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Human enhancement for military purposes: Ethical considerations

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Abstract

The concept of "super soldiers", whose capabilities are modified by NBIC technologies (nanotechnology, biotechnology, information technologies, and cognitive sciences) to enhance their performance, raises ethical challenges about the future of warfare.

In this article, we first philosophically examine definitions of human enhancement (HE) and then provide an overview of selected ethical barriers related to its use. We conclude by reviewing ethical challenges that should be considered when evaluating HE for military purposes.

1. Introduction: A thought experiment

Imagine yourself fighting on the front lines as a super soldier. Your superhuman sense of smell allows you to detect substances such as iron, steel, gunpowder, and other materials. Just a few weeks ago, you acquired this extraordinary ability by undergoing nasal surgery that employed advanced nanotechnology, enhancing your olfactory capabilities beyond those of trained detection dogs. Now, your new capabilities provide your military unit with substantial advantages on multiple levels: improving operational planning, reducing expenditures on costly equipment, and even facilitating more humane warfare. Your sense of smell enables you to detect enemy explosives from hundreds of meters and kilometres away. You can now determine the direction of the enemy and the number of armed combatants solely by scent. Even if you are not deployed on the front line, you can detect mines left behind in minefields, rendering the use of mine detection dogs or expensive technologies obsolete. Moreover, your skills foster creative problem-solving and contribute to ethical warfare. Since you can now more easily distinguish between armed combatants and unarmed individuals, you can adhere to the distinction principle outlined in the Geneva Conventions with greater precision. You and your enhanced capabilities have thus become essential components of a modern and ethically responsible military strategy.

The thought experiment of the super soldier may initially seem like science fiction since the described nanotechnology enabling a superhuman sense of smell does not align with current technological realities. Furthermore, it overlooks numerous practical and labour-related issues. Nevertheless, this scenario effectively highlights the strategic military advantages linked to human enhancement (HE) in the context of defence. It appears that some technologies are already being implemented to enhance military capabilities.[1] In this study, we will critically examine the ethical limitations surrounding the use of HE for military purposes.

Particularly the transhumanist (TH) thinkers, a school of thought[2] aiming to expand the boundaries of humanity by enhancing human capabilities, show a particular interest in HE. Natasha Vita-More illustrates the potential advantages of HE vividly:

> The body, as we transform ourselves over time, will take on different types of appearances and designs and materials. (…) For hiking a mountain, I'd like extended leg strength, stamina, a skin-sheath to protect me from damaging environmental aspects, self-moisturizing, cool-down capability, extended hearing and augmented vision (…) For a party, I'd like an eclectic look - a glistening bronze skin with emerald green highlights, enhanced height to tower above other people, a sophisticated internal sound system so that I could alter the music to suit my own taste, memory enhance device, emotional-select for feel-good people so I wouldn't get dragged into anyone's inappropriate conversations. And parabolic hearing so that I could listen in on conversations across the room if the one I was currently in started winding down.[3]

Vita-More's example does not emphasize currently available technologies; instead, she presents a forward-looking vision of potential technologies used

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[1] See Gabatt, Adam: China conducting biological tests to create super soldiers, US spy chief says. In: The Guardian, 04.12.2020, https://www.theguardian.com/world/2020/dec/04/china-super-soldiers-biologically-enhanced-john-ratcliffe, accessed 29.04.2024; BBC: France to start research into 'enhanced soldiers', 09.12.2020, https://www.bbc.com/news/world-europe-55243014, accessed 29.04.2024.

[2] We do not describe TH as a philosophical movement per se, although it does raise many philosophical questions.

[3] Vita-More, Natasha: Who are transhumans? http://www.transhumanist.biz/interviews.html, 2000, accessed 07.04.2024, p. 5.

for HE purposes: "Human enhancement technologies include biotechnology, nanotechnology, information technology, and cognitive and neuro sciences."[4] Coeckelbergh and other TH-critical researchers also support the definition of HE as a vision facilitated by NBIC technologies.[5]

Drawing an analogy to Vita-More's statements, similar applications of HE might become relevant within a military context. Whereas Vita-More envisions shimmering skin as a social aesthetic, the military could leverage HE to achieve strategic superiority over adversaries. The objective could indeed be the creation of super soldiers, like the one described in our thought experiment, capable of optimally utilizing their enhanced capabilities in combat scenarios. Who would not desire to climb mountains faster through genetically improved stamina, possess bulletproof skin instead of relying on heavy body armor, have bionic eyes for superior night vision, possess hearing capable of intercepting enemy communications from hundreds of meters away, or develop an advanced sense of smell to detect hazardous substances? Relevant applications of HE for military purposes primarily relate to defense, focusing on equipping soldiers for optimal operational performance. This includes physical enhancements for improved combat capability, endurance, strength, and agility, as well as cognitive enhancements like increased resilience, stress tolerance, and enhanced information-processing capacities. Additionally, HE might support redeployment capabilities.[6] The range of HE applications within security policy is extensive, encompassing cognitive, physical, and genetic modifications.

The initial objective of this article is to critically interpret definitions of HE. The second objective is to provide an overview of ethical challenges that arise when enhancing soldiers through NBIC technologies. To determine the ethical barriers that should guide the military use of HE, we will categorize these technologies and present an analysis of associated ethical issues.

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[4] See More, Max/Vita-More, Natasha: The Transhumanist Reader, Oxford/New York 2013, p. 25.

[5] See Coeckelbergh, Mark: Cyborg humanity and the technologies of human enhancement. In: Philosophy: Technology, Macmillan Interdisciplinary Handbooks 2017, p. 143.

[6] See Garren, David J.: Dirty Hands and Clean Minds: On the Soldier's Right to Forget. In: Journal of Military Ethics, Vol. 21 (2)/2022, pp. 162-182. https://doi.org/10.1080/15027570.2022.2109314.

2. About the role of HE in philosophical and ethical debates

Ethics involves the study of moral principles and values that guide human behavior. However, universal ethical frameworks, such as deontology, encounter limitations when applied to emergency scenarios. War, understood as a state of emergency, falls within the realm of emergency ethics.[7] Under specific conditions, emergency ethics can permit actions that deontological principles typically prohibit, such as lying or killing.

