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From mushrooms to artificial intelligence: technology's double-edged sword in enhancing soldiers

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Abstract

This article entails a study of the methods for developing humans' capabilities to increase success rates during military conflicts. Hence, this scientific work encompasses a retrospective of the methods from antiquity by Sumerian, Viking, Greek, and Roman fighters, as well as a contemporary and prospective view of the methods of augmenting soldiers into "supersoldiers". Whether we refer to the first stage and initial attempts at developing soldier capabilities through mushrooms, alcohol, amphetamines, or to the revolutionary phase of this field through the involvement of technology, all these methods represent a „double-edged sword". This is because it involves, besides benefits, a series of ethical and legal concerns. Nevertheless, the article pledges the solution of augmenting soldiers and reinforcing troops, while simultaneously upholding ethical and legal norms.

Keywords:
human capabilities; artificial intelligence; supersoldiers; nanobots; ethical and legal concerns; approaches.

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Global security represents an aspirational goal and nations strive to ensure a genuine defense potential in the event of armed conflict. Therefore, each state reinforces its troops and prepares its soldiers using various methods. Considering that the level of soldier preparation through natural approaches, such as adequate nutrition and fitness, it is no longer a desired benchmark and that real-world challenges demand a higher level of soldier capabilities, alternative methods are being considered. This scientific paper aims to analyze both the history of using war stimulants and the novel methods of augmenting the human essence employed among soldiers for troop consolidation. Given that all these methods raise a range of ethical and legal concerns that hinder their implementation, the article brings to attention a solution for transforming troops into a superior paradigm through the utilization of artificial intelligence.

A retrospective overview of enhancing soldiers' capabilities

Since the inception of humanity and the formation of tribes, military conflicts have been a constant presence in the world, serving as a means to obtain sovereignty over other regions. In recorded history, the first war took place around 2700 BCE between Sumer and Elam (Mark 2009), two ancient civilizations. Gradually, over time and through various battles, the value of well-trained warriors with developed physical and mental abilities was recognized. It was realized that these qualities actually dictate the success rate in combat. Thus, people identified various methods to extend common human limits.

The history of efforts to enhance soldiers' abilities dates back to ancient times when the Greeks and Romans consumed alcohol to numb their senses and boost their courage in battle (Bumbar 2015). This method was also employed in the Middle Ages, in the 16th century, when English soldiers were encouraged to drink beer before battles, and in the 17th century, when French soldiers were encouraged to use wine for the same reasons. During the period between the 8th and 11th centuries, infamous Scandinavian warriors known as "Vikings" were reputed for consuming both intoxicants and hallucinogenic mushrooms to augment their combat skills (Williams 2020). In this way, they gained a reputation in the eyes of other people and became known for their fury, aggression, strength, and bloody victories. Later, during the American Civil War (1861-1865), soldiers used morphine both for relaxation and pain relief (Jones 2020), and to prevent dysentery (Tackett 2022).

Over time, stimulants have undergone a shift in perception. Lukasz Kamienski, a professor of political science at the Institute of American and Polish Diaspora Studies and author of the book "Shooting Up: A Short History of Drugs and War," observed an interesting phenomenon: cocaine had also been used as a substance of abuse on the frontline during wars. It was used to amplify energy, combat fatigue, and reduce anxiety. The drug gained widespread popularity when the British army developed a

combination of cocaine and caffeine called "Forced March" (Bourke 2010), which was then self-prescribed by individuals as a means to cope with the challenges of conflict.

During World War II, the Nazi regime utilized Pervitin, a pill form of amphetamine patented in 1937, to enhance soldiers' performance in combat (Pruitt 2019). Pervitin was administered to soldiers to boost their self-confidence, increase physical energy, and combat fatigue, a technique to create perfect soldiers for the infamous Blitzkrieg (Andreas 2020).

