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Super Soldiers: The Ethical, Legal and Operational Implications (Part 2)

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Chapter 8
Super Soldiers (Part 2): The Ethical, Legal, and Operational Implications

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ABSTRACT

This is the second chapter of two on military human enhancement. In the first chapter, the authors outlined past and present efforts aimed at enhancing the minds and bodies of our warfighters with the broader goal of creating the "super soldiers" of tomorrow, all before exploring a number of distinctions—natural vs. artificial, external vs. internal, enhancement vs. therapy, enhancement vs. disenhancement, and enhancement vs. engineering—that are critical to the definition of military human enhancement and understanding the problems it poses. The chapter then advanced a working definition of enhancement as efforts that aim to "improve performance, appearance, or capability besides what is necessary to achieve, sustain, or restore health." It then discussed a number of variables that must be taken into consideration when applying this definition in a military context. In this second chapter, drawing on that definition and some of the controversies already mentioned, the authors set out the relevant ethical, legal, and operational challenges posed by military enhancement. They begin by considering some of the implications for international humanitarian law and then shift to US domestic law. Following that, the authors examine military human enhancement from a virtue ethics approach, and finally outline some potential consequences for military operations more generally.

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INTRODUCTION

With the background and working definition provided in the previous chapter (Chapter 7), we begin our discussion of the primary ethical, legal and operational issues associated with military human enhancement. At this point, it must be said that to the extent that ethics underwrites law and policy, we are often better placed to understand the former by looking at the latter as the real-world implementation of ethics. This is also beneficial in the sense that international and domestic law—including laws relevant to biomedical enhancement—may demand immediate attention, with potential humanitarian concerns or the possibility of requiring serious sanctions. We therefore adopt the approach of focusing first on legal problems that are generated or exacerbated by military human enhancement.

However, the discussion does not end there. We also sketch a range of other considerations, both explicitly philosophical in nature, as well as some affecting more operational concerns. While certain of these latter considerations are not as likely to lead to direct physical harm to subjects and may seem somewhat abstract, these matters remain of great importance to the moral foundations of military service and the relationship between citizens, states, and their military institutions. Also, even though all of these considerations are in some sense intertwined, we separate them here as best as we can for ease of presentation and comprehension.

INTERNATIONAL LAW

What are the provisions in international law that may bear upon military human enhancements? Should enhancement technologies, which typically do not directly interact with anyone other than the human subject, nevertheless be subjected to a weapons legal review? That is, is there a sense in which enhancements could be considered as "weapons" and therefore subject to legal instruments such as the Biological and Toxin Weapons Convention? How do norms related to human-subject research and medical ethics impact military enhancements?

These are some of the most important questions for military enhancements as they relate to international law (Lin, 2012a). Conceptually, we divide international law into two categories: the first is commonly known as the Law of Armed Conflict (LOAC) and the second is composed of international agreements related to biomedical research. Because these are well-known conventions, we will only list them here and add more detail later as needed.

Under international humanitarian law (IHL), the main instruments of interest here are:

- Hague Conventions (1899 and 1907).
- Geneva Conventions (1949 and Additional Protocols I, II, and III).
- Biological and Toxin Weapons Convention (1972).
- Chemical Weapons Convention (1993).
- Rome Statute of the International Criminal Court (1998).

Under international biomedical laws—which we discuss more in the next section—the main instruments of interest here are:

- Nuremberg Code (1947).
- Declaration of Geneva (1948).
- Declaration of Helsinki (1964).

As it concerns new technologies, Article 36 of the Geneva Conventions, Additional Protocol I, specifies that: "in the study, development, acquisition or adoption of a new weapon, means or method of warfare, a High Contracting Party is under an obligation to determine whether its employment would, in some or all circumstances, be prohibited by this Protocol or by any other rule of international law applicable to the High Contracting Party" (1977).

But does Article 36 apply to human enhancement technologies? That is, should they be considered as a "weapon" or "means or method of warfare" in the first place? Unlike other weapons contemplated by the LOAC, enhancements usually do not directly harm others, so it is not obvious that Article 36 of Additional Protocol I would apply here. If anyone's safety were immediately at risk, it would seem to be that of the individual warfighter, thereby turning the debate into one about bioethics. To that extent, warfighters, whether enhanced or not, are not weapons as typically understood.

Yet in a broader sense, the warfighter is not only a weapon but also perhaps a military's best and oldest weapon. Warfighters carry out missions, they sometimes kill enemies, and they represent one of the largest expenditures or investments of a military. They have cognitive and physical capabilities that no other technology currently has, and this can make them ethical, lethal, and versatile. The human fighter, engaged in hand-to-hand combat, would be the last remaining weapon when all others have been exhausted. So in this basic sense, the warfighter is undeniably a weapon or instrument of war.

Still, should Article 36 be interpreted to include warfighters themselves as weapons subject to regulation? There could be several reasons to think so. First, other organisms are plausibly weapons subject to an Article 36 review. Throughout history, humans have employed animals in the service of war, such as dogs, elephants, pigeons, sea lions, dolphins, and possibly rhinoceroses (Knights, 2007; Beckhusen, 2012; US Navy, 2012). Dogs, as the most commonly used animal, undergo rigorous training, validation, and inspections (US Department of the Army, 2005). If a military were to field a weaponized rhino in an urban battlefield that contains innocent civilians, we would be reasonably worried that the war-rhino does not comply with Article 36, if rhinos cannot reliably discriminate friends from foe, e.g., a rhino may target and charge a noncombatant child in violation of the principle of distinction. A similar charge would apply to autonomous robots in such a general environment in which distinction is important, as opposed to a "kill box" or area of such fierce fighting that all noncombatants could be presumed to have fled (Lin, et al., 2008).

If autonomous robots are clearly regulatable weapons, then consider the spectrum of cyborgs—part-human, part-machine—that exists between robots and unenhanced humans. Replacing one body part, say a human knee, with a robotic part starts us on the cybernetic path. And as other body parts are replaced, the organism becomes less human and more robotic. Finally, after (hypothetically) replacing every body part, including the brain, the organism is entirely robotic with no trace of the original human. If we want to say that robots are weapons but humans are not, then we would be challenged to identify the point on that spectrum at which the human becomes a robot or a weapon. The inability to draw such a line may not be a fatal blow to the claim that humans should be treated as weapons; after all, we cannot draw a precise line at which a man who is losing his hair becomes "bald," yet there is clearly a difference between a bald man and one who has a head full of hair (Stanford, 2011). But a simpler solution may be to say that humans are weapons, especially given the reasons offered previously.

