Super Soldiers

Mrs Kanika Sharma, PhD[@]

Wing Commander UC Jha, PhD (Retd)[#]

Abstract

Human enhancement is a deliberate act of intervention in the body to change or augment otherwise normal ranges of human capabilities. These could be temporary or permanent. Recent advances in biotechnologies and related fields have led to the emergence of the idea that capabilities of a soldier could be augmented to perform most difficult tasks. The idea of enhancing soldiers is neither inherently wrong nor right; however, the consequences of enhancement are significant. An augmented or super soldier may constitute a new means or method of warfare. The International Humanitarian Law has four fundamental principles of military necessity, humanity, distinction, and proportionality. Each of these principles could be impacted by human enhancement both negatively and positively. The need to use human augmentation may ultimately be dictated by national interests.

Introduction

The militaries world over are trying to enhance the capabilities and performance of their soldiers through various means. Enhancements are not restoring lost function but surpassing normal human limits.[1] During earlier days, Greeks discovered enhancement properties of opium and used solution of opium in alcohol to augment soldiers during war, and in the aftermath of battle to calm them down and relieve hateful memories. During the colonial wars of the 19th and early 20th Centuries, the Western militaries

[@]**Mrs Kanika Sharma, PhD** is the Head of the Centre for Advanced Studies in International Humanitarian Law and Military Law at the Indian Society of International Law.

[#]**Wing Commander UC Jha, PhD (Retd)** was an elected member of the United Service Institution of India Council. He is currently serving as Secretary General of the Indian Society of International Law.

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faced serious challenge from the forces of local tribes, who enhanced themselves by consuming a wide variety of stimulating and hallucinogenic psychoactive drugs. An attempt was made in the 1920s to create 'Super Soldiers' for warfare, where the Soviet Union sought to use deoxyribonucleic acid manipulation to crossbreed humans with apes to create an army that would not easily die or complain by becoming resistant to pain and unconcerned about the quality of food they ate.[2] During the World War I, armies on the Allied as well as Axis power employed the drug on a mass scale to improve soldiers' performances. Alcohol has played major roles in war.[3] The Defence Advanced Research Projects Agency, a research and development agency of the United States (US) Department of Defence, also intended to create 'Human Chimeras' with genes from humans and animals in the name of creating a more efficient soldier. This project was later cancelled.[4]

Today, a few militaries are making investments in the enhancement of their armed forces. The emerging technologies like neuroscience, biotechnology, nanotechnology, robotics, Artificial Intelligence (AI), and data processing are being exploited to build soldiers and convert them into 'Super Soldiers', who could operate for days without sleep, lift heavy loads, learn faster, and execute operational tasks with ease. In Aug 2023, the Integrated Headquarters of Ministry of Defence (Army) issued a request for technical and commercial information for 48 jetpack suits that enable soldiers to fly short distances and heights.[5] A jetpack suit is a turbine-based individual mobility platform, which can lift a man safely across varied terrain and could weigh up to 40 kgs. An individual wearing such a suit can fly at a maximum speed of 50 km/hr and reach an altitude of up to 3,000 m. The duration of the fight can vary depending upon the model but would most likely be less than 10 minutes. These suits could be used in counterinsurgency, counterterrorism, war situations as well as during natural calamities.[6] Gravity Industries, which has developed the military version jet suit, demonstrated its military use during a North Atlantic Treaty Organization mountain warfare rescue exercise held in Slovenia in Dec 2021. The British Royal Navy and the US Marine Corps already use these jetpack suits in a limited role.[7]

Defining Super Soldier

A super soldier is a concept implying a soldier capable of operating beyond normal human abilities in terms of physical, cognitive, sensorial, and biological capabilities. This is possible only if a soldier is enhanced. It brings up the question of what exactly is 'Human Enhancement'. The term 'Enhancement' denotes the act of increasing or improving something's magnitude, quality, or value. Thus, the phrase human enhancement means the process of increasing well-being by improving the human mind, physical function, and natural abilities. Enhancement differs from therapy.[8] Soldier enhancement can be defined as enhancements that have a statistically relevant likelihood of increasing the probability of accomplishing the stated military objective through biological, medical, or technological change to a soldier's physical, metabolic, mental, emotional, or moral baseline (or current capability).[9] There is no single definition of human enhancement among authors representing different ethical positions. According to Boisboissel (2015), 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 non-therapeutic substances or static dynamic implants (nanomaterials, prostheses) or applying suitable gene therapeutic treatment.
- Applying enhancement for short- or long-term usage that can even be irreversible, provided its effects are controlled.[10]

According to another paper (Canadian Defence Research and Development), human enhancement includes any technology (drug or device) implanted, ingested, or worn closely to the body that temporarily or permanently modifies or contributes to human functioning.[11] Enhancement of the combatant, according to the author, could be defined as explained by Boisboissel above.[12]