On the other hand, during World War II, the Nazi regime not only administered drugs to its soldiers but also conducted a series of experiments with the aim of creating a superior race of soldiers. These experiments were carried out by the scientific division of the Nazi regime, Ahnenerbe, and aimed at enhancing soldiers through various means, including genetic engineering and other techniques (Charney 2015). One of the main objectives of these experiments was to create stronger, faster, and more resilient soldiers. Ahnenerbe conducted a series of experiments in an attempt to achieve this goal, including procedures on human subjects involving injection with various substances and exposure to extreme conditions. Despite Ahnenerbe's efforts, these experiments ultimately proved to be unsuccessful. Many of the subjects of these experiments suffered severe injuries or died as a result of the procedures, and the Nazi regime failed to create a superior race of soldiers. Consequently, the experiments were abandoned.

Attempts to create "supersoldiers" are not limited to these examples, as history is replete with such endeavors, exploring a wide range of alcohol-based products, plants, mushrooms, and medicinal substances. Just like the Nazi regime, while the "Ahnenerbe" program ventured into bolder territory, many other organizations, such as the Defense Advanced Research Projects Agency (DARPA), have leveraged technological advancements to shift the direction of creating "supersoldiers" (Shah 2019, 10).

A contemporary and prospective overview of creating supersoldiers

The concept of supersoldier has been a constant presence in science fiction literature and superhero narratives for decades, and it has also been explored in certain military and scientific circles as a potential future direction for military technology. Essentially, a supersoldier is a hypothetical type of soldier who has been genetically or technologically enhanced to possess supernatural physical and mental abilities. This concept is complex and multifaceted, touching upon a wide range of issues related to military technology, human enhancement, and the boundaries of what is possible for humanity.

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As technology and other fields have advanced, the subject of creating supersoldiers has become increasingly debated. Thus, the field of "Human Performance Enhancement" (HPE) has emerged, which has seen significant development in the United States, China, and Russia, as well as some European and Asian countries such as the United Kingdom, France, Japan, South Korea, etc. (Blumenthal, Hottes and Foran 2021, 4) Its main objective is to develop the physical and mental capabilities of soldiers, endowing them with supernatural abilities. As a result, numerous methods have been identified, with the most relevant ones including genetic engineering, cybernetic implants, exoskeletons, nanotechnology, wearable devices, performance-enhancing substances, and artificial intelligence.

Studied by the United States Department of Agriculture (USDA), the National Institutes of Health (NIH), the Food and Drug Administration (FDA), and the European Molecular Biology Laboratory (EMBL), genetic engineering is a technology that allows scientists to manipulate or modify the genetic material of an organism to alter or enhance certain characteristics. In the military context, this could involve modifying the genes of military personnel to provide them with improved physical or cognitive abilities. For example, they could receive genes that make them stronger, faster, more intelligent, and more resilient to diseases, or, according to the Nuffield Council on Bioethics, enhance their night vision and develop a sense of smell (Shah 2019, 7). Additionally, genetic engineering is recognized as a significant method for eradicating malaria (Callaway 2015).

Cybernetic implants are being addressed by Neuralink, a company founded by Elon Musk, focusing on brain-machine interfaces and other neural implants; Paradromics, a company developing high-bandwidth neural implants for medical and military applications; and DARPA, the research organization of the US Department of Defense. These implants represent surgically implanted devices designed to enhance specific abilities. They may encompass implants that augment strength, speed, or resilience or provide sensory enhancements, such as highly developed vision or hearing. In addition to enhancing these senses, cybernetic implants serve as the foundation for restoring these abilities in soldiers who have lost them during combat by introducing digital auditory or visual information into the brain (Brownie 2016).

Exoskeletons are significantly developed, particularly in the United States (by organizations such as DARPA and the Tear Research Program for Tele-Empowerment and Augmentation), as well as in Japan and South Korea. Exoskeletons are wearable devices designed to enhance the strength and endurance of the user (Keller 2022). They are worn over the user's clothing and powered by hydraulic motors or other mechanical systems. In military contexts, exoskeletons can aid soldiers in transporting heavy loads over long distances or provide additional protection in combat situations. Some exoskeletons are designed to be lightweight and agile, enabling rapid and effortless movement, while others are heavier and

designed for tasks requiring substantial power, such as lifting heavy objects or carrying large backpacks. Exoskeletons have the potential to revolutionize the performance of soldiers and represent an active area of research and development.

