A multimedia environment for stressing warfighters before they deploy

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ABSTRACT

As part of a controlled study with Marines comparing the effectiveness of a predeployment stress inoculation training program against current best practices, the authors have developed a multimedia stressor environment (MSE) for the practice and assessment of stress-reduction skills. The MSE presents a ten-minute scripted scenario of a recon through a Southeast Asian village comprising mission objectives, vehicular and market activity, sudden explosive impact, loud ambient noise, depiction of casualties, post event chaos, presence of insurgents, and other stimuli, and requiring anticipation of enemy engagement, vigilance to in-scene cues, discrimination between normal or expected behaviors and suspicious or dangerous, and multifaceted response. The scenario portrays rendered 3D content projected onto a large surface in a theater-style setup with 5:1 surround sound; hence, any number of combatants can take part, increasing throughput. The rendered content uses scenes, characters, animations, clothing sets, speech, objects, trauma, sounds, and lighting patterns that the authors have developed for past applications. During presentation of the MSE, participants respond to in-scene cues through a game controller, with vigilance and discrimination for specific cue targets. As they respond, cognitive performance (reaction time) and physiologic arousal (heart rate variability) measures are taken to gauge the degree to which participants employ stress-reduction skills. This paper discusses MSE design, development, and testing to include mini-experiments to focus stress-inducing design decisions.

ABOUT THE AUTHORS

Robert Hubal conducts research on technology assisted learning, focusing on development, presentation, and evaluation of materials and identifying approaches to improve training and assessment effectiveness. He is interested in experimental evaluations of the usability, acceptance, and cost effectiveness of training and assessment systems and their applications to both everyday and specialized domains. Dr. Hubal holds a masters degree in Computer Science and a doctorate in Cognitive Psychology.

Paul Kizakevich conducts development, research, and evaluation in personal, mobile scientific instrumentation, medical modeling and simulation, primary and secondary health intervention, and noninvasive diagnostic methodologies, with emphasis on improving scientific data collection, medical training, medical diagnoses, and health outcomes. He holds a masters degree in Biomedical Engineering.

Amy Noll McLean's research expertise includes using methodology from clinical neuroscience such as functional magnetic resonance imaging to understand neurophysiologic mechanisms that underlie psychological disorders, and to use this understanding to effect improvements in clinical interventions that treat depression and posttraumatic stress disorder. Dr. McLean holds masters and doctorate degrees in Clinical Psychology.

Laurel Hourani has conducted psychological research for over twenty years and has extensive experience with military populations. Her expertise and main interests are in the areas of mental health and substance abuse. She has been the principal investigator on several military-sponsored studies of suicide and mental disorder among U.S. Navy and Marine Corps personnel and currently is involved in directing U.S. Department of Defense (DoD) surveys of health-related behaviors and attitudes. Dr. Hourani, principal investigator for the work described here, holds a Ph.D. in Epidemiology and a Masters of Public Health.

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INTRODUCTION

Protecting the mental health of deploying military personnel can be as crucial for readiness as protecting their physical health. However, data to help develop and optimize DoD mental health prevention programs are lacking. Most predeployment training to date has involved combat skill acquisition/readiness exercises, physical readiness, specific mission-relevant jobs, and teamwork, as well as family separation preparation programs, but has less often prepared combatants for the psychological impact of exposure to combat and other traumatic stressors. Further, although there is much ongoing research to determine the most effective treatments for negative mental health consequences following deployment, little is known about preventive efforts designed to prepare combatants to cope with potential deployment and combat-related stressors.

The larger focus of this research project is on developing coping skills and resilience-building preventative measures that contribute to easing the negative psychological effects of combat and operational stress. The different service branches have introduced variations of predeployment educational briefings and stress control techniques to reduce anxiety and increase skills to cope with stress. Examples of such training programs include the Army's Battlemind program and the Navy's and Marines' Combat and Operational Stress Control (COSC) programs.

This project is based on studies suggesting that a reduction of psychological arousal shortly after trauma exposure may prevent or reduce the likelihood of developing psychological distress, including posttraumatic stress disorder (PTSD) symptomatology, and that methods to reduce arousal levels, such as relaxation training and stress management techniques, play roles in reducing the risk of combat stress casualties. In the study, a predeployment stress inoculation training (PreSIT) intervention is being used to train combatants to control their cognitive and somatic arousal during a laboratory exposure, to evaluate its acceptability, use, and potential effectiveness in reducing stress levels. The approach is being tested with Marine Corps units during predeployment training exercises.