This definition is broad in scope and unrestrictive to encompass enhanced performance derived from different techniques. Some possible enhancement techniques to improve performance of a soldier are as follows:

- **Training**. Physical or intellectual training to prepare for future missions (e.g., building muscular mass, following mental exercises, and improving on endurance).
- **Psychology**. Techniques for maximising potential esprit de corps.
- **Pharmacology**. Pharmacological adjustment or support in cases of stress, fatigue, decreased perception, increased cognitive capacities.
- **Neurosciences**. Transcranial magnetic stimulations to adjust neuronal activity levels, higher-learning capacities, or improved reaction times.
- **Surgery**. Anthropotechnics to improve human performance, free of any medical objective other than enhancing the human in an irreversible manner.
- **Biotechnologies**. Use of methods and techniques on living material to transform the human being and that of integrating mechanical elements or intelligent micro-components in human tissues.
- **Genetics**. Genetic modification for military use.

Military Enhancement Technologies

Armed forces personnel can be enhanced in different ways and for different purposes. Human augmentation, according to a British Government report, will become increasingly relevant and future wars will be won by those who can most effectively integrate the unique capabilities of both people and machine.[13] In a few developed countries, the methods currently being employed include nutrition and nutrigenomics (i.e., genetically personalised meals and supplements) which are designed to optimise physical and cognitive performance; pharmacological enhancement (e.g., nootropic substances, or smart drugs), which can modify biochemistry and improve physical and cognitive performance; and assisted wearable technologies and exoskeletons, which

enable loads to be carried that exceed the unaided ability whilst reducing injury risk. Enhancement can be accomplished through the use of following methods or devices, and each has its own advantages and drawbacks: exosuits and jetpack suits;[14] pharmaceuticals; vaccines; gene editing; body implants; nanotechnology; neuroscience; and biotechnology—especially synthetic biotechnology. Neuroscience, together with computing technology, also offers radical opportunities for enhancing cognitive performance. Uploading of human minds to AI systems represents one of the most radical possibilities for human enhancement.[15]

Wearable suits for the military are being tested by the US, China, Canada, South Korea, Great Britain, Russia[16], Australia, and many other countries for their military and special operation forces. With regards to pharmaceuticals, during the Vietnam War, the US military supplied its servicemen with speed, steroids, and painkillers to help them handle extended combat. Advancements in molecular biology have also provided an unprecedented level of accuracy and efficiency in genome editing.[17] A team of military medical scientists in China has claimed that they inserted a gene from the microscopic water bear[18] into human embryonic stem cells, which significantly increased these cells' resistance to radiation. The development of these technologies is based on the premise that military supremacy must be maintained at any cost.

Future of Super Soldier

The US Department of Defence predicts that by 2050, it will be feasible to enhance four capabilities in a soldier: ocular implant to sharpen vision, hearing, and situational awareness; optogenetic-enabled body-suits for full muscular control; auditory enhancement for communication and protection; and direct neural enhancement of the human brain for two-way data transfer.[19] Hopefully, in the near future, it will be possible for super soldiers to survive on grass for weeks; run for days without rest like wild dogs; communicate telepathically; may not need to sleep for days like dolphins; climb wall like lizards; resist stress; and undertake military operations in most difficult environment. This idea of enhancing soldiers is neither inherently wrong nor right; however, the consequences of enhancement are significant. Enhancement may question the identity of a soldier, challenge the core values of the military, alter the concept of war, and could lead to unanticipated

consequences during war and peace. Human performance enhancement in the military also raises issues of fairness and equity; it raises questions of health and safety, the possibility of social disruption, and legality under International Humanitarian Law (IHL).

Super Soldier and International Humanitarian Law

None of the IHL treaties directly regulate human enhancement technologies or creation of a super soldier. The Geneva Conventions of 1949 do not refer to terms like enhanced or super soldiers. According to Rain (2020), IHL prohibits the use of any enhancing intervention that diminishes the ability of a soldier to comply with the law.[20] For example, administration of a drug or the biomedical human performance enhancement would be unlawful under IHL, if it has an adverse effect on the soldiers' capacity to make judgements required by the law. Such enhancements may make them disinhibited and more impulsive or reduce their inclination to critically evaluate the lawfulness of orders given to them.[21] Criminal liability may still attach to soldiers who use the weapons to commit certain crimes under both domestic and international law. For instance, under the Geneva Conventions, wilful killing constitutes a war crime. There is a strong possibility that with the use of magnetic chips or transcranial magnetic stimulation in helmets, the super soldier could be remotely controlled by their commanders. If these soldiers commit a war crime, will it be legally justified to try them for the crime, when their capacity to make decisions was diminished or externally controlled. An enhanced soldier, who kills one or more persons protected under the Geneva Conventions during an international armed conflict, may be tried for war crimes before the International Criminal Court.[22]

Review under Article 36. The weapon review authorities of a state under Article 36 of Additional Protocols (AP) I[23] must ensure the following:

- The enhancement process is not of a nature that might cause superfluous injury or unnecessary suffering.
- The removal or reversal of enhancement must not be painful.