The manipulation of matter at the atomic and molecular scale, known as nanotechnology, is a field pursued by the three global superpowers and holds significant potential for military applications. In this context, technology can empower soldiers with enhanced abilities, such as improved senses and intelligence, as well as enhanced medical conditions. With dimensions smaller than 500 nm. (Soto, et al. 2020, 14), nanobots can be employed to administer medication with high efficiency. Typically, medications act systemically before reaching the affected area. With the aid of nanotechnology, medication can be precisely targeted, significantly enhancing effectiveness and reducing the likelihood of side effects, enabling soldiers to be healed before symptoms even manifest.

Wearable devices are another key technology for enhancing soldiers. They can take various forms, including smartwatches, head-mounted displays, and clothing embedded with sensors. Wearable devices can provide soldiers with real-time situational awareness, allowing them to know the whereabouts of their teammates, local weather conditions, and even their vital signs. This information can be extremely valuable in combat situations as it enables soldiers to make better-informed decisions and respond more quickly to changing circumstances.

Performance-enhancing substances (PEDs) offer a valuable advantage in situations where soldiers are required to perform at the highest level. These substances are used to enhance both the mental and physical capabilities of soldiers. Firstly, stimulant medications such as amphetamines can increase alertness and reduce fatigue, which is beneficial for soldiers who need to maintain a high level of vigilance over long periods. Similarly, other substances like modafinil have been shown to improve cognitive performance and vigilance, which can be useful for soldiers who need to make rapid and precise decisions in stressful situations. Secondly, these stimulants refer to anabolic steroids, which can increase physical strength by 5 to 20 percent. These medications are often used by athletes in sports that require sudden bursts of energy, such as powerlifting and football. However, most sports prohibit PEDs, and their use can lead to negative side effects such as cardiovascular and hepatic injuries, increased aggression, and alterations in sexual characteristics (Scharre and Fish 2018).

Due to the multifaceted nature of roles within a military system, there is no "one-size-fits-all" solution for enhancing soldiers' capabilities, as they are positioned in diverse situations and assigned a wide range of missions. The methods used to enhance soldiers' performance depend on their specific tasks, and a multitude of enhancement techniques are employed to optimize their effectiveness. Whether it is wearable technology, exoskeletons, chip implants, or nanotechnology, these will be implemented through artificial intelligence, which, in our opinion, will innovate multiple industries.

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Artificial intelligence (AI) is increasingly recognized and utilized in today's world and is developing at a rapid pace. In the military domain, countries such as the United States (DARPA), China, and Russia are exploring this field to enhance human capabilities. AI has the potential to revolutionize the way soldiers are trained and deployed on the battlefield. By leveraging AI technology, military forces can significantly enhance their capabilities and efficiency in various missions. One way AI can be used to enhance soldiers is through the development of intelligent assistants and wearable devices that can assist soldiers in various tasks. These devices can provide soldiers with real-time information about their surroundings, alert them to potential threats, and aid them in navigation and communication. For example, a soldier wearing an AI-equipped smart helmet could receive alerts about approaching enemy fire or be guided through a hazardous area. AI can also be used to improve soldiers' training. By simulating different scenarios and environments, AI can provide soldiers with realistic training experiences that better prepare them for the demands of the battlefield. This can contribute to reducing the risk of human casualties and improving the overall effectiveness of military forces (Blumenthal, Hottes and Foran 2021, 4).