Approach

The PreSIT program consists of three modules: (1) usual educational materials on COSC; (2) a novel coping skills training component involving attentional retraining and a focused breathing exercise with biofeedback; and, most relevant to this paper, (3) exposure to a multimedia stressor environment (MSE) to practice and assess knowledge and skills learned in the first two components. While combatants are exposed to the MSE physiologic and behavioral measures including heart rate variability (HRV) and reaction time (RT) to specified stimuli assess the degree to which they have learned the coping skills.

A pretraining questionnaire captures psychological and demographic information, and in particular combatants' stress and coping strategies, while posttraining debriefings assess the acceptability and use of the training materials and process.

Field testing

Initial buy-in for the approach, and Marine Corps sponsorship as well as approval to collect pilot data at the mock Iraqi village training center at the Camp Pendleton, CA Infantry Immersion Training (IIT) site at the I MEF Battle Simulation Center, was gained following its presentation at a COSC working group meeting at Camp Pendleton in October 2008. The project was granted approval, access, and support from the Second Battalion, Fourth Marine Division for data collection to take place at the IIT.

As mentioned, this work is part of a larger study investigating predeployment stress inoculation training. For the larger study, current best practice predeployment COSC educational materials were obtained, and a coping skills training protocol using relaxation breathing and attentional retraining with biofeedback was developed. A utility was written for capturing responses from a game controller used by participants during the MSE presentation, as well as delivering a rumbling feedback to participants when they respond incorrectly to a cue. A separate utility was written to synchronize participants' computers with that of the computer presenting the MSE, so that timestamped stimuli from MSE scripts matched timestamped RT measurements from the participants' game controller log files. RT results are analyzed with signal detection statistics to determine hits, misses, and delays. Questionnaire items are used as psychological and demographic covariates of measured data.

The PreSIT procedures were piloted at the IIT on 79 combatants from seven squads drawn from participating Marine Expeditionary Units.

MSE OVERVIEW

Development of the virtual MSE scenario was accomplished by building on a computer game platform that has been used for more than a decade to train and assess trauma patient management and triage skills (Kizakevich et al., 2003, 2006). The MSE is a ten minute drive through a typical Southwest Asian town. Stress is induced through anticipation of enemy engagement, required vigilance to in-scene cues, sudden impact (e.g., explosions), depiction of casualties, loud ambient noise, and post-event chaos. The view was made realistic; the camera pans left and right to enable a full field of view of the scene, up and down as the vehicle follows terrain, and bounces when passing over obstacles or in response to nearby explosions. During the drive, participants are required to differentially respond to types of visual and/or aural cues (e.g., overtly dangerous vs. suspicious) as well as unique stimuli meant for assessing RT and accuracy. The MSE scenario uses prerendered 3D content and is projected onto a large screen in a theater-style setup with surround sound and joystick controls for the participants to respond to the key trigger events (i.e., specified stimuli).

Storyboard

The MSE scene is a virtual Iraqi village with representative houses, schools, mosques, vehicles, sandy/dusty streets, trees, market stands, and civilian population. (See **Figure 1** for screenshots from the MSE.) Representative sounds include background Arabic speech, market noises, vehicle noises, and overflying aircraft. The participants' task is to view a scripted path through the village. A number of design decisions went into the scripting of this path and of the events and activities ("triggers") that occur along it.

Figure 1. Screenshots taken within the MSE; market scene (top); suspicious items and a weapon (middle); just after an IED detonation (bottom).

For instance, an initial decision was how to array 75 triggers randomly along the path. The spacing and placement of triggers was critical, because the task for participants would be to respond differentially to each. Placement of, for instance, a suspicious item like a potential improvised explosive device (IED) needed to become visible at a known point in time, as close as possible to its randomly designated spacing, for the participant's particular response at that time to be interpretable. The top image of **Figure 2** shows the path taken by the simulated vehicle through the village and the random spacing of triggers. The viewpoint for each of these locations was brought up, to include what structures such as schools and marketplaces might be present, and consideration was made as to what kind of trigger could be placed into the environment and where it could be placed.