- The effects of the enhancement are irreversible—for example, in the case of gene editing or the physical modification of body parts, its reversal process would, thus, affect the soldier's return to civilian life.

- The enhancement must not cause any permanent psychological torment, disability, or disfigurement.

According to Harrison and Kleffner (2016)[24], an enhancement could be reviewable as one of the following:

- As a weapon, if the enhancement is specifically designed to cause injury or death to enemy personnel or cause damage or destruction to an object. For instance, an artificial limb with an inbuilt gun.[25]

- As means of warfare, if the technology is part of a weapon system and specifically used for the purpose of an attack. For instance, in the case of a brain–computer interface that allowed an operator to control a weapon with his or her mind or in the case of an eye lens that helped a soldier to identify targets.

- As a method of warfare, when the use of enhancement constitutes an integral part of offensive activities at the strategic and tactical levels. An enhancement could be reviewed as a method of warfare, if it is established that the purpose of the enhancement is to make the rule relating to distinction or proportionality impossible to apply.

If super soldiers are considered weapons, they are not *hors de combat* (out of the fight) entitled to legal and ethical protections under the Geneva Conventions.[26] Boulanin (2018) is of the view that an enhanced soldier could not be viewed as weapon, since the concept only refers to objects. Treating combatants as weapons would contradict the good-faith interpretation and ordinary use of the term.[27] According to Harrison (2016), if human enhancement technologies emerge as techniques for weapons and military units to deliver force against opposing armed forces and military objectives, they will invite the review obligations under Article 36 of AP I.[28]

Conclusion

In future warfare, the call for enhanced soldiers to serve as a country's elite killing machine would be a top priority for militaries. The enhanced individual would be programmed to be part of the expeditionary units to perform the most difficult tasks. These super soldiers could be equipped with exoskeletons that would allow for quicker reaction times, precision, and strength of robotic systems and the control and superior cognitive abilities of humans.[29] The pharmacological and bio-technological enhancement of soldiers raise important moral and legal concerns that are unique to the military environment. Enhanced soldiers must be able to follow the principles of IHL, namely distinction, proportionality, and precautions, and not to cause superfluous injury or unnecessary suffering to enemy combatants. Instead of classifying super soldiers as weapons, they should be considered as human beings with rights to autonomy, respect, and well-being.[30] It is necessary that innovative military weapon technologies are encouraged; however, the world needs to exercise care in ensuring that biotechnology and genetic engineering relating to the enhancement of a soldier does not outpace the principles and treaties of IHL.

Endnotes

[1] SM Eagan and DD Moseley, "The Unfinished War: Ethical Challenges in Enhanced Warfighter Reintegration and Long-Term Care", *AJOB Neuroscience* 16, no. 4 (2025): 1–10, accessed 15 Nov 2025, https://pubmed.ncbi.nlm.nih.gov/40560781/

[2] Russell Grigg, "Stalin's ape-man Superwarriors", *Creation Ministries International*, 20 Aug 2007, accessed 15 Nov 2025, https://creation.com/stalins-ape-man-superwarriors

[3] Alcohol has played four major roles in war: (i) It has been employed to anaesthetise the wounded and prevent infections; (ii) It has been used as a stimulant to alleviate the stress of battle, raise courage and bring self-confidence in combat; (iii) It has mental therapeutic value, helps in relaxation, inducing sleep and has been used as a reward for the hardship of battle; and (iv) It has a psychological use, it strengthens the body by supplying considerable extra energy.

[4] Serious ethical objections were raised to chimeras because they blurred the lines between human and animal, male and female, parent, and child, and one individual and another individual. This resulted in adoption of the Human Chimera Prohibition Act of 2005 in the United States. The

Act made it unlawful for any person to knowingly, in or otherwise affecting interstate commerce: (i) create or attempt to create a human chimera; (ii) transfer or attempt to transfer a human embryo into a non-human womb; (iii) transfer or attempt to transfer a non-human embryo into a human womb; or (iv) transport or receive for any purpose a human chimera. Penalties for the violation of the Act was imprisonment up to 10 years, or/and fine of USD 1 mn.

