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Yesterday's war; tomorrow's technology: peer commentary on 'Ethical, legal, social and policy issues in the use of genomic technologies by the US military'

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ABSTRACT

A recent article by Maxwell J. Mehlman and Tracy Yeheng Li, in the *Journal of Law and the Biosciences,* sought to examine the ethical, legal, social, and policy issues associated with the use of genetic screening and germ-line therapies ('genomic technologies') by the US Military. In this commentary, we will elaborate several related matters: the relationship between genetic and non-genetic screening methods, the history of selection processes and force strength, and the consequences and ethics of, as Mehlman and Li suggest, engineering enhanced soldiers. We contend, first, that the strengths of genomic testing as a method of determining enrollment in the armed forces has limited appeal, given the state of current selection methods in the US armed forces. Second, that the vagaries of genetic selection, much like other forms of selection that do not bear causally or reliably on soldier performance (such as race, gender, and sexuality), pose a systematic threat to force strength by limiting the (valuable) diversity of combat units. Third, that the idea of enhancing warfighters through germ-line interventions poses serious ethical issues in terms of the control and ownership of 'enhancements' when members separate from service.

KEYWORDS: bioethics, genomics, genomic technologies, military ethics, genetic discrimination, personalized genomics

INTRODUCTION

Genomic technologies have never been more popular. In civilian life, an ever-expanding range of genetic markers has been found for disease, among other indicators of morbidity or poor health. There is hope that germ-line therapies will someday enable more effective therapies and even cures for certain genetic disorders, such as Huntington's disease. Taken together, these *genomic technologies* have begun to dominate the bioethical landscape, as privacy, confidentiality, and novel consent issues emerge with the advent of these new technologies.

Maxwell J. Mehlman and Tracy Yeheng Li, in their recent article 'Ethical, legal, social and policy issues in the use of genomic technologies by the US Military',[1] seek to investigate the potential—and peril—of these technologies in the military sphere. The advent of 'dual-use technologies' has long been an issue in science and technology studies, as the interplay and transfer of the research, funding, testing, and implementation of technologies across the civilian-military divide poses distinct socio-ethical issues.[2] Mehlman and Li canvas the various ethical, legal, and social implications (ELSI) of these technologies, as they stand to be used by the US military.

We are sympathetic to the claims that Mehlman and Li make, but wish to highlight three issues presented by the military use of genomic technologies that may advance the debate, and present alternative conclusions about the overall acceptability of the use of particular diagnostic of therapeutic modalities. Context is everything, and ultimately these considerations may not always give us reason to contest the ethics of the use of genomic technologies by the military. Nonetheless, there is a need to investigate these issues, before reaching conclusions about the permissibility of the military use of genomic technologies.

THE POWER OF SCREENING

First, Mehlman and Li identify a possible use of genomic technologies in screening soldiers for entry, particular roles in combat operations, and propensity to suffer from afflictions that are an operational hazard for warfighters (such as post-traumatic stress disorder (PTSD), traumatic bone fracture, and blood loss).[3] They note that there is already interest in using genetic testing to select for better warfighter performance, confirm clinical diagnoses, and promote warfighter health. Genetic testing could conceivably supplement existing selection procedures, providing a range of tests to assess the suitability of candidates for membership in the armed forces, or—within the services—for particular positions or roles.

Any screening process, however, must proceed with caution. For a variety of reasons, genetic screening does not provide reliable information that directly relates to selection of individuals with particular traits suited to the military. First, many traits—strength, capacity to develop muscle or retain body fat, intelligence or memory recall—are functions of environment as much as they are genetics. Second, these traits may be the result of epistatic interactions: a phenotype such as strength may depend on both particular

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1 Maxwell J. Mehlman & Tracy Y. Li, *Ethical, Legal, Social, and Policy Issues in the Use of Genomic Technology by the US Military*, 1 J.L. Biosciences 244, 280 (2014).

2 Jordi Molas-Gallart & Tom Sinclair, *From Technology Generation to Technology Transfer: The Concept and Reality of the Dual-Use Technology Centres*, 19 Technovation 661, 671 (1999).

3 *Id.*; Mehlman and Li, *supra* note 1, at 245.

genes, and the interaction of those genes with their genetic background. In this context, it is unlikely that cataloguing genetic markers will result in reliable predictions of complex traits. Third, there may be epigenetic features of behavioral traits: in addition to epistatic interactions and environmental factors influencing a trait, there may be an additional interaction between environment and genetic endowment that is not uniquely determined by either.

These potentials make genetic selection for military purposes a complicated logistical prospect, as acknowledged by the 2010 JASON report on the $100 genome.[4] It also raises ethical issues in the administration of screening processes as a cost-effective way to promote the strength of the armed forces. Any cost-effectiveness analysis contains an explicitly ethical component, as we determine our willingness to pay for a particular test or intervention relative to the purported benefits such a test or intervention provides us.