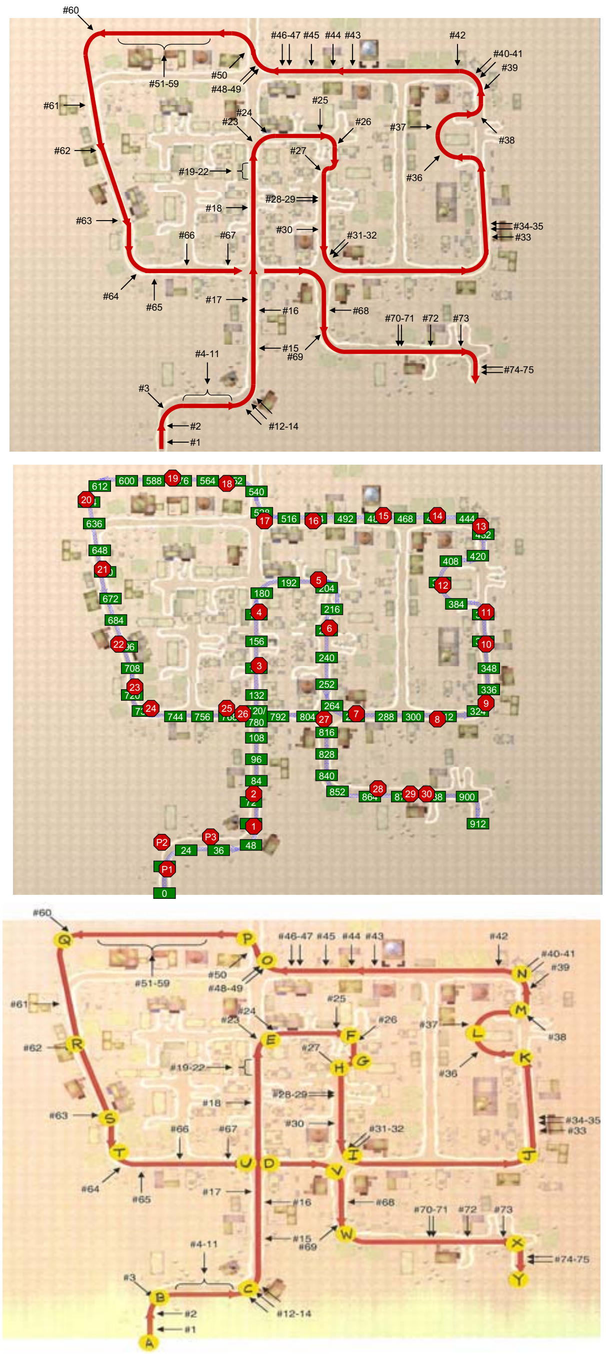

Figure 2. Iterations of the scripted path; initial path with event placement (top); with timing and red targets (middle); path with sound reference points (bottom).

As initially designed, as stated, there were 75 specific response opportunities, triggered either by appearance of an entity or occurrence of an event. One third of triggers were to be suspicious visible items including carcasses, unattended carts, burning vehicles, foreign flags, and propagandist posters. One third of triggers were to be dangerous visible items including militants, snipers, hand grenades, unattended weapons, and IED's. One third of triggers were to be audible items including overhead fighter planes, explosions, rapid rifle firing, screaming women, and radio contact by the combatant's [virtual] commander. **Table 1** presents a storyboard of the design decisions surrounding these triggers, as well as ambient activities.

Table 1. Storyboard (triggers are numbered; ambient activities are not).