Applied ethics refers explicitly to the application of ethical principles to specific domains of human life, such as medicine, technology, economics, or the environment. Its primary aim is to establish practical connections and to highlight responsibilities among different fields and stakeholders. It is important to distinguish clearly between the subject areas of applied ethics and their underlying theoretical frameworks. Military ethics, for instance, can be analysed through virtue ethics, deontological, or utilitarian approaches, as discussed by Budde and Pickl.[8] In this article, we will focus exclusively on the research fields within applied ethics. As illustrated in the following figure, technologies used for HE purposes lie at the intersection of medical ethics, military ethics, and technology ethics:

[7] See Walzer, Michael: Emergency Ethics. In: Walzer, Michael: Arguing about war. New Haven 2004.

[8] See Budde, Dieter/Pickl, Stefan: Human enhancement – An ethical perspective. In chapter ETHICS in this publication.

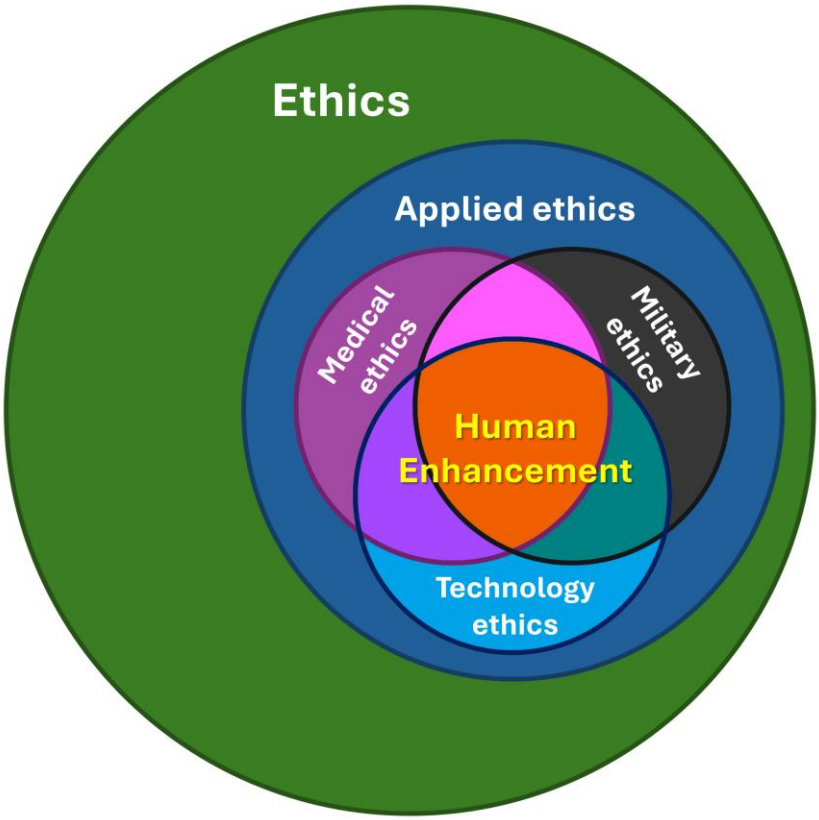

Figure 1: Human enhancement as an overarching subject area of applied ethics. Illustration: LVAk/IFK, based on author's illustration.

It is the task of applied ethics to engage in discussions about the future of military ethics and to identify issues within the intersection between medical ethics, technology ethics, and military ethics. Military ethics is an area of applied ethics specifically concerned with the moral dimensions of military operations and decision-making within the military profession. Technology ethics addresses ethical implications and responsibilities related to the development, distribution, and utilization of technologies. Medical ethics pertains to ethical principles, guidelines, and debates emerging from medical practice and research, encompassing issues such as patient rights, medical decision-making, organ transplantation, medical experimentation, euthanasia, and – relevant to the context of HE – genetic engineering.

HE intersects to varying degrees with each of these areas. Military ethics examines moral principles that justify or constrain warfare, particularly within conflict scenarios.[9] It frequently finds itself in tension between moral idealism and political realism. Realists argue that moral principles frequently cannot be consistently upheld, emphasizing that the realities of war are governed not by morality but by interests, power dynamics, and realpolitik. According to this perspective, moral principles cannot be consistently applied in wartime, as they fundamentally conflict with the realities of armed conflicts. Realist arguments often justify violence by portraying opponents as immoral and presupposing the necessity of at least an equal level of force. Similar reasoning could be used in evaluating and implementing HE measures in warfare. While recognizing the practical realities of warfare and potential implications for (inter)national security and stability, military actions must nevertheless adhere to moral principles, including international law and established war ethics, rather than simply responding to economic or political pressures. This tension between realism and moralism brings forth the classic 'is-ought' problem, which emerges from the realist view challenging the application of moral principles to warfare.[10] The ethical question of how HE can be morally implemented for military purposes intersects with broader issues of technology ethics, particularly addressing the value alignment problem – how technologies can be designed in accordance with moral values. Although this article will not be able to resolve either the realism dilemma or the value alignment problem, it will identify ethical barriers and categorize ethical challenges arising from the use of HE within military, technological, and medical contexts.

To date, research on ethical issues at the intersection of these subject areas remains limited. Although there is considerable literature available from psychological, economic, military, technological, and medical ethics perspec-

[9] Particularly the Just War Theory, which is one of the biggest fields of research within war ethics, is based on the premise that the use of violence in war can be justified if certain conditions are fulfilled. See Frowe, Helen: The Ethics of War and Peace. An Introduction, New York 2015.

