

## SPECIAL ISSUE

# Biofeedback-Based Mental Training in the Military—The “Mental Gym™” Project

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*The “Mental Gym™” is a practical mental training program that helps participants to cope better with stressors and to be able to keep an emotional and physical balance in their everyday tasks. This new multidisciplinary training combines a number of methodologies: biofeedback, neurofeedback, mindfulness, stress inoculation techniques, imagery, and various problem solving and attentional training methods. This article describes the process and obstacles of implementing the Mental Gym project with military pilots and elite unit personnel. Through examples of some of the training protocols, the author also shares insights from ten years of experience in providing an effective “tool box” for enhancing psychophysiological and cognitive flexibility in the military setting.*

### Introduction

Modern military training aims to prepare personnel to perform under life-threatening conditions, sometimes while multitasking. Training incorporates many stressors in an effort to “harden” and prepare personnel for the rigors of combat. However, the emphasis and focus of the training is mainly on improving physical fitness and mastering weapon systems. Very little, if any, of the training is dedicated to mental fitness and cognitive functioning under stress. The debilitating effects of stressors on military performance and their effects on soldiers’ mental health and well-being have long been recognized. After years of working as a psychologist treating veterans suffering from Post Traumatic Stress Disorder, I had a vision to try and develop an effective preventive resilience-focused intervention for soldiers. The aim was to administer this program to soldiers at the beginning of their military service to help inoculate them against the stressors they will encounter.

### Obstacles and Solutions in the Implementation Process of the Program

Ten years ago it was a challenge to introduce a psychological training program into the army setting. In the

military context, and especially in elite units and the air force the word “stress” is rarely mentioned. Soldiers try hard to hide the fact that they are afraid or are stressed. As a veteran myself, I recalled having exactly one hour during my three and a half years of military service dedicated to psychological coping with stress. It was a lecture given by a psychologist about using positive imagery as a coping technique just before our SERE (Survival, Evasion, Resistance, and Escape) training. Most of us, being chronically sleep deprived, fell asleep five minutes after the lecture started.

I knew that introducing a program for stress management or stress inoculation in this setting would require convincing military decision makers that it was necessary. “Stress inoculation” is a concept introduced by Donald Meichenbaum (2007), suggesting that exposure to small amounts of stress, with accompanying training in coping and stress reduction techniques, would increase future resilience in the face of stress.

It took about two years of pilot studies in various army units to develop the desired training package. The following are identified needs that dictated the goals of the intervention and the training principles derived from these requirements for constructing a successful training program:

1. Contrary to my original vision, military needs seemed to focus more on achieving better performance under stress rather than increasing the soldier’s capacity to avoid psychopathology despite difficult circumstances during their military service. Generally, commanders were looking for ways to minimize human errors in decision making or in operating weapons systems under stress, which can cause incompleteness of their mission and sometimes, unnecessary loss of lives. The focus shifted from resilience building to addressing the questions: Can peak performance be summoned on demand in combat conditions? and, Can coping in

extremely stressful situations be improved by offering mental training? If so, what is the best way to conduct such training and how is it possible to maximize generalization of the newly acquired techniques to daily life in a stressful military setting?

2. While searching for answers to these questions I found that each unit had different needs. Therefore, it was necessary to build a training program that was flexible enough to be tailored to the units' and soldiers' idiosyncratic needs. For example, in some units, a major problem was the high levels of stress caused by the need to be very alert for long periods during intensive daily training. In other units, it was the need to stay alert during long periods of boredom. In rescue teams, it was the quick shift from routine to emergency that caused stress, and pilots needed to divide attention or to multitask under stressful conditions and physical distractions. Other common factors were dealing with psychological fatigue (Caldwell & Gilreath, 2002) and coping with uncertainty. It seemed that "flexible readiness" and "flexible attention" were most needed.
3. Due to tight timetables in training and often urgent operational needs, it was complicated to rely on external experts and biofeedback equipment. We needed a solution that was readily available and cost effective, and that enabled opportunity for practice to generate a learning curve. This was how we reached the solution of the Mental Gym. Similar to the physical gym club, soldiers would improve their mental fitness through several training programs, could train during their free time, either alone or with a trainer, and could maintain fitness and skills due to the Mental Gym's high availability.

