



Foundations for Stress Management Training of Traumatic Stressors Using Virtual Reality

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Defence R&D Canada – Valcartier

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In conducting the research described in this report, the investigators adhered to the policies and procedures set out in the Tri-Council Policy Statement: Ethical conduct for research involving humans, National Council on Ethics in Human Research, Ottawa, 1998 as issued jointly by the Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council of Canada and the Social Sciences and Humanities Research Council of Canada.

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Abstract

This research report consists of literature reviews and analyses of data on stressors associated with psychological injuries in theaters of operations and on the efficacy of stress management training (SMT) to potentially reduce those injuries. The information is examined from the prospect of potentially using virtual reality (VR) to train military personnel to master stress management techniques. The first section provides an overview of the characteristics of traumatic stressors and analyses of data on both the stressors' frequency and their association with psychological injuries. This led to the identification of stressful situations that can be developed in VR. A systematic review of 350 empirical papers confirmed the efficacy of SMT and pinpointed the best strategies where VR training could be useful. The third section reviewed VR technologies, important concepts and relevant studies for SMT. The report concludes with an integrated approach for training that could be useful for the Canadian Forces and suggestions of experimental studies that are needed to move forward in the proposed direction.

Résumé

Ce rapport de recherche repose sur des recensions d'écrits et des analyses de données sur les stressors associés aux blessures psychologiques en théâtre d'opération et sur l'efficacité de l'entraînement à la gestion du stress (EGS). Les informations sont examinées sous l'angle de l'usage potentiel de la réalité virtuelle (RV) pour entraîner les militaires à maîtriser les habiletés de gestion de stress. Une première recension des caractéristiques des stressors traumatogènes et l'analyse des données sur la fréquence des stressors et leur association avec les blessures psychologiques a menée à l'identification de situations stressantes pouvant être recrées en RV. Une recension systématique des écrits a permis d'identifier 350 articles démontrant l'efficacité de l'EGS et de cibler quelques stratégies où l'usage de la RV pourrait être avantageux. Une troisième recension survole ce qu'est la RV et les principaux concepts potentiellement associés à l'EGS. Le rapport se conclut par la présentation d'une approche intégrée d'EGS utilisant la RV et offre des suggestions pour des études empiriques permettant d'évaluer les premières pistes de recherche.

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Executive summary

Foundations for Stress Management Training of Traumatic Stressors Using Virtual Reality:

Stéphane Bouchard, Ph.D.; DRDC Valcartier CR 2009-170; Defence R&D
Canada – Valcartier; November 2009.

Introduction or background: The aim of this project is to propose a training solution that would allow Canadian Forces personnel to increase their psychological resilience against psychological injuries associated with traumatic events occurring in various theaters of operations. The project focuses on traumatic stress as opposed to chronic stressors. A key justification of the current project is that simply teaching coping skills is not sufficient to master stress management techniques. Practice in stressful situations is essential and virtual reality offers a practical solution.

In order to offer a coherent training plan for stress management, our solution rests on the description of three key points, one per section of the report: (a) the identification of stressors causing psychological injuries that are the most likely candidate for the development of stressful scenarios in virtual reality; (b) documenting the efficacy of stress management training in order to identify useful techniques to practice in virtual reality; and (c) a survey of the field of virtual reality to describe relevant knowledge and identifying current work related to our proposition.

Results: We began with a literature review on subjective and objective characteristics of traumatic stressors and analyses of published and unpublished data on stressors afflicting Canadian military personnel while in theater of operations and their association with psychological injuries. According to findings we can propose nine stressful situations as likely candidates for the development of virtual environments to be used for coping skills training: seeing dead bodies or uncovering human remains, knowing someone being seriously injured, being under artillery fire, being unable to help ill / wounded civilians because of the rules of engagement, seeing destroyed homes and villages, clearing and searching homes, caves or bunkers, being under small-arm fire, patrolling in dangerous conditions, and demining operations.

A comprehensive literature review on stress management training (SMT) confirms that SMT is an excellent solution to help our military personnel cope with stressors experienced in theater of operations. The literature search yielded an initial pool of 3 611 articles published in peer-reviewed scientific journals. These articles were manually examined, and 350 empirical papers meeting our selection criteria were retained. Careful examination of the studies revealed that stress management training is a umbrella term comprising a variety of techniques. Several techniques have been proven to be effective, showing large and powerful statistical effects. A handful of experimental studies have shown that SMT can be used to reduce stress in objective life-threatening situations. No randomized control trial has yet looked at the efficacy of SMT to increase resilience prior to deployment and reduce the risk of psychological injuries. However, some non-randomized control studies conducted with military personnel, including unpublished data on the Programme d'Entraînement à la Résilience Militaire (PERM, a program already

applied in the Canadian Forces), show promising results. In addition, our review confirmed that relaxation is a very powerful and popular technique. Also, stress management strategies need to be learned and practiced over many sessions, accompanied with extensive between-session practice. Our examination of the PERM and the available data show that the following coping strategies should be targeted for practice in virtual reality: progressive muscle relaxation, autogenic training and meditation, diaphragmatic and controlled breathing, visualization and mental imagery, grounding and focusing techniques, thought stopping and self-talk.

Significance: Virtual reality offers a powerful solution to create standardized situations allowing practicing stress management skills. Only a handful of research teams in the world claim to have applied this technology to prevent psychological injuries following traumatic events. The state of knowledge in this field is still too young to confirm without a doubt that this technology is an effective tool. However, results are very promising.

Future plans: We therefore propose a two-step strategy as a cost-effective solution to train military personnel in the acquisition of stress management skills. First, basic training assisted with biofeedback and coaching should be conducted in virtual reality, using an environment tailored to the Canadian Forces' needs. Furthermore, military personnel should practice their SMT in more challenging and stressful situations using 3D computer games rigged with biofeedback devices that would make the game more difficult to control play unless stress is adequately controlled.

Sommaire

Foundations for Stress Management Training of Traumatic Stressors Using Virtual Reality:

Stéphane Bouchard, Ph.D.; DRDC Valcartier CR 2009-170; R & D pour la défense Canada – Valcartier; Novembre 2009.

Introduction ou contexte: Ce projet a pour but de proposer une solution de formation qui permettrait aux militaires des Forces canadiennes d'augmenter leur résilience psychologique vis-à-vis les blessures psychologiques associées aux événements traumatogènes qui se produisent en théâtre d'opération. Le projet port ainsi plus sur les stressors traumatiques que chroniques. L'une des hypothèses clés de ce projet repose sur le fait que le simple enseignement des techniques de gestion du stress n'est pas suffisant pour maîtriser ces techniques. Il est essentiel de pratiquer ces habiletés en situations stressantes, et à cet égard la réalité virtuelle (RV) revêt un grand intérêt pratique.

Afin de proposer une approche cohérente d'entraînement à la gestion du stress, notre solution repose sur trois points clés, chacun présenté dans une section différente du rapport : (a) l'identification de stressors causant les blessures psychologiques qui sont le plus susceptibles d'être utilisés comme stressors en RV, (b) la documentation de l'efficacité de l'entraînement à la gestion du stress afin d'identifier des techniques à pratiquer en RV, (c) le survol du champ de la RV et ses applications, ainsi que ses concepts théoriques pertinents, afin d'identifier les travaux et applications relatifs à la solution d'entraînement proposée.

Résultats: Nous avons débuté par une recension des écrits sur les caractéristiques subjectives et objectives des stressors traumatogènes ainsi que des analyses de données publiées et non publiées sur les stressors qui affectent les militaires canadiens en théâtre d'opération et leurs associations avec les blessures psychologiques. Suite à ces démarches, nos résultats nous amènent à proposer neuf situations à considérer en tant que stressors potentiels à recréer en RV : voir des corps de gens décédés ou découvrir des restes humains, connaître une personne blessée sérieusement, se trouver sous un tir d'artillerie, être incapable d'aider une personne civile blessée ou malade en raison des règles d'engagement, voir des maisons et villages détruits, évacuer et fouiller des maisons, grottes ou bunkers, se retrouver sous un tir ennemi, patrouiller dans des conditions dangereuses et effectuer des opérations de déminage.

Une recension exhaustive des écrits sur l'entraînement à la gestion du stress (EGS) permet de confirmer que l'EGS représente une approche excellente pour aider nos militaires à composer avec les stressors vécus en théâtre d'opération. La recherche d'articles a permis d'identifier 3611 documents publiés dans des revues avec comités de pairs. Ces articles ont tous été examinés individuellement afin d'en retenir 350 qui correspondaient à nos critères de sélection. Un examen détaillé de ces études a révélé plusieurs faits intéressants. Premièrement, l'EGS représente une catégorie fourre-tout regroupant un très large éventail de stratégies. Plusieurs de ces stratégies ont été démontrées efficaces et présentent des effets puissants et statistiquement significatifs. Une poignée d'études ont montrées que l'EGS pouvait être utilisé pour réduire le stress même dans

des situations menaçant la vie des individus. Aucun essai clinique avec affectation aléatoire n'a encore étudié l'efficacité de l'EGS pour augmenter pré-déploiement la résilience des militaires et réduire les risques de blessures psychologiques. Par contre, quelques études menées avec des populations militaires, incluant les résultats non-publiés sur le Programme d'Entraînement à la Résilience Militaire (PERM, un programme présentement en implantation dans les Forces Canadiennes), laissent entrevoir des résultats prometteurs. Notre recension confirme aussi l'efficacité et la popularité de la relaxation. De plus, il appert que les stratégies de gestion de stress doivent être pratiquées plusieurs fois, incluant lors de pratiques entre les sessions de formation, afin d'être bien maîtrisées. Notre analyse du PERM et des données disponibles montre que les techniques suivantes devraient être ciblées pour un entraînement en RV : relaxation musculaire progressive, training autogène et méditation, respiration contrôlée et diaphragmatique, visualisation et imagerie, s'encren et focaliser, l'arrêt de pensée et l'auto-instruction.

Importance: La RV offre une solution puissante pour créer des situations standardisées permettant de pratiquer les stratégies de gestion du stress. Une poignée de chercheurs de par le monde rapportent avoir utilisé cette technologie pour prévenir les blessures psychologiques subséquentes à un événement traumatisant. L'évolution des connaissances demeure encore trop récente pour pouvoir affirmer hors de tout doute que la RV constitue un outil efficace. Toutefois, les résultats s'avèrent très prometteurs.

Perspectives: Nous proposons donc une stratégie en deux étapes afin d'entraîner de façon efficiente les militaires à acquérir de bonnes habiletés de gestion du stress. Premièrement, un entraînement de base assisté par du biofeedback et de l'encadrement pourrait s'effectuer lors d'immersions dans des environnements adaptés aux stressors spécifiques aux Forces canadiennes. Par la suite, les militaires devraient pratiquer l'EGS dans des situations plus difficiles et stressantes en utilisant des jeux vidéo 3D modifiés où les capteurs de biofeedback rendraient le jeu plus difficile à contrôler si le niveau de stress n'est pas bien géré.

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1 Introduction

1.1 What is the need for a stress management program using virtual reality?

Exposure to an incident in which an individual encounters severe physical harm or a life-threatening occurrence can lead to significant psychological distress. Post Traumatic Stress Disorder (PTSD) is the most frequent mental disorder that may develop following a traumatic event. It includes symptoms of anxiety, arousal, dissociation, or flashbacks and affects between 1% and 14% of the general population. At-risk individuals (e.g. combat veterans, victims of natural disasters or criminal violence) have an exceedingly high prevalence rate of PTSD symptoms, ranging from 3% to 58% within three months of a trauma (American Psychiatric Association, 2000). According to Hoge et al.'s (2004) data, the number for soldiers at risk for mental disorders increased from 9% to 16.6% for those who have returned 3-4 months post-deployment, often experiencing symptoms of "shell shock" or other traumatic experiences from their active duties. In a further study through a U.S. Department of Defence screening, 20.3% of soldiers and 42.2% of reserve soldiers returning from Iraq require mental health treatment (Milliken et al., 2007). The fifth report of the Mental Health Advisory Team (MHAT) (2008; based on 2195 soldiers deployed in Iraq and 699 in Afghanistan in 2007), using self-report measures, reports that 6.9% of the Iraq-deployed sample scored positive for depression (8.8% for those deployed in Afghanistan), 7.3% for anxiety (8.3% for those deployed in Afghanistan), 15.2% for PTSD (13.3% for those deployed in Afghanistan) and 17.9% for any behavioural problem (17.0% for those deployed in Afghanistan). Other U.S. studies report similar estimates of PTSD, with slightly different cohorts of deployed or recently deployed personnel, ranging from 14% to 16.6% (Hoge et al., 2004; MHAT-V, 2006). Rates of PTSD may differ in military personnel in some other countries (e.g., 4% for UK 2003 deployment in Iraq, Hotopf et al., 2006), depending on the nature of the work performed.

Information on variables associated with mental health of Canadian military personnel, while they were in garrison, data have been published based on information collected in 2002 on 5155 regular force members and 3286 reserve force members (Sareen et al., 2007). A significant strength of this study is that PTSD was assessed with a reliable structured interview, as opposed to several U.S. data that were estimated using cut-off scores on self-report measures. However, Sareen et al. (2007) data were not gathered specifically with deployed or recently deployed personnel but rather reflect the mental health of military personnel in the last 12 months as measure while they were on their base in Canada (only 34% had been in combat or peacekeeping mission). The one-year prevalence of the four most common mental disorders among military personnel based in Canada was 6.9% for major depression, 4.8% for alcohol dependence, 3.2% for social phobia, and 2.3% for PTSD. PTSD is the mental disorder which prevalence is most increased by exposure to combat, to peacekeeping operation and to seeing atrocities / massacres, with increases in the magnitude of 2.1, 1.15 and 4.33 fold, respectively. Since Killgore, Stetz, Castro and Hoge (2006) found that soldiers that have prior combat experience experience more somatic than affective complaints, it is even possible that levels of significant stress are even higher than these estimates of PTSD. Sareen et al. (2008) added that the diagnosis of PTSD in this Canadian sample is essentially the only mental disorder significantly associated with combat and/or peacekeeping missions, and that most other mental health problems found in this sample

are attributable to a wide range of putative risk factors. Furthermore, participating in both combat and peacekeeping missions appears to have the worse impact on mental health, as opposed to being exposed to combat or peacekeeping only.

Two potential approaches to reduce PTSD are treatment and prevention. The current project clearly focuses on the second option, preventing psychological injuries by increasing resilience. This is an approach fitting within the general cognitive-behavioral framework of mental health and interventions. It is different from some broad programs like the Marine Corps Operational Stress Control (Marine Corps Reference Publication, 2000) and other programs that focus less on resilience and more on reducing the stressors by dealing with logistic issues such as mission rehearsal, enforcement of sleep discipline, building confidence that supply and equipment are dependable, ensure that family automobiles are in good repair or resolve major legal issues before leaving for deployment, clearly defining lines of communications and maintaining a good communication flow, etc.

Strategies have already been implemented to build resilience and prevent psychological injuries, including PTSD, such as Battlemind Training in the U.S. (Adler, Bliese, Hoge, McGurk & Castro, In preparation) and the Programme d'Entraînement à la Resilience Militaire (PERM, Routhier, 2007) in Canada. MHAT-V data collected during deployment of military personnel who had received Battlemind Training and were deployed in Iraq, suggest that 54.4% of those who received it felt the training was adequate (Adler et al., in preparation). This program may have reduced from 20.35% to 12% the rate of soldiers deployed in Iraq scoring positive on mental health problem.

Canadian data on the use of the PERM are still preliminary (Routhier, 2009), but nevertheless encouraging. Out of 640 respondents who completed the post-deployment survey, 58% felt the training was useful and 85% considered the program well adapted to the military reality (see section 2.4 for more details). Unfortunately, there is no data on how socially acceptable it may be for military personnel to actually practice the types of stress management strategies taught in programs such as the PERM. Because of virility or potential "Army Strong" mentality, some people may be reluctant to practice emotion regulation techniques. In addition, further research is needed to document whether programs such as these can reduce the amount of deployment-related mental health concerns experienced by military personnel.

Training in stress management is important, and not only because it might reduce the risk of PTSD and other psychological injuries. Stress and anxiety also reduces operational effectiveness (Britt, 2006). Anxiety, acute stress or operational stress affect information processing, including focus of attention, sensitivity to certain peripheral cues, memory recall and encoding. It also directly influences physiology (e.g., trembling) and emotion regulation, and thus has a strong impact on performance in situations requiring emotional, cognitive and behavioral control such a military operations (Thompson & McCreary, 2006a). Chronic stress also exacerbates the impact of acute stressors.

Battlemind Training and the PERM are based on traditional cognitive-behavior therapy strategies such as Stress Inoculation Training (Meichenbaum, 1977), Anxiety Management Training (Suinn, 1986) or the more generic Stress Management Training. However, these strategies are modified to fit with what is referred to as Mental Readiness Training, where the classical cognitive-behavior

strategies are adapted to the military culture and context, and delivered by people with operational experience and credibility (Routhier, 2007; Thompson & McCreary, 2006a).

The current project uses the scientific literature on stress management strategies and proposes solutions that fit within the general context of enhancing mental readiness (Armfield, 1994; Thompson & McCreary, 2006a), and this will, in its finality, allow training military personnel to be more efficient in psychological coping skills to control their emotions, cognitions and behaviour.

A key justification of the current project is that simply teaching general coping skills during lectures, even in a 13-hour workshop, is not sufficient. Like any behavioral skill, learning in theory how to use coping strategies will transfer poorly to actual behavior change in stressful operational situations. Practice under stressful situations is needed, and virtual reality appears to offer interesting possibilities to facilitate this practice.

The basic principle for effective learning of a coping skill is to first teach and explain the strategies. That can be done in a group format and can be formulated in different ways that target various audiences, from policy makers to soldiers. However, the next step is to practice coping skills in simple situations, and then progress to more and more stressful (and potentially traumatic) events, using virtual reality. The user can, at his or her own pace, move through the stressful scenarios and learn to master the required stress management strategies. Trainers could also better tailor the training situations to the specific needs of each soldier. It is then expected that soldiers will transfer these skills and apply more efficiently the stress management strategies while facing stressful and potentially traumatic situations during deployment. As suggested by Stetz et al. (2007) and Thompson and McCreary (2006b), virtual reality based training would offer the opportunity for the infusion of mental readiness training principles as the scenario unfolds and reinforce the lessons learned in courses, videos and classroom simulations.

1.2 Structure of the report

In order to lay down the scientific bases of the research hypothesis that will be proposed at the end of this report, our research team gathered and analysed the information presented in the following five sections:

Section 1 - Introduction

Section 2 - A report on stressors causing psychological injuries among military personnel.

Section 3 - A systematic literature review on the efficacy of stress management training.

Section 4 - An overview on the relevant technologies and key concepts in virtual reality.

Section 5 - Conclusion: A proposed list of research questions and hypotheses to use VR for SMT.

After reading this report, the reader wishing to increase efficient training in psychological readiness should know: (a) which are the most important situations and cues that need to be reproduced for training in VR; (b) what are the best stress management strategies to use; and (c)

what are the most promising VR technologies (hardware and software) to use in VR-based training. Given the existence of the PERM, it is hoped that several proposed research questions will blend well with this training program.

2 Stressors causing psychological injuries among military personnel

2.1 Posttraumatic stress disorder

The purpose of this section is to identify the factors that cause psychological injuries among military personnel when exposed to a traumatic event. To this end, a definition of “traumatic event” will first be presented. Events occurring among military personnel that are considered to be potentially traumatic will be reported. Finally, several characteristics which define a traumatic event will be explored. Before detailing this section further, it is important to recognize that non-traumatic stressors also contribute to the strain of military personnel and to the global picture of disability and PTSD. However, this research report will focus on traumatic stressors.

The importance of PTSD in a research on traumatic events lies in the fact that PTSD represents a very likely and severe psychological injury that develops following circumscribed and objective situations. To deal more efficiently with these extreme situations, we must develop mental readiness and resilience among military personnel. This resilience could also be used for other stressors affecting military personnel, such as occupational (e.g., Dobрева-Martinova, 1998) and organizational stressors (e.g., Bartone & Alder, 1994). Using traumatic events and PTSD as references will also guide us in establishing the scientific basis behind the research questions formulated at the end of this report. Finally, it will help to explain why some research ideas could be tempting at first glance, but risk being unproductive after careful considerations.

In order to be given a diagnosis of PTSD, an individual must, among other criteria, have been exposed to a traumatic event. The word “trauma” comes from the Greek word meaning « wound » (Nash, 2007a). According to the International Statistical Classification of Diseases and Related Health Problems (World Health Organization, 1992), a traumatic event is one of an exceptionally threatening or catastrophic nature, which is likely to cause pervasive distress in almost anyone” (p. 147). According to the Diagnostic and Statistical Manual of Mental Disorders, an event is considered as traumatic when two criteria are met. The first one, referred to as “Criterion A1”, stipulates that the individual must have “experienced, witnessed, or been confronted with an event that involves actual or threatened death or injury, or a threat to the physical integrity of self or others” (APA, 1994, p. 467). In this particular case, the term “confronted” means that the individual can experience the event directly, witness it, or even merely learn about an event that included “violent personal assault, serious accident, or serious injury experienced by a family member or a close friend.” (APA, 1994, p. 464). The second criterion, referred to as “Criterion A2”, stipulates that the individual must have, in response to the event described by Criterion A1, reacted with a subjective emotional response which “involved intense fear, helplessness, or horror” (APA, 1994, p. 467). Thus, there are two dimensions to a traumatic event: an objective criterion relating to the characteristics of the event, and a subjective criterion involving the individual response to the event; the latter one can be peritraumatic and/or posttraumatic.

A threat triggers a complex and integrated reaction of body and mind (Herman, 1997). It arouses the sympathetic nervous system, drives the subject into alert state, concentrates the attention to the immediate situation, may alter ordinary perceptions, and evokes intense feelings of fear and

anger; in effect, it mobilises an individual for the strenuous actions of fight or flight (Barlow, 2002; Herman, 1997). A traumatic event is an extraordinary threat that overwhelms the ordinary adaptations to life that in normal circumstances give a sense of control, connection, and meaning (Herman, 1997); it overwhelms and disorganises the normal mechanisms of self-defence, produces profound and lasting changes in physiological arousal, emotion, cognition and memory, and it may sever integrated functions, such as emotion and memory, from one another (Barlow, 2002; Herman, 1997). The posttraumatic symptomatology has been reported to vary as a function of several interacting variables (Briere, 1997; Ehlers & Clark, 2000; Nash, 2007a), including the characteristics of the stressor, variables specific to the victim, subjective response to the stressor, and the response of others to the victim.

Ehlers and Clark (2000; Halligan et al., 2003) have proposed a very interesting model of PTSD (see Figure 1). In a nutshell, this model proposes that several factors lead to a poor integration of the traumatic event in autobiographical memory and a negative appraisal of the trauma and its consequences. Behavioral and cognitive avoidance further contribute to prevent memory integration and more adaptive appraisal (Ehlers & Clark, 2000; Gil & Caspi, 2006).

Additional organizational and individual factors that have an impact on the mental health of deployed soldiers (peacekeepers and combat veterans) include the pace of military operations (Castro & Adler, 2005), deployment length (e.g., Adler et al., 2005), first-deployment (e.g., Adler et al., 2005), past potentially traumatic deployments (e.g., MHAT-V, 2008; McCarroll, Fagan, Hermesen & Ursano, 1997; Stetz et al. 2007; Wolfe, Erickson, Sharkansky, King & King, 1999), exposure to combat (MHAT-V, 2008), powerlessness (Bartone & Adler, 1994), adverse childhood experiences (e.g., Cabrera et al., 2007; Belik et al., 2009), coping styles (e.g., Bliese & Castro, 2003; Gil & Caspi, 2006), and gender (e.g., Adler et al., 2005). But as it will be described later on in this section, it has been extensively demonstrated that it is not stressors *per se*, but how people react to it (Barlow; 2002; Brewin et al., 2000; Ehlers & Clark, 2000; Thompson, Pasto, & McCreary, 2002;) that leads to significant psychological injuries.

A cognitive model of PTSD

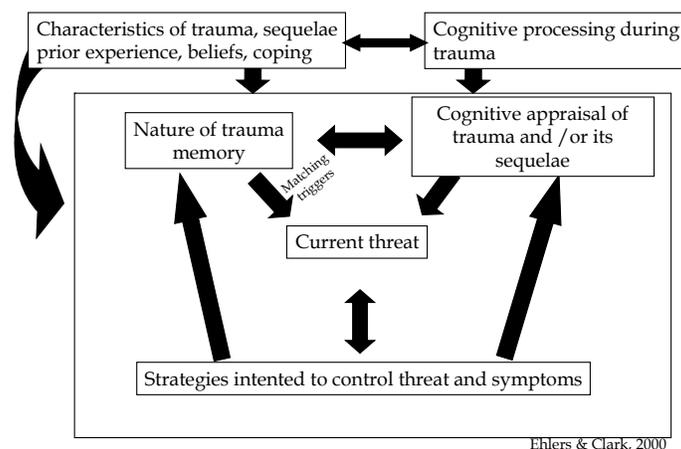


Figure 1: Cognitive model of PTSD.

Psychological hardiness is a known moderator of the impact of deployment stressors on depression post-deployment (Dolan & Adler, 2006). Strong stressors lead to less depression among soldiers who score high on the military hardiness scale. Military hardiness is defined by Dolan and Adler (2006) as composed of three factors related to the military environment: (a) commitment (vs alienation), control (vs powerlessness) and challenge (vs threat). Along those lines, the Transactional Model of stress (Lazarus & Folkman, 1984) also insists on the difference between perceived challenge and perceived threat. According to this model, psychological stress comes from the mismatch between environmental demands and psychological resources. When facing a stressor, the individual makes a primary appraisal whether the stressor represents a challenge (or a threat), and a secondary appraisal of the availability of coping resources. Such two-stage cognitive models are supported by a wide variety of empirical evidences (Ursin & Eriksen, 2004; Thompson & McCreary, 2006a), and even finds echo in neuropsychological mechanisms of emotions and emotion regulation (Phillips, Drevets, Rauch, & Lane, 2003a, 2003b; Pruesner et al., 2007).

In terms of prevention, we believe that resilience, mental readiness and adequate stress management strategies would facilitate dealing with stressors, appraisal of the trauma and its consequences and memory integration, thus hopefully protecting against psychological injuries and reducing the risks of PTSD.

2.2 Traumatic Stressors specific to military personnel

In their overview of the literature on PTSD, Martin, Germain, and Marchand (2006) supported the idea of dividing traumatic events in two categories. Type I traumatic events tend to be sudden, unexpected and of rather short duration. Type II traumatic events tend to be cumulative, to span over much longer period of time, to involve repetition, to be caused voluntarily by humans, and to sometimes be foreseeable. Certain authors suggest that PTSD is more commonly associated with Type II events (Breslau, Davis, Andreski, & Peterson, 1991; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995; Resnick, Kilpatrick, Dansky, Saunders, & Best, 1993). More specifically, it has been reported that events associated with prolonged victimization, such as torture, are associated with the highest estimates for chronic PTSD (Yehuda, McFarlane, & Shalev, 1998).

Commonly reported traumatic events include learning about traumatic event that happened to others, the sudden unexpected death of a colleague, the witnessing of killing/serious injury, having a car accident or other serious accidents, being mugged/threatened with weapon, witnessing a natural disaster, being badly beaten up, discovering a dead body, being sexually assaulted (other than rape), being raped, being shot/stabbed, suffering from a life-threatening illness, having a child suffer from a life-threatening illness, being held captive/tortured/kidnapped, and experiencing combat (Lee & Young, 2001).

Military personnel on either combat or peacekeeping missions are subject to several stressors, including threat, but also isolation, ambiguity (of the mission or command structure), powerlessness and boredom (Bartone, Adler & Vaitkus, 1998). Out of 2 947 U.S. peacekeepers deployed to Bosnia-Herzegovina, 74% reported being exposed to at least one potentially

traumatic event (Bolton et al., 2001). In that sample, the mean number of potentially traumatic events peacekeepers were exposed to was 2.38. About 5.9% of their peacekeepers appeared to meet the DSM-IV PTSD criteria. A study with Canadian troops in Bosnia-Herzegovina reported that 100% of the sample of 219 peacekeepers reported experiencing at least one tragic or life-threatening event (Thompson, Pasto, & McCreary, 2002). Among peacekeepers (Bolton et al., 2001), 73% witnessed natural disasters, 54% witnessed serious injuries or illness, 39% were seriously injured, 26% witnessed physical assaults, and 7% witnessed sexual assault. As it will be discussed at length in a few pages, the likelihood of being exposed to a potentially traumatic event does not correlate positively and linearly with actually developing PTSD. For example, in Bolton et al.'s (2001) sample of peacekeepers, stressors that were occurring the least frequently were the most likely to lead to PTSD, with the prevalence of PTSD being 18% for the least frequent stressor (witnessing sexual assault), followed by 12% for witnessing physical assault, 11% for being seriously injured, and 8% for witnessing serious injuries or natural disasters (the most frequent stressor).

Stressors have also been documented in combat-related situations (Callers, Foy, Donahue, & Goldfarb, 1988; Flack Jr, Litz, & Keane, 1998; Hoge et al., 2004; Karnow, 1983), such as participation in the killing of enemy soldiers, living under the constant threat of identifiable and unidentifiable combatants (such as booby-trapped children or infants), witnessing horrifying maiming and slaughter of fellow soldiers or civilians (grotesque death, dismemberment, disfigurement), failing to act against (or participating in) the commission of atrocities. According to Nash (2007a), in Afghanistan and Iraq, the most potentially traumatic events included "witnessing the violent death of a friend or valued leader, being responsible for the death of unarmed children, failing to save a buddy from death or serious injury, friendly fire, witnessing atrocities, or surviving an unexpected assault in which many friendly casualties were suffered, such as a vehicle born IED attack or a large ambush." (p. 51). The experience of being captured and living in prisoner-of-war conditions (confinement, torture, and extreme deprivation) can also represent a traumatic event (Briere, 1997). In the case of females, the traumatic event could also imply being the target of sexual harassment, or sexual assault, by their male colleagues (Baker, Menard, & Johns, 1989). Rape, regardless of gender, has been consistently found to be one of the most pathogenic traumas (Kaminer, Grimsrud, Myer, Stein, & Williams, 2008). For example, Kilpatrick et al. (1989) found that victims of a crime involving a rape, physical injuries and threat to the victim's life increase the likelihood of developing PTSD by 8.5 times compared to crimes where these three factors are not present.

Questionnaire data have been collected on the occurrence of specific stressors occurring in combat. Table 1 presents the most frequent types and rates of combat experiences reported by U.S. soldiers to the Mental Health Advisory Team V members (2007). In order to find stressors that are frequent and more likely apply to the situation of Canadian military personnel, events occurring to more than 50% of the sample deployed in Afghanistan are reported. The corresponding rates found in the sample deployed in Iraq are also reported.

Table 1: Rate¹ of stressors / combat experiences in US soldiers (Afghanistan N= 699; Iraq N = 2195).

Combat Experience	Afghanistan	Iraq
Receiving incoming artillery, rocket or mortar fire	92%	78%
Knowing someone seriously injured or killed	87%	72%
Having a member of your unit become a casualty	77%	56%
Being attacked or ambushed	75%	52%
Seeing dead bodies or human remains	74%	60%
Receiving small arms fire	70%	58%
Seeing dead or seriously injured Americans	64%	48%
Shooting or directing fire at the enemy	63%	36%
Having hostile reactions from civilians	59%	44%
Being in threatening situations where you were unable to respond because of the rules of engagement	54%	37%
Clearing/searching caves or bunkers	51%	15%

Source: Mental Health Advisory Team (MHAT) V - 14 February 2008

¹ Percentages unadjusted for duration of the missions.

Unpublished data collected on 407 military personnel in Valcartier after returning from Afghanistan in March 2008 (Routhier, personal communication, March 2009) were made available and provide important information for the development of virtual reality scenarios for Canadian troops. This survey revealed that the most frequent combat-related stressors were: (a) seeing destroyed homes and villages, (b) going on patrol in dangerous conditions, (c) being unable to help injured women or child, (d) seeing dead bodies or human remains, and (e) witnessing violence within the local population or between ethnic groups. Table 2 lists the rate of occurrence of all 25 stressors or combat experience measured, in decreasing order of frequency.

The identification of these stressors is very useful to guide the development of virtual reality situations to be used for practicing anxiety management skills. Virtual reality could be used to provide a context where military personnel can practice newly learned coping strategies. The development of a virtual reality environment is a long and costly process. A cost-effective solution would be to develop only a handful of carefully selected virtual situations based on the stressful situations that are experienced by a majority of military personnel. Stressors appear to vary somewhat between Canadian and U.S. military populations, and it is impossible to draw any conclusion about the different rate of stressors / combat situations because of important methodological differences between the U.S. and Canadian samples (e.g., different measures, different tasks performed in different war zones). But seeing and knowing people getting hurt or injured and seeing dead bodies appear to be common potential stressors in both populations, while witnessing civilians' misery (e.g., seeing destroyed homes, unable to help injured children) and patrolling in dangerous conditions seem more specific to Canadians.

Table 2: Rate of stressors / combat experiences for military personnel based in ValCartier.

Combat experience	Rate
Seeing destroyed homes and villages	91.2%
Going on patrol in dangerous conditions	63.9%
Seeing ill/wounded women and children who you were unable to help	60.4%
Seeing dead bodies or human remains	54.1%
Witnessing violence within the local population or between ethnic groups	51.8%
Knowing someone seriously injured or killed	39.4%
Helping injured people	38.8%
Disarming civilians	38.5%
Clearing/searching homes or buildings	38.4%
Being in threatening situations where you were unable to respond because of rules of engagement.	34.2%
Receiving small arms fire	33.9%
Receiving incoming artillery, rocket or mortar fire	32.9%
Having a member of your unit become a casualty	27.3%
Being under the enemy fire	26.4%
Seeing dead or seriously injured Canadians	25.8%
Being surrounded by the enemy	24.7%
Being in danger of getting hurt or killed in the line of fire	21.7%
Being attacked or ambushed	20.9%
Saving the life of a unit member or a civilian	14.5%
Handling or uncovering human remains	12.0%
Being wounded/injured	8.4%
Had a buddy shot or hit who was near you	6.1%
Engaging in hand-to-hand combat	3.9%
Being directly responsible for the death of an enemy combatant	3.0%
Being responsible for the death of U.S. or ally personnel	2.2%

Note. N varies between 405 and 407.

Fortunately, raw data were provided by the CF Land Personnel Concept and Policies office on the frequency of stressors / combat experiences among Canadians military personnel. Our own analyses of these data should be interpreted with caution since they do not represent a detailed analysis of stressors involved in the development of reliably diagnosed cases of PTSD. But they are the closest estimation available to estimate which frequent stressful combat situations are associated with mental health problems. The data comes from the post-deployment Human Dimensions of Operation survey (Villeneuve & Lamerson, 2005), an endeavour in the Canadian Forces to provide information on human dimensions that can affect individual and group performance during and after missions. The post-deployment version of the HDO includes the short version of the Stress on Operations Scale developed by Director General Military Personnel Research and Analysis using items from the U.S. Army Mental Health Advisory Team (MHAT) Survey. It contains a list of 31 situations¹ that may cause soldiers to experience stress, usually when they go outside the base (note that it does not capture well stressors experience by those who do not go into active combat). For each of the situations presented in the survey, two answers are required. First, using a 5-point rating scale, respondents are directed to indicate the frequency of which they have experienced each of these situations. Second, they are asked to indicate how much trouble or concerns each of these situations have caused them, on a scale from 1 (“No trouble or concern”) to 5 (“Very much trouble or concern”). For the purpose of listing potential situations worth developing in virtual reality, we must first document as many stressors as possible, and then select those that are both stressful and applicable to as many people as possible. We therefore decided to focus on whether the stressful situation occurred or not, even if it is only once and if only minimal concern was evoked. Since the summer of 2007, the survey also includes the Kessler Psychological Distress Scale (Kessler et al., 2002), a 10-item self-report assessing psychological distress based on the level of anxiety and depressive symptoms experienced in the last four weeks. A cut-off score of 30 or more indicates that the respondent has three out of four chances to meet the diagnostic criteria for an anxiety or depressive disorder (ten times the risk found in the general population)², thus revealing the strong probability of psychological injuries. Based on that cut-off score, an estimate of 108 military personnel are very likely to suffer from an anxiety or depressive disorder (8.2% of the sample).

The sample consisted of 1319 military personnel, with 53% ranked between Private and Master-Corporal, 24% ranked between Sergeant to Chief Warrant Officer, 15% between Lieutenant and Captain, and 8% ranked senior officers and above. An examination of the rate of stressful situations in Afghanistan reported during this iteration of the post-deployment HDO shows that each of the 30 situations has been frequently experienced by individuals who have a high probability of having an anxiety or depressive disorder. When looking only at the 108 highly probable cases of suffering from psychological injuries, the least frequent stressful experience was engaging in hand-to-hand combat (22%, 24 out of 108 cases) and the most frequent was to know someone seriously injured or killed (77%, 83 out 108 cases). Due to the descriptive nature of our analysis, it is not possible to conclude that these stressors are the cause of PTSD or other psychological injuries. The frequency of these events among people scoring above the critical cut-off score on the Kessler scale closely mirror the rate of occurrence of these stressor in the

¹ Note. We analyzed only 30 stressors because one stressor is classified.

² Note. Raw data obtained from Military Personnel Operational Research and Analysis include between 2 and 8 cases with missing data on the Kessler Psychological Distress Scale. Thus, the percentage of highly probable cases of suffering from a mental disorders reported in our analyses may be underestimated by a few decimal points.

entire sample and in the data reported in Table 2. The average trouble or concern experience in the entire sample is generally low, except for a few stressors being rated on average as a “2” (little trouble or concern) or more: receiving incoming artillery, rocket or mortar fire, knowing someone seriously injured or killed, seeing destroyed homes or villages, working in areas that were mined or had improvised explosive device (IED), or being attacked or ambushed. It is more interesting to look among those to whom each stressor happened, the percentage who are highly susceptible to suffer from an anxiety or depressive disorder (see Table 3). The rate of occurrence of the stressors in the entire sample, and the concerns it caused, are also mentioned to provide perspective about the rarity of some events and their subjective impact. For example, Table 3 shows that being responsible for the death of Canadian or ally personnel occurred 41 times, or to 3.1% of the entire sample. Among the cases, 20 people (48.8%) scored above the cut-off score on the Kessler Psychological Distress Scale, representing 18.5 % of all 108 cases who have a high probability of suffering from an anxiety or depressive disorder. Participating in demining operations is a more frequent stressor but is associated with a high probability of suffering from an anxiety or depressive disorder in 15.4% of those who were involved in demining operations. It is impossible to infer from these data that anxiety or depressive disorders are caused by being shot at and saved by protecting equipment, by being responsible for the death of Canadian or ally personnel, or by engaging in hand-to-hand combat. Respondents are also likely to have been exposed more than one stressful situation during their rotation in Afghanistan. However, even if these events are rare, an impressive number of people who experience them are manifesting signs of psychological injuries. And the opposite is true for stressors that are more frequent or cause more trouble or concern; they are less likely to be associated with anxiety or depressive disorders.

Stressors listed in Table 3 may represent interesting scenarios to develop in virtual reality in the hope of using them to train individuals in becoming more resilient. They replicate the frequency found in an independent sample from Valcartier (Table 2). Since the most frequent stressors are not those most frequently reported by people suffering from psychological injuries, a choice must be made. Should we aim at the development of virtual environments depicting stressors that are more likely to be traumatic but will apply to less people, or for stressors that are more commonly experienced but less traumatic? Those most often associated with psychological injuries, such as anxiety and depressive disorders, are rather infrequent and it is questionable whether it is feasible, ethical or desirable to use highly traumatic events such witnessing brutality or rape or being to help injured civilian women or child. For stress management training in general, it may be a better investment of time and resources to develop virtual scenarios that apply to as many people as possible. But it may be more advantageous to look at stressors that are both disturbing and also relatively frequent, such as those in the middle of Table 3. The conclusion of this section and the report will detail these avenues in more details.

Table 3: The rate of military personnel at high risk of suffering from anxiety or depressive disorder among those who experienced stressful situations. (N=1319).

Stressful situations in the Human Dimensions of Operations Survey	Rate of occurrence		Average trouble or concern, in the entire sample (s.d.)
	of the entire sample	of highly probable cases of anxiety/depression among those who experienced the stressor (n = 108)	
Had a close call; was shot or hit but saved by protective equipment (N=1306)	4.9%	53.1%	1.08 (0.41)
Being responsible for the death of Canadian or ally personnel (N=1305)	3.1%	48.8%	1.05 (0.31)
Engaging in hand-to-hand combat (N=1307)	3.3%	48.8%	1.06 (0.38)
Witnessing brutality/mistreatment toward non-combatants (N=1311)	7.9%	31.1%	1.14 (0.50)
Disarming civilians (N=1307)	9.0%	26.5%	1.17 (0.63)
Being wounded/injured (N=1302)	6.4%	25.3%	1.09 (0.37)
Had a close call; a bullet or shrapnel hit a piece of personal equipment (N=1306)	11.3%	23.1%	1.17 (0.54)
Clearing/searching caves or bunkers (N=1308)	12.2%	19.4%	1.26 (0.79)
Calling in fire on the enemy (N=1306)	15.2%	19.2%	1.35 (0.94)
Witnessing violence with the local population or between ethnic groups (N=1304)	20.7%	18.9%	1.36 (0.81)
Being directly responsible for the death of an enemy (N=1303)	16.4%	18.2%	1.38 (0.97)
Being in threatening situations and being unable to respond because of rules of engagement (N=1310)	20.9%	15.7%	1.42 (0.94)
Handling or uncovering human remains (N=1305)	15.7%	15.7%	1.37 (0.91)
Participating in demining operations (N=1305)	19.9%	15.4%	1.51 (1.16)
Witnessing an accident which resulted in serious injury or death (N=1305)	30.4%	13.9%	1.54 (0.95)
Clearing/searching homes or buildings (N=1310)	22.8%	13.7%	1.59 (1.22)
Improvised IED / booby trap exploded near you (N=1308)	38.3%	13.2%	1.76 (1.13)
Shooting or directing fire at the enemy (N=1308)	27.6%	12.5%	1.68 (1.26)
Receiving small arm fire (N=1309)	39.3%	12.4%	1.93 (1.36)
Seeing ill/injured people and being unable to help (N=1305)	30.0%	12.3%	1.64 (1.13)
Seeing dead or seriously injured Canadians (N=1307)	40.0%	11.9%	1.79 (1.13)
Having a close call: DUD landing near (N=1304)	31.7%	11.9%	1.50 (0.87)
Having hostile reactions from local civilians (N=1307)	42.0%	11.1%	1.92 (1.29)
Being attacked or ambushed (N=1306)	49.9%	10.6%	2.28 (1.50)
Seeing dead bodies or human remains (N=1302)	43.8%	10.4%	1.92 (1.13)
Working in areas that were mined or had IED (N=1306)	51.8%	10.0%	2.43 (1.62)
Having members of your own unit become a casualty (N=1302)	41.2%	9.9%	1.81 (1.11)
Seeing destroyed homes or villages (N=1308)	57.7%	9.7%	2.62 (1.65)
Knowing someone seriously injured or killed (N=1307)	72.2%	8.2%	2.97 (1.13)
Receiving incoming artillery, rocket or mortar fire (N=1304)	77.5%	7.3%	3.46 (1.62)

2.3 Objective characteristics of traumatic stressors

The objective characteristics of a traumatic event can influence the trajectory and severity of psychological injuries, and peritraumatic risk factors are strongly related to the development and chronicity of PTSD (Barlow, 2002; Martin et al., 2006). Since Hans Selye's (1974) pioneering work on stress, decades of experimental controlled research have shown that not every stimulus is equally stressful (Abelson, Khan, Liberzon, Erickson & Young, 2008; Blascovitch & Tomaka, 1996; Dienstbier, 1989; Henry & Grim, 1990; Marks, 1987; Mason, 1968; Rose, 1980; Sapolsky, 1993; also see the meta-analysis by Dickerson and Kemeny, 2004). In general, stressful stimuli possess one of the following characteristics: personally challenging to physical / social / ego integrity, unavailability of control or coping response, novelty or unpredictable.

