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Pharmacological performance enhancement and the military

Exploring an ethical and legal framework for 'supersoldiers'

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Summary

- Debate surrounding the use of performance-enhancing drugs by the military is often forestalled by concerns regarding side effects and safety. By taking as a starting assumption that any such drugs would have already been accepted as safe and approved for military use, this paper seeks to move the discussion beyond these concerns, to explore the broader ethical and legal implications raised by their use – an area in which debate has hitherto been deficient. In opening up the discussion in this way, it is possible to define an ethical and legal framework within which the use of pharmacological technology to enhance military effectiveness would be justifiable.
- Drug use by the armed forces could be employed to improve soldier strength, mental capacity, recovery, and resistance to fatigue and trauma. However, in approving the use of drugs for these military applications, it is critical that their effects on the human nature of soldiers, such as empathetic understanding, or mental capacity, should not be undermined, where soldiers are to uphold their moral obligations under international humanitarian law.
- By sending soldiers to war, society requires them to face dangers and risks that are not comparable to most other walks of civilian life. Administering drugs in a conflict context thus requires a different cost-to-benefit calibration. This paper identifies three scenarios in which pharmacological interventions would be ethically permissible in these circumstances. These are: 1) in 'life vs death' situations; 2) in cases of strategically exceptional mission requirement; and 3) within restorative limits. However, if pharmacological approaches were to be adopted, these could not be an excuse for poor planning, or shortfalls in equipment and training – taking performance-enhancing drugs should not become routine in the military.
- The nature of the military organization is such that achieving the requirements of free and informed consent to pharmacological performance enhancement is a challenge. The hierarchical structure and close bonding of military teams means that soldiers are likely to feel coercion – whether genuine or perceived – from their superiors and their peers. In addition, the secrecy that is likely to surround a military enhancement programme would limit the availability of information on which to base a decision to consent. This would leave military commanders with a predicament over whether to entirely decline the administration of drugs, or to permit some troops to take them and to bear the additional risks and burden, as well as shouldering the damage such a split may confer on unit cohesion.

— The armed forces do not exist in isolation from civil society. Therefore, attitudes towards the use of drugs in the military will ultimately be determined by societal opinion, as was the case with the use of amphetamines during the Second World War. There is a growing acceptance within modern society of drug use: both of prescribed medications (which almost half of UK adults now take regularly), and of illegal drugs, particularly among the younger population from which the military recruits. However, it is suggested that any use of performance-enhancing drugs by the military must be reversible on discharge from the service back into society.

01 Introduction

Militaries are exploring potential pharmacological solutions to enhance the performance of service personnel through improved strength, mental capacity, recovery, and resistance to fatigue and trauma.

In 2018 Maghawir al-Thawra, a group allied to the Free Syrian Army, uncovered a cache of more than 300,000 Captagon pills while conducting operations against ISIS near the Syrian border with Iraq.[1] An amphetamine-based drug, Captagon is the trademark name for fenethylline, a highly addictive stimulant of the central nervous system with euphoric psychoactive properties, which has been listed as a controlled substance by the World Health Organization and the trading of which is illegal in most countries.[2] Captagon has been used by ISIS fighters to induce fearlessness, suppress pain and achieve exceptional human energy, allowing combatants to stay awake for days and fight with a 'reckless abandon'.[3] Originally developed as a treatment for attention and sleep disorders in the 1960s, Captagon had been banned in most countries by the 1980s, as it was found to be highly addictive. Yet the pharmaceutical became a key weapon in the conflict in Syria, where it has been dubbed the 'Jihad pill', and 'chemical courage'.[4]

The use of drugs in war has a long history, as soldiers[5] and their commanders have sought to counter human weaknesses in conflict situations. Mental and physical fatigue, fluctuating psychological confidence or muscular strength, and problems of acclimatization all affect the capabilities and effectiveness

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1 Combined Joint Task Force Operation Inherent Resolve Press Affairs (2018), '$1.4m terrorist drug cache seized, destroyed in southern Syria', 18 June 2018, https://www.inherentresolve.mil/Media-Library/Article/1552560/14m-terrorist-drug-cache-seized-destroyed-in-southern-syria (accessed 15 Jun. 2020).
2 Wu, N., Feng, Z., He, X. et al. (2019), 'Insight of Captagon Abuse by Chemogenomics Knowledgebase-guided Systems Pharmacology Target Mapping Analyses', *Nature*, 9(2268): pp. 1–12, doi:10.1038/s41598-018-35449-6 (accessed 16 Jun. 2020).
3 Holley, P. (2015), 'The tiny pill fueling Syria's war and turning fighters into superhuman soldiers', *Washington Post*, 19 November 2015, https://washingtonpost.com/news/worldviews/wp/2015/11/19/the-tiny-pill-fueling-syrias-war-and-turning-fighters-into-super-human-soldiers (accessed 10 Jun. 2019).
4 Gidda, M. (2017), 'Drugs in War: What is Captagon, the 'Jihad Pill' used by Islamic State Militants?', *Newsweek*, 12 May 2017, https://www.newsweek.com/drugs-captagon-islamic-state-jihad-war-amphetamines-saudi-arabia-608233 (accessed 10 Jun. 2019); Van Hout, M. C. and Wells, J. (2016), 'Is Captagon (fenethylline) helping to fuel the Syrian conflict?', *Addiction*, 111(4): pp. 745–9, doi: 10.1111/add.13262 (accessed 15 Jun. 2020).
5 This paper uses the word 'soldier' in its broadest sense, to include the men and women serving in all branches of the British Armed Forces – the Army, Royal Air Force and Royal Navy (including the Royal Marines).