### **Why Biofeedback in Mental Training with Soldiers?**

It was not easy marketing the idea of self-regulation with biofeedback to the military decision makers. In a setting where stress is believed to facilitate performance, where soldiers would not admit they are stressed, and would routinely attempt to conceal their distress, using the wording "mental fitness" and "optimal performance under pressure" instead of "stress reduction" proved to be a rationale that could be accepted. Commanders and soldiers were introduced to the idea that the new training would help them to control unwanted thoughts and emotional responses that interfered with performance and would help them optimize their attentional resources.

As a therapist I was aware of the advantages of combining biofeedback in the process of learning self-regulation

techniques, but the military needed proof. A few studies were conducted. One, for example, involved 77 soldiers from the Israeli Air Force Special Forces. They were randomly divided into three groups to test the effectiveness of two similar training programs that were administered before an extremely stressful situation. Both training programs were based on the same stress inoculation procedure, but in one program, biofeedback components of Heart Rate Variability (HRV) and electrodermal response (EDR) were incorporated into the training covering self-regulation techniques. Six weeks after completing the program soldiers participated in what was considered to be the most stressful training in their military service. Results show that soldiers belonging to the group that underwent stress inoculation with biofeedback had significantly fewer stress-related symptoms, and their performance in some measures was evaluated as superior to those of the control and the stress inoculation-only groups. Although both intervention groups were taught abdominal breathing, the biofeedback group members reported using it more and their belief in its efficacy as a coping tool was higher. Similar feedback from participants in other pilot studies was consistent with these findings and demonstrated that biofeedback was a motivator for learning and using several mental techniques. In all of these pilot studies, many soldiers expressed their wish to have more such training.

### **Basic Principles of the Mental Gym Method**

Mental Gym is a complete methodology that draws on two main sources: Mental Fitness Training, which improves resilience to stress using biofeedback and psychological cognitive behavioral interventions, and structured thinking tools that address mental fixedness and promote creative problem solving.

The program's main goals are to help trainees reduce errors made due to faulty decision making under stress and to improve their performance under challenging and stressful conditions. This is accomplished by:

1. Identifying stress affecting their performance;
2. Monitoring their psycho-physiological reactions;
3. Acquiring and applying tools for maintaining psycho-physiological balance;
4. Applying problem-solving tools that address mental obstacles and generate creative solutions; and
5. Gaining confidence and proficiency through their command of the integrated method.

The Mental Gym training program creates, in effect, a virtuous circle: The balance and focus achieved through the

mental training enables an effective use of the thinking tools, while the problem solving tools themselves support the trainee's tranquility and self-confidence.

### Basic Features of the Training Program

In order to ensure compliance with training, soldiers are first instructed to respect the confidentiality of training-related events. They are requested not to share scores or compare achievements and it is emphasized that, by virtue of reaching this training stage, all participants have already exhibited resilience and good professional skills. The aim of the program is to help all participants reach their goals for improvement.

Trainees work in a specially designed space that houses several biofeedback workstations. Special care is taken to make sure that each trainee enjoys a private training environment. Portable biofeedback stations equipped with wireless biofeedback systems make it possible to conduct "real world" performance training. Workstations utilize the ProComp2™ and Tele-Infiniti™ systems by Thought Technology Ltd. of Montreal.

The training process includes lectures, biofeedback and cognitive software exercises, hands-on practice, and simulations. Training is supervised by three types of Mental Gym professionals:

1. A Mental Gym trainer is a person with basic knowledge of stress management with biofeedback who is trained to teach the techniques and to operate the biofeedback systems. The trainer is always present when activity takes place at the Mental Gym, except during top secret activities.
2. The military unit's psychologist undertakes biofeedback and cognitive behavioral training and is in charge of the basic training stage.
3. The Mental Gym expert has an extensive background in optimal performance with biofeedback. The expert provides the theoretical and introductory lectures to the trainers and the trainees, and assists the psychologist with complex cases and special needs. In specialized training, the expert provides one to one sessions.