As it applies to military enhancements, integrated robotics may be one form of enhancement, but we can also consider scenarios involving biomedical enhancements such as pharmaceuticals and genetic engineering. Again, on one end of the spectrum would stand a normal, unenhanced human. One step toward the path of being fully enhanced may be a warfighter who drinks coffee or pops amphetamines ("go pills") as a cognitive stimulant or enhancer. Another step may be taking drugs that increase strength, erase fear, or eliminate the need for sleep. At the more radical end may be a warfighter so enhanced that s/he no longer resembles a human being, such as a creature with four muscular arms, fangs, fur, and other animal-like features, and with no moral sense of

distinguishing combatant from noncombatant. If a war-rhino should be subject to Article 36, then so should this radically enhanced human animal, so it would seem. And to avoid the difficult question of drawing the line at which the enhanced human becomes a weapon, a more intuitive position would be that the human animal is a weapon all along, at every point in the spectrum, especially given the previous reasons that are independent of this demarcation problem.

If we agree that enhanced human warfighters could conceivably be weapons subject to Article 36, what are the implications? Historically, new weapons and tactics needed to conform to at least the following:

- Principle of distinction.
- Principle of proportionality.
- Prohibition on superfluous injury or unnecessary suffering (SIrUS).

To explain: First, the principle of distinction demands that a weapon must be discriminating enough to target only combatants and never noncombatants (Geneva Additional Protocol I, 1977; Sassòli, 2003). Biological weapons and most anti-personnel landmines, then, are indiscriminate and therefore illegal in that they cannot distinguish whether they are about to infect or blow up a small child versus an enemy combatant. Unintended killings of noncombatants—or "collateral damage"—may be permissible, but not their deliberate targeting; but to the extent that biological weapons today target anyone, they also target everyone. However, a future biological weapon, e.g., a virus that attacks only blue-eyed people or a certain DNA signature (Hessel et al., 2012), may be discriminate and therefore would not violate this principle (but it could violate others).

Second, the principle of proportionality demands that the use of a weapon be proportional to the military objective, so to keep civilian casualties to a minimum (Geneva Additional Protocol I, 1977; Cohen, 2010). For instance, dropping a nuclear bomb to kill a hidden sniper would be a disproportionate use of force, since other less drastic methods could have been used.

Third, the SIrUS principle is related to proportionality in that it requires methods of attack to be minimally harmful in rendering a warfighter *hors de combat* or unable to fight (Coupland & Herby, 1999). This prohibition has led to the ban of such weapons as poison, exploding bullets, and blinding lasers, which cause more injury or suffering than needed to neutralize a combatant.

However implausible, we can imagine a human enhancement that violates these and other provisions—for instance, a hypothetical "berserker" drug would likely be illegal if it causes the warfighter to be inhumanely vicious, aggressive, and indiscriminate in his attacks, potentially killing children. For the moment, we will put aside enhancements that are directed at adversaries, such as a mood-enhancing gas to pacify a riotous crowd and a truth-enhancing serum used in interrogations; the former would be prohibited outright by the Chemical Weapons Convention in warfare (The Royal Society, 2012), partly because it is indiscriminate, and the latter may be prohibited by laws against torturing and mistreating prisoners of war. The point here is that it is theoretically possible, even if unlikely, for a human enhancement to be in clear violation of IHL.

DOMESTIC LAW

The international law considerations adduced above primarily involve what militaries should (not) do with their enhanced warfighters, but there remains a prior question of whether militaries are permitted to enhance their personnel at all. Traditionally, this has been a question for bioethics and related domestic law, rather than for IHL. Hence, we will briefly outline some key US domestic laws and regulations that would apply to military enhancements.

Does US domestic law allow the military to require enhancements for its own personnel? To answer that question, we look at actual legal cases in the US that are closely related to, if not directly about, questions about human enhancements. While we had excluded vaccinations as a type of human enhancement in the definitional section of the previous chapter— because they are designed to sustain health, not provide capabilities beyond it—we also acknowledged that this understanding was contentious: in a sense, a vaccination seems to be an enhancement of the immune system, especially considering that the patient is not sick at the time of the immunization. At the least, even if not enhancements themselves, vaccination policy can inform a study on how US law might deal with military enhancements.

The us military has been vaccinating troops since 1777 (Gabriel, 2013). There are currently thirteen vaccinations used by the military mandated for trainees alone: mandatory vaccinations include influenza, hepatitis a and b, measles, poliovirus, rubella, and yellow fever, among others (Grabenstein, 2006). The standard military policy for the mandatory administration of pharmaceutical agents is the same as the policy applied to civilians (Russo, 2007): pharmaceuticals need to be approved by the us food and drug administration (FDA) for their intended use before they are mandatorily administered; and absent FDA approval, a presidential waiver or informed voluntary consent must be obtained for the administration of an investigational drug (IND) (Russo, 2007). The US Supreme Court has held that mandatory vaccinations of FDA-approved drugs do not violate the US Constitution (Jacobson v. Commonwealth of Massachusetts, 1905). Mandatory vaccination programs in the military have been challenged in court (United States v. Chadwell, 1965), but they were rarely subjected to substantial legal challenges until 2001, directed at the anthrax vaccine immunization program (AVIP).

Federal Law

As an important catalyst for us law related to vaccinations, AVIP—established in 1997—had roots in operation desert shield in 1990, at which time the US military worried about biological and chemical weapons that Saddam Hussein was rumored to have possessed. At the time, the DOD argued that the informed consent requirement for the administration of INDs was impractical (Doe v. Sullivan, 1991). The requirement was feasible during peacetime, but the DOD urged that it posed significant obstacles to the safety of troops and mission accomplishment in wartime (Brown, 2006). In response to pressure from the DOD, the FDA promulgated rule 23(d), otherwise known as the interim final rule:

- 21 CFR 50.23(d), or Interim Final Rule.

Rule 23(d) allows the DOD to waive the informed consent requirement, if it is not feasible to obtain consent in a particular military operation, subject to conditions (Brown, 2006). Most importantly, the waiver must be limited to "a specific military operation involving combat or the immediate threat of combat" (Doe v. Sullivan, 1991). Upon receiving the request for waiver from the DOD, the FDA must evaluate it and grant the waiver "only when withholding treatment would be contrary to the best interests of military personnel and there is no available satisfactory alternative therapy" (doe v. Sullivan, 1991). This rule was challenged in 1991, in doe v. Sullivan, but the federal court held that 23(d) was constitutional and within the scope of the FDA's authority (Doe v. Sullivan, 1991).

