CyberStudies: Lessons from the Trenches

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Abstract

Many individuals suffer from anxiety, stress, and depression and those serving in the U.S. military are no exception. Warfighters keep returning from theater with combat stress. Several of these military service members are also technology oriented and tend to prefer performing their daily life activities with and/or near computerized systems. Fortunately, some researchers specialize in helping warfighters via gaming or virtual reality technologies. Nevertheless, a dearth of literature is published about challenges researchers face when conducting these types of studies. This article shares the experiences of a research team, under a uniformed Army Research Psychologist (Stetz), who runs research studies (a) with warfighters, (b) with technological equipment, and (c) in nonstandard laboratory settings.

Introduction

EVERY YEAR, about 7 million people in the United States suffer from anxiety and depression.[1] The U.S. armed forces service members are no exception. Many individuals fighting the current Global War on Terrorism are returning from combat with physiological symptoms (e.g., traumatic brain injury),[2] psychological symptoms (e.g., posttraumatic stress disorder, or PTSD),[2,3] and related problems such as poor sleep.[4] Currently, research tends to be driven largely by technology.[5] In this article, the authors share some of their findings as well as the challenges encountered while studying stress with military samples.

Designing a Military Study

To avoid wasting precious resources, a few important points must be considered before running a study with and within the military. It is highly recommended that researchers apply the "5 Ws and the How":

1. What do we want to study (e.g., operational/measurable definition of the problem)?
2. Why do we want to study it (e.g., is there really a problem)?
3. When can we start (e.g., after approved protocol)?
4. Where will it take place (e.g., in a laboratory area, in the field)?
5. Who will be the participants (e.g., soldiers, sailors, airmen, marines)?
6. How will we run the study (e.g., the equipment and staff necessary to help collect and analyze the data)?

Combat Stress Assessment and Treatment

Military researchers must be good scientists and highly skilled in planning, logistics, and operations. Presented below is a brief historic journey of how Major Stetz (Army research psychologist) and her research (civilian and military) staff have run their protocols.

Survey-only studies

One way to study stress in the military is by obtaining (archival) information. Stetz et al.[6] analyzed 5,671 cases of medical evacuations (MEDEVACs) from Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF). In this study, behavioral health diagnoses accounted for 7% of the MEDEVAC cases during OEF and 6% of those during OIF. Behavioral health diagnoses were ranked among the top five reasons for medevacs from each theater of operations.

Archival data studies face many challenges. For example, this research team obtained the records from the Transportation Command Regulating and Command and Control Evacuation System (TRAC2ES), a joint command headed by the U.S. Air Force and designed for transporting supplies and personnel around the world. Information not protected by Health Insurance Portability and Accountability Act (HIPAA) was extracted from TRAC2ES records and transferred to spreadsheets (e.g., Microsoft Excel), then further analyzed

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FIG. 1.   Major Stetz collecting data during a shift change.

with the Statistical Package for the Social Sciences. This analysis suggested that 21%, or 106 out of 509, personnel had psychiatric histories prior to deploying.[7] Although both the U.S. Air Force and U.S. Army are part of the same military, obtaining additional records was not an easy task. The different transportation systems made it difficult to collect additional data for more follow-up analyses.

Another archival study conducted on mild traumatic brain injury (mTBI) records[8] had a sample composed of males between 20 and 76 years old (mean age 30). Twenty of 35 were military service members. Results from the entire sample showed that 34 patients complained of a wake/sleep–related problem, such as insomnia ($p < 0.001$). The main challenge presented in this study was that the neurologist who collected the medical records had to de-identify (in accordance with HIPAA) the records before the researcher (Stetz) could build an electronic data set and statistically analyze it.

However, when there is no data available on an existing problem, researchers must plan how to collect the needed data. Therefore, they must factor in time and monetary constraints to their research protocol. For example, Stetz et al.[9]

FIG. 2.   Major Stetz in Iraq collecting data.

FIG. 3.   Participant saving a virtual reality patient.

administered surveys to Military Police (MP) reservists ($N = 263$) activated after the September 11, 2001, terrorist attacks. Most of the reservists reported low psychological well-being and low intentions to stay in the military. Incidentally, they also reported high workload, high organizational constraints, and high uncertainty on when they would return home. One of the problems encountered during this study was that it involved many data collection points due to their shift-work schedule (Fig. 1). In a follow-up study, the research team also interviewed some of the supervisors of this reserve sample to learn about their leadership support.[10] Fifty-six percent of supervisors consented to a telephone interview. Sixty-eight percent stated that their employees were difficult to replace. Interviewing only those supervisors with an accessible phone, time, and the willingness to answer the questions represented one research challenge.

