were coded into IBM SPSS, version 26.0 (IBM Corp., Armonk, NY) by one of the researchers and analyzed using frequency and percentages. The investigators reviewed focus group transcripts to identify unique themes regarding assistive technology needs. Four themes were selected for inclusion in the analysis: (1) usability, (2) delivery and related services, (3) physical and mental quality of life and well-being, and (4) design, development, and future innovation.

Usability

Usability pertains to the ability of the individual to incorporate the selected intervention into their everyday life. For mobility aids, this refers to the user's interaction with their technology in an everyday environment and their ability, or inability, to carry out ADLs.[12,16] Usability was a significant theme because the women in this study relied on mobility aids to navigate their surroundings and live as independently as possible.

Delivery and related services

Delivery and related services refers to the methods by which a person receives their mobility aids and where they receive education, information, and repair services for them.[2,13,15] It also includes environmental accessibility in the community, public transportation, and home modifications. This topic is critical for women who use mobility aids; wheelchairs often have a limited lifespan and require frequent service.[17,18] Distance and accessibility to an appropriate facility, such as a clinic or repair shop, may not be feasible depending on distance or access to transportation.

Physical and mental well-being

Physical and mental well-being encompasses how mobility aids impact the current health of the user. Such a theme is important to include in this study because women frequently describe personal frustrations and emotional distress related to the use of their mobility aids.[11,12] Information regarding mental health conditions and states of mind, as well as physical functioning and comfort, are included in this section.

Design, development, and future innovation

Design, development, and future innovation refers to product innovation, mobility aid features, and design elements that are seen as either appealing or negatively affecting quality of life.[2,14] Women's involvement in this area, or lack thereof, deserves inquiry in order to identify problems that may be improved by future research, innovation, and involvement of female mobility aid users in the development of these technologies.

RESULTS

Demographics are detailed in Table 1. The average age of participants was 52.8 years, and 91.7% (22) were Veterans. The majority of the women in this study (83.3%; 20) were White, and 33.3% (8) held a bachelor's degree, but 50% (12) were unable to work because of their disability. Many of the women (41.7%; 10), reported they were single, lived in a house or an apartment (87.5%; 22), and made between

Table 1. Demographics (N = 24)

	No. (%) of participants*
Age, y, mean (SD)	52.2 (11.8)
Geographic location	
Urban	6 (25.0)
Rural	8 (33.3)
Suburban	8 (33.3)
Unknown	2 (8.3)
Race/ethnicity	
Non-Hispanic White	20 (83 3)
Non-Hispanic African American	2 (8.3)
Hispanic	1 (4.2)
Multiple	1 (4.2)
Veteran status	
Yes	22 (91.7)
No	2 (8.3)
Education	
High school/GED	7 (29.2)
Associates/vocational	3 (12.5)
Bachelors	8 (33.3)
Masters	5 (20.8)
Other education	1 (4.2)
Work status	
Full time	2 (8.3)
Part time	3 (12.5)
Unable to work	12 (50.0)
Unemployed	1 (4.2)
Choose not to work	5 (20.8)
Student	1 (4.2)
Marital status	
Single	10 (41.7)
Married	8 (33.3)
Couple/partners	1 (4.2)
Divorced	4 (16.7)
Widowed	1 (4.2)
Income, US$	
< $10,000	1 (4.2)
$10,000-$35,000	4 (16.7)
$35,000-$75,000	10 (41.7)
> $75,000	3 (12.5)
Prefer not to answer	6 (25.0)
Living situation	
House/apartment	22 (92.7)
Relative's home	3 (12.5)
Health Insurance	
None	1 (4.2)
Medicare/Medicaid	4 (16.7)
Employer health care	3 (12.5)
Personally paid	1 (4.2)
VA/other	15 (62.5)

*Unless otherwise specified.

GED = general education diploma; VA = Veterans Affairs.

Table 2. Disability and mobility aid needs (N = 24)

Factor	No. (%) of participants*
Diagnosis	
SCI/D	11 (45.8)
Surgery	3 (12.5)
TBI/head injury	1 (4.2)
Multiple sclerosis	3 (12.5)
Multiple diagnoses	1 (4.2)
Other	4 (16.7)
Years with diagnosis, mean (SD)	15.8 (10.4)
Wheelchair	
Manual wheelchair	17 (70.8)
Power wheelchair	5 (20.8)
Scooter	1 (4.2)
Other aid	1 (4.2)
Wheelchair age, y, mean (SD)	3.1 (2.7)
Years using a wheelchair, mean (SD)	10.7 (8.7)
Disability status	
Social Security	7 (29.2)
Social Security Disability	14 (58.3)
Workers Compensation	3 (12.5)
Impact on income	
None	7 (29.2)
Increases income	9 (37.5)
Decreases income	8 (33.3)

*Unless otherwise specified.

SCI/D = spinal cord injury or disease; TBI = traumatic brain injury

US$35,000 and US$75,000 annually (31.8%; 10), with 62.5% (15) reporting they receive VA health benefits. A total of 45.8% of participants (11) had an SCI/D that occurred an average of 15.8 years previously. Approximately 70.8% (17) have used a manual wheelchair for 10.7 years, and the average age of users' current wheelchair was 3.1 years. Most participants reported receiving social security defined disability (58.3%; 14) and 37.5% (9) reported that their disability increases their income.

Table 3. Disability impact on independent living (N = 24)

	No. (%) of participants		
	No problems	Some problems	A lot of problems
Self-care	9 (37.5)	14 (58.3)	1 (4.2)
Completing household ADLs	5 (20.8)	19 (79.2)	0 (0)
Pain and discomfort	2 (8.3)	16 (66.7)	6 (25.0)

ADLs = activities of daily living.

Table 4. Mobility aid appeal (N = 24)

	No. (%) of participants		
	Yes	No	Unsure
Satisfied with mobility aid	8 (33.3)	11 (45.8)	4 (16.7)
Mobility aid works	6 (25.0)	13 (54.2)	4 (16.7)
Mobility aid difficult	15 (62.5)	5 (20.8)	3 (12.5)
Built mobility aid	7 (29.2)	15 (62.5)	1 (4.2)
Self-modified mobility aid	13 (54.2)	8 (33.3)	2 (8.3)
Tech-savvy	7 (29.2)	15 (62.5)	2 (8.3)

Problems with self-care, completing ADLs, and pain/discomfort were reported by 58.3% (14), 79.2% (19), and 66.7% (16) of women in the study, respectively (see Table 3). With regard to mobility aid appeal, 45.8% (11) reported no satisfaction with their mobility aid, while 54.2% (13) reported a mobility aid that does not work and 62.5% (15) reported one that is difficult to use. A total of 62.5% of participants in this study (15) did not build their mobility aid, had to self-modify their mobility aid (54.2%; 13), and indicated they were not tech-savvy (62.5%; 15) (see Table 4).

When asked about the impact of disability on different aspects of independent living, 41.7% of participants (10) completely agreed that technology makes life easy and convenient, while 37.5% (9) completely disagreed that it makes life complicated. When asked if technology provided people with control over their daily lives and provided comfort, 37.5% of participants (9) completely agreed and 33.3% (8) agreed. Approximately 29.2% (7) agreed and 29.2% (7) completely disagreed that technology makes life stressful, with 29.2% (7) completely agreeing that it brings people together. Twenty-five percent of the women in the study (6) completely disagreed that technology creates isolation. When asked about whether technology increases confidence and personal safety, 33.3% of participants (8) completely agreed (see Table 5 for complete results).

When asked about picking technology, 79.2% (19) completely agreed on the importance of technology meeting personal needs, and 58.3% (14) completely agreed that technology needs to be cost-efficient (see Table 3b). When asked about their understanding of technology, 20.8% (5) somewhat disagreed that they enjoy figuring out high-tech gadgets, and 58.4% (14) either agreed or completely agreed that they stay up to date on technology.

Table 5. In general, to what extent do you think technology does the following (N = 24)

	No. (%) of participants						
	Not at all agree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Completely agree
Makes life easy and convenient	0 (0)	0 (0)	0 (0)	4 (16.7)	4 (16.7)	6 (25.0)	10 (41.7)
Makes life complicated	9 (37.5)	4 (16.7)	3 (12.5)	1 (4.2)	1 (4.2)	5 (20.8)	1 (4.2)
Gives people control over Their daily lives	0 (0)	0 (0)	1 (4.2)	2 (8.3)	5 (20.8)	9 (37.5)	7 (29.2)
Makes life comfortable	0 (0)	1 (4.2)	1 (4.2)	3 (12.5)	4 (16.7)	8 (33.3)	7 (29.2)
Makes life stressful	7 (29.2)	2 (8.3)	1 (4.2)	4 (16.7)	7 (29.2)	2 (8.3)	1 (4.2)
Brings people together	5 (20.8)	1 (4.2)	3 (12.5)	3 (12.5)	2 (8.3)	3 (12.5)	7 (29.2)
Makes people isolated	6 (25.0)	2 (8.3)	3 (12.5)	4 (16.7)	5 (20.8)	2 (8.3)	2 (8.3)
Increases confidence	1 (4.2)	1 (4.2)	2 (8.3)	1 (4.2)	5 (20.8)	6 (25.0)	8 (33.3)
Makes people dependent	4 (16.7)	5 (20.8)	2 (8.3)	2 (8.3)	3 (12.5)	4 (16.7)	4 (16.7)
Increases personal safety and security	1 (4.2)	1 (4.2)	1 (4.2)	3 (12.5)	6 (25.0)	4 (16.7)	8 (33.3)
Reduces privacy	4 (16.7)	1 (4.2)	4 (16.7)	4 (16.7)	4 (16.7)	3 (12.5)	4 (16.7)

Table 6. How important are each of the following factors when picking technology (N = 24)

	No. (%) of participants						
Technology needs to …	Not at all important	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Extremely important
Be attractive	2 (8.3)	3 (12.5)	3 (12.5)	6 (25.0)	6 (25.0)	2 (8.3)	2 (8.3)
Be Visible	4 (16.7)	3 (12.5)	3 (12.5)	5 (20.8)	4 (16.7)	2 (8.3)	2 (8.3)
Be Private	1 (4.2)	0 (0)	0 (0)	2 (8.3)	7 (29.2)	4 (16.7)	10 (41.7)
Be Safe	0 (0)	0 (0)	0 (0)	1 (4.2)	3 (12.5)	4 (16.7)	16 (66.7)
Be easy to use	0 (0)	0 (0)	0 (0)	3 (12.5)	1 (4.2)	7 (29.2)	13 (54.2)
Meet my needs	0 (0)	0 (0)	0 (0)	1 (4.2)	1 (4.2)	3 (12.5)	19 (79.2)
Be cost efficient	0 (0)	1 (4.2)	1 (4.2)	0 (0)	3 (12.5)	5 (20.8)	14 (58.3)

Table 7. Appeal when purchasing technology (N = 24)

	No. (%) of participants						
	Not at all accurate	Inaccurate	Somewhat inaccurate	Neutral	Somewhat accurate	Accurate	Extremely accurate
I enjoy figuring out high-tech gadgets	3 (12.5)	4 (16.7)	5 (20.8)	3 (12.5)	4 (16.7)	1 (4.2)	4 (16.7)
I keep up to date with technology	3 (12.5)	0 (0)	2(8.3)	2 (8.3)	3 (12.5)	7 (29.2)	7 (29.2)
Wait to adopt technology until glitches and bugs are fixed	3 (12.5)	0 (0)	2 (8.3)	5 (20.8)	6 (25.0)	6 (25.0)	2 (8.3)
I like the idea of using technology to reduce dependency	4 (16.7)	5 (20.8)	3 (12.5)	2 (8.3)	3 (12.5)	3 (12.5)	4 (16.7)
I prefer interacting with a human	0 (0)	1 (4.2)	0 (0)	7 (29.2)	4 (16.7)	5 (20.8)	7 (29.2)

Table 8. Common themes from focus group data (N = 24)

Theme	No. (%) of participants
Usability	
Difficulties changing direction or manoeuvering	7 (29.2)
Moving items in a mobility aid is a challenge	7 (29.2)
I need something that is easy to use	6 (25.0)
Difficulty using wheelchair requires me to use something different	6 (25.0)
I can only travel so far using my mobility aid before my battery dies	5 (20.8)
Transfers are difficult and I need to be careful I do not fall out of my chair	4 (16.7)
It’s hard to adjust the mobility aid	3 (12.5)
I tend to run into things with my wheelchair	3 (12.5)
Delivery and related services	
A desired service not provided or is poor	16 (66.7)
Getting appropriate technology is frustrating	9 (37.5)
Services are not provided in an efficient period of time	9 (37.5)
Certain transportation services can accommodate my wheelchair and others cannot	9 (37.5)
Not a lot of customization (i.e. size of the chair)	8 (33.3)
Services are rarely provided address gender	6 (25.0)
I would benefit from additional home modifications	6 (25.0)
Cost of services is not ideal	2 (8.3)

(*Continued*)

Table 8. (Continued)

Theme	No. (%) of participants
Physical and mental well-being	
Gender makes it easy to be disrespected and not taken seriously	16 (66.7)
Experience chronic pain and discomfort due to current mobility aid	15 (62.5)
People are sometimes ignorant towards my disability	6 (25.0)
I would like to have the ability to accomplish what an able-bodied women can accomplish	5 (20.8)
Experience heightens emotional distress because of inability to partake in ADLs	2 (8.3)
I can get tired easily and resort to something that requires less energy	2 (8.3)
No one advocates for me	2 (8.3)
Disability and mobility aid create problems for rearing children	2 (8.3)
Design, development, and future innovation	
Female anatomy makes it tough to fit into the wheelchair	14 (58.3)
The wheelchair may not be the right size	10 (41.7)
I have particular cushions that are comfortable and some that are not	7 (29.2)
Aesthetics are an important aspect when approaching a wheelchair selection	6 (25.0)
Friends or family members adjust my mobility devices for me	6 (25.0)
Wheelchair may be heavy	5 (20.8)
An add-on to assist with carrying items (i.e. groceries) would be nice	4 (16.7)
Human Machine Interface difficult to interact with	3 (12.5)
Difficult to position myself appropriately	2 (8.3)
Too many ways to operate	2 (8.3)
A lighter battery would be nice	1 (4.2)

Focus group feedback

Close to one-third of women (29.2%; 7) reported usability-related difficulties related to maneuvering themselves or specific items (i.e. groceries at the store). Participants also reported that a desired service was not provided by their health care provider (66.7%; 16) or that the service was not provided in time (37.5%; 9). With regard to physical and mental well-being, 66.7% (16) felt their gender, generally, made it hard for them to be taken seriously. A total of 63% (15) reported pain and discomfort when using their mobility aid. With regard to design, development, and future innovations, 58% (14) believed the female anatomy makes it more difficult to fit in a wheelchair, of whom 42% (10) mention that the chair is not the right size.

DISCUSSION

This study assessed consumer needs of women using mobility aids, specifically wheelchairs. Focus group and survey results provided insight into specific aspects of assistive technology that need to be addressed in order to improve the quality of life of female mobility aid users. The survey outcomes aligned with focus group input regarding device usability and showed that participants experienced problems completing basic ADLs. Focus group participants commonly reported difficulties with manoeuvering their chairs in different directions, which may hinder ADLs that need to be completed in tight spaces. This observation supports previous literature in which women reported problems with running into walls or furniture, thus creating frustration in their personal and professional lives.

Mixed responses related to difficulties with isolation, privacy, and dependency may indicate health inequity issues related to wheelchair needs.[11] When inquiring into delivery and services, the women surveyed not only preferred a human over technology but also criticized the lack of female technology professionals, creating an impression of, as one woman commented, “a good ol’ boys club.” In the focus groups, the women described feeling disrespected because of their gender. Additionally, they said they find their wheelchairs do not accommodate female anatomy, particularly the hip and thigh area. One woman said it seems there are customizable chairs for men in any situation, but that this doesn’t appear to be the case for women, “except [when asking] if I want hot pink or purple [colors].”

Previous literature supports the findings that women experience more physical and emotional discomfort when using their assistive technology than men.[12][KH2] Despite their concerns, women value mobility aids as a means to increase their participation in society and live independently. In particular, survey results found that most women agreed that technology increases ease and confidence. The survey data indicates preference for assistive technology based on ease of use, cost efficiency, safety, and ability to meet personal needs. This aligns with focus group data that suggested alterations to wheelchairs with respect to size adjustments, customizations, and maneuverability.

Improved wheelchair design can enhance usability and quality of life, reduce dependency on additional services, and advance the disability field to relieve the prejudice experienced by women with disabilities.[20-23] Inquiring into the needs of this population will allow for researchers, clinicians, and the industry to design and develop mobility aids that improve a woman's ability to independently participate in society.[2,15,24,25]

Further studies should include women from diverse backgrounds to elaborate on specific themes.

Conclusion

It is imperative to understand the unique needs and desires of individuals with disabilities in order to ensure they experience equality in multiple facets of their lives. This study of women who use mobility aids reports the need for technology that conforms to the female anatomy, is easier to use, and includes gender-supportive services. Additionally, study participants desired more access to female technology providers and customizable chairs to fit to their specific lifestyles. While feedback provides a roadmap to conduct research among this cohort, further research is needed to provide more generalizable and validated outcomes in order to ensure product developments appeal to this population.

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COMPETING INTERESTS

The authors have nothing to disclose.

CONTRIBUTORS

All authors conceived, designed, researched, and drafted the manuscript and approved the final version submitted for publication.

ETHICS APPROVAL

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RESEARCH

Hand self-shiatsu to promote sleep among Veterans and their family members: A non-randomized, multiple-methods study

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ABSTRACT

Introduction: The determinants of Veterans' and their family members' health and well-being are compromised by sleep deficiency (SD). The use of long-term drug therapies for treatment is controversial, and the evidence to support positive outcomes is limited. Instead, guidelines recommend non-pharmacological sleep interventions for SD. Hand self-shiatsu (HSS) is a drug-free, pragmatic, easy-to-learn self-management technique that provides patients with an intervention they can actively control, thus contributing to feelings of self-efficacy. The objective of this work was to examine whether a prescribed HSS intervention would result in improved objectively and subjectively measured sleep. **Methods:** This was a non-randomized controlled study. Objective (actigraphy) measures and standardized self-report questionnaires were applied at baseline and at four and eight weeks post-intervention. Participants also completed a detailed sleep log. **Results:** No significant differences were found in the actigraphy sleep dimensions across the three measurement time points in either the intervention or the control group. With respect to the self-report measures, a significant change was detected for sleep disturbance ($\chi^2_2 = 10$ [$n = 25$], $p = 0.007$) for the intervention group, and 77% stated they would recommend HSS to others. A significant change in two self-report measures was noted in the control group, a potential artifact of the sub-optimal recruitment to this group imposed by the COVID-19 restrictions. **Discussion:** Although actigraphy data did not support the hypothesis, the self-report measures and qualitative information from participants' end-of-study interviews indicated endorsement of HSS for the management of sleep difficulties and increased self-efficacy.

Key words: families, fatigue, military members, non-pharmacological sleep intervention, shiatsu, sleep disturbance, sleep self-management, Veterans

RÉSUMÉ

Introduction : Les déterminants de la santé et du bien-être des vétérans et des membres de leur famille sont compromis par le manque de sommeil (MS). Les avantages des pharmacothérapies à long terme sont controversés à cet égard, et les données sont limitées pour appuyer des résultats positifs. Des stratégies d'interventions non pharmacologiques pour soulager le MS sont plutôt recommandées. L'auto-shiatsu des mains (ASM) est une technique d'autogestion pragmatique, facile à apprendre et non pharmaceutique que les patients peuvent contrôler activement, contribuant ainsi à leur sentiment d'autoefficacité. Les présents travaux visaient à examiner si la prescription d'une intervention d'ASM améliore le sommeil, selon des mesures objectives et subjectives. **Méthodologie :** Dans cette étude témoin non aléatoire, les chercheurs ont utilisé des mesures objectives (actigraphie) et des questionnaires d'autodéclaration standardisés en début d'étude, puis quatre et huit semaines après l'intervention. Les participants ont également rempli un journal de sommeil détaillé. **Résultats :** Il n'y avait pas de différence significative des dimensions du sommeil à l'actigraphie aux trois points de mesure dans le groupe d'intervention et dans le groupe témoin. Pour ce qui est mesures d'autodéclaration, les chercheurs ont décelé un changement important en matière de perturbations du sommeil ($\chi^2_2 = 10$ [n = 25], p = 0,007) dans le groupe d'intervention, et 77 % ont déclaré qu'ils recommanderaient l'ASM à d'autres. Les chercheurs ont constaté un changement important dans deux mesures autodéclarées du groupe témoin, une conséquence potentielle du recrutement sous-optimal au sein de ce groupe, imposé par les restrictions de la COVID-19. **Discussion :** Les données d'actigraphie n'ont pas appuyé l'hypothèse, mais les mesures autodéclarées et l'information qualitative tirée

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des entrevues de fin d'étude des participants indiquent l'approbation de l'ASM pour prendre en charge les troubles du sommeil et accroître l'autoefficacité.

Mots-clés : autogestion du sommeil, fatigue, intervention non pharmacologique liée au sommeil, membres et familles de militaires, perturbations du sommeil, shiatsu, vétéran(e)s

LAY SUMMARY

This study tested a no-cost, drug-free technique to promote sleep for Veterans and their family members. The technique, hand self-shiatsu (HSS), had promising outcomes in other studies with chronic pain patients and young athletes after concussion. HSS is easy to learn, takes only 10-15 minutes to perform before bed, requires no equipment, and is best done once in bed for the night. The sleep and daytime fatigue of 30 people who were taught HSS and 20 who were not were compared across a two-month period. The two groups were similar in age and gender. The self-report measures showed that people who did HSS reported less daytime fatigue and less sleep disturbance than those who did not. Also, in interviews at the end of the study, participants were very favorable about how easy and potentially useful HSS was. They also commented on the benefit of feeling more in control of their sleep. Although the study has limitations, the findings are promising. A HSS educational video, handouts, and app are available for free at https://cbotlabs.wixsite.com/handselfshiatsu.

INTRODUCTION

Restorative sleep is critical for optimal brain function and overall health. Sleep deficiency (SD), defined by the National Centre on Sleep Disorders Research as "too little sleep, poor quality sleep, or sleep problems including diagnosed sleep disorders,"[1] is a growing problem for people of all ages, and it has a significant impact on many aspects of military members' and Veterans' lives.[2] It has been shown to be associated with decreased insight, challenges with attentional and executive function, such as problem solving and new learning, risk of falls, and motor vehicle accidents.[3] It has also been linked with increased risk of age-related illnesses, such as diabetes, cancer, hypertension, stroke and other cardiac diseases,[4] depression,[5] chronic pain,[6] cardiovascular disease,[7] and dementia.[8] Moreover, recent evidence has suggested that these conditions do not simply occur in parallel, but that a bidirectional relationship exists between SD and many chronic health conditions. There is thus a negative cycle of worsening disease symptoms contributing to inability to sleep and of sleep loss in turn increasing the seriousness of symptoms of both physical and mental health conditions.

Veterans and active military members, and their intimate partners, experience SD at higher rates than the general population.[2,9-11] Insomnia is a frequent, unrelenting, and debilitating complaint, both during and after deployment, and it does not necessarily resolve with transition to civilian life.[12] The determinants of Veterans' well-being,[13] and indeed all aspects of life that Veterans and their families value and find meaningful (such as friendships, employment, social activity, and feelings of well-being and control in life), are compromised by SD.[2,14]

The underlying cause of SD is multi-factorial. It involves environmental and social influences, comorbid physical and mental health problems, individual habits, beliefs, and lifestyle choices, pre-enlistment sleep quality, and emotional and physical trauma experienced before and in the course of service.[2,15] The benefit of ongoing drug therapies in the treatment of SD is controversial, and the evidence to support positive outcomes in long-term use,[16] particularly during deployment, is limited.[17] In addition, medication side effects have been noted, including impairments in cognition, insight, and new learning.[18] Short courses of corrective sleep medication, and more long-term strategies of non-pharma cological sleep interventions for SD, are recommended instead.[19]

An important consideration in any intervention is its acceptability to, and usability by, the patient. Hand self-shiatsu (HSS) is a drug-free, pragmatic, easy-to-learn self-management technique that provides patients with an intervention they actively control, and it can thus contribute to feelings of self-efficacy. Namikoshi shiatsu, on which this HSS intervention is based, involves comfortable pressure on established points on the body related to anatomy and physiology.[20] Although research is limited, aligning with findings from the similar modality of acupressure, shiatsu may exert a sleep-positive biomedical influence related to improved blood circulation, reduced muscle tension, and possible endogenous release of serotonin.[21] Shiatsu is based on the principles of restoring and balancing body energy and reducing stress that underpin traditional Chinese medicine.[22] Shiatsu involves applying pressure with the fingertip to specific points aligned with bodily function and health.