#	t (sec)	Activity	Visual/ aural	L/R	Dir
1	3	Militant	V	L	N
2	9	Unattended cart	V	L	N
3	16	Carcass	V	L	NE
4	24	Sniper	V	R	E
5	30	Rifle fire	A		E
6	31	Burning	V/A	L	E
7	36	Hand grenade	V	R	E
8	38	Carcass	V	L	E
	39	Person talking into	V		E
9	40	radio	A		
10	41	Explosion	V/A	R	E
11	42	IED	V	R	E
12	49	Weapon	V	R	NE
13	55	Explosion; vehicle goes from green to burned	V/A		NE
	56		A		
14	58	Burning vehicle	V	R	NE
	60	HMMWV moving	A		
	62	towards	V		
	73	Children playing	A		
15	74	Militant	V	R	N
16	94	IED	V	R	N
	99	Person talking into	V	L	N
17	100	radio	A		
	110	Dog barking	A		
18	134	Hand grenade	V	L	N
	140	Call to prayer	A		
19	141	Helicopter flyover	A		N
20	145	Helicopter flyover	A		N
21	146	Hand grenade	V	R	N
22	148	Unattended cart	V	L	N
	158		A		
	159	Small vehicle	V		
23	160	Flag	V	R	NE
24	167	Hand grenade	V	L	NE
25	187	Sniper	V	R	E
26	196	Unattended cart	V	L	S
	201	Bazaar	A		
	203	Attended carts at bazaar	V		

	204	Various people, children playing	V/A		
27	217	Weapon	V	L	SW
	222	U.S. flag	V		
28	223	Carcass	V	L	S
29	223	Flag	V	L	S
30	238	Carcass	V	L	S
	247		A		
31	249	Burning vehicle	V	L	SE
32	252	Flag	V	R	SE
	313		A		
	318	HMMWV	V		
33	330	Weapon	V	R	N
	333	Vehicle	A		
34	334	Sniper	V	R	N
35	336	Helicopter	A		N
	339	Bazaar	A		
	341	Attended carts at bazaar	V		
	341	Various people	V		
36	377	Flag	V	R	NW
	381	Children playing	A		
37	388	Scream	A		NE
	395	HMMWV (not moving)	V		
	395	Small truck (not moving)	V		
38	405	Explosion	V/A		NE
	410	Strong wind	A		
39	417	Militant	V	L	N
40	422	Rifle fire	A		NW
41	425	Explosion	V/A		NW
	430		A		
42	432	Burning vehicle	V	R	W
	470	Call to prayer	A		
	473	Vehicle	V/A		
43	474	Sniper	V	L	W
44	485	Militant	V	L	W
45	495	Scream	A		W
46	502	Poster	V	R	W
	503		A		
47	505	Burning vehicle	V	R	W
	508		V		
	509	Various people	A		
48	516	IED	V	L	NW
49	518	Weapon	V	L	NW
	522	Dog barking	A		
50	527	Weapon	V	R	N
	533	Bazaar	A		
	535	Attended carts at bazaar	V		
51	549	Scream	A		W
52	553	Helicopter	A		W
53	562	Poster	V	L	W
	562	Person talking into radio	V	L	W
54	563		A		
	572		A		
55	574	Burning vehicle	V	R	W
56	577	Scream	A		W
57	578	Poster	V	L	W
58	588	Sniper	V	L	W
59	589	IED	V	L	W
	595	Person talking into radio	V	L	SW
60	596		A		
	644	Unattended cart	V	R	S
61	646	Various people	A		
62	661	Helicopter	A		S
63	692	Hand grenade	V	L	SE
	711		A		
	714	HMMWV	V		
64	717	Rifle fire	A		SE
65	726	Carcass	V	R	E
66	735	Flag	V	R	E
	744	Bazaar	A		
	748	Attended carts at bazaar	V		
	749	Various people	V		
67	753	Unattended cart	V	R	E
68	810	Poster	V	L	S
	813	Dog barking	A		
69	819	Rifle fire	A		S
	822		A		
	825	Small truck	V		
70	859	Scream	A		E
	859	Person talking into radio	V	R	E
71	860		A		
72	870	Militant	V	R	E
73	881	IED	V	L	E
	883		A		
	885	Various people	V		
74	894	Poster	V	L	S
75	896	Rifle fire	A		S

A concern with this design arose in the assessment of speed and accuracy. In particular, the design team realized that what was purposefully included to be suspicious or dangerous might not be considered so by the combatants, and vice versa. Further, participants might have responded at a distance before the trigger became clear or might have waited until it could be clearly seen. A subsequent design, then, piloted with Marines, involved not only suspicious and dangerous items but also specified reaction time triggers (shown as red targets in the middle image of **Figure 2**). For the reaction time triggers (a red square flashing anywhere in the field of view), it was possible to objectively determine speed and accuracy of response. As a further test, an additional six blue squares ("foils" to the red square "targets") were flashed to gauge participants' impulsivity. For the suspicious and dangerous triggers, it was then possible to compare within and across participant sessions to see if there were effects of stress.