Stetz[11] designed another protocol to study aviators' stress while in support of OEF and OIF. In the sample of 283 aviators, the most reported stress symptoms were difficulty sleeping (21%), irritability (20%), feeling distant (18%), feeling emotionally numb (13%), and anhedonia (12%). The preferred

FIG. 4.   Participants in a coping study completing a cognitive battery.

coping strategies were going to the gym (66%), listening to music (65%), watching movies (62%), sleeping (61%), playing computer games (39%), joking around (38%), smoking (30%), chatting (29%), card games (26%), and playing sports (11%). Participants preferred to first chat with peers, chaplains, and leaders before consulting a mental health professional. Similarly, other researchers[12] have reported that soldiers would rather utilize mental health care technologies (e.g., video teleconferencing, internet-based treatments, and virtual reality) than talk to a counselor in person.

However, the aviation data from Stetz[11] was painstakingly gathered only by her, while in theater, and in one month. That is, even though this principal investigator (PI) wrote and submitted the protocol 4 months before her deployment, personnel rotations in both review boards (United States and Iraq) resulted in a delayed approval. In Figure 2, this PI is processing some of the surveys while still in Iraq. Other military researchers have also noted that the OPTEMPO (operational tempo/fast-demanding war pace) can result in difficulty running a research effort.[13]

Technology and virtual reality studies

Some investigators[14] have encountered technical barriers while conducting research in the field, specifically, issues involving the need for a database architecture that can easily accommodate different data types from various sources. Other researchers have learned that performing research in realistic environments can be monetarily expensive.[15] Therefore, one benefit of using VR technology, such as video games and head-mounted displays (HMDs), is that stressors can be systematically added to virtual environments to increase immersion. Another benefit of VR technology is that it can serve both as a stressful training simulator for warfighters, such as navigating the streets of Iraq, or as a relaxing virtual environment. Nonetheless, VR studies can still benefit from collecting data through paper-and-pencil/computerized surveys and physiological equipment (e.g., biofeedback).

Wiederhold et al.[16] reported success when applying VR to mitigate the negative effects of combat stress. Similarly, Stetz et al.[17] examined the usefulness of VR technology with a sample of medics ($N = 60$). Most of this sample was composed of officers ($n = 43$; 72%) in the regular army ($n = 45$; 75%) who had been previously deployed ($n = 31$; 52%) and were getting ready for another deployment ($n = 38$; 63%). Most of them ($n = 48$; 80%) reported having previous experience with gaming systems (e.g., computerized, VR). For example, the research examined the emotional levels of participants (Fig. 3) who were either in a group to practice combat medical skills (VR-only) under virtual stress, in a group to practice relaxation techniques in a virtual environment (VR-coping), or in a group to practice both options (VR-both). The VR-only group showed higher levels of hostility than the rest of the groups, suggesting immersion and ongoing inoculation in the VR world. One of the challenges faced during this study was that the sample was composed of medics attending a Flight Medic course. As this course is physically and academically rigorous, data collection had to take place during work-free time (i.e., lunch, evening, and weekends).

Most recently, Stetz et al.[18] reported that many individuals who practiced relaxation (Fig. 4) via VR scenarios ($n = 29$ of 30) would probably continue practicing after the study. A problem during this study was that it took place in a location requiring excessive travel time to the data collection site. Also, the VR and biofeedback system suffered excessive handling, leading to equipment breakdown. Furthermore, hospital demands sometimes took priority over the confirmed data collection sessions.

During another VR study,[19] preliminary data suggested that participants who were wearing head-mounted display ($n = 30$) while watching videos of angry bosses yelling at them showed higher levels of "presence"/immersion and emotional reactivity to anger than those watching the videos via a flat screen ($n = 30$). A challenge faced during this study protocol was that it was written a few years prior to conducting the data. Therefore, hardware and software had to be upgraded and it was necessary for modifications to be submitted for more review approvals.