Pressure-point interventions such as shiatsu and acupressure are suggested to trigger physiological changes such as increased blood circulation, reduced muscle tension, and increased production of serotonin.[23] Research is limited, but small studies have reported that shiatsu can be effective for headache, low-back pain, and mental health problems.[24] A small body of outcomes research specific to sleep benefits of shiatsu or acupressure has had promising findings.[25-32] More recently, pilot studies of hand shiatsu to promote sleep in which patients apply the technique themselves have emerged in the literature involving adults with chronic pain and young athletes with sport-related concussion.[33,34]

Because the HSS technique is quite specific, a sustained degree of concentration is required. Brain functioning and attention research have demonstrated that high concentration prevents one from simultaneously attending to other thoughts.[35] Other cognitive interventions to decrease rumination in persons with insomnia have been shown to be effective.[36] Congruent with these types of cognitive approaches, it was theorized that the active concentration required to carry out HSS may supplant negative sleep inhibiting thoughts and emotions. HSS aligns with the evidence-based principles of self-management and can be practised in the patient's unique biopsychosocial and environmental context.[33,34]

A 2015 review found attrition rates for cognitive-behavioural therapy (CBT) can be in excess of 23%.[37] Although the authors are not aware of studies comparing CBT with self-administered shiatsu, the high rate of acceptance for self-shiatsu found in previous studies contributes to the assumption that, because HSS involves concentrating on a motor activity, as opposed to personal thoughts and feelings, it may be more acceptable to persons who find the interpersonal reflection components of other cognitive therapies less desirable.[33,34]

The aim of this study was thus to examine whether participants in a HSS intervention group would, compared with a non-HSS control group, demonstrate improved sleep, as quantified by a wrist-worn sleep monitor (actigraph), and sleep quality and daytime fatigue, as measured by means of self-report instruments.

METHODS

This was a non-randomized controlled study; arm 1 was a HSS active intervention (taught after baseline data collection), and arm 2 was a wait-list control. Objective and self-report outcomes were measured at baseline (BL) and at four weeks (FU1) and eight weeks (FU2) post-intervention. In an effort to detect potential confounding variables, participants' beliefs about sleep, holistic health, and complementary and alternative medicine were also measured using standardized self-report tools. Qualitative questions were included at FU2 to gather information from the active intervention participants regarding their thoughts about and perspectives on HSS. The wait-list control group was offered HSS training at the end of FU2. Participants were recruited through the Royal Canadian Legion Alberta and the Northwest Territories Command and local chapters, as well as through social media. Volunteers were accepted into the study if they could complete the questionnaires in English, were Veterans (or family members of Veterans), and lived in one of the three study cities in Western Canada. The intervention occurred between Jan. 19 and May 4, 2020. The study protocol was approved by the University of Alberta Health Ethics Board (No. RES0041557).

Intervention

A prescribed HSS protocol developed for previous pilot studies with different populations (available at https://cbotlabs.wixsite.com/handselfshiatsu) was implemented.[33,34] The protocol requires participants to self-apply pressure with the pads of their index finger, thumb, or both, for a count of three, to specific points on the dorsal and volar surfaces of the opposite hand and fingers (see website for details and demonstration video). Participants apply HSS once they are in bed, with the lights out, and ready for sleep. The sequence was applied twice and took approximately 10-15 minutes to complete. Each participant was trained in the protocol in a one-to-one session after one week of baseline sleep actigraphy and self-report data collection. Printed HSS materials (available on the website) were provided to participants to facilitate intervention fidelity. Participants were contacted by telephone in the week after HSS training to clarify questions about the technique. Follow-up assessments occurred at FU1 and FU2.

Variables and measures

Data collection consisted of various tools to measure both objective and self-reported dimensions of sleep and daytime fatigue. Potential confounding factors were also measured.

Real-time sleep data were collected using the wrist-worn ActiSleep monitor (Actigraph LLC, Pensacola, FL). Data were uploaded and analyzed using proprietary software. Actigraphy is considered to be a reliable and valid assessment tool and is widely used in sleep research.[38] Participants in the active intervention group wore the device for seven days at BL (before HSS training) and at FU1 and FU2 after HSS training. The control group followed the same measurement schedule but without HSS training or use. Five actigraphy sleep dimensions were retained for analysis — sleep onset latency (minutes), total sleep time (minutes), waking after sleep onset (minutes), average number of awakenings (frequency), and average time awake (minutes). Lower scores for sleep onset latency, waking after sleep onset, average time awake, and average number of awakenings indicate improvement on these dimensions, whereas higher scores for total sleep time reflect improvement.

All participants completed a sleep log each morning and before bed for seven days at BL, FU1, and FU2. Sleep logs are commonly used to record individuals' sleep-related information. Research with an adult population demonstrated a sensitivity of 87.93% and a specificity of 96.51% in relation to objective actigraphy data.[39] In this study, the sleep log collected information about bed and wake-up times that was required for entry into the ActiSleep software before analysis of downloaded monitor data. Participants also indicated whether they had practised HSS at bedtime and during the night.

Sleep disturbance, sleep-related impairment, and fatigue were measured using three psychometrically strong scales developed by the Patient-Reported Outcomes Measurement Information System (PROMIS) program.[40] For each eight-item scale, raw mean scores are converted to standardized *t*-scores with a mean of 50 and a standard deviation of 10. The measures ask participants to rate the past seven days on a five-point scale. The Sleep Disturbance-Short Form 8a assesses self-reported perceptions of sleep quality, sleep depth, and restoration associated with sleep, including difficulties with getting to sleep or staying asleep, and perceptions of the adequacy and satisfaction with sleep. The Sleep-Related Impairment-Short Form 8a focuses on perceptions of alertness, sleepiness, and tiredness during usual waking hours and the perceived functional impairments during wakefulness associated with sleep problems and impaired alertness. The Fatigue-Short Form 8a measures self-reported experience of fatigue (frequency, duration, and intensity) and the impact of fatigue on physical, mental, and social activities. For all three scales, higher scores indicate worse outcomes (e.g., greater sleep disturbance, greater sleep-related impairment, and greater fatigue).

Participants also completed the Pittsburgh Sleep Quality Index (PSQI), a widely used, psychometrically strong self-report measure that assesses sleep quality and disturbances over the previous month.[41] Nineteen individual items generate seven component scores — subjective sleep quality, sleep latency and duration, habitual (usual) sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction. The sum of the scores for the seven components yields a global score with a possible range of 0-21 points, with higher scores signifying poorer sleep. A global score of five or greater indicates poor sleep quality.

The seven-item Flinders Fatigue Scale,[42] a valid and reliable instrument that measures daytime fatigue experienced over the past two weeks, was also used. Six questions are presented in Likert format, with responses ranging from one (not at all) to four (extremely or entirely). The questions include how problematic fatigue is to the individual, the consequences of fatigue, its frequency and severity, and patients' perception of their fatigue's association with sleep. Total fatigue is calculated as the sum of all individual items, with higher scores indicating greater fatigue.

As a proxy indicator of potential co-intervention bias that could have contributed to changes in sleep behaviour (e.g., exposure to sleep education or self-directed information seeking that occurred simultaneously with the HSS protocol), participants completed the Sleep Beliefs Scale at BL and FU2.[43] This scale contains 20 statements describing select behaviours and asks participants whether each has a positive, negative, or no effect on the quality and quantity of sleep in general. Examples of belief statements include "going to bed and waking up at the same hour" and "getting up when it is difficult to fall asleep." Participants also completed the psychometrically sound Holistic Complementary and Alternative Medicine Questionnaire (HCAMQ),[44] an 11-item questionnaire measuring attitudes about holistic health and the scientific validity of complementary and alternative medicine.

At the end of the study, participants were asked questions about additional sleep strategies they may have used during the intervention, how frequently they used the HSS protocol during the study, how quickly they fell asleep while using the technique, whether the HSS steps were easy to remember, whether they felt HSS improved their sleep, and whether they would recommend HSS to others. They were also asked to identify any perceived positive or negative aspects of HSS as well as to rate HSS as a sleep improvement tool on a scale ranging from 1 to 10.

Data analysis

IBM SPSS Statistics version 26.1(IBM Corporation, Armonk, NY) was used for all analyses. The Mann-Whitney *U* test was used to assess between-groups differences in sex and pre-intervention scores on the potential confounding factors. Chi-square tests were used to assess potential differences in mean age between the intervention and control groups. Friedman's test was used to analyze the variance between measurements over the three consecutive measurement points, with the significance level set at 0.025. The qualitative data were not subjected to a systematic analysis. Rather, the information gleaned was used to inform a general understanding of the acceptability and use of HSS by this population.

RESULTS

Fifty people were recruited into the study, with 30 assigned to the intervention group and 20 assigned to the wait-list control group. Recruitment for the wait-list control group was prematurely terminated Mar. 16, 2020, as a result of COVID-19 pandemic-related public health mandates. Outstanding data collection was completed by mail. Five people dropped out of the intervention group after FU1, and four people in the control group did not complete all the data collection forms. The mean age was 67 (range = 39-100) years for the intervention group and 64 (range = 33-86) years for the control group. Women made up 53% of the intervention group and 42% of the control group. There was no significant difference in age (p = 0.55) or sex (p = 0.64) between groups. Notably, on the basis of actigraphy data, 20.5% (19% intervention group, 22% control group) of the participants slept fewer than 6.5 hours nightly at BL.

Objective outcomes

Friedman's test revealed no significant difference on any of the actigraphy sleep dimensions across the three measurement time points in either the intervention group or the control group (Table 1). Please note that actigraphy data were missing among participants in both groups who reported occasionally forgetting to wear the actigraph.

Sleep log

At FU1 and FU2, 44% and 40% of the intervention group participants, respectively, reported using HSS before bed between four and seven nights a week. At FU1 and FU2, 34% and 26% of these participants, respectively, reported using HSS if they woke during the night. Table 2 details participants' adherence to the HSS protocol.

Table 1. Actigraphy results — Friedman's test (analysis of variance)

Dimension and group	Mean scores			χ^2_2	p*
	BL	FU1	FU2		
Latency (min)					
Intervention	3.70	2.10	2.85	0.50	0.78
Control	2.25	1.15	2.20	0.10	0.95
Total sleep time (min)					
Intervention	438.88	431.49	439.46	1.81	0.41
Control	427.94	432.97	440.55	0.38	0.83
WaSO (frequency)					
Intervention	53.47	53.37	52.75	2.80	0.25
Control	55.38	55.11	56.14	0.38	0.83
Awakenings (frequency)					
Intervention	14.29	14.86	15.05	2.87	0.24
Control	13.64	13.89	13.91	2.63	0.27
ATA (min)					
Intervention	3.80	3.80	3.63	3.90	0.14
Control	4.23	4.10	4.33	1.13	0.57

Note: Intervention group, n = 20; control group, n = 16.

*Significant at $p < 0.025$.

BL = baseline; FU1 = follow-up 1, FU2 = follow-up 2; WaSO = wakenings after sleep onset; ATA = average time awake.

Self-report outcomes

Results for all self-report measures were analyzed using Friedman's test to identify changes from BL through FU1 and FU2 (Table 3). For the intervention group, a significant change was detected for Sleep Disturbance-Short Form 8a (χ^2_2 = 10 [n = 25], p = 0.007), but not for the Sleep-Related Impairment-Short Form 8a, Fatigue-Short Form 8a, PSQI, and Flinder's Fatigue Scale. For the control group, a significant change was detected for the Fatigue-Short Form 8a (χ^2_2 = 7.96 [n = 16], p = 0.019) and the PSQI (χ^2_2 = 9.44 [n = 16], p = 0.009). Analysis of the difference in scores between the intervention and control groups for each self-report measure revealed no statistical significance.

Potential confounding variables

No change was found in scores on the Sleep Beliefs Scale, indicating that the participants likely did not apply new

Table 2. Frequency of HSS protocol completions by intervention group participants during data collection periods

Frequency	*n* (%)	
	FU1	FU2
6-7 nights		
Before bed	18 (36)	15 (30)
During night	5 (10)	4 (8)
4-5 nights		
Before bed	4 (8)	5 (10)
During night	5 (10)	2 (4)
1-3 nights		
Before bed	2 (2)	3 (6)
During night	7 (14)	7 (14)
0 nights		
Before bed		1 (2)
During night	7 (14)	10 (20)
Missing	6 (12)	6 (12)

HSS = hand self-shiatsu; FU1 = follow-up 1; FU2 = follow-up 2.

Table 3. Self-report measures — Friedman's test (analysis of variance)

Scale and group	Mean ranks			χ^2_2	*p*
	BL	FU1	FU2		
Sleep disturbance					
Intervention	2.30	2.20	1.15	10.00	0.007*
Control	2.19	1.88	1.94	1.00	0.61
Sleep-related impairment					
Intervention	2.36	1.74	1.90	5.51	0.06
Control	1.97	2.19	1.84	1.03	0.60
Fatigue SF 8a					
Intervention	2.10	1.84	2.06	1.14	0.57
Control	2.19	2.34	1.47	7.96	0.019*
PSQI					
Intervention	2.29	1.94	1.77	3.79	0.15
Control	2.10	2.43	1.47	9.44	0.009*
Flinder's Fatigue Scale					
Intervention	2.24	1.80	1.96	2.76	0.25
Control	2.26	2.21	1.53	6.13	0.047

Note: Intervention group, *n* = 25; control group, *n* = 16.

*Significant at $p < .025$.

BL = baseline; FU1 = follow-up 1; FU2 = follow-up 2; sleep disturbance = Sleep Disturbance-Short Form 8a; sleep-related impairment = Sleep-Related Impairment-Short Form 8a; SF = Short Form; PSQI = Pittsburgh Sleep Quality Index.

Table 4. Confounding variables

	Sleep Beliefs Scale	CAM	HH	HCAMHQ
Z	1.683	1.027	1.065	0.821
*p**	0.09	0.30	0.29	0.41

*Using Wilcoxon test; *p* £ 0.05.

CAM = Acceptance of Complementary and Alternative Medicine sub-scale; HH = Support for Holistic Health Beliefs sub-scale; HCAMQ = Holistic Complementary and Alternative Medicine Questionnaire

information pertaining to conditions affecting sleep (Table 4). The HCAMQ results also indicated no significant change in scores between BL and FU2. Its two sub-scales, Acceptance of Complementary and Alternative Medicine and Support for Holistic Health Beliefs, were analyzed separately. Again, as expected, there were no changes in these scores from BL to FU 2.

At the completion of the study, participants responded to a brief questionnaire about their experience with HSS. Twenty-three participants (77%) stated that they would recommend HSS to others, and 13 (43%) rated the effectiveness of HSS at a 6 or more on a scale ranging from 1 to 10. An open-ended question, asking why participants thought HSS improved their sleep, yielded the following responses (among others):

> HSS took my focus off of stress and problems of daily living and pain; instead it focused my mind on an activity which in itself was very relaxing.
>
> Now I am getting more sleep and I wake up less often and get to sleep faster; I used to toss and turn all night to the point that I would have to get up and leave the bed but I am leaving less often.
>
> Made me slow down and stay focussed on my sleep hygiene.

When asked whether they would recommend HSS to others, participants stated, "No harm, worth it to try something drug-free," "non-invasive, natural," "I did not feel it helped me but it may help someone else," and "I'm sure some people would benefit; I found it a good way to wind down — sort of a meditation with deep breathing and counting my hold times."

DISCUSSION

The primary objective of this work was to examine whether a prescribed HSS intervention would result in improved objectively and subjectively measured sleep for a population of Veterans and their family members who reported experiencing poor sleep. Although there were no statistically significant demographic differences between the groups, it was notable that more than 20% of all participants had an actigraphy sleep duration measurement of less than 6.5 hours at baseline. This is a notable finding because research has shown that a shorter duration of sleep significantly increases the risk of developing chronic health conditions, including cardiovascular disease and diabetes.[45]

Although there was no statistically significant change in objectively measured actigraphy measures of sleep, results from the intervention group's subjective self-report measures demonstrated statistically significant improvement in sleep disturbance. The importance of including both objective and subjective self-report outcome measures in sleep intervention studies has been well documented in the literature.[46-49] Studies comparing subjective self-report and objective measures indicate that these most likely measure different constructs of restorative sleep. For example, a 2018 study of older adults attending a Veterans Administration adult day health care program in the United States concluded that "objective and subjective sleep measures may represent unique and equally important constructs in this population."[46(p. 145)] Unruh and colleagues pointed out that older adults, having become acclimatized to changes in their sleep quality over time, may not always recognize sleep problems as significant.[49] This may contribute to the disconnect between objective and self-report outcomes. Accordingly, the statistically significant findings for the Sleep Disturbance-Short Form 8a,[40] measuring perceptions of sleep quality, sleep depth, restoration associated with sleep, difficulties with getting to sleep, staying asleep, and feelings about the adequacy and satisfaction with sleep, should not be minimized.

It appears that perceptions of restorative sleep, although not well studied, can be related to daytime functioning, depression, and other quality-of-life factors,[50-52] all of which are important considerations in older adults' ability to age well. There is a significant gap in understanding of the role that subjective feelings of restorative sleep play in overall well-being, and this is an important area for future research.

The authors' rationale for selecting HSS as the non-pharmacological intervention was that it is easy to learn, has no cost, and can contribute to participants' feelings of self-efficacy in managing some aspects of their sleep problems. Although the authors did not directly measure ease of learning HSS and changes in sleep self-efficacy, the positive feedback from the interview at the end of the study (discussed later) seems to support that this was the case for many participants. Regarding ease of learning, participants stated that HSS was "easy, worth a try" and "simple to do; helps you get a sleep routine." Specific statements that suggest an enhanced sense of being in control and self-efficacy included "made me slow down and stay focussed on my sleep hygiene," "it is methodical and becomes habitual," "helped me to stop thinking negatively," "it becomes part of the bedtime routine," and "I used to have fear of going to bed and now I do not feel that way." Some participants also attributed a reduction in medication to HSS: "Gave me another resource and the prospect of not being dependent on sleep drugs," "no medications needed," and "I was considering switching to a stronger sleeping pill, and I'm not going to do that anymore."

Underscoring the importance of facilitating feelings of self-efficacy (a component of resiliency for Veterans)[53] is a 2018 study involving 1,118 U.S. Veterans that determined that self-efficacy had a significant buffering effect on the relationship between psychological distress and poor sleep.[52] This is an emerging area of research, and Grah and colleagues highlight the need for more nuanced sleep self-efficacy outcome measures.[54]

Participants' responses to the end-of-study questionnaire indicate that these older adults were receptive to this type of self-managed sleep intervention. The findings regarding perceived ease of learning, sense of control, and acceptability of the intervention are important, given their relationship to sleep insufficiency and the shortage of non-pharmacological sleep interventions. HSS is a no-cost, self-managed, pragmatic intervention that is easily learned and, by its very nature, undeniably portable. These are important considerations, and HSS may be a useful addition to practice when working with this population.

Limitations

The study had several limitations; the sample size was relatively small, the authors were not able to medically screen for existing or non-diagnosed conditions such as apnea, control group recruitment was forced to terminate prematurely, adherence to the HSS technique between follow-up periods was not monitored, electronic screen time and other sleep-inhibiting activities before bedtime were not controlled for, and HSS technique fidelity was not monitored. The authors noted an unexpected statistically significant change in the control group's scores on the fatigue scales and the PSQI self-report, but they speculate that this may reflect a placebo effect related to wearing the actigraph and completion of self-report forms. The control group had an insufficient sample size due to the premature closure of recruitment because of the COVID-19 pandemic, so caution is required with any conclusions.

Although adherence to the HSS protocol was good during the two follow-up measurement periods, it is possible that participants' HSS use fell off between the data collection periods. The last follow-up may have been too early to identify whether the HSS practice had become a sustained habit. It is also possible that HSS is most effective as an intervention for delayed sleep onset. By FU2, only 12% of participants were using HSS four or more times a week during nighttime awakenings. It therefore cannot be determined whether HSS had an influence on wakenings after sleep onset. The outcome of HSS use during the night needs further examination. Finally, the limitations of actigraphy in collecting objective sleep data need to be acknowledged. Future studies would be enhanced through use of electroencephalography to explore changes in Theta and Delta wave activity and polysomnography collected over several nights.

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COMPETING INTERESTS

The authors have nothing to disclose.

CONTRIBUTORS

Cary A. Brown, Annette Rivard, and Leisa Bellmore conceived and designed the research and contributed to the manuscript. Rivard carried out the data analysis. Morgan Kane and Yuluan Wang conducted the data collection and contributed to the manuscript. All authors approved the final version submitted for publication.

ETHICS APPROVAL

The study protocol was approved by the Research Ethics Board at the University of Alberta, Edmonton, Alberta, Canada.

INFORMED CONSENT

All participants provided written informed consent.

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RESEARCH

‘He messaged me the other night and said you are my saviour’: An interpretative phenomenological analysis of intimate partners’ roles in supporting Veterans with mental health difficulties

Hannah Johnstone[a] and Nicola Cogan[a]

ABSTRACT

Introduction: The limited research base regarding Veteran welfare has emphasized the adverse psychosocial aspects of being the intimate partner of a Veteran struggling with mental health difficulties. Despite this, previous research has identified that remaining in a romantic relationship can be a protective factor against mental health difficulties. This study aims to explore intimate partners’ views of the role they play in supporting Veterans with mental health difficulties and the personal meanings they associate with this role. **Methods:** Six female partners of male Veterans were recruited using purposive sampling. Qualitative data were collected using semi-structured one-on-one interviews. Interpretative phenomenological analysis was used to gain an in-depth understanding of the lived experiences of partners of Veterans living with mental health difficulties. **Results:** Three superordinate themes were identified: 1) the multi-faceted nature of support, 2) vicarious psychosocial consequences of the caring role, and 3) reconstruction of a Veteran’s identity after transition. **Discussion:** Intimate partners of Veterans described how they supported Veterans experiencing mental health difficulties, as well as detailing the challenges they faced. Future research topics are considered, and recommendations for further support for intimate partners are outlined.

Key words: caregiving, depression, interpretative phenomenological analysis, intimate partners, IPA, mental health, military, partners, PTSD, UK, Veterans

RÉSUMÉ

Introduction : Des recherches limitées sur le bien-être des vétérans font ressortir les aspects psychosociaux indésirables pour les conjoints des vétérans aux prises avec des troubles de santé mentale. Malgré tout, des recherches antérieures ont établi que le maintien d’une relation amoureuse peut être un facteur de protection contre ce type de troubles. La présente étude explore les points de vue de conjointes sur leur rôle de soutien auprès des vétérans qui ont des troubles de santé mentale et la signification personnelle qu’elles donnent à ce rôle. **Méthodologie :** Les chercheurs ont recruté six conjointes de vétérans au moyen d’un échantillonnage raisonné. Ils ont colligé des données qualitatives dans le cadre d’entrevues individuelles semi-structurées. Ils ont également utilisé l’analyse phénoménologique interprétative (API) pour acquérir une compréhension approfondie des expériences des conjointes des vétérans qui éprouvent des troubles de santé mentale. **Résultats :** Les chercheurs ont dégagé trois thèmes génériques : 1) la nature multidimensionnelle du soutien, 2) les conséquences psychosociales indirectes du rôle d’aidant et 3) la reconstruction de l’identité du vétéran après la transition. **Discussion :** Les conjointes de vétérans ont décrit leurs façons de soutenir les vétérans qui avaient des troubles de santé mentale et leurs difficultés. Les futurs sujets de recherche sont évalués, et les recommandations pour apporter un soutien supplémentaire aux conjointes elles-mêmes sont soulignées.

Mots-clés : aide, analyse phénoménologique interprétative, API, militaire, partenaires, partenaires intimes, Royaume-Uni, santé mentale, trouble dépressif, TSPT, vétérans

LAY SUMMARY

Previous research has shown that partners of Veterans with mental health difficulties can often struggle with their own mental health difficulties when supporting the Veteran. Despite this, many couples choose to remain in a relationship. The authors wanted to know whether there are any positive aspects to being in a relationship with a Veteran and whether the

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partners of Veterans have a role to play in supporting Veterans with mental health difficulties. Using semi-structured interviews, the interviewer asked six female partners of male Veterans to describe their experiences of being in a relationship with a Veteran with mental health difficulties. The partners described three main themes, suggesting that not only do partners have a role to play in supporting Veterans, and the specific ways they do this, but that this role has challenges as well.

