This expert panel was convened at CyberTherapy 14, in Verbania, Italy, on June 23, 2009, for the purpose discussing current and future uses of technology for the mental health of deployed military service members. Panel members were selected on the basis of their being military mental health providers working with advanced technology either in combat zones or in military treatment facilities, or developing technology to be used in these settings. The panel was charged with examining both appropriate and inappropriate use of current technologies to assist with the psychological health of service members in the field. The panel was also tasked with pointing out areas where technology can further develop to support the psychological health of the field-deployed service member.

Dr. Spira (Panel Chair): Captain (select) Scott Johnston is a Navy clinical psychologist who has been deployed to the Middle East three times, working closely with the U.S. Marines. He has traveled from his temporary duty station at Guantanamo Bay, Cuba, to be with us today.

Dr. Johnston: I became involved with the uses of virtual reality (VR) while working with the team investigating the benefits of VR treatment for PTSD at Naval Medical Center–San Diego (NMCSD), which became my connection to using technology within the military. For purposes of this panel, I am going to break my discussion down into three different aspects that I have seen potential for using technology.

I was stationed at Camp Fallujah in Iraq on a base working with patients that were coming in with various levels of distress, including full-blown PTSD. We had a limited war chest of things we could use at that time, and certainly being able to use something like virtual reality out in the war field is a wonderful opportunity. Although this technology was primarily developed for treatment of PTSD with soldiers within the continental United States (CONUS), Dr. McLay has actually implemented some of this work in Iraq, which he will describe in more detail. I believe that treatment in these forward bases where we have a certain level of safety and where you can physically employ this technology has great potential. That is certainly one way we should be thinking of applying this treatment.

When I was with the Eighth Marines and the Third Marines in Haditha, Iraq, and Ramadi, Iraq, I was working with marines much more engaged with combat. In those scenarios where there is a lot more blood and gore on a daily basis, providing an opportunity for resiliency-building ahead of time is a really exciting prospect for this type of technology. Corpsmen in particular are at risk for developing traumatic stress injuries because they are a marine, fighting one minute, and then as soon as one of their buddies get hurt, they have to switch gears and become a medical personnel out there on the streets of Ramadi or wherever they might find themselves. This group, like army medics, was forward deployed with the infantry, and is at unique risks for developing stress reactions. So to be able to help build some resilience with them by training them in appropriate VR scenarios they would likely encounter before leaving on deployment is a very exciting prospect. I have seen some of what the Army is doing with training their medics in stress inoculation programs, which is a really wonderful way to help give some of these uniquely vulnerable people some help before they deploy.

Finally, in my current duty station in Guantanamo Bay, I work quite a bit with the prison guards. It is a surprisingly stressful situation for these guards—much more than I thought it would be. Although it is not combat in the typical sense, they are certainly involved in psychology warfare on a daily basis. It is really extremely difficult work. I think some of the guards have a harder time reintegrating from that setting than do those who are combat deployed to the Middle East. To be able to assess who might have difficulty adapting to that type of setting ahead of time would be an exciting application of
technology. We find that in Guantanamo, some guards quickly decompensate and are not even able to do their jobs. If we could find a way to expose them to what it is like to have feces thrown on you or to be called every name in the book—whatever those detainees could be tossing out at them—having that kind of experience ahead of time could help us assess who may or may not be successful. Presumably, if we could immerse them in the virtual reality world or find a way to invoke that kind of stimulus to see how they would respond, we might see that some people are less likely to be able to handle that stress than others.

I see those three aspects of how technology could assist mental health professionals in supporting the warfighter as merely the tip of the spear. Although we’ve focused VR technology on treatment, being able to help with resilience-building and then looking at assessment are some exciting ways to use this emerging technology. However, as we are evaluating this, several caveats I would like to offer would be that the two most important things for the end user is that [the technology] is, one, easy to use, and two, … durable. I know with my work at the Naval Medical Center in San Diego, we have had some great results, and it has been a real pleasure and honor to be part of that effort. But a lot of times we have to finagle with the equipment, adjust this and that in order to get it to work. I guess we will hear more of how it actually works in the theater, but having something that is really durable out there will be critically important. The deserts of Iraq are difficult; I am sure the mountains of Afghanistan are going to be difficult as well. Anything complex or that can easily break just won’t be of much use in that environment. When I was with the Infantry Battalion, marines’ weapons were very simple to operate. There is a trigger; put the bullets in here, point, pull the trigger, and the desired outcome happens. Sometimes with technology it is not quite that simple. We all have experienced, in working with technology in our daily lives, that some software and hardware is easy and a joy to use, and some is not so much fun to work with. We need to insure that for purposes of deployment, things are easy to use as we go forward.

Dr. Spira: We are now going to transition to someone who was in the field last year and used various forms of technology for mental health assessment and treatment. CDR McLay is a psychiatrist with an additional doctorate in neurosciences. Following his seven-month deployment to Iraq, he was recently released from active duty as a commander in the Navy Reserves and continues to work with combat veterans at NMCSD.

