

French Symposium on Soldier Enhancement

∞ Part 2 ∞

Editor's note:

A symposium on French army initiatives to enhance soldier capabilities was held in Paris 19 June 2017 at the headquarters of the French Armed Forces titled “The Enhanced Soldier: The Needs and Prospects of Increasing the Fighter’s Abilities.” The Army University Press at Fort Leavenworth, Kansas, agreed to publish translated versions of the presentations given in seven parts as *Military Review* Online Exclusive articles to promote broader understanding of allied views and initiatives on a subject of intense collective interest. The below is the second of the seven presentations. The other presentations are published in separate documents.

The Hexagone Balard, headquarters of the French Armed Forces and the
Ministry of the Armed Forces, 19 December 2015 in Paris.
(Photo courtesy of Wikipedia)



The Enhanced Soldier

Definitions

Gérard de Boisboissel

Jean-Michel Le Masson

This is a translation of a lecture given during the conference on “The Enhanced Soldier: The Needs and Prospects of Increasing the Fighter’s Abilities,” held in the Headquarters of French Armed Forces, in Paris, 19 June 2017.

Before presenting in a dedicated edition of the *National Defense Review* publication, a semantic clarification of enhancement is necessary.

It has been generally accepted by our research program that enhancement is centered on people and their intrinsic capabilities. First, we will limit the scope of our study to the soldier by himself as an individual acting in operations. A second approach, investigating enhancements at the level of sociological group or that of engaged unit (military staff, combat group, etc.) may then be carried out.

“Enhancement,” defined as a process that aims to increase the intrinsic capacities of a soldier, will be considered through two complementary approaches: (a) via the individual himself (i.e., the “naked” human), and (b) via the equipped individual (i.e., a human fit for combat). Such approaches, however, voluntarily exclude the technologies, tools, and equipment that do not improve upon the capabilities of a soldier. In other words, in our definition, the equipment, once configured and worn by a soldier, are those which do not require further actions for their use. We will define them as “embedded equipment,” thus enhancing the soldier’s human performance.

In that respect, a virtual reality headset is regarded as embedded equipment since it enhances a soldier’s capacity with extra information on the tactical situation in his or her field of vision. Similarly, night-and-day vision binoculars enable the infantry soldier to acquire nyctalopic vision, the ability to see in the dark, which gives him or her a tactical advantage. Soldiers’ actions are passive with such equipment, and it brings them added capacity they would

otherwise not have. The exoskeleton falls into this category of equipment worn by the soldier, as is the case with intelligent and connected lenses.

By contrast, the use of robots and weapons are not regarded as enhancing a soldier’s performance even if they contribute in improving the global performance of a military unit or that of security forces. In fact, at least until now, they are operated by a soldier who always remains active to control them. In principle, they are disjoined from a combatant’s embedded system because they offer no enhancement as such. Moreover, a combatant’s deliberate activation is needed to achieve a desired result. On the other hand, a soldier will be enhanced if equipped with a virtual reality headset or with connected lenses enabling him or her to see in real time what a robot can perceive, thus acquiring an enlarged field of vision from a remote position.

The definitions adopted in our project are described hereafter.

Definition of the Enhanced Soldier

The enhanced soldier is a soldier whose capacities are improved, either stimulated or created, to strengthen his or her operational efficiency.

Such enhancements can range from a physiological modification or a change of the soldier’s

Gérard de Boisboissel is a research engineer at the Saint-Cyr Military Academy Research Centre (CREC).

Jean-Michel Le Masson is chief medical officer and associate research-er at CREC Saint-Cyr, a member of the Citizens’ Resilience Institute (Institut Résilience Citoyens), and head of the Western Zone Health Department (Chef du service de santé zonal ouest), French Ministry of the Interior.

psychological condition to other means, embedded in the soldier, that provide a consistent improvement of his or her sensorial, physical, or cognitive capacities.