INTRODUCTION

Over the past decade, the number of UK Veterans diagnosed with a mental health disorder has almost tripled, rising from 1.8% in 2007-08 to 3.1% in 2017-18.[1] Within this population, almost one-fifth of Veterans have common mental health conditions such as depression and anxiety, and posttraumatic stress disorder (PTSD) is reportedly prevalent among 4% of the Veteran community.[2] Help seeking behaviour has increased, which may contribute to a disparity in the reporting of the true prevalence rate.[3] As mental health issues among Veterans become more recognized and understood, interest in their families has increased, with a number of previous studies focusing on families' views of Veteran mental health.[4-6] Despite this, little research has explored intimate partners' views of their role in supporting Veterans with mental health difficulties and whether this role is beneficial to the recovery process.

Conflicting reports exist of Veterans' actual risk of developing mental health difficulties. National Health Service England has suggested that the rate of Veteran mental health difficulties is similar to that among the UK general population,[7] whereas other research has suggested that the prevalence rate is almost double that of the general public.[8] Recent findings indicate that the prevalence rate of common mental health problems among a population of serving personnel during the Iraq and Afghanistan conflicts was around 22%.[9]

It seems clear that, although the true prevalence rate of mental health problems among Veterans remains unclear, findings from a variety of research are beginning to show the impact of deployment and military service on the mental health of Veterans and their intimate partners and families.[2,10-13] Although PTSD is the most widely researched form of mental health difficulty, Veterans with PTSD tend have other comorbid mental health difficulties or substance misuse.[14] Intimate partners of Veterans are also at risk of developing mental health difficulties such as secondary traumatisation.[15,16]

It should be noted that help seeking behaviour within the Veteran population is different from that of the general population.[14] Estimates show that Veterans struggle to seek help for approximately 11 years after discharge from service.[14,17] Although this time gap in help seeking behaviour often precipitates, and contributes to, Veterans developing more severe mental health difficulties,[18] the impact of this time gap on intimate partners is less researched and understood. When considered alongside research indicating that Veterans' partners are at increased risk of developing mental health difficulties,[6,16] this further adds to the question of what intimate partners experience during this time.

Qualitative studies have explored the impact of Veteran mental health on the well-being of their intimate partners,[5,6,19,20] and several positive factors that can facilitate positive well-being, including having social support and receiving education about PTSD,[20] have been identified. One study used interpretative phenomenological analysis (IPA) to explore the impact of PTSD on the Veterans' intimate relationships.[19] Recommendations include research exploring whether family relationships may aid Veterans' recovery from PTSD and that clinicians include family members in a Veteran's recovery.[19] The recommendations from this study suggest that there is further need to explore the role intimate partners play in supporting Veterans with mental health difficulties. Family relationships can positively influence mental health and well-being, as well as aid a Veteran's transition into civilian life, as stated in Lord Ashcroft's transition report.[21] Moreover, in Scotland, a number of projects include family members of Veterans in the recovery journey.[22]

Despite the seemingly negative evidence presented in previous work,[4,6,16,23,24] there is research suggesting that being in a romantic relationship offers some positive benefits, such as increased emotional well-being, as well as being a general protective factor against mental health problems.[25,26] There is, however, seemingly little research exploring whether these findings may be applicable to Veterans' partners. The current study sought to examine partners' specific role and experience of supporting Veterans with mental health difficulties.

METHODS

Participants

Several strategies were used to recruit study participants. Advertisements were placed around the University of

Strathclyde campus and at Veteran organizations and posted on social media. In addition, the researchers attended, and spoke at, events aimed at Veterans and military personnel to advertise the study and recruit participants. In line with the recommended IPA sample size of five to six participants, six participants were recruited for this study.[27] Table 1 shows participant demographic information that was collected using a background information questionnaire. All the participants and Veteran partners were given pseudonyms based on the first letter of their names, and these pseudonyms were used throughout the data collection and analysis.

Data collection

Semi-structured, one-on-one interviews were conducted by the lead researcher (HJ) to collect data. Semi-structured interviews were used because this methodology allows participants flexibility with their answers and the opportunity to explore their experiences as fully as possible.[28] The interview schedule was developed for the purposes of the current study and was informed by previous work.[6,13,16,19] The interview schedule was first tested with one participant to ensure suitability. No changes were made, and the questions were deemed suitable and appropriate. The participants were asked a total of 17 questions. Six questions focused on the partner's understanding of their Veteran's experience of service, both before and after leaving the military. Two questions focused on whether being in the military affected intimate and family relationships. Two questions asked whether the military provided any support during and after service. Seven questions explored the Veteran's mental health difficulties, the impact these difficulties had on the interviewee's own mental health, and the support they were therefore able to offer.

The interviews were audio recorded using a digital voice recorder and then transcribed verbatim. The interviews ranged in length from 49 to 86 minutes (mean = 60.17 min, SD = 13.69 min). Interviews took place in the participants' homes and via Skype. During the interviews, the researcher made reflective notes to collate any nonverbal information that might later inform analysis.

Data analysis

IPA was used because this approach allows for an in-depth exploration of how participants make sense of their own life experiences and the personal meanings they associate with them. [27-30] In addition, IPA was selected not only because the lead researcher had personal insight into the experiences of Veterans' intimate partners but also because of the complex nature of living alongside mental health difficulties — a dynamic process and time of change that is well suited to this methodology.[27,29,31] This insight allowed the lead researcher to better make sense of the participants' experiences.[29]

In IPA, the analysis is phenomenological in that it is concerned with the perceptions and experiences of individuals and interpretative in that it acknowledges the significant role the researcher plays in making sense of these individuals' experiences.[29] This type of research involves a double hermeneutic; the individual tries to make sense of their experiences, and the researcher tries to make sense of the individual trying to make sense of their experiences.[29] Although the researcher attempts to understand what it is like for the individual to have a particular experience, they cannot access such

Table 1. Participants' demographic information

Participant pseudonym	Age, y*	Partner's gender	Still together	Partnered before deployement?	Service of the Veteran	Veteran's length of service, y†	Diagnosed mental health problem?	Severity of mental health diagnosis
Elaine	60–64	F	Y	Y	Army (regular and TA)	15–20	Depression	Moderate
Ruby	50–54	F	Y	Y	Army (TA)	20–25	Depression	Mild
Charlotte	30–34	F	Y	N	Army (regular)	5–10	PTSD	Severe
Shelia	45–49	F	N	Y	Army (regular)	20–25	None	N.A.
Julia	30–34	F	Y	Y	Army (regular)	20–25	PTSD	Mild
Betty	55–59	F	Y	N	Army (regular)	20–25	None	N.A.

* Age ranges are given to maintain participants' confidentiality.

† Veteran's length of service is given as a range because many participants did not know the exact length of service.

F = female; Y = yes; TA = Territorial Army; N = no; PTSD = posttraumatic stress disorder; N.A. = not applicable.

experiences directly, and so their own perceptions and interpretation of the experiences are recognized.[32]

Following the IPA guidelines, the lead researcher conducted an initial reading to become familiar with each of the participants' interview transcripts.[27-29] A re-reading of the transcripts then occurred, and any statements of interest were noted. These initial notes were then collated to develop emergent themes.

The lead researcher, aided by the co-researcher (NC), then condensed these themes through a process of connecting similar thoughts. Once refinement of the emergent themes occurred, it became clear that three superordinate themes best described and encompassed the remaining emergent themes. Analysis did not explore differences between participants' understandings according to their different demographic characteristics. The Consolidated Criteria for Reporting Qualitative Research checklist was used to guide the reporting of the findings.[33] Full ethical approval was gained from the University of Strathclyde Ethics Committee.

Positionality of the researcher

It is necessary to acknowledge how the researcher's experiences and biases may affect the research process.[34] Investigating the views of Veterans' spouses and partners is of personal significance to the lead researcher, who is the daughter of a Royal Air Force Veteran who experienced mental health difficulties after deployment to Iraq during the 2003 Gulf War. This experience, coupled with family anecdotes about the support having a partner brings, allowed for an insider perspective.[35] This insider perspective allowed for an ability to build a rapport with the participants interviewed for this study, an important aspect of IPA research.[27,29,36] An inside knowledge of military life, as well as a thorough understanding of the challenges faced by intimate partners, may have influenced the interpretation of the interview transcripts. Regular reflective supervision with the co-researcher to explore and recognize potential biases, and how one's own experiences may have influenced the interpretation of the data, was found to be a useful means of addressing such issues. Potential biases were further addressed by having the co-researcher cross-check the emergent themes throughout the analytical process.

RESULTS

Superordinate themes were identified as a result of the researchers' active role in data collection and analysis in accordance with the steps outlined in the IPA guidelines (Table 2). Quotes from participants are presented.

Table 2. Superordinate themes and descriptions

Superordinate theme	Description
Multi-faceted nature of support	Partners of Veterans offer everyday support by knowing the warning signs, allowing the Veteran to be their true selves, and being a supportive person in general.
Psychological consequences of the caring role	Through supporting their Veteran, partners can suffer psychological consequences that can affect their own mental health and well-being.
Reconstruction of Veteran's identity after transition	After discharge from the military, Veterans often lose their identity and sense of purpose. Partners and spouses help to reconstruct this.

Multi-faceted nature of support

Participants identified a number of mechanisms by which they supported their Veterans with mental health difficulties on an everyday basis. Participants described that simply "being there" (Julia) was a key mechanism for support.

Ruby described how she supported her husband by "sorting him out." This description, although simple, encompassed a sense of ongoing support that aided her husband on a daily basis:

> There'd be times see I can't remember what he would comment on … you know like newly meeting somebody else … I can't remember when the last time that was when he'd say oh yeah this is Ruby who sorts me out. Keeps me going. Something like that. (Ruby)

In addition, Charlotte suggested, for her partner, being emotionally invested was a key aspect of support. For Charlotte's partner, being a consistent source of support "helped him massively," allowing him the space to talk about issues when he needed to:

> You know he always says that I've helped him massively … and I think one of the things that stands out to me the most about one of the things he's said to me before is that I'm the only person that's actually bothered to take an interest so previous relationships and things, you know, he never really has spoken to anybody about this sort of thing. (Charlotte)

Participants also discussed the ability to identify when their Veteran partner may have been struggling more than usual. This vigilance allowed the partners to know when support needed to adapt. This vigilance, however, meant that participants needed to fulfil a new role — that of a vigilant caregiver. For Julia, being hypervigilant, and knowing her partner's warning signs, allowed for changes to be made and increased support to be given:

> You know there are worse days and I've said to him, you know, I can tell straight away because he's quite, erm I mean John is like one of the most laid back guys but he's quite he's quite short with me and he's quite sort of agitated. I can always tell if he's kind of going to go because he has really bad nightmares. (Julia)

In addition, knowing their Veteran partners' warning signs meant they were able to support them in seeking professional help when needed, as captured in Ruby's account:

> Actually he sorted of coped with it very well in that he didn't go on for years … not going to the GP or anything like that which you know some people do get stuck don't they and not … so he did react reasonably quickly actually so … yeah in that respect I suppose that was a time he was doing what he could to help himself. (Ruby)

Psychosocial consequences of the caring role

Despite identifying that support aided on a day-to-day basis, every participant described a range of psychosocial consequences as a result of caring for their partners. Psychosocial consequences participants faced included a sense of isolation, an increase in anxiety, and a lowering of overall mood. While expressing the difficulties often faced while they cared for their Veteran partners, participants described a sense of both loss and grief, which they attributed to the impact of caring and supporting. Elaine described how it "probably rubbed off on me" in reflecting on how caring for her husband during difficult mental health episodes adversely affected her own well-being. Also, needing to be vigilant regarding their partners' mental health difficulties could have increased strain on the participants. This, coupled with experiencing their partners' mental health difficulties firsthand, could have contributed to the psychological consequences participants described.

Julia expressed a sense of feeling overwhelmed when her partner was struggling more than usual with his mental health, as well as a sense of grief and loss when describing how her partner would withdraw and become less communicative:

> There are days when I can get really upset because John is, you know, he's hardly spoken to me or he's not been as affectionate with me or he'll come in from work and he just doesn't really speak to me and that can be upsetting … but you know sometimes it is there's times where he doesn't want to go out and I'm you know your immediate reaction is [sighs] right so we're not going out then erm you know and I probably am more a wee bit like that. … It breaks my heart to see him, to know what he's going through. (Julia)

Charlotte experienced an increased sense of anxiety as a result of her partner's mental health difficulties. For Charlotte, engaging in everyday tasks, such as taking care of the household, became increasingly difficult because of the sense of "constant worry" that she felt, particularly when her partner expressed and engaged in suicidal ideation with intent:

> I'd come home from work sometimes and I would walk in the house and he'd be in the bedroom and have a rope wrapped round his neck … or there was a time I was in [the supermarket] and I was doing the shopping before I was about to go home and I got a phone call and I had to abandon my shopping in the middle of the shop to get home because he was just so frightened to be in the house on his own … so it's things like that and it's the constant worry. (Charlotte)

Despite experiencing some negative consequences of caring for their partners, Elaine stated, "the experience has made us who we are," suggesting that, without the experience of supporting her husband through his mental health difficulties, their relationship would not be what it is today.

In addition, Betty discussed a sense of safety she felt with her partner, despite his mental health difficulties:

> So I think his anxiety levels are reduced. … I think he relaxes a lot more, I mean I feel very safe with him because I just feel that you know he would just protect me. (Betty)

For Betty, once her partner's mental health difficulties started to resolve, a sense of safety and overall positivity emerged.

Reconstruction of a Veteran's identity after transition

Participants identified that they aided their Veteran partner in finding a sense of purpose once they finished service. Shelia explained that, for her partner, his purpose was intrinsically linked to his military identity. Moreover, this loss of purpose encompassed a sense of grief and disappointment:

> Yeah I think he lost his purpose and didn't, he didn't have a sense of belonging in what was next I think … he was quite, you know, quite a resilient man and he'd got to warrant officer one so he'd got to a senior post in the military and whatever and I think all of that he suddenly became just Tim. (Shelia)

Julia described how her husband, after being medically discharged, lost not only his home but also additional support from his peers. For her partner, being in the military was more than just a job:

> It was, it was a huge change for him because John was based in Southampton so that was his home for 15 years … so you know it wasn't just leaving, he was leaving his home, he was leaving his you know all his friends and things. (Julia)

Despite this sense of loss, participants described how Veteran partners often found solace in their relationships. Betty's partner let her know that, despite the mental health difficulties he faced, she was — and remained — the person with whom he found "safety." The sense of safety Betty described was echoed by nearly all participants, suggesting that, for intimate partners of Veterans, being the saviour for their Veteran comes with a sense of pride and privilege:

> He messaged me other night and said you are my saviour. (Betty)

Elaine mentioned that she felt "quite privileged to live it" when describing her experiences of supporting her husband throughout his military career, and Charlotte suggested that she "cherishes the good days."

DISCUSSION

This study aimed to gain an in-depth understanding of the role of intimate partners in supporting Veterans with mental health difficulties. IPA resulted in three superordinate themes that captured the intense and complex nature of the role intimate partners play and the personal meaning they associate with this role.

Participants described the multi-faceted nature of support they give their Veterans on a daily basis. This theme described the everyday nature of support, as well as exploring the role participants performed when supporting Veteran partners. For the participants, support meant not only providing a psychological sense of safety but also being physically and emotionally available. In addition, participants discussed a sense of vigilance. This sense of vigilance has been found in previous research, with Beks suggesting that being vigilant is a "tumultuous experience."[37](p. 13) However, for participants in this study, being vigilant allowed for an ability to identify when their partners were struggling more than usual with mental health difficulties, therefore allowing for a change in support and, in some cases, accessing professional help.

The findings from this study shine a light on the role partners of Veterans can play — that of a vigilant caregiver. There was a sense of hypervigilance that allowed the partners to be aware of their Veterans' mental health. Partners needed to know when the Veterans' mental health was poor so that they could not only support them further, if necessary, but also allow themselves a chance to protect their own mental health. This understanding of being a vigilant caregiver could provide valuable insight into family- and couple-based interventions, such as those proposed by Turgoose and Murphy.[38] The findings from this study suggest that many forms of intervention, such as psychoeducation, Internet-based interventions, and residential retreats, are successful in improving the mental well-being of intimate partners; however, group-based interventions were especially highlighted for the connections formed between participants.[38] Sharing an understanding of the difficulties faced while supporting a Veteran, as well as unpacking their role as a vigilant caregiver in a social context, may have contributed to the connections that were formed and could form the basis for future interventions.

Participants discussed the negative and positive psychosocial consequences of supporting Veteran partners. The nature of their partners' mental health difficulties meant they had to fulfil various roles, such as confidant and help seeker, as well as trying to maintain a sense of normality. Despite various negative experiences, some participants described a sense of acceptance, suggesting that, without the negative, there would be no positive.

The participants' experiences echoed numerous pieces of past research exploring the impact of Veteran mental health difficulties on intimate partners, and they highlight the need for improved support and services to be established.[5,6,19,20] The most concerning consequence, however, was the self-reported decline in mental health and well-being. This finding concurs with previous research that intimate partners are at greater risk of experiencing poor mental health than the general public. For participants in this study, low mood and increased anxiety were the main changes in their mental health, echoing previous findings in the field. It seems clear that, although they consider supporting their Veteran a valued role, intimate partners must be supported themselves. Previous research has proposed interventions specifically for intimate partners, with findings suggesting that more work must be done. When considered alongside the findings that participants gained a new role as a vigilant caregiver, it is clear that, when contemplating the welfare of Veterans and their partners, greater scrutiny must be placed on treatment providers to ensure partners are not under too much strain and, fundamentally, are not being used in place of providers themselves.[39]

The reconstruction of a Veteran's identity after transition was a task many of the participants identified as requiring the most energy. Participants identified Veterans as struggling with difficulties in the immediate aftermath of leaving the military, and the sheer nature of the change caused the most issues for partners. This concurs with previous research exploring the difficulties Veterans face during transition.

Strength, limitations, and future research

The findings of this study support and build on previous research reporting that partners of Veterans often face challenges while living with a Veteran experiencing mental health difficulties.[5,6,16,23,24] This study also identifies numerous areas of further support that must be explored. A new understanding of the role intimate partners play in supporting Veterans has been provided, and some of the positive aspects participants experienced during this process have been highlighted.

Although this innovative piece of research has strengths, it also has limitations. All participants were female, and all partners were male and had served in the military for at least a decade. There were differences in age between participants, as well as a considerable difference in the length of time they had been in the relationship. No comparisons were made between groups of partners. Further work would benefit from exploring such factors, as well as diverse relationships, such as same-sex relationships, and intimate partners of female Veterans.

Research exploring the intricacies of support mechanisms provided by the wider family unit (e.g., extended family, children), as well as using a larger participant group, would be illuminating. Future research should also further explore how to best support partners of Veterans with regard to Veteran transition, as well as the types of support partners of Veterans would find helpful. All of the Veterans had served in the British Army, which led to a more homogeneous participant group. Future work exploring other service leavers, such as those retiring, those exiting, or early leavers, would be of interest.

Implications

The findings of this study suggest that intimate partners of Veterans believe they provide an important source of support to Veterans struggling with mental health difficulties; however, they struggled to be included in Veterans' treatment. Partners may benefit from being involved in Veterans' treatment or, at the very least, given adequate information by professionals regarding what they can do at home. Recognizing the complexity, intensity, and challenges of the role intimate partners play in supporting Veterans experiencing mental health difficulties may equally enhance engagement with professional services. The results of this study highlight the challenges partners face when supporting Veterans and the consequent impact on their own mental health. In support of previous research findings, the current study's findings add to the already burgeoning call for Veterans' partners to be given adequate support themselves in order to continue providing support. The need for family members to be included in the resettlement process, and for the military, as a whole, to understand the impact intimate partners have on a Veteran's transition once they leave service, is evident.

Conclusions

This study explored the views and lived experiences of intimate partners in terms of the role they believe they play in supporting Veterans with mental health difficulties. Participants identified some of the mechanisms that help them to support their Veterans, as well as the personal challenges faced. Importance was placed on the impact leaving the military can have on intimate relationships and the consequent effect on both partners' and Veterans' mental health. Implications of this research are far reaching, not only for clinical practice but also regarding the inclusion of Veterans' partners in the resettlement process. It is clear from these findings that partners may need support alongside Veterans in order to provide continuity of care and support for Veteran partners.

Finally, it is important to note that, for many of the partners interviewed, being supportive came part and parcel with the role of being the intimate partner of a Veteran. Although this role came with personal challenges, the strengths, dedication, and pride associated with being part of the Veteran community — and supporting Veterans facing mental health difficulties — held important meanings for Veteran partners.

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COMPETING INTERESTS

The authors have nothing to disclose.

CONTRIBUTORS

Hannah Johnstone and Nicola Cogan conceived and designed the study. Hannah Johnstone collected and analyzed the data and drafted the manuscript. Both authors revised the article and approved the final version submitted for publication.

ETHICS APPROVAL

The study protocol was approved by the School Ethics Committee of the School of Psychological Sciences and Health, University of Strathclyde, Glasgow, Scotland, United Kingdom.

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PEER REVIEW

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RESEARCH

Examining the associations among moral injury, difficulties with emotion regulation, and symptoms of PTSD, depression, anxiety, and stress among Canadian military members and Veterans: A preliminary study

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ABSTRACT

Introduction: Moral injury (MI) refers to the psychological distress associated with perceived betrayals or perceived transgressions of one's moral values. It has been studied primarily among military personnel and Veterans and has been found to be associated with posttraumatic stress disorder (PTSD), depression, anxiety, and other psychiatric symptoms. Recently, research has begun to investigate MI and its potential risk factors. Difficulties with emotion regulation (ER), which refers to difficulties with managing and moderating emotions, is a transdiagnostic factor associated with several psychiatric conditions, including PTSD, depression, and anxiety. The objective of the current study was to investigate the relations among MI; symptoms of PTSD, depression, anxiety, and stress; and difficulties with ER in a sample of Canadian military personnel and Veterans. A secondary aim was to discuss the potential relevance of these relations for military personnel, Veterans, and front-line health care workers during the COVID-19 pandemic. **Methods:** Assessments of MI, PTSD, depression, anxiety, stress, and difficulties with ER were administered to Canadian military personnel and Veterans. Correlational analyses were used to assess the relation of MI to these symptoms. **Results:** Increased levels of MI were associated with avoidance and alterations in mood and cognition symptom clusters of PTSD. Perceived betrayals were also significantly correlated with PTSD-related alterations in mood and cognition symptoms. Symptoms of PTSD were significantly associated with depression, anxiety, and stress. Difficulties with ER were significantly correlated with symptoms of PTSD, depression, anxiety, and stress, but not with MI ($p = 0.07$). **Discussion:** These results reveal an association between MI and specific symptom clusters of PTSD, and they highlight the association between difficulties with ER and symptoms of psychiatric illness among Canadian military personnel and Veterans. The potential implications of these findings and future work examining MI in military personnel, Veterans, and front-line health care workers during the COVID-19 pandemic are discussed.

Key Words: anxiety, Canada, COVID-19, depression, difficulties with emotion regulation, military, moral injury, posttraumatic stress disorder, stress

RÉSUMÉ

Introduction : Le préjudice moral (PM) désigne la détresse psychologique découlant des perceptions de trahison et de transgression de ses propres valeurs morales. Il a surtout été étudié chez les membres du personnel militaire et les vétérans, et il a été établi qu'il est associé au trouble de stress post-traumatique (TSPT), à la dépression, à l'anxiété et à d'autres symptômes psychiatriques. Récemment, les recherches ont commencé à porter sur les facteurs de risque potentiels du PM. Les troubles de régulation affective (RA), qui désignent les difficultés à gérer et à modérer ses émotions, sont des facteurs transdiagnostiques liés à divers troubles psychiatriques, y compris le TSPT, la dépression et l'anxiété. La présente étude vise

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à examiner les relations entre le PM, les symptômes de TSPT, la dépression, l'anxiété, le stress et les troubles de RA auprès d'un échantillon de membres du personnel militaire et de vétérans canadiens. Un objectif secondaire consistait à examiner la pertinence potentielle de ces relations pour le personnel militaire, les vétérans et les travailleurs de la santé de première ligne pendant la pandémie de COVID-19. **Méthodologie :** Les chercheurs ont évalué le PM, le TSPT, la dépression, l'anxiété, le stress et les troubles de RA du personnel militaire et des vétérans. Ils ont utilisé des analyses de corrélation pour évaluer le lien entre le PM et ces symptômes. **Résultats :** Un taux élevé de PM était relié de manière significative aux grappes d'évitement, de perturbations de l'humeur et de symptômes cognitifs relatifs aux TSPT. La perception de trahison était également associée de manière significative aux perturbations de l'humeur et aux symptômes cognitifs liés aux TSPT. Les symptômes de TSPT avaient un lien significatif avec la dépression, l'anxiété et le stress. Les troubles de RA étaient corrélés de manière significative avec les symptômes de TSPT, la dépression, l'anxiété et le stress, mais pas avec le PM (p = 0,07). **Discussion :** Ces résultats révèlent une association entre le PM et des grappes précises de symptômes de TSPT et font ressortir le lien entre les troubles de RA et les symptômes de maladie psychiatrique chez les membres du personnel militaire et les vétérans canadiens. Les répercussions potentielles de ces constatations et les futurs travaux sur le PM chez les membres du personnel militaire, les vétérans et les travailleurs de première ligne pendant la pandémie de COVID-19 sont abordés.