- *10 USC §1107(f).*

In 1998, in response to the ruling in Doe v. Sullivan, the US Congress enacted 1107(f). This statutory provision requires the DoD to obtain informed consent from soldiers before administering an

IND (including an approved drug for an unapproved use) and provides that the President can waive said requirement (10 USCA § 1107 (West)).

- *Executive Order 13139.*

President Clinton unified both rule 23(d) and 1107(f) in 1999 with executive order 13139, a guideline for waiving informed consent within the context of military operations (brown, 2006). According to the order, to use an "investigational drug" or a "drug unapproved for its intended use," the Secretary of Defense must obtain informed consent from each individual service member (executive order no. 13139 1999). However, a presidential waiver can overcome this requirement, but it can only be obtained upon a written determination that obtaining consent is: (1) not feasible; (2) contrary to the best interests of the member; or (3) is not in the interests of national security (executive order no. 13139 1999).

- *DoDD 6200.2.*

The department of defense directive (DODD) 6200.2, like executive order 13139, synthesized several sources of authority governing the use of INDs for military health protection (US Dept. of Defense, 2012). It defines an IND as a "drug not approved or a biological product not licensed by the FDA," or alternatively, as a "drug unapproved for its applied use" (US Dept. of Defense, 2012). Further, it provides that the DOD must prefer products approved by the FDA for use as countermeasures to INDs (US Dept. of Defense, 2012). However, "when, at the time of the need for a force health care protection counter-measure against a particular threat, no safe and effective FDA-approved drug or biological product is available, DOD components may request approval of the secretary of defense to use an investigational new drug" (US Dept. of Defense, 2012). If the secretary of defense determines that obtaining informed consent is not feasible, contrary to the best interests of the member, and is not in the interests of national security, s/he can then request a waiver from the president (US Dept. of Defense, 2012).

Military Law

Military law operates in conjunction with federal civil law, but it focuses on matters germane to the military alone. In addition to the constitution, us military law is governed by the uniform code of military justice (UCMJ). In the context of military vaccinations, the issue is about the lawfulness of the order to take the vaccination. The DOD's successful defense strategy of the legality of the AVIP throughout the anthrax cases was straightforward on this account: the vaccine was determined by the FDA to be safe and effective for use against inhalation anthrax, and under military law the legality of an order to take the vaccine was a question of law for a judge to decide, not a question of fact for determination by a jury (Katz, 2001).

Under the UCMJ, disobedience of a direct and lawful order from a superior officer is punishable under articles 90 or 92. Article 90 prohibits willfully disobeying a superior commissioned officer (10 USC § 890 (1994) (UCMJ art. 90)), and article 92 prohibits failing to obey an order or regulation (10 USC § 890 (1994) (UCMJ art. 92)). A soldier who refused to take the anthrax vaccination was court-martialed, where the DOD would file two interlocutory motions: (1) that the lawfulness of the order should be decided as a question of law; and (2) that all the evidence regarding the safety, efficacy, and necessity of the vaccine should be excluded because the legal authority of an order is not based on the safety of the vaccine (ponder v. Stone 2000). The DOD did this in every challenge to the AVIP, and in every challenge to the AVIP in military court they were successful (Katz, 2001).

A strong, but rebuttable, presumption is that a military order is lawful when someone is charged with willful disobedience of a lawful order (US government, manual for court-martial, 2010; Katz,

2001), and the lawfulness of a military order is an interlocutory order to be decided on by a judge, not a jury (us v. New, 1999; Perry v. Wesely, 2000). What this effectively does is foreclose a legal challenge to the scientific efficacy of a vaccine on procedural grounds. Again, while these legal issues were involved with actual cases involving vaccinations, we can plausibly extend them to anticipate how they would address technologies and procedures that are more clearly human enhancement than therapy.

OPERATIONS

Beyond the demands of international and domestic law, military enhancements will likely have important policy implications. We will examine here some of those implications on military operations themselves. Cognitive and physical human enhancements can significantly help a military achieve its missions, operate more efficiently and perhaps ethically, as well as a host of other benefits. But our focus here will be on unintended problems that may be caused by enhancements.

Assuming that enhancements are not adopted by all warfighters at once—for instance, they are rolled out selectively or slowly for safety, economic, or other reasons—there would instantly be an inequality among the ranks, creating problems for unit cohesion. Some warfighters will be privileged (or unlucky?) enough to be appropriately enhanced for their mission, whereas some others may be underenhanced, while others yet will remain "normal." In broader society, we see that uneven access to technology creates a gap between the haves and the have-nots, such as the Internet divide (Rozner 1998); and this translates into a difference in quality of life, education, earnings, and so on. It is therefore not unreasonable to expect a similar effect within the military.

At the unit level, enhancements may cause (or increase) dissension between warfighters. A mix of enhanced and unenhanced warfighters within a single unit may affect morale and unit cohesion. To be sure, similar worries had been voiced related to the integration of different ethnic groups, religions, and sexual orientation in the military (Canaday, 2001); but where these differences do not intrinsically imply different levels of capabilities or merit that would matter operationally, human enhancements do. By definition, an enhanced warfighter would be stronger, faster, or otherwise better enabled than their normal counterparts. This means they could accept riskier roles and have lower support requirements, for instance.

Further, because enhanced warfighters represent a significant investment of research and effort, they may be treated quite differently from 'normal' warfighters, e.g., perhaps they will not be subjected to the hard work of routine fighting or other "mundane" uses. For comparison, many Allied airborne troops in World War II were pulled from the lines after the D-Day invasion of Normandy, rather than being required to slog through France and the Hürtgen Forest in Germany. The asymmetry of needs and capabilities could cause resentment of the unenhanced or underenhanced as a drag on capabilities and operational efficiency of the enhanced, as well as resentment by the others of the superior abilities and (likely) superior status of the enhanced. To some extent, we already witness this when militaries switch their dependence from soldiers to "special operators" such as Navy SEALs. The asymmetry could also create a sense of entitlement among the enhanced and undermine an esprit de corps, much as some superstars do on sports teams.

Morale is also relevant to confidence in command. Enhancements could create novel difficulties for the command structure, particularly if commanders were unenhanced and were seen as physically—or, worse, intellectually—inferior to those they command. To take one firsthand perspective, retired US Army Brigadier General Richard O'Meara asserts that a social contract exists between troops and leaders, one that places the burden of defining the goals of a mission on

the leaders, and the burden of accomplishment on the troops (O'Meara, 2012). But while the troops have the responsibility to accomplish the goals that command has set forth, they also have a right to demand that leaders make informed decisions, even if difficult ones, and to do so in a way that warfighters recognize as legitimate. It is a recipe for disaster when those further down the chain of command are continually second-guessing and evading their orders. If human enhancement exacerbates that lack of confidence in leaders, it could undermine the strategy and tactics of command.