Finally, the timing needed to be determined. The MSE was initially intended to continue for fifteen minutes, so the design team mapped slower and faster periods of movement along the scripted path to reflect how a seven-ton truck might progress. This timing in place, the laying down of audio tracks was possible (bottom image of **Figure 2** and **Table 2**) to reflect activity at relevant points along the path (e.g., near a mosque, schoolhouse, or marketplace; or in relation to a particular event such as a car passing by or an explosion). In this image, the letters D and U indicate the point where the path crosses itself; the other letters indicate inflection points where the participant is rounding a bend or corner and potentially has a new view of the path ahead. The participant was presumed to face North initially, and all source directions for sound were relative to the participant.

Table 2. Sequence of simulation sounds

Sound	Dir	Vol	t_{start}	t_{peak}	t_{end}
Wind	All	-9.6	0:00	n/a	15:24
Fire	N	-8.5	0:28	0:47	1:04
AK47	NW	0.0	0:32	n/a	0:36
Radio	W	-19.0	0:40	0:43	0:46
Explosion	E	-6.0	0:42	n/a	0:46
Explosion	W	-6.0	0:56	n/a	1:00
Fire	W	-10.3	0:58	1:05	1:12
City noise 1	N	-10.5	1:00	n/a	14:08
City noise 2	E	-8.5	1:00	n/a	14:08
City noise 6	S	-10.5	1:00	n/a	14:30
City noise 4	W	-10.5	1:00	n/a	14:30
School	W	-5.0	1:02	1:30	1:58
HMMWV	S	-6.0	1:04	1:12	1:20
Radio	All	-6.0	1:40	1:42	1:44
Dog barking	E	0.4	1:50	1:52	2:16
Helicopter	SE to NW	-4.7	2:14	2:25	2:36
Car	S	-3.0	2:40	n/a	3:00
Call to prayer	W	8.5	2:50	3:03	3:16
Market	W	-18.2	3:00	3:22	3:44
Market	E	-18.2	3:00	3:22	3:44
Call to prayer	W	-13.4, 8.5	3:22	3:35	3:48
Siren	W	0.0	3:58	n/a	4:04
Call to prayer	E	-13.4, 8.5	4:00	4:13	4:28
Fire	W	-0.3	4:10	4:18	4:24
Siren	SW	-6.0	4:46	n/a	5:18
HMMWV	S	-6.0	5:18	5:26	5:34
Helicopter	All	-6.1	5:34	5:42	5:50
Car	SW	-6.0	5:38	n/a	5:58
Market	W, E	-18.2, -6.0	5:40	6:06	6:32
School/play	All	-6.0	6:32	6:58	7:24
Female scream, cry	SE	10.2	6:36	n/a	6:45
Explosion	SW	-6.0	6:52	n/a	6:56
Call to prayer	E	-13.4, 8.5	6:54	n/a	9:02
Wind	All	-6.0	6:58	n/a	7:34
Battle	NW to SW	var	7:06	n/a	7:58
Explosion	W	-6.0	7:11	n/a	7:16
Fire	E	-6.1	7:26	7:33	7:40
Fire	E	-6.0, -6.2	8:18	8:34	8:42
Female scream, cry	W	5.5	8:23	n/a	8:34
Dog barking	W	5.4	8:36	n/a	8:48
Mob	All	-6.0	8:38	8:46	8:54
Helicopter	SW to NE	-4.6	9:16	9:19	9:26
Male scream	S	-3.2	9:18	n/a	9:20
Radio	W	-19.0	9:32	9:34	9:36
Market	E, W	-18.2	9:34	n/a	10:38
Call to prayer	W	-13.4, 8.5	9:34	n/a	10:38
Male scream, cry	S to SE	-3.2, 10.2	9:50	n/a	9:59
Fire	E	-6.1	10:04	10:14	10:24
School/play	All	-6.0	10:32	n/a	12:04
Helicopter	SE	-4.7	11:12	11:20	11:28
HMMWV	S	-6.0	12:02	12:14	12:26
Market	W, E	-18.2	12:14	n/a	13:32
AK47	NE	0.0, -0.3	12:08	n/a	12:34
Crowd	All	-6.0	12:36	n/a	12:56
Call to prayer	W	-13.4, 8.5	13:00	n/a	13:38
Dog growling	E	0.0	13:46	13:54	14:02
Male scream	S	-3.2	14:32	n/a	14:34
Radio	W	-19.0	14:36	n/a	14;40
Mob	W	-6.0	14:56	n/a	15:28
AK47/battle	SE to SW	var	15:12	n/a	15:28