Most-clés : anxiété, Canada, COVID-19, dépression, militaire, préjudice moral, stress, troubles de régulation affective, trouble de stress post-traumatique

LAY SUMMARY

Moral injury (MI) refers to the distress experienced when people do, or do not, do something that goes against their morals or values. It can also occur when people perceive that their values have been betrayed. MI is associated with several mental health conditions, including posttraumatic stress disorder (PTSD), depression, and anxiety. A potential risk factor for MI may include difficulties with emotion regulation (ER). Difficulties with ER refers to the ability to manage emotions. It is associated with the same mental health conditions linked to MI, including PTSD. The purpose of this study was to examine whether difficulties with ER were associated with MI in a Canadian military personnel and Veteran sample. Participants completed several questionnaires assessing for MI, difficulties with ER, and other mental health symptoms, such as PTSD, while they were inpatients at a psychiatric hospital. It was found that MI and perceived betrayals were associated with symptoms of PTSD. Symptoms of PTSD, depression, and anxiety were also associated with one another. Difficulties with ER were also associated with symptoms of PTSD, depression, and anxiety but were not related to MI. The findings serve as a first step in examining potential risk factors of MI.

INTRODUCTION

The Canadian Armed Forces (CAF) employs more than 100,000 individuals,[1] with personnel distributed across the globe.[2] Critically, the CAF faces unconventional and asymmetric warfare in the combat theatre, involving ill-defined enemies and the presence of what may be perceived as morally ambiguous objectives. A burgeoning area of research suggests that military personnel exposed to these situations have the potential to develop moral injury (MI),[3-5] defined as the psychological distress associated with committing, failing to prevent, observing, or learning about an event that violates one's moral and ethical values.[3] MI may result in response to a person's own acts of omission or commission (i.e., perceived transgressions) or through witnessing acts of omission or commission by an authoritative individual or group, resulting in a sense of betrayal.[3,5] Specifically, Litz and colleagues have suggested that the ambiguous context of some combat (e.g., difficulty discriminating between enemies and civilians, guerrilla warfare, rules of engagement limiting assistance to bystanders) and the other roles that military personnel are assigned (e.g., peacekeeping, stabilization, crises work) may expose personnel to situations in which they are required to act in a manner that may or may not be in keeping with their ethical and moral values.[3]

Notably, MI has been associated with numerous psychological difficulties, including posttraumatic stress disorder (PTSD), major depressive disorder (MDD),[6,7] anxiety,[7] suicidal ideation, difficulties with social functioning,[4] loss of trust and spirituality, and feelings of guilt and shame. Preliminary work has begun to examine potential risk factors for MI in an effort to identify those individuals who are more susceptible to the development of distress after a morally injurious event.[8,9] Here, qualitative work in a Veteran sample has identified that MI could occur after events in which loss of vulnerable persons occurs.[8] Moreover, perceived lack of support from leaders, friends, and families, as well as perceived lack of responsibility from leadership, were also indicated as risk factors for the development of distress after a morally injurious event. Veterans also reported that perceived unawareness of the potential emotional and psychological consequences of their actions, or lack of actions; concurrent exposure to other traumatic events or life stressors;

and lower educational attainment may contribute to the risk of developing MI. In addition, a study examining a sample of Canadian military personnel and Veterans found that childhood emotional abuse was significantly associated with MI during adulthood,[9] suggesting that it may also confer risk in the development of MI.

Difficulties with emotion regulation may also constitute another risk factor for the development of MI among military personnel and Veterans, but it remains unexplored in this population. Specifically, difficulties with emotion regulation have been linked to PTSD,[10,11] MDD,[12] anxiety disorders,[13] and borderline personality disorder,[14,15] including among military personnel and Veterans. Emotion regulation includes the ability to manage and moderate emotional responses.[16] Notably, difficulties with emotion regulation have been identified as a transdiagnostic factor and a mechanism of symptom expression and severity in psychiatric disorders, where as difficulty with emotion regulation increases, psychological symptom expression and severity worsen.[17-19] Consequently, difficulty with emotion regulation is a linking factor across several psychological and emotional conditions and may subsequently play a critical role in the relations among MI and other psychiatric conditions.

The effort to identify risk factors of MI, such as difficulties with emotion regulation, may help to identify those individuals who are more susceptible to the development of distress after a morally injurious event and who may subsequently require additional support services and treatment. Notably, this effort may be relevant during the COVID-19 pandemic, in which Canadian military personnel have been tasked with assisting and supporting the Government of Canada's pandemic response.[20] Here, military personnel may also have been exposed to moral and ethical dilemmas. For example, military personnel were tasked with assisting front-line health care workers to provide care in long-term-care facilities in Ontario and Quebec.[20] Accordingly, a report by the Department of National Defence and the CAF was released after the military's involvement in long-term-care facilities, which detailed the deplorable conditions nursing home residents were living in, including how residents were found in soiled bedding after days of neglect.[21] These findings demonstrate the potential of encountering morally injurious events, including bearing witness to the pain and suffering among patients and their families, during the COVID-19 pandemic. Such events may transgress the central dictums of medical care and front-line intervention, which may also increase the susceptibility to experiencing a MI.

Therefore, given the dearth of Canadian research examining MI and its potential risk factors, the objective of this study was to investigate the relations among MI, psychological symptoms, and difficulties with emotion regulation in a sample of Canadian military personnel and Veterans. An additional goal was to discuss the potential relevance of such findings for military personnel, Veterans, and other front-line health care workers in the context of the COVID-19 pandemic.

METHODS

Procedures and participants

Data for this study were collected via Research-Ethics-Board-approved retrospective chart review of standardized assessment batteries administered to all newly admitted patients at the Program for Traumatic Stress Recovery (PTSR) at Homewood Health Centre in Guelph, Ontario, Canada, between May 22, 2015, and June 30, 2016. These data were also combined with data collected prospectively at the centre between August 2017 and November 2019. Of the 634 unique individuals included in the retrospective and prospective sample, 128 participants identified as being either active military personnel or Veterans and were included in the sample.

Demographic information were requested from the Resident Assessment Instrument-Mental Health Assessment, an assessment mandated by the Ontario Ministry of Health and Long-Term Care for the collection of clinical and administrative data. Participants were excluded from the analyses on the basis of missing or incomplete data ($n = 32$; listwise deletion based on missing data from any variable in the analysis) and also for simultaneously identifying as military personnel or Veterans and public safety personnel ($n = 23$), leaving a final sample of 73 military personnel and Veterans. Patients were admitted to the PTSR unit on the basis of presumed exposure to traumatic events. Demographic and clinical characteristics of the sample are reported in Table 1. Data from a subset of participants from the current study (based on available data; samples are not identical) also appear in other reports.[9,22,23]

Measures

Moral injury

MI was assessed using the Moral Injury Events Scale (MIES),[24] which was adapted for the Canadian

Table 1. Demographic and clinical characteristics	Sample (*N* = 73)
Demographic characteristics, *n* (%)*	
Sex, male:female	62:11
Age, mean, (SD)	43.7 (9.3)
Marital status	
Never married	13 (17.8)
Married or common law	41 (56.2)
Living with partner or significant other	4 (5.5)
Separated	9 (12.3)
Divorced	6 (8.2)
Education	
≤ 8th grade	1 (1.4)
Some high school	8 (11.0)
High school	16 (21.9)
Technical or trade school	11 (15.1)
Some college or university	19 (26.0)
Diploma or bachelor's degree	11 (15.1)
Graduate degree	7 (9.6)
Income	
Employed	27 (37.0)
Employment insurance	5 (6.8)
Pension	24 (32.9)
Social assistance	1 (1.4)
Disability insurance	18 (24.7)
Other (e.g., investment, WSIB, inheritance)	12 (16.4)
No income	2 (2.7)
Clinical characteristics, mean (SD)	
Moral injury	
MIES Transgress	23.5 (9.8)
MIES Betrayal	13.1 (4.6)
MIES Total score	36.6 (12.4)
Posttraumatic stress symptoms	
PCL-5 Intrusions	14.3 (4.3)
PCL-5 Avoidance	6.2 (1.9)
PCL-5 Mood and Cognitions	21.6 (4.4)
PCL-5 Reactivity	17.6 (3.8)
PCL-5 Total score	59.6 (11.9)
Depression, anxiety, and stress symptoms	
DASS-21 Depression	28.1 (10.9)
DASS-21 Anxiety	23.5 (9.6)
DASS-21 Stress	28.7 (8.2)
Emotion dysregulation	
DERS Nonacceptance	21.3 (7.4)
DERS Goals	20.5 (4.5)
DERS Impulse	18.4 (6.4)
DERS Awareness	21.1 (5.0)
DERS Strategies	28.6 (7.3)
DERS Clarity	16.7 (4.2)
DERS Total score	126.5 (25.3)

Note: Percentages may not total 100 because of rounding.

*Unless otherwise indicated.

WSIB = Workplace Safety and Insurance Board; MIES = Moral Injury Events Scale; Transgress = Transgression sub-scale; Betrayal = Betrayal sub-scale; PCL-5 = PTSD Checklist for DSM-5; Intrusions = Intrusions sub-scale; Avoidance = Avoidance sub-scale; Mood and Cognitions = Negative Alterations in Mood and Cognitions sub-scale; Reactivity = Arousal and Reactivity sub-scale; DASS-21 = Depression, Anxiety, and Stress Scale; Depression = Depression sub-scale; Anxiety = Anxiety sub-scale; Stress = Stress sub-scale; DERS = Difficulties in Emotion Regulation Scale; Nonacceptance = Nonacceptance sub-scale; Goals = Goals sub-scale; Impulse = Impulse Sub-scale; Awareness = Awareness sub-scale; Strategies = Strategies sub-scale; Clarity = Clarity sub-scale.

military context. Patients rated their agreement on a nine-item self-report measure, which assessed MI along two dimensions — perceived betrayals (MIES Betrayal sub-scale) and perceived transgressions (MIES Transgression sub-scale). High internal consistency coefficients for the MIES have been reported for a military sample in the United States (Cronbach's α = 0.90).[24] In the current sample, Cronbach's α was 0.87 for the MIES total score.

Posttraumatic stress symptoms

The PTSD Checklist for DSM-5 (PCL-5) was administered to patients to assess the severity of PTSD symptoms (PCL-5 total score) according to the diagnostic criteria outlined in the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM-5).[25,26] The symptom domains included intrusive symptoms (PCL-5 Intrusions sub-scale), avoidance (PCL-5 Avoidance sub-scale), negative alterations in mood and cognitions (PCL-5 Negative Alterations in Moods and Cognitions sub-scale), and alterations in arousal and reactivity (PCL-5 Arousal and Reactivity sub-scale). The PCL-5 shows high internal consistency in military (Cronbach's α = 0.95) and Veteran (Cronbach's α = 0.95) samples.[27, 28] In the current sample, Cronbach's α was 0.90 for the PCL-5 total score.

Depression, anxiety, and stress symptoms

The 21-item version of the Depression, Anxiety, and Stress Scale (DASS-21) was administered to assess the severity and presence of symptoms related to depression (DASS-21 Depression sub-scale), anxiety (DASS-21 Anxiety sub-scale), and stress (DASS-21 Stress sub-scale) within the past week.[29] The DASS-21 has been shown to have good internal consistency (Cronbach's $\alpha = 0.73$-0.81). Here, the Cronbach's α values were 0.89, 0.81, and 0.79 for the Depression, Anxiety, and Stress sub-scales, respectively.

Difficulties with emotion regulation

The Difficulties in Emotion Regulation Scale (DERS),[16] a 36-item self-report measure, was used to assess challenges with emotion regulation across six domains — difficulties with accepting negative emotions (DERS Nonacceptance sub-scale), difficulties completing tasks because of negative emotions (DERS Goals sub-scale), difficulties with controlling impulses while experiencing distressing emotions (DERS Impulse sub-scale), difficulties with awareness of emotional experiences (DERS Awareness sub-scale), negative beliefs regarding the ability to regulate emotions (DERS Strategies sub-scale), and difficulties with insight regarding emotions (DERS Clarity sub-scale). Higher scores indicate greater dysfunction with emotion regulation. The DERS has been shown to have good psychometric properties, including internal consistency and construct validity.[16] In the current sample, Cronbach's α was 0.94 for the DERS total score.

Statistical methods

Data were analyzed using IBM SPSS Statistics version 26.0 (IBM Corporation, Armonk, NY). Analyses were preceded by tests of normality. Measures and their sub-scales were found to be non-normal. Therefore, non-parametric analyses were performed. Given the small sample size, to determine whether MI and symptoms of PTSD, depression, anxiety, and stress were associated with difficulties with emotion regulation, correlation analyses (i.e., Spearman's r_s) controlling for age and sex were performed. Analyses were two-tailed, and α was set at 0.05.

RESULTS

The mean MI score was 36.6 (SD = 12.4), with a range of scores falling between 9 and 54. Moreover, the mean symptom severities for PTSD, depression, anxiety, stress, and difficulties with emotion regulation were 59.6 (SD = 11.9), 28.1 (SD = 10.9), 23.5 (SD = 9.6), 28.7 (SD = 8.2), and 126.5 (SD = 25.3), respectively.

Significant positive correlations were found between MI and symptoms of PTSD avoidance ($r_s = 0.3, p = 0.03$; Table 2) and MI and alterations in cognition and mood symptoms related to PTSD ($r_s = 0.2, p = 0.04$). Perceived betrayals also correlated significantly with alterations in cognition and mood symptoms ($r_s = 0.3, p = 0.02$). No significant correlations were found among MI, perceived transgressions, and perceived betrayals with PTSD symptom severity ($r_s = 0.2, p = 0.06$; $r_s = 0.2, p = 0.1$; and $r_s = 0.2, p = 0.06$, respectively), depression ($r_s = 0.2, p = 0.08$; $r_s = 0.2, p = 0.1$; and $r_s = 0.2, p = 0.1$, respectively), anxiety ($r_s = 0.1, p = 0.3$; $r_s = 0.1, p = 0.2$; and $r_s = 0.03, p = 0.8$, respectively), or stress ($r_s = 0.1, p = 0.2$; $r_s = 0.09, p = 0.4$; and $r_s = 0.2, p = 0.1$, respectively) symptoms. Perceived transgressions and perceived betrayals were not significantly associated with difficulties with emotion regulation ($r_s = 0.2, p = 0.1$, and $r_s = 0.2, p = 0.1$, respectively). MI and difficulties with emotion regulation approached significance, but did not reach the α threshold (i.e., $r_s = 0.2, p = 0.07$).

PTSD symptom severity correlated significantly with depression ($r_s = 0.6, p < 0.001$), anxiety ($r_s = 0.6, p < 0.001$), and stress ($r_s = 0.6, p < 0.001$) symptoms. Difficulties with emotion regulation were also correlated significantly with PTSD ($r_s = 0.6, p < 0.001$), depression ($r_s = 0.7, p < 0.001$), anxiety ($r_s = 0.6, p < 0.001$), and stress ($r_s = 0.7, p < 0.001$) symptoms.

DISCUSSION

This study is the first to examine the relations among MI, symptoms of PTSD, depression, anxiety, and stress, and difficulties with emotion regulation in a Canadian military personnel and Veteran sample. Here, significant positive correlations emerged between levels of self-reported MI and symptoms of PTSD-related avoidance (*DSM-5* cluster C criteria for a diagnosis of PTSD) and alterations in cognition and mood (*DSM-5* cluster D criteria for diagnosis of PTSD),[26] which are findings in keeping with previous work demonstrating a link between symptoms of PTSD and MI.[6,7] Notably, the relation between symptoms of MI and PTSD-related avoidance may support previous research that has found that individuals with MI experience challenges with social functioning.[4] Specifically, challenges related to social functioning may be associated with feelings of guilt (i.e., feeling as though one is at fault for a specific outcome) and shame (i.e., negative global self-evaluations),[30] which

Table 2. Summary of Spearman's r_s (controlling for age and sex) for MIES, PCL-5, DASS-21, and DERS sub-scales and total scores

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. MIES Transgress	–	$0.4^{\dagger}$	$1.0^{\dagger}$	0.06	0.2	0.2	0.2	0.2	0.2	0.1	0.09	0.1	0.2	0.2	0.08	0.2	0.1	0.2
2. MIES Betrayal		–	$0.7^{\dagger}$	0.05	0.2	0.3^{*}	0.1	0.2	0.2	0.03	0.2	0.1	0.2	0.09	0.01	0.2	0.2	0.2
3. MIES Total score			–	0.05	0.3^{*}	0.2^{*}	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.08	0.2	0.1	0.2
4. PCL-5 Intrusions				–	$0.4^{\dagger}$	$0.5^{\dagger}$	$0.5^{\dagger}$	$0.8^{\dagger}$	$0.4^{\dagger}$	$0.5^{\dagger}$	$0.4^{\dagger}$	0.3^{*}	0.3^{*}	0.2^{*}	0.05	0.2	0.3^{*}	0.3^{*}
5. PCL-5 Avoidance					–	$0.4^{\dagger}$	0.3^{*}	$0.6^{\dagger}$	0.3^{*}	$0.4^{\dagger}$	0.3^{*}	0.3^{*}	$0.4^{\dagger}$	0.3^{*}	0.2	0.2	0.3^{*}	$0.4^{\dagger}$
6. PCL-5 Mood and Cognitions						–	$0.7^{\dagger}$	$0.9^{\dagger}$	$0.6^{\dagger}$	$0.5^{\dagger}$	$0.6^{\dagger}$	$0.5^{\dagger}$	$0.3^{\dagger}$	$0.5^{\dagger}$	0.2	$0.4^{\dagger}$	$0.5^{\dagger}$	$0.6^{\dagger}$
7. PCL-5 Reactivity							–	$0.8^{\dagger}$	$0.4^{\dagger}$	$0.5^{\dagger}$	$0.6^{\dagger}$	$0.4^{\dagger}$	$0.4^{\dagger}$	$0.6^{\dagger}$	0.2	$0.4^{\dagger}$	$0.4^{\dagger}$	$0.6^{\dagger}$
8. PCL-5 Total score								–	$0.6^{\dagger}$	$0.6^{\dagger}$	$0.6^{\dagger}$	$0.4^{\dagger}$	$0.5^{\dagger}$	$0.5^{\dagger}$	0.2	$0.4^{\dagger}$	$0.5^{\dagger}$	$0.6^{\dagger}$
9. DASS-21 Depression									–	$0.6^{\dagger}$	$0.6^{\dagger}$	$0.6^{\dagger}$	$0.4^{\dagger}$	$0.5^{\dagger}$	$0.4^{\dagger}$	$0.6^{\dagger}$	$0.5^{\dagger}$	$0.7^{\dagger}$
10. DASS-21 Anxiety										–	$0.8^{\dagger}$	$0.5^{\dagger}$	$0.4^{\dagger}$	$0.6^{\dagger}$	0.1	$0.5^{\dagger}$	$0.4^{\dagger}$	$0.6^{\dagger}$
11. DASS-21 Stress											–	$0.6^{\dagger}$	$0.5^{\dagger}$	$0.6^{\dagger}$	0.1	$0.6^{\dagger}$	$0.5^{\dagger}$	$0.7^{\dagger}$
12. DERS Nonacceptance												–	$0.6^{\dagger}$	$0.5^{\dagger}$	–0.04	$0.7^{\dagger}$	$0.4^{\dagger}$	$0.8^{\dagger}$
13. DERS Goals													–	$0.6^{\dagger}$	0.2	$0.7^{\dagger}$	$0.4^{\dagger}$	$0.8^{\dagger}$
14. DERS Impulse														–	0.06	$0.6^{\dagger}$	$0.3^{\dagger}$	$0.7^{\dagger}$
15. DERS Awareness															–	0.2^{*}	$0.5^{\dagger}$	$0.4^{\dagger}$
16. DERS Strategies																–	$0.4^{\dagger}$	$0.9^{\dagger}$
17. DERS Clarity																	–	$0.6^{\dagger}$
18. DERS Total score																		–

Note: Spearman's r_s correlations for a sample of Canadian military and Veteran participants ($N = 73$).

* $p \le 0.05$ (two-tailed).
† $p \le 0.01$ (two-tailed).

MIES = Moral Injury Events Scale; Transgress = Transgression sub-scale; Betrayal = Betrayal sub-scale; PCL-5 = PTSD Checklist for DSM-5; Intrusions = Intrusions sub-scale; Avoidance = Avoidance sub-scale; Mood and Cognitions = Negative Alterations in Mood and Cognitions sub-scale; Reactivity = Arousal and Reactivity sub-scale; DASS-21 = Depression, Anxiety, and Stress Scale; Depression = Depression sub-scale; Anxiety = Anxiety sub-scale; Stress = Stress sub-scale; DERS = Difficulties in Emotion Regulation Scale; Nonacceptance = Nonacceptance sub-scale; Goals = Goals sub-scale; Impulse = Impulse Sub-scale; Awareness = Awareness sub-scale; Strategies = Strategies sub-scale; Clarity = Clarity sub-scale.

are symptoms found within PTSD cluster D criteria. Critically, guilt and shame are generally believed to drive social avoidance and withdrawal from others.[30] Within the context of MI, these emotions may elicit the belief that one's behaviours (i.e., actions or inactions) have caused irreparable harm,[31,32] leading to avoidance of reminders of one's actions and detachment from others, because individuals with MI may not want others to see the "stain on [their] soul."[33(p. 413)]

Moreover, these associations may also be supported by the link found between perceived betrayals and alterations in cognitions and mood (i.e., PTSD cluster D criteria). Specifically, when betrayal occurs in the context of an interpersonal or institutional relationship, it may elicit several psychological and behavioural responses, such as avoidance behaviours.[34-36] More important, betrayal can occur in the military context as a result of its hierarchical organization,[3,4,37,38] such as when an individual does not receive acknowledgement from his or her superiors if injuries are sustained during warfare or if one experiences within-rank violence, such as sexual assault.[4,37]

Moreover, difficulties with emotion regulation among military personnel and Veterans were associated with heightened symptoms of PTSD, depression, anxiety, and stress ($ps < 0.001$). These findings are consistent with earlier reports in the literature,[10-13] in which, for example, the use of maladaptive emotion regulation strategies, such as rumination and non-acceptance of emotional experiences,[12] is thought to contribute to the maintenance of depressive symptomatology and severity, anxiety symptoms,[13] and PTSD.[10,11] Together, this constellation of symptoms is associated with negative outcomes among military personnel and Veterans, including social and occupational withdrawal, increased mental health service utilization, and difficulties with the transition to civilian life,[39] which warrants continued investigation of potential risk factors and potential treatments for MI.

Of note, the associations among MI, perceived transgressions, and perceived betrayals with PTSD symptom severity, depression, anxiety, and stress symptoms were not significant. Furthermore, the relations among difficulties with emotion regulation, MI, and its subsequent dimensions (i.e., perceived transgressions and betrayals) also did not reach the threshold for significance. This is contrary to our prediction that MI and difficulties with emotion regulation are associated with one another. Critically, these non-significant findings may be due to several limitations of the study. In particular, the current study is limited by a relatively small sample size. Future work should aim to replicate these findings with a larger sample. Moreover, clinical data were partly acquired through a retrospective medical chart review, as well as through data collected at one time point, making this study cross-sectional in nature. Accordingly, no conclusions regarding the temporal nature of the relations among the variables may be drawn (i.e., whether symptoms of PTSD made individuals more susceptible to developing MI or vice versa). Future studies may address these issues by using prospective data collection. In addition, clinical data should be collected using structured clinical interviews to confirm the findings from the self-report measures and to assess the index traumas, as well as to confirm exposures to potentially morally injurious events.

An additional weakness of the study includes the use of the MIES.[24] Specifically, the MIES makes it difficult to discern whether it was the exposure to morally injurious events, or the expression of distress associated with MI that contributed to the findings. Future work should ensure that exposure to morally injurious events and the expression of distress associated with MI are clearly delineated. Another weakness of the study is that guilt and shame are indirectly assessed via PTSD cluster D criteria; future studies may address this weakness by including measures of guilt and shame to directly test these relations. Collectively, these limitations also affect the representativeness of the significant findings, and it is cautioned that these findings are preliminary in nature. Subsequently, future work should endeavor to replicate these findings.