Physical enhancements may be less problematic in this regard than cognitive ones, at least with respect to challenges to command. When the troops are generally less educated, less interested in strategy, and more concerned with communal rather than individual rights and values, command can worry less about the potential disobedience that could result from enhancements. Generally speaking, the primary responsibility of typical enlisted soldiers is to know at all times what their superiors desire of them; their well being, even their survival, may well depend on it. Therefore, the rank-and-file are typically extremely sensitive to the wishes of command and, even when those wishes are not officially communicated, there is an expectation that a soldier will "get it" and learn to read the signs and comply, or disregard at their peril. Further, military culture is based on the assumption that the decisions of leadership are entitled to greater weight based on superior knowledge and judgment. Diffusing the power to make decisions strikes at the heart of the legitimacy of leadership; and so cognitive enhancements pose dangers to received military models that mere physical enhancements do not.

There are further implications for service, pay, and conditions. Perhaps we should think about enhanced warfighters as we do with other specially trained operators, such as the Army's Special Forces or Navy SEALs. That is, military policy could be to keep the enhanced separated from the unenhanced, in special or elite units; this would reduce any friction between the two groups. However, this segregation may merely telescope the problem out to a broader level, shifting tension from within units to among different units: if special units are given access to enhancements, or otherwise treated or rewarded differently—assuming we can even think of enhancements as rewards—then other units may feel slighted.

But as we alluded to above, it may be an open question of whether a particular enhancement may be a benefit to the individual. Leaving disenhancements aside, some or many enhancements pose side-effect risks; for instance, we still do not adequately understand the role of sleep and long-term effects of sleep deprivation, even if we can engineer a warfighter to operate on very little or no (true) sleep, as some animals are already capable of doing. So depending on one's perspective, an enhancement could be a reward or benefit, or it could be an undesired risk, as some believed about anthrax vaccinations (Wasserman & Grabenstein, 2003; Berkelman, Halsey, & Resnik, 2012).

How, then, should enhancements affect the service commitment of military personnel? Insofar as an enhancement is costly to develop and represents an investment, it may be reasonable to expect the enhanced warfighter to commit to longer service. But if an enhancement is seen more as a mere risk, then perhaps a shorter length of service is appropriate for the enhanced. Similar decisions may need to be made with respect to pay, promotions, and so on. For instance, if promotions and "danger pay" may be used to incentivize volunteers, enhanced soldiers could be better positioned and more likely to accept dangerous missions in exchange for those benefits.

On the mission side of operations, human enhancements may elicit a backlash that hinders the mission and therefore detracts from the value of enhancements for the military. This kind of blowback is already seen with the US government's use of unmanned aerial vehicles (UAVs) in the so-called "drone wars": While the US views its target strikes as appropriate—if not ethically

required—to the extent that it is taking American military personnel out of harm's way in a presumably just campaign, adversaries often see drones as an unfair, cowardly, and dishonorable proxy for a military afraid to engage face-to-face with human resistance (Galliott, forthcoming). This sentiment seems to fuel resentment and hatred toward the US, which in turn may help to recruit more terrorists (Foust, 2012; Plaw, 2012).

Similarly, if adversaries regard military enhancements as unfair, cowardly or abominable, they may be counterproductive to the larger war effort and perhaps encourage the enemy to resort to more conventional but very much despicable means (Galliott, 2012a). This is not to say that war should be a "fair fight." Indeed, the whole idea of employing emerging technologies is to leverage force and confer some military advantage. However, as with drone strikes, states must carefully think about the consequences of enhancing soldiers in terms of possible retaliatory options, and such considerations may preclude the employment of such means in the first instance (Galliott, 2012b).

Another criticism of the drone wars that may be applied to military enhancements is the charge that these technologies, by better ensuring the survival and success of our own military personnel, serve to make war more risk-free and therefore a more palatable option (Lin, Abney, & Bekey, 2008; Lin, 2010; Lin, 2011; Galliott, forthcoming; Human Rights Watch, 2012). That is, we may be tempted into choosing a military option during a political conflict, rather than saving war as the last resort as demanded by traditional just war theory. This ethical imperative is reflected in Civil War General Robert E. Lee's observation: "It is well that war is so terrible; otherwise, we would grow too fond of it" (Cooke, 1876, p. 184; Levin, 2008). As war becomes less terrible—at least for our own side—our natural aversions to it may be lessened as well.

This criticism leads to other related charges such as that drones are making it easier to wage war secretly, thus subverting democratic requirements, e.g., any due process afforded to targets that are US citizens and the War Powers Resolution of 1973 (50 USC §1541-1548). To the extent that enhancements can make it easier for military teams to covertly conduct missions and penetrate enemy lines, it would likewise be easier to conduct illegal operations, such as assassinations and cross-border attacks without the permission of the receiving nation-state.

ETHICS

In the above two sections, we have identified the key challenges that military human enhancement may pose to law, operations, and related policy. In this final section, we briefly discuss a range of other implications that fall broadly under the banner of "ethics."

Character and Virtue

In recent decades, virtue ethics has enjoyed a broad resurgence of interest by scholars, applying the Aristotelian moral framework to environmental ethics, business ethics, bioethics, medical, and legal ethics (Oakley & Cocking, 2001; Sandler & Cafaro, 2005; Walker & Ivanhoe, 2007). Virtue ethics is often thought of as uniquely suitable for professional ethics, so given that the military is one of the professions, it should not surprise us that virtue ethics has been recognized as having core applications here as well. Indeed, virtue ethics has arguably been an integral component of thinking about military ethics for millennia, insofar as reference to virtues (e.g., courage, honor, loyalty, and justice) is an enduring feature of ethical discourse in the military tradition (Olsthoorn, 2010).