Dr. McLay: My background is as a basic science researcher and as a psychiatrist. And although I do clinical treatment with combat veterans, I got into VR technology somewhat by accident. Dr. Spira had been principal investigator for several virtual reality PTSD treatment projects supported by the Office of Naval Research working with Mark and Brenda Wiederhold and also with Skip Rizzo and the teams at Naval Medical Center and Camp Pendleton. I inherited these projects when Dr. Spira left NMCSD and was fortunate to be able to work with a great team developing some really useful technologies. I am not technologic at all myself but fortunately am involved with a number of folks who are.

When it became time for me to deploy as a psychiatrist in Fallujah, I thought about what I could take to assist me with my work. And although I found Dr. Johnston’s signature on the wall in my room when I got there, things were a lot quieter and different from when he was serving there several years earlier. Yet one advantage I had compared to those who served before me was that due to the generosity of many colleagues, including some sitting in this room today, I was able to take some very cool tools and toys into the field. These included a fully immersive virtual reality system, a Palm version of the Automated Neuropsychological Assessment Metric (ANAM) called BrainCheckers, and some little portable biofeedback devices called StressErasers, which we handed out to the troops. I also was working with a neurologist there who carried a portable infrared scanner capable of detecting neurovascular clots in the field.

I also discovered that there was some technology out there that was not really meant for medical use but has totally revolutionized the mental health aspect of warfare, and that is basic communication technology. Whereas a lot of the troops that were in the initial invasion were completely cut off from the outside world for the entire deployment, we now can communicate with other folks at other bases when we needed a particular type of surgeon: we simply teleconference there and get the additional help we need. Likewise, if someone needs to talk to a psychiatrist, we support them. Also, this technology had dispersed itself throughout the military at all levels. Service members were “Skyping” home on their laptops or computers supplied by the military. Imagine a scenario where a soldier, sailor, or marine would be out in a firefight or [injured by] an IED that day and would be coming back and talking to his or her spouse about it a few hours later. While it is great to have this type of social support, it also presents its own interesting stress on the family.

I was surprised when I found that although I had brought all this wonderful technology for assisting troops with PTSD and mild traumatic brain injury [mTBI], 90% of what I dealt with was stress from people hating their boss (the gunny, lieutenant, or whomever), or they had just gotten this Internet message—formally called a Dear John letter—at light speed. And typically it was a Dear John letter in much, much, much more vicious form, such as “I just posted a video of myself and my lover on U-Tube.” Needless to say, that can cause some stress that rivals any PTSD I’ve seen. So this technology has many implications. It is a great opportunity for assisting medical treatment and also a great opportunity for eliciting great distress—and it’s all tied together with an ability to communicate at the speed of light both for the individuals it helps and for ourselves as providers to gain information and support troops out there in the field.

I do want to touch on some of the other technology that we’ve brought up here, the most obvious one being the virtual reality system that had been being used for the treatment of posttraumatic disorder back at Naval Medical Center–San Diego and at Camp Pendleton. We had developed treatment modalities that seemed to be very effective when we were treating people with posttraumatic stress six or twelve months after the event. We took it into the field wondering what happens when we treat this type
of stress early on. Well, anecdotally, I can tell you that we got really good success. And while that was wonderful technology, I only ended up utilizing it with a relatively small percentage of what I saw. I treated only seven patients for PTSD using the technology—and all but one of them got miraculously better, better within days of starting this. The one who did not respond, I had only nine days with—not a whole lot of time to do treatment. It didn’t get any worse, but I got a little cocky in terms of how fast people were getting better, so I decided to attempt treatment despite the limited time I had to work with this marine. On the whole, using VR to facilitate PTSD treatment was a very useful technology for the techniques that worked stateside with vets who had chronic PTSD, and it also seemed to work quite well in the field with new-onset PTSD. Was... the actual technology [responsible for the successful outcomes, or] was it just people willing to take on their fears? I don’t know. But the end result was quite good.

Another use of these technologies was entirely unanticipated. We brought the VR technology there to use for treatment and had nice protocols for all that. But a lot of the personnel I saw there did not present so much as “this person is broken, please fix them” but more often as “this person, we are not sure if he is quite right; we want to take him on the convoy; he is generally a good guy; he says he wants to go but he seems a little shaken up, and we are not sure if he is ready for that.” So somewhat unexpectedly, rather than simply for treatment, I found myself using the VR technology as a screening tool to assess reactivity. The VR was used as a simulation to bolster our clinical assessment. Rather than simply guessing, a VR simulation could give us ecologically valid information such as whether this person could drive in this simulator before we sent him or her back on the real thing. We also brought a portable neuropsychological assessment tool (Brain Checkers, the ANAM on a handheld mobile device), which enabled us to say, “Your reaction time is in the first percentile compared to other military members, and so there is something wrong here.” That was great technology to be able to utilize to support clinical judgment.