An additional avenue for future work is the further exploration of the relation between perceived betrayals and PTSD symptoms. As discussed previously, in the context of the COVID-19 pandemic, military personnel and Veterans have been called on to assist front-line health care workers in long-term-care facilities where they have witnessed patients in deplorable conditions.[20,21] Notably, not only have military personnel witnessed and experienced these events, but so too did front-line health care workers. Although these two groups are marked by significant differences, including their training, work environments (e.g., health care settings vs. battle theatres), and organizational structures, the betrayal of the central dictums of care alongside the betrayals and failures of the health care system and government to protect patients and front-line health care workers may subsequently expose both groups to potentially morally injurious events and their subsequent consequences.[40] Future work should consider exploring these potential associations and differences among military personnel, Veterans, and front-line health care workers in the wake of the COVID-19 pandemic. Finally, much future work is needed to elucidate whether targeting difficulties with emotion regulation will improve military personnel's and Veterans' psychological distress after exposure to morally injurious experiences.

Despite the study's limitations and preliminary findings, it serves as an initial step in considering additional risk factors associated with MI among military personnel and Veterans, and it postulates whether other populations, such as front-line health care workers, may be considered as also experiencing potentially morally injurious events. Accordingly, this lays the foundation for future research regarding MI and subsequently improving overall social and occupational functioning.

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COMPETING INTERESTS

The authors have nothing to disclose.

CONTRIBUTORS

Alina Protopopescu helped select the research questions, conducted the literature search, analyzed the results, and drafted the manuscript. Margaret C. McKinnon, Ruth A. Lanius, and Rakesh Jetly, conceived the research and assisted in the interpretation of study data. All authors revised the manuscript for important intellectual content and approved the final version submitted for publication.

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The study protocol was approved by Homewood Health Centre Research Ethics Board, Homewood Health Centre, Guelph, Ontario, Canada.

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PEER REVIEW

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RESEARCH

Paternal alcohol misuse in UK military families: A cross-sectional study of child emotional and behavioural problems

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ABSTRACT

Introduction: This study explores the association between paternal alcohol misuse and child emotional and behavioural problems in a representative sample of UK military families. **Methods**: Cohort study data on paternal alcohol consumption were linked to survey data from UK military families on child outcomes. Paternal alcohol use was measured using the Alcohol Use Disorders Identification Test. Parents reported on child behavioural outcomes using the Strengths and Difficulties Questionnaire, measuring hyperactivity and inattention, emotional symptoms, conduct problems, peer relationship problems, prosocial behaviour, and total difficulties. Multivariable logistic regression accounted for survey weights and clustering. Effect modification by child age and gender and paternal mental health was explored. **Results**: A total of 595 fathers and 1,002 children were included in the study; 364 fathers were classed as misusing alcohol (weighted 62.3%). Paternal alcohol misuse was associated with higher odds of conduct disorders (OR 1.39; 95% CI, 0.98-1.98), although this association was not statistically significant ($p = 0.07$). A significant association between paternal alcohol misuse and conduct disorders was apparent for girls and in the restricted analysis of the children of fathers who did not report symptoms of depression or posttraumatic stress disorder. **Discussion**: This study suggests that paternal alcohol misuse may have an effect on the well-being of children in military families. Further studies replicating this association are warranted.

Key words: alcohol, alcohol misuse, child behaviour, child well-being, fathers, military families, paternal, United Kingdom

RÉSUMÉ

Introduction : La présente étude visait à explorer l'association entre la consommation excessive d'alcool par le père et les problèmes émotionnels et comportementaux de l'enfant dans un échantillon représentatif des familles de militaires du Royaume-Uni. **Méthodologie :** Les données d'études de cohorte sur la consommation d'alcool par le père ont été liées aux données d'une enquête auprès de familles de militaires du Royaume-Uni sur les résultats cliniques des enfants. Les chercheurs ont mesuré la consommation d'alcool par le père au moyen du test de dépistage des troubles liés à la consommation d'alcool (test AUDIO). Les parents ont rendu du compte des résultats comportementaux des enfants au moyen du questionnaire sur les forces et les difficultés, qui mesurent l'hyperactivité et l'inattention, les symptômes émotionnels, les troubles des conduites, les problèmes de relations avec les camarades, les comportements prosociaux et les difficultés totales. La régression logistique multivariable a tenu compte de la pondération et du regroupement des enquêtes. Les chercheurs ont exploré la modification de l'effet d'après l'âge et le genre de l'enfant et d'après la santé mentale du père. **Résultats :** Au total, 595 pères et 1,002 enfants ont participé à l'étude, et 364 pères ont été classés comme consommant trop d'alcool (proportion pondérée à 62,3 %). La consommation excessive d'alcool par le père était liée à un risque plus élevé de troubles des conduites (RC 1,39 [0,98 à 1,98]), qui n'était pas statistiquement significatif (p=0,07). Il y avait une association significative entre la consommation excessive d'alcool par le père et les troubles des conduites, laquelle était apparente chez les filles et dans l'analyse restreinte chez les enfants de pères qui n'avaient pas déclaré de symptômes de dépression ou de trouble de stress post-traumatique. **Discussion :** D'après la présente étude,

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la consommation excessive d'alcool par le père peut avoir un effet sur le bien-être des enfants de familles de militaires. D'autres études s'imposent pour répliquer cette association.

Mots-clés : alcool, bien-être des enfants, comportement des enfants, consommation abusive d'alcool par le père, familles de militaires, pères, Royaume-Uni, troubles de comportement

LAY SUMMARY

When parents drink unhealthy amounts of alcohol, it can have negative consequences for their children's mental health. Although some evidence has shown that members of the military may consume alcohol at unhealthy levels, no study has yet looked at the possible impact on children connected to military families. The authors completed a study among children of UK fathers who served in the military and determined that alcohol misuse by fathers who serve in the military may negatively affect their children's behaviour. More research is needed to confirm this relationship and identify targets for prevention and harm reduction.

INTRODUCTION

Alcohol misuse in the United Kingdom, and in the UK Armed Forces, specifically, is a public health concern. One in five UK adults and 67% of the UK military consume alcohol at levels classified as misuse.[1,2] Young men in the military who have experienced trauma are even more likely to consume alcohol at unhealthy levels.[3] Alcohol misuse has negative health consequences for the individual consumer and is one of the leading causes of disability in the United Kingdom.[4] Studies in the UK Armed Forces suggest that alcohol misuse is associated with personal harm, including higher rates of traffic accidents,[5] health problems,[6] and violence,[7,8] as well as a high rate of comorbidity with mental health problems and suicide.[9,10]

Alcohol misuse can also have harmful health effects on the individual consumer's family members, including their children. Parental alcohol dependency during a child's early development is an established risk factor for negative child behavioural and emotional problems, including higher rates of hyperactivity, conduct disorder, and anxiety.[11-15] The children of parents who have an alcohol dependency are more likely to perform poorly at school and to engage earlier in substance use than children of parents who do not misuse alcohol.[13,16-18] Parental alcohol dependency is believed to cause harm through a constellation of causal factors, including prenatal exposure, greater exposure to life stressors (e.g., family violence, poverty), exposure to negative parenting styles (e.g., caregiver neglect, lack of nurturing), and chaotic or unstable family systems.[14,19,20] Parental posttraumatic stress disorder (PTSD) is also an established risk factor for poor child outcomes in a military setting,[21] and a recent systematic review of general population and military studies concluded that the prevalence of PTSD comorbid with alcohol misuse ranged from 2.0% to 62.0%.[22] These effects may be long lasting, providing the foundation for future alcohol consumption patterns and perpetuating the cycle of secondary harm.[23]

Although alcohol consumption is widely recognized as a leading cause of mortality and has no health benefits relative to harm caused to the individual,[24,25] research into the secondary harms of alcohol misuse is sparse. Understanding how alcohol misuse affects child mental health and well-being is important, given the high prevalence of alcohol misuse and its comorbidity with mental health disorders in the UK military. Studies examining the impact of paternal alcohol misuse on the wider UK Armed Forces community, including the mental health and well-being of children in military families, are needed to better support military families. A better understanding of how common comorbid factors, such as paternal PTSD or depression, may exacerbate any negative consequences of alcohol misuse for children is also required. Therefore, the aims of this study were to investigate the effects of paternal alcohol misuse on child emotional and behavioural outcomes in UK military families and to explore potential effect modification by paternal mental health status.

METHODS

Study design and data collection

This study was a secondary analysis of data collected from the Children of Military Fathers with PTSD survey conducted among UK military families that examined the impact of paternal PTSD on child behavioural and emotional outcomes (KIDS study).[26] Data were linked to the King's Centre for Military Health Research (KCMHR) cohort study, which provided paternal alcohol consumption data,[27,28] using an encrypted participant key number that linked individuals across studies.

The KCMHR military cohort study was a large, tri-service prospective cohort investigation of health outcomes for UK Armed Forces deployed to the Iraq and Afghanistan conflicts and a non-deployed comparison group.[27,28] The KCMHR military cohort study collected information on demographics and military service, as well as on social- and health-related outcomes. The KIDS study recruited serving and ex-service fathers of children aged 3-16 years who consented to follow-up from phase II of the KCMHR military cohort study.[26] Fathers were defined as those who identified having biological children, children under care of the local authority, or stepchildren. Fathers were randomly selected from the KCMHR military cohort study to create a group of fathers with and without PTSD, based on their phase II PTSD Checklist for DSM-IV scores.[29]

Overall, 1,030 military fathers from the KCMHR cohort study were invited to participate. Instructions given before the online questionnaire stipulated that participation in the study was voluntary, participants were free to withdraw at any time, and the study was funded by the U.S. Department of Defense. These 1,030 fathers were representative of both regular and reserve members (full-time and voluntary or part-time UK Armed Forces members), all services (navy, army, and Royal Air Force) and included service personnel who had left the military. If the fathers gave consent, the mothers of their children were also contacted and invited to participate in an online survey. A total of 621 fathers (60%) completed the survey, including data on 1,044 children.

The study received ethical approval from the UK Ministry of Defence research ethics committee, the NHS research ethics committee, and the U.S. Human Protection Research Office. This study is reported according to the Strengthening the Reporting of Observational Studies in Epidemiology guidelines.[30]

Measuring paternal alcohol misuse

Paternal alcohol use was measured using data from phase II of the KCMHR cohort study, collected from fathers between November 2007 and September 2009. The survey measured paternal alcohol misuse with the Alcohol Use Disorders Identification Test (AUDIT), a 10-item questionnaire assessing alcohol consumption and dependence and the consequences of alcohol misuse. AUDIT scores range from 0 to 40.[31] An AUDIT score of ≤ 7 is considered low risk; 8-15, harmful; 16-19, hazardous; and 20 or higher, probable alcohol dependence. In the general UK population, a score of 8 or higher indicates hazardous and harmful alcohol consumption.[31] Fathers who reported no past-year alcohol consumption were excluded from the study because the primary study oversampled fathers with PTSD who may be abstaining from alcohol use to receive treatment, and a lack of consumption over the past year may indicate recovery from alcohol dependence or those who simply do not consume alcohol for other reasons (e.g., religion).

Measuring child emotional and behavioural difficulties

Child emotional and behavioural difficulties were measured using data from the KIDS study, collected between July 2010 and October 2012. Data were collected from fathers and mothers using standardized self-report telephone and online questionnaires.[32,33] Child emotional and behavioural difficulties were measured by parental report using the Strengths and Difficulties Questionnaire (SDQ).[34] Child SDQ scores were reported by mothers, when possible, and from fathers when maternal data were not available. Mothers' and fathers' scores have previously been shown to be similar.[35] Total scores were calculated for five subscales: Emotional Symptoms (i.e., worries a lot, often unhappy), Conduct Problems (i.e., temper tantrums, fights with other children), Hyperactivity (i.e., restless, easily distracted), Peer Problems (i.e., solitary, picked on or bullied), and Prosocial Difficulties (i.e., inconsiderate, unkind to others). Caseness for total difficulties was determined by combining four of the five individual SDQ subscales (excluding Prosocial Difficulties). Caseness for total difficulties, and for each subscale, was categorized as normal, borderline, or abnormal using defined cut-offs.[34] For this study, the authors dichotomized scores as being a case (borderline or abnormal) or a non-case (normal).

Statistical analysis

All analyses were undertaken using the statistical software package SAS (version 9.4; SAS Institute, Cary, NC), and statistical significance was defined as $p < 0.05$. All analyses take into account the response weights by using the survey commands and clustering by father using the clustering commands. Alcohol misuse was operationalized as a dichotomous variable; no alcohol misuse (AUDIT score 1-7) and alcohol misuse (AUDIT score ≥ 8). Weighted percentages and odds ratios are presented, together with unweighted cell counts. The authors describe the sample's socio-demographic and military experiences before presenting odds ratios, 95% confidence intervals (CI), and p values, which were calculated to estimate associations between paternal alcohol misuse and childhood SDQ outcomes. Univariable and multivariable logistic regression analyses were undertaken. Socio-demographic (child age, paternal age, sex of child) and military (rank, service, engagement type [regular or reservist status], deployment status [not deployed to Iraq or Afghanistan or deployed to Iraq or Afghanistan]) factors were included in the multivariable analyses as confounders. Confounders were a priori selected from the literature.

Sub-analyses were performed involving stratification by sex of the child and by age of the child (< 11 years and ≥ 11 years) because the prevalence of emotional and behavioural disorders among children varies by age and sex.[36] The authors also completed a sub-analysis of a restricted sample of children whose fathers did not screen positive for depression or PTSD to observe the independent effect of alcohol misuse, without the competing and inextricable impact of a comorbid mental disorder. The presence of PTSD was measured using the Clinician-Administered PTSD Scale (CAPS) during the interview.[32] Individuals meeting the sub-threshold criteria for PTSD were identified as being in the PTSD group. Sub-threshold PTSD was established using the definition used by Cukor et al.[37] Symptoms of depression were measured using the 9-item Patient Health Questionnaire.[38] Fathers scoring five or higher were classified as being in the depression group.[38] The authors considered $p \leq 0.2$ for potential effect modification.

Sensitivity analyses

A sensitivity analysis was performed on the basis of the definition of alcohol misuse. Previous studies have demonstrated that the population distribution of high-risk alcohol consumption in the military is much higher, and so the normative cut-off points may not be applicable.[2,3,39] For the sensitivity analysis, previously established cut-off points were used for harmful and hazardous in the military setting.[40] Fathers who scored between 1 and 15 were considered low-risk alcohol consumers and fathers who scored 16 or higher were considered high-risk consumers.

Role of the funding source

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RESULTS

Alcohol use data were available for 612 of the 621 UK military fathers who completed the survey (representing 1,029 children). A total of 3% of fathers reported no past-year alcohol use (n = 17) and were excluded from the study (n = 27 children). Of the 595 fathers who reported consuming alcohol in the past year, 231 were classed as not misusing alcohol (weighted 37.7%; AUDIT score 1-7), and 364 were classed as misusing alcohol (weighted 62.3%; AUDIT score ≥ 8). Compared with fathers classed as not misusing alcohol, fathers who misused alcohol were younger and more likely to have been deployed to Iraq, Afghanistan, or both and to have probable PTSD or depression (Table 1). Fathers who misused alcohol were less likely to be officers or in the Royal Air Force.

Of the 1,002 children, 396 (weighted 38.3%) had a father classed as not misusing alcohol and 606 (weighted 61.7%) had a father classed as misusing alcohol (Table 2). Children of fathers who misused alcohol were slightly more likely to be male and had a greater likelihood of meeting the case definition for conduct problems.

There was no association between paternal alcohol misuse and child behavioural problems, although a 1.39 greater odds of conduct problems was identified (95% CI, 0.98-1.98; Table 3). When the authors modified the definition of alcohol misuse to an AUDIT score of 16 or higher, there was no change in the conclusions (data not shown). These null findings changed slightly when stratified by child sex (Table 4). Girls of fathers who misused alcohol had greater odds of hyperactivity, conduct problems, and total difficulties, whereas boys of fathers who misused alcohol only had higher odds of conduct problems.

Overall, 337 fathers did not meet the criteria for depression or PTSD (weighted 56.6%). When the study was restricted to only those children whose fathers did not meet the criteria for depression or PTSD, greater odds of emotional problems and conduct problems were observed, although only conduct problems was statistically significant (Table 5).

DISCUSSION

This is the first study to examine possible secondary harm to children and youth in military families associated with paternal alcohol misuse. This study suggests that children and youth in military families are negatively affected by paternal alcohol misuse and that the effect of paternal alcohol misuse may be modified by the serving member's mental health status. These findings are important, considering the high rates of alcohol misuse in serving and ex-serving military personnel, the common comorbidity between alcohol misuse and

Table 1. Characteristics of fathers by alcohol misuse status (as determined by the AUDIT score) (N = 595)*

Characteristic	Unweighted n (weighted %)*		p-value†
	No alcohol misuse, paternal AUDIT < 8 (n = 231)	Alcohol misuse, paternal AUDIT ≥ 8 (n = 364)	
Age at interview, y, mean (SD)	40.0 (8.0)	38.5 (7.7)	0.004
Relationship status			0.07
Single	7 (3.5)	22 (6.3)	
Relationship	224 (96.5)	342 (93.7)	
No. of children			0.17
1	101 (44.7)	179 (49.8)	
2	103 (44.0)	139 (37.6)	
≥3	27 (11.3)	46 (12.6)	
Serving status			0.20
Serving	152 (66.0)	227 (61.7)	
Ex-service	79 (34.0)	137 (38.3)	
Engagement type			0.09
Regular	195 (85.9)	320 (89.6)	
Reserve	36 (14.1)	44 (10.4)	
Service			0.015
Royal Marines/Royal Navy	31 (12.7)	64 (17.8)	
Army	152 (66.7)	248 (68.0)	
RAF	48 (20.6)	52 (14.2)	
Rank			0.018
Officer	61 (22.4)	67 (15.2)	
Non-commissioned officers	140 (62.1)	253 (70.3)	
Other rank	30 (15.5)	44 (14.5)	
Deployment status			0.039
Iraq and/or Afghanistan	88 (38.9)	165 (46.0)	
Neither	143 (61.1)	199 (54.0)	
Depression	82 (36.4)	173 (49.2)	<0.001
PTSD	14 (6.4)	43 (12.6)	0.004

Note: Seventeen fathers who reported no past-year alcohol consumption were excluded.

*Unless otherwise indicated.
†Weighted χ^2 test (categorical data), weighted *t*-test.

AUDIT = Alcohol Use Disorders Identification Test; RAF = Royal Air Force; PTSD = posttraumatic stress disorder.

mental disorders in both the military and the civilian populations, and the lack of attention paid to alcohol's secondary effects on child emotional and behavioural health in defence and public health policy.

Few studies have investigated the impact of hazardous parental alcohol consumption on the health of children to inform the design of appropriate and effective public health strategies that do not focus on alcohol dependency. There is substantial evidence that alcohol dependency is associated with negative child outcomes;[11,41] however, this is a rare problem among UK military personnel and the general population.[1,40] The literature is less conclusive for studies in which the parental alcohol consumption patterns do not meet the clinical definition of alcohol dependency. A recent scoping review of cohort studies focusing on antenatal effects of parental drinking on adverse child outcomes reported that the children of parents who misused alcohol were significantly more likely to experience harm in two-thirds of studies.[14] The authors concluded that although there

Table 2. Characteristics of the children in the KIDS study (N = 1,002) by paternal alcohol misuse status

Characteristic	Unweighted n (weighted %)[*]		*p*-value[†]
	Children with paternal AUDIT < 8 (n = 396)	Children with paternal AUDIT ≥ 8 (n = 606)	
Age, y, mean, SE	10.6 (0.27)	10.0 (0.21)	0.12
Age, y			0.35
3-5	77 (20.5)	145 (25.1)	
6-12	188 (47.7)	302 (49.6)	
13-16	131 (31.8)	159 (25.3)	
Male sex	196 (49.6)	304 (50.1)	0.89
Emotional and behavioural problems[‡]			
Hyperactivity			0.22
Non-case	307 (79.2)	450 (75.6)	
Case	79 (20.8)	141 (24.4)	
Emotional problems			0.87
Non-case	300 (77.4)	453 (76.9)	
Case	86 (22.6)	138 (23.1)	
Conduct problems			0.011
Non-case	308 (79.0)	422 (70.9)	
Case	78 (21.0)	169 (29.1)	
Peer problems			0.53
Non-case	295 (76.0)	460 (77.9)	
Case	91 (24.0)	131 (22.1)	
Social problems			0.43
Non-case	341 (88.2)	511 (86.4)	
Case	45 (11.8)	80 (13.6)	
Total difficulties			0.34
Non-case	310 (79.9)	457 (77.1)	
Case	76 (20.1)	134 (22.9)	

Note: Twenty-seven children whose fathers reported no past-year alcohol consumption were excluded.

[*] Unless otherwise indicated.
[†] Weighted Wald χ^2 test for clustered data (categorical data), weighted *t*-test.
[‡] Missing data for 10 children whose father's AUDIT was < 8 and 15 children whose father's AUDIT was ≥ 8.

AUDIT = Alcohol Use Disorders Identification Test.

was a relatively deep literature base focusing on adolescent alcohol consumption as an outcome, few studies addressed any other effects.[14] This underscores the importance of improving understanding of the secondary harm to children caused by parents' alcohol consumption.[42]

The authors suggest that paternal alcohol misuse has an independent negative effect on child emotional and behavioural health in the absence of PTSD and depression. This finding requires further investigation to clarify causal pathways, as well as to determine policy implications. Substance abuse and in particular alcohol misuse are common comorbidities of PTSD in serving and ex-serving military personnel,[2,28,43] and abstinence from substance use, including alcohol, is a common exclusion from programs and services addressing mental health. Even when programs and services are provided, the mental health problem may overshadow the alcohol misuse, especially if it is not diagnosed as dependency. This study highlights the importance of studying and treating both alcohol misuse and mental health problems together in order to understand the primary and

Table 3. Associations between alcohol misuse (as measured by the AUDIT) and child behavioural problems (as measured by the SDQ), restricted to those fathers who reported past year alcohol consumption (*n* = 1,002 children)

Behavioural problem (case)	No. of events* (%)	High risk (AUDIT ≥ 8)†			
		OR (95% CI)	*p*-value	AOR,‡ (95% CI)	*p*-value
Hyperactivity	141 (24.4)	1.23 (0.88, 1.73)	0.22	1.14 (0.81, 1.61)	0.46
Emotional problems	138 (23.1)	1.03 (0.74, 1.44)	0.87	1.01 (0.71, 1.43)	0.97
Conduct problems	169 (29.1)	1.54 (1.09-2.17)	0.014	1.39 (0.98, 1.98)	0.07
Peer problems	131 (22.1)	0.90 (0.65, 1.25)	0.53	0.88 (0.62, 1.24)	0.46
Social problems	80 (13.6)	1.18 (0.77, 1.82)	0.44	1.15 (0.74, 1.77)	0.54
Total difficulties	134 (22.9)	1.19 (0.83, 1.70)	0.35	1.14 (0.78, 1.66)	0.50

*Unweighted numbers, weighted percentages.
†Reference group: AUDIT < 8 (low risk).
‡OR adjusted for child's age, gender, father's age, deployment status, engagement type, rank, and service.

AUDIT = Alcohol Use Disorders Identification Test; SDQ = Strengths and Difficulties Questionnaire; OR = odds ratio; AOR = adjusted odds ratios.

Table 4. Associations between alcohol misuse (as measured by the AUDIT) and child emotional and behavioural problems (as measured by the SDQ), stratified by child sex and child age

High risk (AUDIT ≥ 8; case)*	Child sex				Child age, y			
	Boys		Girls		< 11		≥ 11	
	OR (95% CI)	*p*-value	OR (95% CI)	*p*-value	OR (95% CI)	*p*-value	OR (95% CI)	*p*-value
Hyperactivity	1.05 (0.68, 1.61)	0.84	1.57 (0.93, 2.67)	0.09	1.20 (0.80, 1.80)	0.37	1.13 (0.65, 1.96)	0.66
Emotional problems	0.81 (0.52, 1.28)	0.37	1.30 (0.82, 2.05)	0.27	0.92 (0.59, 1.45)	0.72	1.26 (0.79, 2.03)	0.33
Conduct problems	1.45 (0.93, 2.26)	0.10	1.65 (1.03, 2.64)	0.036	1.49 (0.99, 2.24)	0.05	1.52 (0.88, 2.60)	0.13
Peer problems	0.71 (0.46, 1.10)	0.13	1.17 (0.73, 1.87)	0.51	0.87 (0.55, 1.35)	0.52	1.00 (0.63, 1.60)	0.99
Social problems	1.31 (0.76, 2.24)	0.33	1.01 (0.52, 1.95)	0.98	1.17 (0.67, 2.04)	0.58	1.21 (0.65, 2.24)	0.54
Total difficulties	0.92 (0.58, 1.44)	0.70	1.67 (1.00, 2.80)	0.05	1.01 (0.65, 1.59)	0.96	1.49 (0.88, 2.53)	0.14

Note: Restricted to the children of fathers who reported past-year alcohol consumption (*n* = 1,002 children).