[10] See Lazar, Seth: War. In: Edward N. Zalta (ed.): The Stanford Encyclopedia of Philosophy, 2016, https://plato.stanford.edu/entries/war, accessed 29.04.2024.

tives, empirical studies[11] and philosophical publications on HE are sparse.[12] Techno-philosophical discussions on HE largely reference TH[13] and include debates among scholars such as Bostrom, More, Vita-More, Kurzweil, and Savulescu. In contrast, bioconservative thinkers such as Habermas, Kass, Fukuyama, and Annas raise critical ethical concerns, notably regarding genetic engineering technologies like preimplantation diagnostics or stem-cell research.[14] There remains a clear need for further ethical analysis, and subse-

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[11] Fiore states that empirical studies on HE are increasing in the field of psychology. See Fiore, Stephen M./Salas, Eduardo/Pavlas, Davin: A view on the history of use-inspired science in human performance research. In: O'Connor, Paul E./Cohn, Joseph V: Human Performance Enhancement in High-Risk Environments: Insights, Developments, and Future Directions from Military Research. Santa Barbara, CA 2017, p. 13, there is a widely criticised lack of empirical studies on the effects of technologies and drugs used for HE purposes. See Walsh, Adrian/Katinka Van de Ven: Human Enhancement Drugs and Armed Forces: An Overview of Some Key Ethical Considerations of Creating 'Super-Soldiers'. In: Monash Bioethics Review, Vol. 41 (1)/2023, pp. 22-36. https://doi.org/10.1007/s40592-022-00170-8.

[12] See Allenby, Braden R.: The Implications of Emerging Technologies for Just War Theory. In: The Applied Ethics of Emerging Military and Security Technologies, 2015, pp. 3-21; Davidovic, Jovana/Crowell, Forrest S.: Operationalizing the Ethics of Soldier Enhancement. In: Journal of Military Ethics. Vol. 20/2021, pp. 180-199, https://doi.org/10.1080/15027570.2021.2018176; Goodley, Héloise: Performance enhancement and the military. Exploring an ethical and legal framework for 'super soldiers', London 2020; Henschke, Adam: Super soldiers: Ethical Concerns in Human Enhancement technologies. In: Analysis / Law and Conflict / New Technologies. 2017. https://blogs.icrc.org/law-and-policy/2017/07/03/supersoldiers-ethical-concerns-human-enhancement-technologies-2/, accessed 07.05.2024; Švaňa, Lukaš: (Military) Human Enhancement – Ethical Aspects. In: Human Affairs, Vol. 27/2017, pp. 155-165. 10.1515/humaff-2017-0014; Van Baarle, Eva M./ Damsté, Carlijn/ Bruijn, Sanne A.J. de/ Bakx, Gwendolyn C.H.: Moral Issues in Soldier Enhancement: Military Physicians' Perspectives. In: Journal of Military Ethics, Vol. 21 (3-4)/2022, pp. 198-209, DOI: 10.1080/15027570.2023.2175861; Van Baarle, Eva M./Molendijk, Tine: Resilience as the Road to Mental Readiness? Reflections from an Ethics-of-care Perspective. In: Journal of Military Ethics, Vol. 20/2021, pp. 129-144; Walsh, Adrian/Katinka Van de Ven: Human Enhancement Drugs and Armed Forces: An Overview of Some Key Ethical Considerations of Creating 'Super-Soldiers'. In: Monash Bioethics Review, Vol. 41 (1)/2023, pp. 22-36. https://doi.org/10.1007/s40592-022-00170-8.

[13] See Vita-More, Natasha: The Transhumanist Manifesto. 1983. https://www.humanityplus.org/the-transhumanist-manifesto, accessed 29.04.2024.

[14] See Kass, Leon R.: Beyond therapy: Biotechnology and the Pursuit of Happiness. Executive Office of the President. Washington, DC. 2003.

quently, normative guidelines, that explicitly address HE as a factor in security policy.

3. A critical philosophical assessment of 'human enhancement'

How should HE be defined, and what challenges arise within the concept? These definitions raise philosophical issues: the distinction between performance and skill, illness and health, human enhancement and human augmentation as well as the existence of specific "HE technologies". This section critically evaluates several definitions of HE from a philosophical standpoint, highlighting the inherent problems of each approach.

Definition 1: *Human enhancement refers to the extension of humans through technology.*

Riding a bicycle, driving a car, or operating a tank all constitute technologies that serve instrumental purposes for humans if we interpret the term in its broadest sense. These modes of transportation effectively enhance human mobility to enable faster movement, thus extending human capacity. However, since no biotechnical fusion occurs between humans and these technologies, meaning that we cannot classify them as HE.[15] Even if advancements lead to faster transportation technologies (e.g. more rapid tanks), this would not constitute HE but rather machine enhancement – or machine learning, if the device itself acquires new capabilities autonomously. Similarly, artificial intelligence (AI) does not necessarily qualify as HE. While AI tools such as ChatGPT can assist with tasks like writing and thereby increase efficiency, they do not directly enhance a person's cognitive capabilities. Likewise, technologies such as night vision devices, GPS navigation systems, and protective vests do not fall under the NBIC technologies framework. These listed technologies have one thing in common: they do not fit within the NBIC framework established at the beginning and therefore cannot be considered HE.

Moreover, the question arises as to what exactly is being enhanced: performance or skills. A performance-based approach to HE[16] presupposes action,

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[15] See Coeckelbergh, Mark: Cyborg humanity and the technologies of human enhancement. In: Philosophy: Technology, Macmillan Interdisciplinary Handbooks 2017, pp. 141-160.

[16] See Ibid.

emphasizing a consequentialist perspective on the agents involved. A conceptual distinction in HE thus lies between performance enhancement – improving an individual's measurable output in specific tasks – and capability enhancement, which focuses on enhancing an individual's capabilities, irrespective of immediate performance outcomes.[17] 'Capability' refers to an individual's underlying ability to carry out a particular function, whereas 'performance' describes the actual achievement or effectiveness displayed when deploying that capability.[18] To avoid debates over whether HE should focus on skill or performance, some theorists instead refer to the concept of 'human nature' – a concept which is shown to be problematic.