Conclusion

Warfighters will continue to experience a significant level of stress as part of their duty lives. Conducting studies on warfighters can involve many challenges. Similarly, building a VR lab involves precious time and money. However, the data emphasizes the importance and benefits of enhanced research when incorporating cutting-edge technology. That said, VR studies can greatly benefit warfighters while in training and at war using assessment, inoculation, and therapy.

Disclosure Statement

No competing financial interests exist.

References

1. Kessler RC, Chiu WT, Demler O, et al. Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. Archives of General Psychiatry 2005; 62:617–27.
2. Mental Health Advisory Team (MHAT-V). (2008) Operation Iraq Freedom 06–08, chartered by the Office of the Surgeon General Multi-National Forces-Iraq and Office of the Surgeon General United States Army Medical Command. www.armymedicine.army.mil (accessed February 14, 2008).
3. Hoge CW, Auchterloni JL, Milliken CS. Mental health problems, use of mental health services, and attrition from military service after returning from deployment to Iraq or Afghanistan. Journal of the American Medical Association 2006; 295:1023–32.
4. Russo MB, Stetz MC, Thomas ML. Monitoring and predicting cognitive state and performance via physiological correlates of neuronal signals. Aviation, Space, & Environmental Medicine 2005; 76:C59–63.
5. Headquarters. Department of the Army. (2009) *Field manual, No. 7-0. training for full spectrum operations.* Washington, DC: Dept. of the Army.
6. Stetz MC, McDonald JJ, Lukey BJ, et al. Psychiatric diagnoses as a cause of medical evacuation. Aviation, Space & Environmental Medicine 2005; 76:C15–20.
7. Stetz MC, Thomas ML, Russo MB, et al. Stress, mental health, and cognition: a brief review of relationships and countermeasures. Aviation, Space & Environmental Medicine 2007; 78:B252–60.
8. Stetz MC, Russo MB, Stetz TA. (2009) An accessible sleep tool for military personnel: the Post Traumatic Stress

Disorder Checklist. *23rd Annual Meeting of the Associated Professional Sleep Societies*, Seattle, Washington.

9. Stetz MC, Castro A, Bliese P. The impact of deactivation uncertainty, workload, and organizational constraints on reservists' psychological well-being and turnover intentions. Military Medicine 2007; 172:576–80.

10. Allison-Aipa TS, De la Rosa GM, Stetz MC, et al. The impact of National Guard activation for homeland defense: employer's perspective. Military Medicine 2005; 170:846–50.

11. Stetz MC, Ganz M, Jenkins CM, et al. Stressors and coping choices while in Operation Iraqi Freedom. Hawaii Psychological Association (HPA), Honolulu, Hawaii., Nov. 9–10, 2009.

12. Wilson JA, Onorati K, Mishkind M, et al. Soldier attitudes about technology-based approaches to mental health care. CyberPsychology & Behavior. 2008; 11:767–9.

13. Kharod C. Military-unique issues in emergency care. Institute of Medicine: The Future of Emergency Care Capstone Workshop, Washington, DC, Dec. 2006.

14. Reifman J, Gilbert GR, Fagan L, et al. Military research needs in biomedical informatics. Journal of the American Medical Informatics Association 2002; 9:509–19.

15. Johnston JH, Poirier J, Smith-Jentsch KA. (1998) Decision making under stress: creating a research methodology. In Cannon-Bowers JA, Salas E, eds. *Decision making under stress: implications for individual and team training*. Washington, DC: American Psychological Association, pp. 39–59.

16. Wiederhold BK, Bullinger AH, Wiederhold MD. (2006) Advanced technologies in military medicine. Novel approaches to the diagnosis and treatment of posttraumatic stress disorder. Amsterdam: IOS Press, pp. 148–60.

17. Stetz MC, Long CP, Wiederhold BK, et al. Combat scenarios and relaxation training to harden medics against stress. Journal of Cybertherapy & Rehabilitation 2008; 1:239–46.

18. Stetz MC, Bouchard S, Wiederhold BK, et al. The receptiveness of stress management techniques by military personnel. Presentation at the 14th Annual International. CyberTherapy & CyberPsychology Conference, Verbania-Intra, Italy, June 2009.

19. Folen RA, Miyahira, Sarah D, et al. Immersive panoramic video display compared to flat screen display: psychological and physiological reactions to anger stimuli. Presentation at the 14th Annual International CyberTherapy & Cyber Psychology Conference, Verbania-Intra, Italy, June 2009.

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