*Reference group AUDIT < 8 (low risk).

AUDIT = Alcohol Use Disorders Identification Test; SDQ = Strengths and Difficulties Questionnaire; OR = odds ratio; CI = confidence interval.

Table 5. Associations between paternal alcohol misuse (as measured by the AUDIT) and child behavioural problems (as measured by the SDQ), restricted to the children of fathers who did not screen positive for depression or post-traumatic stress disorder and who reported past year alcohol consumption (*n* = 574 children)

Child behavioural problem (case)	No depression or PTSD,* OR (95% CI)	*p*-value
Hyperactivity	1.37 (0.86, 2.17)	0.18
Emotional problems	1.57 (0.98, 2.51)	0.06
Conduct problems	1.74 (1.07, 2.84)	0.026
Peer problems	0.97 (0.63, 1.51)	0.90
Social problems	1.46 (0.83, 2.58)	0.19
Total difficulties	1.25 (0.75, 2.08)	0.39

Note: Three hundred thirty-seven fathers had no mental health problem, 201 had depression only, 53 had PTSD and depression, 4 had PTSD only.

*Reference group: AUDIT < 8 (low risk).

AUDIT = Alcohol Use Disorders Identification Test; SDQ = Strengths and Difficulties Questionnaire; OR = odds ratio; CI = confidence interval; PTSD = post-traumatic stress disorder.

secondary harms of alcohol misuse, in both the general population and the armed forces.

Current health promotion strategies targeting the negative health impacts of alcohol to the individual have elicited little sustainable behaviour change.[24] Identifying potential health risks of alcohol misuse on dependents may strengthen the impact of public health messages. In addition, barriers to engaging armed forces members in mental health services continue to remain, even though there is evidence that the military member's mental health has negative consequences for the family unit.[26,44] Explicitly stating the potential harm mental disorders and alcohol misuse may have on children could help address barriers to help seeking and behaviour change. This avenue for health promotion is supported by theories of family-based substance abuse treatment and by the World Health Organization Alcohol Strategy, which identifies families as key stakeholders in alcohol misuse prevention by providing accessible family-based interventions.[20,45,46] However, families are often excluded or inadequately engaged in programs and services supporting the mental health of serving and ex-serving military members.[47] This study highlights the need for mental health practitioners to take a holistic approach to the serving member and Veteran, considering and addressing both their mental health and their alcohol misuse, as well as the potential impact on the family unit.

This study has several limitations, including its cross-sectional design, potential selection bias, and small sample size. The cross-sectional design of the survey detracts from causal interpretation of whether the child's behavioural problems or paternal alcohol misuse came first and increases the possibility of social desirability bias in fathers' reporting of alcohol consumption.[48] To address this, the authors used measurements of paternal alcohol consumption from a previous study to establish temporality and enhance causal interpretation, as well as to mitigate the effects of under-reporting alcohol misuse. Stable alcohol consumption patterns have been previously reported for the UK military.[49] Fathers who were more likely to misuse alcohol were less likely to participate in the study, and the authors therefore do not have information on their children's outcomes. This may mean that the true association is underestimated. Inverse probability weighting methods incorporating a wealth of baseline information on the invited participants were used to adjust for potential selection bias. This study included only individuals with a past-year history of alcohol consumption. As a result, it may have underestimated the true impact of alcohol misuse on child emotional and behavioural outcomes. This study includes the largest number of children and youth from UK military families to date, but it had a limited sample size. Children in military families rarely met the full criteria for emotional and behavioural problems. By combining children who met the full criteria for emotional and behavioural problems with those who were sub-threshold, the true effect of paternal alcohol misuse may have been underestimated. In addition, the authors were limited in their ability to study interactions. This resulted in low study power and imprecise effect estimates. Future studies should take effect modification into account when estimating sample size. In particular, studies should also consider the interaction between paternal alcohol misuse and household characteristics such as family size, composition, and whether or not the father and children resided in the same home.

Before the secondary harms of alcohol to the family may be considered in policy-making,[50,51] further studies of alcohol misuse at sub-clinical levels are required. Longitudinal studies exploring the impact of different alcohol misuse measures (e.g., binge drinking, number of daily drinks), prolonged alcohol misuse, and cumulative effects of parent alcohol misuse on children, as well as changes in alcohol consumption patterns over time, are needed. Such studies will lead to a better understanding of the secondary effects of alcohol and consistency of the relationships. Although there is a well-established literature implicating parental alcohol misuse in youth substance abuse among families globally, future work addressing this emerging area in military families is needed. In addition, studies targeting other child health outcomes, such as depression and anxiety, are warranted. Studies of maternal alcohol consumption as a mediating factor or an effect modifier are also important,[52-54] especially considering increased rates of hazardous consumption in spouses of serving and ex-serving military personnel.[55] Follow-up of these UK military families to understand the long-term effects of paternal alcohol misuse on family infrastructure and functioning and child behaviours is essential.

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COMPETING INTERESTS

Alyson L. Mahar, Sarah Rowe, David Pernet, Simon Wessely, and Alice B. Aiken have no conflicts of interest to declare. Nicola T. Fear is a trustee of the Warrior Programme, a charity supporting ex-service personnel and their families. She is also a member of the Independent Group Advising NHS Digital on the Release of Patient Data.

CONTRIBUTORS

Alyson L. Mahar, Sarah Rowe, Alice B. Aiken, Simon Wessely, and Nicola T. Fear conceived of the study. Sarah Rowe, David Pernet, Simon Wessely, and Nicola T. Fear collected the data. Alyson L. Mahar and Nicola T. Fear designed the study. Alyson L. Mahar completed the statistical analyses. All authors contributed to interpretation of the findings. Alyson L. Mahar and Nicola T. Fear drafted the manuscript. All authors contributed critical revisions to the final manuscript and approve its content.

ETHICS APPROVAL

The study received ethical approval from the UK Ministry of Defence Research Ethics Committee (MODREC/174/2008), UK NHS Research Ethics Committee (08/H0808/27), and the U.S. Office for Human Research Protections (IRB-A-15389).

INFORMED CONSENT

All participants gave informed consent.

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PEER REVIEW

This manuscript has been peer reviewed.

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RESEARCH

Relationship among combat experience, Veteran pathology, and pathology of Veterans' intimate partners: Factors predicting the pathology of Veterans and their intimate partners

Edwin A. Brennan[a], Nancy Carbonell[a], Jimmy Kijai[a] and Dennis Waite[a]

ABSTRACT

Introduction: Military members and their families have been part of the Global War on Terrorism since the September 11, 2001, terrorist attacks on the United States. As a result, higher levels of pathology — such as posttraumatic stress disorder, generalized anxiety disorder, and depression — are being seen. No known studies have addressed the concept of resonating pathology between combat Veterans and their intimate partners. Resonating pathology, for the purpose of this study, is when the combat Veteran and their intimate partner demonstrate the same pathology at similar levels. **Methods:** Veterans and their intimate partners from across the United States (N = 398 couples) were asked to complete an Internet survey. Couples were required to meet the following criteria: one of them being a combat Veteran and both of them being together during the time of deployment. The authors used bivariate correlations to investigate the relationship between combat experience and Veteran pathology. Cross-tabulation analysis and paired *t*-tests were used to examine the relationship between Veteran and partner pathology, and categorical regression analysis was used to investigate predictive factors for pathology in both. **Results**: Combat exposure was moderately correlated to Veteran pathology, as expected. Moderate correlations were found between Veterans' and intimate partners' pathology and in the categories of severity. Combat exposure was found to be the most important factor in predicting both Veteran and partner pathology. **Discussion:** These findings support the construct of resonating pathology between combat Veterans and their intimate partners. Clinical implications of co-joint interventions and treatment planning are discussed.

Key words: combat exposure, combat Veterans, co-occurring, family resiliency, family systems, military partners, PTSD, secondary trauma, stressor, trauma, U.S.

RÉSUMÉ

Introduction : Les militaires et leur famille participent à la lutte mondiale contre le terrorisme depuis l'attentat contre les États-Unis à New York en 2001. Par conséquent, on observe des taux de pathologie plus élevés, tels que l'état de stress post-traumatique (ÉSPT), le trouble d'anxiété généralisé (TAG) et la dépression. Le chercheur n'a trouvé aucune donnée sur le concept de résonance de pathologie entre les anciens combattants et leurs partenaires. Pour les besoins de la présente étude, la résonance de pathologie désigne l'existence d'une même pathologie de la même intensité chez l'ancien combattant et son partenaire. **Méthodologie :** Dans différentes régions des États-Unis (N = 398), les vétérans et leur partenaire ont été invités à remplir un sondage en ligne. Les couples devaient respecter certains critères : l'un d'eux devait être un ancien combattant et tous deux devaient être en relation de couple pendant le déploiement. Les chercheurs ont utilisé la corrélation bivariée pour explorer la relation entre l'expérience du combat et la pathologie des vétérans. Ils ont utilisé l'analyse croisée et le test de Student pour échantillons appariés pour examiner la relation entre la pathologie des vétérans et de leur partenaire et se sont servis de l'analyse de régression catégorique pour explorer les facteurs prédictifs de pathologie dans les couples. **Résultats :** Comme on s'y attendait, l'exposition au combat était modérément corrélée avec la pathologie des vétérans. Les chercheurs ont constaté une corrélation modérée entre la pathologie des vétérans et celle de leur partenaire et entre les catégories de gravité. Ils ont constaté que l'exposition au combat était le principal facteur prédicteur de la pathologie du vétéran et de son partenaire. **Discussion :** Ces observations appuient le concept de pathologie de résonance entre les vétérans et leur partenaire. Les conséquences cliniques d'interventions et de planification thérapeutique conjointes sont abordées.

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Mots-clés : anciens combattants, cooccurrence, état de stress post-traumatique, États-Unis, exposition au combat, facteur de stress, partenaires de militaires, résilience familiale, systèmes familiaux, trauma, traumatisme, traumatisme secondaire

LAY SUMMARY

For nearly 20 years, military members and their families have been involved in some form of military operation in support of what is known as the Global War on Terrorism. Research has shown that military members and Veterans demonstrate increased levels of mental health disorders, such as anxiety, depression, and posttraumatic stress disorder. No studies to date, however, have explored how the resulting mental illness is shared by the intimate partners of these military members and Veterans. For this research, the term "resonating of pathology" is used to identify this phenomenon. The research authors surveyed combat Veterans and their intimate partners to gather the data for analysis. The authors then completed statistical analysis to examine both associations and predictive factors that would help clinicians, researchers, and academics understand and develop theories and clinical interventions for such couples. Although the research appears to confirm this sharing of mental health diagnosis, more research will be needed to create a better understanding in the future.

INTRODUCTION

The link between combat experience or combat exposure, and pathology for military members has been well established. (The terms combat experience and combat exposure are used interchangeably, depending on the concept of the couples' experience or data analysis and interpretation.) This is especially true for posttraumatic stress disorder (PTSD), which has been thoroughly researched, allowing mental health professionals to understand the symptoms, modalities, and, to some extent, the etiology of this disorder.[1] The impact of trauma on the relationships of intimate partners and their families is less clear.[2] Work that has begun in the past 10 years is beginning to help the field to understand how military families face disruption, trauma, and stress and what these mean to them.[1] Studies to date have not addressed the pathology of family members beyond trauma or possibly family disruption.

It should be noted that significant research has demonstrated the effects of secondary trauma. This has been particularly true of research with first responders, emergency department staff, and family members. There is also a growing body of research related to military families and partners of military members or Veterans, who demonstrate higher instances of mental health diagnosis than the general population. In the current study, however, the authors examine how the pathology of combat Veterans is mirrored, or resonated, by the intimate partner. Resonated pathology is defined as the intimate partner demonstrating symptoms of the same pathology, at a similar level, as the combat Veteran. For example, if the combat Veteran demonstrates symptoms of depression, generalized anxiety disorder (GAD), or PTSD, the intimate partner will demonstrate a similar level of depression, GAD, or PTSD.

The theoretical foundation of this study is based on family systems theory. Family systems theory focuses on the patterns of family behaviour as a system that needs to adjust to both external and internal influences. How well the family adjusts to these influences is determined by the closeness, or distance, in these relationships.[3] The ability of individual family members to diffuse, feel a responsibility toward the family system, differentiate, and become somewhat autonomous can be a factor in how the family system functions.[4] Military families must also adapt to two different family structures, one when the military member is around and another when the military member is away. This could be reflected in family members' withdrawal or avoidance, feeling a lack of control, and adjustments.[5,6,7] The current study is built on the concept of undue outside influences, such as added communication and combat exposure, as well as other variables, that can resonate throughout the family system. It is hypothesized that as pathology is inserted into the system, such resonance will have a significant impact on family functioning. It is also hypothesized that the intimate partner, who has a prime interest in maintaining stasis, is more likely than not to significantly reflect, or mirror, the pathology of the combat Veteran.

Through an examination of such resonated pathology, it can be understood that pathology in the Veteran is not isolated and, as such, is reflected throughout the family system. Moreover, the relationships within the family system can face disruption on a frequent basis, implicating not only the pathology in itself but also the viability of the system. Through this understanding, the clinician working with the Veteran alone, the couple, or the family can focus on interventions that address not just the individual or the pathology but the family system as a whole.

Veterans' intimate partners are distinct from intimate partners in the general population. There has been very little research on the effects of combat on intimate partners, but common themes that have been investigated are resilience, coping skills, and social support.[8] Mediating factors that have been shown to determine resiliency for military families have also been investigated.[9] Other research has determined six themes that are helpful in determining resiliency: mental health service encounters and requests for help, relationships, partner or family reactions to living with someone with PTSD, protective factors, responses to the research they were involved in, and miscellaneous comments.[10]

Couples who experience trauma generally have certain dynamics. These include polarized emotional roles, extreme pursuer-distancer patterns, secrecy surrounding the trauma, individual trauma symptoms in both partners, parentification of the non-traumatized partner, and impacts on other subsystems.[11,12] Although education programs often speak to some of these experiences, such traumatic experiences may be beyond the grasp of all but the most experienced military couples.[13] The ability to make these adjustments is dependent on the resiliency of the military member, the spouse, and even the bond the member has with other unit members.[14]

The impact of trauma on relationships may also prove to be a barrier to intimacy within the relationship. Research has demonstrated that the relationship between trauma and relationship quality is more complex than previously described. Also, it is important to be mindful of the trauma histories of the individuals within the couple.[15,16] More recent investigations have revealed that for combat Veterans with PTSD, relationship and interpersonal difficulties are linked to poorer prognosis, lower treatment engagement, and elevated suicide risk.[17] Considering the theoretical constructs of the symptoms of PTSD, understanding how emotional numbing and dysphoria affect relationship distress when one member has PTSD is important.[18] Researchers also examined the role of PTSD as a stressor among peacekeepers and their spouses. The results indicated that the stress on their relationships led to isolation from other support networks, such as family members and friends. In turn, peacekeepers and partners did not sufficiently draw on the strength of their relationship or others in their social network, resulting in worsening of the partners' respective stress symptoms.[19,20]

The purpose of this study was to examine couple pairs and their shared pathology when one member of the couple is a combat Veteran. In an effort to understand the effects on intimate partners, the authors first wanted to quantify the pathology among the combat Veterans in the study population. As such, it was necessary to first analyze the pathology of the combat Veterans. Second, the authors wanted to examine the relationship between the Veterans' pathology and that of their intimate partners, with respect to not only the diagnosis but also the severity of symptoms associated with the diagnosis, which could demonstrate resonated pathology. Finally, the authors wanted to understand predictive factors that may influence not only Veterans' pathology but also that of intimate partners. The shared experiences of multiple factors were expected to predict pathology and the partners' resonation of the pathology. This study sought to quantify the relationship between resonated pathology and the effects of combat experience on that relationship.

Research questions for this study were as follows:

1. What is the relationship between combat exposure and pathology among Veterans?
2. What is the relationship between Veterans' pathology and their intimate partners' pathology?
3. What factors account for Veteran and partner pathology?

It is hypothesized that, as the exposure to combat operations is increased, the Veteran will begin to experience greater levels of pathology and that the correlation between Veteran and partner pathology will be positive. Finally, there will be factors that will predict pathology in the Veteran and intimate partner.

METHODS

Participants

The population for this study consisted of couple pairs, one member of whom served in the U.S. military during the Global War on Terrorism from 2001 to the present. Criteria for participation included the Veteran having had a combat deployment and the intimate partner having been in a relationship with the Veteran during the time of deployment. Couples were recruited from across the United States, with at least one couple from each U.S. state. From an initial group of 1,905 couples who volunteered, 398 couples met the criteria necessary for participation. The majority of the combat Veterans were men (n = 250; 62.8%), and two-thirds were between ages 18 and 40 years. Two-thirds of the intimate partners were female (n = 266; 66.8%) and fell in the age range of 18-40 years. The Veterans came from all branches of the military, with 50.0% coming from the army. The rest came from the air force (14.8%), navy (18.3%), and Marines (16.8%). Approximately two-thirds of the couples had been married for between 0 and 5 years, and 288 (72.4%) of the Veterans stated that they had children during their deployment.

This study used a cross-sectional survey design in which couples volunteered to answer an online survey through QuestionPro (Survey Analytics LLC, Austin, TX). The couples were required to take the survey on the same device but not at the same time. The couples were matched by a case number so their responses could be analyzed together. The sample was screened for individuals who had combat experience and couples who were together during the Veteran's deployments. The couple's scores were tied together using their computer's IP address. Approval for the research was obtained through the Andrews University Institutional Review Board.

Measures

The Patient Health Questionnaire-9 (PHQ-9) is a 10-item self-report measure that assesses depression symptom severity using *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*) criteria. Participants are asked to rate how often they experienced certain symptoms over the past two weeks on a four-point scale ranging from 0 (not at all) to 3 (nearly every day). The PHQ-9 total score indicates total symptom severity and ranges from 0 to 27. Cut-off scores were determined as follows: 0-14, no pathology; 15-19, mild depression; 20-24, moderate depression; and 25-27, severe depression.[21] The PHQ-9 has exhibited strong psychometric properties and has a Cronbach's α of 0.81.[21]

The Generalized Anxiety Disorder-7 (GAD-7) scale is seven-item self-report measure that is used to assess *DSM-5* GAD symptom severity. Participants are asked to rate how often they experienced certain symptoms over the past two weeks on a four-point scale ranging from 0 (not at all) to 3 (nearly every day). Cut-off scores were determined as follows: respondents with scores of 0-11 were considered to have no GAD; 12-16, mild GAD; 17-21, moderate GAD; and 22-28, severe GAD.[21] The GAD-7 has exhibited strong psychometric properties, with a Cronbach's α of 0.89.[22]

The PTSD Checklist for DSM-5 (PCL-5) is a 20-item self-report measure that assesses *DSM-5* PTSD symptom severity. Participants rated the extent to which they had been bothered by each PTSD symptom over the past month on a five-point scale ranging from 0 (not at all) to 4 (extremely). The PCL-5 total score indicates the total symptom severity and ranges from 0 to 80. The diagnosis of PTSD does not have categories of mild, moderate, or severe in the DSM-5, and as such this measure only determines symptoms associated with the diagnosis. A cut-off of 33 has been established as reliable for the diagnosis of PTSD and thus was used in this research.[23] Moreover, the *DSM-5* states that criteria A, B, C, D, and E must be met for the diagnosis, so these criteria were used to determine diagnosis. The PCL-5 has exhibited strong psychometric properties, and the present Cronbach's α is 0.84.[23]

The Combat Exposure Scale (CES) is a seven-item self-report scale used to measure the subjective report of wartime stressors experienced by combatants. Some of the questions required them to report how may times they were exposed to an action or, alternatively, how much time they were exposed to certain actions. The total number of frequencies and experiences are then calculated to provide a score indicating the subjective experience of combat intensity. The CES total score indicates the subjective rated experience and ranges from 0 (no experience) to 43 (heavy experience). The CES has exhibited strong psychometric properties and consistencies, with a correlation with combat experience of 0.75 and a test-retest reliability of 0.97.[24]

Statistical methods

A bivariate correlation analysis was used to examine the relationship between combat experience and Veteran pathology. The authors chose to use a correlation analysis to determine a relationship between combat and pathology as a foundation for the introduction of pathology into the family system. Two procedures were used to investigate the relationship between Veteran and partner pathology, cross-tabulation and correlated (paired-samples) *t*-test. To determine predictive factors that could account for the Veterans' and intimate partners' pathology, a categorical regression (CATREG) analysis was used. The predictive factors analyzed were age range, gender, branch of service, length of marriage, children, frequency of communication, same-sex relationship, combat exposure, and the use of cellphones, email, Skype, landline phones, and snail mail. Modes of communication were added because they were frequently cited by family members as stress factors for family dysfunction.[4,6,18] An attempt was made to include any type of communication available between family members and deployed individuals.

RESULTS

Combat experience and pathology

First, a bivariate correlation was run to examine the relationship between combat exposure and Veteran pathology. The results were significant ($p < 0.001$). For combat experience, the correlation between combat exposure and symptoms of PTSD as assessed with the PCL-5 was moderately positive at 0.496. For depression, the correlation between combat exposure and PHQ-9 depression was also moderately positive at 0.381. The correlation between GAD, as assessed with the GAD-7, and combat exposure was moderately positive at 0.380.

Veteran and partner pathology

To examine the relationship between the pathology of combat Veterans and that of their partners, a cross-tabulation correlation analysis was used. The χ^2 analysis for each run indicated significance at $p < 0.001$. The analysis shows that for Veterans who demonstrated significant PTSD symptoms (n = 305), 158 (51.8%) of their partners also demonstrated PTSD symptoms. Of those who endorsed severe depression symptoms (n = 245), 169 (69.0%) of their partners also endorsed severe depression symptoms. For Veterans with moderate depression (n = 64), 22 (34.4%) of their partners endorsed moderate depression symptoms; for those with mild depression (n = 44), 1 (22.7%) of their partners endorsed mild depression symptoms. For the Veterans who endorsed severe GAD symptoms (n = 155), 75 (48.4%) of the partners endorsed severe GAD symptoms. For Veterans who endorsed moderate GAD symptoms (n = 116), 50 (43.1%) of the partners endorsed moderate GAD symptoms. For the Veterans who endorsed mild GAD symptoms (n = 61), 19 (31.1%) of their partners endorsed mild GAD symptoms. This analysis demonstrates a pattern that indicates a resonation of pathology between combat Veterans and their intimate partners. As can be seen, not only did the pathology of the partner follow that of the Veteran but so too did the severity classification levels. The data from this analysis are shown in Table 1.

The relationship between Veteran and partner pathology was further examined using correlated (paired-samples) *t*-tests. The correlations between Veteran and partner pathology are moderate at 0.68 for GAD, 0.69 for PTSD, and 0.72 for depression ($p < 0.001$). Effect sizes are moderate for GAD (0.57) and depression (0.44) but large for PTSD (1.21). The results of the paired-samples *t*-tests are shown in Table 2.

Factors predicting pathology

CATREG analysis was run to examine factors that may predict pathology among Veterans and their intimate partners. Six CATREG equations were completed, three

Table 1. Pathology cross-tabulation between the Veteran and their partner

Veteran pathology (*n*)	Intimate partner pathology, *n* (%)									
	PTSD	No PTSD	Depression				GAD			
			None	Mild	Moderate	Severe	None	Mild	Moderate	Severe
PTSD (305)	158 (51.8)	147 (48.2)								
No PTSD (93)	2 (2.2)	91 (97.8)								
No depression (45)			38 (84.4)	2 (4.4)	4 (8.9)	1 (2.2)				
Mild depression (44)			34 (77.3)	1 (22.7)	5 (11.4)	4 (9.1)				
Moderate depression (64)			11 (17.2)	19 (29.7)	22 (34.4)	12 (18.8)				
Severe depression (245)			19 (7.8)	19 (7.8)	38 (15.5)	169 (69.0)				
No GAD (66)							59 (89.4)	4 (6.1)	3 (4.5)	0 (0.0)
Mild GAD (61)							30 (49.2)	19 (31.1)	8 (13.1)	4 (6.6)
Moderate GAD (116)							17 (14.7)	38 (32.8)	50 (43.1)	11 (9.5)
Severe GAD (155)							23 (14.8)	14 (9.0)	43 (27.7)	75 (48.4)

Note: Percentages may not total 100 because of rounding.

PTSD = posttraumatic stress disorder; GAD = generalized anxiety disorder.