Being a relatively new and highly interesting field, numerous companies worldwide are rapidly engaging in AI research. On November 30, 2022, "OpenAI," a company founded by a consortium in collaboration with Elon Musk, released a free AI program called "Chat GPT" to the public, showcasing the remarkable benefits of AI. It is an AI-powered assistant designed to help and provide useful information in multiple languages across a wide range of topics. Trained using massive amounts of textual data, Chat GPT processes and generates text almost instantaneously in various contexts, making it an incredibly useful tool for a wide range of applications. For instance, it is capable of understanding and can be applied in various conversational applications such as building chatbots, virtual assistants, creating interactive conversation interfaces for games, websites, solving integrals, and even debugging lines of code. Chat GPT3 (the current version) runs on a neural model of 175 billion characters, and Elon Musk's promise is to develop ChatGPT4 in 2023, which runs on 100 trillion characters. Essentially, in one year, it will become 571 times more powerful, faster, and more efficient.
Therefore, considering the capabilities of an AI-based program and observing how easily it can be employed, in the near future, AI will become a powerful tool and innovate numerous industries, especially military services.

Ethical and legal concerns regarding the creation of supersoldiers and troop enhancement

Although we have powerful tools for developing supersoldiers and intelligent systems for enhancing military troops, certain factors still prevent us from taking the army to a higher level. Thus, we are constrained by ethical and legal concerns. In

general, the ethical and legal issues surrounding soldier enhancement are complex and multifaceted. Special attention must be paid to the potential risks and benefits of any proposed enhancements, and measures must be taken to ensure that they are used ethically, legally, and responsibly. There are several ethical and legal issues that arise when considering soldier augmentation. These issues can be broadly grouped into four categories: ethical aspects related to the welfare of soldiers, the welfare of the military society as a whole, the potential for abuse or misuse of technologies, and legal aspects.

The primary ethical concern related to soldier enhancement is the risk of compromising their physical and mental integrity. Some enhancements, such as performance-enhancing drugs, may have negative side effects or long-term consequences for health. For example, there is potential for enhancements to cause psychological harm, such as altering a soldier's sense of self or creating feelings of dependency. There is also the possibility of the technology implemented in soldiers' bodies becoming faulty, leading to irreversible consequences.

The implementation of artificial intelligence systems results in job obsolescence. As technologies become more advanced and precise, they may be capable of performing tasks that were previously carried out by human employees. This could lead to military personnel being displaced and disruption within the entire military industry. There is a risk of enhancements being corrupted or compromised through cyberattacks and used to control or manipulate soldiers, or to be used for nefarious purposes, such as creating killing machines. Additionally, enhancements can lead to errors that result in serious consequences.

In addition to ethical concerns, there are also jurisdictional concerns. This is due to the lack of specialized legislation addressing the ramifications of these new technologies. For example, in the event that an autonomous weapon system incorrectly identifies a group of non-combatants as hostile enemies and initiates attacks (as programmed), there will be no recourse for the resulting victims.
Considering the availability of such powerful tools for creating "supersoldiers" and the potential for fortifying troops with artificial intelligence systems, ethical and jurisdictional issues hinder or at least slow down these endeavors.

Approaching the creation of supersoldiers compliance with ethical and legal concerns

In an ethically guided society, maintaining the physical and mental health of soldiers and protecting human integrity is a parameter of normality. Therefore, procedures for soldier enhancement that involve risks to their physical and mental well-being need to be reassessed. Solutions can be identified to mitigate the negative impact created by the implementation of these technologies on individuals' livelihoods.

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Human oversight during the initial implementation phase of innovations is one such solution. As systems become so advanced and precise that human presence is no longer necessary, human personnel will be notified in advance, and appropriate solutions will be found to address unemployment. For example, redistributing employees to areas where there is a staff shortage, reducing the workload of a position to make it shareable with another employee, thereby increasing efficiency, or simply transferring them to reserves and ensuring pensions. Thus, in the end, society can significantly benefit from the implementation of these technologies, even though it may initially pose a complex challenge with negative repercussions for employees.

New technologies come with risks, but compared to those associated with human activity, they are much smaller. We consider that, like humans, the new technologies will also be vulnerable to corruption through cyberattacks and system overload, compared to corruption at the leadership level or fatigue experienced by humans. However, certain human characteristics that lead to frequent errors will no longer be present, such as negligence, lack of interest, personal issues, and other situations faced by personnel. It is expected that at the beginning of implementing these new technologies, errors will be identified, but they can be improved until the incident rate approaches zero.