Virtue ethical frameworks are also being applied to the unique ethical challenges presented by emerging military technologies, such as autonomous robots and drones (Lin, Abney, & Bekey, 2012; Enemark, 2013). We can extend that trend to consider the ethical implications that military

enhancements may have with respect to the moral virtues. First, let us briefly clarify what we mean by "virtues" in the ethical context that concerns us here. In most ethical theories in which virtues play a central role, moral virtues are understood to be states of a person's character, which we have already said are stable dispositions that promote that person's reliable performance of right or excellent actions. Such actions, when the result of genuine virtue, imply the praiseworthiness of the person performing them. In human beings, virtues of character are not gifts of birth or passive circumstance; they are cultivated states that lead to a person's deliberate and reasoned choice of the good. They result from habitual and committed practice and study of right actions, and they imply an alignment of the agent's feelings, beliefs, desires and perceptions in ways that are consistently found to be appropriate to the various practical contexts in which the person is called to act.

Thus, virtues of character are conceived as personal "excellences" in their own right; their value is not exhausted in the good actions they promote. When properly integrated, individual virtues contribute to a moral agent's possession of "virtue" writ large; that is, they motivate us to describe a person as virtuous, rather than merely noting their embodiment of a particular virtue such as courage, honesty or justice. States of a person's character contrary to virtue are characterized as vices, and a person whose character is dominated by vice is therefore appropriately characterized as vicious.

A virtuous person is conceived as good, they are also understood to be moving toward the accomplishment of a good, flourishing or excellent life; that is, they are living well. While the cultivation of virtue does not aim at securing the agent's own flourishing independently of the flourishing of others (it is not egoistic in this sense), the successful cultivation of a virtuous character is conceptually inseparable from the possibility of a good life for the agent. Yet the way this good is achieved in action cannot be fixed by a set of advance rules or principles, but must be continually discerned by the agent herself in a manner that is adapted to the particular practical contexts and roles she occupies. This contextual element sets virtue ethics clearly apart from utilitarian and deontological frameworks, and it explains why virtue ethics is so useful for application to the military profession.

Virtue ethics presupposes that the appropriate actions of a courageous soldier in battle, for example, will be very different from those of a courageous teacher or courageous politician, and from how the soldier displays courage at home in civilian life. The virtuous agent is "prudentially wise," meaning that she is able to readily see what moral responses different situations call for, and she can adapt her conduct accordingly in a way that nevertheless reflects her unified character as a virtuous individual. What, then, are the implications of military enhancements for the ability of warfighters to cultivate and express virtue? What follows does not exhaust the topics of potential concern about military enhancement and virtue, but merely an overview of the issues that are likely to matter most from a virtue-ethical standpoint.

We should start by questioning what counts as a "virtuous" enhancement. Many proposed enhancements might be viewed as ways to directly enhance military virtue itself. For example, if a pill, subdermal implant, or genetic alteration can make warfighters more willing to expose themselves to risk of harm, doesn't the enhancement make them more courageous? Yet this is too simple an analysis. From the moral standpoint, a trait or disposition is not a virtue just because it happens to result in appropriate actions. Virtuous actions must also emanate from the person's own moral viewpoint, that is, from his or her way of seeing and judging the ethical and practical implications of a situation. Otherwise the actions, however desirable from an institutional point of view, are not creditable to the moral character and wisdom of the agent. Thus if virtue and character matter in military ethics (note this assumes that we have

gone beyond narrowly utilitarian considerations, such as risk-benefit calculations), then it very much matters how an enhancement modifies warfighters, not just how it affects their behavior.

For example, a pill that suppresses common physiologically-rooted panic reactions in battle looks compatible with virtue, if those reactions would otherwise undermine the soldier's training, expertise and rational grasp of the situation. Consider a soldier who successfully cultivates the thoughts, desires and feelings that are fitting for an excellent soldier in battle, but whose actions in the field are still hampered by autonomic symptoms of alarm beyond his or her control (e.g., shortness of breath, dangerously elevated pulse). Such a person could be aided in courage by an enhancement that short-circuits those symptoms.

Yet if the enhancement leads a soldier to act in ways that contradict a cognitive grasp of what's appropriate (e.g., "I knew it was too risky to engage that truck convoy without better reconnaissance, but for some reason I just did it anyway"), then the enhancement is actually an impediment to courage, in this case promoting the contrary vice of rashness. Alternatively, if the enhancement elicits apparently courageous actions from a soldier who continues to have seriously inappropriate feelings, attitudes, and judgments about battlefield risk, we would not say that the outcome of the enhancement is a courageous or "good" soldier; we have merely boosted the utility of a bad one. Enhancements of this sort would be problematic not only in particular cases, but also because they could interfere more generally with the ethical habituation of virtuous soldiers, who become prudentially wise actors only by habitually learning to see situations correctly and develop appropriate responses and strategies for dealing with them. If enhancements come to be used as a substitute for that learning process, they will actually hinder the cultivation of prudent, courageous and good soldiers, according to virtue ethics.

The issue of reversibility of enhancements is relevant here too. Since virtue presupposes the cognitive or affective flexibility to adapt behavior to circumstance and social context, an enhancement that "set" an agent's behavior patterns in a certain mode, or otherwise made his or her reaction patterns less adaptable (e.g., to civilian life or peacetime operations) would inhibit the ability to function virtuously and, by extension, to lead a good life. Even temporary enhancements could introduce this problem if they prevent the soldier from adapting well to the emerging exigencies of battle. A virtuous soldier is one who can immediately "dial down" the targeted desire to kill the enemy when a crowd of children unpredictably enters the field of action.

Virtue ethics also requires us to consider the potential impact of enhancements on moral leadership in military life. Most virtue ethicists acknowledge that fully virtuous agents who cultivate and display moral wisdom in all of their professional and personal roles are usually a significant minority in any population: it's not easy to be virtuous. Therefore, one of the most important social and professional functions of the virtuous person is to serve as a moral example to which others aspire and strive to emulate. In the context of military life, this function is largely imputed to the officer corps. Enlisted soldiers are certainly recognized for exemplary acts of courage and valor, but as in any profession, complete military virtue is thought to require not only fine actions but also much experience, as well as mature reflection upon the goals and ideals of the profession—something officer training can provide.

This invites a novel set of ethical questions about enhancements, some recurring throughout this report: Will they be given to officers, or just combat soldiers? Will they erect a moral divide between the military ranks? Who will have greater "moral authority" and status as ethical exemplars: enhanced or unenhanced military personnel? How will enhancement impact the process of military education? Would an unenhanced officer's lessons on cultivating courage or fortitude over a lifetime of service be relevant to a soldier artificially enhanced for these qualities? There are also important questions about how enhancement

might affect perceptions of military character by civilians and by unenhanced forces abroad; for example, will enhanced soldiers encounter less goodwill or greater resistance from those who see their status as antithetical to traditional ideals of military virtue and character?