My take-home message here is what you develop technology for may not be what it actually ends up being used for. They say that no plan lasts past the first shell in battle, and I think that is definitely true on the medical side as well: things are going to be changing on the fly. As Dr. Johnston alluded to earlier, things are going to break. This was supposedly a portable system, and even had wheels, which sounded great, as far as we could predict. But try dragging something with wheels across the sand—it doesn’t work real well. There were all kinds of situations where the technology had to get to places that were not anticipated, and the stuff gets beat up. We tried to adapt as much as possible, but sandstorms eat computers, and 140-degree heat doesn’t do them very good either. So you have to have technology that is resilient, is relatively simple to use, and that people can use creatively to meet the situations they find themselves in. Many times, the military gets labeled as being very rigid (and they are for various reasons), but other times they are forced to be pretty creative on the fly. If you give them good tools (stuff that is durable that is relatively straightforward and easy to figure out), they will come up with neat ways of applying these tools in the field.

A lot of these technologies ended up being pretty useful. The more sophisticated biofeedback devices that we used with our VR system completely fried in the sand. So we adapted the little StressEraser handheld biofeedback devices we brought for sleep support in combination with the VR systems for arousal control. Again, stuff is going to get shifted around and used as necessary. We appreciate what is given out there and the opportunity to try these things in the field, as well as the possibility of adapting it to new uses. I want to thank everyone who is developing these sorts of technologies to help our active-duty folks. I think it does offer great possibilities for keeping people mentally healthy, focused, and capable of doing the right thing. I know a lot of people have moral qualms about working with the military system. But if you train people correctly and keep up their mental health, you allow them to do the right thing, and given the right tools to do that, it will allow a better, more moral, more capable, and sharper military.

Dr. Spira: I would next like to have retired Navy Captain Wood, a psychologist who has gone on three deployments during his Navy career. Dr. Wood has worked with a virtual reality system for treating PTSD following deployment. Today, I would like him to briefly discuss that system and [its] potential to be more field-deployable.

Dr. Wood: The unit that the Virtual Reality Medical Center has developed utilizes three laptop computers: two that drive the VR system to facilitate the combat-related exposure component and one that is a biofeedback system for arousal control. This VR system is identical to the system that Dr. McLay took to Iraq. Anytime you deploy a piece of equipment forward, it has to be rugged; it has to be designed for the environment you are taking it into. It would be ideal if, for field-deployable systems, the people who design computers get together with the operators, put their heads together, and come up with more resilient systems that are deployable. My perception, after having done approximately 400-plus VR sessions with warriors over the past three years is that the system we’re using at Naval Medical Center–San Diego and Naval Hospital Camp Pendleton are very user friendly, predicated upon the fact the psychologist or therapist has the proper training in exposure therapy and biofeedback. We are finding that this therapy is very effective for use with our warriors. Having said that, Dr. Hunter Hoffman from the University of Washington gave a comment earlier in the conference about the need for additional research, additional patients, and multiple research sites. That is certainly something that needs to be done, and hopefully the Department of Defense will critically evaluate that and pay for additional studies, additional training for therapists, as well as [for] extended follow-up. And, as Dr. McLay indicated earlier, it is of great interest to see how this technology that we are finding so valuable back home could be used in theater. I am all for this new technology to be pushed forward operational. If I was to return to active duty and become operational again, I would love to take this equipment with me because personally, I believe, from having done therapy with combat warriors since the mid-seventies, that this is the therapy that is the most effective. I have heard Dr. Spira make similar comments in terms of
his experience doing different types of therapy with combat veterans over many years, including his use of exposure therapy with imagery, hypnotherapy, interpersonal therapy, cognitive-behavior-oriented therapy, and others: that this therapy is the most effective.

I am concerned, though, about researchers and clinicians being able to determine which warriors would be most responsive to this therapy. Although we have some data on this, we need to collect far more data to be able to determine if various levels of initial arousal determined during the assessment (in response to rest, arousal recall, and recovery) influence progress in treatment. We also need to determine how the warriors are faring six, twelve, or twenty-four months posttreatment.

Dr. Spira: We now turn from the use of assessment and treatment to focus on stress inoculation. There have been some comments made about treatment, assessment in the field, but can we have technology that might actually prevent the onset of PTSD or other psychological wounds that can be used just prior to or even in the combat arena? Sinisa is an engineer and a computer scientist who has a very interesting perspective on how to integrate this into the technologies we’ve talked about for preventive measures. It is very relevant to our discussion of field deployability because it reduces the need for a specialist-operator and instead places reliance on the users themselves.

Sinisa Popovic: I am working on methods to make technology more user friendly, more effective, and more cost efficient by putting more “intelligence” into the systems. Therefore, I will discuss preventive and treatment strategies for arousal control and cognitive learning. In an intelligent system of this sort, there are three overlapping phases: one, stress coping skill acquisition and rehearsal; two, initial, conceptual education phase; and three, stress coping skills application and follow-through.