Definition of a Soldier's Enhancement

Enhancing a soldier is the action of rendering him or her more efficient during military operations by

- strengthening intellectual skills (mental, psychological, cognitive) and/or physical abilities, or by letting the soldier acquire new skills;
- using technologically advanced equipment worn by the soldier to enhance performance;
- using nontherapeutic substances or using static dynamic implants (nanomaterials, prostheses) or applying suitable gene therapeutic treatment; and
- applying enhancement for short- or long-term usage that can even be irreversible provided its effects are controlled.

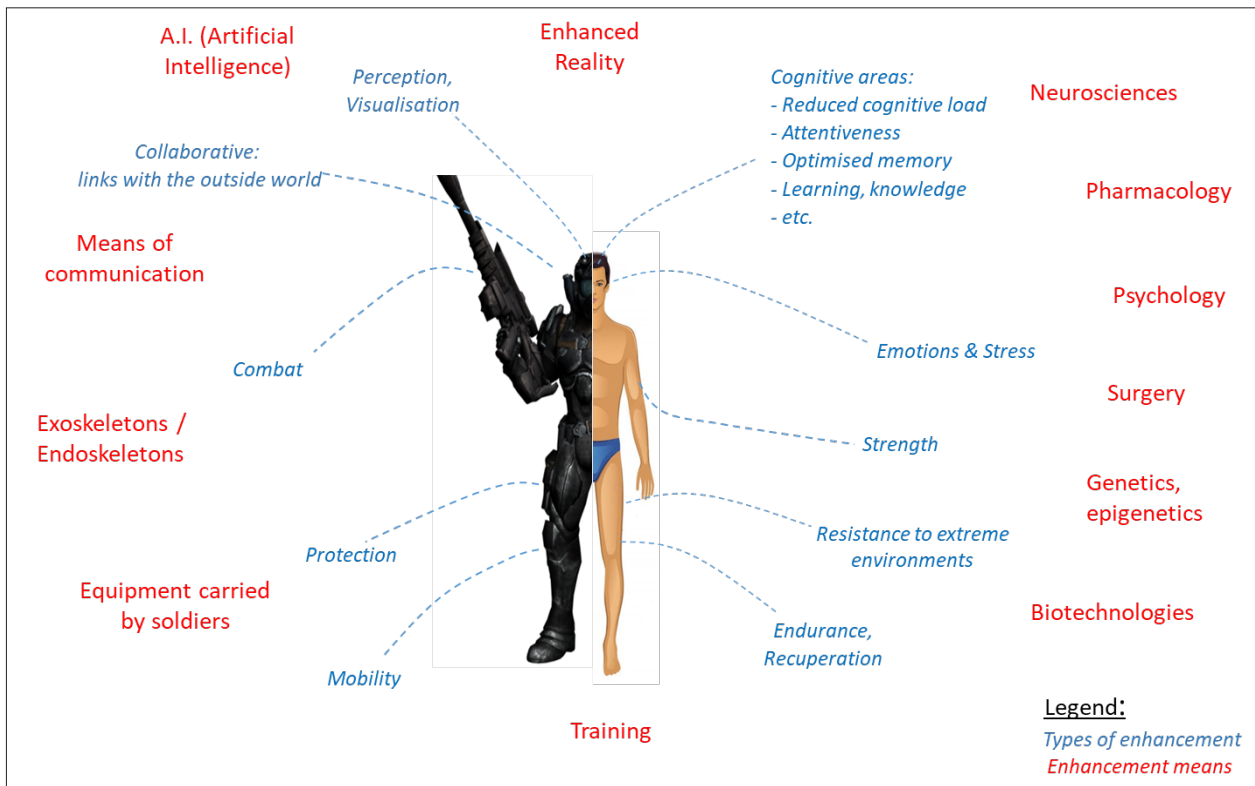
By efficiency, we mean operational efficiency; in other words, an individual's capacity to achieve results in fulfilling a mission. Efficiency helps ensure effectiveness.