More specifically to trauma, the characteristics of potentially traumatic stimuli include the severity of the exposure (Brewin, Andrews & Valentine, 2000; Brunet, Sergerie, & Corbo, 2006), the degree of similarity of the event with a previously traumatic event (Briere, 1997), predictability (Barlow, 2002), and the duration of the event (Lane, 1993, 1991; Paton, 1989; indeed, it seems that longer events are associated with a greater severity of PTSD symptoms (Zeiss, & Dickman, 1989). Other characteristics that seem to increase the likelihood of psychological harm include an effect of surprise, as well as being trapped or exposed to the point of exhaustion (Herman, 1997).

Another feature of a potentially traumatic event is the challenge it poses to the individual's belief system, the defiance of the individual's ability to give it a sense, thereby denying the coming to terms with it (Nash, 2007b). Witnessing the horror of human carnage, "seeing other people maimed, dismembered or turned into a pink mist by a direct hit can be a highly traumatic experience, particularly when such carnage involves someone close" (Nash, 2007b, p. 27); "the greater the identification with the damaged person, the greater the threat posed to one's own sense of security and invulnerability." (Nash, 2007b, p. 27) Furthermore, due to the continued exposure to threats, there exists an inability to grieve the loss, or injury, of a close comrade; thus, instead of being able to live and process the normal but intense emotions that attend the loss, individuals partially numb-up to experience, and store the grief (Nash, 2007a).

Events implicating the discovery of human bodies (McCammon, Durham, Allison & Williamson, 1988), unexpected or intentional events threatening life, and physically or psychologically degrading experiences are more susceptible to favour the development of PTSD (Brewin ete al., 2000; Martin et al., 2006). Physical injury causing events are more associated with the development of PTSD than non-injury causing events (Kilpatrick et al, 1989; Resnick, Kilpatrick, Dansky, Saunders, & Best, 1993).

Environmental factors surrounding the event also seem to play part in its toxicity. Acoustically, the deafening and continuous noise during firefights, the sounds of a rocket motor buzzing close overhead, the sound of a mortar shell screaming down on one's position, and the sounds of animals or humans agonizing in death are powerful stressors (Nash, 2007b). Olfactory stimuli, such as the smells of human waste, human waste burned in diesel oil, burning trash, blood, viscera, as well as burnt flesh can be psychologically toxic, and act as markers of traumatic events (Nash, 2007b). Finally, darkness tends to heighten the level of anxiety experienced (Nash, 2007b).

To sum up the available data on the objective characteristics of traumatic stressor, a combination of two set of factors must be present. First, the stimuli had to be stressful, and for that, possessing at least one of the following characteristics (Mason, 1968, 1975): challenging, uncontrollable, novel or unpredictable. The defining objective features of a traumatic event remain a point of contention, however there is some consensus on the following characteristics: “(a) an experience that grossly violates fundamental beliefs and expectations about the self and the world; (b) an event that entails unconditioned stimulation, including pain, tissue damage, and/or primary affective reactions of helplessness, horror, and disgust; and (c) an event and context that overwhelms the individual's capacity for coping.” (Flack Jr. et al., 1998, p. 79).

2.4 Human factors associated with traumatic stressors

There is no clear boundary between ordinary stressors and traumatic stressors (Weathers & Keane, 2007); instead, it is the individual perception and appraisal of the event that determines its potential toxicity (Barlow, 2002; Ehlers & Clark, 2000; Van Hooff, McFarlane, Baur, Abraham, & Barnes, 2009). In addition, the occurrence of a traumatic event does not necessarily lead to the development of a mental disorder such as PTSD. For example, a study by Rothbaum, Foa, Murdock, Riggs and Walsh (1992) on the natural course of the psychological reaction following a traumatic event such as rape revealed that a majority of victims could meet the diagnostic criteria of PTSD in the days following the event, and that number decreased to 40 percent six-months after the event. The natural and progressive decay in PTSD symptoms occurred despite the lack of intervention. Studies like this one have helped researchers understand that it is not the traumatic event *per se* that leads to a mental disorder, but a series of factors, including how people deal with it.

A traumatic event evokes the response of catastrophe, and the common denominators of psychological trauma are intense fear, helplessness, horror (APA, 1994), loss of control and the threat of annihilation (Herman, 1997). The likelihood, and perhaps the intensity, of posttraumatic stress is positively associated with the perceived intensity of the threat or danger (Green, Grace, & Gleser, 1985), as well as with the level of suffering (Speed, Engdahl, Schwartz, Eberly, & Raina, 1989). The characteristics of an individual's perception that affect the traumatic potential include the perceived intensity of the threat to life (of own or others), the perception that the harm is inflicted voluntarily, the importance of the resulting losses, and the unpredictability of the event (Green, 1994; Green, Grace, Lindy, Gleser et Leonard, 1990). Most of the time, the severity of a trauma is evaluated via the perceived level of threat to life (Martin et al., 2006). While the perceived level of threat has been found to predict PTSD in 12 distinct studies (Ozer, Best, Lipsey, & Weiss, 2003), the severity of a trauma has also been reported as a predictor of PTSD symptoms (Bernat, Rondfeldt, Calhoun, & Arias, 1998; Brewin, Andrews, & Valentine, 2000; Green, & Berlin, 1987; Hodgins, Creamer, & Bell, 2001).

It seems that those who subsequently develop PTSD reported greater emotional responses during the event than those who did not develop PTSD (Kilpatrick et al., 1998). Individuals that react with strong negative emotions (such as fear, guilt, shame, anger, disgust, sadness), or strong physical reactions of anxiety (such as palpitations, shaking, dizziness, sweating, hot flashes or chills), during and immediately after the event, are more vulnerable to developing PTSD (Andrews, Brewin, Rose, & Kirk, 2000; Bernat et al., 1998; Maercker, Beauducel, & Schutzwohl, 2000; Martin, & Marchand, 2003). Of the three emotions characterising the diagnostic criteria of

PTSD, namely fear, horror and helplessness, it is the latter one that best predicts PTSD (Roemer, Orsillo, Borkovec, & Litz, 1998). According to Herman (1997), the salient characteristic of a traumatic event is its power to inspire helplessness and terror, This information is particularly pertinent in today's theatres of military operations, where asymmetrical warfare condemns soldiers to wait until fired upon before being able to identify enemy combatants (Nash, 2007b). Wallenius, Johansson, and Larsson (2004) observed that an unpredictable and diffuse threat could evoke a feeling of powerlessness, resignation, and a perception of a lack of control.

At the same time, it seems that the complete absence of emotion during the event is also linked with PTSD. Indeed, the term "fright" refers to the absence of emotion, thought, words, and the sensation of being frozen during part of the event, when one suddenly faces the reality of his own death, or that of another person (Martin et al., 2006); experiencing fright during an event increases significantly the risk of meeting PTSD criteria in the future (Vaiva et al., 2003). Along the same line, several studies suggest that dissociation during, and right after, the event is strongly related to PTSD symptoms, (Marmar et al., 1994; O'Toole, Marshall, Schureck, & Dobson, 1998; O'Toole, Marshall, Schureck, & Dobson, 1999; Tichenor, Marmar, Weiss, Metzler, & Ronfeldt, 1996). According to Ozer and colleagues' (2003) meta-analysis, dissociation is the best predictor of PTSD; however, several authors suggest that when considering dissociation, factors such as the intensity of the event (Spiegel & Cardena, 1991) and the duration of the dissociation (Martin & Marchand, 2003) need to be taken into account.

2.5 Summary of Section 2

The aim of this section of the report is to clarify the psychological injuries found in Canadian Forces personnel in order to provide a list of virtual environments that could be developed to train military personnel. Table 3 provides such a list for 30 stressors and revealed that the five stressors that are most associated with psychological injuries are: (a) being hit and saved by protective equipment, (b) being responsible for the death of Canadian or ally personnel, (c) engaging in hand-to-hand combat, (d) witnessing brutality or mistreatment toward non-combatants, and (e) disarming civilians. Since the current project focuses on developing coping strategies as opposed to treatment, developing highly traumatic training scenario may be questionable. It is doubtful that one wants to desensitize people to inhumane situations and stressors, and the long term consequences would probably be disastrous. Thus, less traumatic and more infrequent stressful situations have been retained in our analysis as it would probably be more productive to develop them into virtual scenarios. According to a combined analyses of data gathered on frequency of combat situations (Tables 1 and 2), the association with psychological injuries (Table 3) and objective and subjective characteristics of traumatic stressors (see Table 4), the following nine stressful situations are proposed as likely candidates for the development of virtual environments to be used for coping skills training:

- seeing dead bodies or uncovering human remains;
- knowing someone being seriously injured;
- being under artillery fire;
- being unable to help ill / wounded civilians because of the rules of engagement;
- seeing destroyed homes and villages;

- clearing and searching homes, caves or bunkers;
- being under small-arms fire;
- patrolling in dangerous conditions;
- demining operations.

Additional scenarios might be worth considering, such as infrequent but still stressful situations like an attack on the base and the ensuing base defence activities, or transport convoys. Providing basic medical assistance while waiting for the medic might be another stressor to consider. This was informally mentioned by soldiers we meet in Valcartier in 2008, but its frequency and relationship with psychological injuries has never been assessed.

Table 4: Checklist of traumatic events considered in the selection of virtual environments to be developed for SMT.

Stressful combat experiences and situations	Frequent (> 50% in Tables 1, 2 or 3)	Prevalent in psychologically injured personnel (> 10% in Table 3)	Perceived challenge / threat	Duration (long)	Unpredictable	Lack / loss of control	Helplessness	Life Threatening	Challenge to beliefs systems	Horrible	High in stimulations (sounds, smell, etc.)	Voluntarily caused harm	Novelty
Seeing dead bodies / uncovering human remains	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Knowing someone being injured	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>
Being under artillery fire	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		
Being unable to help because of ROE ³	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Seeing destroyed homes and villages	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Clearing (house, cave, bunker)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Being under small arms fire	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		
Patrolling in dangerous conditions	<input checked="" type="checkbox"/>	NA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	
Demining operations	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>					

³ ROE: rules of engagement

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3 Literature review on the efficacy of stress management training

Most of the efforts of our research team have focused on performing a literature review on Stress Management Training (SMT) as a potential solution to help our military personnel cope with stressors experienced in theater of operations. It is hoped that SMT techniques can be combined with VR technology to prepare soldiers for potential highly stressful situations in an effort to diminish their negative reactions to stress. The ultimate long-term potential benefits would be that training military personnel with SMT would increase resilience and lower the incidence of PTSD. The first step in this endeavor is to confirm with empirical evidences that SMT, or some of its strategies, is an effective approach. We therefore performed an extensive search in peer-reviewed scientific journals, analyzed the published empirical, and organized the results of our findings in five categories based on their relevance to the purpose of this report.

The following pages will describe the methodology used to gather these articles, how they were analyzed and the results of our search for each category. A definition of the various stress management approaches will first be provided. The last pages of this section will present already available stress management skills developed for military personnel and will conclude with recommendations on avenues for further research. These recommendations will be integrated with those of other sections into a series of explicit research questions and potential studies in the general conclusion of the research report.

3.1 Definitions

Stress Management Training (SMT)

Despite the existence of several definitions of stress, it is generally considered an affective state that occurs in response to perceived demands and challenges in the environment with which one feels unable to cope (Lazarus & Folkman, 1984, see section on PTSD in Chapter 1). A variety of stress management techniques have been developed over the years in order to help individuals prevent, eliminate or cope with stress. All these techniques have the objective to modify factors associated with stress (behavioral, cognitive, physiological, emotional and environmental).

Early references to SMT date back to the work of Gottlieb, Strite and Koller (1977) who applied stress reduction strategies in behavioral medicine with people presenting Type A behavioral patterns. Other early work with SMT also burgeoned out of behavioral medicine applications (Jenni & Wollersheim, 1979) and coping with stressful situations (Garrison, 1978a, 1978b). SMT now represents an extremely diverse set of strategies and our literature review confirmed that notion several times. Authors include almost any available techniques, from Yoga (Parshad, 2004) to prayer (Oman, Flinders & Thoresen, 2008), along with exposure to feared situations (Milliken, Clements, & Tillman, 2007), cognitive restructuring (Amstadter, McCart, & Ruggiero, 2007), problem solving (Timmerman, Emmelkamp & Sanderman, 1998), etc. It is far from a unified set of strategies like Stress Inoculation Training (Meichenbaum, 1977) or Anxiety Management Training (Suinn, 1986) programs.

In general, SMT can be defined as the application of any set of techniques aiming to improve the way people cope with stress. Coping represents efforts to manage demands, conflicts and pressures that drain, or exceed, a person's resources (Lazarus & Folkman, 1984). Lazarus and Folkman proposed two broad set of coping strategies, emotion-focused coping methods and problem-focused methods. Murphy and Sauter (2003) offered to better integrate the applications of SMT strategies to contemporary notions of prevention by dividing SMT into primary, secondary and tertiary interventions. Primary interventions focus on changing the sources of the stress response (e.g., by modifying the environment) before stress becomes a problem, while secondary interventions aim at reducing the severity of symptoms associated with stress (much like secondary prevention, before non-clinical symptoms crystallize into disorders). Finally, tertiary interventions represent the application of SMT to treat mental and physical disorders. According to Murphy and Sauter (2003), the most common stress management interventions are secondary programs aimed at the individual level and involve instruction in techniques to manage and cope with the stress associated with current problems.

Since the breath of SMT encompasses such techniques as relaxation, cognitive restructuring, problem solving, social skills training, planning behavioral changes and exposure to stressful situations, other stress management programs relying on these techniques also fall under the broad definition of SMT, such as Stress Inoculation Training (SIT; Meichenbaum, 1977) and Anxiety Management Training (AMT; Suinn, 1986). As opposed to SMT, where there is no coherent set of techniques and official definition, SIT and AMT are far from umbrella categories of various psychological techniques. SIT and AMT represent coherent intervention programs with a number of defining strategies that are carefully selected among those usually found in SMT. We therefore decided that AMT and SIT had to be included in our literature review since they represent subtypes of SMT.

Stress Inoculation Training (SIT)

SIT is a set of cognitive-behavioral techniques developed as a treatment by Donald Meichenbaum around the same years as SMT was gaining popularity (Meichenbaum, 1977). The aim of SIT is to help individuals cope with the consequences of being exposed to stressful events and on a preventative basis to "inoculate" individuals to current and future stressors. SIT is an individually-tailored and defined group of strategies used to augment the individual's repertoire of coping strategies and make use of already existing skills. In general, the program involves 12 to 15 sessions and ideally includes a few booster sessions that may be delivered 6 or 12 months after the program. Although it is made to be tailored to the client's need, the application of the SIT program follows a semi-structured and clearly outlined format (Meichenbaum, 1985).

SIT unfolds in three distinct phases: (a) conceptualization, (b) skills acquisition and rehearsal, and (c) application and follow through. In the conceptualization phase, the trainer or therapist first builds a good working alliance and then educates the individual in a Socratic-style about the nature and impact of stress, the role of cognitive appraisal, what are emotion-focused and problem-focused reactions, how to break down global stressors into specific short-term and longer term goals, and how to differentiate situations that can be changed or not. In the second phase, coping skills are thought and practiced, initially with the therapist (or trainer) and then *in vivo*. Typical skills include emotion self-regulation, acceptance, relaxation training, self-instructional training, cognitive restructuring, problem solving, social skills training, etc. The last phase of application and follow-through allows individuals to practice their coping skills across

an increasingly difficult range of stressors. The term inoculation is used to simulate the concept of immunization through progressive exposure. The individual uses techniques such as imagery and behavior rehearsal, role play, modeling and progressive exposure to stressful situations. Techniques for relapse prevention and attribution of success to one's own efforts are also used. Follow-up and booster sessions are also planned as an incentive to further practice newly acquired skills, fine-tune coping strategies and troubleshoot potential difficulties.

Anxiety Management Training (AMT)

AMT was developed by Suinn and Richardson (1971) and research on its use was blooming at the same time as SMT and SIT (Suinn & Bloom, 1975). It is therefore not surprising that, as cognitive-behavior techniques, they share common roots and principles. However, its focus on learning relaxation and generalizing it to daily stressors is much stronger. AMT was first developed for the treatment of what was defined at the time as "free floating anxiety". It was geared more toward clinical anxiety than was SMT and SIT. Suinn's basic philosophy was that patients can be taught to: (a) detect emotional, cognitive and physical signs associated with the onset of anxiety, and (b) react to these signs in manners that would make them disappear. One specific aspect of AMT is that patients are not required to find the causes or stimuli that precipitate their anxiety; they are essentially taught to focus on recognizing the presence of anxiety and its symptoms. Once anxiety-related cues are felt, the patient learns to use relaxation skills in order to alleviate the anxiety. Later on in therapy, the patient learns to identify the cognitive and physiological signs of anxiety arousal sooner. Relaxation is practiced at home, either in the form of Jacobson's progressive muscle groups or autogenic training. Even if AMT has been created to treat patients suffering from an anxiety disorder, it has been used in other contexts, such as enhancing performance and reducing general stress, and therefore deserves to be included in the current literature review.

Learning AMT requires five, 60-minute, weekly sessions, although variations to the standard treatment length and additional sessions are possible (Suinn, 1986; Suinn & Deffenbacher, 1988). The first session involves completing four steps, with: (a) presenting treatment rationale, (b) development of relaxation scene, (c) relaxation training, and (d) homework assignments. The next session follows the same format, with the additional steps of identifying an anxiety provoking scene, relaxation, feeling the anxiety arousal associated with rehearsing the scene again, and more relaxation, followed by additional homework assignments. The third session builds on the previous ones with the addition of self-initiated relaxation and paying attention to anxiety and arousal symptoms. The fourth session introduces two new key ingredients: adding a scene that evokes a strong anxiety reaction (rated as 90% on a 0% to 100% intensity scale) and asking patients to assume even greater responsibility for regaining self-control after anxiety arousal. The last session completes the fading out of therapist control and the completion of patient's self-control.

The formal AMT program is designed in such a way that it can easily be delivered in groups of six to eight patients. In these cases, the length of the session is extended to allow each participant to practice the new skills, and the anxiety scenes are written instead of being stated out-loud in order to have scenes tailored to each participant's need.

3.2 Methodology of the literature review

A search for scientific papers was conducted using the Scopus database. Scopus was selected because it is the largest abstract and citation database of research literature available. It includes over 16,000 peer-reviewed journals from more than 4,000 publishers. It also references articles “In Press” from over 3,000 journals. Scopus has a 100% overlap with Medline, PsycLit and PsycInfo, the databases most commonly used in medicine, psychiatry and psychology. The next best tool for peer-reviewed journal literature research is Web of Science, which covers only 8,000 journals. Web of Science may provide a better coverage of papers in the fields of life and physical sciences, but at the expense of allocating only 23% of its content to social science and arts and humanities titles.

The Scopus database was searched using the following search terms (written without quotes): stress management training, stress inoculation training and anxiety management training. To reduce the risk of missing relevant papers the search was not limited to keywords but open to keywords, title and abstract. The search was performed with publication date ranging from 1950 to February 2009 (the oldest paper found in our search dates from 1958). Information available only from websites, dissertations and conferences were not considered. Taking into account the fact that some papers included two or more of the search terms SMT, SIT and AMT, the literature search resulted in 3 611 papers published in peer-review journals.

As intended, a manual examination of each of these results showed that our search strategy was extremely broad. The majority of the 3 611 papers (89.5%) were rejected because they either: (a) were irrelevant to SMT, SIT or AMT (usually because the search terms were not written within quotes⁴), (b) did not include any⁵ quantitative or qualitative data (e.g., theoretical paper, description of projects yet to be realized, clinical descriptions, policy position papers), (c) were in languages other than English or French, and (d) were limited to the development of psychometric tests. Meta-analyses and literature reviews based on systematic search of published papers were not rejected. However, their reference lists were cross-checked to confirm we had not missed any relevant articles. The tedious process of systematic paper selection led to 350 articles, 200 falling under the general umbrella of SMT, 55 on the variation or subtype of SMT called SIT and 95 on the variation or subtype of SMT called AMT.

The 350 papers addressing the broad definition of SMT techniques were divided into five categories, presented in increasing order of relevance to the purpose of this report (see Table 5): (a) improving physical and medical conditions, (b) treatment of anxiety disorders and other mental disorders, (c) control of already existing stress-related issues (i.e., not clinical diagnoses), (d) preventing the consequences of traumatic events, and (e) development of strategies to cope more efficiently with future stressful situation (i.e., primary prevention). In reviewing the articles, special attention was devoted to studies on military personnel and similar populations (e.g., police

⁴ Putting search terms within quotes limits the search to an exact sequence of words. For example, an article using the expression stress management intervention in the title, abstract or keyword would not be included, even if the word training occurs elsewhere in the abstract, like in the phrase training in stress management.

⁵ This criterion was relaxed for papers applying SMT with populations similar to military personnel (see Category 5).

SWAT teams, firefighters) and papers discussing virtual reality applications. Papers pertaining to each category are referenced in the Addendum at the end of this report.

Table 5: Number of peer-reviewed papers found in the literature search on SMT.

Categories	Total: broad SMT definition	SIT	AMT	Other SMT techniques
1. Improving physical and medical conditions	124	13	20	91
2. Treatment of anxiety and other mental disorders	61	15	39	7
3. Control of already existing stress-related issues	140	21	36	83
4. Preventing the consequences of traumatic events	13	0	0	13
5. Development of strategies to cope more efficiently with future stressful situations related to sports, military personnel and other stressors.	12	6	0	6
Total	350	55	95	200

The following pages will present the results of this extensive search on SMT. Given the extremely wide variety of SMT techniques, SIT and AMT are considered to fit in the broad inclusive description of SMT. Results for all these techniques will thus be presented together. For the sake of brevity and clarity, in the first four categories only the most relevant studies will be discussed or cited as examples. All studies are reported in the reference list at the end of this report, therefore if a study is cited it is because of its value or relevance to our work. This strategy allows summarizing the most significant findings and provides the reader with an understanding of the utility of SMT without being overwhelmed with less relevant details. Category five includes studies that are clearly relevant to the purpose of our work on mental readiness training to cope with stress. Within this category, studies on sport psychology may appear less relevant but other papers address explicitly the use of SMT to deal with stress among military and related personnel. Due to their relevance to the aim of our endeavor on preventing psychological injuries, some studies in category five will be described in more details. The section will end by bridging the gap between findings on SMT and available programs for training military personnel to cope with stress.

3.3 Results

Category 1. Improvement of physical and medical conditions

Findings on the impact of SMT on physical indices and medical conditions are very useful. They provide objective manifestations of the efficacy of training people to use skills to cope with stress. Most SMT programs have been developed to deal with medical illness and were found in publications dealing with behavioral medicine. Among the 91 scientific papers, 39 examined the efficacy of using SMT to impact on cardiovascular and coronary heart diseases, and most report statistically significant results (e.g., Bundy et al., 1998). Other papers also revealed positive results with medical problems such as cancer (e.g., Krischer et al., 2007), gastrointestinal diseases (e.g., Fernandez & Amigo, 2006), HIV (e.g., Berger et al., 2008), diabetes (e.g., Hains et al., 2000), asthma (e.g., Hockemeyer & Smyth, 2002), arthritis (e.g., Multon et al., 2001), dermatology (e.g., Hampel et al., 2001), Tourette syndrome (e.g., Michultka et al., 1989), incontinence (e.g., Stauber et al., 2007), ulcers (e.g., Han, 2002), obesity (e.g., Stauber et al., 2002), acute pain (e.g., Swann, 1989) and musculo-skeletal symptoms (e.g., Wiholm & Arnetz, 2006).

An examination of all 91 papers on SMT exposed the breadth of the coping skills included in SMT programs. Most techniques are part of the typical cognitive-behavior therapy arsenal, such as psychoeducation, guided imagery, problem solving, coping skills training, and cognitive restructuring. Other techniques are also frequently found, such as deep breathing, time management, aerobic exercises and meditation.

The vast majority of papers confirm that SMT has a positive impact in the reduction of physical symptoms related to medical conditions. However, a meta-analysis conducted by Rainforth et al. (2007) was performed on general SMT programs in patients with elevated blood pressure. They included 17 control trials, with 960 patients, where the following SMT techniques were used: biofeedback, relaxation-assisted biofeedback, progressive muscle relaxation and transcendental meditation. Their results revealed that none of these general SMT techniques, except meditation, show lasting, statistically significant change in elevated blood pressure. The superiority of meditation over other techniques may reside in its structured approach and focus in lasting changes in life habits.

A more structured form of SMT, AMT, has been studied in 20 peer-reviewed papers. Studies using AMT to help cope with the psychological consequences of having a serious medical condition showed more potent and lasting results, notably for coping with having HIV (Kemppainen, Eller et al., 2006) and cancer. For example, a study by Elsesser, Berkel, Sartory, Biermann-Göcke and Ohl (1994) on patients suffering from cancer revealed a significant improvement on measures of anxiety and bodily complaints. However, results on the immune system were not statistically significant. Other studies found a statistically significant impact of AMT on physiological parameters such as glucose level in diabetic patients (Rose, Firestone, Heick, & Faught, 1983) and systolic / diastolic blood pressure (Bloom & Cantrell, 1978; Canino et al. 1994; Jorgensen, Houston, & Zurawski, 1981). In most applications of AMT to medical conditions, the basic treatment program was slightly adapted to include strategies tailored specifically to the medical condition under study (e.g., pain management in Quillen & Denney 1982).

SIT is a “heavier” program to implement; it teaches several strategies that must be practiced over 10 weeks or more. However, it was demonstrated to be effective in coping with chronic pain, such as third-degree burns (Wernick, Jaremko, & Taylor, 1981), performance of athletes after a surgery (Ross & Berger, 1996), dental treatment (Law, Logan, & Baron, 1994), preparing for surgery (Wells et al., 1986), and experimental pain (Milling & Breen, 2003; Milling, Levine, & Meunier, 2003). The efficacy of SIT on physiological parameters has also been reported in hypertensive patients (Amigo, Buceta, Becona, & Bueno, 1991; Duran, Simon, & Seoane, 2002). Like AMT, SIT has been tested with success to help patients cope with stress and anxiety related to a medical condition, such as open-heart surgery (Blythe & Erdahl, 1986), leukemia (Jay & Elliot, 1990) and multiple sclerosis (Foley, Bedell, LaRocca, Scheinberg, & Reznikoff, 1987).

Overall, studies on the application of the broad strategies used in SMT show that it sometimes has a physical impact on medical conditions and is clearly effective to help patients cope with associated psychological reactions. Most studies, but not all, support the effectiveness of SMT. SMT is indeed a set of extremely varied techniques and not a structured program with a defined and standardized set of techniques. When it comes to dealing with chronic physical illness, strategies having an enduring impact on patient’s life and coping style might also be more effective than brief interventions.

Category 2. Treatment of anxiety and other mental disorders

The purpose of the current literature review is to document how stress management strategies can be used to help military personnel cope with stressful situations in theatre of operation, not to treat existing anxiety disorders. Nevertheless, one cannot ignore that we found 61 scientific papers on that topic. Among all SMT techniques, AMT has clearly been the tool most often studied in regard to the treatment of anxiety disorders and other mental disorders found in the DSM-IV (APA, 2000), with 39 papers. Most studies (n = 29) were conducted with people suffering from an anxiety disorder: 11 targeted generalized anxiety disorder (e.g., Bond, Wingrove, Valerie-Curran & Lader, 2002; Blowers, Cobb & Mathews, 1987; Jannoun, Oppenheimer & Gelder, 1982), two were conducted with patients suffering from panic disorder and agoraphobia (Edelman & Chambless, 1993; Pollard, Obermeier & Cox, 1987), two focused on obsessive-compulsive disorder (Piacentini, 1999; March, 1995), three addressed social anxiety (Melfsen, Osterlow, Beyer & Florin, 2003; Marks, 1985; Butler, Cullington, Munby, Amies & Gelder, 1984), four were performed with phobic patients (e.g., Rothbaum, Anderson, Zimand, Hodges, Lang & Wilson, 2006; Anderson, Zimand, Hodges & Rothbaum, 2005) and four were for people suffering from posttraumatic stress disorder (Amstadter, McCart & Ruggiero, 2007; Foa et al., 1991; Keane et al., 1989; Pantaloni & Motta, 1998; Peniston, 1986). For most of these disorders, at least one randomized control trial was conducted with reliably diagnosed patients and long-term follow-up. There is strong evidence to claim that AMT can have a favourable impact on anxiety disorders, including PTSD. AMT has also been used with patients suffering from other mental disorders, such as schizophrenia (Dodd & Wellman, 2000; Brown, 1983) and alcoholism (Ormrod & Budd, 1991), with statistically significant impact on associated anxiety symptoms.

SIT has been used in 15 published studies to treat anxiety disorder or symptoms of anxiety in people suffering from mental disorders such as schizophrenia (e.g., in comparison with drug treatment, Holcomb, 1986) or addictions (Awalt, Reilly & Shopshire, 1997). Ten studies were conducted on the treatment of PTSD (e.g., Cahill, Rauch, Hembree & Foa, 2003; Karam et al., 2008; Resick, Jordan, Girelli, Kotsis-Hutter & Marhoefer-Dvorak, 1988) and five on specific phobia (e.g., Moses & Hollandsworth, 1985; Jaremko, 1980). For example, in a randomized control trial Foa et al. (1991) compared SIT to prolonged exposure, minimal support (active control condition) and waiting list (passive control condition) for rape victims suffering from PTSD. Results were statistically superior to the other two control conditions at post-treatment and gains were maintained at follow-up. There are only a limited number of outcome studies using SIT with clinical populations, but their results clearly support the efficacy of this approach to psychological injuries that are severe enough to warrant the clinical diagnosis of PTSD.

Much less research has been conducted on the use of more vaguely defined sets of SMT strategies. Our literature search found seven studies conducted on learning stress management skills in different populations suffering from: schizophrenia (Lee, Tan, Ma & Tsai, 2006; Norman, Malla, McLean, McIntosh, Neufeld et al., 2002; Stein & Nikolic, 1989), substance abuse (Rohsenow, Smith & Johnson, 1985; Charlesworth & Dempsey, 1982), attention deficit disorder (Gonzalez & Sellers, 2002), and ambulatory psychosomatic patients (Stormer-Labonte, Machemer & Hardinghaus, 1992). For example, Puls et al. (2002) used SMT as a component of workplace prevention of substance use disorder. The study was conducted with 105 employees and follow-up examination after three months showed a significant reduction in controlling their urges to drink, their alcohol consumption and their expectations of the effects of alcohol consumption. They concluded that participation in workplace stress management programs with addiction prevention components can lead to a reduction in alcohol consumption. No study was conducted with the aim of treating a mental disorder with less structured SMT techniques. These SMT techniques were tested to help patients cope with daily stressors. Strategies used with these populations include muscular relaxation, biofeedback, autogenic training and meditation, and coping skills rehearsal. Four of these studies are randomized control trials with rigorous designs, acceptable sample and long-term follow-up. Their conclusions are supported by the other, less rigorous, trials. For example, it can be safely stated that for people with chronic schizophrenia, training in stress management clearly provides skills for coping with acute work and daily-life stressors and reduces the likelihood of subsequent acute exacerbation of symptoms with needs for hospitalization. It is also useful for substance abuse and ADHD as tools to better regulate stress.

In summary, when looking at mental disorders our literature review showed that SIT is an effective tool for PTSD and AMT has been validated for PTSD and also to some extent for generalized anxiety disorder. Other SMT techniques have not been used to treat mental disorders but as a set of tools for helping people with mental disorders dealing with other stress related issues. The broad set of SMT intervention, which include the more standardized SIT and AMT techniques, are powerful enough to treat mental disorders, as long as they are structured and include ingredients at the core of SIT and AMT like exposure, cognitive restructuring and homework assignments. Softer techniques often included in SMT, like relaxation and basic coping skills, can be learned and mastered effectively by people who suffer from significant life impairment like schizophrenia or alcoholism.

Category 3. Control of already existing stress-related issues (i.e. not clinical diagnoses)

Intervening on general, non pathological, anxiety symptoms are the most frequent application of the broad set of SMT techniques. An examination of the bulk of scientific papers collected during our literature review lead us to create three categories of non-clinical applications (see Table 5): controlling already existing issues and problems, preventing pathological consequences of traumatic stress and developing strategies to cope with future stressors. Researchers have published 136 studies on controlling already existing stress-related problems and non-clinical anxiety. Some of these studies did not focus on efficacy, such as De Jong and Emmelkamp (2000) who looked at trainer's expertise and Gudjonsson (1983) who compared junior and senior British police officers' perceptions of organizational stress management strategies. But even if it was not the aim of their study, they collected meaningful pre/post data and thus were not excluded from our literature search.

A total of 33 studies have focused on using the broad range of SMT strategies with student populations, with 11 studies using essentially the AMT protocol for school related or exam stressors (Crockford et al., 2004; Deffenbacher, Michaels, Daley & Michaels, 1980; Deffenbacher & Shelton, 1978; Heyne et al., 2001; Thompson, Griebstein & Kuhlenschmidt, 1980). In a classic experiment, Suinn and Richardson (1971) successfully treated 24 students suffering from math anxiety. Additional studies were conducted with university students, seven studies used the SIT protocol (Sheehy & Horan, 2004; Schiraldi & Brown, 2001) and 15 studies used various other SMT strategies, mostly relaxation (in its various forms, from breathing-cued relaxation and autogenic training, to progressive relaxation of muscle groups).

The most frequent use of broad SMT strategies (more than 50 studies) is for coping with work-related stress. Applications to the workplace of various SMT strategies like relaxation, breathing retraining, positive thinking, repeating mantras, thought stopping, repeating coping self-statements, SIT and AMT have been used with health professionals in 23 studies (e.g., Bormann et al., 2006; De Jong & Emmelkamp, 2000; Kushnir, Malkinson, & Ribak, 1998; Kunkler, & Whittick, 1991), in five studies with teachers (e.g., Cecil & Forman, 1990; Stefansdottir & Sutherland, 2005; Forman, 1982), in six studies with high-risk jobs such as policemen or maintenance worker (e.g., Gudjonsson, 1983; Le Scanff & Taugis, 2002; Peters & Carlson, 1999; Spettel & Liebert, 1986) and in 18 studies with office workers (e.g., Munz, Kohler & Greenberg, 2001; Brown, Cochrane, Mack, Leung & Hancox, 1998). Richardson and Rothstein (2008) published a meta-analysis of 36 carefully designed studies using SMT in the workplace and demonstrated that it is clearly effective. The most interesting aspect of their study is the dismantling and assessment of the effectiveness of specific strategies. They regrouped broadly defined SMT strategies into five types: cognitive-behavioral (such as SIT and AMT), relaxation training, organizational changes interventions, holistic / multimodal approaches, and alternative strategies (such as biofeedback and meditation). Structured cognitive-behavioral intervention, namely SIT and AMT, were the most effective strategies, with an average effect size of 1.17, followed by alternative strategies ($d = .91$). Other strategies were significantly less effective. These results echoed a previous less rigorous review conducted by Murphy (1996) on 64 studies collected based on broader selection criteria.

Several other applications have demonstrated the efficacy of coping strategies with fears and anxieties that are not severe enough to warrant a clinical diagnosis, such as dental anxiety (e.g., Coulthard & Craig, 1997; Hill, Hainsworth, Burke & Fairbrother, 2008), or with medical conditions that cannot be considered illnesses (e.g., pregnancy, Marteau et al., 1993; Maspfuhl & Rauchfuss, 1986; Pavelka, Ringler & Loziczky, 1980). Six studies applied SIT to control anger, (e.g., Hart, 1984; Novaco, 1977), 3 studies looked at SMT with people having a general personal style (i.e. personality) characterized by stress (e.g., Kelly & Stone, 1987; Nakano, 1990), and three targeted burn-out (Van Rhenen et al., 2005; Paisley & Powell, 2007; Malkinson et al., 1997). All were conclusive and the studies on burnout were sufficiently well designed to suggest that broad SMT strategies that include either exercise plus either relaxation or cognitive restructuring are equally effective.

Saunders et al. (1996) completed a meta-analysis to determine the overall effectiveness of broadly defined SMT training and to identify conditions that may moderate the effectiveness of this approach. The analysis was based on a total of 37 studies and 1837 participants. Results indicated that stress inoculation training was an effective means for reducing performance anxiety ($r = .509$, $z = 15.929$, $p < .001$), reducing state anxiety ($r = .373$, $z = 14.953$, $p < .001$), and enhancing performance under stress ($r = .296$, $z = 5.602$, $p < .001$). Furthermore, the examination of moderators provided interesting results. SMT programs do not appear to be more or less effective if the study is conducted with clinical or non-clinical samples. The number of training sessions is also correlated with efficacy. The beneficial effect of stress inoculation training on reducing performance anxiety and reducing state anxiety increases with greater training and more practice sessions, with strong effects being obtained after six to seven sessions. However, their data suggest that even a minimal training intervention of one session is likely to produce some minor positive effects. Whether training was conducted by a more experienced or a less experienced trainer did not make a difference of treatment efficacy.

As mentioned above, six studies were conducted with people whose work involved high-risk situations. The randomized control trial by Peters and Carlson (1999) demonstrated convincingly that SMT can be effective but the study by Le Scanff and Taugis (2002) deserves to be mentioned in more detail given the similarity between their sample and the military context of our project. Le Scanff and Taugis (2002) developed and applied a SMT program for the French police Special Forces units. The introduction of their paper describes how they developed their program. After examining the scientific literature and identifying stressors specific the work of the Special Forces (e.g., dealing with hostage situations), they followed policemen in their work for 96 hours over three weeks. One important factor stands out of their analysis and is pertinent to our work: virility. They defined virility as being able to reestablish order and domination, or to inflict pain and suffering on another person, without expressing doubt or feeling. They noted that admitting to feelings of anxiety was considered akin to being afraid and not being a real man, and could interfere with professional efficiency. This observation is interesting for our own work with military personnel. It is in line with subtle factors that must be built in SMT programs delivered to military personnel working in theaters of operations (Routhier, 2007; Thompson & McCreary, 2006a). Their seven-day pilot program was built to include corrective solutions for important organizational problems and therefore includes many strategies that may not apply to the training of military personnel. Apart from organizational one, the following SMT strategies were used: identifying stress factors and cues, learning coping skills (progressive muscle relaxation, deep breathing, concentration/centering, releasing tension in specific muscle groups, imagery), follow-up on problems experienced while applying the SMT strategies, reinforce the use of efficient

coping skills, and develop better communication and assertiveness skills. Sadly, the authors adopted a limited and unsystematic qualitative approach to document the impact of their program. Empirical data were not systematically collected pre or post implementation with their sample of 150 male police officers. Only global interests towards the training sessions were assessed. It revealed that trainees appreciated the program, felt they had learned something and reported that the program broadened their perspective and understanding of stress.

Also worthy of note, the study by Cigrang, Todd and Carbone (2000), which used two 90-minute classes inspired from SIT techniques to increase the number of young recruits graduating from basic military training. Unfortunately, no results are reported from this randomized control trial on the efficacy of their SMT program on actual stress level or if the participants were coached in the application of the coping skills in their daily life. But the program was not effective in increasing the graduation rates of their 178 participants.

In summary, a large number of study used stress management techniques to train people to control their stress in already stressful situations. These studies represent a secondary prevention approach, where people are already dealing with stress that has not yet reached a clinical level of significance. Broadly defined SMT interventions are effective to deal with stress in the workplace, with academic stressors and for healthcare professionals. Structured approaches like SIT and AMT, as well as biofeedback, appear to be superior. Adapting the coping strategies and how they are presented to the trainees may be inevitable when it comes to applying them to specific contexts such as school and police work. Along those lines, some authors have noted that the need to also adapt SMT programs to attitudes of trainees towards stress and emotion regulation.

Category 4. Preventing the consequences of traumatic events

Several papers on SMT actually address what is frequently referred to as debriefing, which is an attempt to mitigate the psychological impact of recent traumatic events. There are several different kinds of debriefing⁶. They vary in number of phases, focus of discussion and degree of structure provided in the intervention. Group psychological debriefing is one of the most common early interventions with military units (Adler & Bartone, 1999). Debriefing originates from the work of Mitchell (1983) who developed the Critical Incident Stress Debriefing. Critical Incident Stress Debriefing program is a crisis intervention tool used in critical incident stress management to assist a homogeneous group of people after exposure to a crisis. Its aim is to promote emotional processing by allowing people to share their experience and emotions and receive support to enable the normalization of stress reactions (Morrison, 2007a & 2007b). There has been much debate about the usefulness of debriefing and several studies suggested that it may even be detrimental to participants (e.g., Bisson, 2003; Lits, Gray, Bryant & Adler, 2002; van Emmerik, Kamphuis, Hulsbosch & Emmelkamp, 2002).

Despite the large number of position papers advocating the use of debriefing, every controlled study using adequate measures that we found in our literature search concluded that debriefing was no more effective than the control conditions. For example, Marchand et al. (2006) looked at the impact of debriefing intervention for victims of armed robbery by randomly assigning 75

⁶ Note. Because of its methodology, our literature search should not be considered a comprehensive review on debriefing.

victims to either critical incident stress debriefing or a control group. They found no evidence of the usefulness of debriefing to prevent PTSD or attenuate posttraumatic symptoms. The results remain the same after controlling for the severity of depressive mood.

Due to the growing consensus on the inefficiency of debriefing and the aim of our research report, we will not describe each study. However, one study among the 13 found in our literature search deserved to be described at least minimally. Adler et al. (2008) randomly assigned 952 U.S. peacekeepers to critical incident stress debriefing, standard stress management class or no intervention at all. The program closely followed Mitchell's approach and was delivered in groups of about 15 soldiers. The intervention was delivered following a standardized semi-structured protocol and to the degree to which the protocol was followed was confirmed by examination of the audio-taped sessions. Analyses revealed that there were no clear positive effects associated with debriefing. A revised version of the program, applied to soldiers deployed in Iraq, may be more promising, although the results have not yet been published (Adler, Castro, & McGurk, 2009).

The studies we analyzed almost invariably mention that people attending debriefing programs liked the experience very much and are under the impression that it had been beneficial to them. However, empirical data, especially when collected in rigorously designed studies, do not support its efficacy. This conclusion has been confirmed several times and in other more comprehensive reviews (e.g., Bisson, 2003; van Amering et al., 2002) and the consensus is that debriefing trauma victims is not an effective approach, at least to reduce the incidence of mental disorders.

