Essay

Super-Soldiers Revisited: The Ethics of Using Military Personnel as Research Subjects

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Super-Soldiers Revisited: The Ethics of Using Military Personnel as Research Subjects

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Abstract: A fascinating topic that has not been recently revisited by bioethics is the ethics of human experimentation within the military context, in keeping with the pace of modern technology development. Many research innovations stem from military research, where emerging technologies are first applied in the field then eventually repurposed for civilian contexts. This commentary presents an ethical framework for the usage of military personnel as research subjects, within the context of modern military research such as epigenetic technology development in soldiers. Tensions are raised between existing military versus civilian bioethical frameworks for human experimentation and compared to risk-benefit assessments within and beyond the military context. A harmonized ethical framework is proposed for the use of research subjects within the military. The pace of modern scientific research, particularly in genomics, poses new ethical considerations of genetic profiling, consent, risk, and data privacy that urges a timely revisit of military bioethics.

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Manuscript

A fascinating topic that has not been recently revisited by bioethics is the ethics of human experimentation within the military context, in keeping with the pace of modern technology development. Many research innovations stem from military research, where these technologies are applied in the field or eventually repurposed for civilian contexts. Within this context, experimentation on soldiers or other military personnel may designate these demographics to be potentially vulnerable populations, with ethical ramifications beyond the scope of the military. Furthermore, the pace of modern scientific research, particularly in genomics, poses new ethical considerations of genetic profiling, consent, risk, and data privacy that urges a timely revisit of military bioethics. This commentary will present an ethical framework for the usage of military personnel as research subjects, within the context of modern military research such as epigenetic technology development in soldiers. Tensions are raised between existing military versus civilian bioethical frameworks for human experimentation and compared to risk-benefit assessments within and beyond the military context. A harmonized ethical framework is then proposed for the use of research subjects within the military.

First, to understand the rapidly evolving state of scientific research in the military, one has to look no further than by surveying the latest developments in genomics. Recently, the Defense Advanced Research Projects Agency (DARPA) of the U.S. Department of Defense released a press statement announcing an Epigenetic CHaracterization and Observation (ECHO) Proposers Day. It revealed the U.S. military's development of technologies that enabled detection of a person's history of exposure weapons of mass destruction, infectious diseases, or exposure precursors through profiling an individual's epigenome as a "footprint." [1] Furthermore, the Études de l'Ifri, an independent research centre, published a report outlining ethical and operational issues in using genetic engineering for human enhancement in the French military [2]. Along similar sentiments, research is currently being conducted to develop epigenetic biotypes of post-traumatic stress disorder

(PTSD) in war-zone exposed veterans and active-duty males, with the hopes of potential applications in risk assessment for military personnel [3]. Finally, it is possible that emerging epigenetic technologies such as GrimAge, an epigenetic predictor of biological age and risk of mortality based on multi-modal measures of brain health, may be of relevance in the profiling of military personnel [4]. Given these milestones, it is clear that explicit guidance is needed to ensure the translation and usage of these technologies is done in a safe and ethical manner.

To adopt a moral framework for the use of epigenetic technologies in a military setting, it is important to consider the extent that soldiers and military personnel apply as formal research subjects. A shared Western history of war crimes and medical scandals have culminated in the formal, legal protections and ethical guidelines that exist today to the interests and safety of human research subjects. The "Belmont Report," published by the U.S. National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research in 1979, outlined the main ethical principles that still apply today to guide scientific research involving human subjects: justice, respect for persons, and beneficence [5,6]. In addition to being a defining moment in the history of medical ethics, this report also officially defined those who constituted as 'vulnerable populations' and in need of special protections from harm [6,7]. Notably, these included soldiers, prisoners, employees, and the mentally infirm—demographics which undoubtedly apply to a military setting. Thus, under this framework, it implies that special protections, or at the least, extra scrutiny should be placed when using soldiers and military personnel for epigenetic research and biological enhancements.

However, these sentiments are contrasted by the codes of conduct, norms, and specific ethical principles established within the military culture. Some key ethical values upheld by the military include selflessness, the duty to obey orders, accountability, and the obligation to look out for the welfare of one's subordinates [8]. These values reflect one of the core principles of military bioethics—paternalism—which in the military context constitutes respect for authority through obeying orders [9]. This is also a first instance of clear tensions between the protected rights of autonomy and consent for military individuals against the responsibilities to serve and obey, and it is unclear how much these rights represent the formal human ethical protections within the realities of military life. For example, military personnel serving under the control of a higher order will have limited freedoms of autonomy. Without autonomy, it may not be possible to provide freely informed consent, without coercion from rank or social customs, on the use of biomedical technologies. Furthermore, the ability to give freely informed consent may be compromised by the norms of the military chain of command, where it is dissuaded or prohibited for lower-rank individuals to voice dissent. Incentives may also be more tolerated in a military setting if rank promotions and "danger pay" are used to persuade military personnel to accept dangerous missions as a result of undergoing biological enhancements [10]. However, incentives are a form of implicit coercion already scrutinized in civilian bioethics as it compromises on the rational capacity of the individual to provide freely informed consent [10].