This definition is intentionally broad in scope and unrestrictive to encompass enhanced performance derived from different techniques, notably cognitive capacities (e.g., reasoning, perception, memory), psychological capacities (e.g., resistance to stress, emotional stability, resistance to mental abuse, resilience), and physical capacities (e.g., strength, endurance, mobility, protection, combat skills).

By contrast, the definition given above does not imply that its technicalities are all acceptable from an ethical, sociological, or legal perspective. The purpose of the Saint-Cyr Military Academy Research Program is to ultimately develop a research proposal on the significance of such enhancements and reflect on the modus operandi to support and/or assist the armed forces in managing enhancement.

Classifications of Soldier Enhancement

The diagram illustrated in the figure shows different types of enhancement classifications as well as the different means currently available for their implementation.



(Figure used with permission from the Saint Cyr Military Academy. May not be distributed without prior consent.)

Figure. Classifications of Soldier Enhancement

For enhancement needs, we have considered capacity strengthening, stimulation, or additional human developments through technological inputs but also using methods of strengthening or enhancing a soldier's cognitive, physiological, and physical capacities. Possible enhancement categories are listed in the first inner circle of the diagram, highlighted in blue. It should, however, be noted that the related comments in parentheses listed below should be regarded as tentative and the list is not exhaustive. Such enhancements cover the following:

- ◆ Mobility (speed, agility)
- ◆ Protection (fireproof and camouflage clothing, bullet-proof vests with the ability to automatically constricting human tissues in case of an injury or automatically administering a painkiller)
- ◆ Fighting capacities
- ◆ Interconnection with the outside world (the soldier blends into a more extensive collaborative system)
- ◆ Perception (see further, detect invisible threats with the naked eye, hear ultrasound levels)
- ◆ Cognitive analysis (access to preanalyzed information, memory optimization, data-processing speed) but also decreasing the cognitive load in cases of high intensity (maintain continued attention, tactical data synthesis developed for the mission phase)
- ◆ Control of emotions and stress
- ◆ Resistance to extreme environments
- ◆ Endurance and recovery (improved endurance with increased lung or heart capacity)

Possible enhancement families are listed in the second outer circle of the diagram highlighted in red. At first, let us consider those not affecting the human body (related comments listed below are nonexhaustive examples):

- ◆ Equipment worn by the soldier (vests, binoculars, lenses, haptic gloves)
- ◆ Exoskeletons, physical restraint devices
- ◆ Seamless communications (embedded antennas integrated in the warrior's clothing, osteophone systems)
- ◆ Artificial intelligence (AI) whose automated processes enable the soldier to be informed and advised in real time on changes in a tactical situation or assist him or her in decision-making. This type of AI can be embedded or nonembedded.
- ◆ Assisted reality or augmented reality enrich a warrior's visual perception with additional information assisting him or her in carrying out a mission.

Further still, examples of enhancement techniques affecting the human body to improve its performance via physical intervention (techniques based on validated scientific data) are listed below:

- ◆ Neurosciences (transcranial magnetic stimulations to adjust neuron activity levels, higher-learning capacities, or improved reaction times)
- ◆ Pharmacology (pharmacological adjustment or support in cases of stress, fatigue, decreased perception, increased cognitive capacities). It is important to note that any medication intake has possible iatrogenic effects. It can cause inhibition, simulation, or suppression constituting a physiological effect with the aim, in this case, of dramatically increasing or decreasing capacities depending on the desired result.
- ◆ Psychology (techniques for maximizing potential, esprit de corps)
- ◆ Surgery (anthropotechnics to improve human performance, free of any medical objective other than enhancing the human in an irreversible manner)
- ◆ Genetics and epigenetics (the study of genes and their functions to facilitate or inhibit their expression without any modification). They are drawn from studies on the sequencing of the human genome (genomics). If genetic modifications are unlikely for military use, except for pain relief via gene therapy, they can have an impact in the future primarily for testing existing skills or for potential enhancements through genetic testing (e.g., soldier recruitment).
- ◆ Biotechnologies (use of methods and techniques on living material to transform the human being and that of integrating mechanical elements or intelligent microcomponents in human tissues)
- ◆ Training (optimum physical or intellectual training to prepare for future missions (e.g., building muscular mass, following mental exercises, and improving on endurance)