Table 2. Paired-samples *t*-test results

Pathology and group	Mean	*r*	t_{397}	*p*	ES (*d*)
PTSD		0.69	24.23	< 0.001	1.21
Veteran	65.70				
Partner	49.93				
Depression		0.72	8.73	< 0.001	0.44
Veteran	26.03				
Partner	23.26				
GAD		0.68	11.31	< 0.001	0.57
Veteran	19.01				
Partner	16.11				

ES = effect size; PTSD = posttraumatic stress disorder; GAD = generalized anxiety disorder.

for the Veteran and three for the partner, using PTSD, depression, and GAD as dependent variables for each group. The factors used for all groups were age range, gender, branch of service, length of marriage, children, frequency of communication, same-sex relationship, combat exposure, and use of cellphones, email, Skype, landline phones, and snail mail. Both the full model with all factors and restricted models with only significant factors were run for each group.

The first full model was run using PTSD as the dependent variable. A significant equation was reported ($F_{20, 383} = 6.38$, $p < 0.001$; $R^2 = 0.261$; adjusted $R^2 = 0.220$), indicating that 26% of the variance in PTSD may be accounted for by the full set of factors. Pratt's measure of relative importance indicated that combat exposure,[25] at $R^2 = 0.887$ ($p < 0.001$), contributes most to the variance in PTSD for combat Veterans. Branch of service was the only other variable that accounted for PTSD. A restricted CATREG demonstrated a significant regression equation ($F_{4, 398} = 33.171$, $p < 0.001$; $R^2 = 0.252$; adjusted $R^2 = 0.245$). Together, combat exposure and branch of service explained approximately 25% of PTSD, with combat exposure as the most important variable at $R^2 = 0.967$.

The second full model was run for depression with a significant equation ($F_{21, 383} = 3.36$, $p < 0.001$; $R^2 = 0.164$; adjusted $R^2 = 0.115$), accounting for approximately 16% of the variance. Combat exposure was the most important factor, with an $R^2 = 0.811$, and branch of service was also significant. The restricted run indicated a significant regression equation ($F_{4, 398} = 17.344$, $p < 0.001$; $R^2 = 0.150$; adjusted $R^2 = 0.141$). Combat exposure and branch of service explained approximately 15% of depression.

The third full run examined GAD, and a significant equation was reported ($F_{19, 383} = 3.31$, $p < 0.001$; $R^2 = 0.164$; adjusted $R^2 = 0.120$), accounting for 16% of the variance. Again, combat exposure was the most important at $R^2 = 0.792$. A restricted model was run, and a significant equation was found ($F_{1, 398} = 17.344$, $p < 0.001$; $R^2 = 0.145$), indicating that combat exposure explains approximately 15% of GAD at $R^2 = 0.954$.

For the partners, a full model was run for PTSD, and a significant equation was reported ($F_{18, 388} = 5.92$, $p < 0.001$; $R^2 = 0.224$; adjusted $R^2 = 0.186$), accounting for 22% of the variance. Combat exposure was the most important factor at $R^2 = 0.694$; gender, same-sex couple, and branch of service were also significant. A restricted model was run, and a significant regression equation was found ($F_{7, 398} = 15.046$, $p < 0.001$; $R^2 = 0.213$; adjusted $R^2 = 0.199$), accounting for approximately 21% of PTSD; combat exposure was the most significant factor at $R^2 = .783$.

A full model was run for depression, and a significant equation was reported ($F_{18, 388} = 4.46$, $p < 0.001$; $R^2 = 0.182$; adjusted $R^2 = 0.142$), accounting for approximately 18% of the variance. Combat exposure was the most important factor at $R^2 = 0.639$, with branch of service and gender also being significant. A restricted model was run, and a significant regression equation was found ($F_{6, 398} = 12.046$, $p < 0.001$; $R^2 = 0.156$; adjusted $R^2 = 0.143$), accounting for approximately 15% of depression; combat exposure was the most significant factor at $R^2 = 0.841$

A model was run for GAD, and a significant equation was reported ($F_{19, 388} = 3.11$, $p < 0.001$; $R^2 = 0.152$; adjusted $R^2 = 0.109$), accounting for approximately 15% of the variance. Combat exposure was the most important factor at $R^2 = 0.618$, with same-sex couple, branch of service, and gender also being significant. A restricted model was run, and a significant regression equation was found ($F_{7, 398} = 8.348$, $p < 0.001$; $R^2 = 0.130$; adjusted $R^2 = 0.115$), accounting for approximately 13% of GAD. Combat exposure was the most important factor at $R^2 = 0.778$.

DISCUSSION

These analyses indicate that combat exposure is the most significant factor in the pathology of both Veterans and their intimate partners. Interestingly, Veteran and intimate partner pathology follow similar patterns, indicating that Veteran pathology resonates in the intimate partner. Moreover, combat experience seems to be the most significant factor in predicting pathology, not only for Veterans but also for their partners.

The first research question investigated the relationship between combat exposure and the pathology of the Veterans who had this experience. The authors had hypothesized that there would be a significant relationship between combat experience and Veteran pathology. The statistical analysis for the first research question found that combat experience was moderately correlated to Veteran's pathology.

For this research, the authors also examined the relationship between Veteran pathology and the pathology of the intimate partner. The analysis demonstrated a significant relationship between Veterans' pathology and their intimate partners' pathology. Within-couples analysis showed that intimate partners' PTSD followed, or resonated, the combat Veterans' pathology. This was also true for major depression, moderate depression, and mild depression. GAD followed a similar pattern, with a within-couples analysis showing that partners' pathology levels followed the Veterans' pathology levels. These results suggest that Veteran and partner pathology had similar patterns, indicating that pathology resonated within the couple.

Exploring the factors that could predict pathology in Veterans and their partners was also important. Factors explored were couples' age range, gender, branch of service, length of marriage, children, frequency of communication, same-sex relationship, combat exposure, and the use of cellphones, email, Skype, landline phones, and snail mail. The analysis demonstrated that combat exposure was the most important factor in predicting pathology among both Veterans and their intimate partners. Other factors — including branch of service, same-sex couple, and gender — were significant, but only at minor levels.

Practical implications

The research is significant because it demonstrates patterns of pathology among Veterans and their intimate partners. The significance of these findings of pathology resonance should prove useful in clinical settings. Clinicians may now have a better understanding of relationship distress and its effects on the couple as a whole. Using this research to facilitate future research into family dynamics of Veteran families could provide better insight into the effects of combat within this population.

These findings, along with other research, indicate that there is value in considering the effects of combat on the couple, not just the Veteran. The interpersonal impact of combat experiences on the Veteran indicates the importance of integrating the intervention efforts of both the Veteran and their intimate partner. Although there are some indications of joint couples therapy in settings that treat Veterans, it remains an uncommon practice. These findings indicate that continued development of interventions for couples in joint therapy may prove useful.

Limitations

This study had several limitations. The first was that the survey was an online survey and participants were volunteers; as such, there were no controls on who decided to respond and who did not. This limited the cross-section of the sample to those who volunteer, which may not represent a true cross-section of the population. The second limitation of the study is the use of self-report measures. Self-report measures have been criticized for activating a social desirability bias in which respondents provide answers that will be viewed favorably by the researcher. A final limitation may be in the rating of pathology as a best practice in the field. Although the instruments used all have strong validity and reliability, the assignment of pathology is usually done not through self-report measures, but through examination by a licensed professional in conjunction with such measures.

Although the findings supported the hypothesis, it is important to consider the context of the study. The study focused on a sample who reported symptoms and did not include interventions or the results of interventions. It is important that considerable research be focused on how these data can be used to develop interventions that can be used in the field. With improved understanding of the interpersonal dynamics of pathology in these couples, there can be increased ability to tailor interventions that serve this population.

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AUTHOR INFORMATION

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COMPETING INTERESTS

The authors have nothing to disclose.

CONTRIBUTORS

Edwin A. Brennan conceived and designed the study and acquired and analyzed the data as part of a dissertation. Nancy Carbonell was the dissertation chair and helped conceive and design the study. Dennis Waite helped to design the study and revised it for important intellectual content. Jimmy Kijai helped to design the study, analyzed the results, and edited and revised the manuscript. All authors approved the final version submitted for publication.

ETHICS APPROVAL

The study protocol was approved by the Institutional Review Board at Andrews University, Berrien Springs, Michigan, United States of America.

INFORMED CONSENT

Informed consent was provided through the survey data collection program as part of the initial stages of the survey instrument. Couples who chose not to accept informed consent were redirected to an exit screen.

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RESEARCH

Factors that help and factors that prevent Canadian military members' use of mental health services

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ABSTRACT

Introduction: Depression is the most common mental health diagnosis for Canadian Armed Forces (CAF) members, and its prevalence surpasses that among the general Canadian population. This research aimed to explore the experiences of CAF members accessing mental health care and clinicians who work with them. **Methods**: This doctoral research included an inquiry team from across Canada; semi-structured qualitative focus group data were collected. **Results**: Themes of "those people" or client identity, "old-school CAF" or culture of mental health stigma, loss of purpose, and facilitators of care were described. The theme of "those people" or client identity included being ostracized after seeking care, pervasive unit cohesion and warrior culture endorsing weakness if mental health care is sought, client identity as separate from warrior and clinician identity, and trying to figure things out rather than seeking services because of stigma. The theme of "old-school CAF" or culture of mental health stigma involved language, variance between elements, toxic mentality, leadership style, and treatment of those accessing mental health services. The loss-of-purpose theme included the impact on one's career and sense of belonging within the unit once services were accessed, and the facilitators-of-mental-health-care theme encompassed cultural change in the CAF, higher rank support for use of services, CAF-wide education on mental health, time allotted for appointments, and confidentiality. **Discussion**: Normalizing the use of specialized resources during cultural indoctrination into the military, and highlighting testimonials by credible CAF leaders, may further the cultural shift in the CAF. Also, to facilitate mental health care seeking by military members, more than just addressing structural barriers is needed.

Key words: barriers to mental health care, CAF, Canadian Armed Forces, facilitators to mental health care, mental health, mental health stigma, military culture, military mental health

RÉSUMÉ

Introduction : La dépression est le principal diagnostic de trouble de santé mentale dans les Forces armées canadiennes (FAC), et sa prévalence dépasse celle observée dans l'ensemble de la population canadienne. La présente étude visait à explorer les expériences des membres des FAC qui cherchent à accéder à des services en santé mentale et celles des cliniciens qui travaillent avec eux. **Méthodologie** : La présente étude incluait une équipe d'enquête pancanadienne, et les chercheurs ont colligé les données qualitatives et semi-structurées du groupe de travail. **Résultats** : Les chercheurs ont décrit les thèmes « ces gens-là »/l'identité des clients, « les FAC de la vieille école »/la culture de préjugés liés aux troubles de santé mentale, la perte de motivation et les incitations aux soins. « Ces gens-là »/l'identité des clients incluait la stigmatisation après avoir demandé des soins, la cohésion omniprésente des unités et la culture guerrière pour lesquelles une demande de services en santé mentale est preuve de faiblesse, l'identité des clients qui est distincte de celle de guerrier et de l'identité des cliniciens et les tentatives pour se débrouiller seul plutôt que de demander des services à cause des préjugés. « Les FAC de la vieille école »/la culture de préjugés liés aux troubles de santé mentale incorporait le langage, la contradiction entre les éléments, la mentalité toxique, le style de leadership et le traitement de ceux qui accédaient à des services de santé mentale. La perte de motivation intégrait les répercussions de l'accès aux services sur la carrière et sur le sentiment d'appartenance à l'unité. Les incitations aux soins en santé mentale englobaient le changement de

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culture au sein des FAC, le soutien des grades plus élevés à l'utilisation des services, l'éducation de l'ensemble des FAC en matière de santé mentale, le temps accordé pour les rendez-vous et la confidentialité. **Discussion** : La normalisation du recours aux ressources spécialisées dans le cadre de l'endoctrinement culturel aux forces militaires et la mise en évidence des témoignages de leaders crédibles des FAC pourraient faire progresser la transformation culturelle des FAC. De plus, il ne faut pas se contenter de vaincre les obstacles structurels pour inciter les militaires à demander des soins en santé mentale.

Mots-clés : culture militaire, FAC, Forces armées canadiennes, incitations aux soins en santé mentale, obstacles aux soins de santé mentale, préjugés liés aux troubles de santé mentale, santé mentale, santé mentale des militaires

LAY SUMMARY

Canadian Armed Forces (CAF) members experience depression at higher rates than civilian Canadians. Mental health services are available, yet members do not always use them, even when needed. The authors hosted focus groups to find out what brings military members to mental health services. The results show that the CAF is dealing with structural barriers, including time for members to go to appointments, confidentiality, language about mental health, and higher ranking members talking about their own experience, which helps members seek help. Military culture, which has changed over the years, makes a difference for military members in either promoting or preventing getting help. Also, personal stigma still exists, and it is one reason members do not use mental health services. Basic training, when members are introduced to military culture, may be a place for higher ranking members to talk about their experiences with mental health help. Leaders' openness about their use of services and ensuring that leaders know about the resources that exist may continue to foster members' use of mental health services. Personal-level stigma needs more research.

INTRODUCTION

Depression is the most common mental health issue for Canadian Armed Forces (CAF) members.[1] According to Pearson and colleagues,[1] depression is reported more often by Regular Force CAF members than are symptoms of panic, posttraumatic stress, anxiety, and alcohol abuse or dependence. Regular Force members also report a higher prevalence of depression than the general Canadian population.[1] According to Sareen and colleagues,[2] military members are 32% more likely than civilian Canadians to have suicidal thoughts and 64% more likely to plan suicide.

In response to this dire public health concern, suicide prevention has become a top priority for the CAF.[3-4] Yet, despite the availability of mental health services for soldiers that surpass those at the disposal of Canadian civilians,[2] military members do not always access the plethora of available supports.[2,5] In 2002, it is estimated that one-third of CAF members did not access treatment-related services, despite acknowledging the need for help.[6-8] Between 2002 and 2013, service use increased from an average of 2.59% to 6.17%.[9]

According to Myerholtz,[10] patients first access primary care providers with symptoms of depression. Despite the prevalence of depressed patients seeking treatment, however, stigma toward those diagnosed with a mental illness exists among health care providers.[10] The privileging of specific disciplines, such as medical doctors and psychiatrists, within a traditional health care model reinforces a silo effect,[11] and in practice, patient outcomes are negatively affected by this silo effect of fragmented care.[11] Outcomes for both patients and providers are improved in a collaborative health care model in which care is team driven, population focused, measurement guided, and evidence based.[10] Exploring CAF members' experiences of mental health services via participatory action research (PAR) is warranted, because PAR's goal includes creating a more inclusive practice.[12]

A qualitative approach was used to explore facilitators of Regular Force CAF members' use of military mental health services and clinicians' experiences working with CAF members. The primary researcher's interest in this area was sparked after nine years of working as a civilian in military mental health departments at three military bases in Canada. In collaboration with the PAR inquiry team, the three research questions developed were as follows:

1. What works in our military mental health care system?
2. What supports CAF members to access military mental health services?
3. In your mind, what role does culture play in facilitating or creating barriers to accessing care?

METHODS

PAR was chosen for this doctoral research because it includes participants in the process of enhancing their situations.[12] Engaging both mental health care providers and those members accessing mental health services brings depth to the exploration by involving various perspectives. In the health literature, PAR is seen as transformative because researchers and participants co-create knowledge.[13-16]

Voluntary informed consent was collected before participation, and the purpose of the research, the role of each participant, the explanation regarding withdrawal, the potential benefits of and harm associated with participation, and how privacy was protected were covered. Participant agreements were signed, and the protocol for handling, storing, and destroying the data was addressed. Ethical approval for this research was granted by Royal Roads University Research Ethics Board, the Social Science Research Review Board, and the Surgeon General.

Inquiry team co-researchers and focus group participants were recruited in Esquimalt, British Columbia; Edmonton, Alberta; and Trenton, Ontario. Flyers were placed in the mental health waiting rooms at three CAF Health Services locations in these cities. Members of the PAR inquiry team were recruited first and were engaged in all parts of the research. The team consisted of three Regular Force CAF members and four mental health clinicians (social workers, psychologists, and nurses). The purpose of this team was collaborative discussion of and agreement on the nature of the problem and sources of change. Military mental health service user and service provider focus group participants were then recruited. These contributors participated solely in the focus groups. Seven focus groups occurred — three with five CAF mental health services users and four with five mental health clinicians working with the CAF. Inquiry team members and focus group participants varied in gender, age, rank, position within the CAF, length of time in the CAF or working with the CAF as a clinician, and in service element (army, navy, air force).

Data collection

The inquiry team and primary researcher generated nine open-ended, semi-structured focus group questions. Focus group sessions ranged from 60 to 90 minutes, depending on participation by contributors. Audio-recorded focus group data were transcribed verbatim by the principal investigator (MH).

Data analysis

Focus group data were analyzed in collaboration with the inquiry team. Journal entries by the principal researcher contained observations and initial reactions to the focus group sessions. Focus group transcriptions were discussed with inquiry team members. Emerging themes were identified in each transcription, and consensus on the central themes was recorded.

RESULTS

While analyzing the data from the focus groups, 12 categories were identified. These categories were then grouped into seven themes, which were then further collapsed into four themes: "those people" or client identity, "old-school CAF" or culture of mental health stigma, loss of purpose or belongingness, and facilitators of care.

"Those people" or client identity

By investigating facilitators of care, participants addressed what prevented them from accessing mental health services. When asked what would make it easier for them to access services, client identity emerged. Comments related to identity included "you are not ostracized, but you are kind of like 'those people'" and "I think services were available, but when I joined 20 years ago, it was really … you were ostracized for going to mental health." Many mentioned taking months and years to come forward after trying to manage on their own. The indoctrination into unit cohesion and warrior culture is so pervasive, one member explained, that he was "brainwashed" into believing that he was weak if he got help.

> I got so brainwashed that if you go to the [medical inspection room] because you hurt yourself that you are weak and are whatever else, that I … it took me a while to change that for myself … for myself, I couldn't, I don't know, it's weird to explain … because I don't lead that way … I tell others to get help when you need it.

Another member with more than 30 years' experience stated that "self-stigmatization" still exists and commented that no professional wants to struggle.

> People are getting the message that it's OK to get help … still, self-stigmatization [still exists] in that there is no professional that doesn't want to be able to do their job … there are still people that resist coming in."

Others also referenced special treatment centres for professionals and how clinicians probably access mental health care less than military personnel. "It's kind of like how we have special treatment centres for doctors and pharmacists and professionals."

"Old-school CAF" or culture of mental health stigma

Many participants spoke of how culture plays a role in both facilitating and creating barriers to care.

> There was a stigma attached to mental health, and I think that even now we are still trying to change the culture of that stigma.
>
> Stigma from society and the old guard mentality is still very much alive [in the CAF] … unit-level care would not be beneficial … things have to happen more at a higher level, not lip service forced down but implemented … the old guard needs to be weeded out and get the new thought process in.

The impact of language, the difference in CAF elements, and past versus present military perspective was discussed, which highlighted change over time, as well as the change that is still needed.

One member with more than 20 collective years in the CAF — eight years in combat arms service and 12 years in the air force — referenced the difference between the army and the air force, as well as the forces in the past.

> I think we are better because, when I was a younger guy, I would've never tell people that I don't feel well, on a mental side because then you're weak. Yeah, there is more empathy and less of that, I don't like saying macho but like that toxic mentality that used to have before you know, there used to be that mentality like nothing can break us. In the '90s, people would get kicked out of the CAF for mental health issues, unceremoniously kicked out … we've come a long way … not what we used to be by a long way … we are way better.

Participants talked about the shift in CAF culture, and many referenced changes over the past 10 years. Participants talked about how, in the past, members would be kicked out of the military for mental health issues and said labels such as "crazies" were used by the chain of command (COC). One participant said that he had a:

> hard time pointing … like a specific point [to the shift] I would say at least 10 years ago, it starts to change at least 10 years ago. … 2000, we still had lots of the dinosaurs, you know, the dumb people from the late '70s, early '80s that, for example, when we were doing a run one morning, it was the fast group, the slow group, and the sick, lame, and lazy … that was the three groups … if you were not capable of joining [physical therapy], you were sick, lame, and lazy so you were labelled like that.

Another participant addressed the impact of a clinician's label on "finances, belongingness, identity, rank, my whole life":

> The main thing, the big points, the leadership culture change, that's the most important, especially if you are a junior rank, if you see your leaders calling people crazies, you're not going to want to be seeking help, so that's changed.

A pivot in the beliefs, as shown in the language used, the leadership styles, and in the treatment of those accessing mental health services, has occurred in the Forces, according to the expressed lived experience of members in these focus groups.

Loss of purpose or belongingness

Reinforcing the sense that accessing mental health has an impact on one's purpose and belongingness within the unit, participants talked about their experiences after seeking support: "it felt like things were against me" and "you are already feeling terrible and now let's make you feel insignificant." Another participant talked about how:

> worse than getting kicked out or medically released is that you are still at the unit watching all of your friends do what you want to be doing but not able to do it. I always use the phrase "the machine will keep moving" … you don't have to ostracize these people or us … this impacts postings, adoption, anything else that, outside of deployment … with things like that I really regret coming to mental health, but I still would not direct people away from mental health if that makes sense.

Unit cohesion is the essence of military life, from the beginning of one's career, starting in basic training. Mental health support is provided for members, and it can have an impact on one's career and sense of belonging within the unit.

Facilitators of care

Overlapping responses related to what participants thought helps CAF members access services included leadership disclosing their own use of services, leadership's knowledge and positive messages and promotion of mental health services, cultural attunement, allowing time for sessions, confidentiality, and the availability of services:

> When a senior leader in the organization self-discloses their positive experience of mental health, it contributes to supporting the member in getting care when they need it.
>
> A supportive COC can definitely help let someone access care by telling them that they won't lose their job and won't be shunned or shamed or criticized or punished.

Several participants talked about culture and reported the following:

> I think there's been an improvement in people being more open to go [to mental health] because their COC is promoting it.
>
> The message coming from leadership that it's ok to seek services, speaking about services … members are being given the language of the mental health continuum … a common language, and we are having conversations about mental health … you are given permission that you can actually talk to your COC or peers if [you are] having an orange moment.
>
> CAF promotes the use of mental health services via the [Road to Mental Readiness] training, unit training days, leadership not stigmatizing it.
>
> The primary thing is leadership knowing about the resources and referring their people to assistance.
>
> We do a great job of providing multidisciplinary services for our people.

DISCUSSION

Focus group participants talked about feeling and being seen as "those people," separate from the CAF warrior. These messages imply that warriors do not access support, and it is known that CAF members sometimes struggle with accessing services even when they need them.[6-8] Although structural stigma is addressed,[17] as seen in the "Facilitators of care" section, internal personal stigma seems to continue to thrive.

The aim of military basic training includes immersing new members in the social norms and essential tasks of the armed forces.[18] One's civilian identity is stripped away, and the warrior identity is donned.[19] Beliefs about warrior conduct, morals, unit cohesion, capabilities, and expectations, as well as the ability to cope with high levels of stress, exist and are taught.[20] Members align with CAF membership beliefs, values, and assumptions that, when seeking help, collides with the client group.[21] Other research has addressed this insider and outsider — or us and them — that separates the "mad" and "non-mad," along with the othering that goes along with it.[22-24]

Unit cohesion, paramount to the CAF identity, may be seen as being at odds with the individual focus of therapy.[25-27] Separating oneself from the unit, being perceived as an out-group member by others and oneself, as expressed by the focus group participants, may be one element of the personal stigma ascribed to the client identity. In aligning with the client role, members face competing interests between unit cohesion and therapy. Other research has found that, at the start of a struggle with mental illness, people feel a loss of self.[28] In light of the importance of unit cohesion and the internalized qualities of the warrior, members would inevitably feel a sense of loss once help seeking actions are taken.

Members talked about the "old guard" and about what the CAF was like in the past. These past beliefs and ideas about mental health continue to linger, as seen in the members' comments on the differences between units, despite the shift in perspective at the national level. The impact of historical beliefs, language, and actions by the CAF, specifically related to mental health, can be seen in the time it took members to access support, especially among longer serving members. One member mentioned that he no longer fears career implications, and another said that, although he supports his troops in accessing mental health, he did not do so for himself, despite the need. This emphasizes that more than just structural changes, such as providing time to attend sessions and available resources, needs to occur to support members in accessing mental health services.

Despite suffering, members will ignore physical and mental concerns for fear of the implications. Although structural changes occurred in the recent past, the old-school-CAF belief system is apparent. Change has occurred over time in the CAF, and change is still needed because the disparity between the elements, and with primary care and mental health care clinicians, remains.