Definition 2: *Human enhancement refers to the use of technologies, methods or substances to expand human capabilities (physical or cognitive) beyond what is considered 'normal' or 'natural'.*[19]

Following this definition, we can only speak of HE when 'natural' human capabilities are enhanced, for instance, NBIC technologies enable individuals to hear as acutely as a lynx, provide eagle-like vision, or create a sense of smell rivalling that of a mine detection dogs, as described in the introductory thought experiment. The concept of 'human nature', however, has been criticised in contemporary philosophy, not least because of its ambiguity.[20] One more moderate position views 'human nature' as the average level (mean value) of human ability.[21] Yet the moderate view is also problematic: not only

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17 See Coeckelbergh, Mark: Cyborg humanity and the technologies of human enhancement. In: Philosophy: Technology, Macmillan Interdisciplinary Handbooks 2017, p. 147.

18 See Savulescu, Julian/B. Foddy/M. Clayton: "Why we should allow performance enhancing drugs in sport". In: British Journal of Sports Medicine, 38/2004, pp. 666-670. https://doi.org/10.1136/bjsm.2003.005249.

19 Working definition of the human enhancement project as a security policy factor, March 2024.

20 See Birnbacher, Dieter: Wieweit lassen sich moralische Normen mit der "Natur des Menschen" begründen? In: Weiss, Martin (ed.): Bios and Zoe. Die menschliche Natur im Zeitalter ihrer technischen Reproduzierbarkeit, Frankfurt/Main 2009, pp. 219-239; Lagos Berríos, Rodrigo: La disputa por la naturaleza humana. Comentarios sobre el concepto de naturaleza humana en el contexto del transhumanismo y las mejoras biotecnológicas, ETHIKA+ Revista de Filosofía, 2022, pp. 101-117; Lewens, Tim: Human nature: the very idea. In: Philosophy & Technology, Vol. 25/2012, pp. 459-474.

21 See Fukuyama, Francis: Our Posthuman Future: Consequences of the Biotechnology Revolution, London. 2002.

is the mean value of a human ability indeterminable in practice and imprecise in application, but it also merely represents a current state of human capacities.[22]

When trying to understand 'normality' in literature around HE, the term Human Augmentation (HA) emerges either as a synonym or as a broader concept of HE.[23] In her article, Grinschgl differentiates between optimisation, enhancement, and augmentation.[24] Schulyok et al., meanwhile, differentiate between Human Performance Optimization (HPO) and HE, both of which they categorize as forms of HA: HA refers to any improvement or augmentation of human performance; HPO involves optimization up to the biological limits of human capabilities; and HE designates augmentation that surpasses those biological limits.[25] Under their framework, HE applies only when individuals exceed records of human capacities – such as surpassing the highest IQ or the fastest distance-running times. Because the precise determination of both the mean and maximum thresholds of human potential is problematic to measure and apply, distinguishing HA from HE proves challenging for our purposes. Consequently, we will use HA and HE interchangeably. Davidovic and Crowell seek to circumvent the issue of 'human

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[22] However, following Kahnemann, human capabilities can be enhanced not only by NBIC technologies, but by training as well. In this sense, brain stimulation techniques have long been researched by cognitive scientists. Kahnemann's bestseller *Thinking Fast and Slow* also refers to 'average' thinkers. Using concentration and learning techniques, he explains how the greatest possible brain capacity can be achieved. See Kahneman, Daniel: Thinking, Fast and Slow. London 2012; Grinschgl, Sandra: Cognitive enhancement – A critical reflection from psychology and neuroscience. In chapter MEDICINE in this publication refers to enhancement through training as active enhancement.

[23] See e.g. Raisamo, Roope et al.: Human augmentation: Past, present and future. International journal of human computer studies, 2019, Vol. 131, pp. 131-143. https://doi.org/10.1016/j.ijhcs.2019.05.008: "Human augmentation […] and related concepts Augmented Human and Human 2.0 refer to technologies that enhance human productivity or capability, or that somehow add to the human body or mind"; they define Human augmentation the following way: "Human augmentation is an interdisciplinary field that addresses methods, technologies and their applications for enhancing sensing, action and/or cognitive abilities of a human. […]".

[24] Grinschgl, Sandra: Cognitive enhancement – A critical reflection from psychology and neuroscience. In chapter MEDICINE in this publication.

[25] See Schulyok, Bernhard et al.: Human enhancement from a military perspective – WHY, WHAT, and HOW? In chapter MILITARY in this publication.

nature' by defining "soldier enhancement"[26] with reference to standardised military fitness levels as a mean value.

Definition 3: *Human enhancement refers to the medical modification of healthy individuals using NBIC technologies.*

When discussing HE, a common distinction is made between interventions for the ill and the healthy. When examining this third definition, we must ask why medical interventions for individuals with illnesses are not considered HE. Defining illness and health in the context of HE is challenging, as these concepts are fluid and necessitate clear operational definitions.[27] By definition, regenerative treatments do not aim to enhance human capabilities. Therapeutic interventions focus on restoring a patient's prior capabilities, rather than enhancing them, which falls under the scope of regenerative medicine. For example, antidepressants, antiallergy medications, psychotropic drugs, or laser eye surgery do not qualify as HE if their primary purpose is healing or compensation.

Two examples question whether biomedical interventions on individuals with illnesses or healthy individuals qualify as HE. Neural implants provide a first illustrative example: devices such as those developed by Elon Musk's company Neuralink enable patients, particularly those with paralysis, to control technology using their thoughts. Since this technology has thus far been used exclusively for medical treatment, we cannot yet classify it as HE. Should the same technology be applied to healthy individuals for enhance-

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[26] "'soldier enhancement' is an enhancement because (and when) it has 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)."; Davidovic, Jovana/Crowell, Forrest S.: Operationalizing the Ethics of Soldier Enhancement. In: Journal of Military Ethics. Vol. 20/2021, https://doi.org/10.1080/15027570.2021.2018176, p. 181.