Category 5. Development of strategies to cope more efficiently with future stressful situations

Our extensive search of the Scopus database journals led to the identification of 12 papers reporting empirical results on applications of SMT that should be meaningful for our endeavour to help military personnel develop effective coping skills. We will begin with papers dealing with military or other life-threatening stressors, followed by papers on sports psychology. Before concluding this category we will describe two SMT programs that are currently being applied in the U.S. and Canada.

One study by Rice and Gerardi (1999) was conducted with military personnel. They did not train participants to use SMT techniques for themselves and unfortunately they did not report any results, so at first glance their study may appear less relevant. But they trained occupational therapists to deal with stress related issues in their work with soldiers in a theatre of operation. The philosophy of their program is based on SMT and illustrates well several differences that will be found between papers in this category and those presented in the preceding fourth ones.

Military occupational therapists are soldiers and health professional that uses what people normally do to occupy themselves, including self-care, leisure and work, to reinforce adaptive occupational skills and habits. They also work closely with military units in monitoring stress levels, providing suggestions to deal with stress, performing neuropsychiatric triage of combat stress disorders, conducting critical incident stress debriefing and helping in psychiatric rehabilitation (Gerardi, 1999). Traditionally, these health professional are less often exposed to a combat environment and therefore Rice and Gerardi (1999) report descriptive information about the use of a training program aimed at preparing occupational therapists to deal with the stress

they will experience in missions as well as with the stress of the soldiers they will treat. At first glance their program appears similar to most traditional training for soldiers. However, several SMT strategies are used, such as detecting signs of stress, skills training, exercises, role play, progressive exposure to stressful situations, and fostering a feeling of control. The training focuses on detecting, and intervening with, soldiers manifesting symptoms of combat fatigue. The program is described in detail in Rice and Gerardi's (1999) paper, and includes training schedules, casualty role-play scenarios in increasingly stressful situations, practicing critical incident stress debriefing and other clinical tasks performed in theater of operations, as well as learning how to function under stressful conditions.

They did not train their participants to use either traditional SIT and SMT strategies that are more difficult to master, and which may be more difficult to apply in combat situations (e.g., cognitive restructuring or progressive muscle relaxation). Greater emphasis is put on concepts such as progressively practicing newly acquired skills, over learning basic skills so they become automatic, and relying on experience for complex situations. For selected tasks that require reviewing and considering all available facts instead of reacting automatically, helping trainees build experience is carefully planned in such a way to avoid over learning in order to allow the emergence of more reflexive solutions. The program is divided in four steps delivered over a period of nine days. It brings trainees to perform their work in situations that are increasingly stressful, moving from knowledge acquisition in a safe, non-threatening context, through knowledge integration and finally into high fidelity application in a realistic environment.

Unfortunately, no results are provided on the effectiveness of the program. The authors stated they expect that providing coping skills and practicing them in progressively stressful situations should prevent occupational therapists from feeling overwhelmed or helpless and increase performance in their duties.

Rice and Gerardi's (1999) program closely matches the philosophy behind military training, with graduated skills acquisition, repeated practice and progressive transfer of skills in active battlefield settings. What sets it apart is the focus on coping with stress experience (battle fatigue) by the patients of the occupational therapists and by the therapists themselves. The strong reliance on practicing SMT skills in progressive exposure to stressful situations is also noteworthy.

Another SMT program has been described by Sheehan (1999) for training new FBI agents in coping with stress. The program consists essentially of psychoeducation by teaching future agents about the impact of stress and that they cannot avoid this emotion. They receive information on coping strategies and how other experienced agents deal with stress. They are also lectured on the difference between chronic and traumatic stress. The training unfolds following three steps: recognition, understanding and coping with stress. Additional organization strategies to control stress are accompanying the program, such as employee assistance program, a chaplain support program, a critical incident stress debriefing program, and a peer-support program. Unfortunately, the author did not report any empirical results on the impact of the program. The interest of this program is the use of simple SMT strategies that the author hopes can be used during acute stress caused by objective threats, as opposed to more complex SIT and AMT strategies. It is also part of a global approach focusing not only on the individual but also involving actions at the organizational level. The program highlights clearly three important steps of most SMT approaches: detecting signs of stress, psychoeducation and applying specific coping strategies.

Unfortunately, it remains unclear the extent to which the trainees actually practiced the coping strategies and whether it was effective.

Professors, speakers, workshop leaders and trainers believe too often that if they provide lectures about new attitudes and behaviors people will change. To change their behavior, and approach stressors differently from how it was done before, people need much more than just listening on what they should do. Behavioral change is more complicated than that. There is extensive scientific and empirical literature documenting that people do not begin to act differently just because they know what to do, from performing adequate professional skills to stopping risky, potentially life-threatening behaviors (such as quitting unsafe sex practices that increase the risks of contracting HIV, adhering to medical treatments, etc.; e.g., Bandura, 1986; Coombs et al., 1995; Meichenbaum & Turk, 1987; Pritchard, Butow, Stevens, & Duley, 2006). One important ingredient in behavior change is practicing the newly acquired skills, ideally with coaching until it is adequately mastered. This is akin to over learning mentioned by Rice and Gerardi (1999). It is common knowledge in psychotherapy research that change is difficult, but unfortunately it is too frequently ignored when it comes to mental health prevention. If military personnel are to apply coping strategies in stressful situations, simply participating in workshops is insufficient; they must practice the new skills extensively, which is unlikely they will do on their own if it is perceived as being weak and not virile (Le Scanff & Taugis, 2002) or if their time is overloaded with tasks they perceived as being more important.

Sheehan's (1999) report on the FBI agents also raises the issue of coping with objectively life-threatening stressors. Many SIT and AMT techniques focus on correcting dysfunctional appraisals of stressors and coping strategies. This is fine when dealing with phobias, stress in the workplace or a dysfunctional lifestyle. But how can people cope effectively with being under artillery fire or being caught in an ambush? Cognitive restructuring and progressive muscle relaxation may be hard, or even inadequate, to implement when facing real danger. It may be more productive to use "lighter" techniques such as focusing on the situation at hand, breathing-cued relaxation, breathing retraining, thought stopping and coping self-statements. But these strategies must be mastered before going in theater of operations. Complex, or "heavier", SIT and AMT techniques might be more appropriate once back to the base, when the soldier has more time to use them.

Kamiyama et al. (2004) published a brief report on a SMT program for marine hazard rescuers. They recruited 28 professionals performing rescue operations for marine disasters and accidents. Participants were randomly assigned to a group receiving: (a) a SMT program based on psychoeducation about stress, relaxation and autogenic training, or (b) only psychoeducation about stress. Both interventions were delivered in five weekly 90-minute sessions. Outcome was assessed with self-report questionnaires on anxiety and depression, and with blood concentration of natural killer cells (granular cytotoxic lymphocyte in the immune system whose concentration is negatively correlated with stress). After the fifth session participants were sent in a (real, not simulated) rescue mission following a devastating earthquake. Statistical analyses confirmed that participants who received the enhanced SMT program scored better on the anxiety and depression measures and higher on natural killer cells compared to the control group that received only basic psychoeducation. This study possesses several strengths, such as the use of both self-report and biological markers of stress, a credible control group and random assignment. Even if the lack of a follow-up precludes concluding that the program had a long lasting effect, it is clear that some SMT strategies can help people working in high-risk situations cope more efficiently with stress.

In another paper with professionals working in stressful situations, Hytten, Jensen and Skauli (1990) report studies with smoke divers and with free fall lifeboat passengers. In both cases, the SIT program was designed to prepare future oil workers for catastrophes and increase their chances of survival. Participants were recruited for smoke diving (i.e., a task some trained firefighters perform using an oxygen mask and full body gear) among oil industry “regular” employees receiving basic safety course. They were randomly assigned to a control group (n = 43) and an experimental group (n = 44). The experimental group received a one-hour training session based on the SIT protocol and the control group did not receive any SMT training. On the day following training all 87 smoke divers went to a bunker and participated in a fire simulation where they had to crawl in a narrow labyrinth filled with fire smoke, in total darkness. Participants were constantly watched by instructors and could call for help during the simulation. Those who received SIT training required significantly less help from instructors but, contrary to expectations, they reported significantly more anxiety than the control group. No difference was found on salivary cortisol response, a well known biological marker of the stress response.

A second study is reported in the same article, this time on the training of oil industry personnel to use a freefall lifeboat. On offshore oil and gas platforms, rapid evacuation in cases of emergencies rely on the use of boats that slide out from a ramp and hit the water away from the platform. This is a stressful experience, especially when falling from the height of an oversea oil platform. After random assignment, 21 participants received one hour of SIT training and the remaining 41 control participants received no additional training at all. On the following day, four consecutive free dives were performed. Results revealed no statistical significant difference between the two conditions on self-report and salivary cortisol measures. However, participants who received SIT training reported higher acceptance of the free fall lifeboat concept than the control group.

Based on comments expressed earlier in this section, it is possible that the use of SIT may not have been optimal in Hytten et al.’s (1990) work. SIT was planned to be learned over many sessions, accompanied with extensive between-session practices and includes several techniques that may be more appropriate for dysfunctional primary and secondary appraisal than dealing with the adequate appraisal of an objective life-threatening stressors. In any case, Hytten et al.’s (1990) paper suggests that a brief, one hour, SMT training is probably not sufficient to learn how to cope effectively with objective life-threatening stressors. Longer programs, with extensive practice, may be required (see Saunders et al.’s 1996 review in Category 3).

Dealing with the pressure of sport competition is far different from being in a theatre of operations and stressors are not life threatening. However, it is worth examining the SMT strategies used by athletes because they may be applicable to the military context. Mace and Carroll (1986) studied gymnasts to see if SIT could increase athlete’s performance by reducing negative beliefs during competitions. In pilot cases studies, Mace, Eastman and Carroll (1986) and Mace and Carroll (1986) observed significant improvement in a young female gymnast who had suffered from a series of injuries and in two squash players wanting to improve their performance and mental approach. Qualitative data gathered from the athletes and their coaches supported their initial expectations. In 1989, they reported an experimental study with 18 female gymnasts performing a bench sequence. Participants were randomly assigned to two conditions: (a) seven SIT sessions of training in relaxation, imagery and using coping self-statements, or (b)

seven training sessions during which they practiced a series of coordination exercises but no psychological stress management training was given to them. Outcome was assessed with several measures, including self-report, heart rate frequency (the most common biological marker of stress and anxiety) prior to the performance, independent observer's ratings of distress and scores provided by qualified gymnastics judges who rated video recording of the participant's performance. Pre/post comparisons revealed that athletes who received SIT training were significantly less anxious during their performance ($F(1, 16) = 12.55, p < 0.01$) and obtained significantly better scores by the expert judges than those in the control condition. No difference was found in the heart-rate measure.

The same team tested how SIT could be used to control the stress experienced by rock climbers during rappelling (also known as abseiling; Mace, Carroll, & Eastman, 1986). Half of the twenty volunteers were randomly assigned to a SIT group and the other half to a no training control group. Following SIT training, participants were invited to complete their descent down a rope in rappelling from the roof of a 21.2 m building. Self-reported stress, overt signs of distress assessed by an independent observer and heart rate frequency were measured prior to the descent. The SIT group showed significantly less self-reported stress ($F(1, 18) = 9.49, p < 0.01$), distress ($F(1, 18) = 14.67, p < 0.01$) and fewer behavioural signs of distress as judged by the observer ($F(1, 18) = 27.77, p < 0.01$). However, as with the previous study, there were no significant differences between the groups in terms of heart rate.

Another study in sports psychology reported positive results of using SIT on the performance of golf players (Larsson, Cook and Starin, 1988), and two studies had been found on the reduction of injuries among athletes. Kolt et al. (2004) could not find any significant impact on the frequency of injuries of among their 22 gymnasts assigned to a SMT or a control condition, but Perna et al. (2003) found that 34 athletes randomly assigned to a SMT program experienced significant reductions in the number of illness and injury days as compared athletes in the control group.

In summary, a few interesting studies were reviewed in Category 5. Their results suggest that broadly defined SMT strategies could be effective in preparing individuals to cope with a highly specific upcoming stressor. Studies with military personnel and other people facing life-threatening stressors are scarce, and the breadth of stressors they are likely to experience might be too great to provide effective training options for some of the training programs (e.g., SIT). However, the existing research does suggest that some SMT strategies could be effective, even for life-threatening situations. Their efficacy might be increased if the SMT strategies are structured, sufficiently long to be well learned, and practiced until they are well mastered in stressful situations. Attitudes towards using such coping skills may be a factor to take into account when designing the training protocols.

3.4 Overview of two SMT programs being tested for military personnel

The U.S. Army and the Canadian Forces have developed their own programs to help military personnel cope with stress. Guidelines and handbooks have been used in the past to deal with combat stress (e.g., Marine Corps Reference Publication, 2000), sometimes with suggestions of strategies to implement pre-deployment, during deployment and when returning home. These

programs often focus on reducing the stressors (e.g., dealing with logistic issues) more than coping psychologically with acute stressors or on increasing resilience. The first program to be implemented is Battlemind, developed by the Walter Reed Army Institute of Research. The aim of this program is to prepare soldiers mentally for the rigors of combat and other military deployments in order to foster better mental health post-deployment. Additional objectives are to help soldiers transition back home from a theater of operations and to develop better peer-support. This program is essentially based on providing unbiased information about what to expect in theater of operations and maintain positive thoughts during times of adversity. The Battlemind program has been broadened with pre-deployment modules and website information available for soldiers, unit leaders, health care providers and spouses, as well as post-deployment modules for spouses and post-deployment modules for soldiers who are redeployed (<https://www.battlemind.army.mil>, last access, March 29th 2009). Data collected on the mental health of U.S. soldiers in Iraq (MHAT-V, 2008) who received pre-deployment training with Battlemind suggest the program was beneficial, although it was not collected from a randomized control trial. The rate of soldiers reporting signs of anxiety, depression or acute stress was found to be 15.5% among the 1 438 who received the training, as opposed to 23% among the 688 who did not. When controlling statistically for rank, gender, number of months deployed and level of combat exposure, the analysis suggests that the program may have reduced from 20.35% to 12% the rate of soldiers deployed in Iraq screening positive on mental health symptom checklists.

The Battlemind results presented in the MHAT-V report must be interpreted with extreme caution. The impact of the Battlemind is likely to be biased and inflated by the concomitant implementation of other effective behavioral health prevention and interventions strategies pre, during and post-deployment (Warner et al., 2007a, 2007b, 2007c). Warner's papers show that when soldiers were deployed in Iraq, strong measures were taken to screen and refer cases at risk to develop mental health problems. The impact of behavioral, primary care and specialized services available onsite may explain why, despite a documented increase in combat stressors and subjective reports of stress, there was no increase in mental health casualties. The implementation of an effective program in conjunction with Battlemind questions the efficacy of the SMT module of the Battlemind program, which is essentially limited to one the most basic ingredients of SMT programs, which is objective and realistic information about stressors. Otherwise, it pales in comparison with other SMT programs, although it has the merits of targeting several populations (including spouses), situations (first deployment and redeployment) and debriefing (Adler, Castro, & McGurke, 2009).

The most elaborated and theoretically sound program is the Programme d'Entraînement à la Résilience Militaire (PERM) developed by Routhier (2007) for the Canadian Forces Quebec Area. This SMT program explicitly aims at preventing psychological injuries related to operational stress and improve resilience both in theatre of operations and in garrison. It is expected that the PERM will reduce soldier's suffering and incidence of PTSD as well as increasing their performance. Its modules target soldiers, superiors higher in the chain of command, spouses and life-partners and mental health professionals. It is grounded in a cognitive-behavioral / bio-psychosocial approach and also includes a spiritual dimension. The portion of the program developed for soldiers unfolds in 13 modules delivered in workshops and lectures cumulating in 13 hours of training pre-deployment. The program remains active during the mission, in the form of peer-support. Additional sessions are also delivered post-deployment. The program is delivered following a detailed trainer's manual which emphasizes its multi-component approach such as life hygiene (e.g., adequate eating and sleeping habits), buddy-

support system, its own variation of Mitchell’s (1983) debriefing, and time to discuss issues related to death and killing people. Pre-deployment, SMT skills are taught over a period of six to nine months and the vocabulary is adapted to the culture and attitude of military personnel towards stress and coping skills. For example, “psychotherapy” is referred to by “looking for tools”, “PTSD” and “mental disorders” are referred to as “stress injuries”, “counter-measures” is used to refer to “coping skills”, and “stress” is referred to as a “weapon”. The program is also structured in such a way that some coping strategies can be used *in situ*, during a life-threatening situation, and other can be used on more diverse occasions. Some structured practice is planned in three modules delivered during an operational exercise.

Based on the description of the PERM (Routhier, 2007), the individual portion of the PERM delivered pre-deployment and the strategies included in the “psychological first aid kit” reveal that PERM trains participants in 11 key strategies (see Table 6). Some of these strategies address primary appraisal of stressful stimuli (e.g., self-talk, thought stopping), other allow building a realistic but more reassuring secondary appraisal of coping (autogenic training and meditation, visualization, listening to music, signing or reading, humor), and some can be used to sustain acute stress associated with objective life-threatening stressors (e.g., listening to silence, focusing, breathing, de-identification / self-observation). As documented in Routhier’s manual and accompanying support documents, some of the SMT strategies are based on extensive empirical support (e.g., relaxation), some others rely more on clinical experience with military populations than experimental support (e.g., listening to silence), and a few are more grounded in theoretical considerations than empirical support (e.g., de-identification / self-observation).

Table 6: List of PERM key individual strategies applied pre-deployment.

Progressive muscle relaxation
Autogenic training and meditation
Diaphragmatic and controlled breathing
Visualization and mental imagery
Grounding and focusing techniques
Thought stopping
Self-talk
Listening to silence
De-identification / self-observation
Listening to music, signing or reading
Humor

From the point of view of our endeavor to develop virtual environments to train Canadian troops in the effective use of SMT strategies, the first advantage of the PERM is that time and efforts

have already been successfully invested to develop and implement the program in the Canadian Forces. It has been applied pre-deployment to more than 3 5000 soldiers preparing for deployment to Afghanistan. It is based on a sound documentation, well described in a trainer's manual, and carefully elaborated SMT techniques.

Routhier (2009) provided preliminary data on the use of the PERM. Pre-deployment descriptive data have been gathered with 763 respondents from Rotation 4 for Afghanistan. Most of them were men who, on average, have 8.24 years of experience in the Canadian Forces and already completed one prior mission. Out of 763 who received PERM pre-deployment training, 640 respondents completed the post-deployment survey. On average, 58% felt the training was useful, 85% considered the program well adapted to the military reality, and 88% considered that getting professional help would be acceptable to them. Information gathered during and after the mission revealed that understanding stress reactions increased from 59% during the mission to 65% post-mission, and the impression of knowing how to react if they were psychologically injured increased from 68% to 75%. Post-deployment, 28% of the 640 respondent who received PERM said that they used the knowledge and exercises learned in the training. And the number of military personnel who actually practiced the stress management strategies on their own is probably not much higher. Like for the Battlemind program, we must express caution on the specific effectiveness of the PERM to reduce psychological injuries as it may be biased by the impact of the Third Location Decompression program. Third Location Decompression is implemented after deployment, when soldiers who are back from theaters of operations do a stopover for psychological decompression on the island of Cyprus and can benefit from psychosocial support.

Canadian Forces are fortunate to have such a comprehensive and potentially effective SMT program such as the PERM. Given that it was developed based on sound theoretical ground, with most techniques supported by already existing empirical, practical considerations and a good knowledge of the military culture, the usefulness of our own literature review may appear less relevant. This is one of the reasons it might have been pointless to spend more time describing and criticizing in this report each 350 studies found in the literature survey. But it was essential to perform an independent and extensive literature search to provide converging evidences and summarize key findings. The preliminary data gather by Routhier (2009) are very encouraging. It would be a pointless loss of resources not to build on this program and propose different SMT strategies to use with virtual reality applications. Furthermore, one result from Routhier's (2009) survey must be commented on. It appears that 28% of the soldiers trained with the PERM recall using one of its techniques. On the positive side, it is comforting to see that at least some trainees used the coping strategies. However, it is somewhat disconcerting because, given the number of stressors reported in theater of operations; this rate should be much higher. Several *ad hoc* hypotheses could be formulated, from under reporting because soldiers are not aware they used the coping skills, to low perceived self-efficacy or use of other techniques. It is our opinion that the PERM coping skills would be used more often if soldiers were available to practice more, to the point of over learning, and building a sense of virility and mastery in using them.

3.5 Physiological measures of stress

The following section will provide some background information on psychophysiological measures of stress. Textbooks and review papers have been published on the topic since the

pioneer work of Selye (1974) and a brief summary is found in Sasse (2008, pp 20-21). Some typical measures are described below, but the interested reader is referred to detailed textbook such as Andreassi (2000) or Lovallo (2005).

The most common objective measure of stress is heart rate response. Stress increases heart rate frequency and stability of the inter-beat intervals. Heart rate is monitored with an electrocardiogram, which records the electrical activity of the heart. Blood-pressure could be used to measure heart rate but it is less precise. Since heart rate is influenced by breathing patterns, an increasingly popular index is the respiratory sinus arrhythmia amplitude (RSA). Heart rate has the advantage of being simple to measure but is influenced by the subject's physical activity during the assessment. When comparing results between subjects, researchers must compensate for individual differences by adjusting the heart rate measure in the experiment with resting / baseline heart rate. This correction is called the law of initial values.

Skin conductance level is also frequently used to measure stress. Galvanic skin response, electrodermal activity or skin conductance are all synonyms of measuring the electrical resistance of the skin. Changes in the hydration of the sweat glands allow the skin to better conduct electricity. This phenomenon is related to sympathetic activity in the nervous system caused by emotional arousal. Note that many emotions elicit this response (e.g., anxiety, sexual feelings, guilt). Skin conductance presents a phasic response where it peaks rapidly after introduction of emotional stressors and progressively fades out afterward.

Electromyography is another tool used to measure physiological response to stressors. It assesses the electric potential of muscle cells associated with muscle contraction. Several groups of muscles could be assessed as signs of stress, usually facial muscles. By definition, these measures are extremely sensitive to muscle tension, and thus subjects movements.

Electroencephalography (EEG) is a neurophysiologic measure of electrical activity along the scalp produced by the firing of neurons within the brain. Analysis of EEG results is known to be complex and using EEG is slightly invasive due to the placement of several electrodes on the scalp. It is rarely used as a primary measure of stress although it can be used for this purpose.

Psychoneuroendocrine response is gaining in popularity as a measure of stress and anxiety. Cortisol is a hormone released in the blood stream and its concentration is directly influenced by stress. Cortisol is often nicknamed one of the stress hormones, along with adrenalin, and can be measured from a blood sample or in the saliva (then referred to as free or salivary cortisol). The advantages of the cortisol response is that it is not affected by the participant movements and getting a free cortisol sample is not invasive. However, since the concentration of cortisol varies naturally during the day, timing must be taken into account.

Pupil dilation, blink rate and scan path, three indices that can be assessed with eye-tracking devices, are influenced by stress. Much like the physiological mechanism behind skin conductance, pupil dilation is caused by stimulation from the sympathetic nervous system and is associated with a general orienting response towards stimuli that are associated with interest. Increase in blinking rate is associated with stress, and scan paths can be examined to analyse subject's attention toward, or away from, specific stimuli present in the environment.

Stress can also be measured with recent brain imaging techniques. Functional magnetic resonance imaging measures changes in blood oxygenation of neurons in action. By detecting brain areas consuming more oxygen researcher can assess their activity. This method is ideal to document if areas of the brain associated with fear are activated, such as the amygdala or the locus coeruleus. Apart from its cost, one major drawback is that participants must lie down and cannot physically move, which is a limitation in several experiments.

Overall, many physiological parameters can be used to objectively measure stress. Heart rate is a classical measure, but the choice of a psycho-physiological parameter must be guided by specific research questions and feasibility.

3.6 Summary of Section 3

This section describes the results of an extensive literature search performed within a critically brief period of seven weeks during the winter of 2009. An initial pool of 3 611 articles published in peer-reviewed scientific journals was manually examined to retain 350 papers on the use of SMT. Because it was expected that SMT would not correspond to a well defined and limited set of strategies, a broad definition was used and 43% of the papers found actually correspond to the more structured and defined SIT and AMT strategies.

Several observations and conclusions can be made regarding the efficacy of SMT. First, there is no doubt that SMT is indeed an umbrella category comprised of a variety of stress management techniques. Most of the techniques usually originate from the clinical psychological literature on cognitive-behavior therapy, although this is not always the case (e.g., the use of mantras). More than 50 randomized control trials have been conducted and their findings provide firm ground on which meta-analyses can be conducted. The repeated replications of findings from these control trials clearly show that SMT and its variants (SIT and AMT) are effective. Five meta-analyses have been found and all confirm that broadly defined SMT strategies are not only statistically superior to control interventions or no treatment, but also that the effect sizes are large and meaningful.

Studies addressing the impact of coping strategies on physical and medical conditions revealed that SMT has sometimes, but not always, a positive physical impact on medical conditions. However, it is effective in helping patients cope with medical conditions and their associated psychological reactions (e.g., stress resulting from receiving a diagnosis of cancer). When it comes to dealing with chronic physical illness, strategies having a positive, enduring impact on patient's life and coping style might be more effective than briefer interventions. When looking at mental disorders, our literature review showed that structured strategies such as SIT and AMT are powerful enough to treat mental disorders, as long as they include progressive exposure to stressful stimuli, cognitive restructuring and homework assignments. Techniques such as relaxation and basic coping skills can be effective to cope with daily stressors and learned by people suffering from significant life impairment like schizophrenia or alcoholism. A very large number of studies confirmed that SMT is effective to deal with stress in the workplace, with academic stressors and to improve the abilities of professionals to perform their duties. Structured approaches and biofeedback assisted relaxation received very good support. It stands from clinical experience and observations made when reviewing the studies that there is a need to adapt the coping strategies to the culture of the trainees' environment.

No control trial study has yet looked at the efficacy of SMT delivered to military personnel to reduce the risk of psychological injuries. Some studies conducted with military personnel, including unpublished data on the PERM, show that SMT is well accepted. A handful of experimental studies have shown that SMT can be used to reduce stress in objective life-threatening situations and preliminary data are encouraging for the recent the PERM. However, no clinical trial with long-term follow-up has yet been published with military personnel or actual life-threatening stressors.

Not all studies support the efficacy or effectiveness of SMT, but inconclusive studies are rare. Given the bulk of favorable studies on the use of SMT to deal with, and prevent, stress, the methodology (e.g., lack of control or unreliable measures), application of the program (e.g., not long enough) and strategies used (e.g., less effective ones) can be questioned. Except for debriefing; although commonly used, and despite potentially interesting results from yet unpublished data, the efficacy of SMT applied in the form of debriefing is not supported by currently available empirical evidences, a conclusion echoed by several independent reviews on the topic.

Some SMT strategies stand out as being found to be consistently effective, such as providing psycho educative and accurate information, progressive exposure or “inoculation” to stressful stimuli, relaxation (from simple techniques to more pervasive ones like meditation and autogenic training), biofeedback, diaphragmatic and other breathing techniques, and cognitive restructuring. Other techniques have been used less often in clinical trials but still benefit from good empirical support, such as visualization and imagery, focusing (on the task at hand, on a stable stimulus in the environment, on breathing patterns or on mantras), Wolpe’s thought stopping technique and repeated positive (but realistic) self-statements.

Further examination of effective strategies reported in Categories 1 to 5 suggests a shift in efficacy versus complexity. Techniques requiring deeper life changes, such as meditation, AMT or SIT, appear to be more effective for dealing with medical conditions, treating anxiety disorders and addressing stressful lifestyle patterns (e.g., Type A behaviour). A mix of SMT techniques appear to be effective for daily stressors such as stress in the workplace, academic performance and other minor stressors. Slightly different techniques may be useful to deal with acute and objective life-threatening stressors. These coping techniques would be considered counterproductive avoidance strategies (e.g., thought stopping, diaphragmatic breathing, listening to silence) or insufficiently powerful (e.g., self-talk, cognitive “control”, relaxation) if they were used to treat people suffering from anxiety disorders. However, they may be the most appropriate ones to stay focused on the task during life or death situations. It would be useful to practice and over learn these skills until they become automatically applied in stressful situations. However, it remains to be empirically tested whether these strategies can become avoidance tools, and then hinder therapy, if PTSD or other mental disorder develops. In addition, two obvious facts are that: (a) relaxation, in one form or another is systematically used in effective SMT programs, and (b) coping strategies need to be learned and practice over many sessions, accompanied with extensive between-session practices, to be mastered by the individual.

Very early on in the project, the possibility was raised that it could be useful to develop a SMT program that would be built on the use of virtual environments to practice newly acquired skills. Our literature review would then have help selecting the most effective SMT strategies. But given fruitful efforts by Routhier to develop and implement a sound SMT program, and in the light of

promising preliminary results, it would be a sad lost of resources not to build on the PERM. Practicing selected skills in virtual reality would be beneficial and trainees could be coached, they could practice in increasingly stressful and difficult situations and they could build a sense of self-efficacy and mastery. It is believed that increasingly practicing coping skills would enable more soldiers to use them in theater of operation.

To better integrate the SMT strategies in the PERM that are applied pre-deployment at the individual level, as opposed to organizational level, we used our literature review to comment on the empirical support of the main techniques. Based on the information shown in Table 7, we would definitely recommend considering to train military personnel in virtual reality with the first seven techniques. The remaining four strategies may be useful in the context PERM but their specific efficacy benefits from less empirical evidence. More refined suggestions will be proposed after integrating this with information provided in the first and third sections of this report.

Table 7: Match between pre-deployment PERM strategies and our literature review.

PERM key strategies	Supporting evidences from our literature review on SMT	Subjective assessment of	
		Effect size	Applicability in theater of operation
Progressive muscle relaxation	Very strong	Very large	Yes
Autogenic training and meditation	Strong	Large	Yes
Diaphragmatic / controlled breathing	Strong	Large	Yes
Visualization and mental imagery	Strong	Fair	Difficult
Grounding and focusing techniques	Good	Fair	Yes
Thought stopping	Good*	Fair	Yes
Self-talk	Good*	Fair	Yes
Listening to silence	Weak	Weak	Yes
De-identification / self-observation	Weak	Weak	Yes
Listening to music / signing / reading	Weak*	Weak	No
Humor	Weak	Weak	Yes

Note : * This technique could be considered an avoidance strategy in the context of the treatment of an anxiety disorder such as PTSD and would therefore be contributing to its crystallization. This may not be a problem for dealing with objective life-threatening stressor.

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4 Relevant concepts and key technologies in virtual reality

One of the mandates of the first year of this research contract is to provide information on virtual reality and other technologies that can be used to train military personnel more effectively in applying broadly defined SMT techniques. Given the type and frequency of most significant stressors reported by Canadian troops in combat mission, and available effective coping strategies, how could we best implement training techniques that would increase resilience and prevent psychological injuries? To provide meaningful suggestions, we need to describe potentially useful advanced and interactive visualization technologies. Applications of virtual reality to stress-related issues such as treatment of PTSD and training in stressful tasks will be addressed. The potential contribution of the feeling of presence in synthetic environments will be discussed, and serious gaming, a potentially interesting avenue, will be mentioned very briefly.

4.1 Virtual reality technologies

By definition, virtual reality (VR) is “an application that lets users navigate and interact with a three-dimensional computer-generated (and computer-maintained) environment in real time” (Pratt, Zyda, & Kelleher, 1995, p. 17). The key concept that differentiates VR from the use of other audio-visual medias is interactivity. Even if stressful stimuli are presented on slides, computer or IMAX theatre screen, this is not sufficient to be considered as VR. The mediated experience becomes an alternate reality when participants can explore the surroundings (e.g., open a door, walk out of a room) and the displayed images are changing accordingly.

Different technologies can immerse the patient to different degrees in the virtual environments, from a simple presentation on a computer screen to the use of head-mounted displays and motion trackers, and even to a full-size 10 by 10 by 10-foot room with stereoscopic images projected on walls, floor and ceiling.

The most affordable technology is often referred to as HMD, because of the use of a head mounted display (see image on the right). With this type of technology, the user can be immersed in virtual reality through the use of a virtual reality helmet that uses either monoscopic or stereoscopic display. In addition, a motion tracker tracks head rotations (more refined system offer better tracking options) and the computer adapts the virtual images according to the user’s head movements.



Figure 2: Virtual reality using a HMD.

Room-size systems, often referred to by the trade name of CAVE⁷ (C-Automated Virtual Environment™, Fakespace Technology), are very attractive mediums to deliver virtual stimuli. They are very appreciated in the research community, especially among engineers and computer scientists. As the user stands up in the middle of stereoscopic 3D projected images (see image below), objects are seen as literally there, perceived as if they were in the middle of the room surrounding the user. The field of view is much wider than the majority of HMDs and the user can actually see his physical body. Immersive rooms are often considered the gold standard of immersive technology because of their power to induce the illusion of presence. But they are also extremely costly to build and require a fairly large amount of physical space.



Figure 3: Virtual reality in a room-sized system.

The military, medical and entertainment industries were instrumental in the early development of VR applications. The technology really gained popularity in clinical psychology in the early 1990's, with VR being used to treat anxiety disorders. Initially, VR was used with specific phobias (North, North, & Coble, 1996; Stanney, 2002), which was useful for researchers in need of well defined mental disorders, circumscribed treatments and easily available objective and behavioral outcome measures. The field is now moving towards more appealing applications for clinicians, such as complex anxiety disorders like PTSD.

The potential of VR to elicit genuine fear reaction when people are exposed to stressful virtual stimuli is a prerequisite for using VR in SMT. The capacity of VR to reliably produce stress reactions has been repeatedly documented. For example, Robillard, Bouchard et al. (2003) have demonstrated that the presentation of frightening virtual stimuli to non-phobics participants can elicit subjective fear reactions, and these reactions are significantly more intense among phobic participants. Renaud, Bouchard and Proulx (2002) have shown using eye-tracking that presenting frightening virtual stimuli can lead to behavioral avoidance patterns that are significantly more pronounced in phobics than in normal controls. Looking at physiological measures, Moore et al. (2002) have shown that non-phobics encountering potentially stressful virtual situations such as elevators, grocery stores or avatars (virtual copies of people) manifest significant changes in heart rate and skin conductance. Meehan (2001) and Zimmons (2004) have assessed participants' reaction under a variety of conditions while immersed in a virtual environment and confirmed

⁷ Since CAVE is a trademark, similar systems not built by Fakespace are often referred to as CAVE-like systems.

that VR can produce strong and significant changes in heart rate, skin conductance and skin temperature when exposed to phobogenic cues.

People's reactions to virtual stimuli also apply to virtual humans. For example, James, Lin, Steed, Swapp and Slater (2003) have immersed non-phobics in various virtual social environments and observed an increase in anxiety when participants had to interact with virtual humans who appeared disinterested to their presence. Later on, the same research team (Slater, Pertaub, Barker & Clark, 2004) compared the impact of giving a speech in an empty seminar room or to a virtual audience on phobics and non-phobics. The level of anxiety, measured subjectively and physiologically, was low among non-phobics in both conditions, but it was significantly higher among phobics in the empty room condition and even higher when the phobics delivered their speech to the virtual humans. Pursuing their research on autonomous agents (virtual images of people that do not exist in the physical reality, as opposed to avatars), Pertaub, Slater and Barker (2002) compared the reaction of 43 people suffering of fear of public speaking when they delivered two speeches to an audience of autonomous agents that were programmed to respond neutrally (no reaction), positively (leaning forward, eyes wide open, etc.) or negatively (leaning back, discussing among themselves, etc.) to the speeches. Delivering a speech to the negative audience was significantly more anxiety inducing and rated as less satisfying than delivering a speech to a neutral audience. Interestingly, all these studies used virtual environments and virtual representations of humans that were far from perfectly realistic. They also found significant correlations between stress and the feeling of presence (the illusion of being in the virtual environment), which might give us clues to explain why VR can elicit emotions.

However, it is not clear whether physiological responses to virtual environments show a consistent pattern across individuals. Wiederhold and Wiederhold (2000) found that participants do not show consistent changes in peripheral skin temperature or heart rate when being exposed to virtual environments. Similarly, Jang et al. (2002) exposed eleven nonphobic individuals for fifteen minutes to virtual environments depicting a flying or driving scenario. Analyses of heart rate variability showed no significant differences between an interactive driving condition and passively exploring a flying environment. Within environments, however, baseline and immersion heart rates were significantly different in the driving but not the flying environment. Consistent with habituation principles, participants initially showed an increased skin conductance in the driving environment that dissipated after seven minutes.

4.2 Applications of VR to stress-related issues

VR has made substantial advancements in the field of PTSD, improving and enhancing treatment efficacy for PTSD in the survivors of several types of trauma. Cognitive-behavior therapists use VR-based exposure therapy to create a safe, virtual environment with the ability to allow a patient to stop avoiding the intrusive flashbacks associated with PTSD and "relive" their experiences in a thorough and efficient method, by slowly exposing themselves to events that trigger memories of the traumatic event. In some treatment protocols, the patient is first taught coping skills, and can then use those skills while exposed to the traumatic events in VR. The patient can then, at their own pace, move through the traumatic scenarios and experience the corresponding emotional responses (Wiederhold & Bouchard, in preparation).

For example, Rothbaum, Hodges, Ready, Graap and Alarcon (2001) used HMD technology to immerse 16 Viet Nam veterans suffering from PTSD in environments including a helicopter and jungle terrain. Patients experienced a 34% decrease in clinician-rated PTSD symptoms and a 45% decrease in self-ratings. Using scenarios depicting stressors commonly experienced in Iraq, Wood et al. (2008) showed that after VR-based exposure therapy, two-third of their sample of Iraq war veterans no longer met the diagnostic criteria for PTSD. Applications of VR to the treatment of PTSD for military personnel is recent and hot topic in the field, as shown by the frequent publications from ongoing randomized clinical trials (e.g., Reger & Gahm, 2008; Rizzo et al., 2007, 2008). Based on Wiederhold and Wiederhold (2008) review and recently published work, we were able to find 19 studies published on the use of VR to treat PTSD, for a total of 413 patients and five types of trauma (war, car accidents, earthquakes, September 11th / World Trade Center incident, and terrorist attacks). The war-related traumas include Vietnam, Angola and Iraq. When counting the number of publications and patients involved, research in this field is heavily driven by three research groups (in alphabetical order: Difede et al., Rothbaum/Rizzo et al., Wiederhold et al.), although significant contributions to the field are not limited to these research teams.

Other VR studies are more relevant to our work and focus on preparing individuals to deal with stressful situations. A key publication comes from researchers at the Virtual Reality Medical Center, led by Mark and Brenda Wiederhold, who published in 2005 their final report on studies performed with a total of 612 members⁸ of elite units of the United States Navy, United States Marine Corps and United States Coast Guard (Wiederhold, 2005). Their aim was to document the effectiveness of VR training to increase performance in applying tactical and trauma care skills as well as practicing combat breathing⁹. They also purposefully conducted all their immersions using a (yet powerful for the time) laptop computer and no HMD in order to test a low-cost solution. They replicated the same experimental design for most study, with less than half of the participants receiving one session of VR training where they practiced performing their duties while their stress and arousal were monitored. Participants in the control condition did not receive any VR training. It is assumed that participants were not randomly assigned to the experimental conditions in the first four studies and the utility of the physiological monitoring is unexplained in their report. The authors describe their key outcome measures as actual response time in “real world” physical environments, subjective and rated assessments from training officers, and psycho-physiological assessment during VR training (e.g., heart rate, skin conductance, and breathing). Interestingly, their studies were conducted less than two weeks prior to deployment of the participants to Iraq.

In Study 1, 90 U.S. Marine Corps navigated a virtual shoothouse for approximately 15 minutes and feedback was provided on their performance after the immersion. The tasks were to take down and secure the "objective" (shoothouse) as quickly as possible, conduct sensitive site exploitation and exfil a crisis sight in a village. The authors compared on variety of parameters the performance of the 90 participants trained in VR with 120 Marines that did not receive any training at all. Results, based on mostly subjective information, suggest an increased efficiency of those who received prior training. The few data subjected to statistical analyses revealed that: (a)

⁸ This number is based on the actual number of participants reported in the five studies (with only 332 having received VR training) rather than the 970 that is mentioned in their summary.

⁹ Except for a mention in the introduction, no information is reported on the practice of breathing skills or its impact.

averaged over 60 trials, participants trained in VR took 9 seconds to clear the physical room, as opposed to 11 seconds in the control group who never had any training ($p < .001$); (b) those receiving VR training took (averaged over 35 trials) 21 minutes to secure the objective as opposed to 23 minutes (averaged over 32 trials only) for those in the control group. When it comes to conducting site sensitive exploration, receiving VR training significantly ($p < .001$) reduced the time to sketch a house to 4 minutes as opposed to 6 minutes in the control group. A host of other data are reported, notably higher accuracy for Marines who benefited from the VR training and the accompanying feedback, but no statistical analyses are reported¹⁰ to confirm whether these differences occur above chance level.

Study 2 was conducted with United States Navy SEAL, with 30 team members receiving the same VR training as Study 1, and 90 team members being in the control condition. No empirical data or statistical analyses are reported for this sample. The authors noted that VR training was helpful according to an enumeration of qualitative and anecdotal observations.

The third study from Wiederhold (2005) report was conducted with 30 U.S.MC Marine Expeditionary Unit but no control condition. Participants' task was to conduct "Visit, Board, Search, and Seize" procedures on a ship. The VR training consisted of taking a virtual ship under custody and search for hidden cargo and contraband within 10 minutes. No empirical data or statistical analyses are reported for Study 3. The authors considered that VR training was helpful based on an enumeration of unsystematic observations, such as reduction in 14.2% of time needed to search the ship. The same comments can be formulated for Study 4 conducted with United States Coast Guards' Pacific Tactical Law Enforcement Detachment. They report descriptive and qualitative data gathered on 20 participants receiving VR training and 80 participants in the control condition.

The last study was conducted with 152 members of the Light Armored Reconnaissance battalion. They were midway through their pre-deployment work up and the focus of their training was on military operations in urban terrain and house clearing in the shoothouse (as in Study 1 and 2). The study aimed at several objectives at the same time: (a) compare whether training with the VR scenario was more effective than simply playing a computer game (in which ones link chains of identical sparkling jewels), and to no training at all, (b) compare if training on the laptop was less effective than projecting the image on a screen from approximately 15 feet away (note, there is no indication that stereoscopy was used), and (c) whether multiple performance in the physical reality has an impact on time it takes to clear the physical house. For the first research question, no statistical analyses are performed so it is impossible to know if the 9.42 seconds it took for those trained in VR is really a meaningful difference with the 12.07 and 12.15 seconds it took by participants the two control conditions. For the second research question, participants receiving the desktop training and those who did not receive any training were compared with those receiving the training on the large screen. Again, no statistical analyses was used to confirm whether the 8.42 seconds taken after being trained with the large screen is really better than the 9.42 and 12.07 it took for the other participants. Finally, although repeating four times the clearing of the physical house improved performance time from 12.19 seconds to 9.85, no statistical analyses are performed so it is impossible to know if this is different from the time

¹⁰ The authors declared in their final report that overall 773 hours of multi-dimensional analyses were conducted for the entire report. However, very few inferential analyses (i.e., more than frequencies and means) are reported.

taken by those who received the desktop training (9.42 seconds). Unfortunately, no conclusion can be reached from this interesting study.