Put another way, the expense of genetic screening to determine a particular trait like maximum muscle mass, even if possible, may not be cost-effective relative to, say, a push-up test. Humanity has, for thousands of years, displayed a remarkable ability to determine the quality of particular traits in members of their species. The ability to use a novel explanatory mechanism to describe what we can already identify through 'low-tech means' is not necessarily an advance, properly understood. Fetishizing these advances for their novelty alone has, for example, been shown to be spurious in the case of advances in neuroscience that 'show' a person is lying;[5] we should proceed with similar caution in this domain.

Of course, the idea of a '$100 genome' gives the appearance of low cost. However, the idea costing on a per-genome basis has been questioned.[6] The acquisition, sequencing, *analysis*, and storage of genomic information—in electronic and biological forms—combined with the cost of decision-making will likely be higher. We have to decide if, and where, this type of screening will be an effective use of resources, or if there are other ways we can improve force strength and national security.

DISCRIMINATION

The idea of fetishizing a particular explanatory mechanism dovetails into our second concern: genetic discrimination. Here, we set aside the idea that, due to its exemption from the Genetic Information Nondiscrimination Act, the armed forces do nothing *illegal* by utilizing screening. We are interested, rather, in the ethical implications of genetic discrimination—the 'E' in the ELSI presented by Mehlman and Li. What are the ethical implications of genetic discrimination within the military?

Although more advanced in some respects than the rest of American society (eg in racial integration), the United States military nonetheless has a history of discriminatory policies and practices. Recent episodes involving the repeal of 'don't ask, don't tell' involving a warfighter's sexual orientation and the blanket ban on women serving in particular combat roles—for example, Navy SEALS, Special Forces, and other elite combat units—exemplify continuing struggles with work conditions that are not necessarily

4 D. McMorrow, *The $100 Genome: Implications for the DoD* (2010).

5 Neil Levy, Neuroethics (2007).

6 Erika C. Hayden, *Is the $1,000 Genome for Real?* Nature News (2014), http://www.nature.com/news/is-the-1-000-genome-for-real-1.14530 (accessed November 28, 2014).

grounded in rationality. While we have seen significant progress in non-discriminatory behavior in recent years, there is no reason to believe that the tools of genetics will be immune from such challenges.

Moreover, the United States military has, at times, practiced genetic discrimination in the denial of healthcare benefits to its service members. For example, a Marine Corps instructor was denied healthcare and disability insurance after a cancer diagnosis, due to concurrent diagnosis of Von Hippel–Lindau syndrome, a genetic condition that predisposes the sufferer to tumor growth. While the instructor was able to demonstrate that his affliction had been exacerbated by military service, the case shows that the US military already engages in treatment of individuals that discriminates against them on the basis of genomic results.[7]

Yet, there are many in which the screening for certain diseases that will not appear until later in a warfighter's life—potentially beyond their service period—would constitute a discrimination based on characteristics that will not influence a warfighter's performance. Mehlman and Yi note the case in which an officer was asked to test for the presence of the gene for Huntington's disease before promotion to flag officer, after it was revealed that members of his family possessed the gene. Huntington's is, indeed, a disease that not only affects the body, but also the mind, and changes in mood and decision-making capacity are no doubt concerns for an officer responsible for subordinates. Nonetheless, there is considerable variety in the onset of symptoms; some of this difference even has its own genetic basis.[8] If the individual in question had markers indicating a slow onset or progression, or a family history demonstrating a slow progression of the disease, there is no reason that they could not perform as well as their peers before their capacities were undermined. Any compromise of performance is exceedingly unlikely to occur suddenly, and thus there is little risk of significant impairment mid-mission. Plenty of battlefield injuries, such as traumatic brain injury, *could* engender such risks and with a more rapid onset than Huntington's; yet, we don't deny individuals the capacity to continue service on the basis of the risk of a brain injury.

This type of discrimination highlights an arbitrary distinction between the inevitable onset of a genetic disease such as Huntington's and the probabilistic but (relatively) statistically likely occurrence of a debilitating injury leading to discharge through injury. Until such an occurrence affects an individual's ability to serve, we continue to allow individuals in the latter category to do their jobs. Injury may not be the *inevitable* end of a warfighter's capacities in the same way as Huntington's might be. But the burden of proof ought to be on the military to provide reasons that the mere *presence* of the Huntington's gene should be enough to qualify an individual from enlistment or promotion. Disease is an inevitable, but manageable, decline in capacity to serve—as much as age, infirmity, or battlefield-acquired disability. The idea that someone cannot serve because of what they will be *one day* undermines the dignity of those with heritable conditions or other particular genetic qualities.

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[7] Susannah Baruch, Mark Nunes & Jay Platt, Genetics and Public Policy Center, *Berman School of Bioethics, John Hopkins University, NW* (Jan. 10, 2006), http://www.dnapolicy.org/news.past.php?action=detail&past_event_id=25 (accessed November 28, 2014).