Professor Spira has already discussed the stress coping skill acquisition and rehearsal phase, and as psychologists, I am sure that most of you are familiar with this topic. The conceptual education phase is more like an understanding of stress arousal and the edification of the causes of these stressful situations, and this may be something that the technology would be appropriate to assist with. Applications to stress inoculation training have been discussed in the psychiatry and psychotherapy literature (see Michenbaum’s work). The third phase of stress manipulation training can combine realistic combat experience with a stressful experience. For example, VR applications can provide a realistic setting, and we observe physiology stress reactions from various combat simultaneous. Various relevant components about the warfighter’s job and his being exposed to various stressors can be applied as appropriate. This is currently being conducted by the clinician in treatment. However, it could be automated. For instance, if the user has low arousal, then the VR program could increase the simulated combat experience. If arousal becomes too high, then the program could downregulate the stimulus. There are various applications to consider. First is the witnessing of bad things that happen to your comrades in theater, which we cannot do anything about in some situations and which can lead to stress-related disorders. Dr. Wiederhold wrote a review of VR-facilitated stress inoculation training [SIT] that concluded that this type of training is likely to prevent such stress-related disorders.

The second approach is for technology to have a role in facilitating this stress management of such exposures. We are trying to research and develop techniques for emotional regulation with implications to stress-related training in psychotherapy. We present scenarios by generating multimedia stimuli in a VR environment. The subject has this stimuli presented from a stimuli generator, and he first reacts emotionally to that. Within that index we are interested in the physiological response of the subject. We register his arousal level physiologically, and then the subject can learn to recognize and then respond, first automatically and then with control. With feedback about the automaticity of reactions, first comes the cognitive understanding of what is happening, and then they can learn to control the reactivity. Initially, the stimulus causes an automatic cognitive and physiological reactivity that is not understood by the subject. Yet with feedback to one’s reaction to the stimuli, one comes to be able to both understand and then control one’s reactions. This leads to a gradual disconnection from the automatic physical and emotional reactivity and replaces it with awareness and control. Through multiple sessions, you will get such stress reactions to a range of stimuli, and hopefully they would generalize the newly learned responses situations. Within this context, we are hoping to get more precise benefits for such stress-related disorders. We believe that by diminishing such stress reactions, a person will be more resistant to stress-related disorders in any situation. This is our approach to stress inoculation training. To be more specific, through multiple sessions, in each session multiple stimuli can be delivered, and we then keep track of how the person reacts in each session and decide how to go about reducing the automatic reactivity and then how to better proceed in the next session. This is what a therapist can do, yet this is also possible through intelligent technology monitoring and presenting stimulus levels according to one’s reactivity.

For patients, VR not only brings up stress responses, but such responses are going to be amplified by the patient’s memory, and so it can get very intense for the patient. For the healthy person, response levels depend on each individual because they don’t have specific trauma memories, and so it is critical to rely on other factors, such as whether they are going to react more to the realism of the video or more to the immersion of the virtual reality. Our experience is that healthy persons treat such simulations more like a game, and the simulation might result in a different sort of reaction than would be found in combat. So does the intensity of the reaction to VR simulation depend upon the characteristics of the VR scenario, the vividness of a video, or of the person being exposed. Therefore, we have to consider which medium is optimal.

It seems no studies yet exist on technology-assisted SIT that use direct prevention outcomes. Generic technology can be useful for emotion elicitation, assessment, and closed-loop control. Human–computer interaction can make use of the affective computing paradigm.

Figure 1 is a model of our algorithm where the system attempts to find pertinent stimuli that elicit high physiological reactivity in the subject. Next, the system exposes the subject to these stimuli, who practices stress coping skills,
until reactivity is sufficiently decreased. The system strives
to gradually increase the stimuli intensity while the user
strives to control his reactivity. Through multiple sessions,
one is able to obtain diminished stress reactions and greater
skills in controlling them. Hopefully, the result is becoming
more resistant to stress-related disorders.

What I hope you will take away from this is that
technology currently depends on an intelligent operator to
assemble all the pieces in a clinically meaningful interac-
tion. Yet some of this intelligence can be built into the
technology itself to reduce the reliance on the operator.
Possibly, this can even improve upon some aspects that are
now dependent on operator control. This approach can be
used not only prior to deployment, as in SIT, or
postdeployment, as in treatment of PTSD, but possibly
during deployment itself. The military is looking into ways
to incorporate medic and corpsman functions into the
uniform of the warfighter. Perhaps mental health can begin
to be incorporated in the same way.

Dr. Spira: I want to turn briefly to the transition home from
combat. We have been focusing on preparation for combat
and supporting the troops in combat. However, it is
equally important to assist with the transition home from
combat. The U.S. Army has recently initiated resiliency
training in preparation for combat with all its soldiers. The
National Guard and Naval Special Warfare has also begun
pre- and postdeployment resiliency workshops for its
married and single members. However, at present, there is
insufficient support for the transition home for regular
active-duty and reserve soldiers, sailors, and marines. Dr.
Russoniello is a psychologist on the faculty of East Carolina
University and president-elect of the Association for
Applied Psychophysiology and Biofeedback. He is also a
former marine who served in Vietnam.