In their review on stress management training, Wiederhold and Wiederhold (2008) report a few additional studies where VR was used. One study was conducted by Tarnanas and Manos (2001) where they used VR to train pre-school children and children suffering from Down syndrome to evacuate their classroom in the case of an earthquake. Although this may resemble more stress inoculation than stress management training, their results are interesting as they show that participants were able to learn to better perform under a stressful virtual situation. In a preliminary phase of the larger study mentioned above (Wiederhold, 2005), Wiederhold and Wiederhold (2004) tested whether practicing in VR tending to a wounded virtual person while being shot at, or without being shot at, had an impact on performance. According to the information reported in Wiederhold and Wiederhold (2008), results were positive.

Another leading researcher in stress inoculation / management training of military personnel is Major Melba Stetz. In 2008, Stetz, Long, Wiederhold and Turner published the conclusion of a project whose results were progressively released in 2006 (Stetz, Wildzunas, Wiederhold, Stetz & Hunt, 2006) and 2007 (Stetz, Long, Schober, Cardillo & Wildzunas, 2007). The final sample was composed of 63 military volunteers who were attending combat medical class (for flight medic, ranger's first responders, mountain medics and medical personnel). Two tasks were available and performed over two or four sessions. One task consisted in providing care to a wounded team member (see image below, with the wounded body, the medical kit on the left and options for tasks to perform, in the bottom middle-left) and within about three minutes to triage, stop life threatening bleeding, treat casualties, administer intravenous fluids and pain medication, chest seals, call for medical help, etc. The other task consisted in treating a similar casualty inside a helicopter. The immersion in VR was created with the use of a HMD (z800 by eMagin) and its built-in tracker, a low frequency set of speakers (to reproduce vibrations) and olfactive cues produced with Scentpalette (scent machine). The stress management training consisted in practicing progressive muscle relaxation and controlled breathing while performing the task. Participants were assigned to the following four conditions: (a) control with no training at all, (b) no training with the VR tasks but training in stress management, (c) training with the VR tasks with no stress management, and (d), combined training with the VR tasks plus stress management. Condition (b) actually constitutes a second control condition as it provides a baseline upon which the other two experimental conditions can be compared. The goal of the study was to induce stress during the task, and is therefore presented by the authors as an approach to harden soldiers against the stressors they will encounter in the battlefield (p. 240).



Figure 4: Simulated medical care

The analyses could not find any difference between the three experimental conditions and the control group, maybe because of the small size of this group (n=9) compared to the experimental groups (each n = 18). When performing the analyses with the three experimental groups and taking into account whether participants have been deployed or not in the past, two results stand out. First, those immersed in the VR only and those immersed in the VR combined with stress management felt more hostility during the sessions than those in the stress management only condition. Second, participants who had been deployed in the past felt more anxiety during the sessions in the VR only condition than those in the same condition who had never been deployed before. The impact of previous deployment on anxiety was not significant in the other two conditions, where stress management was applied. Other statistically significant findings were reported for sensation seeking and dysphoria, but they are difficult to meaningfully interpret given the pattern of results and the analyses performed.

Stetz et al.'s (2008) findings on hostility revealed that their VR environment increased the hostility level in all participants who were immersed. Participants scored higher on a scale measuring the extent to which they felt annoyed, critical, disagreeable, disgusted, furious, hostile, etc. It shows that the content of the VR environment and the tasks performed may have been quite effective in inducing frustration. In addition, the use of the stress management strategies was ineffective in buffering the level of hostility, probably because of the strength of the hostility induced by the environment and because participants learned to apply the strategies during the immersion, as opposed to progressively mastering the techniques before applying it to highly engaging situations (Killgore et al., 2006; Sareen, 2007). However, these can only be tentative conclusions given the lack of random assignment and control of pre-experiment levels of hostility (e.g., pre-experiment comparisons or repeated measures analyses).

Findings on anxiety are interesting as well because anxiety was induced only in those who meet three conditions: having been deployed in the past, being immersed in the VR environment, and not applying the stress management techniques. This suggests that the content of the VR environment and the task were anxiogenic for people who may have been sensitized to emotionally related to it because of past experience, and also that the stress management techniques may have been effective in buffering the level of anxiety. However, since the analyses did not control for pre-intervention levels of anxiety, it is impossible to state whether the results among those who received stress management are due to individual differences prior to the experiment among participant's ability to regulate stress or to the acquisition of new and effective skills. Findings on dysphoria, which is a global score combining anxiety, depression and hostility, further question the impact of prior individual differences. Indeed, significantly more dysphoria was found in those who had been previously deployed, as compared with those who have not, both in the participants that were immersed in the VR only and in those who received stress management, but opposite results were found in those in the combined condition. Nevertheless, we concur with Stetz et al. (2008) that the study suggests VR may increase negative affect in those who have previously been deployed and that it is a promising tool to harden military personnel for future operations.

In a recent yet unpublished study, Stetz, Bouchard, Wiederhold & Folen (2009) assessed sixty soldiers to document their receptivity to stress management techniques. Given the potential negative impact of a culture favouring virility in the military personnel, this research question seemed especially timely. For three days the experimental group practiced progressive muscle relaxation and control breathing while listening to a script embedded in a video of an isolated

beautiful 3D island developed for VR. In the mornings, they would practice these techniques while watching the video projected on a screen. In the evening, they would watch the same video but via a portable play station. Preliminary results show they prefer the controlled breathing technique but they all liked the techniques. About half of the sample also said they would consider practicing these techniques after the study. These results concur with those reported by Routhier (2009) with the PERM that stress management is well accepted. What remains to be documented is whether they actually practice stress management strategies until they master it.

One additional observation that must be made regarding to Stetz's work is the selection of medical training as a target for using VR. Medics and other military personnel providing medical assistance play an important role in theater of operations. And the tasks to be performed could be highly stressful. This fits with an observation mentioned at the end of the first section of this report, regarding medical interventions being interesting situations to recreate in VR to train military personnel in using SMT. More results are expected from this study based on analyses of additional objective data (Stetz, Strunk & Reeves, 2009).

In sum, the interactivity and possibility to create virtual scenarios that resemble physical reality are significant assets for using VR in SMT training. The VRMC group report some data suggesting that having military personnel practicing a house clearing and other similar tasks using a 3D software on a desktop, along with receiving feedback, may improve actual performance by a few seconds. Stetz et al.'s work suggest that being immersed in a VR environment to perform a simulated, low interactivity, medical task can possibly increase psychological stress, especially hostility and anxiety among people who have been previously deployed. After extensive search of the literature using Scopus and other databases (e.g., IDA, NATO, TATRC), it appears that no further (independent) attempt had been made to empirically test these ideas. For the moment, most of the VR research in the field of psychological application for stress related problems focuses on the treatment of PTSD, with less than a handful of studies on SMT. Most of VR applications, including in the Canadian Forces, is for training in applications that are irrelevant to clinical psychology (e.g., flight simulations for pilots).

4.3 The feeling of presence

It is intriguing that VR may work given the fact that virtual reality does not perfectly replicate physical reality. The impression that the virtual reality is "the real reality"¹¹ has been defined as the subjective impression of being *there* in the virtual environment (Sadowski & Stanney, 2002). Presence is also thought to be related to the suspension of disbeliefs (Wiederhold & Wiederhold, 2005), or when the user fails to perceive the existence of a medium in his interactions with the environment (the illusion of non-mediation; Lombard & Ditton, 1997). Presence may occur when a person interacting with a virtual environment reports a greater degree of interactivity with the virtual environment than with their physical environment (Wiederhold & Wiederhold, 2000).

Presence should be distinguished from immersion, the latter being related to the technology used to provide multimodal sensory input to users (Sadowski & Stanney, 2002). Immersion is an

¹¹ Note. The expression "real reality" is used here only to introduce the concept of presence because reality is a subjective construction, hence the need to use a more adequate term such as physical reality instead of real reality.

objective and quantifiable description of what any particular system provides, compared the subjective feeling of being transported in VR.

Sadowski and Stanney (2002) and Slater and Usoh (1993) proposed to organize the known factors influencing the level of presence experienced in a virtual environment in seven categories: (a) ease of interaction (presence is reduced when user have difficulties navigating in the virtual environment); (b) user-initiated control (the greater the level of control a user has regarding their action, the higher the presence); (c) pictorial realism (the quality of the visual display is related to presence, although it is much less influential than other factors, see the second paragraph below); (d) length of exposure (presence level raises during the first few minutes of immersion and usually remain stable until influenced by specific stimuli or events); (e) social factors (the feeling of presence is increased when communicating with virtual or physical people); (f) system factors (the better the technology and multimodal sensory input replicate the objective reality, the stronger the feeling of presence); and (g) internal factors (individual differences in how individuals cognitively and emotionally process the information).

In 2006 and 2007, Youngblut submitted to the Institute of Defense Analyses reports where she performed a comprehensive analysis of system factors influencing presence. She reviewed 301 studies, looking at details like methodology and factors such as technical characteristics, interfaces, tasks performed by users, etc. Her results (see Table 8) represent the best and most comprehensive synthesis of studies published in peer-reviews journals and conference proceedings. She confirmed that stronger presence is associated with using: (a) more immersive technologies, (b) better textures, more realistic light maps, higher polygon count, (c) visual displays with higher resolution, wider field of views and foreground occlusion, (d) peripherals providing more interactivity, (e) more efficient navigation methods and computer performances, and (f) high quality and spatialized audio stimuli. It is important to highlight here the conclusion that CAVE-like system reliably produces more presence than HMD technology, which are superior to desktop display (Heldal et al., 2005; Krijn et al., 2004 Schroeder et al., 2001). Her review also support the growing notion among researchers that an increase in all the factors cited above do not necessarily lead to corresponding increases in presence. There may be a ceiling effect where beyond a certain point it is not cost effective to invest money, time and energy to reach for higher sense of presence.

Table 8: Reproduction of Youngblut's (2007) summary of the analyses of factors associated with presence.

Audio display:	Aural rendering quality	▲	Sound rotation, velocity	▲
	HRTF	▲	Spatialized audio	■ ●
	Sound rotation, direction	▲		
Avatars & Agents:	Agency	○	Relation to user	▲
	Behavioral realism	●	Role, interacting	●
	Form realism	○	Role, passive	●
Interaction:	Audio interaction aid	▲	Latency, end-to-end	▲
	Collision detection, audio	▲	Latency, visual	▲
	Collision detection, haptic	▲	Level of	●
	Collision detection, tactile	▲	Moving between worlds	▲
	Collision detection, visual	▲	Number of	▲
	Haptic force feedback	●	Passive haptics	○
Navigation:	Control of	○▲	Navigation method	■ ●▲
	Device	▲		
Self-representation:	Fidelity of body	■ ○	Fidelity of hand	○
User movement:	Cross-modal illusions	▲	Seated or standing	▲
	Head movement, bending	▲	vection	○
	Hand reaching	▲		
Visual detail:	Color	▲	Scene realism	□ ●
	Dynamic shadows	○	Texture mapping, use of	●▲
	Rendering quality	○	Texture mapping, quality	●
Visual display:	Device, Cave-HMD-monitor	■ ●	Frame rate	▲
	Device, HMD-monitor	■ ○	Resolution	▲
	Device, HMD-p/screen-monitor	○	Stereopsis	●
	Device, proj screen-monitor	●	Tracking, face	○
	Device, other	▲	Tracking, head	○
	Field of view	●▲	Update rate	■ ●
	Foreground occlusion	■ ●		
World characteristics:	Audio cues	○▲	Olfactory cues	▲
	Audio sources, nature of	▲	Presentation quality	■ ●
	Audio sources, number of	■	Scene detail	■ ● ²
	Manipulation, presence	▲	Speed of user movement	▲
	Manipulation, social presence	▲	Tactile cues	○

Key:

- Replicated experiments with consistent findings
- Replicated experiments with inconsistent findings
- ▲ Single experiment
- Other experiment(s) with consistent findings
- Other experiment(s) with inconsistent findings

Youngblut's reviews did not address specifically internal factors such as emotions, which also play a role in presence. Judgment about the perceived realism of VR environments is significantly affected by stress and anxiety. The Robillard et al. (2003) study mentioned earlier is an example where the comparison between phobics and non-phobics revealed significantly stronger anxiety, presence, and sense of realism among phobics. Taking the realism to a minimum, Herbelin, Riquier, Vexo and Thalmann (2002) asked social anxious participants to deliver a speech in a virtual room filled with images of just and only eyes staring at them. Even in this unrealistic condition, participants reported significant increases in subjective anxiety and heart rate. These are only few examples reminding us that emotions are not logical and that anxiety can be triggered by the simple perception of a threat, even if the stimuli are virtual and cartoonish. In sum, anxiety is only minimally related to the level of anxiety felt by patients in VR, despite the initial impression that VR environments must look realistic.

Zimmons immersed 42 non-phobics in a virtual height simulation (throwing balls down a pit) and, in an attempt to assess whether the texture or the lighting quality of the image played a role in the experience felt in VR, used a simple black and white grid representation of the virtual pit as a control condition. Interestingly, there was a statistically significant increase in anxiety, as measured with heart rate, even in the black and white environment. These are only a few examples reminding us that emotions are not logical and that anxiety can be triggered by the simple perception of a threat, even if the stimuli are virtual, cartoonish and not really dangerous.

The relationship between presence and the level of anxiety felt in the VR environment may be more complex than it appears at first glance. As mentioned earlier, there is a strong relationship between anxiety and presence. For example, Robillard et al. (2003) reported a significant correlation ($r = .74, p < .001$) between anxiety and presence. Our research group has done pioneering work with experimental manipulations of emotions and presence. In order to document the direction of the causal relationship between anxiety and presence, two studies were conducted by Bouchard and his colleagues. In a first randomized single-blind study conducted with snake phobics, participants were told that the virtual environments were either infested or not infested with snakes (Bouchard, St-Jacques, Robillard & Renaud, 2008). Since the VR environments were exactly the same, changing the instructions allowed the researchers to manipulate experimentally the level of anxiety and assess its impact on presence. Using a counter-balanced design, they found that inducing anxiety lead to a significant increase in presence. To test the inverse relationship, Michaud, Bouchard, Dumoulin and Zhong (2004) asked acrophobics to do a stressful task (i.e., riding a glass elevator up to a selected floor, crawling outside the building while looking down to the streets, walking on wooden scaffolds toward a building across the street, etc.) while immersed in VR with conditions that were favourable or unfavourable to presence (lights turned on in the laboratory, surrounding physical environment visible in the participant's field of view, etc.). Interestingly, the randomized single-blind and crossover trial showed that levels of anxiety were higher in the immersions conducted when presence was higher, and vice versa. Taken together, these two studies suggest that there is a reciprocal determinism between anxiety and presence; increasing anxiety leads to more presence, and more presence leads to increase in anxiety. What remains to be tested is whether this relationship is linear and if it holds if only a minimal level of stress, or presence, is reached.

The relationship between stress (or, more precisely, anxiety) and presence has been studied to a limited extent, yet this is significantly more than what had been done with performance in the physical world. For learning to perform new tasks (e.g., Burkhardt, Lourdeaux & d'Huart, 2003) or new academic (Moshell & Hughes, 2002) or educational (Cobb, Neale, Crosier & Wislon, 2002) concepts, researchers have not thoroughly addressed the question. Some authors (e.g., Burkhardt et al., 2003) even confess explicitly that attaining high degrees of realism is not essential in creating a virtual environment.

We found one study by Youngblut and Huie (2003) where presence in the virtual environment and performance in a physical environment was examined. A group of 35 students were randomly assigned to three conditions: a control group (with no VR training), and Immersive VR training group (with one rear large projection screen) and a Desktop VR training group (non-immersive interface). The VR task had been developed for the special nuclear, biological and chemical response team and involved two training missions for basic procedures in searching for weapons of mass destruction (e.g., identify hazardous material, suspicious objects and casualties, position alarms, etc.). Participants in the control group only studied a manual describing mission

procedures. Those in the VR groups received, in addition to the manual, two training missions using the interactive 3D software. Coaching and feedback was also provided during the VR training. A performance score was derived based on audio and video recordings of a survey mission conducted in the physical reality, as well as an inspection of the searched areas. The analysis showed a significant effect of training condition on knowledge of mission procedures ($p < .001$), with participants in the Immersive VR condition achieving higher mission scores. There was no difference in presence ratings in both VR training conditions, probably due to the limited immersiveness of both systems. Correlations with performance yielded mixed results, with a significant correlation with the Slater and Usoh Scale ($r = .42, p < .04$) but not with the Presence Questionnaire ($r = .39, p = .059$). However the non-significant correlation with the Presence Questionnaire may be related to limitations inherent to this instrument.

It is important to differentiate the role of presence in the transfer of skills from the virtual to the physical reality, and skills' transfer itself. It is not because the contribution of presence is understudied that generalization of learning should be questioned. There is a wealth of evidence that what is learned in a virtual reality is real and can be generalized *in vivo* to the physical reality (see Stanney, 2002 for reviews). For example, in the field of anxiety disorders (see Bouchard, Côté & Richard, 2006 for a review), several randomized control trials have demonstrated that successfully learning to face feared stimuli in virtual reality transfers in the patient's day to day life, and up to many years post treatment. Studies in the area of motor and cognitive rehabilitation (see Holden, 2005 for a review) demonstrate that people can learn, or reacquire, motor and cognitive skills thanks to virtual reality.

4.4 The potential usefulness of 3D games

Given our interest in the development of stressful VR scenarios to train military personnel, one might consider looking in the direction of the game industry to find 3D environments that are developed with that aim in mind.

Computer game is a lucrative industry and cutting-edge research is conducted with powerful resources, although research results are not always made public. Artists and researchers from the film industry have also studied at length what stresses viewers and gamers. The body of knowledge is growing, with 127 papers published on stress and gameplay or computer games. Interesting reviews have been written (for example see Alexander, Brunyé, Sidman & Weil, 2005; Stoudenmire, White, & Roy, 2005) on the topic and any moviegoer or computer game player can testify that some films or game are stressful. For example, Sharma, Khera, Mohan, Gupta and Ray (2006) have shown with physiological measures (e.g., heart rate, facial muscle tension, skin conductance, plasma cortisol) that computer games can be used very effectively to experimentally induce stress among adults. Experimental studies (e.g., Morris, Hancock & Shirkey, 2004) and systematic analyses of psychological factors associated with game play have also been conducted (e.g., Perron, 2004; 2005a, 2005b).

The potential of using already developed 3D games must not be underestimated and a detailed analysis of stressful characteristics of available computer games should be conducted.

4.5 Summary of Section 4

Let's begin our conclusion of Chapter 3 by acknowledging the wide variety of equipments that can be used to immerse trainees in virtual environments and allow practicing SMT techniques. However, most VR system could be divided under three categories: simple desktop 3D display, HMD or CAVE-like systems. Some applications have been developed for psychological injuries among military personnel, essentially to treat PTSD. A few researchers claim to have developed VR environments SIT or SMT. A closer look at Wiederhold (2005) studies suggests that VR was actually used to train military personnel in performing their duties (e.g., house clearing). The largest published report describes a set of studies performed by the Virtual Reality Medical Center. Unfortunately, it is difficult to reach any conclusion from their results given the generalized lack of statistical analyses, as well as the number of comparisons performed (i.e., inflation of Type I statistical error), and difference between conditions on the number of trials used to assess speed. At best, it may be said that training military personnel could reduce by a few seconds that time it takes for house clearing. Stetz's work aimed at stressing medical personnel, rather than teaching them to cope with stress. Her results suggest that VR may induce hostility and anxiety, and that prior deployment may be a factor increasing the impact of the virtual environment. Again, methodological considerations preclude any firm conclusions.

Presence is an interesting concept in VR and is studied intensively. Several factors are associated with an increase in presence and, essentially, presence grows as the immersive properties of the system provide a closer replica of the physical reality. However, this relationship is not linear. For example, a strong feeling of presence might be obtained even when users are immersed in low-quality virtual systems. There may be plateau and ceiling effects where, before and beyond certain points, the relationship between realism and presence may be weaker. To paraphrase Morris, Ganey, Ross and Hancock (2002), there are increasing evidences that aiming for perfect realism may be pointless since humans effortlessly employ a cognitive "immersive-fill" when appropriate conditions are present and cognitively compensate for details that are missing or imperfect. Among well accepted differences between technologies, it has been known that CAVE-like systems lead to a stronger feeling of presence than HMD and desktop. Factors relevant to the individual immersed in the virtual environment are gaining recognition. For example, elevated levels of stress and anxiety have a strong positive impact on presence.

The relationship between presence and performance remains understudied. Only one study was found reporting a significant, but weak, correlation. For some authors, if procedural learning occurs in VR, it should transfer to the physical reality if the environment is sufficiently realistic. The illusion of being *there* in the virtual environment would be less relevant for transferring procedural knowledge, which is a different position from the one of researchers working with emotions and mental health applications. The role of presence on actual performance, especially if the VR environment must elicit emotions, is an area that must be studied more thoroughly. Nevertheless, one should be confident that learning occurring in a virtual environment does transfer to day to day situations occurring in the physical reality.

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5 Conclusion: Using virtual reality to enhance the effectiveness of stress management training: suggested research questions

The purpose of this section is to provide a list of ideas and research questions for stress management strategies to increase resilience and, hopefully, prevent psychological injuries. These strategies will focus on coping with traumatic stressors, as opposed to non-traumatic or chronic stressors. Previous chapters have highlighted that nine situations may be sufficiently stressful and frequent to be considered for the development of virtual environments: (a) seeing dead bodies or uncovering human remains, (b) knowing someone being seriously injured, (c) being under artillery fire, (d) being unable to help ill / wounded civilians because of the rules of engagement, (e) seeing destroyed homes and villages, (f) clearing and searching homes, caves or bunkers, (g), being under small-arm fire, (h) patrolling in dangerous conditions and (i) demining operations. Other situations deserve to be considered based on their frequency, if they apply to most military personnel (e.g., base defense), or if they involve high value assets personnel (e.g., Special Forces, snipers, medics).

Broadly defined SMT strategies have received ample empirical support, especially, progressive exposure or “inoculation” to stressful stimuli, relaxation, biofeedback, diaphragmatic and other breathing techniques and cognitive restructuring. When accompanied with these strategies, providing psycho-educative and accurate information becomes an effective strategy as well. Other SMT strategies also deserve our attention: visualization and imagery, focusing, thought stopping and self-statements. SMT are complex skills to master in a stressful situation, and therefore repeated practice is important, usually over several training sessions. The exact number of sessions or hours of training remain undefined, but attaining a performance-based criteria appears to be optimal (e.g., reaching a pre-defined level of stress control or perceived self-efficacy) and is usually the standard in psychotherapeutic applications.

The Programme d’Entraînement à la Résilience Militaire (PERM) is actually implemented in Canada and some of its SMT strategies deserve to be seriously considered as candidates for practice in VR, namely progressive muscle relaxation, autogenic training and meditation, diaphragmatic and controlled breathing, visualization and mental imagery, grounding and focusing techniques, thought stopping and self-talk. Given the efficacy and importance of these techniques, every soldier should master them efficiently. Unfortunately, based on data from Routhier (2009) it appears that too few of them report using the strategies while they were deployed. This observation supports the notion that more practice is needed.

The main thoughts coming from our research team is that at least some, if not all, SMT strategies learned in the PERM must be practiced repeatedly and with coaching in order to be mastered and applied automatically. Some of the challenges facing this course of action include: (a) the development which stressful VR scenarios, (b) to what extent do they need to be stressful, (c) can they remain stressful over repeated immersion, (c) what population should be targeted (everyone, high value assets, etc), (d) how to built a hierarchy of stressors allowing the trainees to progressively practice and master SMT skills?

It is our opinion that a hybrid strategy might be cost-effective. Basic training assisted with biofeedback and supervision could be conducted in virtual reality using specially tailored environment, and practice in more challenging and stressful situations could use computer games. While providing biofeedback in the HMD (or in the peripheral field of view in the case of CAVE-like systems), military personnel can be coached and practice some PERM strategies in a virtual environment until they are mastered and perceived self-efficacy is high. The assets of using VR environments include: increasing motivation, allowing coaching, using manageable stress levels and maximizing the generalizability of the training by using known stressors that relates to stressors experienced in theater of operations. The second step takes profit of already stressful and fun (buy-in factor for soldiers) off-the-shelf 3D games to continue applying PERM strategies, sustained by biofeedback information provided in the 3D game console. The military personnel could then bring these “coping-skills enhanced 3D games” with them in missions. On the base, after their having performed their duties (during times of rest and recreation), they can play 3D games they already like to play, but with the additions of a biofeedback that modulates the game based on their stress level. For example, their proficiency and ability to aim in first-person shooter game, or to drive in racing car games, can be reduced as their stress level increases above a certain limit. Controlling their stress level while enjoying playing 3D games would allow regular practice of PERM coping skills while in theater of operations, without having to overtly practice skills that can be perceived as less virile or associated with being weak. Such a strategy may also allow avoiding the problem of habituation to a specific stressful training scenario.

We therefore envision the following two studies as basic steps to build resilience among military personnel via the acquisition of SMT skills: (a) testing how users immersed in VR react to pain expressed by an avatar (a virtual image of a real person) they know as opposed to pain expressed by an autonomous agent (an image of an entirely virtual person) they don't know; (b) what is the most efficient VR technology to use stressful 3D games? The results of Study 1 would allow deciding whether it is necessary to produce avatars (virtual replicas) of unit members in order to better train medics while they are practicing their skills in virtual reality, or if generic autonomous agents (unknown virtual people) would be just as effective in terms wounded patients in pain. One of the methodological control that must be taken into account in such an experiment is to detangle whether the potential difference in reactions is due to an affective bond with the virtual person (i.e., knowing or not the person), to seeing virtual people emote (i.e., expressing emotions or not), or is specific to witness the emotion of pain felt by the avatar of someone they have an affective bond with (e.g., a friend or a unit member). Both subjective and physiological measures of stress must be recorded and the study would gain in being conducted with a mix sample of civilians and military personnel but, given the cost associated with the creation of highly realistic avatars, it would be more affordable and realistic better to use it with students and colleagues of one of our lab members. The proposed hypothesis is that seeing a known avatar expressing pain would lead to a more significant increase in stress that seeing an unknown autonomous agent. In addition, it is expected that seeing a virtual person emote would trigger physiological and subjective reactions in users immersed in VR.

The results of Study 2 would provide invaluable information on the potential of games to stress people using games that have been developed for levels of stress that are considered fun and enjoyable, and which hardware technology should be used. Would 3D games elicit levels of stress that are high enough for practicing biofeedback-assisted stress management skills? In addition, must this approach use very expensive CAVE-like systems or can it be applied with low-cost HMD, or even simple computer monitors? One of the methodological controls that would be wise

is to measure personality and gender difference in factors that are associated with immersiveness and absorption in 3D games. Some people are probably more attracted by some types of games than others, and more easily stressed by some game-play than others. This information would help in tailoring, in future experiments, the game and its stress levels to our training needs. A mix sample of civilians and military personnel would be ideal given our interest in personality variables, and subjective as well as physiological measures of stress must be used. This second study should also address the contribution of presence and how it affects stress and anxiety. It would be useful to be able to describe the form of the relationship between anxiety and presence. Is it linear? Being able to demonstrate that the relationship is not linear and that it is sufficient to reach a certain level of stress to obtain very high levels of presence would help saving time in the creation of future VR environment to train in SMT. The specific hypotheses of this project are that stress level will be higher with the HMD than the computer display, and that the CAVE-like system will be the most stressful situation. However, the stress induced in the HMD will be sufficient to apply biofeedback and SMT techniques.

In the meantime, some questions remain to be decided in the months to come in order to prepare the methodology of studies to be conducted in the third year of our project. The following five questions still need to be addressed before the end of this year. Which off-the shelf 3D game should be used for Study 2? Which high value assets personnel should be targeted first (Study 1 is aiming at medical applications but must other application be considered as well)? Which skills of the PERM should be selected to be practice in VR? What form of biofeedback (visual bar, darker environment, less precise aiming tool, tunnel vision) should be provided to the user of the “coping-skills enhanced 3D games”? Is there any other stressful situation that should be selected to create VR scenarios?

Preparing this report raised several interesting research questions that will not be examined because they are outside the scope of our SMT project. However, they deserve to be mention as they can stir new ideas in readers of this report. It would be very valuable to know which skills of the PERM are used or not (and if not, why) by military personnel while they are in theater of operations. The application of SMT, or PERM skills, would be more effective if there would be data on which skills can be over learned, to the point of becoming automatic, and if some skills would be more suited for very acute and immediate stressors (e.g., being under fire) as opposed to “longer” stressors (e.g., driving a truck in a area with landmines). As clinicians, our team was also curious if some SMT skills used in the PERM to cope with life-threatening stressors can become avoidance strategies that would play a role in the development of PTSD or interfere with therapy (e.g., thought stopping). Finally, as a tool to practice SMT skills it may be interesting to ask the user immersed in the VR environment to coach an avatar showing signs of stress on how to apply coping strategies.

In conclusion, it is hoped that this report will provide valuable information to plan the next two years of the SMT project.

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References

- Abelson, J. L., Khan, S., Liberzon, I., Erickson, T. M., & Young, E. A. (2008). Effects of perceived control and cognitive coping on endocrine stress responses to pharmacological activation. *Biol Psychiatry*, *64*, 701-707.
- Adler, A. B., & Bartone, P. T. (1999). International survey of military mental health professionals. *Milit Med*, *164*, 788-792.
- Adler, A. B., Bliese, P. D., Hoge, C. W., McGurk, D., & Castro, C. A. (In preparation). Early interventions during reintegration with soldiers returning from Iraq: Randomization by platoon. Cited in the MHAT-C (2008) report, page 55.
- Adler, A. B., Castro, C. A., & McGurk, D. (2009). Time-Driven battlemind psychological debriefing: A group-level early intervention in combat. *Military Medicine*, *174*(1), 21-28.
- Adler, A. B., & Huffman, A. H. (2005). The impact of deployment length and experience on the well-being of male and female soldiers. *Journal of Occupational Health Psychology*, *10*(2), 121-137.
- Adler, A. B., Litz, B. T., Castro, C. A., Suvak, M., Thomas, J. L., Burrell, L., McGurk, D., Wright, K. M., Bliese, P. D. (2008). A group randomized trial of critical incident stress debriefing provided to U.S. peacekeepers. *Journal of Traumatic Stress*, *21*(3), pp. 253-263.
- Aeschleman, S. R., & Imes, C. (1999). Stress inoculation training for impulsive behaviors in adults with traumatic brain injury. *Journal of Rational - Emotive and Cognitive - Behavior Therapy*, *17*(1), 51-65.
- Albright, G. L., Andreassi, J. L., & Brockwell, A. L. (1991). Effects of stress management on blood pressure and other cardiovascular variables. *International Journal of Psychophysiology*, *11*(2), 213-217.
- Alexander, A. L., Brunyé, T., Sidman, J., Well, S. A. (2005). *From gaming to training: A review of studies on fidelity, immersion, presence, and buy-in and their efforts on transfer in pc-based simulations and games*. DARWARS Training Impact Group.
- Amarosa-Tupler, B., Tapp, J. T., & Carida, R. V. (1989). Stress management through relaxation and imagery in the treatment of angina pectoris. *Journal of Cardiopulmonary Rehabilitation*, *9*(9), 348-355.
- American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders (4th ed. – Text revision)*. Washington, DC: Author.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders (4th ed.)*. Washington, DC: Author.

- Amigo, I., Buceta, J. M., Becona, E., & Bueno, A. M. (1991). Cognitive behavioural treatment for essential hypertension: A controlled study. *Stress Medicine*, 7(2), 103-108.
- Amstadter, A. B., McCart, M. R., & Ruggiero, K. J. (2007). Psychosocial interventions for adults with crime-related PTSD. *Professional Psychology: Research and Practice*, 38 (6), 640-651.
- Anderson, P. L., Zimand, E., Hodges, L. F., & Rothbaum, B. O. (2005). Cognitive behavioural therapy for public-speaking anxiety using virtual reality for exposure. *Depression and Anxiety*, 22 (3), 156-158.
- Andreassi, J. L. (2000). *Psychophysiology: Human behaviour and physiological response (4th Ed.)*. Toronto: Erlbaum.
- Andrews, B., Brewin, C. R., Rose, S., & Kirk, M. (2000). Predicting PTSD symptoms in victims of violent crime: The role of shame, anger, and childhood abuse. *Journal of Abnormal Psychology*, 109(1), 69-73.
- Antoni, M. H. (2003). Stress management effects on psychological, endocrinological, and immune functioning in men with HIV infection: Empirical support for a psychoneuroimmunological model. *Stress*, 6(3), 173-188.
- Antoni, M. H. (2003). Stress management and psychoneuroimmunology in HIV infection. *CNS Spectrums*, 8(1), 40-51.
- Antoni, M. H., Cruess, S., Cruess, D. G., Kumar, M., Lutgendorf, S., Ironson, G., et al. (2000). Cognitive-behavioral stress management reduces distress and 24-hour urinary free cortisol output among symptomatic HIV-infected gay men. *Annals of Behavioral Medicine*, 22(1), 29-37.
- Antoni, M. H., Wimberly, S. R., Lechner, S. C., Kazi, A., Sifre, T., Urcuyo, K. R., et al. (2006). Reduction of cancer-specific thought intrusions and anxiety symptoms with a stress management intervention among women undergoing treatment for breast cancer. *American Journal of Psychiatry*, 163(10), 1791-1797.
- Archer, J. J., & Reisor, J. S. (1982). A group approach to stress and anxiety management. *Journal for Specialists in Group Work*, 7, 238- 244.
- Armfield, F. (1994). Preventing posttraumatic stress disorders resulting from military operations. *Military Medicine*, 159(12), 739-746.
- Attari, A., Sartippour, M., Amini, M., & Haghghi, S. (2006). Effect of stress management training on glycemic control in patients with type 1 diabetes. *Diabetes Research and Clinical Practice*, 73(1), 23-28.
- Awalt, R. M., Reilly, P. M., & Shopshire, M. S. (1997). The angry patient: An intervention for managing anger in substance abuse treatment. *Journal of Psychoactive Drugs*, 29(4), 353-358.
- Baguena-Puigcerver, Ma. J. (2001). Efficacious psychological treatments for post-traumatic stress disorder. *Psicothema*, 13 (3), 479-492.

- Baer, P. E., Cleveland, S. E., & Montero, A. C. (1985). Improving post-myocardial infarction recovery status by stress management training during hospitalization. *Journal of Cardiac Rehabilitation*, 5(4), 191-197.
- Bailey, B. K., McGrady, A. V., & Good, M. (1990). Management of a patient with insulin-dependent diabetes mellitus learning biofeedback-assisted relaxation. *The Diabetes Educator*, 16(3), 201-204.
- Bakcer, M. S., Armfield, F. (1996). Preventing post-traumatic stress disorders in military medical personnel. *Military Medicine*, 161(5), pp. 262-264.
- Baker, R. R., Menard, S. W., & Johns, L. A. (1989). The military nurse experience in Vietnam: Stress and impact. *Journal of Clinical Psychology*, 45, 736-744.
- Bandura, A. (1986). *Social foundation of thought & action: A social cognitive theory*. New Jersey: Prentice-Hall Inc.
- Barlow, D. H. (2002). *Anxiety and its disorders: the nature and treatment of anxiety and panic 2nd edition*. New York: Guilford Press.
- Baron, R. S., & Logan, H. (1993). Desired control, felt control, and dental pain: Recent findings and remaining issues. *Motivation and Emotion*, 17(3), 181-204.
- Barona, E. G., & Jimenez, J. C. R. (2005). Strategies for intervention and prevention of burnout in teaching. *Salud Mental*, 28(5), 27-33.
- Barrera, M. (2000). Brief clinical report: Procedural pain and anxiety management with mother and sibling as co-therapists. *Journal of Pediatric Psychology*, 25(2), 117-121.
- Barrios, B. A., & Shigetomi, C. C. (1979). Coping-skills training for the management of anxiety: A critical review. *Behavior Therapy*, 10(4), 491-522.
- Barrios-Choplin, B., McCraty, R., & Cryer, B. (1997). An inner quality approach to reducing stress and improving physical and emotional wellbeing at work. *Stress Medicine*, 13, 193-201.
- Bartone, P. T., & Adler, A. B. (1994, October 25-27). A model for soldier psychological adaptation in peacekeeping operations. *Proceedings of the 36th Annual Conference of the International Military Testing Association (pp.33-40)*. Rotterdam, The Netherland.
- Bartone, P. T., Adler, A. B., & Vaitkus, M. A. (1998). Dimension of psychological stress in peacekeeping operations. *Military Medecine*, 163(9), 587-593.
- Batey, D. M., Kaufmann, P. G., Raczynski, J. M., Hollis, J. F., Murphy, J. K., Rosner, B., et al. (2000). Stress management intervention for primary prevention of hypertension: Detailed results from phase I of trials of hypertension prevention (TOHP-I). *Annals of Epidemiology*, 10(1), 45-58.
- Beaver, C., Brown, R. A., & Lichtenstein, E. (1981). Effects of monitored nicotine fading and anxiety management training on smoking reduction. *Addictive Behaviors*, 6(4), 301-305.

- Beckham, J. C., Vrana, S. R., May, J. G., Gustafson, D. J., & Smith, G. R. (1990). Emotional processing and fear measurement synchrony as indicators of treatment outcome in fear of flying. *Journal of Behavior Therapy and Experimental Psychiatry, 21*(3), 153-162.
- Belik, S.-L., Stein, M. B., Asmundson, G. J. G., & Sareen, J. (2009). Relation between traumatic events and suicide attempts in Canadian military personnel. *The Canadian Journal of Psychiatry, 54*(2), 93-104.
- Bennett, G., & Millard, M. (1985). Compliance with relaxation training: The effect of providing information. *Behavioural Psychotherapy, 13*(2), 110-119.
- Berger, J. A., & O'Brien, W. H. (1998). Effect of a cognitive-behavioral stress management intervention on salivary IgA, self-reported levels of stress, and physical health complaints in an undergraduate population. *International Journal of Rehabilitation and Health, 4*(3), 129-152.
- Berger, S., Schad, T., Von Wyl, V., Ehlert, U., Zellweger, C., Furrer, H., et al. (2008). Effects of cognitive behavioral stress management on HIV-1 RNA, CD4 cell counts and psychosocial parameters of HIV-infected persons. *AIDS, 22*(6), 767-775.
- Berliner, L., & Saunders, B. E. (1996). Treating fear and anxiety in sexually abused children: Results of a controlled 2-year follow-up study. *Child Maltreatment, 1*(4), 294-309.
- Bernat, J. A., Rondfeldt, H. M., Calhoun, K. S., & Arias, I. (1998). Prevalence of traumatic events and peritraumatic predictors of posttraumatic stress symptoms in a non clinical sample of college students. *Journal of Traumatic Stress, 11*(4), 645-664.
- Bertino, L. S. (1989). Stress management with SCI clients. *Rehabilitation Nursing : The Official Journal of the Association of Rehabilitation Nurses, 14*(3), 127-129.
- Bisson, J. I. (2003). Single-session early psychological interventions following traumatic events. *Clinical Psychology Review, 23*(3), pp. 481-499.
- Blascovich, J., & Tomaka, J. (1996). The biopsychosocial model of arousal regulation. *Advances in Experimental Social Psychology, 28*, 1-51.
- Bledsoe, B. E. (2003). Critical incident stress management (CISM): Benefit or risk for emergency services? *Prehospital Emergency Care, 7*(2), pp. 272-279.
- Bliese, P. D., & Castro, C. A. (2003). The soldier adaptation model (SAM): Applications to peacekeeping missions. In T. W. Britt and A. B. Adler (Eds). *The psychology of the peacekeeper: Lessons learned from the field* (pp. 185-204). Westport, CT: Praeger.
- Bloom, L. J., & Cantrell, D. (1978). Anxiety management training for essential hypertension in pregnancy. *Behavior Therapy, 9*(3), 377-382.
- Bloom, A. J., & Hautaluoma, J. E. (1990). Anxiety management training as a strategy for enhancing computer user performance. *Computers in Human Behavior, 6*(4), 337-349.

Blowers, C., Cobb, J. & Mathews, A. (1987). Generalised anxiety: A controlled treatment study. *Behaviour Research and Therapy*, 25(6), 493-502.

Blumenthal, J. A., Jiang, W., Babyak, M. A., Krantz, D. S., Frid, D. J., Coleman, R. E., et al. (1997). Stress management and exercise training in cardiac patients with myocardial ischemia: Effects on prognosis and evaluation of mechanisms. *Archives of Internal Medicine*, 157(19), 2213-2223.

Blythe, B. J., & Erdahl, J. C. (1986). Using stress inoculation to prepare a patient for open-heart surgery. *Health & Social Work*, 11(4), 265-274.

Boardway, R. H., Delamater, A. M., Tomakowsky, J., & Gutai, J. P. (1993). Stress management training for adolescents with diabetes. *Journal of Pediatric Psychology*, 18(1), 29-45.

Bohachick, P. (1984). Progressive relaxation training in cardiac rehabilitation: Effect of psychological variables. *Nursing Research*, 33(5), 283-287.

Bolton, E. E., Litz, B.T., Britt, T. W., Adler, A., & Roemer, L. (2001). Reports of prior exposure to potentially traumatic events and PTSD in troops poised for deployment. *Journal of Traumatic Stress*, 14(1), 249-256.

Bond, A. J., Wingrove, J., Valerie-Curran, H., & Lader, M. H. (2002). Treatment of generalised anxiety disorder with a short course of psychological therapy, combined with buspirone or placebo. *Journal of Affective Disorders*, 72(3), 267-271.

Bormann, J. E., Oman, D., Kemppainen, J. K., Becker, S., Gershwin, M., & Kelly, A. (2006). Mantram repetition for stress management in veterans and employees: A critical incident study. *Journal of Advanced Nursing*, 53(5), 502-512.

Bosley, F., & Allen, T. W. (1989). Stress management training for hypertensives: Cognitive and physiological effects. *Journal of Behavioral Medicine*, 12(1), 77-90.

Bouchard, S, Côté, S., & Richard, D. S. (2006). Virtual reality applications of exposure. Dans D.S. Richard and D. Lauterbach (Éd.). *Handbook of exposure (Ch. 16)*, pp. 347-388. New York: Academic Press,

Bouchard, S., St-Jacques, J., Robillard, G., & Renaud, P. (2008). Anxiety increases the sense of presence in virtual reality. *Presence: Teleoperators and Virtual Environments*, 4(1), 376-391.

Breslau, N., Davis, G. C., Andreski, P., & Peterson, E. (1991). Traumatic events and post-traumatic stress disorder in an urban population of young adults. *Archives of General Psychiatry*, 48, 216-222.

Brewin, C. R., Andrews, B., & Valentine, J. D. (2000). Meta-analysis of risk factors for post-traumatic stress disorder in trauma-exposed adults. *Journal of Consulting and Clinical Psychology*, 68(5), 748-766.

Briere, J. (1997). *Psychological assessment of adult post-traumatic states*. Washington: American Psychological Association.