[27] In this context, Lagos Berríos emphasises in his criticism of Kurzweil (Kurzweil, R.: The Singularity Is Near: When Humans Transcend Biology. London 2005, p. 25) that technologies which counteract ageing should not count as HE because ageing is not a disease that needs to be overcome. See Lagos Berríos, Rodrigo: La disputa por la naturaleza humana. Comentarios sobre el concepto de naturaleza humana en el contexto del transhumanismo y las mejoras biotecnológicas, ETHIKA+ Revista de Filosofía, 2022, pp. 101-117.

ment, it would then fall within the realm of HE. Consequently, no specific technology can be universally labeled as a 'HE-specific technology'; rather, its classification as 'HE technology' depends on the context and intended use. A second example illustrates the fluid nature of the boundary between therapy and enhancement.[28] Neil Harbisson's case challenges conventional understandings of HE: Harbisson, who was born with achromatopsia – an inability to perceive color – underwent a procedure to implant an antenna in his head, enabling him to perceive colors through auditory signals.[29]

From a conventional health standpoint, this procedure might be seen as a compensatory form of impairment correction (therapeutic), because it affords Harbisson an ability that most people consider ordinary: perceiving color. However, one could also argue that the implanted antenna constitutes a form of HE, as it endows Harbisson with a sensory capacity exceeding what is typically considered normal for humans. Ultimately, whether Harbisson's intervention should be classified as remedying a deficiency or as HE depends on how the term is defined and the context in which it is analysed. In some instances, it may qualify as a remedy for a limitation that simultaneously amounts to a significant sensory and physical enhancement. Harbisson's case thus illustrates that HE can apply not only to healthy individuals striving to augment their capabilities but also to those with illnesses who wish to improve or overcome their existing constraints.

So far, three definitions of HE have been critiqued and philosophically examined. We argued that the concept of HE remains ambiguous upon closer examination, as long as core terms such as HE technology, human nature, disease, and health remain undefined.

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[28] See Hauskeller, M.: Mythologies of transhumanism. London 2016.

[29] See Alcaraz, Aleksandra Łukaszewicz: Cyborgs' Perception, Cognition, Society, Environment, and Ethics: Interview with Neil Harbisson and Moon Ribas, 14 October 2016, Ace Hotel, New York City. Journal of Posthuman Studies 3 July 2019; 3 (1): pp. 60-73. doi: https://doi.org/10.5325/jpoststud.3.1.0060.

4. Ethical barriers in the use of HE for military purposes

With regard to the discussion on whether HE follows moral purposes, researchers such as Bostrom and Hughes offer divergent perspectives. Bostrom emphasizes the individual dimension of HE, arguing that individuals should have the freedom to choose which technologies they wish to apply to themselves.[30] Thus, for Bostrom, HE is primarily a matter of personal choice. Hughes, by contrast, focuses on the social dimension of HE. He asserts that social inequality is largely rooted in biological differences and suggests that HE could play a role in addressing these disparities.[31] In military contexts, HE predominantly aligns with Bostrom's perspective, as it focuses on enhancing individual soldiers to secure strategic advantages over potential adversaries.

If HE is not adopted primarily for moral purposes, the question arises as to how HE should be addressed within military ethics. The table below offers a non-exhaustive overview of selected technologies, whether already in use or potentially deployable for military purposes. HE technologies such as exoskeletons, prosthetics, caffeine, Ritalin, access chips, genetic engineering, and cyborg technologies[32] are categorised according to specific ethical criteria and barriers.[33] This descriptive classification highlights concerns about the ethical implications of using these technologies without clearly defining their intended applications. Moral questions regarding their normative application will be explored in the subsequent chapter.

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[30] See Bostrom, Nick: In Defense of Posthuman Dignity. In: Bioethics, Vol. 19 (3)/2005, p. 203.

[31] See Hughes, James J.: Citizen Cyborg: Why Democratic Societies Must Respond to the Redesigned Human of the Future.New York 2004, p. 195.

[32] See Coeckelbergh, Mark: Cyborg humanity and the technologies of human enhancement. In: Philosophy: Technology, Macmillan Interdisciplinary Handbooks 2017, pp. 141-160.

[33] The moral issues are not listed in an order that reflects their 'severity'.

Ethical barriers and soldier enhancement technologies	Exo-skeleton	Prosthetic limbs	Caffeine	Ritalin	Access chip	Genetic engineering	Cyborg[34]
Area of application	Physical	Physical	Neuro-logical	Neuro-logical	Physical	Physical	Physical
Invasive			x	x	x	x	x*
Non-invasive	x	x					
Permanent				x*[35]	x*	x	x*
Non-permanent	x	x					
Reversible	x	x			x*		
Irreversible						x	x*

Technologies that are or could be employed for soldier enhancement purposes cover a wide range of application areas. Physical applications of HE extend to 'skin-sensor' technologies, including intelligent uniforms equipped with sensors and advanced communication systems; indeed, the United Nations already employs certain versions of these uniforms operationally to aid wounded soldiers.[36] Other examples of physical enhancements involve exoskeletons designed to carry heavy loads, along with non-invasive prosthetics and removable devices that do not remain in the body indefinitely – unlike invasive access chips, which can, for instance, lock or unlock secure facilities. When it comes to neurological areas of application, neuro-enhancers are used to increase individuals' attention span, reaction time, and speed. These applications also include sleep aids and other stimulants aimed at enhancing cognitive functioning: legal stimulants like caffeine as well as so-called 'smart drugs' and substances such as Ritalin, nootropics, and modafinil, which have reportedly been used in the U.S. military. While the long-term effects of these

[34] Donna Haraway describes a cyborg as: "a hybrid of machine and organism, a creature of social reality as well as a creature of fiction". Haraway, Donna: A Cyborg Manifesto. In: Bel, David/ Kennedy, Barbara M. (ed.): The Cybercultures Reader, London/New York: 2000, p. 291. First published in: Haraway, Simians: Cyborgs, and Women: The Reinvention of Nature. New York 1991.

[35] Consideration is given not only to existing technologies but also to those marked with *, highlighting potential future relevance.