Dr. Russoniello: “Our inventions are wont to be pretty toys,
which distract our attention from serious things. They are
but improved means to an unimproved end.” This was said
by Henry Thoreau in 1854 and seems all the more true
today. The U.S. Marines are the most respected fighting
force in the world today. Part of what makes them great is
their strong bond to each other. However, once they return
home, that bond is often lacking, especially for reserve
service members demobilizing, active-duty separating
from service, or the thousands of wounded service mem-
bers medically separating from service. Today, there are
more homeless Vietnam veterans than died in that war 35
years ago. Can technology assist the combat veterans of the
war on terror transition more successfully than their
predecessors?

We have been working with marines at Camp Lejeune to
teach them arousal control through biofeedback training.
Most marines who return from combat have an elevated
baseline level of arousal. Of course, if they have PTSD, their
arousal level spikes well above that. Self-medicating with
alcohol is all too common with combat veterans, with
estimates of greater than 40 percent postcombat. Relation-
ships also suffer in greater numbers postcombat. Biofeed-
back is used to train marines to control their stress arousal
levels, self-comfort in healthy ways, and be less automat-
ically reactive to others. Dr. McLay mentioned the use of
biofeedback in Iraq for those who have been identified as
having stress-related difficulties. I would like to see a
situation where all service members could train in biofeed-
back prior to deployment in order to control their arousal
while in-country and following deployment to help them
reestablish control of their arousal levels for more success-
ful reintegration to home life. We have inexpensive
technology that can be used in a squad-level format, a
training format familiar to the military.

Other ways that technology could be useful in facili-
tating reintegration could include keeping marines
connected postcombat through chat rooms in Second Life
or writing on each other’s walls in Facebook. This affords
unit members the opportunity to stay connected without
the expense of travel and allows for anonymity or identi-
fication if desired.

Dr. Spira: Before we open the panel and audience for
discussion, I’d like to make a more “field deployable”
link for what Sinisa has been discussing. I am involved
in research with marines and Navy Seals doing much of
what you just talked about, including stress inoculation
training. We have service members hooked up to biofeedback
looking at their heart rate variability while they are
learning skills (specifically Zen meditation) to be fully
immersed in the moment, noticing when there are distrac-
tions or excessive reactivity, either psychophysical arousal
distractions or thought distractions, learning to let that
go and reattend to what is in front of them. The concept is
different than we use for VR treatment for supporting
prolonged exposure in posttraumatic stress disorder where
the provider is trying to elicit arousal and then extinguish
that arousal.

For predeployment stress inoculation training, we use
generated a gamelike environment as an opportunity to
practice their skills (Zen meditation). It does not need to
elicit a fear response in normal people, since it probably
won’t anyway in predeploying personnel. So we create
an opportunity for them to practice their skills in stress
reactivity control and focused attention. We are examining
if they not only control their psychophysiology but also
improve their attention and reaction time to perform better
on mission-oriented tasks they engage in during this game
simulation. This is being done in a squad-level format, so it
is very economical. As Dr. Mclay said, you want them to
shoot the right people, not the wrong people. You want
them to be more ethical and better warriors, not stressed
out warriors, and of course we want to reduce the rates of
PTSD coming back.

I agree with what was said—that it is prohibitively
expensive and time consuming to do such trainings in a
totally immersed individual VR system. Therefore, we are
doing projection onto a wall for them to practice with.
The notion of looking at psychophysical and cognitive arousal
mechanisms, training within an SIT environment, and
doing it within a classroom setting at the squad level is
fifteen times more economical than with individuals. And
then the question arises, how economical can such a system
be? Can it be made so simple that it can be on one of these
little handheld devices or somehow how can you train
hundreds of thousands of warriors to do this effectively in a
very cost-effective and effective manner?

Now, let’s open this up for other discussion: What
thoughts do you have about the benefits and drawbacks
of utilizing technology for military in the field or pre-
deployment or postdeployment?

Question: Dr. Spira, you talked about the assessment,
resilience ability, and therapy. In the presentation yester-
day, you made it relatively clear that most of the combat
PTSD we are seeing has an onset of six to twelve months, is
that right?

Dr. Spira: It seems to be delayed, not necessarily six to twelve
months, but certainly maybe three months or so after
returning home.

Question: I am wondering what is being done right now when
the warrior comes home? Is there some kind of preventive
maintenance? In the example you gave yesterday about the
sergeant who returned back to basically noncombat
deployment and then decompensated in that situation—I
am wondering if between deployments, things are being
done to maybe catch the problems before they surface a
couple of years later.

Dr. Spira: One would hope that would be the case. There
is education that is being given to all branches. There is a
postdeployment BattleMind Training in the Army, which is
an online briefing; the Marines have Combat Operational
Stress presentations, which can be an hour presentation
given by chaplains, psychologists, and others, but these are
also very brief and more informational. What systematic
programs do we have, or do you think we should have,
that would help the reintegration and preparation for
redeployment?