- Britt, T. W. (2006). *The psychology of serving in peace and combat*. Praeger Security International.
- Brown, J. S. L., Cochrane, R., Mack, C.F., Leung, N., & Hancox, T. (1998). Comparison of effectiveness of large scale stress workshops with small stress / anxiety management training groups. *Behavioural and Cognitive Psychotherapy*, 26, 219-235.
- Brown, S. (1983). Coping skills training: Attitude toward mental illness, depression, and quality of life 1 year later. *Journal of Counseling Psychology*, 30(1), 117-120.
- Brown, J. L., & Venable, P. A. (2008). Cognitive-behavioral stress management interventions for persons living with HIV: A review and critique of the literature. *Annals of Behavioral Medicine*, , 1-15.
- Brown, K. J., Villeneuve, M., & Lamerson, C. D. (2005, June). *Human dimensions of operation survey : Revision and two year validation (Technical note 2004-10)*. Ottawa : National Defence Headquarters.
- Brunet, A., Sergerie, K., & Corbo, V. (2006). Une théorie neurocognitive des processus impliqués dans le développement et la remission des psychotraumatismes. In S. Guay, & A. Marchand (Eds), *Les troubles liés aux évènements traumatiques – Dépistage, évaluation et traitements* (pp. 119-136). Montréal : Les Presses de l'Université de Montréal.
- Buljan, D., Buljan, M., Živković, M. V., & Šitum, M. (2008). Basic aspects of psychodermatology. *Psychiatria Danubina*, 20(3), 415-418.
- Bundy, C., Carroll, D., Wallace, L., & Nagle, R. (1998). Stress management and exercise training in chronic stable angina pectoris. *Psychology and Health*, 13(1), 147-155.
- Burkhardt, J.-M., Lourdeaux, D., & d'Huart, D. M. (2003). La conception des environnements virtuels pour l'apprentissage. In P. Fuchs & Moreau, G. (Eds.), *Le traité de la réalité virtuelle (2e éd.) volume II : Création des environnements virtuels et application* (pp.207-296). Paris : École des Mines de Paris – Les Presses.
- Butcher, P., & Davis, H. (1988). Personal effectiveness and stress management course for community health workers: A pilot study. *Patient Education and Counseling*, 12, 13-27.
- Butler, G., Cullington, A., Munby, M., Amies, P., & Gelder, M. (1984). Exposure and anxiety management in the treatment of social phobia. *Journal of Consulting and Clinical Psychology*, 52(4), 642-650.
- Byron, D. (2002). The use of hypnosis to help an anxious student with a social communication disorder to attend school. *Contemporary Hypnosis*, 19(3), 125-132.
- Cabrera, O. A., Hoge, C. W., Bliese, P. D., Castro, C. A., & Messer, S. C. (2007). Childhood adversity and combat as predictors of depression and post-traumatic stress in deployed troops. *Am J Prev Med*, 33(2), 77-82.

- Cahill, S. P., Rauch, S. A., Hembree, E. A., & Foa, E. B. (2003). Effect of cognitive-behavioral treatments for PTSD on anger. *Journal of Cognitive Psychotherapy: An International Quarterly*, 17(2), 113-131.
- Callers, J., Foy, D. W., Donahue, C. P., & Goldfarb, J. (1988). Post-traumatic stress disorder in Vietnam combat veterans: Effects of traumatic violence exposure and military adjustment. *Journal of Traumatic Stress*, 1, 181-192.
- Canino, E., Cardona, R., Monsalve, P., Pérez Acuña, F., López, B., & Fragachan, F. (1994). A behavioral treatment program as a therapy in the control of primary hypertension. *Acta científica Venezolana*, 45(1), 23-30.
- Carrico, A. W., Antoni, M. H., Durán, R. E., Ironson, G., Penedo, F., Fletcher, M. A., et al. (2006). Reductions in depressed mood and denial coping during cognitive behavioral stress management with HIV-positive gay men treated with HAART. *Annals of Behavioral Medicine*, 31(2), 155-164.
- Carrington, P., Collings Jr., G. H., & Benson, H. (1980). The use of meditation-relaxation techniques for the management of stress in a working population. *Journal of Occupational Medicine*, 22(4), 221-231.
- Cary, M., & Dua, J. (1999). Cognitive-behavioral and systematic desensitization procedures in reducing stress and anger in caregivers for the disabled. *International Journal of Stress Management*, 6(2), 75-87.
- Castro, C. A., & Adler, A. B. (2005). Preface to the special issue. *Military Psychology*, 17(3), 131-136.
- Cecil, M. A., & Forman, S. G. (1990). Effects of stress inoculation training and coworker support groups on teachers' stress. *Journal of School Psychology*, 28, 105-118.
- Charlesworth, E. A., & Dempsey, G. (1982). Trait anxiety reductions in a substance abuse population trained in stress management. *Journal of Clinical Psychology*, 38(4), 764-769.
- Charlesworth, E. A., Murphy, S., & Beutler, L. E. (1981). Stress management skill for nursing students. *Journal of Clinical Psychology*, 37(2), 284-290.
- Charlesworth, E. A., Williams, B. J., & Baer, P. E. (1984). Stress management at the worksite for hypertension: Compliance, cost-benefit, health care and hypertension-related variables. *Psychosomatic Medicine*, 46(5), 387-397.
- Childs-Clarke, A., Whitfield, W., Cadbury, S., & Sandu, S. (1989). Anxiety management groups in clinical practice. *Nursing times*, 85(30), 49-52.
- Cigrang, J. A., Todd, S. L., & Carbone, E. G. (2000). Stress management training for military trainees returned to duty after mental health evaluation: Effect on graduation rates. *Journal of Occupational Health Psychology*, 5(1), 48-55.

- Coombs, R. B., Jensen, P., Hao Her, M., Ferguson, B. S., Jarry, J. L., wong, J. S. W., & al. (1995). *Review of the scientific literature on the prevalence, consequences, and health costs of noncompliance & inappropriate use of prescription medication in Canada*. Ottawa: Robert B. Coombs, University of Toronto Press.
- Coates, T. J., McKusick, L., Kuno, R., & Stites, D. P. (1989). Stress reduction training changed number of sexual partners but not immune function in men with HIV. *American Journal of Public Health*, 79(7), 885-887.
- Cobb, S., Neale, H., Crosier, J., & Wilson, J. R. (2002). Development and evaluation of virtual environments for education. In K. M. Stanney, (Ed.), *Handbook of virtual Environments. Design, implementation, and applications* (pp. 911-936). Mahwah, New Jersey : Lawrence Erlbaum Associates, Publishers.
- Cohen, L. L. (2008). Behavioral approaches to anxiety and pain management for pediatric venous access. *Pediatrics*, 122 Suppl 3, S134-139.
- Coogle, C. L., Jablonski, R., Rachel, J. A., & Parham, I. A. (2008). Skills-enhancement training program for home care providers: Implications for redefining quality care. *Home Health Care Management & Practice*, 20(4), 312-322.
- Coulthard, P., & Craig, D. (1997). Conscious sedation. *Dental Update*, 24(9), 376-381.
- Cragan, M. K., & Deffenbacher, J. L. (1984). Anxiety management training and relaxation as self-control in the treatment of generalized anxiety in medical outpatients. *Journal of Counseling Psychology*, 31(2), 123-131.
- Credidio, S. G. (1980). Stress management with a psychophysiological profile, biofeedback, and relaxation training techniques. *American Journal of Clinical Biofeedback*, 3(2), 130-136.
- Crockford, D., Holt-Seitz, A., & Adams, B. (2004). Preparing psychiatry residents for the certification exam: A survey of residency and exam experiences. *Canadian Journal of Psychiatry*, 49(10), 690-695.
- Crouch, R. B. (2008). A community-based stress management programme for an impoverished population in south Africa. *Occupational Therapy International*, 15(2), 71-86.
- Crowther, J. H. (1983). Stress management training and relaxation imagery in the treatment of essential hypertension. *Journal of Behavioral Medicine*, 6(2), 169-187.
- Cruess, D. G., Antoni, M. H., Schneiderman, N., Ironson, G., McCabe, P., Fernandez, J. B., et al. (2000). Cognitive-behavioral stress management increases free testosterone and decreases psychological distress in HIV-seropositive men. *Health Psychology*, 19(1), 12-20.
- Cruess, S., Antoni, M., Cruess, D., Fletcher, M. A., Ironson, G., Kumar, M., et al. (2000). Reductions in herpes simplex virus type 2 antibody titers after cognitive behavioral stress management and relationships with neuroendocrine function, relaxation skills, and social support in HIV-positive men. *Psychosomatic Medicine*, 62(6), 828-837.

- Cruess, S., Antoni, M. H., Hayes, A., Penedo, F., Ironson, G., Fletcher, M. A., et al. (2002). Changes in mood and depressive symptoms and related change processes during cognitive-behavioral stress management in HIV-infected men. *Cognitive Therapy and Research*, 26(3), 373-392.
- Daley, P. C., Bloom, L. J., Deffenbacher, J. L., & Stewart, R. (1983). Treatment effectiveness of anxiety management training in small and large group formats. *Journal of Counseling Psychology*, 30(1), 104-107.
- Davey, T. L., & Neff, J.A. (2001). A shelter-based stress-reduction group intervention targeting self-esteem, social competence, and behaviour problems among homeless children. *Journal of Social Distress and the Homeless*, 10(3), 279-291.
- Deahl, M., Srinivasan, M., Jones, N., Thomas, J., Neblett, C., Jolly, A. (2000). Preventing psychological trauma in soldiers: The role of operational stress training and psychological debriefing. *British Journal of Medical Psychology*, 73(1), pp. 77-85.
- Deffenbacher, J. L., & Michaels, A. C. (1981). Anxiety management training and self-control desensitization--15 months later. *Journal of Counseling Psychology*, 28(5), 459-462.
- Deffenbacher, J. L., & Michaels, A. C. (1981). A 12-month follow-up of homogeneous and heterogeneous anxiety management training. *Journal of Counseling Psychology*, 28(5), 463-466.
- Deffenbacher, J. L., Michaels, A. C., Daley, P. C., & Michaels, T. F. (1980). A comparison of homogeneous and heterogeneous anxiety management training. *Journal of Counseling Psychology*, 27(6), 630-634.
- Deffenbacher, J. L., Michaels, A. C., Michaels, T., & Daley, P. C. (1980). Comparison of anxiety management training and self-control desensitization. *Journal of Counseling Psychology*, 27(3), 232-239.
- Deffenbacher, J. L., & Shelton, J. L. (1978). Comparison of anxiety management training and desensitization in reducing test and other anxieties. *Journal of Counseling Psychology*, 25(4), 277-282.
- de Jong, G. M., & Emmelkamp, P. M. G. (2000). Implementing a stress management training : Comparative trainer effectiveness. *Journal of Occupational Health Psychology*, 5(2), 309-320.
- de Vente, W., Kamphuis, J. H., Emmelkamp, P. M. G., & Blonk, R. W. B. (2008). Individual and group cognitive-behavioral treatment for work-related stress complaints and sickness absence: A randomized controlled trial. *Journal of Occupational Health Psychology*, 13(3), 214-231.
- Dewe, P. (1989). Developing stress management programs: What can we learn from recent research ? *Journal of Occupational Health and Safety – Australia and New Zealand*, 5(6), 493-500.
- Dickerson, S. S., & Kemeny, M. E. (2004). Acute stressors and cortisol responses: A theoretical integration and synthesis of laboratory research. *Psychological Bulletin*, 130(3), 355-391.

- Dienstbier, R. A. (1989). Arousal and physiological toughness: Implications for mental and physical health. *Psychological Review*, 96, 84-100.
- Dobрева-Martinova, T., Little, G. P., & Wild, W. R. (1998). *Psychometric analysis of the stress in military service questionnaire based on surveys of deployed Canadian forces personnel* (Sponsor Research Report 98-16). Ottawa: National Defense Headquarters.
- Dodd, H., & Wellman, N. (2000). Staff development, anxiety and relaxation techniques: a pilot study in an acute psychiatric inpatient setting. *Journal of Psychiatric and Mental Health Nursing*, 7(5), 443-448.
- Dolan, C. A. Adler, A. B., & (2006). Military hardiness as a buffer of psychological health on return from deployment. *Military Medicine*, 171(2), 93-98.
- Dollard, M., Forgan, R., & Winefield, A. (1998). Five-year evaluation of a work stress intervention program. *Journal of occupational health and safety*, 14(2), 159-165.
- Durán Bouza, M., Simón, M. A., & Seoane, J. M. (2002). An evaluation of pharmacological treatment combined with stress inoculation training in the management of oral lichen planus. *Psychology and Health*, 17(6), 793-799.
- Durham, R. C., Fisher, P. L., Treliving, L. R., Hau, C. M., Richard, K., & Stewart, J. B. (1999). One year follow-up of cognitive therapy, analytic psychotherapy and anxiety management training for generalized anxiety disorder: Symptom change, medication usage and attitudes to treatment. *Behavioural and Cognitive Therapy*, 27(1), 19-35.
- Durham, R. C., Murphy, T., Allan, T., Richard, K., Treliving, L.R., & Fenton, G. W. (1994). Cognitive therapy, analytic psychotherapy and anxiety management training for generalised anxiety disorder. *British Journal of Psychiatry*, 165, 315-323.
- Dusek, J. A., Hibberd, P. L., Buczynski, B., Chang, B., Dusek, K. C., Johnston, J. M., et al. (2008). Stress management versus lifestyle modification on systolic hypertension and medication elimination: A randomized trial. *Journal of Alternative and Complementary Medicine*, 14(2), 129-138.
- Edelman, & Chambless, D. L. (1993). Compliance during sessions and homework in exposure-based treatment of agoraphobia. *Behaviour Research and Therapy*, 31(8), 767-773.
- Edimansyah, B. A., Rusli, B. N., & Naing, L. (2008). Effects of short duration stress management training on self-perceived depression, anxiety and stress in male automotive assembly workers: A quasi-experimental study. *Journal of Occupational Medicine and Toxicology*, 3(1), 28.
- Edwards, D. (1997). Lifestyle, stress and hypertension: A case-study approach. *South African Journal of Psychology*, 27(1), 22-29.
- Edwards, D., & Burnard, P. (2003). A systematic review of stress and stress management interventions for mental health nurses. *Journal of Advanced Nursing*, 42(2), 169-200.

- Ehlers, A., & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy*, 38, 319-345.
- Elsesser, K., Sartory, G., & Maurer, J. (1996). The efficacy of complaints management training in facilitating benzodiazepine withdrawal. *Behaviour Research and Therapy*, 34(2), 149-156.
- Elsesser, K., Van Berkel, M., Sartory, G., Biermann-Gocke, W., & Ohl, S. (1994). The effects of anxiety management training on psychological variables and immune parameters in cancer patients: A pilot study. *Behavioural Psychotherapy*, 22(1), 13-23.
- Eniola, M., & Busari, A. O. (2007). Effects of stress management training of self-image perception of the visually impaired individuals. *Essays in Education*, 19, 10-17.
- Eriksen, H. R., Ihlebaek, C., Mikkelsen, A., Gronningsaeter, H., Sandal, G. M., & Ursin, H. (2002). Improving subjective health at the worksite: A randomized controlled trial of stress management training, physical exercise and an integrated health programme. *Occupational Medicine*, 52(7), 383-391.
- Esch, T., Duckstein, J., Welke, J., Stefano, G. B., & Braun, V. (2007). Mind/body techniques for physiological and psychological stress reduction: Stress management via tai chi training - A pilot study. *Medical Science Monitor*, 13(11), CR488-CR497.
- Feeny, N. C., Zoellner, L. A., & Foa, E. B. (2002). Treatment outcome for chronic PTSD among female assault victims with borderline personality characteristics: A preliminary examination. *Journal of Personality Disorders*, 16(1), 30-40.
- Fernández, C., & Amigo, I. (2006). Efficacy of training in stress and contingency management in cases of irritable bowel syndrome. *Stress and Health*, 22(5), 285-295.
- Fernandez, C., Perez, M., Amigo, I., & Linares, A. (1998). Stress and contingency management in the treatment of irritable bowel syndrome. *Stress Medicine*, 14(1), 31-42.
- Fiedler, N., Vivona-Vaughan, E., & Gochfeld, M. (1989). Evaluation of a work site relaxation training program using ambulatory blood pressure monitoring. *Journal of Occupational Medicine*, 31(7), 595-602.
- Fitzgerald, S. G., & Gonzalez, E. (1994). Dissociative states induced by relaxation training in a PTSD combat veteran: Failure to identify trigger mechanisms. *Journal of Traumatic Stress*, 7(1), 111-115.
- Flack Jr, W. F., Litz, B. T., & Keane, T. M. (1998). Cognitive-Behavioral Treatment of War-Zone-Related Posttraumatic Stress Disorder - A flexible, hierarchical approach. In V. M. Follette, J. I. Ruzek, & F. R. Abues (Eds). *Behavioral Therapies for Trauma* (pp. 77-99). New York: The Guilford Press.
- Flannery Jr., R. B. (2001). The Assaulted Staff Action Program (ASAP): Ten year empirical support for Critical Incident Stress Management (CISM). *International Journal of Emergency Mental Health*, 3(1), pp. 5-10.

- Flannery Jr., R. B., & Everly Jr., G. S. (2004). Critical incident stress management (CISM): Updated review of findings, 1998-2002. *Aggression and Violent Behavior, 9*(4), 319-329.
- Foa, E. B., Dancu, C. V., Hembree, E. A., Jaycox, L. H., Meadows, E. A., & Street, G. P. (1999). A comparison of exposure therapy, stress inoculation training, and their combination for reducing posttraumatic stress disorder in female assault victims. *Journal of Consulting and Clinical Psychology, 6* (2), 194-200.
- Foa, E. B., Rothbaum, B. O., Riggs, D. S., & Murdock, T. B. (1991). Treatment of posttraumatic stress disorder in rape victims: A comparison between cognitive-behavioral procedures and counseling. *Journal of Consulting and Clinical Psychology, 59*(5), 715-723.
- Foley, F. W., Bedell, J. R., LaRocca, N. G., Scheinberg, L. C., & Reznikoff, M. (1987). Efficacy of stress-inoculation training in coping with multiple sclerosis. *Journal of Consulting and Clinical Psychology, 55*(6), 919-922.
- Fontana, A. M., Hyra, D., Godfrey, L., & Cermak, L. (1999). Impact of a peer-led stress inoculation training intervention on state anxiety and heart rate in college students. *International Journal of Fracture, 100*(1), 45-63.
- Forbes, E. J., & Pekala, R. J. (1993). Psychophysiological effects of several stress management techniques. *Psychological Reports, 72*(1), 19-27.
- Forman, S. G. (1981). Stress-management training: Evaluation of effects on school psychological services. *Journal of School Psychology, 19*(3), 233-241.
- Forman, S. G. (1982). Stress management for teachers : a cognitive-behavioral program. *Journal of School Psychology, 20*(3), 180-187.
- Frisch, M. B., Elliott, C. H., Atsides, J. P., Salva, D. M., & Denney, D. R. (1982). Social skills and stress management training to enhance patients' interpersonal competencies. *Psychotherapy: Theory, Research and Practice, 19*(3), 349-358.
- Gaab, J., Blättler, N., Menzi, T., Pabst, B., Stoyer, S., & Ehlert, U. (2003). Randomized controlled evaluation of the effects of cognitive-behavioral stress management on cortisol responses to acute stress in healthy subjects. *Psychoneuroendocrinology, 28*(6), 767-779.
- García-Vega, E., & Fernandez-Rodriguez, C. (2004). A stress management programme for crohn's disease. *Behaviour Research and Therapy, 42*(4), 367-383.
- García-Vera, M. P., Sanz, J., & Labrador, F. J. (2004). Blood pressure variability and stress management training for essential hypertension. *Behavioral Medicine, 30*(2), 53-62.
- García-Vera, M. P., Sanz, J., & Labrador, F. J. (1998). Psychological changes accompanying and mediating stress-management training for essential hypertension. *Applied Psychophysiology Biofeedback, 23*(3), 159-178.

- Gardner, B., Rose, J., Mason, O., Tyler, P., & Cushway, D. (2005). Cognitive therapy and behavioural coping in the management of work-related stress: An intervention study. *Work & Stress, 19*(2), 137-152.
- Garrison, J. (1978). Stress management training for the handicapped. *Archives of Physical Medicine and Rehabilitation, 59*(12), 580-585.
- Garrison, J. E. (1978). Stress management training for the elderly: A psychoeducational approach. *Journal of the American Geriatrics Society, 26*(9), 397-403.
- Gerardi, S. M. (1999). Part I. Work hardening for warriors: Occupational therapy for combat stress casualties. *Work, 13*, 185-195.
- Gil, S., & Caspi, Y. (2006). Personality traits, coping style, and perceived threat as predictors of posttraumatic stress disorder after exposure to a terrorist attack: A prospective study. *Psychosomatic Medicine, 68*, 904-909.
- Gilbert, C. (2003). Clinical applications of breathing regulation: Beyond anxiety management. *Behavior Modification, 27*(5), 692-709.
- Goldberg, M. (1980). Clinical application of anxiety management and relaxation training: A multi-referral workshop. *Clinical Social Work Journal, 8*(4), 266-276.
- Gonzalez, L. O., & Sellers, E. W. (2002). The effects of a stress-management program on self-concept, locus of control, and the acquisition of coping skills in school-age children diagnosed with attention deficit hyperactivity disorder. *Journal of Child and Adolescent Psychiatry Nursing, 15*(1), 5-15.
- Gorini, A., & Riva, G. (2008). The potential of virtual reality as anxiety management tool: A randomized control study in a sample of patients affected by generalized anxiety disorder. *Trials, 9*, 25.
- Green, B. (1994). Psychological research in traumatic stress: An update. *Journal of Traumatic Stress, 7*, 341-362.
- Green, M. A., & Berlin, M. A. (1987). Five psychosocial variables related to the existence of post-traumatic stress disorder symptoms. *Journal of Clinical Psychology, 43*(6), 643-649.
- Green, B., Grace, M. C., & Gleser, C. G. (1985). Identifying survivors at risk: Long-term impairment following the Beverly Hills Supper Club fire. *Journal of Consulting and Clinical Psychology, 53*, 672-678.
- Green, B. L., Grace, M. C., Lindy, J. D., Gleser, G. C., & Leonard, A. C. (1990). Risk factors for PTSD and other diagnoses in a general sample of Vietnam veterans. *American Journal of Psychiatry, 147*, 729-733.
- Greenberg, J. S., Ramsey, S. A., & Hale, J. F. (1987). A portable, self-instructional stress management program for college students. *The Journal of School Health, 57*, 53-55.

- Grossman, S., & Wheeler, K. (1999). Integrating multidimensional stress management into a baccalaureate nursing curriculum. *Nursing Connections*, 12(2), 23-29.
- Gudjonsson, G. H. (1983). Factors reducing occupational stress in police officers: Junior officers' view. *Police Journal*, 56(3), 251-255.
- Hains, A. A. (1992). A stress inoculation training program for adolescents in a high school setting: A multiple baseline approach. *Journal of Adolescence*, 15(2), 163-175.
- Hains, A. A., Davies, W. H., Parton, E., Totka, J., & Amoroso-Camarata, J. (2000). A stress management intervention for adolescents with type 1 diabetes. *Diabetes Educator*, 26(3), 417-424.
- Hains, A. A., & Ellmann, S. W. (1994). Stress inoculation training as a preventive intervention for high school youths. *Journal of Cognitive Psychotherapy: An International Quarterly*, 8(3), 219-232.
- Halligan, S. L., Michael, T., Clark, D. M., & Ehlers, A. (2003). Posttraumatic stress disorder following assault: the role of cognitive processing, trauma memory, and appraisals. *Journal of Consulting and Clinical Psychology*, 71(3), 419-431.
- Hammerfald, K., Eberle, C., Grau, M., Kinsperger, A., Zimmermann, A., Ehlert, U., et al. (2006). Persistent effects of cognitive-behavioral stress management on cortisol responses to acute stress in healthy subjects - A randomized controlled trial. *Psychoneuroendocrinology*, 31(3), 333-339.
- Hampel, P., Jahr, A., & Backhaus, O. (2008). Gender-specific stress management training at school. *Praxis der Kinderpsychologie und Kinderpsychiatrie*, 57(1), 20-38.
- Hampel, P., Meier, M., Kümmel, U. (2008). School-based stress management training for adolescents: Longitudinal results from an experimental study. *Journal of Youth and Adolescence*, 37(8), pp. 1009-1024.
- Hampel, P., Petermann, F., Schmidt, S., Scheewe, S., & Stachow, R. (1999). Cognitive-behavioral stress management training as a major component of patient education for children and adolescents with psoriasis: Preliminary data. [Kognitiv-behaviorales stressbewältigungstraining als Baustein in der patientenschulung für kinder und jugendliche mit psoriasis: Erste ergebnisse] *Pravention Und Rehabilitation*, 11(1), 37-46.
- Hampel, P., Rudolph, H., Petermann, F., & Stachow, R. (2001). Stress management training for children and adolescents with atopic dermatitis during inpatient rehabilitation. *Dermatology and Psychosomatics*, 2(3), 116-122.
- Hampel, P., Rudolph, H., Stachow, R., & Petermann, F. (2003). Multimodal patient education program with stress management for childhood and adolescent asthma. *Patient Education and Counseling*, 49(1), 59-66.

- Han, K. S. (2002). The effect of an integrated stress management program on the psychologic and physiologic stress reactions of peptic ulcer in Korea. *International Journal of Nursing Studies*, 39(5), 539-548.
- Hart, K. E. (1984). Anxiety management training and anger control for type A individuals. *Journal of Behavior Therapy and Experimental Psychiatry*, 15(2), 133-139.
- Heldal, I., Schroeder, R., Steed, A., Axelsson, A.-S., Spante, M., & Widerström, J. (2005). Immersiveness and symmetry in copresent scenarios. *Proceedings of IEEE Virtual Reality 2005*, Bonn, Germany, March 171-178.
- Henry, J. P., & Grim, C. E. (1990). Psychosocial mechanism of primary hypertension. *Journal of Hypertension*, 8, 783-793.
- Henry, J. L., Wilson, P. H., Bruce, D. G., Chisholm, D. J., & Rawling, P. J. (1997). Cognitive-behavioural stress management for patients with non-insulin dependent diabetes mellitus. *Psychology, Health and Medicine*, 2(2), 109-118.
- Herbelin, B., Riquier, F., Vexo, F., and Thalmann, D. (2002). Virtual Reality in Cognitive Behavioral Therapy : a preliminary study on Social Anxiety Disorder. In: *8th International Conference on Virtual Systems and Multimedia, VSMM2002*.
- Herman, J. (1997). *Trauma and recover : The aftermath of violence - from domestic abuse to political terror*. New York: Basic Books.
- Heron, R. J. L., McKeown, S., Tomenson, J. A., & Teasdale, E. L. (1999). Study to evaluate the effectiveness of stress management workshops on response to general and occupational measures of stress. *Occupational Medicine*, 49(7), 451-457.
- Heyne, D., King, N. J., Tonge, B. J., & Cooper, H. (2001). School refusal epidemiology and management. *Paediatric Drugs*, 3(10), 719-732.
- Higgins, N. C. (1986). Occupational stress and working women: The effectiveness of two stress reduction programme. *Journal of Vocational Behavior*, 29(1), 66-78.
- Hill, K. B., Hainsworth, J. M., Burke, F. J. T., & Fairbrother, K. J. (2008). Evaluation of dentists' perceived needs regarding treatment of the anxious patient. *British Dental Journal*, 204(8).
- Hirokawa, K., Yagi, A., & Miyata, Y. (2002). An examination of the effects of stress management training for Japanese college students of social work. *International Journal of Stress Management*, 9, 113.
- Hockemeyer, J., & Smyth, J. (2002). Evaluating the feasibility and efficacy of a self-administered manual-based stress management intervention for individuals with asthma: Results from a controlled study. *Behavioral Medicine*, 27(4), 161-172.
- Hodgins, G. A., Creamer, M., & Bell, R. (2001). Risk factors for posttrauma reactions in police officers: A longitudinal study. *Journal of Nervous and Mental Disease*, 189(8), 541-547.

- Hoge, C. W., Castro, C. A., Messer, S. C., McGurk, D., Cotting, D. I., & Koffman, R. L. (2004). Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care. *NewEngland Journal of Medicine*, *351*, 13-22.
- Hoge, C. W., Terhakopian, A., Castro, C. A., Messer, S. C., & Engel, C. C. (2007). Association of posttraumatic stress disorder with somatic symptoms, health care visits, and absenteeism among Iraq war veterans. *Am J Psychiatry*, *164*(1), 150-153.
- Holcomb, W. R. (1986). Stress inoculation therapy with anxiety and stress disorders of acute psychiatric inpatients. *Journal of Clinical Psychology*, *42*(6), 864-872.
- Holden, M.K. (2005). Virtual environments for motor rehabilitation: review. *Cyberpsychology and Behavior*, *8*, 187 – 211.
- Holtzworth-Munroe, A., Munroe, M. S., & Smith, R. E. (1985). Effects of a stress-management training program on first- and second-year medical students. *Journal of Medical Education*, *60*(5), 417-419.
- Hotopf, M., Fear, N. T., & al. (2006). The health of UK military personnel who deployed to the 2003 Iraq war: A cohort study. *Lancet*. *367*. 1731-1741.
- Hutchings, D. F., Denney, D. R., Basgall, J., & Houston, B. K. (1980). Anxiety management and applied relaxation in reducing general anxiety. *Behaviour Research and Therapy*, *18*(3), 181-190.
- Hytten, K., Jensen, A., & Skauli, G. (1990). Stress inoculation training for smoke divers and free fall lifeboat passengers. *Aviation Space and Environmental Medicine*, *61*(11), 983-988.
- Iglesias, S. L., Azzara, S., Squillace, M., Jeifetz, M., Lopes, M. R., Desimone, M., & Diaz, L. (2005). A study on the effectiveness of a stress management programme for college students. *Pharmacy Education*, *5*, 27-31.
- Jacobs, J., Horne-Moyer, H. L., Jones, R. (2004). The effectiveness of critical incident stress debriefing with primary and secondary trauma victims. *International Journal of Emergency Mental Health*, *6*(1), pp. 5-14.
- Jacobsen, P. B., Meade, C. D., Stein, K. D., Chirikos, T. N., Small, B. J., & Ruckdeschel, J. C. (2002). Efficacy and costs of two forms of stress management training for cancer patients undergoing chemotherapy. *Journal of Clinical Oncology*, *20*(12), 2851-2862.
- Jaremko, M. E. (1980). The use of stress inoculation training in the reduction of public speaking anxiety. *Journal of Clinical Psychology*, *36*(3), 735-742.
- Jannoun, L., Oppenheimer, C., & Gelder, M. (1982). A self-help treatment program for anxiety state patients. *Behavior Therapy*, *13*(1), 103-111.
- Jay, S. M., & Elliott, C. H. (1990). A stress inoculation program for parents whose children are undergoing painful medical procedures. *Journal of Consulting and Clinical Psychology*, *58*(6), 799-804.

Joachim, G. (1983). The effects of two stress management techniques on feelings of well-being in patients with inflammatory bowel disease. *Nursing Papers. Perspectives En Nursing*, 15(4), 5-18.

Johnston, D. W. (1982). Behavioural treatment in the reduction of coronary risk factors: Type A behaviour and blood pressure. *British Journal of Clinical Psychology*, 21(4), 281-294.

Jorgensen, R. S., Houston, B. K., & Zurawski, R. M. (1981). Anxiety management training in the treatment of essential hypertension. *Behaviour Research and Therapy*, 19(6), 467-474.

Kaminer, D., Grimsrud, A., Myer, L., Stein, D. J., & Williams, D. R. (2008). Risk for post-traumatic stress disorder associated with different forms of interpersonal violence in South Africa. *Social Science & Medicine*, 67, 1589-1595.

Kaminer, Y., & Sharar, A. (1987). The stress inoculation training management of self-mutilating behavior: A case study. *Journal of Behavior Therapy and Experimental Psychiatry*, 18(3), 289-292.

Kamiyama, K., Yamami, N., Sato, K., Aoyagi, M., Kyoya, M., Mizuno, E., et al. (2004). Effects of a structured stress management program on psychological and physiological indicators among marine hazard rescues. *Journal of Occupational Health*, 46(6), 497-499.

Karam, E. G., Fayyad, J., Karam, A. N., Tabet, C. C., Melhem, N., Mneimneh, Z., Dimassi, H. (2008). Effectiveness and specificity of a classroom-based group intervention in children and adolescents exposed to war in Lebanon. *World Psychiatry*, 7(2), pp. 103-109.

Karnow, S. (1983). *Vietnam: A history*. New York: Viking Press.

Kazdin, A. E., & Whitley, M. K. (2003). Treatment of parental stress to enhance therapeutic change among children referred for aggressive and antisocial behavior. *Journal of Consulting and Clinical Psychology*, 71(3), 504-515.

Keane, T. M., Fairbank, J. A., Caddell, J. M., & Zimering, R. T. (1989). Implosive (flooding) therapy reduces symptoms of PTSD in Vietnam combat veterans. *Behavior Therapy*, 20, 245-260.

Keane, T. M., Marshall, A. D., & Taft, C. T. (2006). Posttraumatic stress disorder: Etiology, epidemiology, and treatment outcome. *Annual Review of Clinical Psychology*, 2, 161-197.

Keinan, G., Segal, A., Gal, U., & Brenner, S. (1995). Stress management for psoriasis patients: The effectiveness of biofeedback and relaxation techniques. *Stress Medicine*, 11(4), 235-241.

Kelly, J. A., Bradlyn, A. S., Dubbert, P. M., & St.Lawrence, J. S. (1982). Stress management training in medical school. *Journal of Medical Education*, 57(2), 91-99.

Kelly, K. R., & Stone, G. L. (1987). Effects of three psychological treatments and self-monitoring on the reduction of type A behavior. *Journal of Counseling Psychology*, 34(1), 46-54.

Kempainen, J., Eller, L. S., Bunch, E., Hamilton, M. J., Dole, P., Holzemer, W., et al. (2006). Strategies for self-management of HIV-related anxiety. *AIDS Care - Psychological and Socio-Medical Aspects of AIDS/HIV*, 18(6), 597-607.

- Kempainen, J. K., Holzemer, W. L., Nokes, K., Eller, L. S., Corless, I. B., Bunch, E. H., et al. (2003). Self-care management of anxiety and fear in HIV disease. *Journal of the Association of Nurses in AIDS Care, 14*(2), 21-29.
- Kessler, R. C., Andrews, G., Colpe, et al. (2002). Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological Medicine, 32*, 959-956.
- Kessler, R. C., Sonnega, A., Bromet, E., Hughes, M., & Nelson, C. B. (1995). Posttraumatic stress disorder in the National Comorbidity Survey. *Archives of General Psychiatry, 52*, 1048-1060.
- Keyes, J. B., & Dean, S. F. (1988). Stress inoculation training for direct contact staff working with mentally retarded persons. *Behavioral Residential Treatment, 3*(4), 315-323.
- Killgore, W.D.S., Stetz, M. C., Castro, C.A., & Hoge, C.W., (2006). The effects of prior combat experience on the expression of somatic and affective symptoms in deploying soldiers. *Journal of Psychosomatic Research, 60*, 379-385.
- Kilpatrick, D. G., Resnick, H. S., Freedy, J. R., Pelcovitz, D., Resick, P., Roth, S., et al. (1998). Posttraumatic stress disorder field trial: Evaluation of the PTSD construct-criteria A through E. In T. A. Widiger, A. J. Frances, H. A. Pincus, R. Ross, M. B. First, W. Davis, & M. Kline (Eds.), *DSM-IV sourcebook, Vol. 4* (pp. 803–841). Washington, DC: American Psychiatric Press.
- Kilpatrick, D. G., Saunders, B. E., Amick-McMullan, A., Best, C. L., Veronen, L. J., & Resnick, H. S. (1989). Victim and crime factors associated with the development of crime-related post-traumatic stress disorder. *Behavior Therapy, 20*, 199-214.
- Kim, J. H. (2007). A meta-analysis of effects of job stress management interventions (SMIs). *Taehan Kanho Hakhoe Chi, 37*(4), 529-539.
- Kirby, E. D., Williams, V. P., Hocking, M. C., Lane, J. D., & Williams, R. B. (2006). Psychosocial benefits of three formats of a standardized behavioural stress management program. *Psychosomatic Medicine, 68*(6), 816-823.
- Kiselica, M. S., Baker, S. B., Thomas, R. N., & Reddy, S. (1994). Effects of stress inoculation training on anxiety, stress, and academic performance among adolescents. *Journal of Counseling Psychology, 41*(3), 335-342.
- Klaman, D. L. (1997). The stress management workshop for medical students: Realizing psychiatry's potential. *Academic Psychiatry, 21*(1), 42-47.
- Koder, D. A. (1998). Treatment of anxiety in the cognitively impaired elderly: Can cognitive-behavior therapy help? *International Psychogeriatrics, 10*(2), 173-182.
- Kolt, G. S., Hume, P. A., Smith, P., Williams, M. M. (2004). Effects of a stress-management program on injury and stress of competitive gymnasts. *Perceptual and Motor Skills, 99*(1), 195-207.

- Kong, D. S., Lim, L. J., & Oon, C. H. (1989). Biofeedback and stress management strategies. *Annals of the Academy of Medicine Singapore*, 18(3), 261-265.
- Kontogiannis, T. (1996). Stress and operator decision making in coping with emergencies. *International Journal of Human Computer Studies*, 45(1), 75-104.
- Kraag, G., Van Breukelen, G., Lamberts, P., Vugts, O., Kok, G., Fekkes, M., Huijjer Abu-Sadd, H. (2007). Process evaluation of 'learn young, learn fair': A stress management programme for 5th and 6th graders. *School Psychology International*, 28(2), pp. 206-219.
- Kraag, G., Zeegers, M. P., Kok, G., Hosman, C., Abu-Saad, H. H. (2006). School programs targeting stress management in children and adolescents: A meta-analysis. *Journal of School Psychology*, 44(6), pp. 449-472.
- Krijn, M., Emmelkamp, P. M. G., Biemond, R., de Wilde de Ligny, C., Schuemie, M. J., van der Mast, C. A. P. G. (2004) Treatment of acrophobia in virtual reality : the role of immersion and presence. *Behaviour Research and Therapy*, 42, 229-239.
- Krischer, M. M., Xu, P., Meade, C. D., & Jacobsen, P. B. (2007). Self-administered stress management training in patients undergoing radiotherapy. *Journal of Clinical Oncology*, 25(29), 4657-4662.
- Kunkler, J., & Whittick, J. (1991). Stress-management groups for nurses : Practical problems and possible solutions. *Journal of Advanced Nursing*, 16, 172-176.
- Kushnir, T., Malkinson, R., & Ribak, J. (1994). Teaching stress management skills to occupational and environmental health physicians and practitioners: A graduate-level practicum. *Journal of Occupational Medicine*, 36(12), 1335-1340.
- Kushnir, T., Malkinson, R., & Ribak, J. (1995). A graduate level course: Teaching stress management skills to occupational health physicians and practitioners. *Safety Science*, 20, 337-341.
- Kushnir, T., Malkinson, R., & Ribak, J. (1998). Rational thinking and stress management in health workers: A psychoeducational program. *International Journal of Stress Management*, 5(3), 169-178.
- Lader, M. H., & Bond, A. J. (1998). Interaction of pharmacological and psychological treatments of anxiety. *British Journal of Psychiatry*, 173, 42-48.
- Lane, P. S. (1993-1994). Critical incident stress debriefing for health care workers. *Omega: Journal of Death and Dying*, 28(4), 301-315.
- Larsson, G., Cook, C., & Starrin, B. (1988). A time and cost efficient stress inoculation training program for athletes: A study of junior golfers. *Scandinavian Journal of Sports Sciences*, 10(1), 23-28.
- Law, A., Logan, H., & Baron, R. S. (1994). Desire for control, felt control, and stress inoculation training during dental treatment. *Journal of Personality and Social Psychology*, 67(5), 926-936.

- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.
- Leahy, A., Clayman, C., Mason, I., Lloyd, G., & Epstein, O. (1998). Computerised biofeedback games: A new method for teaching stress management and its use in irritable bowel syndrome. *Journal of the Royal College of Physicians of London*, 32(6), 552-556.
- Lee, C., Gavriel, H., Drummond, P., Richards, J., & Greenwald, R. (2002). Treatment of PTSD: Stress inoculation training with prolonged exposure compared to EMDR. *Journal of Clinical Psychology*, 58(9), 1071-1089.
- Lee, M. S., Ryu, H., & Chung, H. T. (2000). Stress management by psychosomatic training: Effects of ChunDoSunBup Qi-training on symptoms of stress: A cross-sectional study. *Stress Medicine*, 16, 161-166.
- Lee, H.-L., Tan, H.K.-L., Ma, H.-I., & Tsai, K. (2006). Effectiveness of a work-related stress management program in patients with chronic schizophrenia. *American Journal of Occupational Therapy*, 60(4), 435-441.
- Lee, D., & Young, K. (2001). Post-traumatic stress disorder: Diagnostic issues and epidemiology in adult survivors of traumatic events. *International Review of Psychiatry*, 13, 150-158.
- Leff, J. (1994). Working with the families of schizophrenic patients. *The British Journal of Psychiatry*, 23, 71-76.
- Legarreta Vázquez, N., Albizu, C., Vera, M., & Dávila Torres, R. R. (2001). Factors associated with the level of anxiety of nursing personnel taking care of HIV positive patients. [Factores Asociados al Nivel de Ansiedad del Personal de Enfermería al Ofrecer Cuidado al Paciente VIH Positivo.] *Puerto Rico Health Sciences Journal*, 20(4), 395-404.
- Le Scanff, C., & Taugis, J. (2002). Stress management for police special forces. *Journal of Applied Sport Psychology*, 14, 330-343.
- Lester, D., Leitner, L. A., & Posner, I. (1983). Stress management training for hospital supervisory personnel. *Hospital Topics*, 61(3), 8-9.
- Levenson Jr., R. L. (2004). The care and feeding of critical incident stress management. *International Journal of Emergency Mental Health*, 6(1), pp. 1-3.
- Liang, M. T. C., Garcia, M. D., & McAllister, L. (1988). Effects of an exercise and stress management program on cardiac patients' psychosocial and vocational status: Preliminary study. *Journal of the American Osteopathic Association*, 88(10), 1209-1218.
- Lindsay, W. R., Gamsu, C. V., & McLaughlin, E. (1987). A controlled trial of treatments for generalized anxiety. *British Journal of Clinical Psychology*, 26(1), 3-15.
- Litz, B. T., Gray, M., Bryant, R. A., & Adler, A. B. (2002). Early intervention for trauma: current status and future directions. *Clin Psychol Sci Pract.*, 9, 112-134.