The training in the Mental Gym focuses on several levels of human functioning under stress. Training incorporates considerable psycho-education relating to stress and performance, with examples derived from the personal experiences of the soldiers and commanders. Psycho-education is an important factor since preparatory information reduces the tendency to focus narrowly on threat-related stimuli, thereby diverting mental resources from task relevant demands.

Some training is directed at achieving resilience and flexibility at the physiological level: For example, resonant frequency training is used to increase cardiac variability (Gevirtz, 2000). This is done using computerized training protocols (Alive™ software by Somatic Vision). Some training requires high levels of expertise, such as alpha EEG training neurofeedback protocols (Wilson, Peper, & Moss, 2006), and sometimes it combines heart rate and skin conductance together with neurofeedback to reinforce an optimal level of cortical arousal.

Most of the training is centered on biofeedback-assisted learning of different psychophysiological and mental coping skills that have proved to be efficacious in stress management and stress inoculation programs (e.g., abdominal breathing, progressive muscle relaxation, positive self-talk, visual-motor behavioral rehearsal, goal setting, focused attention, problem solving, etc.). After the skill acquisition stage, soldiers apply the techniques while experiencing increasingly elevated levels of stressors including imagery, simulators, and graded in vivo exposures, first with, and later on without, the biofeedback. For example, biofeedback is also used in conjunction with video materials to facilitate high-quality positive mental imagery (Davis & Sime, 2005). The Mental Gym model was found to be very helpful in the maintenance and the generalization of self-regulatory skills. In the following section I will describe in detail one of the advanced training methods, which was made possible due to the special setting and the availability of multiple biofeedback workstations.

### Interpersonal Biofeedback Training

It was during an introductory lecture about mental training when giving the body-mind demonstration to a group of combat helicopter pilots that I realized that the impact of interpersonal relations on physiology should be integrated into the Mental Gym program. While using a sensitive electrodermal biofeedback device to show the effect of thoughts on our body, a volunteer pilot did not exhibit any significant change in arousal levels in response to questions, whether arithmetical, historical, or personal. I asked his peers to direct questions to him, but this did not elicit significant changes in arousal levels. "A very cool subject or an extremely low reactor," I was thinking to myself before giving up, and just then the squadron commander suddenly entered the room and spontaneously directed a question at the volunteer pilot: "What happened last night in the navigating exercise? You seemed to have made an error in the route." This was enough to cause a very sharp rise in the electrodermal level, with a very slow recovery rate.



Figure 1. The Dual Drive game used for training up to four people simultaneously.

Humans are a social species and therefore there are enormous advantages in training to self-regulate while being aware of others' biofeedback responses in the room. In addition, the identity of the "others" present in the room seems to have a significant impact on the personal training.

In their work on emotional contagion, Levenson and Gottman (1983) proposed that when the autonomic nervous system (ANS) physiology of two people shows "linkage" (i.e., one person's patterns of activation across the ANS measures mirror those of another person), there is emotional involvement. While working in the Mental Gym we noticed high levels of contagion and exchange of both negative and positive emotions between trainees. This phenomenon is used in two ways.

First, training in several physiological channels is incorporated to increase an individual's capacity to main-

tain optimal functioning while in competition or while engaged in a highly stressful scenario, regardless of the emotional environment that surrounds them. This, for example, is relevant to paramedics who treat people who are in pain.

One of the exercises conducted in a group or in pairs uses graph displays with auditory feedback. A sharp rise in electrodermal level while one trainee is being challenged can cause a rise in other training stations. Basic training is to be able to distract oneself from what is happening in one's surroundings and to keep calm and in a predefined zone.

Taking this training one step further we use the Dual Drive™ game developed by Somatic Vision (Figure 1). The game is used in a multiplayer mode where up to four participants compete in a car race, either in electrodermal or heart rate variability mode, or combined. For competitive



Figure 2. Half-Life 2: The Co-op elicits intensive emotions.

individuals this is a wonderful way to learn to self-regulate their ANS reactivity, to train to recover quickly, and to cope with temporary failures. While soldiers compete with others, the trainer can also add pressure to the situation by asking questions that have to be answered quickly, or by distracting the participants in ways that they are likely to encounter while performing in battle. Another kind of stressor is to have a high-ranking commander watch the competition. Some individuals react to such conditions in a completely different way to that of training alone or playing against teammates, and their physiology changes dramatically. This situation may alter physiology and performance levels while eliciting unique emotions. This social element of training is key for a team working closely together.