of soldiers in combat, and militaries have used various methods over the centuries to overcome these difficulties.[6] Today, militaries in the West are investing in research and development programmes to enhance the performance of their soldiers, exploring pharmacological solutions to improve soldier strength, mental capacity, recovery, and resistance to fatigue and trauma.[7] Such applications could deliver significant advantage on the battlefield, where any improvement in the cognitive, physical or emotional capabilities of soldiers can increase survivability and mission success. However, the possibilities for the pharmacological enhancement of soldiers raise important ethical and legal concerns that are unique to the military environment.

The possibilities for the pharmacological enhancement of soldiers raise important ethical and legal concerns that are unique to the military environment.

Much of the narrative surrounding performance-enhancing drugs principally derives from the controversy over doped athletes, cheating their way to an unfair advantage at sporting events. This is misleading when considering their potential use by the military: the level playing field of competitive sport is not to be compared to the existential threat of today's battlefield. The use of performance-enhancing drugs in sport has no social benefit. Furthermore, the secrecy and opprobrium that shrouds their use has left a gap in scientific research about their effectiveness and side effects, which means that militaries are failing to: a) capitalize on their advantages;[8] b) understand their impact when in use by an adversary; and c) develop an assessment of any long-term drawbacks, should they ever be used in a future conflict.

This paper will explore the ethical and legal considerations surrounding the pharmacological performance enhancement of soldiers. It investigates how changing the experience of war could change the very character of conflict itself, and examines how the implications of drug use in war could undermine the legitimacy of the use of armed force by the state. It presents several scenarios in which performance enhancement would be ethically permissible in a conflict context; scrutinizes the impact of implementing performance enhancement programmes on soldier human rights and on broader society; and argues that the research and development of performance-enhancing drugs in the military must take place within an ethically and legally justifiable framework. Since the author is a serving member of the British Army, some considerations take specific account of the UK context; however, much of the analysis is applicable for militaries and policymakers more widely.

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6 Kamieński, L. (2017), *Shooting Up: A History of Drugs in Warfare*, London: C. Hurst & Co.
7 Scharre, P. and Fish, L. (2018), 'Super Soldiers: Human Performance Enhancement', Research Paper, Center for a New American Security, https://s3.amazonaws.com/files.cnas.org/documents/CNAS_Super-Soldiers_6_Human-Performance-Enhancement-FINAL.pdf?mtime=20180917103621 (accessed 11, Jun. 2019); The Royal Society (2012), *Brain Waves 3: Neuroscience, conflict and security,* Policy Document 06/11, London: The Royal Society, https://royalsociety.org/-/media/Royal_Society_Content/policy/projects/brain-waves/2012-02-06-BW3.pdf (accessed 11 Jun, 2019); DARPA (2018), 'Reinventing Drug Discovery and Development for Military Needs', 28 November 2018, https://www.darpa.mil/news-events/2018-11-28 (accessed 2 Jul. 2019).
8 Scharre and Fish (2018), 'Super Soldiers: Human Performance Enhancement'.

02
A brief history

Throughout history, there is evidence of armed groups – both state and non-state – seeking to advance the physical and mental limits of human performance.

Despite significant advances in military technology, war remains a fundamentally human endeavour. People, not machines, fight wars, and people have remained largely the same. They need to sleep, eat, rest and recover, they feel trauma, and are constrained by the extent of the body's physical and mental capabilities. Throughout history, there is evidence of individual soldiers and entire armies seeking to advance these limits of human performance. To give just a few examples, the Ancient Greeks used opium; Viking Berserkers took hallucinogenic mushrooms; Inca warriors chewed coca leaves; and the Wehrmacht used a forerunner of crystal methamphetamine (informally known as crystal meth).[9]

In 1776, during the American War of Independence, General George Washington ordered all of his troops in the Continental Army to be vaccinated against smallpox, to enhance their immunity to the disease which he described as a greater threat 'than the sword of the enemy'.[10] Historically, disease was the real enemy in war. Contagion traditionally killed more soldiers in war than enemy action, and vaccination programmes have become a routine part of military service, as governments owe a duty of care to protect their soldiers from such foreseeable exposure.[11] This has not been without controversy, however, and later in this paper the experience of Gulf War veterans provides a useful parallel from which to consider the ethical considerations of pharmacological enhancement.