Mission and instructions

Participants were given the following description as their MSE mission:

> Your mission is to conduct recon in a village that was mostly vacated last month after we engaged insurgents there. Now the villagers are beginning to return, and there is suspicion of insurgent activity once again. You are riding on seven-ton vehicle. Due to your mission, you won't be able to stop. But you will be responding to things in your environment. Sometimes you will be responding to immediate threats. Other times, if you see something that might be a concern to other troops or civilians, you will be noting that so others can check it out.

Specific instructions then followed (see **Figure 3** for referenced trigger buttons; participants were allowed to use either side (left or right) for responding):

> Your job will be to respond as quickly and accurately as possible to things on the screen that you see or hear using different buttons on the controller. You will be looking for three types of items in the video mission.
>
> (1) When you see a red box flash on the screen, press the red trigger button on the back of controller.
>
> (2) When you see any weapon (whether held or by itself), then press any of the buttons on the top of the controller, once, marked in yellow.
>
> (3) As you move through the town, you need to be constantly aware of potentially disruptive situations. So if you identify something that might be a danger now or to those who come later, then you will note your concern ("like radioing this information back to your command", or noting in a log book for later debriefing). It won't always be obvious when to note things, so use your best judgment. To simulate this, you will pull back on the controller's joystick (either one), marked blue.

All pilot participants were able to follow these instructions without incident.

Refined storyboard

Initially fifteen minutes in length, the MSE was designed as a prerendered 3D computer simulation of an Iraqi village environment, portrayed on a large screen in a theater-style setup, to include village structures, people, animals, vehicles, and filler objects, as well as layered ambient noises to accompany the simulation on a 5.1 surround sound to enhance the realism of the MSE. Following the advice given by Marine Corps officials briefed and certain suggestions made by demonstration participants at Camp Pendleton, the MSE was shortened to a duration of just over ten minutes. This was a relatively quick change, necessitating only a proportional speedup along the scripted path, reset timing for triggers, and relaid audio tracks. Other revisions derived from demonstration testing involved redesigning and reprogramming the simulated Iraqi village, including enhancement of the village structures, people, animals, vehicles, noises, and filler objects.

Figure 3. Trigger buttons.

From data collected and observations made during pilot testing of Marines, and through additional testing with a civilian convenience sample, several variants were introduced into the MSE to increase stressfulness. First, about two minutes of footage from a convoy ambush scene from a recent popular movie was shown immediately prior to the participant viewing the MSE. The intent of this variant was to engage the participant in a well-understood setting with powerful content. Also, creating a movie file for the MSE, as opposed to rendering it each session, turned out to be important to simplify its presentation.

Second, additional instructions were given to participants. For instance, in one mini-experiment, during the viewing of the footage the participant was instructed as follows:

> Your mission is to observe and respond to activity during a convoy operation that has engaged insurgents. The need for this mission is that there is a constant need to improve our military's effectiveness in response to insurgent activity. You are watching a lot of action. Due to your mission, you won't be able

to stop. But you will be responding to things in your environment. Sometimes you will be responding to immediate threats. Other times, if you see something that might be a concern to other troops or civilians, you will be noting that so others can check it out.

Your job will be to respond as quickly and accurately as possible to things on the screen that you see or hear using different buttons on the controller. You will be looking for five types of items in the video mission. The game controller will vibrate when the program detects that you have missed one of these items.

(1) When you see any yellow item on the screen, press any yellow button on the front of controller.

(2) When you see any weapon (whether held or by itself), then pull back on the controller's joystick (either one), marked blue.

(3) When you hear any foreign (non-English) language spoken, then press any combination of the buttons on the back marked in red and top of the controller, once, marked in yellow.

(4) As you move through the town, you need to be constantly aware of potentially disruptive situations. If you identify something that might be a danger now or to those who come later, then note your concern ("like radioing this information back to your command", or noting in a log book for later debriefing). It won't always be obvious when to note things, so use your best judgment. To note your concern, press both any red button and any blue button.