Legal issues are inherent in the implementation of such systems. If the technology makes errors, no individual can be held accountable under current regulations. However, this lack of liability is not a negative factor. It is important to recognize that holding someone responsible for an error does not guarantee that the problem will be resolved or that errors will not recur. Inevitably, issues and errors will always exist, and it is unconstructive to seek blame and impose sanctions, other than addressing and fixing the error itself. Otherwise, it would be only a superficial form of redressing the harm. Therefore, it is necessary to stop the respective system, followed by identifying solutions that contribute to software improvement. Additionally, after the implementation and deployment of the system, developers will carefully analyze its functionality and provide updates.

Conclusion

The augmentation of military personnel is a delicate matter governed by ethical and legal norms that prohibit the creation of "supersoldiers." This is because the procedures used for military augmentation carry inherent risks and may compromise the integrity of individuals. Therefore, the methods previously mentioned can be considered a "double-edged sword" as they offer both benefits and ethical and legal challenges.

Even though „supersoldiers" created using the aforementioned methods may bring significant advantages in military conflicts, and their utilization may not have

immediate negative effects, soldiers can suffer long-term consequences. Therefore, considering the rapid advancement of technology (as is the case with ChatGPT), we believe that the legal implementation of such systems will occur in the near future, once these technologies reach a highly developed level that ensures the protection of soldiers' integrity to a near 100% extent.

However, in the present context, a solution could be considered fortifying troops with AI-based systems. This way, we can avoid compromising soldiers' integrity and altering their natural structure through genetic engineering, chip implantation, nanobots, and so on. Instead, by utilizing AI-based devices, we can achieve a consistent set of advantages within the Romanian armed forces. Some of these advantages include the efficient optimization of the military structures' logistics system, adapting medical structures to the requirements of current armed conflicts, supporting decision-making in the operational planning process, and addressing personnel shortages. Thus, integrating Artificial Intelligence systems within the military can bring significant benefits both at an individual level and for the military society as a whole.

At an individual level, young logisticians can save time and resources by utilizing an AI-integrated logistics system. These systems can be programmed to understand document structure and content, allowing them to automatically generate the appropriate documents based on the situation. They can also be programmed to fill out forms and identify and correct errors in documents, including invoices, contracts, repair orders, or any other document necessary in the logistics process.

Integrating an AI-based medical system within the military can provide significant benefits to soldiers. These benefits include more accurate diagnoses and more effective treatments tailored to the needs of each individual. By utilizing machine learning algorithms and understanding data from previous experiences, the system can provide a diagnosis closer to reality and suggest more efficient treatments. It can also be used to monitor the individual health of soldiers and prevent illnesses. These benefits can help improve soldiers' conditions for successful mission completion.

Implementing AI-based security and defense systems can bring numerous advantages to the military personnel involved in security and combat operations. These benefits include enhanced security, surveillance, and recognition through the use of image recognition algorithms, enabling quicker and more precise identification of suspicious objects or individuals, intrusion detection in secure areas, and efficient monitoring of terrains. Additionally, integrating sensor-guided technology with AI can improve the accuracy and effectiveness of artillery, thus minimizing collateral damage and providing better protection for soldiers and civilians involved in military operations.

At the societal level of the military as a whole, systems based on such technology can significantly reduce human labor, resource consumption, and time. AI systems can

be programmed to identify issues in the supply chain and make quick and precise decisions to ensure a continuous flow of resources to the operational zone, optimizing the entire logistics space. Furthermore, once these technologies are implemented and reach an advanced stage of development, human presence becomes redundant in the regions where these systems are deployed. As a result, human personnel can be redistributed to areas with a shortage of workforce, addressing the personnel gaps present in military units. Implementing these systems will solve the existential problems of the armed forces and significantly reduce human errors since these systems will be programmed to perform specific functions with precision and rigor. In the event of errors, the solution is much simpler, involving software updates, as opposed to lengthy and complex legal processes against individuals.

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