The impact of accessing mental health services was shared by focus group members who referenced various losses. The theme "loss of purpose" includes change in identity. Once members identified with the label of client, in their own perception and in the perception of others (COC, family members, and friends), their role as a CAF member changed.

Unit cohesion is a foundational part of the CAF indoctrination.[20] As part of a unit, members function as a group. Once members are ill or injured, their role within that unit changes. The loss of one's role within a team is devastating for most, and, as one member explained, to be on unit lines, watching your friends do what you trained to do and are unable to do, demolishes one's sense of purpose. Clinicians struggle with juggling the role of caregiver and the role of client, which can be complicated when one wears a CAF uniform. Rank and role identity, along with unit cohesion, clash.

According to Peterson,[29] identity formation is fundamental for health professionals with a mental illness. Threats to identity, for those struggling with mental health concerns, include discrimination, stereotypes, and prejudice.[29] Although the focus of Peterson's research is health professionals,[29] the findings ring true for CAF members. Various roles are expected of CAF members, depending on their rank, trade, element, and commission. The role of client, if accepted by CAF members, requires a shift in identity in which members may experience "uncertainty about the identity of self and purpose."[30] (p. 22)

Similar facilitators of care were identified in the focus groups. Participants referenced culture, time, confidentiality, rapport, the use of services by clinicians and peers, and disclosure of use by senior leaders, as well as the sharing of information regarding available services. According to Jones and colleagues,[31] (p. 17) "senior UK military commanders may be able to influence stigma by encouraging the discussion of mental health among subordinates" and assert that "combating stigmatising perceptions of weakness and fears of being treated differently should be the central focus of command activity." Senior leadership disclosing their own use of services seems to give members permission to seek formal mental health support and reinforces that one can be both warrior and client.

The focus group data indicate that structural barriers to military mental health care are being addressed. The CAF provides time for members to attend appointments, resources exist, confidentiality is ensured, and testimony by peers and senior leaders during briefings or informally addresses these barriers. Ting has reported that personal reasons, rather than structural barriers, are more often the cause of members not accessing mental health support.[17] Although Ting's research focused on students in the caregiving professions of social work, nursing, psychology, and medicine,[17] there appear to be more similarities between the CAF warrior and the caregiver in terms of mental health seeking.

Limitations

Every focus group participant in this study was Caucasian. All but one was Anglophone. Also, the inquiry team consisted of CAF members solely from the army, and all but one was Caucasian, which may limit the transferability of these findings. The number of focus group participants, and the time allocated to complete the doctoral research, were also limitations of this study.

Conclusion

Depression is prevalent, and its prevalence among CAF members is higher than among the general Canadian population.[1] CAF members, however, do not always use the mental health services that exist,[2,5] although service use did increase between 2002 and 2013.[9] The aim of this research was to explore CAF members' experience of military mental health services, as well as the bias clinicians may have toward those diagnosed with a mental illness. During this investigation, the importance of identity and culture, for both military and clinicians, emerged. This research uncovered the strides made in the reduction of CAF structural barriers to mental health care and highlights the facets of personal stigma that continue to act as barriers.

To further this cultural shift, normalizing the use of specialized resources during the indoctrination into military culture, and focusing on personal testimonials by credible CAF leaders, may be of benefit. The promotion of care seeking as part of unit cohesion and health, involving regular annual check-ins (similar to dental checkups), may help reduce the personal stigma of accessing mental health support when needed.

Military members live with depression and suffer even when help exists. Addressing more than just the structural barriers is needed to continue to facilitate access to services. Clearly, more research is needed to uncover ways of addressing warrior and clinician personal biases and stigma toward use of mental health care services.

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CONTRIBUTORS

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PERSPECTIVES

Reimagined connection: New possibilities for virtual mental health support for children and youth of public safety personnel affected by operational stress injuries

Helena Hawryluk[a], Jerris Popik[a] and Linna Tam-Seto[b]

LAY SUMMARY

Young people in public safety personnel (PSP)-connected families are affected by the distinctive stress related to having a parent with mental health issues, including operational stress injuries (OSIs) and the existing strain connected to the COVID-19 pandemic. This increased vulnerability makes it important to be innovative in opportunities for prevention in the PSP community. After reviewing available resources aimed at helping young people affected by a parental OSI, the authors uncovered a gap in prevention and intervention programs accessible to all Canadian PSP families. A new virtual six-week program offered to Canadian young people in military and PSP families affected by an OSI creates potential for developing resilience. The online platform opens access to young people who may be isolated from joining a traditional face-to-face mental health support program with peers. The virtual program aims to empower young people in their knowledge of mental health and enable them to learn about the complex nature of parental OSIs, such as posttraumatic stress disorder. More research on this program is needed to ensure interventions created for this target population are effective in the Canadian context and meet the unique needs of PSP-connected young people.

INTRODUCTION

The increasing mental health needs of children and youth worldwide as a result of the COVID-19 pandemic has led to an increased need to develop accessible programming.[1,2] The potential indirect effects of pandemic-related public health measures may lead to increased adverse childhood experiences for children and youth who live in families that are already affected by mental health problems. In particular, children and youth of public safety personnel (PSP)-connected families are at risk for developing mental health difficulties as a result of their parents' work.[3] Targeted mental health care for children and youth has been identified as critically important for PSP families.[4] Reviews of specialized mental health programs for children and youth show limited availability of evidence-based programs.[5] A recent study reported that almost 45% of Canadian PSP screened positive for one or more mental health disorders, indicating a growing need for support within the PSP community.[6]

Repeated exposure to potentially psychologically traumatic events has been linked to PSP reporting decreased mental health and has led to negative consequences for family relationships — more specifically, for parent-child relationships.[7] Evidence indicates that operational stress injuries (OSIs) have a systemic effect on the family, with reports of parental posttraumatic stress disorder (PTSD) leading to lower family functioning and family readjustment issues.[8] Research examining the impact of parental PTSD on children suggests that they have an increased risk for mental health concerns.[9,10] Specifically, when children have a parent with PTSD, their behaviour, social functioning, and psychological well-being are affected.[11–13]

Although trends indicate a rapid evolution of young people reaching out and seeking mental health support through use of online technologies,[14] an opportunity may exist to engage young people in PSP families by offering culturally sensitive and developmentally appropriate online prevention-intervention support to

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this at-risk population. The nature of young people's technology use makes online delivery of support an attractive method to reach those in need. Given the immediate concerns for safety related to the COVID-19 virus, many front-line workers, such as PSP and military families, have limited access to traditional face-to-face mental health supports during a critically stressful time. Access to online prevention and intervention mental health supports are needed when family systems are experiencing both pandemic-related stress and the enduring stress of a parental OSI.[2]

Preliminary findings from a recent six-week virtual group aimed at providing psycho-education through play-based activities for young people ages 8-16 years living with a parent affected by an OSI show promise, but program evaluation and assessment of clinical efficacy are needed to ensure that they meet the need for accessible support of Canadian children and youth from both PSP and military families. This article discusses an online mental health program adapted to run on a virtual platform that offers psycho-educational support to young people from PSP and military families affected by a parental OSI. It highlights preliminary observations from this program to advocate for it as a potential avenue to meet the growing need for mental health support of PSP families affected by OSIs, and it offers a unique opportunity to examine the usefulness of delivering mental health supports using a virtual platform.

LESSONS LEARNED FROM MILITARY OPERATIONAL STRESS INJURY RESEARCH WITH CHILDREN

Although more research on the well-being of children and youth from PSP families affected by a parental OSI is needed,[7] evidence from the military context indicates that young people face mental health consequences when a parent has PTSD.[4,11,15] It should be recognized that important similarities exist between the PSP and military cultural contexts that allow for a comparison of occupational stressors.[15] These similarities include the mandate to respond to critical incidents and the possibility that members will be placed in dangerous life-or-death situations.[15] Therefore, one may contend that the current evidence for the negative effects of a parental OSI on military children can also be extended to PSP-connected children. Future research including PSP-connected children and youth could provide important insight into this particular group of young people and inform the development of mental health support programs that include both military and PSP families. Children and youth in PSP families are affected not only by the mental health of a parent with OSI but also by the current stress connected to the pandemic. This increased vulnerability makes it important to be innovative in opportunities for prevention in the PSP community.

The mental health community has offered targeted support to military families affected by OSIs through individual counselling, peer-based support, and support groups.[16] The primary mode of delivery for these programs has been in person, with limited online programs designed to support young people who have a family member living with an OSI.[16] A recent review of programs designed for military and Veteran families affected by an OSI indicates that access to these programs is available only to those families who live within driving distance. For example, families living near major military bases had the opportunity to take part in mental health programs, whereas those living in remote rural locations did not.[16] In addition, web-based programs such as the video series The Mind's The Matter, whose content is exclusive to the Canadian Armed Forces (CAF) and aimed at supporting youth of CAF and Veteran families experiencing OSI,[17] have not yet been adapted to support the needs of children and youth in PSP families. Several programs designed to support mental health literacy and resilience of PSP personnel have been adapted from the CAF, such as Road to Mental Readiness;[18,19] however, programs developed for young people in the military context have yet to be adapted and explored for PSP families. Support may be growing for the use of technology to provide cost-effective and geographically accessible specialized mental health programming for families affected by an OSI.

Generally speaking, the increasing burden of mental health disorders,[20] in addition to advancements in technology, has resulted in a significant rise in the electronic delivery of health care services. The paradigm shift in mental health care provision has been identified as particularly beneficial for populations connected to the military or PSP as a result of concerns about access to traditional face-to-face therapy or the stigma associated with receiving mental health care.[21-23] The rapid transition to offering telehealth to Veterans and their families in the United States has presented clinicians with an opportunity to examine the potential impact and the efficiency and effectiveness of behavioural health care.[24] Preliminary discussions on the use of a telehealth platform suggest that families and Veterans may prefer this mode of therapy, with a predicted increase in demand for telehealth services in the near future.[25,26]

ONLINE MENTAL HEALTH SUPPORT FOR CHILDREN AND YOUTH

Over the past several years, young people have increasingly turned to the use of online platforms to access mental health supports.[14,27] Research has shown that online telehealth interventions for youth have great potential to improve mental health when they are facilitated by a trained mental health care provider and offer synchronous sessions that actively build rapport.[28] The results of a systemic review of the impact of online mental health interventions show significant positive effects of online cognitive-behavioural therapy, with adolescents indicating increased compliance rates when online prevention and intervention programs incorporate both face-to-face web-based interaction between participant and counsellor and web-based support.[14] Another benefit identified is that online mental health interventions can offer convenient access to quality, evidence-informed resources, targeting several barriers that many children and youth face when attempting to access mental health interventions. Such barriers include stigma, cost, and lack of access to transportation to attend sessions.[29,30]

NEW OPPORTUNITY FOR ONLINE MENTAL HEALTH PROGRAM FOR PSP-CONNECTED CHILDREN AND YOUTH

A virtual mental health program was adapted from an in-person, two-day camp format and delivered by trained mental health professionals in a synchronous, online format for one hour over six weeks. The program was clinically designed to be psycho-educational; it offered play-based activities to assist participants to gain developmentally appropriate knowledge on OSI, increase awareness of mental health (e.g., emotional regulation, mental health vs. mental illness), offer a hands-on opportunity to learn new coping strategies (e.g., mindfulness jars, painting to music), and reduce social isolation by connecting with peers in similar family contexts across Canada.

Initial impressions of the program provide some insight into important ways in which virtual programming can increase accessibility of customized support and greater connection with others in similar contexts. Specifically, participants reported reduced isolation and normalization of having a parent in a unique career, such as first responder, military, or Veteran, especially while having limited access to family and friends for support because of the pandemic regulations. For example, participants joined from various locations across Canada, several in rural areas, where access to a program on parental OSI is not available. The clinically facilitated program was delivered via a virtual platform that allowed participants to connect from various portals, such as a cellphone, tablet, or laptop, which was convenient for young people and provided the flexibility to attend from various locations. It also allowed for adaptability to family schedules. Children and youth were able to sign in to the sessions during family camping trips or while visiting extended family. Synchronous delivery of the program added important human connection for children and youth, potentially pointing to the reason for the program's high completion rate.

Access to adequate mental health resources can be challenging for PSP families with unique needs related to an OSI.[31] The Government of Canada's Action Plan on Post Traumatic Stress Injuries acknowledges PSP's high need for mental health support and the barriers to treatment. It supports the introduction of Internet-delivered cognitive-behavioural therapy as an acceptable treatment option for PSP.[4] Awareness has been raised by mental health professionals and the Government of Canada regarding issues of access to care for PSP resulting from inadequate funding, lack of access to evidence-based prevention programs,[32] and a civilian health care system that is often unaware of the realities of life faced by PSP.[33,34] The compounded challenges experienced by children and youth in PSP families require that they receive customized and evidenced-based care to support their mental health needs. These life realities, therefore, necessitate accessible, innovative, and effective mental health care options for military- and PSP-connected young people.

FUTURE DIRECTIONS

Virtual mental health care program delivery for PSP-connected families has the potential to address multiple barriers faced by this target population (e.g., isolation, stigma, accessibility). Although several apps and online platforms have been developed in the child and youth mental health field, a gap exists in evaluating the efficacy of these programs.[28] It is crucial that researchers evaluate existing virtual care-delivery programs to ensure interventions and programs created for this target population are effective in the Canadian context and meet the unique needs of children and youth in PSP-connected families. Research should focus on identifying key practices and strategies in a virtual mental health program for PSP- and military-connected families that will improve access to culturally sensitive and developmentally appropriate support for an increasingly vulnerable population.

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PERSPECTIVES

Return to aviation duty after recovery from COVID-19

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LAY SUMMARY

As the COVID-19 pandemic continues to grow in many areas of the world, the virus may increasingly infect military service members and their families. Most service members who contract COVID-19 develop a mild disease course that requires primarily supportive care and steps to limit the spread of infection to others. However, increasing evidence suggests that heart, lung, and coagulation disorders and psychological sequelae may occur even among generally healthy young adult COVID-19 patients. These potential manifestations of the disease are a cause for concern for Israeli Air Force pilot cadets and aircrew personnel, particularly in high-performance aircraft, because they may lead to decreased performance during flight and potentially to sudden incapacitation. In this article, the authors describe the Israeli Aeromedical Center's recommendations to flight surgeons on the medical workup required before military aviators return to flight duties after recovery from COVID-19.

Key words: aeromedical waiver, aerospace medicine, aircrew, aviation, cardiac, COVID-19, Israeli Air Force, military health, pilot, pulmonary

Mots-clés : aviation, cardiaque, COVID-19, équipage, Force aérienne et spatiale israélienne, médecine aérospatiale, pilote, pulmonaire, dérogation aéromedicale, santé militaire

COVID-19, an emerging infectious disease caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), appeared in China in December 2019 and was declared a pandemic by the World Health Organization on Mar. 11, 2020.

Person-to-person transmission is thought to occur primarily via respiratory droplets.[1] SARS-CoV-2 may be stable on various surfaces, possibly allowing for indirect transmission.[2] The incubation period is generally 14 days post-exposure. The median incubation period is estimated to be 5 days.[3] The basic reproduction number is thought to be 2.0-2.5.[4]

COVID-19 is primarily a respiratory illness. A wide range of clinical presentations manifest in different individuals, typically with development of an upper respiratory flu-like illness. Atypical pneumonia with interstitial involvement leading to acute respiratory distress syndrome and death has been described.[5] It is important to note that there are reports of radiographic pulmonary involvement in patients with no clinically apparent lower respiratory tract symptoms.[6] Transmission may also be possible from asymptomatic and pre-symptomatic individuals during the incubation period.[7,8] Case reports suggest possible cardiac involvement in COVID-19, including myocarditis.[9,10]

Several risk factors for serious morbidity have been reported, such as cardiovascular, pulmonary, and kidney diseases. Other risk factors include older age, obesity, smoking, immunocompromising conditions, and chronic liver disease.[7,8]

Although the prevalence of comorbidities among young adult COVID-19 patients is reported to be low, environmental and occupational circumstances of military service members may propagate infection.[5] Increasingly, reports in the Israeli military have suggested that young adults of mandatory military service age (18-21 y) experience a typically milder disease course. Specifically, Israeli Air Force cadet pilots and aircrew

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members are generally young, healthy adults with no significant comorbidities, all of whom undergo strict pre-conscription medical screening and routine health checkups. Therefore, they do not constitute a high-risk population for significant morbidity and mortality due to COVID-19. However, COVID-19 may potentially have a negative impact on human performance in extreme environments such as high-performance aviation. As far as we know, there are currently no published data on COVID-19 and civilian or military aviation.

Prevention of COVID-19 in a military organization is challenging. Various methods were put in place to mitigate COVID-19 spread in the Israeli Air Force, including reinforcement of the importance of personal hygiene and respiratory etiquette, mandatory use of face masks by all personnel, limitations on contact with the civilian population, and relative physical distancing by compartmentalization into functioning "capsules" within units to form smaller working groups, as well as an aggressive two-week quarantine policy for suspected cases. Moreover, capability for independent, rapid SARS-CoV-2 testing was developed, facilitating the isolation of suspected and confirmed cases on base.

However, as air force training and operational duties continue, the spread of COVID-19, although at a slower rate, is ultimately inevitable, particularly for young cadet pilots undergoing training in relatively large and dense groups. For example, cadet pilots and aircrews return home and come into close contact with members of their nuclear families. On return from the civilian environment, they may then transmit the infection to other service members within their own capsule with whom close contact is unavoidable. Taken together, formulation of criteria for an aeromedical waiver upon recovery is necessary.

To date, most infected pilot cadet and aircrew patients have been transferred to a dedicated military recovery facility and cared for by a medical team until resolution. Recovery is defined as two consecutive negative reverse transcription polymerase chain reaction for SARS-CoV-2 in naso- and oropharyngeal swabs obtained after resolution of symptoms or after at least 10 days have elapsed from symptom onset, with three consecutive days without respiratory symptoms or fever.[11] It is then reasonable to assume that both viral shedding and probability of clinical deterioration are exceedingly low, based on the reported natural history of COVID-19.[12]

For a person to be considered acceptable for aviation duty, a medical condition must not pose a risk for performance compromise or sudden or subtle incapacitation. Hypoxia, hypobaric environment, and G-force load are some aviation environment factors that could exacerbate silent hypoxia or cardiac involvement, especially in high-performance aircraft.

For example, an aeromedical waiver after a non-complicated community-acquired pneumonia is typically granted after complete clinical resolution, completion and discontinuation of prescribed medical therapy, and a normal repeat physical examination by a flight surgeon. A repeat chest radiograph is usually performed six to eight weeks after diagnosis, but the aviator is not typically grounded until a normal follow-up chest radiograph is obtained.

Post-COVID-19, the possibility for sub-clinical pulmonary or cardiac involvement remains an aeromedical concern because it can cause subtle changes that could potentially be exacerbated by flight and compromise the aviator's resistance to G-forces, lead to hypoxia, or lead to poor flight performance. At present, non-flying ground-based operators are returned to their duties with only routine aeromedical workup post-recovery.

It is recommend that post-COVID-19 aircrews of all flying classes who were asymptomatic or who had a mild non-complicated course have a complete routine aeromedical examination performed, including flight surgeon examination; ear, nose, and throat and ophthalmology specialist examination; and complete blood count, basic metabolic panel, and urinalysis. A post-COVID-19 medical workup may be started as soon as recovery from COVID-19 has been defined by the flight surgeon caring for the aviator.

Aircrews of all flying classes who had a more severe clinical course requiring hospitalization, oxygen supplementation, or intensive care should be grounded and carefully evaluated as part of an aeromedical consultation with a senior flight surgeon and specialist consultants after complete recovery from COVID-19.

The authors recommend that all recovered air force aviators have a chest radiograph and spirometry before return to flight. For high-performance aircrews and pilot cadets, The authors recommend that plethysmography and diffusion capacity of the lungs for carbon monoxide be performed post-COVID-19. To further challenge pulmonary function, the authors suggest reduced oxygen breathing device (ROBD) training for all recovering high-performance aviators after respiratory clearance. During training, aviators are exposed to hypoxia under controlled conditions while performing cognitive tasks or flying a simulator. The fraction of inspired oxygen is

Table 1. Approach to medical examination of aircrew after COVID-19 infection

High-performance aviators and pilot cadets	Other flying classes — rotary wing, military, or civilian transport
Standard aeromedical evaluation — Complete blood count, basic metabolic panel, urinalysis Chest radiography Electrocardiography Basic pulmonary function tests Audiology + ENT specialist Ophthalmology specialist Flight surgeon evaluation Referral to aeromedical psychiatrist if suspected psychosocial impact	*Standard aeromedical evaluation —* Complete blood count, basic metabolic panel, urinalysis Chest radiography Electrocardiography Basic pulmonary function tests Audiology + ENT specialist Ophthalmology specialist Flight surgeon evaluation Referral to aeromedical psychiatrist if suspected psychosocial impact
Ancillary testing — Pulmonary Plethysmography Diffusion capacity of carbon monoxide Reduced oxygen breathing device training	*Ancillary testing —* Only if pathology is found in standard aeromedical evaluation
If abnormal — Consider chest HRCT Pulmonologist consult Cardiac Transthoracic echocardiography	
If abnormal — Consider cardiac MRI Cardiologist consult Hematology Coagulation tests (PT, aPTT, INR)	
If abnormal or high clinical suspicion — Consider D-dimer Hematologist consult	

ENT = ear, nose, and throat; HRCT = high-resolution computed tomography; PT = prothrombin time; aPTT = activated partial thromboplastin clotting time; INR = international normalized ratio.

gradually reduced to 7.5%, simulating hypoxia at an altitude of 25,000 feet. Training is immediately stopped if blood oxygen saturation reaches 50%. High-resolution chest computed tomography should be reserved for cases with an abnormal initial pulmonary workup, residual symptoms, or sub-optimal performance or symptoms exacerbated by ROBD training. Taken together, these tests should be sufficient to rule out any clinically significant residual pulmonary pathology that may manifest in a high-performance aviation environment.

A recent expert consensus article recommended a two-week convalescence followed by no diagnostic cardiac testing for asymptomatic patients and electrocardiography and transthoracic echo (TTE) for mildly symptomatic patients.[13] However, new studies using cardiac MRI show that some recovered athletes demonstrate myocardial inflammation or late gadolinium enhancement.[14,15] Therefore, the authors recommend that electrocardiography be performed on recovering air force aviators of all flying classes. TTE should be performed for all recovered high-performance aviators and pilot cadets. Aviators of other flying classes shoulder undergo TTE if cardiac manifestations were documented during the course of disease or if pathology was found on initial workup. Cardiac findings in the patient's history or physical examination should prompt cardiologist consultation, and cardiac MRI should be considered.

Coagulopathy associated with COVID-19 has been reported, particularly among critically ill patients.[16] Thus, coagulation tests and D-dimer levels should be considered for recovering aviators with a more severe disease course, particularly if a venous thromboembolic event occurred during the disease course. Abnormal coagulation tests, increased D-dimer level, or a history of thromboembolism require a hematologist consultation before return to aviation.

Symptoms of COVID-19, quarantine or hospitalization, and fear of infecting others may lead to anger, anxiety, fatigue and insomnia, irritability, and impairment in concentration and memory. These symptoms may be associated with an increasingly recognized post-COVID-19 syndrome that extends beyond three weeks from disease onset.[17,18] Flight surgeons should actively inquire about psychiatric symptoms and the psychosocial impacts of COVID-19 on the recovered aviator, and consult with an aeromedical psychiatrist as needed.

Finally, routinely used symptomatic therapy such as analgesics, antipyretics, and decongestants do not necessitate continued grounding of the aviator. Because resolution of symptoms is clinically important for the definition of recovery, continued use of analgesics should prompt grounding of the aviator and an investigation of the underlying cause. A flight surgeon should investigate whether any off-label or experimental medications were used by the aviator during the course of disease that may affect return to aviation. For example, the many potential adverse effects of corticosteroids, the increased risk of bleeding with low-molecular-weight heparin, and potential hepatic and renal failure associated with remdesivir are incompatible with military flight.

Flight surgeons should allow return to flying duties post-COVID-19 after a normal work-up as described and as summarized in Table 1.

These are interim recommendations based on current understanding of COVID-19. There is an urgent need for continued research. Until more data are available, local guidance based on expert opinion should be developed to guide aeromedical decision making. It is recommend that civilian and military aeromedical experts form guidelines for return to flying duties post-COVID-19.

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COMPETING INTERESTS

The authors have nothing to disclose.

CONTRIBUTORS

David Gilad and Daniel Gabbai conducted the literature search and drafted the manuscript. Omer Tehori, Amir Bar-Shai, Shachar Shapira, and Oded Ben-Ari helped conceptualize the study design and edited and revised the manuscript. All authors revised the article for important intellectual content and approved the final version submitted for publication

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