The second application of this principle aims to enhance calmness during teamwork, thereby strengthening the

team's cohesiveness. For example, while in combat flight training, often the experienced flight instructor notices his cadet developing unwanted stress levels. Mental Gym protocols use various methods to improve performance by rapidly restoring physiological calm. These include learning to elicit positive emotions on demand, changing self-talk and cognitively regulating emotions, certain mindfulness techniques for changing quality of attention, and arousal reduction techniques. A group setting elicits emotions differently from those elicited when performing the same task in individual setting. Psychologically, emotions alter attention and activate relevant associative networks in memory. Physiologically, emotions rapidly affect somatic muscular tonus, ANS activity, and endocrine activity thereby affecting our performance (Beilock & Carr, 2001). Therefore it is necessary to train under conditions that elicit a variety of emotional responses.

It is important to clarify that, prior to reaching the group training stage, soldiers are trained individually to emotionally regulate, e.g., reduce their cardiovascular arousal that was elevated from watching fear inducing films. We also use the Biomod "Half-Life 2" game that elicits intense physiological reactivity (Figure 2). We use protocols to regulate electrodermal hyperarousal caused by noise, intensive games, and even different simulators such as flight simulators.

Biofeedback group training also includes protocols to enhance decision-making under pressure (Hansen, Johnsen, & Thayer, 2003). Although this is a topic addressed with individuals in the earlier stages of training, in a group setting the ability to self-regulate physiologically is critical in shaping and reinforcing the behavior of others. Within a group this helps create conditions that promote expansive thinking and creativity.

### Issues and Challenges in Biofeedback Group Training

The psychologist or trainer must take precautions while using biofeedback in mental training and make sure that this unique way to enhance self-regulation does not cause negative effects. Competitive individuals tend to compare themselves to other members of the team continuously and at this stage of their military service, soldiers usually have established self-confidence in their abilities. This unique way of mirroring their physiology can, for some people, act negatively on their self-efficacy (Bandura, 1997). Some individuals may have known that they were stressed but managed to conceal this stress from themselves or from others. In some cases, the objective, medical-like device that measures stress may show them that they are more stressed than they believed they were. In addition, biofeedback enhances internal awareness and for soldiers who are encouraged to suppress their emotions, biofeedback training may cause a negative emotional reaction. This is especially true in such competitive environments and wrong usage of this psychophysiological mirroring may lower self-efficacy. The desired effect can be achieved by using the proper physiological channels, by adapting the challenge levels, or by matching trainees to one another according to their sensitivity and mastery of self-regulation techniques.

During the training process we emphasize (1) that physiological patterns are unique to each trainee, and that the goal in training is for each individual to improve his self-regulation relative to himself; and (2) that all trainees reaching this stage have already proved that they are highly resilient and that this is only one aspect of mental coping.

It is important to highlight the fact that group physiological training requires intimacy and trust between members of the team and is a form of advanced training that is given after careful consideration of risks. We are especially careful using biofeedback with simulators or in real military performance settings and we take into account the potential negative effects of combining these tasks. It is easier to grow confidence than to fix it.

### Conclusion

After ten years of implementing the Mental Gym program in the Israeli military, the mere fact that it still exists and keeps expanding implies that, to at least some extent, it is delivering the expected outcome. It is possible to teach mental skills without biofeedback, but as more military units are implementing Mental Gyms, it is clear that for this population the challenge and unique motivational properties of training with biofeedback make a difference. Last year, a specialized biofeedback course was created and 20 military psychologists were trained to deliver and run new Mental Gyms. For the first time, the Gyms were not limited to only the elite units, which will enable many more soldiers to benefit from this new way of acquiring self-regulatory skills. As one soldier commented after completing his mental gym training, "I was given tools for life and I am grateful that the army has given me this gift."

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