Dr. Johnston: One thing that we certainly have in place
is testing. We do screening of people five days before they
leave theater, and they are given the Post Deployment
Health Assessment (PDHA). Within three to six months
afterwards, they take the Post Deployment Health Reas-
essment (PDHRA). So we are testing them at two different
time periods, particularly to try to catch these people with
delayed onset. The Marines, with whom I am more
familiar, talk about the deployment cycle, which is this
wheel that involves pre-workup, different types of educa-
tion with hope of prevention, as Dr. Spira was mentioning.
But as mentioned, it tends to be more psychoeducational.
They get in a room and are given a brief about what they
can expect. It doesn’t get to the level of what we could be
doing, which is looking more at the stress inoculation or
other ways of giving them better tools before they deploy.

Dr. Wood: The Army has driven assessment of PTSD beyond
the questionnaire. The primary care providers in all the
Army medical clinics basically have to do a face-to-face
interview with the warriors within a certain period of time
after they have come back from deployment and then again
on some sort of cycle. They are capturing a higher number
of Army warriors right now that have PTSD than otherwise
would volunteer that they have PTSD. On the Marine
Corps side, due to their strong bond to each other, they feel
a disincentive to go to the clinic and say “I’m broken” or “I
can’t do my part for the platoon company.” So in spite of
senior leadership on the Marine Corps coming out and
talking about the need to demystify PTSD or take the
stigma away from PTSD, that is not operational at this
point in time. We can only hope that it will be operational.

There are some other models in the Navy and the Marine
Corps that would be very easy to put into a predeployment
training cycle, but it isn’t happening at this time. Take tank
drivers at 29 Palms and at Camp Pendleton for a case in
point. Every hour, you drive a tank, there are eight to ten
hours of maintenance: driving tanks is very expensive. So
they’ve developed simulator programs that are used on an
ongoing basis for tank drivers. It would be relatively
easy technology to develop a similar type of reeducation/
decompression program along the lines of a stress inocula-
tion training in a virtual reality environment. Let me
mention another quick model. The Air Force trains C-17
pilots over a seven-month period of time. Over that seven-
month period of time, in pilot training you spend only four
hours in actual cockpit flying a C-17. The rest of the time
is simulator training. So here again is another inrood if
Dr. Spira: Simulator training can be made easy, affordable, and, again, you have a demonstrated successful product, much like Air Force pilots getting their wings and moving on to whatever their operational assignments are. That certainly is a direction for us to take a look at.

Parenthetically, an aspect of simulator training is also used to assess which individuals should not be in pilot training. These simulations can crank up the stress of causing different system failures, and as a result of that, people say, "I'm done, I don't want to learn to fly this thing," or they perform so poorly that the command makes that decision for them. As a result, you get a better pilot at the end of the output. But again, we need to take a look at some of those algorithms that are already in aviation and for tank operators as well as in rehabilitation medicine.

Dr. McLay: I just want to add that I think we need to be humbled in our ability in both what we can detect and what we can prevent. There have been numerous efforts to screen certain members when they get back, say three to six months later, to do face-to-face interviews and to add all these different aspects that have been mentioned. But right now, the only thing we have to pick up PTSD is what the individual tells us. We have no mindreading technology as of yet, and that is a real limitation. Some people are going to overreport, some people are going to underreport, and until something new comes along, that is all we are going to have.

Another problem is in our ability to actually prevent PTSD. Even if we did pick up early signs, we don't do a very good job at preventing its onset. Nothing I know of in medicine has been tested and failed as much as has Critical Incident Stress Debriefing, and yet we continue to use it! We have looked at other wars and attempted to put preventive measures into place as well. From other wars, the military developed something called the Biceps Concept. They took all the knowledge about what caused people to get "shell shock" and developed this idea that you give the expectancy of recovery. We seemed to have finally learned some valuable lessons after failing at this in the Crimean, World War I, and World War II. Do you know when these lessons were actually put into place at the beginning of the war? Vietnam. We had the best "return to duty" rates in the history of warfare in Vietnam. We thought we were doing real well, but it turns out that it didn't work out so well in the long term, as we now know. My point is that we just have to be humble and realize our own ignorance when it comes to our ability to actually prevent, change, and alter the course of combat stress reactions. We should not give up, of course, but clearly this is going to be a work in progress. Whatever we put in place, we are going to have to have a treatment backup plan in case this "screening method" or "strengthening method" doesn't work.