Finally, ethical concerns with military enhancement do not end with the question of what it means to be a good soldier; they extend to what it means to be a good human being. There is a debate among virtue ethicists about whether virtue is rooted in a distinctive conception of what, if anything, a human should naturally be. Aristotle certainly thought so, but some modern virtue ethicists deny this (Swanton 2003; Slote 2011). Still, most virtue ethicists believe that what is ethical for a human is inseparable from what is appropriate to human development on the whole. If they are right, then enhancements that take us too far from what is distinctively human are morally problematic in their own right. That said, enhancements that introduce non-natural physiology like the ability to eat grass or forgo sleep would be of far less concern to a virtue ethicist than enhancements that warp the distinctive moral, emotional and intellectual capacities that underpin virtue of character. For example, a pill or neural implant that disrupted or diminished a soldier's overall capacity to experience grief, guilt, compassion, curiosity, creativity, critical reflection or love would be highly problematic from a virtue-ethical standpoint (Nussbaum, 2011).

Emotion and Honour

Related to the issue of military virtues and professionalism is the question of what role emotions and honor, or codes of ethics, play in warfighters. With human enhancements, military organizations may elevate or diminish emotions and other psychological dispositions in their operators for some immediate benefit, but we also need to consider broader effects. Questions in this area include: does participation in any war, regardless of whether one's own side of the conflict's participation fulfills just war theory criteria, damages one's humanity? What does killing do to the psychological, spiritual, and emotional health of the warrior? What effect would human enhancements have with respect to that health?

Some scholars and clinicians assert that any violence against another human being causes the perpetrator psychological damage, even if the actions were taken undeniably in self-defense. Rachel MacNair, clinical psychologist and author of *Perpetration-Induced Traumatic Stress: The Psychological Consequences of Killing*, describes the dangers of taking another human life:

All of these things—anxiety, panic, depression, substance abuse—can also be included in the 'psychological consequences' of killing, along with such things as increased paranoia or a sense of disintegration, or dissociation or amnesia at the time of the trauma itself. In the case of killing, feelings of guilt can vary widely, from killing that is not socially approved, such as criminal homicide, to killing that is not only approved but also expected, such as soldiers in war. People can feel guilty even under circumstances that involve clear self-defense.... [S]evere PTSD can be suffered without any feelings of guilt at all, and guilt can be suffered without any symptoms of PTSD (MacNair, 2002).

The warfighters' code of honor plays a key role in preserving their mental health, in addition to preventing atrocities. As French explains in *The Code of the Warrior* (French, 2003): Murder is a good example of an act that is cross-culturally condemned. Whatever their other points of discord, the major religions of the world agree in the determination that murder (variously defined) is wrong. Unfortunately, the fact that we abhor murder produces a disturbing tension for those who are asked to fight wars for their tribes, clans, communities, cultures or nations. When they are trained for war, warriors are given a mandate by their society to take lives. But they must learn to take only certain lives in certain ways, at certain

times, and for certain reasons. Otherwise, they become indistinguishable from murderers and will find themselves condemned by the very societies they were created to serve.

Warrior cultures throughout history and from diverse regions around the globe have constructed codes of behavior, based on that culture's image of the ideal warrior. These codes have not always been written down or literally codified into a set of explicit rules. A code can be hidden in the lines of epic poems or implied by the descriptions of mythic heroes. One way or another, it is carefully conveyed to each succeeding generation of warriors. These codes tend to be quite demanding. They are often closely linked to a culture's religious beliefs and can be connected to elaborate (and frequently death defying or excruciatingly painful) rituals and rites of passage.

In many cases this code of honor seems to hold the warrior to a higher ethical standard than that required for an ordinary citizen within the general population of the society the warrior serves. The code is not imposed from the outside. The warriors themselves police strict adherence to these standards; with violators being shamed, ostracized, or even killed by their peers.

The code of the warrior not only defines how he should interact with his own warrior comrades, but also how he should treat other members of his society, his enemies, and the people he conquers. The code restrains the warrior. It sets boundaries on his behavior. It distinguishes honorable acts from shameful acts.

But why do warriors need a code that ties their hands and limits their options? Why should a warrior culture want to restrict the actions of its members and require them to commit to lofty ideals? Might not such restraints cripple their effectiveness as warriors? What's wrong with, "All's fair in love and war?" Isn't winning all that matters? Are concerns about honor and shame burdens to the warrior? And, again, what is the interplay between cognitive enhancements and this code of honor?

One reason for such warriors' codes may be to protect the warrior himself (or herself) from serious psychological damage. To say the least, the things that warriors are asked to do to guarantee their cultures' survival are far from pleasant. Even those few who, for whatever reason, seem to feel no revulsion at spilling another human being's guts on the ground, severing a limb, slicing off a head, or burning away a face are likely to be affected by the sight of their friends or kinsmen suffering the same fate. The combination of the warriors' own natural disgust at what they must witness in battle and the fact that what they must do to endure and conquer can seem so uncivilized, so against what they have been taught by their society, creates the conditions for even the most accomplished warriors to feel tremendous self-loathing.

In the introduction to his valuable analysis of Vietnam veterans suffering from post-traumatic stress disorder (PTSD), *Achilles in Vietnam: Combat Trauma and the Undoing of Character*, psychiatrist and author Jonathan Shay stresses the importance of "understanding...the specific nature of catastrophic war experiences that not only cause lifelong disabling psychiatric symptoms but can ruin good character" (Shay, 1994). Shay has conducted countless personal interviews and therapy sessions with American combat veterans who are part of the Veterans Improvement Program (VIP). His work has led him to the conclusion that the most severe cases of PTSD are the result of wartime experiences that are not simply violent, but which involve what Shay terms the "betrayal of 'what's right'" (Shay, 1994). Veterans who believe that they were directly or indirectly party to immoral or dishonorable behavior (perpetrated by themselves, their comrades, or their commanders) have the hardest time reclaiming their lives after the war is over. Such men may be tortured by persistent nightmares, may have trouble discerning a safe environment from a threatening one, may not be able to trust their friends, neighbors, family members, or government, and many have problems with alcohol, drugs, child or spousal

abuse, depression, and suicidal tendencies. As Shay sorrowfully concludes, "The painful paradox is that fighting for one's country can render one unfit to be its citizen" (Shay, 1994).