Without going into excessive details concerning the potential enhancement of the soldier, we would like to refer to opportunities that are likely to arise before 2030, according to a study conducted in 2017 by the General Secretariat for Defence and National Security titled "Impacts of Technological Transformations and Disruptions on Our Strategic and Security Environments."¹ We can thus foresee the development of the following:

- ◆ Implants for enhancing visual or hearing acuity

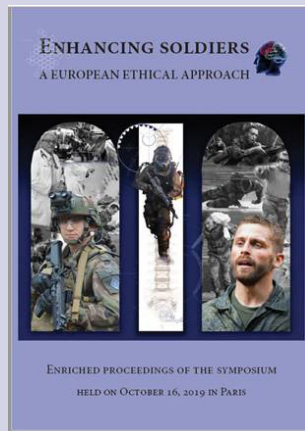
- Electro-stimulating cerebral devices for operators working in a complex environment. A technique that could be used by staff subjected to numerous requests and having to remain concentrated over long periods of time (e.g., drone pilots)
- Brain-machine interfaces either for using exoskeletons to enhance locomotor capacities or for controlling drones and/or robots

- sustainable (enhancements must not reduce the soldier's autonomy; it must be able to integrate his environment and help in his needs by enhancement but not hamper the mission).

Enhancement Does Not Mean Repair

In addition, if we deem enhancement as an action bringing human capacity to a level it could not have reached in the past or obtain capacities that were unattainable before, we should draw a distinction between enhancement and repair. The act of repairing is the minimum restoration of the human body to bring it back to its original state, even if it can be surpassed or improved in the long run.

It differs from enhancement as it only reinstates an individual's original physical or psychological state, a state he or she was in prior to an injury. Undergoing repairs can, nevertheless, also bring



Enhancing Soldiers, A European Ethical Approach is a compendium of the proceedings of a symposium sponsored by the International Society for Military Ethics in Europe, held 16 October 2019 in Paris, that provided a venue for the presentation of papers by a variety of international scholars discussing research on topics related to initiatives associated with efforts to enhance soldier capabilities. The symposium revisited and updated issues that were previously examined in a similar symposium titled "The Enhanced Soldier: The Needs and Prospects of Increasing the Fighter's Abilities," sponsored by the French army 19 June 2017 at the headquarters of the French Armed Forces. The compendium is available online at https://www.euroisme.eu/images/Documents/pdf_cahiers/Le%20soldat%20augmenté%2019-06-2020-web%20Final.pdf.

Key Features of Soldier Enhancement

Enhancements must have features that directly link to their implementation. An enhancement should thus be

- intuitive in its use;
- modular (any enhancement should be implementable depending on the needs of the mission and the choice of the military leader;
- comfortable (it should avoid interfering negatively when used on the field or on after action recovery); and

about increased performance when compared to the victim's original condition. We would then label it an "enhanced repair," akin to the feats accomplished by the athlete Oscar Pistorius, born with no fibula, but whose physical performance exceeds that of a traditional individual [Pistorius competed with prosthetic legs in both Paralympic and Olympic Game sprint races. ■

We express our gratitude to Patrick Godart, chief medical officer of the Armed Forces, for proofreading this document and for his advice.

Notes

1. *Chocs Futurs: Étude prospective à l'horizon 2030: impacts des transformations et ruptures technologiques sur notre environnement stratégique et de sécurité* [Future shocks: Prospective study for 2030: Impacts of technological transformations and disruptions on our strategic and security environment] (Paris: Secretariat-General for National Defence and Security, May 2017), accessed 26 June 2020, <http://www.sgdsn.gouv.fr/uploads/2017/04/sgdsn-document-prospectives-v5-bd.pdf>.