[36] See NATO: Making Life Saving wearable tech for soldiers, 10.02.2023, https://shape.nato.int/news-archive/2023/video-making-life-saving-wearable-tech-for-soldiers, accessed 29.04.2024.

substances remain unclear, modafinil in particular has been associated with changes in the user's personality (i.e., lethargy).[37]

The above-mentioned technologies raise ethical concerns. The table classified them based on these features, highlighting invasiveness, permanence, and reversibility as key considerations. For example, invasive technologies such as access chips that are implanted subcutaneously raise distinct medical-ethical principles like dignity and autonomy.[38] Distinguishing between invasive and non-invasive modalities also becomes crucial for questions of justice: certain devices can remain within the body indefinitely – such as implanted access chips – whereas others, like caffeine or other substances, only have temporary effects. Irreversible technologies are those integrated into the body so thoroughly that they cannot be removed. Meanwhile, the distinction between permanent and non-permanent typically refers to the duration over which an individual is altered – short, medium, or long-term. Additionally, there may be future technologies specifically designed to promote moral or cultural enhancement, as Savulescu describes:

> Technology might even be used to improve our moral character (…) It may be possible to alter biology to make people predisposed to be more moral by promoting empathy, imagination, sympathy, fairness, honesty, etc.[39]

Drawing on Savulescu's vision, it is plausible that certain technologies might be developed to make warfare more equitable or humane[40] – for example, a contact lens capable of automatically distinguishing between combatants and civilians, thereby simplifying adherence to the principle of distinction from international humanitarian law. Such innovations would seek to reconcile

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37 Goodley, Héloise: Performance enhancement and the military. Exploring an ethical and legal framework for 'super soldiers', London 2020, p. 21.

38 See Beauchamp, Tom L./Childress, James F.: Principles of Biomedical Ethics. New York 2001.

39 Savulescu, Julian: Genetic Interventions and The Ethics of Enhancement of Human Beings. In: Steinbock, Bonnie (ed.): The Oxford Handbook of Bioethics, Oxford 2009, https://doi.org/10.1093/oxfordhb/9780199562411.003.0023, p. 523.

40 See Wiseman, Harris: Moral Enhancement – "Hard" and "Soft" Forms. In: American Journal of Bioethics, Vol. 14 (4)/2014, pp. 48-49. https://doi.org/10.1080/15265161.2014.889247. Kamiehski, Lukasz: On Weaponizing Cannabis. In: Journal of Military Ethics, Vol. 20/2021, pp. 251-268 also discusses this topic with regard to cannabis.

values with technological artefacts, providing potential solutions to the value alignment problem in technology ethics.[41]

5. Ethical challenges in the application of HE: An overview

Ethical concerns extend beyond the barriers outlined in the previous chapter. We also need to address the use of technologies themselves, e.g. in scenarios where soldiers are *required* to ingest stimulants to maintain cognitive alertness. Even technologies that do not exceed the listed ethical barriers above – those that are non-invasive, non-permanent, and reversible – can still be employed in morally questionable ways. Below, we offer a non-exhaustive overview of ethical concerns such as justice and inequality, bodily integrity, and autonomy.

5.1 Justice and inequality

The bioconservative Fukuyama objects to the use of biomedical technologies on the grounds of preserving human dignity and preventing threats to human rights. He fears that bio-technological interventions aimed at enhancing human capabilities may lead to the emergence of a wealthy elite, granting enhanced individuals significant social and economic advantages, particularly in the job market.[42] Annas likewise warns that HE could split society into a classification of first-class people – who are genetically modified and have enhanced capabilities – and second-class people – who are not genetically modified and maintain standard capabilities.[43] Sandel adds to the normative justice critique that these disparities might continue to affect future generations.[44]

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41 Moral values are dynamic and not only differ across cultures, histories, and legal contexts but also evolve over time.

42 See Fukuyama, Francis: Our Posthuman Future: Consequences of the Biotechnology Revolution, London 2002, p. 145.

43 See Annas, George J./ Andrews, Lori B/ Isasi, Rosario M.: Protecting the endangered human: toward an international treaty prohibiting cloning and inheritable alterations. In: American Journal of Law & Medicine, Vol. 28(2-3)/2002, p. 162.

44 See Sandel, Michael J.: The Case against Perfection. Ethics in the Age of Genetic Engineering. Cambridge 2007. https://doi-org.uaccess.univie.ac.at/10.4159/9780674043060, p. 15.

A similar problem of inequality arises with regard to knowledge. Fricker stresses that epistemic injustice can lead to the classification of people: those who have access to relevant knowledge and those who are excluded from this knowledge due to structural barriers or discrimination.[45] Particularly concerning access to education and professional opportunities, practical questions of justice and fair access to knowledge arise for the implementation of technologies for HE purposes: Will non-enhanced individuals be disadvantaged in the future due to epistemic injustice and restricted job accessibility?

Comparable concerns also arise within military contexts, regarding soldier enhancement as perpetuating existing inequalities. For example, would a super soldier possessing an exceptionally keen sense of smell receive priority in future job placements? Proponents of HE, such as Harris, dismiss such scenarios as problematic. Drawing on a consequentialist cost-benefit analysis,[46] Harris argues that equal opportunities need not be a prerequisite for fair competition between enhanced and non-enhanced individuals.[47] While enhanced persons may indeed potentially get better employment chances, they could simultaneously experience disadvantages in other areas, like social integration. In the long run, Harris contends that HE represents the inevitable progression in a medically enlightened age, even if they do ultimately form an enhanced elite.[48]

5.2 Bodily integrity and paternalism

Depending on the values and structures within particular military forces, soldiers may exhibit varying degrees of compliance with superior's orders. According to positivist interpretations, hierarchy is often viewed as fulfilling

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[45] See Fricker, Miranda: Evolving Concepts of Epistemic Injustice. In: Kidd, Ian James, José Medina and Gaile Pohlhaus (ed.): The Routledge Handbook of Epistemic Injustice. London & New York 2017, pp. 53-59.

[46] See Harris, John: Enhancing Evolution: The Ethical Case for Making Better People. Princeton 2011, p. 38.

[47] See Harris, John: Enhancing Evolution: The Ethical Case for Making Better People. Princeton 2011, p. 47.