Dr. Spira: I agree. We aren't very good at even understanding what is going on with PTSD. For example, imagine that we had the technology so that everyone coming back would, at the three-month post deployment mark, have to train in a virtually reality system like we've been employing, and we'd be monitoring their skin conductance, heart rate variability, maybe EEG, et cetera, and see how well they can do in terms of their reactivity. That might sensitize us to having to do a clinical screen. The problem with that is you put a Navy Seal through these systems, and their arousal will go way up, but it just comes down really fast too, and their arousal doesn't seem to interfere with their performance. If anything, it may enhance their performance. So just because someone gets aroused in these type of systems doesn't mean that it is a bad thing. Perhaps looking at recovery from stress is as or more important a predictor of performance or developing PTSD. Again, it is very hard for us to accurately detect or predict problems through such methods—at best these approaches will serve as screeners that require clinical confirmation. Unfortunately, at present we are not really sure that a person will have problems until they actually have problems, so anything we can do to develop better prediagnostic tools will be of value.

Question: How do the causes of combat-related PTSD differ from civilian cases, and how do treatments developed for civilian PTSD apply to combat PTSD? It seems to me that sleep disturbance is the earliest and most common symptom that we see. Would treatment for sleep disturbance be an effective intervention?

Dr. Spira: You raise some very good points. First of all, most of the research that has been done in PTSD has been conducted on single-incident, acute onset. Some limited research has been conducted with cases of complex PTSD (history of child abuse). Yet the nature of this conflict and the corresponding nature of the PTSD seen stemming from this conflict is clearly different from what we've seen among civilians. It has been interesting for many of us to observe that the treatments that have been developed for an assault or motor vehicle accident also seem to be very useful for this more nebulous kind of onset where there is not a particular incident but instead where there may be many particular incidents or even just a general accrual of stress. Within this context, a warfighter may then experience an incident that might not have otherwise developed PTSD. But because of this background stress of multiple deployments and life-threatening episodes, et cetera, PTSD arises in these individuals. So the nature of the beast is slightly different in this case.

Your point about different precursors for combat PTSD is very interesting in that prior to the onset of diagnosable PTSD or even acute stress disorder, if someone is starting to develop sleep disturbance and nightmares (even prior to the onset of full-blown avoidance, reexperiencing, or hyperarousal), perhaps a treatment at that point could be very effective.

Dr. McLay: Some of this stuff we looked at goes back to the fact that we don't have the tools to accurately diagnose who will develop a problem and who won't. So the question in military PTSD is, Is PTSD really delayed, or is the reporting of PTSD really delayed? We looked at some of our screeners in terms of seventeen symptoms of PTSD and we got very, very low response rates in the initial wave for PTSD. So what we did was break it down to all the symptoms and said, "Of all these seventeen symptoms of PTSD, what do people actually complain about?" People complain about insomnia. It's culturally acceptable to complain about insomnia. So guess what? Insomnia predicts the appearance of PTSD three to six months later. Is it really that insomnia is the first thing to show up in PTSD? That would be sort of backwards to the general model that it is, in order, reexperiencing, avoidance, then hyperarousal.
Or is it that people aren’t really willing to say that anything is wrong until they have given it three to six months and realize they have wrecked their lives and now they are finally willing to admit that maybe something is wrong and they need to come in and seek treatment for PTSD. I am not saying that is definitely or always the case. The sample I see is by definition biased: they have come in to see me because something is wrong. But I have a good number of people who have been through four rounds of PTSD screening and it never showed up, and now they present with horrible PTSD, and I ask them, “Well, when did you start having problems?” The most common response from them is, “The day after I got home.” So I ask them, “Then, how did you get through all these screenings?” And they almost always reply, “Well, that is a pain in the neck. I didn’t want to let anyone know anything was wrong.” So, from what I’ve seen, I think that is a large part of what is going on. On the other hand, there are the converse antidotal stories that you do hear about people who said that they were fine in theater, and then it did appear later. But when you see the numbers and it looks like there is this large jump three to six months later, I think much of that must be underreporting early on.

**Dr. Johnston:** I agree. I think that within the military population, it is not that they don’t have ASD or PTSD, but they have stigma. Stigma is the big issue early on. They choose not to report. I have done some research on how to help people redeploy after these events. It is amazing that in only three days after being a warrior in a combat theater, they return home, expected to be normal citizens. Typically, they would say to me, “Doc, all I need is a beer and to hug my wife and I’ll be fine.” Yet they weren’t sleeping and were having nightmares—but they think they can put all that away because they believe that once they get home, everything is going to be fine. I think we break through that at the three-month point. That is why they started doing these assessments.

**Dr. Spira:** Here then is another potential use of advanced technology: wearing an ambulatory monitor for daily symptoms from the day they return home in order to assess the real level of symptom development in those first six months. There are many scientists developing mobile technologies, such as mobile phones, to record psychological, psychophysiological, neuropsychological, and even motion activity for such uses.

**Question:** How useful would it be to be able to pick up stress levels or conflicts in one’s life before being deployed? For instance, like recruits leaving home for the first time in their lives, or recruits who have a more traumatic background. Some can handle it better than others.