[5] Integrated Headquarters of Ministry of Defence (Army), letter dated 24 Jan 2023, accessed 15 Nov 2025, https://mod.gov.in/sites/default/files/RFP-Jet-Pack-Suit-24-Ja-%202023.pdf

[6] SB Dutta, "Jet Pack Suits That Allow Wearers To Fly At 50 Kmph Still Not Received By Indian Army", *India Times*, 29 Aug 2023, accessed 16 Nov 2025, https://www.indiatimes.com/news/india/jet-pack-suits-that-allow-wearers-to-fly-at-50-kmph-still-not-received-by-indian-army-613427.html

[7] Ritu Sharma, "Indian Army's 'Jet Pack Suits' Could Debut In Kashmir; Can Also Be Used To Defend 'Key Points' Near China, Pakistan", *The Eurasian Times*, 09 May 2023, accessed 03 Dec 2025, https://www.eurasiantimes.com/indian-armys-jet-pack-suits-could-debut-in-kashmir-can/

[8] There is a clear distinction between enhancement and therapy. Enhancement is the characterisation of the intervention designed to improve human form beyond what is necessary to restore, and sustain good health. By common definition, "therapy" means to treat disability, disease, or impairment by means of medical intervention in order to return a person to a normal state of health. Buchner Christina M., "Biologically Fit: Using Biotechnology to Create Better Soldier", *US Naval Postgraduate School*, Unpublished Thesis, Dec 2013, p. 75

[9] Jovana Davidovic and Felicity Crowell, "Operationalizing the Ethics of Soldier Enhancement", *Journal of Military Ethics*, 20, no. 2 (2021): pp 180–199, accessed 21 Nov 2025

[10] Gérard de Boisboissel and Jean-Michel Le Masson, "The Enhanced Soldier", *Military Review* (Online Exclusive), Jan 2021, accessed 16 Nov 2025, https://www.armyupress.army.mil/Journals/Military-Review/Online-Exclusive/2020-ole/enhance-soldier/

[11] Kimberly Girling et al., *Identifying Ethical Issues of Human Enhancement Technologies in the Military* (Canada: Defence Research and Development Canada, 2017), p 207

[12] Boisboissel and Masson, "The Enhanced Soldier"

[13] "Human Augmentation: The Dawn of a New Paradigm", *UK Ministry of Defence and German Federal Ministry of Defence*, May 2021, accessed

16 Nov 2025, https://assets.publishing.service.gov.uk/media/609d23c6e90e07357baa8388/Human_Augmentation_SIP_access2.pdf

[14] Andrew Herr and Lt. Scott Cheney Peters, "Between Iron Man and Aqua Man: Exosuit Opportunities in Maritime Operation", *Center for a New American Security*, Jan 2015, accessed 16 Nov 2025, https://www.files.ethz.ch/isn/187248/CNAS_IronManAndAquaMan_HerrCheneyPeters-1.pdf

[15] Calum MacKellar, ed., *Cyborg Mind: What Brain–Computer and Mind–Cyberspace Interfaces Mean for Cyberneuroethics* (Oxford: Berghahn), 2019

[16] Patrick Tucker, "Russia, US Are in a Military Exoskeleton Race", *Science & Technology*, 20 Aug 2018, accessed 16 Nov 2025

[17] Jonathan Montgomery et al., "Genome Editing: An Ethical Review", (London: Nuffield Council on Bioethics), 30 Sep 2016, p 128.

[18] Over years of scientific testing, water bear (also known as tardigrade or moss piglet is an eight-legged animal smaller than 1 millimetre long and the hardiest creature on Earth) has survived -200 degrees Celsius, more than an hour in boiling water and after flying in space. The water bear's toughness comes in part from a gene that can generate shieldlike proteins to protect its cells against radiation and other environmental damage.

[19] Peter Emanuel, *Cyborg Soldier 2050: Human/Machine Fusion and the Implications for the Future of the Department of Defence* (US: US Army Combat Capabilities Development Command Chemical Biological Centre), Oct 2019

[20] Rain Liivoja, "Being More than You Can Be: Enhancement of Warfighters and the Law of Armed Conflict", *Law and the Future of War Research Paper*, no. 1 (University of Queensland Law School), Apr 2020, accessed 20 Nov 2025

[21] Ibid.

[22] Rome Statute of the International Criminal Court, art. 8(2)(a)(i), accessed 17 Nov 2025, https://www.icc-cpi.int/sites/default/files/RS-Eng.pdf

[23] Vincent Boulanin and Maaike Verrbruggen, "SIPRI Compendium in Article 36 Review", *SIPRI*, Dec 2017, p 28, accessed 03 Dec 2025, https://www.sipri.org/sites/default/files/201712/sipri_backgrounder_art36_compendium_1712.pdf

[24] Dinniss Heather A. Harrison and Jann K. Kleffner, "Soldier 2.0: Military Human Enhancement and International Law", *International Law Studies*, Vol. 92, 2016, pp 438-439, accessed 20 Nov 2025

[25] Thibault Moulin, “No More Humans? Cybernetically-Enhanced Soldiers under the Legal Review of Article 36”, *Journal of Law & Cyber Warfare* 8, no. 2 (2022): pp 58–103, accessed 21 Nov 2025

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