Warriors need a way to distinguish what they must do out of a sense of duty from what a serial killer does for the sheer sadistic pleasure of it. Their actions, like those of the serial killer, set them apart from the rest of society. Warriors, however, are not sociopaths. They respect the values of the society in which they were raised and which they are prepared to die to protect. Therefore, it is important for them to conduct themselves in such a way that they will be honored and esteemed by their communities, not reviled and rejected by them. They want to be seen as proud defenders and representatives of what is best about their culture: as heroes, not "baby-killers."

In a sense, the nature of the warrior's profession puts him or her at a higher risk for moral corruption than most other occupations because it involves exerting power in matters of life and death. Warriors exercise the power to take or save lives, order others to take or save lives, and lead or send others to their deaths. If they take this awesome responsibility too lightly—if they lose sight of the moral significance of their actions—they risk losing their humanity and their ability to flourish in human society.

In his powerful work, *On Killing: The Psychological Cost of Learning to Kill in War and Society*, Lt. Col. Dave Grossman illuminates the process by which those in war and those training for war attempt to achieve emotional distance from their enemies. The practice of dehumanizing the enemy through the use of abusive or euphemistic language is a common and effective tool for increasing aggression and breaking down inhibitions against killing:

It is so much easier to kill someone if they look distinctly different than you. If your propaganda machine can convince your soldiers that their opponents are not really human but are 'inferior forms of life,' then their natural resistance to killing their own species will be reduced. Often the enemy's humanity is denied by referring to him as a 'gook,' 'Kraut,' or 'Nip' (Grossman, 1996).

Like Shay, Grossman has interviewed many US veterans of the Vietnam War. Not all of his subjects, however, were those with lingering psychological trauma. Grossman found that some of the men he interviewed had never truly achieved emotional distance from their former foes, and seemed to be the better for it. These men expressed admiration for Vietnamese culture. Some had even married Vietnamese women. They appeared to be leading happy and productive post-war lives. In contrast, those who persisted in viewing the Vietnamese as "less than animals" were unable to leave the war behind them.

Grossman writes about the dangers of dehumanizing the enemy in terms of potential damage to the war effort, long-term political fallout, and regional or global instability:

Because of [our] ability to accept other cultures, Americans probably committed fewer atrocities than most other nations would have under the circumstances associated with guerrilla warfare in Vietnam. Certainly fewer than was the track record of most colonial powers. Yet still we had our My Lai, and our efforts in that war were profoundly, perhaps fatally, undermined by that single incident. It can be easy to unleash this genie of racial and ethnic hatred in order to facilitate killing in time of war. It can be more difficult to keep the cork in the bottle and completely restrain it. Once it is out, and the war is over, the genie is not easily put back in the bottle. Such hatred lingers over the decades, even centuries, as can be seen today in Lebanon and what was once Yugoslavia (Grossman, 1996).

The insidious harm brought to the individual warriors who find themselves swept up by such devastating propaganda matters a great deal to

those concerned with the warriors' own welfare. In a segment on the "Clinical Importance of Honoring or Dishonoring the Enemy," Jonathan Shay describes an intimate connection between the psychological health of the veteran and the respect he feels for those he fought. He stresses how important it is to the warrior to have the conviction that he participated in an honorable endeavor:

Restoring honor to the enemy is an essential step in recovery from combat PTSD. While other things are obviously needed as well, the veteran's self-respect never fully recovers so long as he is unable to see the enemy as worthy. In the words of one of our patients, a war against subhuman vermin 'has no honor.' This is true even in victory; in defeat, the dishonoring absence of human themis (shared values, a common sense of 'what's right') linking enemy to enemy makes life unendurable"(Shay, 1994).

Shay finds echoes of these sentiments in the words of J. Glenn Gray from Gray's modern classic on the experience of war, *The Warriors: Reflections on Men in Battle*. With the struggle of the Allies against the Japanese in the Pacific Theater of World War II as his backdrop, Gray brings home the agony of the warrior who has become incapable of honoring his enemies and thus is unable to find redemption himself:

The ugliness of a war against an enemy conceived to be subhuman can hardly be exaggerated. There is an unredeemed quality to battle experienced under these conditions, which blunts all senses and perceptions. Traditional appeals of war are corroded by the demands of a war of extermination, where conventional rules no longer apply. For all its inhumanity, war is a profoundly human institution....This image of the enemy as beast lessens even the satisfaction in destruction, for there is no proper regard for the worth of the object destroyed....The joys of comradeship, keenness of perception, and sensual delights [are] lessened.... No aesthetic reconciliation with one's fate as a warrior [is] likely because no moral purgation [is] possible (Gray, 1998).

By setting standards of behavior for themselves, accepting certain restraints, and even "honoring their enemies," warriors can create a lifeline that will allow them to pull themselves out of the hell of war and reintegrate themselves into their society, should they survive to see peace restored. A warrior's code may cover everything from the treatment of prisoners of war to oath keeping to table etiquette, but its primary purpose is to grant nobility to the warriors' profession. This allows warriors to retain both their self-respect and the respect of those they guard (French, 2003). Cognitive enhancements, then, would operate against this complex and subtle background to effects that may be psychologically disastrous or difficult to predict.

Broader Impacts

From the preceding, we can see that concerns about military enhancements can be focused inward, toward the health and character of the human subject. But these concerns can also ripple outward, focused beyond the human subject. These issues engage law, policy, and ethics; for instance, how do enhancements impact military operations, including how adversaries might respond? But since enhancements change the human person—the basic unit of society—we can expect changes and challenges beyond such first-order and second-order effects. These broader impacts are temporally more distant and therefore tend to be discounted; but they are nevertheless foreseeable and should also be considered ahead of rapidly advancing science and technology.

First, we can expect the proliferation of perhaps every military technology we invent, as history shows. For instance, besides WWII-era Jeeps and modern-day Humvees returned to society as better-

polished civilian models, and GPS was directly adopted by society without any modification (Lin, 2010). The method of diffusion would be different and more direct with enhancements, though: most warfighters return to society as civilians (our veterans) and would carry back any permanent enhancements and addictions with them. Again, the US has about 23 million veterans, or one out of every 10 adults, in addition to 3 million active and reserve personnel (US Census, 2011), so this is a significant segment of the population. Would these enhancements—such as a drug or an operation that subdues emotions—create problems for the veteran to assimilate to civilian life? What kinds of pressures and how much, including healthcare costs, would be placed on the Department of Veteran Affairs, given military enhancements, and are we prepared to handle those costs?