[48] See Harris, John: Enhancing Evolution: The Ethical Case for Making Better People. Princeton 2011, p. 45.

effectiveness in security policy issues.[49] As argued elsewhere, certain circumstances – especially emergencies – can justify violence in order to act collectively as quickly and as effectively as possible. Yet does this rationale extend to coercive invasive measures of HE? Can it be morally permissible to order the enhancement of soldiers on the grounds of emergency?[50]

Beauchamp and Childress define paternalism as:

> the intentional overriding of one person's preferences or actions by another person, where the person who overrides justifies the action by appeal to the goal of benefiting or of preventing or mitigating harm to the person whose preferences or actions are overridden.[51]

Paternalism rests on acting in the best interests of the individual in question and can, in certain situations, momentarily override autonomy. Such approaches may involve banning, prescribing, or regulating behaviors to attain a particular goal. In its milder form, soft paternalism can lead to preferential treatment of an individual and is justified by an assumption of better insight into the circumstances, particularly when the individual lacks awareness of their own self-interest.[52] By contrast, positive paternalism actively interferes with a person's decision-making, whereas negative paternalism withholds information that could otherwise influence the decisions of those involved.[53] A practical example of soft, positive paternalism would be a military leader concluding that HE interventions serve both the soldiers' and (inter)national security's best interests even if the soldiers themselves might not fully grasp

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[49] See Walsh, Adrian/Van de Ven, Katinka: Human Enhancement Drugs and Armed Forces: An Overview of Some Key Ethical Considerations of Creating 'Super-Soldiers'. In: Monash Bioethics Review, Vol. 41 (1)/2022, p. 21. https://doi.org/10.1007/s40592-022-00170-8.

[50] Pressure does not necessarily come from hierarchical paternalism; it can also arise through peer or group influence.

[51] Beauchamp, Tom L./Childress, James F.: Principles of Biomedical Ethics. New York 2001, p. 169.

[52] See Beauchamp, Tom L./Childress, James F.: Principles of Biomedical Ethics. New York 2001, p. 171.

[53] "As a negative obligation, the principle requires autonomous actions not to be subjected to controlling constraints by others. As a positive obligation, the principle requires both respectful disclosures of information and other actions that foster autonomous decision making." Beauchamp, Tom L./Childress, James F.: Principles of Biomedical Ethics. New York 2001, p. 80.

or acknowledge the risks. Introducing collectivity and hierarchy to this argument, in such cases, soldiers could be mandated to accept interventions designed to optimize the unit's performance and fulfil strategic objectives, potentially at the expense of their personal autonomy and discrediting their bodily integrity.

Advocates of autonomy would rarely agree with this kind of paternalistic rationale. Beauchamp and Childress frame bodily integrity to be a moral boundary in medical ethics, viewing personal autonomy as the fundamental right to make free decisions about one's own body and its external limits.[54] They define an autonomous person based on their capability of making intentional decisions, with fully informed understanding and without external control.[55] In defending the right to non-interference,[56] they posit that a patient's autonomy extends to preserving their bodily integrity, even against potentially beneficial interventions. Under this bioethical principle, nobody should be forced to compromise their bodily integrity.

The emergency argument for invasive interventions for military operations is based on the necessity for rapid action during emergency situations. Prior arguments emphasizing the soldiers' autonomy in combat suggest that military personnel retain ultimate decision-making authority, and, by extension, bodily autonomy, even in emergency scenarios.[57] However, balancing the need for moral actions with the operational speed required in urgent military scenarios is inherently delicate.[58] In such circumstances, paternalistic measures might be justifiable under the principle of necessity. However, while swift action in life-threatening medical emergencies may be justified by

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54 See Beauchamp, Tom L./Childress, James F.: Principles of Biomedical Ethics. New York 2001, p. 77.

55 See Beauchamp, Tom L./Childress, James F.: Principles of Biomedical Ethics. New York 2001, pp. 78f.

56 See Beauchamp, Tom L./Childress, James F.: Principles of Biomedical Ethics. New York 2001, p. 290.

57 See Tragbar, Lisa: Die Lehre des gerechten Krieges als Militärethik: Über die Vorbereitung von Militärangehörigen auf kognitive Kriegsführung, The Defence Horizon Journal 2023. https://doi.org/10.5281/zenodo.10154313.

58 See Walsh, Adrian/ Van de Ven, Katinka: Human Enhancement Drugs and Armed Forces: An Overview of Some Key Ethical Considerations of Creating 'Super-Soldiers'. In: Monash Bioethics Review, Vol. 41 (1)/2022, pp. 22-36. https://doi.org/10.1007/s40592-022-00170-8.

paternalistic reasoning, this logic does not seamlessly apply to HE.[59] Unlike immediate life-saving interventions, HE is typically employed as a pre-emptive modification rather than an urgent necessity, thus not falling within the scope of the emergency argument. According to Beauchamp and Childress, individuals have a moral right to full disclosure. Accepting autonomy as the foundation of bioethical decision-making implies that voluntary consent must remain a baseline requirement for employing invasive HE technologies, regardless of the urgency of the situation.

5.3 Changes in 'human nature'

Is there a fundamental human boundary that HE must not breach? If we assume the existence of 'human nature', does it become impermissible to alter it? Certain bioconservatives maintain that there are enduring personality characteristics that should remain inviolate. For instance, Habermas argues that interventions aimed at modifying 'human nature' could transform our ethical self-understanding of our species:

> From this perspective, the question arises as to whether the instrumentalization ("Technisierung") of human nature changes species-ethical self-understanding ("gattungsethische Selbstverständnis") in such a way that we can no longer understand ourselves as ethically free and morally equal beings who are oriented to norms and reasons.[60]

He argues that the instrumentalization of human nature, if it alters our fundamental capabilities or characteristics, could undermine our self-understanding as ethically autonomous and morally equal beings, guided by universal norms and reasons. Habermas opposes embryo selection and genetic manipulation unless justified by a clear medical purpose, such as the treatment of diseases: "the line between therapy for an illness and improving a

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[59] For instance, if HE is used preventively, its absence does not necessarily result in death but may lead to a strategic disadvantage compared to opponents. In contrast, a patient requiring urgent treatment to prevent life-threatening complications may provide a stronger justification for paternalistic measures, as their life is at immediate risk.