- Lloyd-Williams, M., & Hughes, J. G. (2008). The management of anxiety in advanced disease. *Progress in Palliative Care*, 16(1), 47-50.
- Lobitz, W. C., Brammell, H. L., Stoll, S., & Niccoli, A. (1983). Physical exercise and anxiety management training for cardiac stress management in a nonpatient population. *Journal of Cardiac Rehabilitation*, 3(10), 683-688.
- Loh, K. Y., & Siang, T. K. (2008). Understanding non ulcer dyspepsia. *Medical Journal of Malaysia*, 63(2), 174-176.
- Long, B. C. (1985). Stress-management interventions: A 15-month follow-up of aerobic conditioning and stress inoculation training. *Cognitive Therapy and Research*, 9(4), 471-478.
- Lovallo, W. R. (2005). *Stress & Health.: Biological and psychological interaction (2nd Ed.)*. SAGE Publications, Inc.
- Lovas, J. G., & Lovas, D. A. (2007). Rapid relaxation - practical management of preoperative anxiety. *Journal of the Canadian Dental Association*, 73(5), 437-440.
- Lozano, J. A. F., Candenas, J. A., Sanchez, C. A. V., Iglesias, B. M. B., & Suarez, P. C. M. (1999). Psychosocial stimulation programs for caregivers of elderly people («professional caregivers»). *Geriatry*, 15(2), 15-23.
- Lucini, D., Riva, S., Pizzinelli, P., & Pagani, M. (2007). Stress management at the worksite: Reversal of symptoms profile and cardiovascular dysregulation. *Hypertension*, 49(2), 291-297.
- Luskin, F., Reitz, M., Newell, K., Quinn, T. G., & Haskell, W. (2002). A controlled pilot study of stress management training of elderly patients with congestive heart failure. *Preventive Cardiology*, 5(4), 168-172+176.
- Luskin, F., Newell, K., & Haskell, W. (1999). Stress management training of elderly patients with congestive heart failure: Pilot study. *Preventive Cardiology*, 2(3), 101-104.
- Lutendorf, S. K., Antoni, M. H., Ironson, G., Klimas, N., Kumar, M., Starr, K., et al. (1997). Cognitive-behavioral stress management decreases dysphoric mood and herpes simplex virus-type 2 antibody titers in symptomatic HIV-seropositive gay men. *Journal of Consulting and Clinical Psychology*, 65(1), 31-43.
- Mace, R., & Carroll, D. (1986). Stress inoculation training to control anxiety in sport : Two case studies in squash. *British Journal of Sports Medicine*, 20(3), 115-117.
- Mace, R., & Carroll, D. (1989). The effects of stress inoculation training on self-reported stress, observer's rating of stress heart rate and gymnastics performance. *Journal of Sports Sciences*, 7, 257-266.
- Mace, R., Carroll, D., & Eastman, C. (1986). Effects of stress inoculation training on self-report, behavioural and psychophysiological reactions to abseiling. *Journal of Sports Sciences*, 4, 229-236.

- Mace, R., Eastman, C., & Carroll, D. (1986). Stress inoculation training: A case study in gymnastics. *British Journal of Sports Medicine*, 20(3), 139-141.
- Maercker, A., Beauducel, A., & Schutzwohl, M. (2000). Trauma severity and initial reactions as precipitating factors for posttraumatic stress symptoms and chronic dissociation in former political prisoners. *Journal of Traumatic Stress*, 13(4), 651-660.
- Malcolm, A. S., Seaton, J., Perera, A., Sheehan, D. C., & Van Hasselt, V. B. (2005). Critical incident stress debriefing and law enforcement: An evaluative review. *Brief Treatment and Crisis Intervention*, 5(3), pp. 261-278.
- Malkinson, R., Kushnir, T., Weisberg, E. (1997). Stress management and burnout prevention in female blue-collar workers: Theoretical and practical implications. *International Journal of Stress Management*, 4(3), pp. 183-195.
- Mandel, A. R., & Keller, S. M. (1986). Stress management in rehabilitation. *Archives of Physical Medicine and Rehabilitation*, 67(6), 375-379.
- Manderino, M. A., & Brown, M. C. (1992). Practical, step-by-step approach to stress management for women. *Nurse Practitioner*, 17(7), 18-24.
- Manderino, M. A., Ganong, L. H., & Darnell, K. F. (1988). Survey of stress management content in baccalaureate nursing curricula. *The Journal of Nursing Education*, 27, 321-325.
- March, J. S. (1995). Cognitive-behavioral psychotherapy for children and adolescents with OCD: A review and recommendations for treatment. *Journal of the American Academy of Child and Adolescent Psychiatry*, 34(1), 7-18.
- Marchand, A., Guay, S., Boyer, R., Iucci, S., Martin, A., & St-Hilaire, M.-H. (2006). A randomized controlled trial of an adapted form of individual critical incident stress debriefing for victims of an armed robbery. *Brief Treatment and Crisis Intervention*, 6(2), pp. 122-129.
- Marks, I. (1985). Behavioral treatment of social phobia. *Psychopharmacology Bulletin*, 21 (3), 615-618.
- Marks, I. M. (1987). *Fears, phobias and rituals : Panic, anxiety and their disorders*. NY : Oxford University Press.
- Marmar, C. R., Weiss, D. S., Schlenger, W. E., Fairbank, J. A., Jordan, B. K., Kulka, R. A., & Hough, R. L. (1994). Peritraumatic dissociation and post-traumatic stress in male Vietnam theater veterans. *American Journal of Psychiatry*, 151, 902-907.
- Marshall, M. (1991). Stress management in dermatology patients. *Nursing Standard (Royal College of Nursing (Great Britain) : 1987)*, 5(24), 29-31.
- Marteau, T. M., Kidd, J., Michie, S., Cook, R., Johnston, M., & Shaw, R. W. (1993). Anxiety, knowledge and satisfaction in women receiving false positive results on routine prenatal screening: A randomized controlled trial. *Journal of Psychosomatic Obstetrics and Gynaecology*, 14(3), 185-196.

- Martin, M., Germain, V., & Marchand, A. (2006). Facteurs de risque et de protection dans la modulation de l'état de stress post-traumatique. In S. Guay, & A. Marchand (Eds), *Les troubles liés aux événements traumatiques – Dépistage, évaluation et traitements* (pp. 58-86). Montréal: Les Presses de l'Université de Montréal.
- Martin, M., & Marchand, A. (2003). Prediction of posttraumatic stress disorder: Peritraumatic dissociation, negative emotions and physical anxiety among french-speaking university students. *Journal of Trauma and Dissociation*, 4(2), 49-63.
- Mason, J. W. (1968). A review of psychoendocrine research on the pituitary-adrenal cortical system. *Psychosomatic Medicine*, 30, 576-607.
- Mason, J. W. (1975). A historical view of the stress field. *Journal of Human Stress*, 1(2), 22-36.
- Maspfuhl, B., & Rauchfuss, M. (1986). Program and effectivity of psychological preparation for childbirth. 1. communication: Behaviour program of preparation for childbirth. [Programm und effizienz psychologisch orientierter geburtsvorbereitung. 1. Mitteilung: Verhaltenstherapeutisches geburtsvorbereitungsprogramm] *Zentralblatt Fur Gynakologie*, 108(2), 97-103.
- McCain, N. L., Munjas, B. A., Munro, C. L., Elswick Jr., R. K., Wheeler Robins, J. L., Ferreira-Gonzalez, A., et al. (2003). Effects of stress management on PNI-based outcomes in persons with HIV disease. *Research in Nursing and Health*, 26(2), 102-117.
- McCain, N. L., Zeller, J. M., Cella, D. F., Urbanski, P. A., & Novak, R. M. (1996). The influence of stress management training in HIV disease. *Nursing Research*, 45(4), 246-253.
- McCammon, S., Durham, T. W, Allison, E. J., & Williamson, J. E. (1988). Emergency worker's cognitive appraisal and coping with traumatic events. *Journal of Traumatic Stress*, 1(3), 353-372.
- McCarroll, J. E., Fagan, J. G., Hermesen, J. M., & Ursano, R. J. (1997). Posttraumatic stress disorder in U.S. Army Vietnam veterans who served in the Persian Gulf War. *Journal of Nervous and Mental Disease*, 185(11), 682-685.
- McCraty, R., Barrios-Choplin, B., Rozman, D., Atkinson, M., & Watkins, A. D. (1998). The impact of a new emotional self-management program on stress, emotions, heart rate variability, DHEA and cortisol. *Integrative Physiological and Behavioral Science*, 33(2), 151-170.
- Meehan, M. (2001). *Physiological reaction as an objective measure of presence in virtual environments*. Ph.D. Dissertation. Chapel Hill, U.S.A.
- Meichenbaum, D. & Turk, D. C. (1987). *Facilitating treatment adherence. A practitioner's guidebook*. New-York: Plenum Press.
- Meinberg, R. A., & Yager, G. G. (1985). Effects of a workshop fee on women's stress management skills and evaluations. *Journal of Counseling Psychology*, 32(4), 626-629.
- Melfsen, S., Osterlow, J., Beyer, J., & Florin, I. (2003). Evaluation of a cognitive-behavioral training program for children with social anxiety. *Zeitschrift fur Klinische Psychologie und Psychotherapie*, 32(3), 191-199.

- Méndez, F. J., & Beléndez, M. (1997). Effects of a behavioral intervention on treatment adherence and stress management in adolescents with IDDM. *Diabetes Care*, 20(9), 1370-1375.
- Mendonca, J. D., & Siess, T. F. (1976). Counseling for indecisiveness: Problem-solving and anxiety-management training. *Journal of Counseling Psychology*, 23(4), 339-347.
- Mental Health Advisory Team (MHAT) V. (2008). *Operation Iraqi Freedom 06-08: Iraq / Operation Enduring Freedom 8: Afghanistan*. Department of Defense, the United States of America.
- Michaud, M., Bouchard, S., Dumoulin, S., & Zhong, X.-W. (2004). Manipulating presence and its impact on anxiety. Paper presented at the Cybertherapy Conference 2004, San Diego, January 2004. In: Wiederhold, B., Riva, G. and Wiederhold, M.D., (Eds) *Cybertherapy 2004*. San Diego, CA: Interactive Media Institute.
- Michultka, D. M., Blanchard, E. B., & Rosenblum, E. L. (1989). Stress management and Gilles de la Tourette's syndrome. *Biofeedback and Self-Regulation*, 14(2), 115-123.
- Miksche, L. W., & Robbeling, I. (1988). Stress prophylaxis in the company : Stress-management-seminars. *Zentralblatt für Arbeitsmedizin, Arbeitsschutz, Prophylaxe und Ergonomie*, 38, 7-10.
- Milliken, C. S., Auchterlone, J. L., & Hoge, C. W. (2007). Longitudinal assessment of mental health problems among active and reserve component soldiers returning from the Iraq war. *JAMA*, 298(18), 2141-2148.
- Milling, L. S., & Breen, A. (2003). Mediation and moderation of hypnotic and cognitive-behavioural pain reduction. *Contemporary Hypnosis*, 20(2), 81-97.
- Milling, L. S., Levine, M. R., & Meunier, S. A. (2003). Hypnotic enhancement of cognitive-behavioral interventions for pain: An analogue treatment study. *Health Psychology*, 22(4), 406-413.
- Milne, B., Joachim, G., & Niedhardt, J. (1986). A stress management programme for inflammatory bowel disease patients. *Journal of Advanced Nursing*, 11(5), 561-567.
- Milne, D., Jones, R., & Walters, P. (1989). Anxiety management in the community: A social support model and preliminary evaluation. *Behavioural Psychotherapy*, 17(3), 221-236.
- Mitchell, J. T. (2007). Innovative, precise, and descriptive terms for group crisis support services: A United Nations initiative. *International Journal of Emergency Mental Health*, 9(4), pp. 247-252.
- Mitchell, J. T. (2004). Characteristics of successful early intervention programs. *International Journal of Emergency Mental Health*, 6(4), pp. 175-184.
- Mitchell, J. T. (1983). When disaster strikes...the critical incident stress debriefing process. *Journal of Emergency Medical Services*, 8(1), 36-39.

- Mittag, O. (1997). Stress management: Goals and techniques for the rehabilitation of patients suffering from coronary heart disease. [Stressmanagement: Ziele und Methoden in der Rehabilitation von Koronarpatienten] *Pravention Und Rehabilitation*, 9(4), 147-153.
- Moon, J. R., & Eisler, R. M. (1983). Anger control: An experimental comparison of three behavioral treatments. *Behavior Therapy*, 14(4), 493-505.
- Moore, K., Wiederhold, B. K., Wiederhold, M. D., & Riva, G. (2002). Panic and agoraphobia in a virtual world. *Cyberpsychology and Behavior*, 5, 197-202.
- Morris, C. S., Gane, H. C. N., Ross, J., & Hancock, P. A. (2002). The point diminishing immersive return: implications for simulation-based training. Proceedings of the 23rd annual Army Science Conference: Orlando (Fl, U.S.A).
- Morris, C. S., Hancock, P. A., & Shirley, E. C. (2004). Motivational effects of adding context relevant stress in pc-based game training. *Military psychology*, 16(1), 135-147.
- Morrison, J. Q. (2007a). Perceptions of teachers and staff regarding the impact of the Critical Incident Stress Management (CISM) model for school-based crisis intervention. *Journal of School Violence*, 6(1), pp. 101-120.
- Morrison, J. Q. (2007b). Social validity of the critical incident stress management model for school-based crisis intervention. *Psychology in the Schools*, 44(8), pp. 765-777.
- Moses III, A.N., & Hollandsworth Jr., J.G. (1985). Relative effectiveness of education alone versus stress inoculation training in the treatment of dental phobia. *Behavior Therapy*, 16 (5), 531-537.
- Moshell, J. M., & Hughes, C. E. (2002). Virtual environments as a tool for academic learning. In K. M. Stanney, (Ed.), *Handbook of virtual Environments. Design, implementation, and applications* (pp. 893-910). Mahwah, New Jersey : Lawrence Erlbaum Associates, Publishers.
- Mott, M. L., & Snyder, M. P. (1993). Mine emergency responsiveness development program procedures. *Mining Engineering*, 45(10), 1258-1261.
- Multon, K. D., Parker, J. C., Smarr, K. L., Stucky, R. C., Petroski, G., Hewett, J. E., et al. (2001). Effects of stress management on pain behavior in rheumatoid arthritis. *Arthritis Care and Research*, 45(2), 122-128.
- Munz, D. C., & Kohler, J. M. (1997). Do worksite stress management programs attract the employees who need them and are they effective? *International Journal of Stress Management*, 4(1), 1-11.
- Munz, D. C., Kohler, J. M., & Greenberg, C. I. (2001). Effectiveness of a comprehensive worksite stress management program: Combining organizational and individual interventions. *International Journal of Stress Management*, 8(1), 49-62.
- Murphy, L. R. (1996). Stress management in work settings: A critical review of the health effects. *American Journal of Health Promotion*, 11(2), 112-135.

- Murphy, L. R., DuBois, D., Hurrell, J.J. (1986). Accident reduction through stress management. *Journal of Business and Psychology*, 1(1), pp. 5-18.
- Murphy, L. R., & Sauter, S. L. (2003). The U.S.A perspective: Current issues and trends in the management of work stress. *Australian Psychologist*, 38, 151–157.
- Nakano, K. (1990). Effects of two self-control procedures on modifying type A behavior. *Journal of Clinical Psychology*, 46(5), 652-657.
- Nash, W. P. (2007a). Combat/operational stress adaptations and injuries. In C. R. Figley, & W. P. Nash (Eds), *Combat Stress Injury: Theory, Research, and Management* (pp. 33-63). New York, NY: Routledge.
- Nash, W. P. (2007b). The stressors of war. In C. R. Figley, & W. P. Nash (Eds), *Combat Stress Injury: Theory, Research, and Management* (pp. 11-31). New York, NY: Routledge.
- Natsume, M., Noda, T., Sato, T., Inui, T., & Takagaki, Y. (1996). Studies on 119 employees who visited the stress dock of Osaka Prefectural Mental Health Center. *Japanese Journal of Psychosomatic Medicine*, 36, 169-174.
- Nelson, D. V., Baer, P. E., Cleveland, S. E., Revel, K. F., & Montero, A. C. (1994). Six-month follow-up of stress management training versus cardiac education during hospitalization for acute myocardial infarction. *Journal of Cardiopulmonary Rehabilitation*, 14(6), 384-390.
- Norman, R. M. G., Malla, A. K., McLean, T. S., McIntosh, E. M., Neufeld, R. W. J., Voruganti, L. P., & Cortese, L. (2002). An evaluation of a stress management program for individuals with schizophrenia. *Schizophrenia Research*, 58, 293-303.
- North, M. M., North, S. M., & Coble, J. R. (1996). *Virtual reality therapy. An innovative paradigm*. Colorado Springs: IPI Press.
- Novaco, R. W. (1977). A stress inoculation approach to anger management in the training of law enforcement officers. *American Journal of Community Psychology*, 5(3), 327-346.
- Oman, D., Hedberg, J., & Thoresen, C. E. (2006). Passage meditation reduces perceived stress in health professionals: A randomized, controlled trial. *Journal of Consulting and Clinical Psychology*, 74(4), 714-719.
- Onyett, S. R., & Turpin, G. (1988). Benzodiazepine withdrawal in primary care: A comparison of behavioural group training and individual sessions. *Behavioural Psychotherapy*, 16(4), 297-312.
- Ormrod, J. (1995). Short and long-term effectiveness of group anxiety management training. *Behavioural and Cognitive Psychotherapy*, 23, 63-70.
- Ormrod, J., & Budd, R. (1991). A comparison of two treatment interventions aimed at lowering anxiety levels and alcohol consumption amongst alcohol abusers. *Drug and Alcohol Dependence*, 27(3), 233-243.

Ornish, D., Scherwitz, L. W., & Doody, R. S. (1983). Effects of stress management training and dietary changes in treating ischemic heart disease. *Journal of the American Medical Association*, 249(1), 54-59.

Öst, L. G. (1978). Behavioral treatment of thunder and lightning phobias. *Behaviour Research and Therapy*, 16(3), 197-207.

O'Toole, B. I., Marshall, R. P., Schureck, R. J., & Dobson, M. (1999). Combat, dissociation, and posttraumatic stress disorder in Australian Vietnam veterans. *Journal of Traumatic Stress*, 12(4), 625-640.

O'Toole, B. L., Marshall, R. P., Schureck, R. J., & Dobson, M. (1998). Risk factors for post traumatic stress disorder in Australian Vietnam veterans. *Australian and New Zealand Journal of Psychiatry*, 32, 21 -31.

Ozer, E. J., Best, S. R., Lipsey, T. L., & Weiss, D. S. (2003). Predictors of posttraumatic stress disorder and symptoms in adults: A meta-analysis. *Psychological Bulletin*, 129(1), 52-73.

Paisley, K., Powell, G. M. (2007). Staff Burn-Out Prevention and Stress Management. *Child and Adolescent Psychiatric Clinics of North America*, 16(4), pp. 829-841.

Pantalon, M. V., & Motta, R. W. (1998). Effectiveness of anxiety management training in the treatment of posttraumatic stress disorder : A preliminary report. *Journal of Behavior Therapy and Experimental Psychiatry*, 29, 21-29.

Parker, J. C., Smarr, K. L., Buckelew, S. P., Stucky-Ropp, R. C., Hewett, J. E., Johnson, J. C., et al. (1995). Effects of stress management on clinical outcomes in rheumatoid arthritis. *Arthritis and Rheumatism*, 38(12), 1807-1818.

Patel, C., & Marmot, M. (1988). Can general practitioners use training in relaxation and management of stress to reduce mild hypertension? *British Medical Journal*, 296(6614), 21-24.

Patel, C. (1997). Stress management and hypertension. *Acta Physiologica Scandinavica, Supplement*, 161(640), 155-157.

Patel, C., & Marmot, M. G. (1987). Stress management, blood pressure and quality of life. *Journal of Hypertension*, 5(SUPPL. 1), S21-S28.

Paton, D. (1989). Disasters and helpers: Psychological dynamics and implications for counselling. *Counselling Psychology Quarterly*, 2(3), 303-322.

Pavelka, R., Ringler, M., & Loziczky, G. (1980). A behavioural approach towards coping with the anxieties of the pregnant women. [Die angst der schwangeren – verhaltenstherapeutische ansatze zu ihrer bewaltigung] *Wiener Klinische Wochenschrift*, 92(10), 346-351.

Pekala, R. J., & Forbes, E. J. (1990). Subjective effects of several stress management strategies: With reference to attention. *Behavioral Medicine*, 16(1), 39-43.

- Peniston, E. G. (1986). EMG biofeedback-assisted desensitization treatment for Vietnam combat veterans' posttraumatic stress disorder, *Clinical Biofeedback and Health: An International Journal*, 9(1), 35-41.
- Perna, F. M., Antoni, M. H., Baum, A., Gordon, P., Schneiderman, N. (2003). Cognitive behavioral stress management effects on injury and illness among competitive athletes: A randomized clinical trial. *Annals of Behavioral Medicine*, 25(1), pp. 66-73.
- Perron, B. (2004). Sign of a treat: the effects of warning systems in survival horror games. Paper presented at *COSIGN 2004*, University of Split (Croatia), September 14-16.
- Perron, B. (2005). Coming to play at frightening yourself: welcome to the world of horror video games. Paper presented at the *Aesthetics of Play conference*, Bergen (Norway), October 14-15.
- Perron, B. (2005). A cognitive psychological approach to gameplay emotions. *Proceedings of DiGRA 2005 Conference*.
- Peters, K. K., & Carlson, J. G. (1999). Worksite stress management with high-risk maintenance workers: A controlled study. *International Journal of Stress Management*, 6(1), 21-44.
- Petosa, R., & Oldfield, D. (1985). A pilot study of the impact of stress management techniques on the classroom behaviour of elementary school students. *The Journal of School Health*, 55(2), 69-71.
- Phillips. M. L., Drevets. W. C., Rauch. S. L., & Lane. R. (2003a). Neurobiology of emotion perception I: The neural basis of normal emotion perception. *Biological Psychiatry*, 54, 504-514.
- Phillips. M. L., Drevets. W. C., Rauch. S. L., & Lane. R. (2003b). Neurobiology of emotion perception II: Implications for major psychiatric disorders. *Biological Psychiatry*, 54, 515-528.
- Phillips, K. D., & Morrow, J. H. (1998). Nursing management of anxiety in HIV infection. *Issues in Mental Health Nursing*, 19(4), 375-397.
- Piacentini, J. (1999). Cognitive behavioural therapy of childhood OCD. *Child and Adolescent Psychiatric Clinics of North America*, 8(3), 599-616.
- Pollard, C. A., Obermeier, H. J., & Cox, G. L. (1987). Inpatients treatment of complicated agoraphobia and panic disorder. *Hospital and Community Psychiatry*, 38(9), 951-958.
- Pritchard, M. T., Butow, P. N., Stevens, M. M., & Duleu, J. A. (2006). Understanding medication adherence in pediatric acute lymphoblastic leukemia: A review. *Journal of Pediatric Hematology/Oncology* 28(12), 816-823.
- Pruessner, J. C., Dedovic, K., Khalili-Mahani, Engert, V., Pruessner, Buss, C., Renwick, R., Dagher, A., Meaney, M. J., & Lupien, S. (2007) Deactivation of the limbic system during acute psychosocial stress: Evidence from positron emission tomography and functional magnetic resonance imaging studies. *Biol Psychiatry*, 63, 234-240.

- Puls, W., Inhester, M.-L., Wienold, H. (2002). Stress management trainings as a component of workplace prevention of substance use disorders [Stressbewältigungstrainings als komponente betrieblicher suchtprevention]. *Sucht*, 48(4), pp. 271-283.
- Quillen, M. A., & Denney, D. R. (1982). Self-control of dysmenorrheic symptoms through pain management training. *Journal of Behavior Therapy and Experimental Psychiatry*, 13(2), 123-130.
- Rainforth, M. V., Schneider, R. H., Nidich, S. I., Gaylord-King, C., Salerno, J. W., & Anderson, J. W. (2007). Stress reduction programs in patients with elevated blood pressure: A systematic review and meta-analysis. *Curr Hypertens Rep*, 9(6):520-528.
- Ramm, E., Marks, I. M., Yuksel, S., & Stern, R. S. (1982). Anxiety management training for anxiety states: Positive compared with negative self-statements. *British Journal of Psychiatry*, 140(4), 367-373.
- Raudenska, J., & Javurkova, A. (2003). Cognitive-behavioral therapy of depression, generalized anxiety disorder and panic disorder in chronic pain. *Bolest*, 6(1), 8-16.
- Reger, G. M., & Gahm, G. A. (2008). Virtual reality exposure therapy for active duty soldiers.. *Journal of Clinical Psychology: In session*, 64(8), 940-946.
- Renaud, P., Bouchard, S., & Proulx., R. (2002). Behavioral dynamics in the presence of a virtual spider. *IEEE Transactions on Information Technology in Biomedecine*, 6(3), 235-243.
- Resick, P. A., Jordan, C. G., Girelli, S. A., Kotsis-Hutter, C., & Marhoefer-Dvorak, S. (1988). A comparative outcome study of behavioural group therapy for sexual assault victims. *Behavior Therapy*, 19(3), 385-401.
- Resick, P. A., Wendiggensen, P., Ames, S., & Meyer, V. (1978). Systematic slowed speech: A new treatment for stuttering. *Behaviour Research and Therapy*, 16(3), 161-167.
- Resnick, H. S., Kilpatrick, D. G., Dansky, B. S., Saunders, B. E., & Best, C. L. (1993). Prevalence of civilian trauma and posttraumatic stress disorder in a representative national sample of women. *Journal of Consulting and Clinical Psychology*, 61(6), 984-991.
- Rhee, S. H., Parker, J. C., Smarr, K. L., Petroski, G. F., Johnson, J. C., Hewett, J. E., et al. (2000). Stress management in rheumatoid arthritis: What is the underlying mechanism? *Arthritis Care and Research*, 13(6), 435-442.
- Rice, V. J., & Gerardi, S. M. (1999). Part II. work hardening for warriors: Training military occupational therapy professionals in the management of combat stress casualties. *Work*, 13(3), 197-209.
- Richardson, K. M., & Rothstein, H. R. (2008). Effects of occupational stress management intervention programs: A meta-analysis. *Journal of Occupational Health Psychology*, 13(1), 69-93.

- Richardson, F. C., & Suinn, R. M. (1973). A comparison of traditional systematic desensitization, accelerated massed desensitization, and anxiety management training in the treatment of mathematics anxiety. *Behavior Therapy*, 4(2), 212-218.
- Rizzo, A., Parsons, T., Pair, J., McLay, R., Johnston, S., Perlman, K., et al. (2008). Clinical results from the virtual Iraq exposure therapy application for PTSD. Proceedings of the Army Science Conference, Orlando (Fl., U.S.A), November.
- Robillard, G., Bouchard, S., Fournier, T., & Renaud, P. (2003). Anxiety and presence during VR immersion: A comparative study of the reactions of phobic and non-phobic participants in therapeutic virtual environments derived from computer games. *CyberPsychology and Behavior*, 6(5), 467-476.
- Roemer, L., Orsillo, S. M., Borkovec, T. D., & Litz, B. T. (1998). Emotional response at the time of a potentially traumatizing event and PTSD symptomatology: A preliminary retrospective analysis of the DSM-IV criterion A-2. *Journal of Behavior Therapy and Experimental Psychiatry*, 29, 123-130.
- Roger, D., & Hudson, C. (1995). The role of emotion control and emotional rumination in stress management training. *International Journal of Stress Management*, 2 (3), 119-132.
- Rohsenow, D. J., Smith, R. E., & Johnson, S. (1985). Stress management training as a prevention program for heavy social drinkers: Cognitions, affect, drinking, and individual differences. *Addictive Behaviors*, 10(1), 45-54.
- Rose, S. M. (1980). Endocrine responses to stressful psychological events. *Psychiatric Clinics of North America*, 3, 251-276.
- Rose, M. I., Firestone, P., Heick, H. M. C., & Faight, A. K. (1983). The effects of anxiety management training on the control of juvenile diabetes mellitus. *Journal of Behavioral Medicine*, 6(4), 381-395.
- Ross, M. J., & Berger, R. S. (1996). Effects of stress inoculation training on athletes' postsurgical pain and rehabilitation after orthopedic injury. *Journal of Consulting and Clinical Psychology*, 64(2), 406-410.
- Rothbaum, B. O., Anderson, P., Zimand, E., Hodges, L., Lang, D., & Wilson, J. (2006). Virtual reality exposure therapy and standard (in vivo) exposure therapy in the treatment of fear of flying. *Behavior Therapy*, 37(1), 80-90.
- Rothbaum, B. O., Foa, E. B., Murdock, T., Riggs, D., & Walsh, W. (1992). A prospective examination of post-traumatic stress disorder in rape victims. *Journal of Traumatic Stress*, 5, 455-475.
- Rothbaum, B.O., Hodges, L., Smith, S., Lee, J. H., & Price, L. (2000). A controlled study of virtual reality exposure therapy for the fear of flying. *Journal of Consulting and Clinical Psychology*, 68(6), 1020-1026.

- Routhier, C. (2007) Programme d'entraînement à la résilience militaire (PERM). Unpublished document : SQFT.
- Routhier, C. (2009, February). Military resilience training program: Executive report. Presented at the *MH & OSI JSB Harmonization of MH Education Initiative*.
- Routhier, C. (2009, March). A way to IOR: The Military Resilience Training Program. Communication presented at the *Individual Operational Readiness: Personal and Personnel Challenges and Stressors* Workshop. Toronto, Canada: Defence Research and Development Canada.
- Sadowski, W., & Stanney, K. (2002). Presence in Virtual Environments. In: K. M. Stanney (Ed.) *Handbook of Virtual Environments: Design, Implementation, and Applications* (pp. 791-806). Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.
- Sapolsky, R. M. (1993). Endocrinology alfresco: Psychoendocrine studies of wild baboons. *Recent progress in Hormone Research*, 48, 437-468.
- Sareen, J., Belik, S.-L., Afifi, T. O., Asmundson, G. J. G., Cox, B. J., & Stein, M. B. (2008). Canadian military personnel's population attributable fractions of mental disorders and mental health service use associated with combat and peacekeeping operations. *American Journal of Public Health*, 98(12), 2191-2198.
- Sareen, J., Cox, B. J., Afifi, T. O., Stein, M. B., Belik, S.-L., Meadows, G., et al. (2007). Combat and peacekeeping operations in relation to prevalence of mental disorders and perceived need for mental health care. *Arch Gen Psychiatry*, 64(7), 843-852.
- Sasse, D. B. (2008). A framework for psychophysiological data acquisition in digital games. Sweden: Blekinge Institute of Technology.
- Saunders, T., Driskell, J. E., Johnston, J. H., & Salas, E. (1996). The effect of stress inoculation training on anxiety and performance. *Journal of Occupational Health Psychology*, 1(2), 170-186.
- Saxe, G. A., Major, J. M., Nguyen, J. Y., Freeman, K. M., Downs, T. M., & Salem, C. E. (2006). Potential attenuation of disease progression in recurrent prostate cancer with plant-based diet and stress reduction. *Integrative Cancer Therapies*, 5(3), 206-213.
- Schiraldi, G. R., & Brown, S. L. (2001). Primary prevention for mental health: Results of an exploratory cognitive-behavioral college course. *The Journal of Primary Prevention*, 22(1), 55-67.
- Schlichter, K. J., & Horan, J. J. (1981). Effects of stress inoculation on the anger and aggression management skills of institutionalized juvenile delinquents. *Cognitive Therapy and Research*, 5(4), 359-365.
- Schmidt, L., Tjornhoj-Thomsen, T., Boivin, J., & Andersen, A. N. (2005). Evaluation of a communication and stress management training programme for infertile couples. *Patient Education and Counseling*, 59, 252-262.

- Schroeder, R., Steed, A., Axelsson, A.-S., Haldal, I., Abelin, A., et al. (2001). Collaborating in networked immersive spaces: As good as being together? *Computers & Graphics*, 25, 781-788.
- Schwartz, D. P., Large, H. S., & DeGood, D. E. (1984). A chronic emergency room visitor with chest pain: Successful treatment by stress management training and biofeedback. *Pain*, 18(3), 315-319.
- Schwickert, M., Langhorst, J., Paul, A., Michalsen, A., & Dobos, G. J. (2006). Stress management in the treatment of essential arterial hypertension. [Stressmanagement: Entspannung für hyperteniker - Aktiv oder meditativ] *MMW-Fortschritte Der Medizin*, 148(47), 40-42.
- Scott, C. D. (1988). Stress management can lead to reduced malpractice. *Physician executive*, 14(1), pp. 18-20.
- Searle, B. J. (2008). Does personal initiative training work as a stress management intervention ? *Journal of Occupational Health Psychology*, 13(3), 259-270.
- Sears, S. F., Vazquez, L. D., Matchett, M., & Pitzalis, M. (2008). State-of-the-art: Anxiety management in patients with implantable cardioverter defibrillators. *Stress and Health*, 24(3), 239-248.
- Selye, H. (1974). *Stress without distress*. Philadelphia: JB Lippincott.
- Shapiro, S. L., Schwartz, G. E., & Bonner, G. (1998). Effects of mindfulness-based stress reduction on medical and premedical students. *Journal of Behavioral Medicine*, 21, 581-599.
- Shapiro, S. L., Shapiro, D. E., & Schwartz, G. E. (2000). Stress management in medical education: A review of the literature. *Academic Medicine*, 75(7), 748-759.
- Sharma, R., Khera, S., Mohan, A., Gupta, N., Ray, R. B. (2006). Assessment of computer game as a psychological stressor. *Indian J Physiol Pharmacol*, 50(4), 367-374.
- Sheehan, S. S. (1999). Stress management in the federal bureau of investigation: Principles for program development. *International Journal of Emergency Mental Health*, 1(1), 39-42.
- Sheehy, R., & Horan, J. J. (2004). Effects of stress inoculation training for 1st-year law students. *International Journal of Stress Management*, 11(1), 41-55.
- Singer, G. H. S., Ethridge, B. L., & Aldana, S. I. (2007). Primary and secondary effects of parenting and stress management interventions for parents of children with developmental disabilities: A meta-analysis. *Mental Retardation and Developmental Disabilities Research Reviews*, 13, 357-369.
- Slater, M., & Usoh, M. (1993). Representations systems, perceptual position, and presence in virtual environments. *Presence: Teleoperators and Virtual environments*, 2(3), 221-233.
- Snaith, P., Owens, D., & Kennedy, E. (1992). An outcome study of a brief anxiety management programme: Anxiety control training. *Irish Journal of Psychological Medicine*, 9(2), 111-114.

- Sokol, M. B., & Aiello, J. R. (1993). Implications for team focused stress management training. *Consulting Psychology Journal*, 45 (4), 1061-1087.
- Sorby, N. G. D., Reavley, W., & Huber, J. W. (1991). Self help programme for anxiety in general practice: Controlled trial of an anxiety management booklet. *British Journal of General Practice*, 41, 417-420.
- Speed, N., Engdahl, B. E., Schwartz, J., Eberly, R. E., & Raina, E. (1989). Posttraumatic stress disorder as a consequence of the POW experience. *Journal of Nervous and Mental Disease*, 177, 147-153.
- Spettell, C. M., & Liebert, R. M. (1986). Training for safety in automated person-machine systems. *American Psychologist*, 41(5), 545-550.
- Spiegel, D., & Cardena, F. (1991). Comments on hypnotizability and dissociation. *American Journal of Psychiatry*, 148(6), 813-815.
- Stanney, K. M. (2002), *Handbook of virtual Environments. Design, implementation, and applications*. Mahwah, New Jersey : Lawrence Erlbaum Associates, Publishers.
- Stauber, T., Petermann, F., Bachmann, H., Bachmann, C., & Hampel, P. (2007). Cognitive-behavioral stress management training for boys with functional urinary incontinence. *Journal of Pediatric Urology*, 3(4), 276-281.
- Stauber, T., Petermann, F., Bachmann, H., Bachmann, C., & Hampel, P. (2004). Cognitive-behavioral stress management training for children and adolescents with functional urinary incontinence. [Kognitiv-behaviorales stressbewältigungstraining in der patientenschulung von kindern und jugendlichen mit funktioneller harninkontinenz] *Zeitschrift Fur Klinische Psychologie, Psychiatrie Und Psychotherapie*, 52(4), 323-345.
- Stauber, T., Petermann, F., Korb, U., Bauer, A., & Hampel, P. (2002). In-patient educational training in obesity with stress management - A pilot study. [Kombiniertes adipositas- und anti-streß-training im stationären bereich: Eine pilotstudie] *Pravention Und Rehabilitation*, 14(4), 179-188.
- Stein, F., & Nikolic, S. (1989). Teaching stress management techniques to a schizophrenic patient. *The American Journal of Occupational Therapy*, 43(3), 162-169.
- Stefansdottir, S. I., & Sutherland, V. J. (2005). Preference awareness education as stress management training for academic staff. *Stress and Health*, 21, 311-323.
- Stetz, M. C., Bouchard, S., Wiederhold, B., & Folen, R. (2009). The receptiveness of stress management techniques by military personnel. Poster to be presented at the annual CyberTherapy Conference, June 2009, Verbania (Italy).

- Stetz, M.C., Long, C.P., Schober, W. V., Cardillo, C. G., & Wildzunas, R. M. (2007). Stress assessment and management while medics take care of the VR wounded (pp. 165-172). In B.K., Wiederhold, S. Bouchard and & Riva, (Eds), *Annual Review of CyberTherapy and Telemedicine, Vol. 5*. San Diego: Interactive Media Institute.
- Stetz, M. C., Long, C. P., Wiederhold, B. KI., & Turner, D. D. (2008). Combat scenarios and relaxations training to harden medics against stress. *Journal of CyberTherapy and Rehabilitation, 1*(3), 239-246.
- Stetz, M. C., Strunk, K. K., & Reeves, D. L. (2009). The effectiveness of immersive assisted relaxation training for forwards surgical teams. Internal research report. Contract no. W911NF-07-D-0001.
- Stetz, M. C., Thomas, M. L., Russo, M. B., Stetz, T. A., Wildzunas, R. M., McDonald, J. J., & al. (2007). Stress, mental health, and cognition: A brief review of relationships and countermeasures. *Aviation Space and Environmental Medecine, 78*(5-II), B252-B260.
- Stetz, M.C., Wildzunas, R. M., Wiederhold, B.K., Stetz, T.A., & Hunt, M.P. (2006). The usefulness of virtual reality stress inoculation training for military medical females: A pilot study (pp. 51-58). In B.K., Wiederhold, S. Bouchard and & Riva, (Eds), *Annual Review of CyberTherapy and Telemedicine, Vol. 4*. San Diego: Interactive Media Institute.
- Storch, M., Gaab, J., Küttel, Y., Stüssi, A. -, & Fend, H. (2007). Psychoneuroendocrine effects of resource-activating stress management training. *Health Psychology, 26*(4), 456-463.
- Stormer-Labonte, M., Machemer, P., & Hardinghaus, W. (1992). A meditative stress-management-program for psychosomatic patients. *PPmP Psychotherapie Psychosomatik Medizinische Psychologie, 42*(12), 436- 444.
- St.Lawrence, J. S., McGrath, M. L., Oakley, M. E., & Sult, S. C. (1983). Stress management training for law students: Cognitive-behavioral intervention. *Behavioral Sciences and the Law, 1*(4), 101-110.
- Stoudenmire, E., White, M. A., & Roy, K. (2005). Assessment and validation of gaming technology as applied to training: current state and the way ahead.
- Suinn, R. M. (1995). Clinical practice, university research, and students: A historical perspective on anxiety management training. *American Psychologist, 50*(4), 287-292.
- Suinn, R. M., & Bloom, L. J. (1978). Anxiety management training for pattern A behavior. *Journal of Behavioral Medicine, 1*(1), 25-35.
- Suinn, R. M., & Richardson, F. (1971). Anxiety management training: A nonspecific behavior therapy program for anxiety control. *Behavior Therapy, 2*(4), 498-510.
- Surwit, R. S., Van Tilburg, M. A. L., Zucker, N., McCaskill, C. C., Parekh, P., Feinglos, M. N., et al. (2002). Stress management improves long-term glycemic control in type 2 diabetes. *Diabetes Care, 25*(1), 30-34.

- Swann, P. (1989). Stress management for pain control. *Physiotherapy*, 75(5), 295-298.
- Tableman, B., Feis, C. L., Marcianiak, D., & Howard, D. (1985). Stress management training for low-income women. *Prevention in Human Services*, 3(4), 71-85.
- Tallant, S., Rose, S. D., & Tolman, R. M. (1989). New evidence for the effectiveness of stress management training in groups. *Behavior Modification*, 13(4), 431-446.
- Tarnanas, I., & Manos, G. (2001). Using virtual reality to teach special populations how to cope in crisis: The case of a virtual earthquake. *Studies in Health Technology and Informatics*, 81, 495-501.
- Taylor, D. N. (1995). Effects of a behavioral stress-management program on anxiety, mood, self-esteem, and T-cell count in HIV positive men. *Psychological Reports*, 76(2), 451-457.
- Thompson, J. G., Griebstein, M. G., & Kuhlenschmidt, S. L. (1980). Effects of EMG biofeedback and relaxation training in the prevention of academic underachievement. *Journal of Counseling Psychology*, 27(2), 97-106.
- Thompson, M. M., & McCreary, D. R. (2006a). Enhancing Mental readiness in military personnel. Military life: In T.W. Britt (Ed.) *The psychology of serving in peace and combat* (pp.54-79). Praeger Security International.
- Thompson, M. M., & McCreary, D. R. (2006b). Enhancing mental readiness in military personnel. In Human dimensions in military operations – military leaders’ strategies for addressing stress and psychological support (pp.4-1 – 4-12). *Meeting Proceedings RTO-MP-HFM-134, Paper 4*. Neuilly-sur-Seine, France: RTO.
- Thompson, M. M., Pastò, L., & McCreary, D. R. (2002). Deployment stressors, coping, and psychological well-being among peacekeepers. *Presented at the 7th International Command and Control Research and Technology Symposium*. Quebec City, QC, Canada.
- Tichenor, V., Marmar, C. R., Weiss, D. S., Metzler, T. J., & Ronfeldt, H. M. (1996). The relationship of peritraumatic dissociation and posttraumatic stress: Findings in female Vietnam theater veterans. *Journal of Consulting and Clinical Psychology*, 64(5), 1054-1059.
- Tichon, J. G. (2007). Using presence to improve a virtual training environment. *Cyberpsychology and Behavior*, 10(6), 781-787.
- Timmerman, I. G. H., Emmelkamp, P. M. G., & Sanderman, R. (1998). The effects of a stress-management training program in individuals at risk in the community at large. *Behaviour Research and Therapy*, 36, 863-875.
- Timmons, P. L., Oehlert, M. E., Sumerall, S. W., Timmons, C. W., & Borgers, S. B. (1997). Stress inoculation training for maladaptive anger: Comparison of group counseling versus computer guidance. *Computers in Human Behavior*, 13(1), 51-64.
- Tisdelle, D. A., Hansen, D. J., St-Lawrence, J. S., & Brown, J. C. (1984). Stress management training for dental students. *Journal of Dental Education*, 48, 196-202.