(5) When you see a child on the screen, press both a yellow button and a blue button on the controller.

These same instructions were given to participants when they subsequently experienced the MSE, with the additional instruction to respond to red squares by pressing a red button.

Third, not only were more red targets and blue foils flashed during the MSE, but also yellow targets and black foils were flashed, and as a group these squares were positioned (after Mills et al., 1999) so as to cover the entire field of view. Fourth, there were more people walking about, objects, activities, and injuries depicted throughout the environment, and there was better synchronization of sounds with scenario events.

Last, the utility that was written to capture controller actions was also designed to provide (negative) feedback to the participant. When an expected button press or set of button presses was *not* detected within a small window after a given trigger (recall that the clock on the computer rendering the MSE was synchronized with the clock on the computer used to capture participant data, hence the timing of appearance of triggers was known), the participant's controller was caused to rumble.

These changes, and a number of variants (particularly for the instructions, to try to reach the highest state of alertness while not overwhelming participants with too-difficult tasks), were piloted with a civilian convenience sample of 20 persons.

Findings

Not only was RT considered but also number and kind of button presses, as well as physiological measures. The RT and physiological data are more relevant to the larger experiment, comparing participants across experimental conditions. Hence here only a type of signal detection analysis is reported, collapsing across experimental conditions.

Analyses were performed on data from the pilot experiments with Marines at Camp Pendleton. "Hits" were defined as correct button-press responses to targets (i.e., red squares), and "misses" as either correct responses that occurred too late (beyond some preestablished threshold) or failure to respond to targets. "False alarms" were button-presses to foils (i.e., blue squares), and "correct rejections" as failure to respond to foils. For these data, participants identified (hit) 88% of the targets, and missed only 12%. Only about 17% of the time did participants respond incorrectly (false alarms) to foils, correctly rejecting, on average, five out of six (interestingly, not always the first blue square, but often one of the flashes in the middle of the MSE experience).

Similar findings stemmed from a mini-experiment with civilians. In one session, for instance, with the less intensive MSE, participants hit 80% of the thirty targets. When they missed responding, most of the time it was because they did respond but beyond a set (time) threshold, suggesting that they were otherwise occupied (e.g., in responding to other stimuli) but still noticed the target. Only 11% of the time did the foils trigger a false alarm. In contrast, when the more intensive MSE was presented, participants hit only 55% of the 133 targets, and issued dozens of false alarms. Subjective data, including observations of participants and their debrief comments, support these analytic data: Participants were sometimes frustrated, found the directions "easy to follow but difficult to execute", found the task "hard", and felt the MSE had "more stressful" segments. This is in contrast to the less intense MSE where participants were observed to be engaged but not overly stressed. Across the mini-experiments, it was determined that four types of responses was adequate to engage participants but not overwhelm them.

SUMMARY

The MSE is quite similar to a number of existing simulations used for pre- or postdeployment reasons, such as Virtual Iraq (Rizzo et al., 2009) and VR-SIT for use with combat medics (Stetz et al., 2008), all of which are based on theoretically guided uses of virtual environments for therapeutic aims (Spira et al., 2006). A difference between this MSE and others is its integration into a PreSIT protocol, meaning the specific and changeable events and actions employed to induce stress and trigger reactions. Another difference is the need in other simulations for immersive systems such as head mounted displays; here only a projection was needed. As with most game-based simulations, this MSE has proved easily adaptable; creating an Afghan village from the Iraq village (**Figure 4**) required only a swap of background environments and cultural-specific objects in the scene.

Figure 4. Screenshot of Afghan village MSE.

If shown to be effective, the PreSIT protocol can be disseminated within the Services to supplement and strengthen current best practice COSC educational materials. The PreSIT design team is also looking to port the MSE and certain responses to handheld devices. Finally, more realistic interactions (as in Hubal, Kizakevich, & Furberg, 2007) are thought to lead to greater engagement, compared to the participants' inability to control movement through the virtual environment currently, likely leading to increased physiological response. It is hoped that findings from this research will represent the beginning of development and evaluation of effective evidence-based predeployment programs for force health protection and combat stress casualty prevention.

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