[60] Habermas, Jürgen: Die Zukunft der menschlichen Natur: Auf dem Weg zu einer liberalen Eugenik? Frankfurt/Main 2005, p. 74.

disposition" [61] cannot always be clearly drawn. In the discussion of genetic interventions, he does not refer to enhancement but instead refers to 'eugenics'.[62] According to him, the selection or enhancement of genes violates the liberal principles of autonomy and equality:

> "If a genetically modified person feels limited in the use of their ethical self-determination (ethische Gestaltungsfreiheit) by the foreign designer, they suffer from the awareness that they have to share the authorship of their own life destiny with another author."[63]

According to Habermas, genetically modified individuals cannot be regarded as fully responsible authors of their own life stories if their genetic makeup has been determined by their parents' personal preferences. Moreover, such genetic interventions would undermine equality by disrupting the fundamental symmetry between free and equal persons across generations.[64] He criticises interventions in the human genome for bluffing the intuitive distinction between "subjective" and "objective", as well as "grown" and "made".[65] In his view, they could be seen as a form of instrumentalization, which disregards nature's inherent self-regulation. Habermas posits that genetic interventions in humans could transform the control of nature into an act of self-empowerment, therefore changing our "ethical self-understanding of the species" and affecting a universalistic understanding of morality.[66]

6. Conclusion

While soldier enhancement has considerable potential for military security strategies, the risk of misusing HE for combat purposes is no less plausible than the dangers of crossing moral barriers. To illustrate both the advantages and ethical concerns associated with its use in military contexts, we initially employed the thought experiment of a "super soldier" featuring enhance-

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61 Habermas, Jürgen: Vorwort. In: Michael Sandel (Ed.): Plädoyer gegen die Perfektion. Im Zeitalter der genetischen Technik, Berlin 2008, p. 9.

62 See Habermas, Jürgen: Vorwort. In: Michael Sandel (Ed.): Plädoyer gegen die Perfektion. Im Zeitalter der genetischen Technik, Berlin 2008, pp. 7-16.

63 Habermas, Jürgen: Die Zukunft der menschlichen Natur: Auf dem Weg zu einer liberalen Eugenik? Frankfurt/Main 2005, p. 137.

64 See ibid., p. 30.

65 See ibid., p. 85.

66 See ibid.

ments based on NBIC technologies. However, subsequently, we conducted a critical examination of the term HE to clarify its ambiguities and to delineate which technologies fall outside its scope. After categorizing various technologies and their ethical barriers according to the criteria of invasiveness, permanence, and reversibility, we concluded with an overview of the ethical issues surrounding HE. Drawing on Fukuyama and Annas, we highlighted potential consequences for justice matters. We then applied Beauchamp and Childress's framework of biomedical ethics to examine the limits of paternalism in the discussion of bodily integrity and soldier enhancement. Finally, we showed Habermas's perspective to explore the challenges of preserving human autonomy in the context of genetic interventions. Nevertheless, several unresolved issues remain, which we could only briefly touch upon in this ethical overview of HE for military purposes.

What still requires attention? Ethical conclusions depend on empirical data regarding the precise effects of HE-related technologies.[67] While further research on potential side effects is urgently needed, such studies remain scarce – largely due to the broad scope of the topic, as shown in Chapter 2. Before establishing normative guidelines for implementing HE in the military, it is crucial to address foundational ethical questions and standardize key terminology.[68] Additionally, several pragmatic bioethical issues relating to responsibility and liability remain unresolved. For instance, who is accountable if a subdermal chip malfunctions? Is there a right to compensation if complications arise from removing a prosthetic limb?[69] Should the emphasis of HE for military purposes lay on achieving optimal performance, enhancing sol-

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[67] See Walsh, Adrian/Katinka Van de Ven: Human Enhancement Drugs and Armed Forces: An Overview of Some Key Ethical Considerations of Creating 'Super-Soldiers'. In: Monash Bioethics Review, Vol. 41 (1)/2022, p. 33. https://doi.org/10.1007/s40592-022-00170-8.

[68] Walsh et al and Allenby suggest that the Just War Theory could be useful in the development of normative standards. See Walsh, Adrian/Katinka Van de Ven: Human Enhancement Drugs and Armed Forces: An Overview of Some Key Ethical Considerations of Creating 'Super-Soldiers'. In: Monash Bioethics Review, Vol. 41 (1)/2022, pp. 22-36. https://doi.org/10.1007/s40592-022-00170-8. See Allenby, Braden R.: The Implications of Emerging Technologies for Just War Theory. In: The Applied Ethics of Emerging Military and Security Technologies, 2015, pp. 3-21.

[69] See Coeckelbergh, Mark: Cyborg humanity and the technologies of human enhancement. In: Philosophy: Technology, Macmillan Interdisciplinary Handbooks 2017, p. 141.

diers' competency profiles, or fostering virtues?[70] Ultimately, the use of HE for military purposes is an area that requires further ethical consideration, particularly regarding the criteria that are essential to protect a soldier's autonomy: providing adequate information, ensuring voluntary participation, and maintaining transparency about both potential consequences and military applications.[71] These unresolved issues extend to core philosophical and ethical concerns, including autonomy, human nature, and conflicting values in machine design.

[70] See Pfaff, Anthony C: Virtue and Applied Military Ethics: Understanding Character-Based Approaches to Professional Military Ethics. In: Journal of Military Ethics Vol. 22 (3-4)/2023: p. 168-84. https://doi.org/10.1080/15027570.2023.2200064.

[71] See Goodley, Héloise: Performance enhancement and the military. Exploring an ethical and legal framework for 'super soldiers', London 2020, p. 24f. Goodley explains what to consider when giving consent and what types of consent there are, e.g. explicit, tacit, informed consent and an opt-out option.

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