- Treacy, L., Tripp, G., & Baird, A. (2005). Parent stress management training for attention-deficit/hyperactivity disorder. *Behavior Therapy, 36*(3), 223-233.
- Treven, S., & Potocan, V. (2005). Training programmes for stress management in small business. *Education + Training, 47*, 640-652.
- Triffleman, E., Carroll, K., & Kellogg, S. (1999). Substance dependence posttraumatic stress disorder therapy: An integrated cognitive-behavioral approach. *Journal of Substance Abuse Treatment, 17*(1-2), 3-14.
- Trzcieniecka-Green, A., & Steptoe, A. (1996). The effects of stress management on the quality of life of patients following acute myocardial infarction or coronary bypass surgery. *European Heart Journal, 17*(11), 1663-1670.
- Tucker, A. S., Henry, J., Spaulding, T., Van Hasselt, V. B. (2007). Critical incident stress management in a mid-sized police department: A case illustration. *International Journal of Emergency Mental Health, 9*(4), pp. 299-304.
- Tunnelcliffe, M. R., Leach, D. J., & Tunnelcliffe, L. P. (1986). Relative efficacy of using behavioral consultation as an approach to teacher stress management. *Journal of School Psychology, 24*(2), 123-131.
- Ulmer, D. (1996). Stress management for the cardiovascular patient: A look at current treatment and trends. *Progress in Cardiovascular Nursing, 11*(1), 21-29.
- Unknown Author (2002). Boost glycemic control in type 2 diabetics with stress management training. *Disease Management Advisor, 8*(4), 58-59, 49.
- Unknown Author (1998). The self-care series: Part II, stress management. *Positive Directions News : A Support and Information Network of People with HIV/AIDS, their Families, Friends and Providers, 10*(2), 20-24 contd.
- Ursin, H., & Eriksen, H. R. (2003). The cognitive activation theory of stress. *Psychoneuroendocrinology, 29*, 567-592.
- Vaiva, G., Brunei, A., Lebigot, F., Boss, V., Ducrocq, F., Devos, P., et al. (2003). Fright and other peritraumatic responses after serious motor vehicle accident: Prospective influence on acute PTSD development. *Canadian Journal of Psychiatry, 48*(6), 395-401.
- Van der Hek, H., & Plomp, H.N. (1997). Occupational stress management programmes: A practical overview of published effect studies. *Occupational Medicine, 47*(3), pp. 133-141.
- Van Emerik, A. A. P., Kamphuis, J. H., Hulsbosch, A. M., Emmelkamp, P. M. G. (2002). Single session debriefing after psychological trauma: A meta-analysis. *Lancet, 360*, 766-771.
- Van Hooff, M., McFarlane, A. C., Baur, J., Abraham, M., & Barnes, D. J. (2009). The stressor Criterion-A1 and PTSD: A matter of opinion? *Journal of Anxiety Disorders, 23*, 77-86.

- Van Rhenen, W., Blonk, R. W. B., van der Klink, J. J., van Dijk, F. J., Schaufeli, W. B. (2005). The effect of a cognitive and a physical stress-reducing programme on psychological complaints. *International Archives of Occupational and Environmental Health*, 78(2), pp. 139-148.
- Viens, M., De Koninck, J., Mercier, P., St-Onge, M., & Lorrain, D. (2003). Trait anxiety and sleep-onset insomnia. Evaluation of treatment using anxiety management training. *Journal of Psychosomatic Research*, 54, 31-37.
- Vocks, S., Ockenfels, M., Jürgensen, R., Mussgay, L., & Rüdell, H. (2004). Blood pressure reactivity can be reduced by a cognitive behavioral stress management program. *International Journal of Behavioral Medicine*, 11(2), 63-70.
- Von Baeyer, C., & Krause, L. (1983). Effectiveness of stress management training for nurses working in a burn treatment unit. *International Journal of Psychiatry in Medicine*, 13 (2), 113-126.
- Vuori, J., Price, R. H., Mutanen, P., & Malmberg-Heimonen, I. (2005). Effective group training techniques in job-search training. *Journal of Occupational Health Psychology*, 10(3), 261-275.
- Wallace, A. (1989). An active role for patients in stress management. *Professional nurse (London, England)*, 5(2), 65-72.
- Wallenius, C., Larsson, G., & Johansson, C. R. (2004). Military observers' reactions and performance when facing danger. *Military Psychology*, 16(4), 211-229.
- Walters, H., Bond, M., & Pointer, S. (1995). A stress management program for nursing home staff: An evaluation of combined education and relaxation strategies. *Journal of Occupational Health and Safety – Australia and New Zealand*, 11(3), 243-248.
- Walton, W. T. (1993). Parents of disabled children burn-out too: Counseling parents of disabled children on stress management. *International Journal for the Advancement of Counselling*, 16(2), 107-118.
- Warner, C. H., Appenzeller, G. N., Barry, M. J., Morton, A., & Grieger, T. (2007). The evolving role of the division psychiatrist. *Military Medicine*, 172, 918-924.
- Warner, C. H., Breibach, J. E., Appenzeller, G. N., Yates, V., Grieger, T., & Webster, W. G. (2007). Division mental health in the new brigade combat team structure; Part I predeployment and deployment. *Military Medicine*, 172, 907-911.
- Warner, C. H., Breibach, J. E., Appenzeller, G. N., Yates, V., Grieger, T., & Webster, W. G. (2007). Division mental health in the new brigade combat team structure; Part II redeployment and postdeployment. *Military Medicine*, 172, 912-917.
- Weathers, F. W., & Keane, T. M. (2007). The criterion A problem revisited: Controversies and challenges in defining and measuring psychological trauma. *Journal of Traumatic Stress*, 20(2), 107-121.

- Webb, M., Beckstead, J., Meininger, J., & Robinson, S. (2006). Stress management for african american women with elevated blood pressure: A pilot study. *Biological Research for Nursing*, 7(3), 187-196.
- Wells, J. K., Howard, G. S., Nowlin, W. F., Vargas, M. J. (1986). Presurgical anxiety and postsurgical pain and adjustment: Effects of a stress inoculation procedure. *Journal of Consulting and Clinical Psychology*, 54(6), pp. 831-835.
- Wernick, R. L. (1984). Stress management with practical nursing students: Effects on attrition. *Cognitive Therapy and Research*, 8(5), 543-550.
- Wernick, R. L., Jaremko, M. E., & Taylor, P. W. (1981). Pain management in severely burned adults: A test of stress inoculation. *Journal of Behavioral Medicine*, 4(1), 103-109.
- White, J. (1995). Stresspac: A controlled trial of a self-help package for the anxiety disorders. *Behavioural and Cognitive Psychotherapy*, 23(2), 89-107.
- White, J., Jones, R., & McGarry, E. (2000). Cognitive behavioural computer therapy for the anxiety disorders: A pilot study. *Journal of Mental Health*, 9(5), 505-516.
- Wiederhold, B. K., & Bouchard, S. (2009, in preparation). *Comprehensive handbook of virtual reality and anxiety disorders*. Toronto: Kluwer.
- Wiederhold, B.K., & Wiederhold, M. (2000). Lessons learned from 600 virtual reality sessions. *Cyberpsychology and Behavior*, 3(3), 393-400.
- Wiederhold, B.K., & Wiederhold, M. (2008). Virtual reality for posttraumatic stress disorder and stress inoculation training. *Journal of CyberTherapy and Rehabilitation*, 1(1), 23-35.
- Wiederhold, B.K., & Wiederhold, M. D. (2005). *Virtual reality therapy for anxiety disorders. Advances in evaluation and treatment*. Washington (DC): American Psychological Association Press.
- Wiederhold, M. D. (2005). *Psychological monitoring during simulation training and testing (final report)*. Issued by U.S. Army Aviation and Missile Command Under.
- Wiederhold, M. D. & Wiederhold, B.K., (2004). Training combat medics using VR. *Cyberpsychology and Behavior*, 7(3), 319.
- Wiholm, C., & Arnetz, B. (2006). Stress management and musculoskeletal disorders in knowledge workers: The possible mediating effects of stress hormones. *Advances in Physiotherapy*, 8(1), 5-14.
- Wiholm, C., Arnetz, B., & Berg, M. (2000). The impact of stress management on computer-related skin problems. *Stress Medicine*, 16(5), 279-285.
- Wilson, R. W., Taliaferro, L. A., & Jacobsen, P. B. (2006). Pilot study of a self-administered stress management and exercise intervention during chemotherapy for cancer. *Supportive Care in Cancer*, 14(9), 928-935.

Wittrock, D. A., Blanchard, E. B., McCoy, G. C., McCaffrey, R. J., & Khramelashvili, V. V. (1995). The relationship of expectancies to outcome in stress management treatment of essential hypertension: Results from the joint U.S.SR-U.S.A behavioral hypertension project. *Biofeedback and Self-Regulation*, 20(1), 51-63.

Wolfe, J., Erickson, D. J., Sharkansky, E. J., King, D. W., & King, L. A. (1999). Course and predictors of posttraumatic stress disorder among Gulf War veterans: A prospective analysis. *Journal of consulting and clinical psychology*, 67(4), 520-528

World Health Organization. (1992). *The ICD-10 classification of mental and behavioural disorders: clinical descriptions and diagnostic guidelines*. Geneva: Author.

Yamagishi, M., Kobayashi, T., Kobayashi, T., Nagami, M., Shimazu, A., & Kageyama, T. (2007). Effect of web-based assertion training for stress management of Japanese nurses. *Journal of Nursing Management*, 15, 603-607.

Yehuda, R., McFarlane, A. C., & Shalev, A. Y. (1998). Predicting the Development of Posttraumatic Stress Disorder from the Acute Response to a Traumatic Event. *Biol Psychiatry*, 44, 1305-1313.

Yglesias, P., Cross, H., & Nockleby, D. (1984). A comparison of EMG biofeedback and anxiety management training in the treatment of test anxiety. *American Journal of Clinical Biofeedback*, 7(2), 112-121.

Yohannes, A. M. (2008). Management of anxiety and depression in patients with COPD. *Expert Review of Respiratory Medicine*, 2(3), 337-347.

Youngblut, C. (2006). *What a decade of experiments reveals about factors that influence the sense of presence..* Virginia: Institute for Defense Analyses

Youngblut, C. (2007). *What a decade of experiments reveals about factors that influence the sense of presence: latest findings*. Virginia: Institute for Defense Analyses

Youngblut, C., & Huie, O. (2003) The relationship between presence and performance in virtual environments: results of a VERTS Study. Proceedings of the *IEEE Virtual Reality 2003*.

Yussuf, A. D., Ajiboye, P. O., Buhari, O. I. N., Kuranga, S. A., & Balogun, O. R. (2006). Psychological health problems of resident doctors in a Nigerian teaching hospital. *South African Journal of Psychiatry*, 12(4), 106-111.

Zeiss, R., & Dickman, H. (1989). Incidence and person-situation correlates of former POWs. *Journal of Clinical Psychology*, 45, 80-87.

Zimber, A., Rudolf, A., & Teufel, S. (2001). A training program to reduce distress among geriatric caregivers. *Zeitschrift fur Gerontologie und Geriatrie*, 34(5), 401-407.

Zoellner, L. A., Feeny, N. C., Fitzgibbons, L. A., & Foa, E. B. (1999). Response of African American and Caucasian women to cognitive behavioral therapy for PTSD. *Behavior Therapy*, 30(4), 581-595.

Zimmons, S. (2004). *Anxiety and image characteristics in virtual environments. The Virtual-Pit experiment*. Dissertation. Preliminary results. Chapel Hill, U.S.A.

Zurawski, R. M., Smith, T. W., & Houston, B. K. (1987). Stress management for essential hypertension: Comparison with a minimally effective treatment, predictors of response to treatment, and effects on reactivity. *Journal of Psychosomatic Research*, 31(4), 453-462.

Annex A Addendum – Reference list of studies included in Chapter 2 Studies on SMT, AMT and SIT, by categories

A.1 Category 1: Improving physical and medical conditions

Aeschleman, S. R., & Imes, C. (1999). Stress inoculation training for impulsive behaviors in adults with traumatic brain injury. *Journal of Rational - Emotive and Cognitive - Behavior Therapy*, 17(1), 51-65.

Albright, G. L., Andreassi, J. L., & Brockwell, A. L. (1991). Effects of stress management on blood pressure and other cardiovascular variables. *International Journal of Psychophysiology*, 11(2), 213-217.

Amarosa-Tupler, B., Tapp, J. T., & Carida, R. V. (1989). Stress management through relaxation and imagery in the treatment of angina pectoris. *Journal of Cardiopulmonary Rehabilitation*, 9(9), 348-355.

Amigo, I., Buceta, J. M., Becona, E., & Bueno, A. M. (1991). Cognitive behavioural treatment for essential hypertension: A controlled study. *Stress Medicine*, 7(2), 103-108.

Antoni, M. H. (2003). Stress management effects on psychological, endocrinological, and immune functioning in men with HIV infection: Empirical support for a psychoneuroimmunological model. *Stress*, 6(3), 173-188.

Antoni, M. H. (2003). Stress management and psychoneuroimmunology in HIV infection. *CNS Spectrums*, 8(1), 40-51.

Antoni, M. H., Cruess, S., Cruess, D. G., Kumar, M., Lutgendorf, S., Ironson, G., et al. (2000). Cognitive-behavioral stress management reduces distress and 24-hour urinary free cortisol output among symptomatic HIV-infected gay men. *Annals of Behavioral Medicine*, 22(1), 29-37.

Antoni, M. H., Wimberly, S. R., Lechner, S. C., Kazi, A., Sifre, T., Urcuyo, K. R., et al. (2006). Reduction of cancer-specific thought intrusions and anxiety symptoms with a stress management intervention among women undergoing treatment for breast cancer. *American Journal of Psychiatry*, 163(10), 1791-1797.

Attari, A., Sartippour, M., Amini, M., & Haghghi, S. (2006). Effect of stress management training on glycemic control in patients with type 1 diabetes. *Diabetes Research and Clinical Practice*, 73(1), 23-28.

Baer, P. E., Cleveland, S. E., & Montero, A. C. (1985). Improving post-myocardial infarction recovery status by stress management training during hospitalization. *Journal of Cardiac Rehabilitation*, 5(4), 191-197.

- Bailey, B. K., McGrady, A. V., & Good, M. (1990). Management of a patient with insulin-dependent diabetes mellitus learning biofeedback-assisted relaxation. *The Diabetes Educator*, *16*(3), 201-204.
- Baron, R. S., & Logan, H. (1993). Desired control, felt control, and dental pain: Recent findings and remaining issues. *Motivation and Emotion*, *17*(3), 181-204.
- Barrera, M. (2000). Brief clinical report: Procedural pain and anxiety management with mother and sibling as co-therapists. *Journal of Pediatric Psychology*, *25*(2), 117-121.
- Batey, D. M., Kaufmann, P. G., Raczynski, J. M., Hollis, J. F., Murphy, J. K., Rosner, B., et al. (2000). Stress management intervention for primary prevention of hypertension: Detailed results from phase I of trials of hypertension prevention (TOHP-I). *Annals of Epidemiology*, *10*(1), 45-58.
- Berger, J. A., & O'Brien, W. H. (1998). Effect of a cognitive-behavioral stress management intervention on salivary IgA, self-reported levels of stress, and physical health complaints in an undergraduate population. *International Journal of Rehabilitation and Health*, *4*(3), 129-152.
- Berger, S., Schad, T., Von Wyl, V., Ehlert, U., Zellweger, C., Furrer, H., et al. (2008). Effects of cognitive behavioral stress management on HIV-1 RNA, CD4 cell counts and psychosocial parameters of HIV-infected persons. *AIDS*, *22*(6), 767-775.
- Bertino, L. S. (1989). Stress management with SCI clients. *Rehabilitation Nursing : The Official Journal of the Association of Rehabilitation Nurses*, *14*(3), 127-129.
- Bloom, L. J., & Cantrell, D. (1978). Anxiety management training for essential hypertension in pregnancy. *Behavior Therapy*, *9*(3), 377-382.
- Blumenthal, J. A., Jiang, W., Babyak, M. A., Krantz, D. S., Frid, D. J., Coleman, R. E., et al. (1997). Stress management and exercise training in cardiac patients with myocardial ischemia: Effects on prognosis and evaluation of mechanisms. *Archives of Internal Medicine*, *157*(19), 2213-2223.
- Blythe, B. J., & Erdahl, J. C. (1986). Using stress inoculation to prepare a patient for open-heart surgery. *Health & Social Work*, *11*(4), 265-274.
- Boardway, R. H., Delamater, A. M., Tomakowsky, J., & Gutai, J. P. (1993). Stress management training for adolescents with diabetes. *Journal of Pediatric Psychology*, *18*(1), 29-45.
- Bohachick, P. (1984). Progressive relaxation training in cardiac rehabilitation: Effect of psychological variables. *Nursing Research*, *33*(5), 283-287.
- Bosley, F., & Allen, T. W. (1989). Stress management training for hypertensives: Cognitive and physiological effects. *Journal of Behavioral Medicine*, *12*(1), 77-90.
- Brown, J. L., & Venable, P. A. (2008). Cognitive-behavioral stress management interventions for persons living with HIV: A review and critique of the literature. *Annals of Behavioral Medicine*, , 1-15.

- Buljan, D., Buljan, M., Živković, M. V., & Šitum, M. (2008). Basic aspects of psychodermatology. *Psychiatria Danubina*, 20(3), 415-418.
- Bundy, C., Carroll, D., Wallace, L., & Nagle, R. (1998). Stress management and exercise training in chronic stable angina pectoris. *Psychology and Health*, 13(1), 147-155.
- Canino, E., Cardona, R., Monsalve, P., Pérez Acuña, F., López, B., & Fragachan, F. (1994). A behavioral treatment program as a therapy in the control of primary hypertension. *Acta científica Venezolana*, 45(1), 23-30.
- Carrico, A. W., Antoni, M. H., Durán, R. E., Ironson, G., Penedo, F., Fletcher, M. A., et al. (2006). Reductions in depressed mood and denial coping during cognitive behavioral stress management with HIV-positive gay men treated with HAART. *Annals of Behavioral Medicine*, 31(2), 155-164.
- Charlesworth, E. A., Williams, B. J., & Baer, P. E. (1984). Stress management at the worksite for hypertension: Compliance, cost-benefit, health care and hypertension-related variables. *Psychosomatic Medicine*, 46(5), 387-397.
- Coates, T. J., McKusick, L., Kuno, R., & Stites, D. P. (1989). Stress reduction training changed number of sexual partners but not immune function in men with HIV. *American Journal of Public Health*, 79(7), 885-887.
- Cohen, L. L. (2008). Behavioral approaches to anxiety and pain management for pediatric venous access. *Pediatrics*, 122 Suppl 3, S134-139.
- Crowther, J. H. (1983). Stress management training and relaxation imagery in the treatment of essential hypertension. *Journal of Behavioral Medicine*, 6(2), 169-187.
- Cruess, D. G., Antoni, M. H., Schneiderman, N., Ironson, G., McCabe, P., Fernandez, J. B., et al. (2000). Cognitive-behavioral stress management increases free testosterone and decreases psychological distress in HIV-seropositive men. *Health Psychology*, 19(1), 12-20.
- Cruess, S., Antoni, M., Cruess, D., Fletcher, M. A., Ironson, G., Kumar, M., et al. (2000). Reductions in herpes simplex virus type 2 antibody titers after cognitive behavioral stress management and relationships with neuroendocrine function, relaxation skills, and social support in HIV-positive men. *Psychosomatic Medicine*, 62(6), 828-837.
- Cruess, S., Antoni, M. H., Hayes, A., Penedo, F., Ironson, G., Fletcher, M. A., et al. (2002). Changes in mood and depressive symptoms and related change processes during cognitive-behavioral stress management in HIV-infected men. *Cognitive Therapy and Research*, 26(3), 373-392.
- Durán Bouza, M., Simón, M. A., & Seoane, J. M. (2002). An evaluation of pharmacological treatment combined with stress inoculation training in the management of oral lichen planus. *Psychology and Health*, 17(6), 793-799.

- Dusek, J. A., Hibberd, P. L., Buczynski, B., Chang, B., Dusek, K. C., Johnston, J. M., et al. (2008). Stress management versus lifestyle modification on systolic hypertension and medication elimination: A randomized trial. *Journal of Alternative and Complementary Medicine*, *14*(2), 129-138.
- Edwards, D. (1997). Lifestyle, stress and hypertension: A case-study approach. *South African Journal of Psychology*, *27*(1), 22-29.
- Elsesser, K., Sartory, G., & Maurer, J. (1996). The efficacy of complaints management training in facilitating benzodiazepine withdrawal. *Behaviour Research and Therapy*, *34*(2), 149-156.
- Elsesser, K., Van Berkel, M., Sartory, G., Biermann-Gocke, W., & Ohl, S. (1994). The effects of anxiety management training on psychological variables and immune parameters in cancer patients: A pilot study. *Behavioural Psychotherapy*, *22*(1), 13-23.
- Esch, T., Duckstein, J., Welke, J., Stefano, G. B., & Braun, V. (2007). Mind/body techniques for physiological and psychological stress reduction: Stress management via tai chi training - A pilot study. *Medical Science Monitor*, *13*(11), CR488-CR497.
- Fernández, C., & Amigo, I. (2006). Efficacy of training in stress and contingency management in cases of irritable bowel syndrome. *Stress and Health*, *22*(5), 285-295.
- Fernandez, C., Perez, M., Amigo, I., & Linares, A. (1998). Stress and contingency management in the treatment of irritable bowel syndrome. *Stress Medicine*, *14*(1), 31-42.
- Fiedler, N., Vivona-Vaughan, E., & Gochfeld, M. (1989). Evaluation of a work site relaxation training program using ambulatory blood pressure monitoring. *Journal of Occupational Medicine*, *31*(7), 595-602.
- Foley, F. W., Bedell, J. R., LaRocca, N. G., Scheinberg, L. C., & Reznikoff, M. (1987). Efficacy of stress-inoculation training in coping with multiple sclerosis. *Journal of Consulting and Clinical Psychology*, *55*(6), 919-922.
- Gaab, J., Blättler, N., Menzi, T., Pabst, B., Stoyer, S., & Ehlert, U. (2003). Randomized controlled evaluation of the effects of cognitive-behavioral stress management on cortisol responses to acute stress in healthy subjects. *Psychoneuroendocrinology*, *28*(6), 767-779.
- García-Vega, E., & Fernandez-Rodriguez, C. (2004). A stress management programme for crohn's disease. *Behaviour Research and Therapy*, *42*(4), 367-383.
- García-Vera, M. P., Sanz, J., & Labrador, F. J. (2004). Blood pressure variability and stress management training for essential hypertension. *Behavioral Medicine*, *30*(2), 53-62.
- García-Vera, M. P., Sanz, J., & Labrador, F. J. (1998). Psychological changes accompanying and mediating stress-management training for essential hypertension. *Applied Psychophysiology Biofeedback*, *23*(3), 159-178.

- Hains, A. A., Davies, W. H., Parton, E., Totka, J., & Amoroso-Camarata, J. (2000). A stress management intervention for adolescents with type 1 diabetes. *Diabetes Educator*, 26(3), 417-424.
- Hammerfald, K., Eberle, C., Grau, M., Kinsperger, A., Zimmermann, A., Ehlert, U., et al. (2006). Persistent effects of cognitive-behavioral stress management on cortisol responses to acute stress in healthy subjects - A randomized controlled trial. *Psychoneuroendocrinology*, 31(3), 333-339.
- Hampel, P., Petermann, F., Schmidt, S., Scheewe, S., & Stachow, R. (1999). Cognitive-behavioral stress management training as a major component of patient education for children and adolescents with psoriasis: Preliminary data. [Kognitiv-behaviorales stressbewältigungstraining als Baustein in der patientenschulung für kinder und jugendliche mit psoriasis: Erste ergebnisse] *Pravention Und Rehabilitation*, 11(1), 37-46.
- Hampel, P., Rudolph, H., Petermann, F., & Stachow, R. (2001). Stress management training for children and adolescents with atopic dermatitis during inpatient rehabilitation. *Dermatology and Psychosomatics*, 2(3), 116-122.
- Hampel, P., Rudolph, H., Stachow, R., & Petermann, F. (2003). Multimodal patient education program with stress management for childhood and adolescent asthma. *Patient Education and Counseling*, 49(1), 59-66.
- Han, K. S. (2002). The effect of an integrated stress management program on the psychologic and physiologic stress reactions of peptic ulcer in korea. *International Journal of Nursing Studies*, 39(5), 539-548.
- Henry, J. L., Wilson, P. H., Bruce, D. G., Chisholm, D. J., & Rawling, P. J. (1997). Cognitive-behavioural stress management for patients with non-insulin dependent diabetes mellitus. *Psychology, Health and Medicine*, 2(2), 109-118.
- Hockemeyer, J., & Smyth, J. (2002). Evaluating the feasibility and efficacy of a self-administered manual-based stress management intervention for individuals with asthma: Results from a controlled study. *Behavioral Medicine*, 27(4), 161-172.
- Jacobsen, P. B., Meade, C. D., Stein, K. D., Chirikos, T. N., Small, B. J., & Ruckdeschel, J. C. (2002). Efficacy and costs of two forms of stress management training for cancer patients undergoing chemotherapy. *Journal of Clinical Oncology*, 20(12), 2851-2862.
- Jay, S. M., & Elliott, C. H. (1990). A stress inoculation program for parents whose children are undergoing painful medical procedures. *Journal of Consulting and Clinical Psychology*, 58(6), 799-804.
- Joachim, G. (1983). The effects of two stress management techniques on feelings of well-being in patients with inflammatory bowel disease. *Nursing Papers. Perspectives En Nursing*, 15(4), 5-18.
- Johnston, D. W. (1982). Behavioural treatment in the reduction of coronary risk factors: Type A behaviour and blood pressure. *British Journal of Clinical Psychology*, 21(4), 281-294.

Jorgensen, R. S., Houston, B. K., & Zurawski, R. M. (1981). Anxiety management training in the treatment of essential hypertension. *Behaviour Research and Therapy*, 19(6), 467-474.

Keinan, G., Segal, A., Gal, U., & Brenner, S. (1995). Stress management for psoriasis patients: The effectiveness of biofeedback and relaxation techniques. *Stress Medicine*, 11(4), 235-241.

Kemppainen, J., Eller, L. S., Bunch, E., Hamilton, M. J., Dole, P., Holzemer, W., et al. (2006). Strategies for self-management of HIV-related anxiety. *AIDS Care - Psychological and Socio-Medical Aspects of AIDS/HIV*, 18(6), 597-607.

Kemppainen, J. K., Holzemer, W. L., Nokes, K., Eller, L. S., Corless, I. B., Bunch, E. H., et al. (2003). Self-care management of anxiety and fear in HIV disease. *Journal of the Association of Nurses in AIDS Care*, 14(2), 21-29.

Koder, D. A. (1998). Treatment of anxiety in the cognitively impaired elderly: Can cognitive-behavior therapy help? *International Psychogeriatrics*, 10(2), 173-182.

Krischer, M. M., Xu, P., Meade, C. D., & Jacobsen, P. B. (2007). Self-administered stress management training in patients undergoing radiotherapy. *Journal of Clinical Oncology*, 25(29), 4657-4662.

Law, A., Logan, H., & Baron, R. S. (1994). Desire for control, felt control, and stress inoculation training during dental treatment. *Journal of Personality and Social Psychology*, 67(5), 926-936.

Leahy, A., Clayman, C., Mason, I., Lloyd, G., & Epstein, O. (1998). Computerised biofeedback games: A new method for teaching stress management and its use in irritable bowel syndrome. *Journal of the Royal College of Physicians of London*, 32(6), 552-556.

Liang, M. T. C., Garcia, M. D., & McAllister, L. (1988). Effects of an exercise and stress management program on cardiac patients' psychosocial and vocational status: Preliminary study. *Journal of the American Osteopathic Association*, 88(10), 1209-1218.

Lloyd-Williams, M., & Hughes, J. G. (2008). The management of anxiety in advanced disease. *Progress in Palliative Care*, 16(1), 47-50.

Lobitz, W. C., Brammell, H. L., Stoll, S., & Niccoli, A. (1983). Physical exercise and anxiety management training for cardiac stress management in a nonpatient population. *Journal of Cardiac Rehabilitation*, 3(10), 683-688.

Loh, K. Y., & Siang, T. K. (2008). Understanding non ulcer dyspepsia. *Medical Journal of Malaysia*, 63(2), 174-176.

Lucini, D., Riva, S., Pizzinelli, P., & Pagani, M. (2007). Stress management at the worksite: Reversal of symptoms profile and cardiovascular dysregulation. *Hypertension*, 49(2), 291-297.

Luskin, F., Reitz, M., Newell, K., Quinn, T. G., & Haskell, W. (2002). A controlled pilot study of stress management training of elderly patients with congestive heart failure. *Preventive Cardiology*, 5(4), 168-172+176.

- Luskin, F., Newell, K., & Haskel, W. (1999). Stress management training of elderly patients with congestive heart failure: Pilot study. *Preventive Cardiology*, 2(3), 101-104.
- Lutgendorf, S. K., Antoni, M. H., Ironson, G., Klimas, N., Kumar, M., Starr, K., et al. (1997). Cognitive-behavioral stress management decreases dysphoric mood and herpes simplex virus-type 2 antibody titers in symptomatic HIV-seropositive gay men. *Journal of Consulting and Clinical Psychology*, 65(1), 31-43.
- Mandel, A. R., & Keller, S. M. (1986). Stress management in rehabilitation. *Archives of Physical Medicine and Rehabilitation*, 67(6), 375-379.
- Marshall, M. (1991). Stress management in dermatology patients. *Nursing Standard (Royal College of Nursing (Great Britain) : 1987)*, 5(24), 29-31.
- McCain, N. L., Munjas, B. A., Munro, C. L., Elswick Jr., R. K., Wheeler Robins, J. L., Ferreira-Gonzalez, A., et al. (2003). Effects of stress management on PNI-based outcomes in persons with HIV disease. *Research in Nursing and Health*, 26(2), 102-117.
- McCain, N. L., Zeller, J. M., Cella, D. F., Urbanski, P. A., & Novak, R. M. (1996). The influence of stress management training in HIV disease. *Nursing Research*, 45(4), 246-253.
- McCraty, R., Barrios-Choplin, B., Rozman, D., Atkinson, M., & Watkins, A. D. (1998). The impact of a new emotional self-management program on stress, emotions, heart rate variability, DHEA and cortisol. *Integrative Physiological and Behavioral Science*, 33(2), 151-170.
- Méndez, F. J., & Beléndez, M. (1997). Effects of a behavioral intervention on treatment adherence and stress management in adolescents with IDDM. *Diabetes Care*, 20(9), 1370-1375.
- Michultka, D. M., Blanchard, E. B., & Rosenblum, E. L. (1989). Stress management and Gilles de la Tourette's syndrome. *Biofeedback and Self-Regulation*, 14(2), 115-123.
- Milling, L. S., & Breen, A. (2003). Mediation and moderation of hypnotic and cognitive-behavioural pain reduction. *Contemporary Hypnosis*, 20(2), 81-97.
- Milling, L. S., Levine, M. R., & Meunier, S. A. (2003). Hypnotic enhancement of cognitive-behavioral interventions for pain: An analogue treatment study. *Health Psychology*, 22(4), 406-413.
- Milne, B., Joachim, G., & Niedhardt, J. (1986). A stress management programme for inflammatory bowel disease patients. *Journal of Advanced Nursing*, 11(5), 561-567.
- Mittag, O. (1997). Stress management: Goals and techniques for the rehabilitation of patients suffering from coronary heart disease. [Stressmanagement: Ziele und Methoden in der Rehabilitation von Koronarpatienten] *Pravention Und Rehabilitation*, 9(4), 147-153.
- Multon, K. D., Parker, J. C., Smarr, K. L., Stucky, R. C., Petroski, G., Hewett, J. E., et al. (2001). Effects of stress management on pain behavior in rheumatoid arthritis. *Arthritis Care and Research*, 45(2), 122-128.

- Nelson, D. V., Baer, P. E., Cleveland, S. E., Revel, K. F., & Montero, A. C. (1994). Six-month follow-up of stress management training versus cardiac education during hospitalization for acute myocardial infarction. *Journal of Cardiopulmonary Rehabilitation, 14*(6), 384-390.
- Onyett, S. R., & Turpin, G. (1988). Benzodiazepine withdrawal in primary care: A comparison of behavioural group training and individual sessions. *Behavioural Psychotherapy, 16*(4), 297-312.
- Ornish, D., Scherwitz, L. W., & Doody, R. S. (1983). Effects of stress management training and dietary changes in treating ischemic heart disease. *Journal of the American Medical Association, 249*(1), 54-59.
- Parker, J. C., Smarr, K. L., Buckelew, S. P., Stucky-Ropp, R. C., Hewett, J. E., Johnson, J. C., et al. (1995). Effects of stress management on clinical outcomes in rheumatoid arthritis. *Arthritis and Rheumatism, 38*(12), 1807-1818.
- Patel, C., & Marmot, M. (1988). Can general practitioners use training in relaxation and management of stress to reduce mild hypertension? *British Medical Journal, 296*(6614), 21-24.
- Patel, C. (1997). Stress management and hypertension. *Acta Physiologica Scandinavica, Supplement, 161*(640), 155-157.
- Patel, C., & Marmot, M. G. (1987). Stress management, blood pressure and quality of life. *Journal of Hypertension, 5*(SUPPL. 1), S21-S28.
- Phillips, K. D., & Morrow, J. H. (1998). Nursing management of anxiety in HIV infection. *Issues in Mental Health Nursing, 19*(4), 375-397.
- Quillen, M. A., & Denney, D. R. (1982). Self-control of dysmenorrhic symptoms through pain management training. *Journal of Behavior Therapy and Experimental Psychiatry, 13*(2), 123-130.
- Rainforth, M. V., Schneider, R. H., Nidich, S. I., Gaylord-King, C., Salerno, J. W., & Anderson, J. W. (2007). Stress reduction programs in patients with elevated blood pressure: A systematic review and meta-analysis. *Curr Hypertens Rep, 9*(6):520-528.
- Rhee, S. H., Parker, J. C., Smarr, K. L., Petroski, G. F., Johnson, J. C., Hewett, J. E., et al. (2000). Stress management in rheumatoid arthritis: What is the underlying mechanism? *Arthritis Care and Research, 13*(6), 435-442.
- Rose, M. I., Firestone, P., Heick, H. M. C., & Faight, A. K. (1983). The effects of anxiety management training on the control of juvenile diabetes mellitus. *Journal of Behavioral Medicine, 6*(4), 381-395.
- Ross, M. J., & Berger, R. S. (1996). Effects of stress inoculation training on athletes' postsurgical pain and rehabilitation after orthopedic injury. *Journal of Consulting and Clinical Psychology, 64*(2), 406-410.
- Saxe, G. A., Major, J. M., Nguyen, J. Y., Freeman, K. M., Downs, T. M., & Salem, C. E. (2006). Potential attenuation of disease progression in recurrent prostate cancer with plant-based diet and stress reduction. *Integrative Cancer Therapies, 5*(3), 206-213.

- Schwartz, D. P., Large, H. S., & DeGood, D. E. (1984). A chronic emergency room visitor with chest pain: Successful treatment by stress management training and biofeedback. *Pain*, 18(3), 315-319.
- Schwickert, M., Langhorst, J., Paul, A., Michalsen, A., & Dobos, G. J. (2006). Stress management in the treatment of essential arterial hypertension. [Stressmanagement: Entspannung für hyperteniker - Aktiv oder meditativ] *MMW-Fortschritte Der Medizin*, 148(47), 40-42.
- Stauber, T., Petermann, F., Bachmann, H., Bachmann, C., & Hampel, P. (2007). Cognitive-behavioral stress management training for boys with functional urinary incontinence. *Journal of Pediatric Urology*, 3(4), 276-281.
- Stauber, T., Petermann, F., Bachmann, H., Bachmann, C., & Hampel, P. (2004). Cognitive-behavioral stress management training for children and adolescents with functional urinary incontinence. [Kognitiv-behaviorales stressbewältigungstraining in der patientenschulung von kindern und jugendlichen mit funktioneller harninkontinenz] *Zeitschrift Fur Klinische Psychologie, Psychiatrie Und Psychotherapie*, 52(4), 323-345.
- Stauber, T., Petermann, F., Korb, U., Bauer, A., & Hampel, P. (2002). In-patient educational training in obesity with stress management - A pilot study. [Kombiniertes adipositas- und anti-streß-training im stationären bereich: Eine pilotstudie] *Pravention Und Rehabilitation*, 14(4), 179-188.
- Surwit, R. S., Van Tilburg, M. A. L., Zucker, N., McCaskill, C. C., Parekh, P., Feinglos, M. N., et al. (2002). Stress management improves long-term glycemic control in type 2 diabetes. *Diabetes Care*, 25(1), 30-34.
- Swann, P. (1989). Stress management for pain control. *Physiotherapy*, 75(5), 295-298.
- Taylor, D. N. (1995). Effects of a behavioral stress-management program on anxiety, mood, self-esteem, and T-cell count in HIV positive men. *Psychological Reports*, 76(2), 451-457.
- Trzcieniecka-Green, A., & Steptoe, A. (1996). The effects of stress management on the quality of life of patients following acute myocardial infarction or coronary bypass surgery. *European Heart Journal*, 17(11), 1663-1670.
- Ulmer, D. (1996). Stress management for the cardiovascular patient: A look at current treatment and trends. *Progress in Cardiovascular Nursing*, 11(1), 21-29.
- Unknown Author (2002). Boost glycemic control in type 2 diabetics with stress management training. *Disease Management Advisor*, 8(4), 58-59, 49.
- Vocks, S., Ockenfels, M., Jürgensen, R., Mussgay, L., & Rüdell, H. (2004). Blood pressure reactivity can be reduced by a cognitive behavioral stress management program. *International Journal of Behavioral Medicine*, 11(2), 63-70.

- Webb, M., Beckstead, J., Meininger, J., & Robinson, S. (2006). Stress management for african american women with elevated blood pressure: A pilot study. *Biological Research for Nursing*, 7(3), 187-196.
- Wells, J. K., Howard, G. S., Nowlin, W. F., Vargas, M. J. (1986). Presurgical anxiety and postsurgical pain and adjustment: Effects of a stress inoculation procedure. *Journal of Consulting and Clinical Psychology*, 54(6), pp. 831-835.
- Wernick, R. L., Jaremko, M. E., & Taylor, P. W. (1981). Pain management in severely burned adults: A test of stress inoculation. *Journal of Behavioral Medicine*, 4(1), 103-109.
- Wiholm, C., & Arnetz, B. (2006). Stress management and musculoskeletal disorders in knowledge workers: The possible mediating effects of stress hormones. *Advances in Physiotherapy*, 8(1), 5-14.
- Wiholm, C., Arnetz, B., & Berg, M. (2000). The impact of stress management on computer-related skin problems. *Stress Medicine*, 16(5), 279-285.
- Wilson, R. W., Taliaferro, L. A., & Jacobsen, P. B. (2006). Pilot study of a self-administered stress management and exercise intervention during chemotherapy for cancer. *Supportive Care in Cancer*, 14(9), 928-935.
- Wittrock, D. A., Blanchard, E. B., McCoy, G. C., McCaffrey, R. J., & Khramelashvili, V. V. (1995). The relationship of expectancies to outcome in stress management treatment of essential hypertension: Results from the joint U.S.SR-U.S.A behavioral hypertension project. *Biofeedback and Self-Regulation*, 20(1), 51-63.
- Yohannes, A. M. (2008). Management of anxiety and depression in patients with COPD. *Expert Review of Respiratory Medicine*, 2(3), 337-347.
- Zurawski, R. M., Smith, T. W., & Houston, B. K. (1987). Stress management for essential hypertension: Comparison with a minimally effective treatment, predictors of response to treatment, and effects on reactivity. *Journal of Psychosomatic Research*, 31(4), 453-462.

A.2 Category 2: Treatment of anxiety and other mental disorders

- Amstadter, A. B., McCart, M. R., & Ruggiero, K. J. (2007). Psychosocial interventions for adults with crime-related PTSD. *Professional Psychology: Research and Practice*, 38 (6), 640-651.
- Anderson, P. L., Zimand, E., Hodges, L. F., & Rothbaum, B. O. (2005). Cognitive behavioural therapy for public-speaking anxiety using virtual reality for exposure. *Depression and Anxiety*, 22 (3), 156-158.

- Awalt, R. M., Reilly, P. M., & Shopshire, M. S. (1997). The angry patient: An intervention for managing anger in substance abuse treatment. *Journal of Psychoactive Drugs*, 29(4), 353-358.
- Baguena-Puigcerver, Ma. J. (2001). Efficacious psychological treatments for post-traumatic stress disorder. *Psicothema*, 13 (3), 479-492.
- Beckham, J. C., Vrana, S. R., May, J. G., Gustafson, D. J., & Smith, G. R. (1990). Emotional processing and fear measurement synchrony as indicators of treatment outcome in fear of flying. *Journal of Behavior Therapy and Experimental Psychiatry*, 21(3), 153-162.
- Berliner, L., & Saunders, B. E. (1996). Treating fear and anxiety in sexually abused children: Results of a controlled 2-year follow-up study. *Child Maltreatment*, 1(4), 294-309.
- Blowers, C., Cobb, J. & Mathews, A. (1987). Generalised anxiety: A controlled treatment study. *Behaviour Research and Therapy*, 25(6), 493-502.
- Bond, A. J., Wingrove, J., Valerie-Curran, H., & Lader, M. H. (2002). Treatment of generalised anxiety disorder with a short course of psychological therapy, combined with buspirone or placebo. *Journal of Affective Disorders*, 72(3), 267-271.
- Brown, S. (1983). Coping skills training: Attitude toward mental illness, depression, and quality of life 1 year later. *Journal of Counseling Psychology*, 30(1), 117-120.
- Butler, G., Cullington, A., Munby, M., Amies, P., & Gelder, M. (1984). Exposure and anxiety management in the treatment of social phobia. *Journal of Consulting and Clinical Psychology*, 52(4), 642-650.
- Cahill, S. P., Rauch, S. A., Hembree, E. A., & Foa, E. B. (2003). Effect of cognitive-behavioral treatments for PTSD on anger. *Journal of Cognitive Psychotherapy: An International Quarterly*, 17(2), 113-131.
- Charlesworth, E. A., & Dempsey, G. (1982). Trait anxiety reductions in a substance abuse population trained in stress management. *Journal of Clinical Psychology*, 38(4), 764-769.
- Childs-Clarke, A., Whitfield, W., Cadbury, S., & Sandu, S. (1989). Anxiety management groups in clinical practice. *Nursing times*, 85(30), 49-52.
- Cragan, M. K., & Deffenbacher, J. L. (1984). Anxiety management training and relaxation as self-control in the treatment of generalized anxiety in medical outpatients. *Journal of Counseling Psychology*, 31(2), 123-131.
- Dodd, H., & Wellman, N. (2000). Staff development, anxiety and relaxation techniques: a pilot study in an acute psychiatric inpatient setting. *Journal of Psychiatric and Mental Health Nursing*, 7(5), 443-448.
- Durham, R. C., Fisher, P. L., Treliving, L. R., Hau, C. M., Richard, K., & Stewart, J. B. (1999). One year follow-up of cognitive therapy, analytic psychotherapy and anxiety management training for generalized anxiety disorder: Symptom change, medication usage and attitudes to treatment. *Behavioural and Cognitive Therapy*, 27(1), 19-35.