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9 Kamieński (2017), *Shooting Up*. Ohler, N. (2017), 'Blitzed: Drugs in Nazi Germany', London: Penguin.
10 Becker, A. M. (2004), 'Smallpox in Washington's Army: Strategic Implications of the Disease during the American Revolutionary War', *The Journal of Military History*, 68(2): pp. 381–430, doi: 10.1353/jmh.2004.0012 (accessed 14 Jun. 2020).
11 Ministry of Defence (2018), *Joint Service Manual of Medical Fitness*, JSP 950 Medical Policy Leaflet 6-7-7 (V1.4 Sep 18), http://data.parliament.uk/DepositedPapers/Files/DEP2019-0604/Joint_Service_Manual_of_Medical_Fitness.pdf (accessed 7 Aug. 2020); Gibson, T. M. (2002), 'A Shot in the Arm for the Military: Consent to Immunisation Against Biological Warfare Agents', *Medical Law International*, 5(3): pp. 161–79.

The context of total war during the Second World War relaxed the moral boundaries regarding the use of performance-enhancing drugs, and they became widely used by both the Allied and Axis forces.[12] Wehrmacht troops were issued with methamphetamine, or crystal meth, to keep them awake on long missions, and the popularity of its use by Panzer tank crews earned it the nickname 'Panzerschokolade' (tank chocolate).[13] By increasing the rate of metabolic processes, amphetamines boost energy and physical strength, improving stamina and eliminating the need for soldiers to sleep. In the UK, the Royal Air Force (RAF) provided aircrews with amphetamines during the war, in the form of Benzedrine 'wakey-wakey pills', to promote wakefulness when sleep was a threat to performance.[14] The British Army also provided amphetamines to its soldiers for their 'consciousness-altering properties', which were found to lift the mood and improve the courage and determination of troops, allowing them to fight harder.[15] Historians have also recorded the use of amphetamines during the Second World War by Australian, Finnish, Italian, Japanese and US troops, with the Soviet Union seemingly being the only notable exception as regards adopting the practice, preferring instead to dispense vodka to its troops.[16]

Unsurprisingly, it was in the so-called 'swinging Sixties' when experimentation with drugs became prolific in conflict, reflecting changing trends in their use across wider society at that time. The Vietnam War became the first true 'pharmacological war', so called because of the unprecedented consumption of drugs by the US military during the conflict.[17] American troops in Vietnam were issued with medical kits containing painkillers, codeine (an opiate) and amphetamines, and before departing on long-range patrols soldiers received injections of anabolic steroids.[18] A 1971 US government report revealed that 225 million tablets of stimulants, mostly the amphetamine Dexedrine, had been provided to US armed forces in Vietnam between 1966 and 1969.[19] In addition to those prescribed by the military, American soldiers in Vietnam also 'self-prescribed' a cocktail of illicit drugs including marijuana, hallucinogens (mainly LSD) and heroin.[20]

Illicit drug use among combatants continues to be a feature of present-day conflicts, most notably where irregular armed groups seek to counter the technical superiority of Western militaries.[21] Drug use has been reported among members

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12 Walker, M. (2009), 'The mobilisation of science and science-based technology during the Second World War: A Comparative History', in Maas, A. and Hooijmaijers, H. (eds), *Scientific Research in World War II: What Scientists Did in the War*, London: Routledge.
13 Steinkamp, P. (2006), 'Pervitin (Metamphetamine) tests, use and misuse in the German Wehrmacht', in Eckart, W. U. (ed.) (2006), *Man, Medicine, and the State: The Human Body as an Object of Government Sponsored Medical Research in the 20th Century*, Stuttgart: Franz Steiner Verlag; Tooze, A. (2007), *The Wages of Destruction: The Making and Breaking of the Nazi Economy*, London: Penguin Books.
14 Pugh, J. (2018), 'The Royal Air Force, Bomber Command and the Use of Benzedrine Sulphate: An Examination of Policy and Practice During the Second World War', *Journal of Contemporary History*, 53(4): pp. 740–61, doi:10.1177/0022009416652717 (accessed 4 Jun. 2019).
15 Rasmussen, N. (2008), *On Speed: The Many Lives of Amphetamines*, New York: New York University Press.
16 Kamieński (2017), *Shooting Up*; Pugh, J. (2017), 'Amphetamines and the Second World War: Stimulating Interest in Drugs and Warfare', *Defence-in-Depth*, 11 August 2017, https://defenceindepth.co/2017/08/11/amphetamines-and-the-second-world-war-stimulating-interest-in-drugs-and-warfare/#_ftn14 (accessed 12 Jul. 2019).
17 Kamieński (2017), *Shooting Up*.
18 Ibid.
19 Ibid.
20 Robins, L. (1974), *The Vietnam Drug User Returns: Final Report*, Special Action Office Monograph, Washington, DC: Special Action Office for Drug Abuse Prevention, https://files.eric.ed.gov/fulltext/ED134912.pdf (accessed 7 Aug. 2020).
21 Kan, P. R. (2009), *Drugs and Contemporary Warfare*, Washington, DC: Potomac Books.