Ethical judgements can also differ between military and civilian contexts. Risk-benefit analysis represents such an example. In civilian bioethics, a medical experiment is generally impermissible if risks to the research subject outweigh the benefits of the knowledge derived (whether the benefits are to the individual or the collective community). However, in the military, risk-benefit assessments typically follow the norms of the military culture. Judgements about proportional risk must be made by the appropriate level of command: the greater the risk, the higher level of command at which the decision must be made [8]. Furthermore, commanders who instruct military personnel to assume risky situations are held accountable to their decisions and subject to punishment if their orders were improper [8]. However, it is unclear if this framework for governing military personnel in combatant settings should apply to governing military personnel as research subjects. If it does apply, it implies that firstly, the threshold for what is deemed a "risky" depends on the position of the military subject relative to the person making the decision following the chain of command. However, this seems counterintuitive to the ultimate goal of risk-benefit analysis, namely, to prevent humans from being exposed to inventions or experiments that are risky in itself. Judgements on the inherent risk of medical interventions should not depend on the position of the governing authority, however removed they are from the situation of the military personnel in question. On the second point, it is

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impractical and unrealistic to hold commanders accountable for improper orders in a military setting. Commanders may not have the medical knowledge to make an informed decision on all the possible health risks that may incur. Furthermore, it does not matter what retroactive or punitive measures would look like for the commander when the military research subject has already experienced the harms from the medical experiment.

Another point to consider is that the degree of health risk may depend on whether the product of the medical intervention is permanent, long-term, temporary, or reversible [10]. If the intervention is permanent or irreversible in some way, then there is a stronger moral imperative that the risk-benefit assessment should not follow the typical military framework. This is because the adverse effects of a medical intervention may eventually or inadvertently affect non-military life, such as family or other social dynamics who become harmed by the adverse health effects or imbue changes to the military personnel's offspring [10]. The latter is a particular concern for the field of epigenetics, as preliminary research suggests that epigenetic signatures can confer international and transgenerational inheritance in humans [11]. It also means that any epigenetics research which has the possibility to confer generational changes now falls within ethical and legal considerations in genetics and childcare rights. Thus, in the risk-benefit assessment for military research experimentation, it is important to utilize a framework which considers all the external parties that may be irrevocably impacted by the medical intervention.

The most cited framework for making such decisions in the military context is the principle of proportionality [8]. This principle states that a biomedical risk can be imposed only when it is necessary, and no other safer alternative is available [8]. When this intervention is used in a mission context, the mission must seek to accomplish a legitimate objective. In addition, the nature and degree of risk must be proportional to the proposed advantage gained, with more important objectives being permitted greater ethical risk [8]. However, it may be an oversimplistic framework for risk assessment in the epigenetics context. For example, in the context of using epigenetic biotechnology to improve human fitness, non-epigenetic alternatives such as exoskeletons would always be available as the safer and more effective choice. Secondly, the idea of "proposed advantage" implies a muddled risk-benefit tradeoff in the research setting, where the research subject sacrifices personal safety for the end goals of military superiors, which may not be necessarily good for the collective society. In other words, the benefits of military research might serve the interests of military leaders more than for personal health or community research knowledge, while the soldiers assume more risk to personal health [8]. Even though commanders have a duty to protect and ensure that biomedical risks imposed on subordinates are reasonable under the principle of proportionality, these implicit conflicts of interest can jeopardize altruistic attempts at applying the principle of proportionality to a research experimentation context.

This leads us to propose our own ethical framework for the use of military personnel as research subjects, one which relies on other ethical principles to aid in the decision-making process. First, conditions of external validity should be met: the validity of research in a military setting must also hold outside of the context. This means that the study design, purpose, and knowledge generated from the experimental setting must be apply for the general population. For example, epigenetic-based therapy which mitigates PTSD symptoms for veterans would be permissible if the same intervention can hold for general PTSD survivors. This also means that novel epigenetic technology, such as human epigenetic editing, where the risks are higher due to the unprecedented nature of novel technologies, would not be permissible if they are deemed unreasonable by civilian standards. If a civilian context is not realistic, then equipoise between the epigenetic intervention arm (e.g., a drug that confers strength) and the standard military intervention arm (e.g. exoskeleton for strength) should be the bare minimum condition that must be met to justify the reason for experimentation alongside the epigenetic arm.

Importantly, it must be emphasized that no medical intervention is completely safe – it is accompanied by risk of some form whether the risk is known or not [10]. In the case of epigenetic research, any technology that purports to change a person's epigenome or epigenetic regulation, whether used to satisfy military objectives or not, is considered human experimentation and thus

needs to be protected as such through unincentivized informed consent. The ethos of consent and risk assessment for military personnel in the battlefield should not translate to a blanket assumption to accept greater risks or harms in research. These individuals consented to a reasonable restriction of personal autonomy to fulfil their roles as military soldiers, but they likely did not consent to be used as research subjects. Military personnel should thus be permitted to refuse participation as research subjects, or at the very least, be offered non-experimental alternatives without having their decision perceived as a disobedience of order, or compromising their job security, rank, or promotion [10]. In essence, although certain ethical frameworks like risk-benefit assessment may have a different context, certain ethical principles such as validity, equipoise, or consent cannot be compromised in the military context.

In conclusion, this commentary has provided a brief overview of the ethical considerations in conducting scientific research using military personnel. I explored the tensions of designating military personnel as research subjects, and how assessments of risk-benefits may differ in novel research contexts, especially pertaining to genomics research. Finally, a framework for military bioethics was proposed, one which rest on meeting the conditions of external validity and a reinforcement of the fundamental principles of bioethics.

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