[8] J Brandt et al., *Trinucleotide Repeat Length and Clinical Progression in Huntington's Disease*, 46 NEUROLOGY 527, 531 (1996); Karl Kieburtz et al., *Trinucleotide Repeat Length and Progression of Illness in Huntington's Disease*, 31 J. MED. GENET. 872, 874 (1994).

The obvious reply to this is that the potential costs of failing to achieve (legitimate) military objectives are so high that national interest trumps what is a relatively modest imposition on individual rights. Yet, even if we take this seriously, an open question remains regarding whether the ultimate result of genetic testing in the military will be improved force preparedness. Stigma undermines force preparedness, and—as Mehlman and Yi note—there is already concern that genetic testing will lead to stigmatization of serving members based on results that indicate a potential adverse health outcome in the warfighter's force. In recent years, the armed forces have determined that stigma around mental illness is not only detrimental to individuals, but to overall force effectiveness.[9] Any decisions around the violation of individual rights will have to contend not only with the type of violation genetic discrimination entails, but on the broad consequences of adopting a policy of genetic discrimination.

The focus on genetics points to another facet of the military—its *telos*. Picking a set of genetic traits on which to base the selection of personnel and their assignment to given roles implies a static set of individual skills. Yet, the increasingly varied set of engagements in which the military takes part requires a corresponding diversity of individuals needed to pursue these legitimate goals.[10] As military activities change, we ought to exercise care in ensuring that our selection of warfighters is appropriate to the ends of the military.

Particularly as the armed forces are required to interface and build trust with civilian populations—something they struggle with already[11]—, we want to avoid unintentionally screening out a wide range of personal characteristics among military personnel that might meaningfully contribute to the legitimate aims of the armed forces. In peacekeeping, military policing, establishing transitional governments, disaster relief, and other important roles the military plays, our forces may need to represent our values. Diversity is a hallmark of American life. In the military, as in other fields of endeavor, we ought to guard against designing an institution that compromises our deeply held values.[12]

GENOMIC TECHNOLOGIES AS A SECURITY RISK

A final concern relates to germ-line enhancements. Genetic enhancement is not, we believe, in principle impermissible, but depending on the circumstances they may present a number of risks. For example, a formerly enhanced soldier may run the risk of having difficulty reintegrating not just with civil society, but with their civilian self. There may be serious psychological and social consequences for the warfighter suddenly returned to a physiological or cognitive norm, like someone accustomed to high-risk environments suddenly stripped of their weapons. Conversely, if a soldier is discharged still enhanced, they are conceivably still partly a militarized self, prepared to bring to bear physical or mental advantages in inappropriate situations.

More importantly, we ought to worry about the security threat a discharged, enhanced warfighter could present. Mehlman and Li note that one of the ways genomic

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[9] Sadie F. Dingfelder, *The Military's War on Stigma*, 40 Monitor Psychol. 52 (2009).

[10] Adam Henschke & Nicholas G. Evans, *Winning Well by Fighting Well*, 26 Int'l J Applied Philos. 149, 163 (2012).

[11] J. Christopher Daniel & Kathleen H. Hicks, Global Health Engagement (2014).

[12] Jeremy Waldron, *Dignity and Defamation: The Visibility of Hate*, Harv. L. Rev. 1596, 1657 (2010).

technologies may be used is in identifying better ways to defeat an adversary. In the event of enhancing our soldiers, it is likely that belligerent states and non-state actors will attempt to exploit or undermine these enhancements. A soldier's body could become a security risk, in the same way as the loss of an unmanned aerial vehicle over enemy territory incurs the risk of unintended technology transfer.

The typical strategy of restricting access to 'dual-use technologies' is to control their export, sale, and transfer. And unlike many other occupations—and warfighting is increasingly a professional occupation[13]—, we typically privilege the military's interests over the warfighter's rights. Yet the troubling move here, that the military could very well attempt to exercise its prerogative over a soldier beyond her enlistment in the interests of protecting against technology, cannot be overlooked.

This is, we believe, a serious challenge for the enhanced warfighter and one that current ethics on the subject does not properly address. Indeed, by introducing paternalism as a criterion for decision-making about the use of genomic technologies on warfighters, Mehlman and Li further move the locus of bodily control away from the warfighter and more to the military's purview. While paternalism is often justifiable in the context of military service, enhancement might well turn out to be forever. Whether a warfighter is able to consent to this type of relationship—whether they should be *able* to do so—should be a serious question in future works on the subject.

Although we don't believe that any of these concerns are an insurmountable problem for Mehlman and Li's analysis, we do think that they are important concerns for an ELSI of genomic technologies in the military. Genomic technologies have promise; the challenge is making sure that promise is not overstated and is not used to the detriment of the proximate and ultimate goals of our security forces.

[13] Henschke and Evans, *supra* note 10, at 155; Ned Dobos, *Endangering Soldiers and the Problem of Private Military Contractors*, in The Routledge Handbook of Ethics and War (Allhoff, Evans, and Henschke, eds., 2013) at 269, 271.