**Dr. Mc Lay:** My own thought on this, and maybe Dr. Johnston would have a different view of it, is that there is a lot that would be useful to know what it means down the road, because there is a problem with doing screening and telling someone you can’t do something when you don’t actually know if it is going to have a negative effect. You are going to get a lot of push back from the individual and from the command who wants proof that just because you had an abusive history, you won’t make a good warfighter. If you tell them, “You are damaged material,” they might reply, “Why? I am the best marksman in the unit.” And the CO says, “He’s great, so you tell me he has a postconcussive syndrome. So what? He’s still the best sniper we’ve got.” I think we need to know the “so what” before the screening is in place. If you can show me data that your screening process actually predicts stuff down the road, the military will be very thankful. A healthy fighting force is a successful fighting force. But if you can just show that someone is impaired on a particular test early on, I am not sure I care, and I am pretty sure that the CO or the individual doesn’t care.

**Dr. Johnston:** I agree. Actually, there is a big movement to answer this very question in the military now. And every Navy psychologist is getting training on doing the ANAM neuropsychological assessment and other measures. But questions have been raised about what Dr. Mc Lay brought up regarding what we are really going to get with that information. So I think that it is definitely an unanswered question that we are looking at right now.

**Question:** So is the military interested in developing some kind of protocol to answer that question?

**Dr. Johnston:** There is a massive undertaking in that. Everyone wants to know when you get a computerized screening battery repeated pre- and postdeployment, what does that mean in terms of the impact on actual functioning. Another research project we are doing is looking at how all this neuropsych testing relates to something as simple as firearms use? If they have a slow reaction time, can you compensate for that through additional training and still be able to hit the right target most of the time?

**Dr. Spira:** Concussion is an example where there is a real need to connect performance on a test with performance in the field. The military has been slow to appreciate the real impact of mTBI. Most mTBI appears to recover rapidly, usually within a week. If they don’t recover in a week, most of them recover within three months. And those who don’t recover within three months might sustain problems out to a year, with many of those recovering as well. So it looks, at least out of any real deployment-related context, when you take a neuropsych assessment in a quiet room, or when you get a neurological exam in the doctor’s office, that many of these persons are fit to return to duty. However, that type of noncontextual assessment has little bearing on deployment performance. If you give it ecological validity by having them wearing a hundred pounds of gear, walking on a treadmill in high heat, listening to someone give them instruction while they are trying to shoot accurately, I think that you would find that a good portion of them are not really prepared to return to duty. The military has pursued thus far a “watch and wait” approach: if someone has documented TBI, the military will simply watch and see if they recover. If they don’t recover, there is always the VA, and if they do recover, they can be shipped back to duty. But we know that even if they report being fine and test fine (in isolation), if they have a second head injury within three months, they can be significantly impaired and with much lower chances of recovery. So to go to what Dr. Wood was saying, it would be nice to have a virtual system or some ecologically valid system in place. Currently, it is very expensive to do that. But certainly for those who have evidence of some TBI, ready to return to duty, I think it would be great to have this system in place. Naval Health
Research Center and other Navy labs are interested in doing that, but the money is hard to come by for such purposes.

Audience comment: We are doing quite a bit of work at the University of Southern California with neuropsychological assessment for the military. Right now, we have a memory module, a virtual city, and the three or four attention modules: driving, static, very boring activities, navigation tasks, etcetera. I agree totally that we have to examine relevance for showing how they will perform when there is a lot of noise.

Dr. Spira: When a neuropsychologist or computerized battery asks you a question, and that is all you are doing, you could rally your cognitive effort to do the task. But cognitive effort gets diminished significantly when you are under stressful conditions.

Dr. Wood: But again, we need to appreciate the relationship of test performance to field performance. One of the neurosurgeons at Balboa Hospital has gone out and assessed different EOD (explosive ordinance disposal) groups at Navy Base, Coronado. All the members of the EOD group have had a concussion—all of them. Yet they continue to function and do their jobs. Of course, we don’t have any measures of how well they are doing their jobs, but they get up everyday and go out there. At what point in time is one of those EOD operators going to reach a point that what they are doing is going to risk the other people on their team? We just don’t have the data and information on that.

We need to appreciate that every day we fly airplanes off an aircraft carrier, we spend a million dollars just servicing those airplanes. The cost of treatment or the cost of research, compared to what we spend on aviation gas and to fix airplanes, is minuscule in terms of the overall budget. So wherever you come from, we have to get to the decision makers—the ones writing the checks. We can’t just keep replacing or breaking our warriors. My son is headed back to Iraq for his third tour in November. Dr. Johnston has already had three tours. In the foreseeable future, that is just going to continue. Dr. Spira’s comment a moment ago about within a certain period of time, if a warrior has another exposure to an explosive device that “rings his chimes,” so to speak, the risk of long-term injury is exponential in relationship to that second, third, fourth, or fifth blast exposure.

Dr. Spira: I was giving a predeployment briefing to the Navy SEAL Officers and was trying to explain mTBI to them and what to look for. I asked how many of them have experienced a blast where they actually felt the wave of that move them back. They all laughed and said, “Doc, you got to understand, we do that nine to ten times a day with our percussion grenades. We throw them in, and even though we step behind the wall, we feel it.” They do that...