Proliferation into society is not limited to our own borders, but we can expect it to occur internationally, again as history shows. Even the military robotics that have been deployed in war only within the last decade are not just a US phenomenon, as much as it may seem from the international media's focus. It is reported that more than 50 nations now have or are developing military robotics, including China and Iran (Singer, 2009; Sharkey, 2011). Where the US deploys robots for their considerable advantages in surveillance, strike, and other roles, we would be unprepared to receive the same treatment if (and when) it is inflicted upon us. With nuclear weapons, while the US had the first-mover advantage, proliferation pushed us toward non-use agreements and erased much of that advantage (International Atomic Energy Agency, 1970). Likewise with military enhancements (and robotics), we can expect other nations to develop or adopt the same technologies we develop and therefore, at some point, have the same capabilities, again diminishing the competitive benefits once derived from the enhancements.

The wider impact of military enhancements echoes those already identified in the rich literature on human enhancements generally, for instance: would enhanced veterans—say, with bionic limbs and augmented cognition—put other civilians at a competitive disadvantage with respect to jobs, school, sports, and so on? Would this create an enhancement arms race beyond steroids, as is now starting in sports? If enhanced veterans (and the other enhanced people they inspire) live longer than usual, does that put undue burdens on social security and pension funds? Would these advantages create social pressures to enhance more generally, as we are witnessing with Modafinil—a cognitive enhancer—in both the classroom and the workplace?

Relatedly, would enhanced warfighters be bad role models, such as steroid-using athletes, for children? We can expect some children will want to enhance themselves, and some will succeed. But this seems bad insofar as their bodies are still developing and anyway don't have full intellectual or legal capacity to make informed life-altering decisions (e.g., tattoos). Enhancements, as distinct from purely therapeutic uses, would likely not have been tested on normal children and other populations, such as pregnant women and those of advanced age, in that it may be too risky to conduct such testing on those healthy individuals, relative to the benefits. That is, there would be no countervailing benefit of helping to cure the individual of an illness, if those subjects were normal to begin with.

Earlier, we discussed the issue of access to enhancements within the military: who should receive them, some warfighters or all; and what problems could unequal access create? At a larger societal scale, there may be friction between the enhanced and unenhanced, or at least a class divide—in terms of education, job outlook, etc.—as we already see between those with Internet access and those without. If enhancements in society are expensive and only afforded by the wealthier, then this may widen the gap between the haves and the have-nots. Similarly, would there be a communication divide between the enhanced and unenhanced, if the former can see in different

wavelengths and have different powers of perception? On the other hand, if there's no moral issue generally with enhancing humans, then why not uplift animals closer to human-level intelligence (Dvorsky, 2012), building on chimera work previously discussed?

While neither international nor domestic law requires that we consider these and other societal effects, ethics and public policy do. Without proper management, technological disruptions can have serious, avoidable effects. Possible solutions, as suggested for other issues previously considered, may include a policy to implement only reversible or temporary enhancements in the military as a firewall for broader society. To be sure, some commentators do not view enhancements in the general population as a bad or unmanageable outcome. So this continuing wider debate on human enhancements—which we will not explicate here, as it is available elsewhere (Allhoff et al., 2010a)—should be of interest to the military, especially as the military is a key driver of new technologies that eventually make their way into broader society.

CONCLUSION

Human enhancements have the potential to make it easier and safer for warfighters to do their job. Enhancements have a long history in the military, but recent opposition to their use in realms such as sports and academia, as well as controversy over the off-label or experimental use of certain drugs by the military, are forcing questions about the appropriateness of their use by the military. While military enhancements have largely escaped the scrutiny of the public as well as policymakers, the science and technologies underwriting human enhancements are marching ahead.

The military technology getting the most attention now is robotics. As we suggested throughout the report, there may be ethical, legal, and policy parallels between robotics and enhancements, and certainly more lessons can be drawn. We can think of military robotics as sharing the same goal as human enhancement. Robotics may aim to create a super soldier from an engineering approach: they are our proxy mecha-warriors. However, there are some important limitations to those machines. For one thing, they don't have a sense of ethics—of what is right and wrong—which can be essential on the battlefield and to the laws of war. Where it is child's play to identify a ball or coffee mug or a gun, it's notoriously tough for a computer to do that, especially objects that are novel or otherwise unlabeled (Le et al., 2012). This does not give us much confidence that a robot can reliably distinguish friend from foe, at least in the foreseeable future.

In contrast, cognitive and physical enhancements aim to create a super-soldier from a biomedical direction, such as with drugs and bionics. For battle, we want our soft organic bodies to perform more like machines. Somewhere in between robotics and biomedical research, we might arrive at the perfect future warfighter: one that is part machine and part human, striking a formidable balance between technology and our frailties. Indeed, the field of neuromorphic robots already aims to fill this gap by using biological brains to control robotic bodies (Krichmar & Wagatsuma, 2011).

In changing human biology with enhancements, we also may be changing the assumptions behind existing laws of war and even human ethics. If so, we would need to reexamine the foundations of our social and political institutions—including the military—if prevailing norms create "policy vacuums" (Moor 2005) in failing to account for new technologies (Lin, 2012b; Lin, Allhoff, & Rowe, 2012; Taddeo, 2012).

In comic books and science fiction, we can suspend disbelief about the details associated with fantastical technologies and abilities, as represented by human enhancements. But in the real world—as life imitates art, and "mutant powers" really are changing the world—the details matter and will require real investigations.

The issues discussed in this report are complex, given an unfamiliar interplay among technology ethics, bioethics, military law, and other relevant areas. As such, further studies will require close collaborations with a range of disciplines and stakeholders, as is increasingly the case in technology ethics (Brey, 2000). Given the pervasive role of national security and defense in the modern world in particular, as well as the flow of military technologies into civilian society, many of these issues are urgent now and need to be actively engaged, ideally in advance of or in parallel with rapidly emerging science and technologies.

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KEY TERMS AND DEFINITIONS

Disenhancement: A medical or biological intervention that makes one worse off.

Miltiary-Technical Proliferation: The spread of military technologies into the civilian realm.

Principle of Distinction: An element of international law and just war theory which demands that a weapon must be discriminating enough to target only combatants and never noncombatants.

Principle of Proportionality: Demands that the use of a weapon be proportional to the military objective, so as to keep civilian casualties to a minimum.

SIrUS Principle: Related to proportionality in that it requires methods of attack to be minimally harmful in rendering a warfighter *hors de combat* or unable to fight.

Soldier Enhancement: Medical or biological intervention introduced into a soldier's body designed to improve warfighting performance, appearance, or capability besides what is necessary to achieve, sustain or restore health.

Therapy: An intervention or treatment intended to alleviate a condition suffered by a patient, elevating his or health closer to normal.