- Durham, R. C., Murphy, T., Allan, T., Richard, K., Treliving, L.R., & Fenton, G. W. (1994). Cognitive therapy, analytic psychotherapy and anxiety management training for generalised anxiety disorder. *British Journal of Psychiatry*, *165*, 315-323.
- Edelman, & Chambless, D. L. (1993). Compliance during sessions and homework in exposure-based treatment of agoraphobia. *Behaviour Research and Therapy*, *31*(8), 767-773.
- Feeny, N. C., Zoellner, L. A., & Foa, E. B. (2002). Treatment outcome for chronic PTSD among female assault victims with borderline personality characteristics: A preliminary examination. *Journal of Personality Disorders*, *16*(1), 30-40.
- Foa, E. B., Dancu, C. V., Hembree, E. A., Jaycox, L. H., Meadows, E. A., & Street, G. P. (1999). A comparison of exposure therapy, stress inoculation training, and their combination for reducing posttraumatic stress disorder in female assault victims. *Journal of Consulting and Clinical Psychology*, *6* (2), 194-200.
- Foa, E. B., Rothbaum, B. O., Riggs, D. S., & Murdock, T. B. (1991). Treatment of posttraumatic stress disorder in rape victims: A comparison between cognitive-behavioral procedures and counseling. *Journal of Consulting and Clinical Psychology*, *59*(5), 715-723.
- Gonzalez, L. O., & Sellers, E. W. (2002). The effects of a stress-management program on self-concept, locus of control, and the acquisition of coping skills in school-age children diagnosed with attention deficit hyperactivity disorder. *Journal of Child and Adolescent Psychiatry Nursing*, *15*(1), 5-15.
- Gorini, A., & Riva, G. (2008). The potential of virtual reality as anxiety management tool: A randomized control study in a sample of patients affected by generalized anxiety disorder. *Trials*, *9*, 25.
- Holcomb, W. R. (1986). Stress inoculation therapy with anxiety and stress disorders of acute psychiatric inpatients. *Journal of Clinical Psychology*, *42*(6), 864-872.
- Hutchings, D. F., Denney, D. R., Basgall, J., & Houston, B. K. (1980). Anxiety management and applied relaxation in reducing general anxiety. *Behaviour Research and Therapy*, *18*(3), 181-190.
- Jaremko, M. E. (1980). The use of stress inoculation training in the reduction of public speaking anxiety. *Journal of Clinical Psychology*, *36*(3), 735-742.
- Jannoun, L., Oppenheimer, C., & Gelder, M. (1982). A self-help treatment program for anxiety state patients. *Behavior Therapy*, *13*(1), 103-111.
- Karam, E. G., Fayyad, J., Karam, A. N., Tabet, C. C., Melhem, N., Mneimneh, Z., Dimassi, H. (2008). Effectiveness and specificity of a classroom-based group intervention in children and adolescents exposed to war in Lebanon. *World Psychiatry*, *7*(2), pp. 103-109.
- Keane, T. M., Fairbank, J. A., Caddell, J. M., & Zimering, R. T. (1989). Implosive (flooding) therapy reduces symptoms of PTSD in Vietnam combat veterans. *Behavior Therapy*, *20*, 245-260.

- Keane, T. M., Marshall, A. D., & Taft, C. T. (2006). Posttraumatic stress disorder: Etiology, epidemiology, and treatment outcome. *Annual Review of Clinical Psychology*, 2, 161-197.
- Lader, M. H., & Bond, A. J. (1998). Interaction of pharmacological and psychological treatments of anxiety. *British Journal of Psychiatry*, 173, 42-48.
- Lee, C., Gavriel, H., Drummond, P., Richards, J., & Greenwald, R. (2002). Treatment of PTSD: Stress inoculation training with prolonged exposure compared to EMDR. *Journal of Clinical Psychology*, 58(9), 1071-1089.
- Lee, H.-L., Tan, H.K.-L., Ma, H.-I., & Tsai, K. (2006). Effectiveness of a work-related stress management program in patients with chronic schizophrenia. *American Journal of Occupational Therapy*, 60(4), 435-441.
- Leff, J. (1994). Working with the families of schizophrenic patients. *The British Journal of Psychiatry*, 23, 71-76.
- Lindsay, W. R., Gamsu, C. V., & McLaughlin, E. (1987). A controlled trial of treatments for generalized anxiety. *British Journal of Clinical Psychology*, 26(1), 3-15.
- March, J. S. (1995). Cognitive-behavioral psychotherapy for children and adolescents with OCD: A review and recommendations for treatment. *Journal of the American Academy of Child and Adolescent Psychiatry*, 34(1), 7-18.
- Marks, I. (1985). Behavioral treatment of social phobia. *Psychopharmacology Bulletin*, 21 (3), 615-618.
- Melfsen, S., Osterlow, J., Beyer, J., & Florin, I. (2003). Evaluation of a cognitive-behavioral training program for children with social anxiety. *Zeitschrift für Klinische Psychologie und Psychotherapie*, 32(3), 191-199.
- Moses III, A.N., & Hollandsworth Jr., J.G. (1985). Relative effectiveness of education alone versus stress inoculation training in the treatment of dental phobia. *Behavior Therapy*, 16 (5), 531-537.
- Norman, R. M. G., Malla, A. K., McLean, T. S., McIntosh, E. M., Neufeld, R. W. J., Voruganti, L. P., & Cortese, L. (2002). An evaluation of a stress management program for individuals with schizophrenia. *Schizophrenia Research*, 58, 293-303.
- Ormrod, J. (1995). Short and long-term effectiveness of group anxiety management training. *Behavioural and Cognitive Psychotherapy*, 23, 63-70.
- Ormrod, J., & Budd, R. (1991). A comparison of two treatment interventions aimed at lowering anxiety levels and alcohol consumption amongst alcohol abusers. *Drug and Alcohol Dependence*, 27(3), 233-243.
- Öst, L. G. (1978). Behavioral treatment of thunder and lightning phobias. *Behaviour Research and Therapy*, 16(3), 197-207.

- Pantaloni, M. V., & Motta, R. W. (1998). Effectiveness of anxiety management training in the treatment of posttraumatic stress disorder : A preliminary report. *Journal of Behavior Therapy and Experimental Psychiatry*, 29, 21-29.
- Peniston, E. G. (1986). EMG biofeedback-assisted desensitization treatment for Vietnam combat veterans' posttraumatic stress disorder, *Clinical Biofeedback and Health: An International Journal*, 9(1), 35-41.
- Piacentini, J. (1999). Cognitive behavioural therapy of childhood OCD. *Child and Adolescent Psychiatric Clinics of North America*, 8(3), 599-616.
- Pollard, C. A., Obermeier, H. J., & Cox, G. L. (1987). Inpatients treatment of complicated agoraphobia and panic disorder. *Hospital and Community Psychiatry*, 38(9), 951-958.
- Ramm, E., Marks, I. M., Yuksel, S., & Stern, R. S. (1982). Anxiety management training for anxiety states: Positive compared with negative self-statements. *British Journal of Psychiatry*, 140(4), 367-373.
- Resick, P. A., Jordan, C. G., Girelli, S. A., Kotsis-Hutter, C., & Marhoefer-Dvorak, S. (1988). A comparative outcome study of behavioural group therapy for sexual assault victims. *Behavior Therapy*, 19(3), 385-401.
- Rohsenow, D. J., Smith, R. E., & Johnson, S. (1985). Stress management training as a prevention program for heavy social drinkers: Cognitions, affect, drinking, and individual differences. *Addictive Behaviors*, 10(1), 45-54.
- Rothbaum, B. O., Anderson, P., Zimand, E., Hodges, L., Lang, D., & Wilson, J. (2006). Virtual reality exposure therapy and standard (in vivo) exposure therapy in the treatment of fear of flying. *Behavior Therapy*, 37(1), 80-90.
- Rothbaum, B.O., Hodges, L., Smith, S., Lee, J. H., & Price, L. (2000). A controlled study of virtual reality exposure therapy for the fear of flying. *Journal of Consulting and Clinical Psychology*, 68(6), 1020-1026.
- Snaith, P., Owens, D., & Kennedy, E. (1992). An outcome study of a brief anxiety management programme: Anxiety control training. *Irish Journal of Psychological Medicine*, 9(2), 111-114.
- Sorby, N. G. D., Reavley, W., & Huber, J. W. (1991). Self help programme for anxiety in general practice: Controlled trial of an anxiety management booklet. *British Journal of General Practice*, 41, 417-420.
- Stein, F., & Nikolic, S. (1989). Teaching stress management techniques to a schizophrenic patient. *The American Journal of Occupational Therapy*, 43(3), 162-169.
- Stormer-Labonte, M., Machemer, P., & Hardinghaus, W. (1992). A meditative stress-management-program for psychosomatic patients. *PPmP Psychotherapie Psychosomatik Medizinische Psychologie*, 42(12), 436- 444.

Triffleman, E., Carroll, K., & Kellogg, S. (1999). Substance dependence posttraumatic stress disorder therapy: An integrated cognitive-behavioral approach. *Journal of Substance Abuse Treatment, 17*(1-2), 3-14.

Viens, M., De Koninck, J., Mercier, P., St-Onge, M., & Lorrain, D. (2003). Trait anxiety and sleep-onset insomnia. Evaluation of treatment using anxiety management training. *Journal of Psychosomatic Research, 54*, 31-37.

White, J. (1995). Stresspac: A controlled trial of a self-help package for the anxiety disorders. *Behavioural and Cognitive Psychotherapy, 23*(2), 89-107.

White, J., Jones, R., & McGarry, E. (2000). Cognitive behavioural computer therapy for the anxiety disorders: A pilot study. *Journal of Mental Health, 9*(5), 505-516.

Zoellner, L. A., Feeny, N. C., Fitzgibbons, L. A., & Foa, E. B. (1999). Response of african american and caucasian women to cognitive behavioral therapy for PTSD. *Behavior Therapy, 30*(4), 581-595.

A.3 Category 3: Control of already existing stress-related issues

Archer, J. J., & Reisor, J. S. (1982). A group approach to stress and anxiety management. *Journal for Specialists in Group Work, 7*, 238- 244.

Barona, E. G., & Jimenez, J. C. R. (2005). Strategies for intervention and prevention of burnout in teaching. *Salud Mental, 28*(5), 27-33.

Barrios, B. A., & Shigetomi, C. C. (1979). Coping-skills training for the management of anxiety: A critical review. *Behavior Therapy, 10*(4), 491-522.

Barrios-Choplin, B., McCraty, R., & Cryer, B. (1997). An inner quality approach to reducing stress and improving physical and emotional wellbeing at work. *Stress Medicine, 13*, 193-201.

Beaver, C., Brown, R. A., & Lichtenstein, E. (1981). Effects of monitored nicotine fading and anxiety management training on smoking reduction. *Addictive Behaviors, 6*(4), 301-305.

Bennett, G., & Millard, M. (1985). Compliance with relaxation training: The effect of providing information. *Behavioural Psychotherapy, 13*(2), 110-119.

Bloom, A. J., & Hautaluoma, J. E. (1990). Anxiety management training as a strategy for enhancing computer user performance. *Computers in Human Behavior, 6*(4), 337-349.

- Bormann, J. E., Oman, D., Kempainen, J. K., Becker, S., Gershwin, M., & Kelly, A. (2006). Mantram repetition for stress management in veterans and employees: A critical incident study. *Journal of Advanced Nursing*, 53(5), 502-512.
- Brown, J. S. L., Cochrane, R., Mack, C.F., Leung, N., & Hancox, T. (1998). Comparison of effectiveness of large scale stress workshops with small stress / anxiety management training groups. *Behavioural and Cognitive Psychotherapy*, 26, 219-235.
- Butcher, P., & Davis, H. (1988). Personal effectiveness and stress management course for community health workers: A pilot study. *Patient Education and Counseling*, 12, 13-27.
- Byron, D. (2002). The use of hypnosis to help an anxious student with a social communication disorder to attend school. *Contemporary Hypnosis*, 19(3), 125-132.
- Carrington, P., Collings Jr., G. H., & Benson, H. (1980). The use of meditation-relaxation techniques for the management of stress in a working population. *Journal of Occupational Medicine*, 22(4), 221-231.
- Cary, M., & Dua, J. (1999). Cognitive-behavioral and systematic desensitization procedures in reducing stress and anger in caregivers for the disabled. *International Journal of Stress Management*, 6(2), 75-87.
- Cecil, M. A., & Forman, S. G. (1990). Effects of stress inoculation training and coworker support groups on teachers' stress. *Journal of School Psychology*, 28, 105-118.
- Charlesworth, E. A., Murphy, S., & Beutler, L. E. (1981). Stress management skill for nursing students. *Journal of Clinical Psychology*, 37(2), 284-290.
- Cigrang, J. A., Todd, S. L., & Carbone, E. G. (2000). Stress management training for military trainees returned to duty after mental health evaluation: Effect on graduation rates. *Journal of Occupational Health Psychology*, 5(1), 48-55.
- Coogle, C. L., Jablonski, R., Rachel, J. A., & Parham, I. A. (2008). Skills-enhancement training program for home care providers: Implications for redefining quality care. *Home Health Care Management & Practice*, 20(4), 312-322.
- Coulthard, P., & Craig, D. (1997). Conscious sedation. *Dental Update*, 24(9), 376-381.
- Credidio, S. G. (1980). Stress management with a psychophysiological profile, biofeedback, and relaxation training techniques. *American Journal of Clinical Biofeedback*, 3(2), 130-136.
- Crockford, D., Holt-Seitz, A., & Adams, B. (2004). Preparing psychiatry residents for the certification exam: A survey of residency and exam experiences. *Canadian Journal of Psychiatry*, 49(10), 690-695.
- Crouch, R. B. (2008). A community-based stress management programme for an impoverished population in south Africa. *Occupational Therapy International*, 15(2), 71-86.

Daley, P. C., Bloom, L. J., Deffenbacher, J. L., & Stewart, R. (1983). Treatment effectiveness of anxiety management training in small and large group formats. *Journal of Counseling Psychology, 30*(1), 104-107.

Davey, T. L., & Neff, J.A. (2001). A shelter-based stress-reduction group intervention targeting self-esteem, social competence, and behaviour problems among homeless children. *Journal of Social Distress and the Homeless, 10*(3), 279-291.

Deffenbacher, J. L., & Michaels, A. C. (1981). Anxiety management training and self-control desensitization--15 months later. *Journal of Counseling Psychology, 28*(5), 459-462.

Deffenbacher, J. L., & Michaels, A. C. (1981). A 12-month follow-up of homogeneous and heterogeneous anxiety management training. *Journal of Counseling Psychology, 28*(5), 463-466.

Deffenbacher, J. L., Michaels, A. C., Daley, P. C., & Michaels, T. F. (1980). A comparison of homogeneous and heterogeneous anxiety management training. *Journal of Counseling Psychology, 27*(6), 630-634.

Deffenbacher, J. L., Michaels, A. C., Michaels, T., & Daley, P. C. (1980). Comparison of anxiety management training and self-control desensitization. *Journal of Counseling Psychology, 27*(3), 232-239.

Deffenbacher, J. L., & Shelton, J. L. (1978). Comparison of anxiety management training and desensitization in reducing test and other anxieties. *Journal of Counseling Psychology, 25*(4), 277-282.

de Jong, G. M., & Emmelkamp, P. M. G. (2000). Implementing a stress management training : Comparative trainer effectiveness. *Journal of Occupational Health Psychology, 5*(2), 309-320.

de Vente, W., Kamphuis, J. H., Emmelkamp, P. M. G., & Blonk, R. W. B. (2008). Individual and group cognitive-behavioral treatment for work-related stress complaints and sickness absence: A randomized controlled trial. *Journal of Occupational Health Psychology, 13*(3), 214-231.

Dewe, P. (1989). Developing stress management programs: What can we learn from recent research ? *Journal of Occupational Health and Safety – Australia and New Zealand, 5*(6), 493-500.

Dollard, M., Forgan, R., & Winefield, A. (1998). Five-year evaluation of a work stress intervention program. *Journal of occupational health and safety, 14*(2), 159-165.

Edimansyah, B. A., Rusli, B. N., & Naing, L. (2008). Effects of short duration stress management training on self-perceived depression, anxiety and stress in male automotive assembly workers: A quasi-experimental study. *Journal of Occupational Medicine and Toxicology, 3*(1), 28.

Edwards, D., & Burnard, P. (2003). A systematic review of stress and stress management interventions for mental health nurses. *Journal of Advanced Nursing, 42*(2), 169-200.

Eniola, M., & Busari, A. O. (2007). Effects of stress management training of self-image perception of the visually impaired individuals. *Essays in Education, 19*, 10-17.

- Eriksen, H. R., Ihlebaek, C., Mikkelsen, A., Gronningsaeter, H., Sandal, G. M., & Ursin, H. (2002). Improving subjective health at the worksite: A randomized controlled trial of stress management training, physical exercise and an integrated health programme. *Occupational Medicine*, 52(7), 383-391.
- Fontana, A. M., Hyra, D., Godfrey, L., & Cermak, L. (1999). Impact of a peer-led stress inoculation training intervention on state anxiety and heart rate in college students. *International Journal of Fracture*, 100(1), 45-63.
- Forbes, E. J., & Pekala, R. J. (1993). Psychophysiological effects of several stress management techniques. *Psychological Reports*, 72(1), 19-27.
- Forman, S. G. (1981). Stress-management training: Evaluation of effects on school psychological services. *Journal of School Psychology*, 19(3), 233-241.
- Forman, S. G. (1982). Stress management for teachers : a cognitive-behavioral program. *Journal of School Psychology*, 20(3), 180-187.
- Frisch, M. B., Elliott, C. H., Atsides, J. P., Salva, D. M., & Denney, D. R. (1982). Social skills and stress management training to enhance patients' interpersonal competencies. *Psychotherapy: Theory, Research and Practice*, 19(3), 349-358.
- Gardner, B., Rose, J., Mason, O., Tyler, P., & Cushway, D. (2005). Cognitive therapy and behavioural coping in the management of work-related stress: An intervention study. *Work & Stress*, 19(2), 137-152.
- Garrison, J. (1978). Stress management training for the handicapped. *Archives of Physical Medicine and Rehabilitation*, 59(12), 580-585.
- Garrison, J. E. (1978). Stress management training for the elderly: A psychoeducational approach. *Journal of the American Geriatrics Society*, 26(9), 397-403.
- Gilbert, C. (2003). Clinical applications of breathing regulation: Beyond anxiety management. *Behavior Modification*, 27(5), 692-709.
- Goldberg, M. (1980). Clinical application of anxiety management and relaxation training: A multi-referral workshop. *Clinical Social Work Journal*, 8(4), 266-276.
- Greenberg, J. S., Ramsey, S. A., & Hale, J. F. (1987). A portable, self-instructional stress management program for college students. *The Journal of School Health*, 57, 53-55.
- Grossman, S., & Wheeler, K. (1999). Integrating multidimensional stress management into a baccalaureate nursing curriculum. *Nursing Connections*, 12(2), 23-29.
- Gudjonsson, G. H. (1983). Factors reducing occupational stress in police officers: Junior officers' view. *Police Journal*, 56(3), 251-255.
- Hains, A. A. (1992). A stress inoculation training program for adolescents in a high school setting: A multiple baseline approach. *Journal of Adolescence*, 15(2), 163-175.

- Hains, A. A., & Ellmann, S. W. (1994). Stress inoculation training as a preventive intervention for high school youths. *Journal of Cognitive Psychotherapy: An International Quarterly*, 8(3), 219-232.
- Hampel, P., Jahr, A., & Backhaus, O. (2008). Gender-specific stress management training at school. *Praxis der Kinderpsychologie und Kinderpsychiatrie*, 57(1), 20-38.
- Hart, K. E. (1984). Anxiety management training and anger control for type A individuals. *Journal of Behavior Therapy and Experimental Psychiatry*, 15(2), 133-139.
- Heron, R. J. L., McKeown, S., Tomenson, J. A., & Teasdale, E. L. (1999). Study to evaluate the effectiveness of stress management workshops on response to general and occupational measures of stress. *Occupational Medicine*, 49(7), 451-457.
- Heyne, D., King, N. J., Tonge, B. J., & Cooper, H. (2001). School refusal epidemiology and management. *Paediatric Drugs*, 3(10), 719-732.
- Higgins, N. C. (1986). Occupational stress and working women: The effectiveness of two stress reduction programme. *Journal of Vocational Behavior*, 29(1), 66-78.
- Hill, K. B., Hainsworth, J. M., Burke, F. J. T., & Fairbrother, K. J. (2008). Evaluation of dentists' perceived needs regarding treatment of the anxious patient. *British Dental Journal*, 204(8).
- Hirokawa, K., Yagi, A., & Miyata, Y. (2002). An examination of the effects of stress management training for Japanese college students of social work. *International Journal of Stress Management*, 9, 113.
- Holtzworth-Munroe, A., Munroe, M. S., & Smith, R. E. (1985). Effects of a stress-management training program on first- and second-year medical students. *Journal of Medical Education*, 60(5), 417-419.
- Iglesias, S. L., Azzara, S., Squillace, M., Jeifetz, M., Lopes, M. R., Desimone, M., & Diaz, L. (2005). A study on the effectiveness of a stress management programme for college students. *Pharmacy Education*, 5, 27-31.
- Kaminer, Y., & Sharar, A. (1987). The stress inoculation training management of self-mutilating behavior: A case study. *Journal of Behavior Therapy and Experimental Psychiatry*, 18(3), 289-292.
- Kelly, J. A., Bradlyn, A. S., Dubbert, P. M., & St.Lawrence, J. S. (1982). Stress management training in medical school. *Journal of Medical Education*, 57(2), 91-99.
- Kelly, K. R., & Stone, G. L. (1987). Effects of three psychological treatments and self-monitoring on the reduction of type A behavior. *Journal of Counseling Psychology*, 34(1), 46-54.
- Keyes, J. B., & Dean, S. F. (1988). Stress inoculation training for direct contact staff working with mentally retarded persons. *Behavioral Residential Treatment*, 3(4), 315-323.

- Kim, J. H. (2007). A meta-analysis of effects of job stress management interventions (SMIs). *Taehan Kanho Hakhoe Chi*, 37(4), 529-539.
- Kirby, E. D., Williams, V. P., Hocking, M. C., Lane, J. D., & Williams, R. B. (2006). Psychosocial benefits of three formats of a standardized behavioural stress management program. *Psychosomatic Medicine*, 68(6), 816-823.
- Kiselica, M. S., Baker, S. B., Thomas, R. N., & Reddy, S. (1994). Effects of stress inoculation training on anxiety, stress, and academic performance among adolescents. *Journal of Counseling Psychology*, 41(3), 335-342.
- Klaman, D. L. (1997). The stress management workshop for medical students: Realizing psychiatry's potential. *Academic Psychiatry*, 21(1), 42-47.
- Kong, D. S., Lim, L. J., & Oon, C. H. (1989). Biofeedback and stress management strategies. *Annals of the Academy of Medicine Singapore*, 18(3), 261-265.
- Kunkler, J., & Whittick, J. (1991). Stress-management groups for nurses : Practical problems and possible solutions. *Journal of Advanced Nursing*, 16, 172-176.
- Kushnir, T., Malkinson, R., & Ribak, J. (1994). Teaching stress management skills to occupational and environmental health physicians and practitioners: A graduate-level practicum. *Journal of Occupational Medicine*, 36(12), 1335-1340.
- Kushnir, T., Malkinson, R., & Ribak, J. (1995). A graduate level course: Teaching stress management skills to occupational health physicians and practitioners. *Safety Science*, 20, 337-341.
- Kushnir, T., Malkinson, R., & Ribak, J. (1998). Rational thinking and stress management in health workers: A psychoeducational program. *International Journal of Stress Management*, 5(3), 169-178.
- Lee, M. S., Ryu, H., & Chung, H. T. (2000). Stress management by psychosomatic training: Effects of ChunDoSunBup Qi-training on symptoms of stress: A cross-sectional study. *Stress Medicine*, 16, 161-166.
- Legarreta Vázquez, N., Albizu, C., Vera, M., & Dávila Torres, R. R. (2001). Factors associated with the level of anxiety of nursing personnel taking care of HIV positive patients. [Factores Asociados al Nivel de Ansiedad del Personal de Enfermería al Ofrecer Cuidado al Paciente VIH Positivo.] *Puerto Rico Health Sciences Journal*, 20(4), 395-404.
- Le Scanff, C., & Taugis, J. (2002). Stress management for police special forces. *Journal of Applied Sport Psychology*, 14, 330-343.
- Lester, D., Leitner, L. A., & Posner, I. (1983). Stress management training for hospital supervisory personnel. *Hospital Topics*, 61(3), 8-9.
- Long, B. C. (1985). Stress-management interventions: A 15-month follow-up of aerobic conditioning and stress inoculation training. *Cognitive Therapy and Research*, 9(4), 471-478.

- Lovas, J. G., & Lovas, D. A. (2007). Rapid relaxation - practical management of preoperative anxiety. *Journal of the Canadian Dental Association*, 73(5), 437-440.
- Lozano, J. A. F., Candenas, J. A., Sanchez, C. A. V., Iglesias, B. M. B., & Suarez, P. C. M. (1999). Psychosocial stimulation programs for caregivers of elderly people («professional caregivers»). *Geriatika*, 15(2), 15-23.
- Malkinson, R., Kushnir, T., Weisberg, E. (1997). Stress management and burnout prevention in female blue-collar workers: Theoretical and practical implications. *International Journal of Stress Management*, 4(3), pp. 183-195.
- Manderino, M. A., & Brown, M. C. (1992). Practical, step-by-step approach to stress management for women. *Nurse Practitioner*, 17(7), 18-24.
- Manderino, M. A., Ganong, L. H., & Darnell, K. F. (1988). Survey of stress management content in baccalaureate nursing curricula. *The Journal of Nursing Education*, 27, 321-325.
- Marteau, T. M., Kidd, J., Michie, S., Cook, R., Johnston, M., & Shaw, R. W. (1993). Anxiety, knowledge and satisfaction in women receiving false positive results on routine prenatal screening: A randomized controlled trial. *Journal of Psychosomatic Obstetrics and Gynaecology*, 14(3), 185-196.
- Maspfuhl, B., & Rauchfuss, M. (1986). Program and effectivity of psychological preparation for childbirth. 1. communication: Behaviour program of preparation for childbirth. [Programm und effizienz psychologisch orientierter geburtsvorbereitung. 1. Mitteilung: Verhaltenstherapeutisches geburtsvorbereitungsprogramm] *Zentralblatt Fur Gynakologie*, 108(2), 97-103.
- Meinberg, R. A., & Yager, G. G. (1985). Effects of a workshop fee on women's stress management skills and evaluations. *Journal of Counseling Psychology*, 32(4), 626-629.
- Mendonca, J. D., & Siess, T. F. (1976). Counseling for indecisiveness: Problem-solving and anxiety-management training. *Journal of Counseling Psychology*, 23(4), 339-347.
- Miksche, L. W., & Robbeling, I. (1988). Stress prophylaxis in the company : Stress-management-seminars. *Zentralblatt fur Arbeitsmedizin, Arbeitsschutz, Prophylaxe und Ergonomie*, 38, 7-10.
- Milne, D., Jones, R., & Walters, P. (1989). Anxiety management in the community: A social support model and preliminary evaluation. *Behavioural Psychotherapy*, 17(3), 221-236.
- Moon, J. R., & Eisler, R. M. (1983). Anger control: An experimental comparison of three behavioral treatments. *Behavior Therapy*, 14(4), 493-505.
- Munz, D. C., & Kohler, J. M. (1997). Do worksite stress management programs attract the employees who need them and are they effective? *International Journal of Stress Management*, 4(1), 1-11.
- Munz, D. C., Kohler, J. M., & Greenberg, C. I. (2001). Effectiveness of a comprehensive worksite stress management program: Combining organizational and individual interventions. *International Journal of Stress Management*, 8(1), 49-62.

- Murphy, L. R. (1996). Stress management in work settings: A critical review of the health effects. *American Journal of Health Promotion, 11*(2), 112-135.
- Nakano, K. (1990). Effects of two self-control procedures on modifying type A behavior. *Journal of Clinical Psychology, 46*(5), 652-657.
- Natsume, M., Noda, T., Sato, T., Inui, T., & Takagaki, Y. (1996). Studies on 119 employees who visited the stress dock of Osaka Prefectural Mental Health Center. *Japanese Journal of Psychosomatic Medicine, 36*, 169-174.
- Novaco, R. W. (1977). A stress inoculation approach to anger management in the training of law enforcement officers. *American Journal of Community Psychology, 5*(3), 327-346.
- Oman, D., Hedberg, J., & Thoresen, C. E. (2006). Passage meditation reduces perceived stress in health professionals: A randomized, controlled trial. *Journal of Consulting and Clinical Psychology, 74*(4), 714-719.
- Paisley, K., Powell, G. M. (2007). Staff Burn-Out Prevention and Stress Management. *Child and Adolescent Psychiatric Clinics of North America, 16*(4), pp. 829-841.
- Pavelka, R., Ringler, M., & Loziczky, G. (1980). A behavioural approach towards coping with the anxieties of the pregnant women. [Die angst der schwangeren – verhaltenstherapeutische ansatze zu ihrer bewaltigung] *Wiener Klinische Wochenschrift, 92*(10), 346-351.
- Pekala, R. J., & Forbes, E. J. (1990). Subjective effects of several stress management strategies: With reference to attention. *Behavioral Medicine, 16*(1), 39-43.
- Peters, K. K., & Carlson, J. G. (1999). Worksite stress management with high-risk maintenance workers: A controlled study. *International Journal of Stress Management, 6*(1), 21-44.
- Petosa, R., & Oldfield, D. (1985). A pilot study of the impact of stress management techniques on the classroom behaviour of elementary school students. *The Journal of School Health, 55*(2), 69-71.
- Resick, P. A., Wendiggensen, P., Ames, S., & Meyer, V. (1978). Systematic slowed speech: A new treatment for stuttering. *Behaviour Research and Therapy, 16*(3), 161-167.
- Richardson, K. M., & Rothstein, H. R. (2008). Effects of occupational stress management intervention programs: A meta-analysis. *Journal of Occupational Health Psychology, 13*(1), 69-93.
- Richardson, F. C., & Suinn, R. M. (1973). A comparison of traditional systematic desensitization, accelerated massed desensitization, and anxiety management training in the treatment of mathematics anxiety. *Behavior Therapy, 4*(2), 212-218.
- Roger, D., & Hudson, C. (1995). The role of emotion control and emotional rumination in stress management training. *International Journal of Stress Management, 2*(3), 119-132.

- Saunders, T., Driskell, J. E., Johnston, J. H., & Salas, E. (1996). The effect of stress inoculation training on anxiety and performance. *Journal of Occupational Health Psychology, 1*(2), 170-186.
- Schiraldi, G. R., & Brown, S. L. (2001). Primary prevention for mental health: Results of an exploratory cognitive-behavioral college course. *The Journal of Primary Prevention, 22*(1), 55-67.
- Schlichter, K. J., & Horan, J. J. (1981). Effects of stress inoculation on the anger and aggression management skills of institutionalized juvenile delinquents. *Cognitive Therapy and Research, 5*(4), 359-365.
- Schmidt, L., Tjornhoj-Thomsen, T., Boivin, J., & Andersen, A. N. (2005). Evaluation of a communication and stress management training programme for infertile couples. *Patient Education and Counseling, 59*, 252-262.
- Searle, B. J. (2008). Does personal initiative training work as a stress management intervention ? *Journal of Occupational Health Psychology, 13*(3), 259-270.
- Sears, S. F., Vazquez, L. D., Matchett, M., & Pitzalis, M. (2008). State-of-the-art: Anxiety management in patients with implantable cardioverter defibrillators. *Stress and Health, 24*(3), 239-248.
- Shapiro, S. L., Schwartz, G. E., & Bonner, G. (1998). Effects of mindfulness-based stress reduction on medical and premedical students. *Journal of Behavioral Medicine, 21*, 581-599.
- Shapiro, S. L., Shapiro, D. E., & Schwartz, G. E. (2000). Stress management in medical education: A review of the literature. *Academic Medicine, 75*(7), 748-759.
- Sheehy, R., & Horan, J. J. (2004). Effects of stress inoculation training for 1st-year law students. *International Journal of Stress Management, 11*(1), 41-55.
- Singer, G. H. S., Ethridge, B. L., & Aldana, S. I. (2007). Primary and secondary effects of parenting and stress management interventions for parents of children with developmental disabilities: A meta-analysis. *Mental Retardation and Developmental Disabilities Research Reviews, 13*, 357-369.
- Sokol, M. B., & Aiello, J. R. (1993). Implications for team focused stress management training. *Consulting Psychology Journal, 45* (4), 1061-1087.
- Spettell, C. M., & Liebert, R. M. (1986). Training for safety in automated person-machine systems. *American Psychologist, 41*(5), 545-550.
- Stefansdottir, S. I., & Sutherland, V. J. (2005). Preference awareness education as stress management training for academic staff. *Stress and Health, 21*, 311-323.
- St.Lawrence, J. S., McGrath, M. L., Oakley, M. E., & Sult, S. C. (1983). Stress management training for law students: Cognitive-behavioral intervention. *Behavioral Sciences and the Law, 1*(4), 101-110.

- Suinn, R. M. (1995). Clinical practice, university research, and students: A historical perspective on anxiety management training. *American Psychologist*, 50(4), 287-292.
- Suinn, R. M., & Bloom, L. J. (1978). Anxiety management training for pattern A behavior. *Journal of Behavioral Medicine*, 1(1), 25-35.
- Suinn, R. M., & Richardson, F. (1971). Anxiety management training: A nonspecific behavior therapy program for anxiety control. *Behavior Therapy*, 2(4), 498-510.
- Tableman, B., Feis, C. L., Marcianiak, D., & Howard, D. (1985). Stress management training for low-income women. *Prevention in Human Services*, 3(4), 71-85.
- Tallant, S., Rose, S. D., & Tolman, R. M. (1989). New evidence for the effectiveness of stress management training in groups. *Behavior Modification*, 13(4), 431-446.
- Thompson, J. G., Griebstein, M. G., & Kuhlenschmidt, S. L. (1980). Effects of EMG biofeedback and relaxation training in the prevention of academic underachievement. *Journal of Counseling Psychology*, 27(2), 97-106.
- Timmerman, I. G. H., Emmelkamp, P. M. G., & Sanderman, R. (1998). The effects of a stress-management training program in individuals at risk in the community at large. *Behaviour Research and Therapy*, 36, 863-875.
- Timmons, P. L., Oehlert, M. E., Sumerall, S. W., Timmons, C. W., & Borgers, S. B. (1997). Stress inoculation training for maladaptive anger: Comparison of group counseling versus computer guidance. *Computers in Human Behavior*, 13(1), 51-64.
- Tisdelle, D. A., Hansen, D. J., St-Lawrence, J. S., & Brown, J. C. (1984). Stress management training for dental students. *Journal of Dental Education*, 48, 196-202.
- Treacy, L., Tripp, G., & Baird, A. (2005). Parent stress management training for attention-deficit/hyperactivity disorder. *Behavior Therapy*, 36(3), 223-233.
- Treven, S., & Potocan, V. (2005). Training programmes for stress management in small business. *Education + Training*, 47, 640-652.
- Tunnelcliffe, M. R., Leach, D. J., & Tunnelcliffe, L. P. (1986). Relative efficacy of using behavioral consultation as an approach to teacher stress management. *Journal of School Psychology*, 24(2), 123-131.
- Van Rhenen, W., Blonk, R. W. B., van der Klink, J. J., van Dijk, F. J., Schaufeli, W. B. (2005). The effect of a cognitive and a physical stress-reducing programme on psychological complaints. *International Archives of Occupational and Environmental Health*, 78(2), pp. 139-148.
- Von Baeyer, C., & Krause, L. (1983). Effectiveness of stress management training for nurses working in a burn treatment unit. *International Journal of Psychiatry in Medicine*, 13 (2), 113-126.

Vuori, J., Price, R. H., Mutanen, P., & Malmberg-Heimonen, I. (2005). Effective group training techniques in job-search training. *Journal of Occupational Health Psychology, 10*(3), 261-275.

Wallace, A. (1989). An active role for patients in stress management. *Professional nurse (London, England), 5*(2), 65-72.

Walters, H., Bond, M., & Pointer, S. (1995). A stress management program for nursing home staff: An evaluation of combined education and relaxation strategies. *Journal of Occupational Health and Safety – Australia and New Zealand, 11*(3), 243-248.

Wernick, R. L. (1984). Stress management with practical nursing students: Effects on attrition. *Cognitive Therapy and Research, 8*(5), 543-550.

Yamagishi, M., Kobayashi, T., Kobayashi, T., Nagami, M., Shimazu, A., & Kageyama, T. (2007). Effect of web-based assertion training for stress management of Japanese nurses. *Journal of Nursing Management, 15*, 603-607.

Yglesias, P., Cross, H., & Nockleby, D. (1984). A comparison of EMG biofeedback and anxiety management training in the treatment of test anxiety. *American Journal of Clinical Biofeedback, 7*(2), 112-121.

Yussuf, A. D., Ajiboye, P. O., Buhari, O. I. N., Kuranga, S. A., & Balogun, O. R. (2006). Psychological health problems of resident doctors in a Nigerian teaching hospital. *South African Journal of Psychiatry, 12*(4), 106-111.

Zimber, A., Rudolf, A., & Teufel, S. (2001). A training program to reduce distress among geriatric caregivers. *Zeitschrift für Gerontologie und Geriatrie, 34*(5), 401-407.

A.4 Category 4: Preventing the consequences of traumatic events

Adler, A. B., Castro, C. A., & McGurk, D. (2009). Time-Driven battlemind psychological debriefing: A group-level early intervention in combat. *Military Medicine, 174*(1), 21-28.

Adler, A. B., Litz, B. T., Castro, C. A., Suvak, M., Thomas, J. L., Burrell, L., McGurk, D., Wright, K. M., Bliese, P. D. (2008). A group randomized trial of critical incident stress debriefing provided to U.S. peacekeepers. *Journal of Traumatic Stress, 21*(3), pp. 253-263.

Deahl, M., Srinivasan, M., Jones, N., Thomas, J., Neblett, C., Jolly, A. (2000). Preventing psychological trauma in soldiers: The role of operational stress training and psychological debriefing. *British Journal of Medical Psychology, 73*(1), pp. 77-85.

Flannery Jr., R. B. (2001). The Assaulted Staff Action Program (ASAP): Ten year empirical support for Critical Incident Stress Management (CISM). *International Journal of Emergency Mental Health*, 3(1), pp. 5-10.

Hampel, P., Meier, M., Kümmel, U. (2008). School-based stress management training for adolescents: Longitudinal results from an experimental study. *Journal of Youth and Adolescence*, 37(8), pp. 1009-1024.

Kraag, G., Van Breukelen, G., Lamberts, P., Vugts, O., Kok, G., Fekkes, M., Huijjer Abu-Sadd, H. (2007). Process evaluation of 'learn young, learn fair': A stress management programme for 5th and 6th graders. *School Psychology International*, 28(2), pp. 206-219.

Kraag, G., Zeegers, M. P., Kok, G., Hosman, C., Abu-Saad, H. H. (2006). School programs targeting stress management in children and adolescents: A meta-analysis. *Journal of School Psychology*, 44(6), pp. 449-472.

Marchand, A., Guay, S., Boyer, R., Iucci, S., Martin, A., & St-Hilaire, M.-H. (2006). A randomized controlled trial of an adapted form of individual critical incident stress debriefing for victims of an armed robbery. *Brief Treatment and Crisis Intervention*, 6(2), pp. 122-129.

Morrison, J. Q. (2007a). Perceptions of teachers and staff regarding the impact of the Critical Incident Stress Management (CISM) model for school-based crisis intervention. *Journal of School Violence*, 6(1), pp. 101-120.

Morrison, J. Q. (2007b). Social validity of the critical incident stress management model for school-based crisis intervention. *Psychology in the Schools*, 44(8), pp. 765-777.

Murphy, L. R., DuBois, D., Hurrell, J.J. (1986). Accident reduction through stress management. *Journal of Business and Psychology*, 1(1), pp. 5-18.

Scott, C. D. (1988). Stress management can lead to reduced malpractice. *Physician executive*, 14(1), pp. 18-20.

Tucker, A. S., Henry, J., Spaulding, T., Van Hasselt, V. B. (2007). Critical incident stress management in a mid-sized police department: A case illustration. *International Journal of Emergency Mental Health*, 9(4), pp. 299-304.

A.5 Category 5: Development of strategies to cope more efficiently with future stressful situations related to sports, military personnel and other stressors.

Gerardi, S. M. (1999). Part I. Work hardening for warriors: Occupational therapy for combat stress casualties. *Work*, 13, 185-195.

Hytten, K., Jensen, A., & Skauli, G. (1990). Stress inoculation training for smoke divers and free fall lifeboat passengers. *Aviation Space and Environmental Medicine*, 61(11), 983-988.

Kamiyama, K., Yamami, N., Sato, K., Aoyagi, M., Kyoya, M., Mizuno, E., et al. (2004). Effects of a structured stress management program on psychological and physiological indicators among marine hazard rescues. *Journal of Occupational Health*, 46(6), 497-499.

Kolt, G. S., Hume, P. A., Smith, P., Williams, M. M. (2004). Effects of a stress-management program on injury and stress of competitive gymnasts. *Perceptual and Motor Skills*, 99(1), 195-207.

Larsson, G., Cook, C., & Starrin, B. (1988). A time and cost efficient stress inoculation training program for athletes: A study of junior golfers. *Scandinavian Journal of Sports Sciences*, 10(1), 23-28.

Mace, R., & Carroll, D. (1986). Stress inoculation training to control anxiety in sport : Two case studies in squash. *British Journal of Sports Medicine*, 20(3), 115-117.

Mace, R., & Carroll, D. (1989). The effects of stress inoculation training on self-reported stress, observer's rating of stress heart rate and gymnastics performance. *Journal of Sports Sciences*, 7, 257-266.

Mace, R., Carroll, D., & Eastman, C. (1986). Effects of stress inoculation training on self-report, behavioural and psychophysiological reactions to abseiling. *Journal of Sports Sciences*, 4, 229-236.

Mace, R., Eastman, C., & Carroll, D. (1986). Stress inoculation training: A case study in gymnastics. *British Journal of Sports Medicine*, 20(3), 139-141.

Perna, F. M., Antoni, M. H., Baum, A., Gordon, P., Schneiderman, N. (2003). Cognitive behavioral stress management effects on injury and illness among competitive athletes: A randomized clinical trial. *Annals of Behavioral Medicine*, 25(1), pp. 66-73.

Rice, V. J., & Gerardi, S. M. (1999). Part II. work hardening for warriors: Training military occupational therapy professionals in the management of combat stress casualties. *Work*, 13(3), 197-209.

Sheehan, S. S. (1999). Stress management in the federal bureau of investigation: Principles for program development. *International Journal of Emergency Mental Health*, 1(1), 39-42.

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This research report consists of literature reviews and analyses of data on stressors associated with psychological injuries in theater of operations and on the efficacy of stress management training (SMT). The information is examined from the angle of potentially using virtual reality (VR) to train military personnel in mastering stress management techniques. The first overview of characteristics of traumatic stressors and analyses of data on stressors' frequency and their association with psychological injuries led to the identification of stressful situations that can be developed in VR. A systematic review of 350 empirical papers confirmed the efficacy of SMT and pinpointed to a few strategies where VR training could be useful. A third review covered VR technologies, important concepts and relevant studies for SMT. The report concludes with an integrated approach for training that could be useful for the Canadian Forces and suggestions of experimental studies that are needed to move forward in the proposed direction.

Ce rapport de recherche repose sur des recensions d'écrits et des analyses de données sur les stressors associés aux blessures psychologiques en théâtre d'opération et sur l'efficacité de l'entraînement à la gestion du stress (EGS). Les informations sont examinées sous l'angle de l'usage potentiel de la réalité virtuelle (RV) pour entraîner les militaires à maîtriser les habiletés de gestion de stress. Une première recension des caractéristiques des stressors traumatogènes et l'analyse des données sur la fréquence des stressors et leur association avec les blessures psychologiques a menée à l'identification de situations stressantes pouvant être recrées en RV. Une recension systématique des écrits a permis d'identifier 350 articles démontrant l'efficacité de l'EGS et de cibler quelques stratégies où l'usage de la RV pourrait être avantageux. Une troisième recension survole ce qu'est la RV et les principaux concepts potentiellement associés à l'EGS. Le rapport se conclut par la présentation d'une approche intégrée d'EGS utilisant la RV et offre des suggestions pour des études empiriques permettant d'évaluer les premières pistes de recherche.

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