of ISIS, Al-Qaeda and the Taliban, as well as among Chechen fighters, Somali militants and rebel groups in Liberia, Sierra Leone, Uganda and the Democratic Republic of the Congo, where combatants make use of psychoactive substances in an attempt to compensate for inadequate military training and technology.[22] These non-state armed groups use drugs to embolden and stimulate fighters, as in the case of the Pakistan-based militant group Lashkar-e-Taiba (LeT), which carried out a protracted series of terrorist attacks across Mumbai in November 2008. LeT fighters were found to have used steroids and cocaine to sustain them during the 60-hour siege, with one individual continuing to fight despite suffering serious injury.[23] Drugs are also used by these groups to reward good combat performance, and to overcome poor living conditions; they are used to recruit new fighters, and to promote fearlessness and dependency, most disturbingly in child soldiers.[24] In this way, by intoxicating combatants, drugs present irregular armed groups with a mechanism to potentially enhance their human capability, and their prospects of success in asymmetric warfare.

Drugs are also used by non-state armed groups to reward good combat performance, and to overcome poor living conditions; they are used to recruit new fighters, and to promote fearlessness and dependency, most disturbingly in child soldiers.

The armed forces are not the only profession to have resorted to drugs in order to enhance performance. The use of banned substances by professional athletes is well documented, with particularly infamous cases from the worlds of athletics and cycling. However, the occupational use of drugs is more prevalent than some may think. For example, beta blockers are reportedly used by some classical musicians to alleviate the anxiety of 'stage fright', while students and their professors may take 'smart drugs' such as Ritalin (commonly prescribed in cases of attention deficit hyperactivity disorder – ADHD), to help them focus and study. Meanwhile, Modafinil, a drug licensed for the treatment of narcolepsy, has had many occupational uses, such as combating fatigue in shift workers and regulating astronauts' sleep, and has recently has been trialled to investigate whether it can help reduce errors by tired doctors.[25]

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22 Kamieński (2017), *Shooting Up*; Kan (2009), *Drugs and Contemporary Warfare*.
23 McElroy, E. (2008), 'Mumbai attacks: Terrorists took cocaine to stay awake during assault', *Telegraph*, 2 Dec 2008, https://www.telegraph.co.uk/news/worldnews/asia/india/3540964/Mumbai-attacks-Terrorists-took-cocaine-to-stay-awake-during-assault.html (accessed 10 Sep. 2019).
24 Kan (2009), *Drugs and Contemporary Warfare*.
25 Tindall, B. (2004), 'Better Playing through Chemistry', *New York Times*, 17 October 2004, https://www.nytimes.com/2004/10/17/arts/music/better-playing-through-chemistry.html (accessed 12 Jun. 2019); Cadwalladr, C. (2015), 'Students used to take drugs to get high. Now they take them to get higher grades', *Guardian*, 15 February 2015, https://www.theguardian.com/society/2015/feb/15/students-smart-drugs-higher-grades-adderall-modafinil (accessed 12 Jun. 2019); Arendt, J. (2010), 'Shift work: coping with the biological clock', *Occupational Medicine*, 60(1): pp. 10–20, https://doi.org/10.1093/occmed/kqp162 (accessed 12 Jun. 2019); Whitmire, A., Slack, K., Locke, J. and Keeton, K. (2013), 'Sleep quality questionnaire: Short-duration flyers', NASA/TM-2013-217378, Houston: Johnson Space Center. https://ston.jsc.nasa.gov/collections/trs/_techrep/TP-2013-217378.pdf (accessed 12 Jun. 2019); Joelving, F. (2011), 'Modafinil has mixed effects on dozy surgeons', Reuters, 2 November 2011, https://uk.reuters.com/article/health-us-modafinil/modafinil-has-mixed-effects-on-dozy-surgeons-idUKTRE7A17ZU20111102 (accessed 12 Jun. 2019).

This overview of historical drug use in warfare, and of its professional applications in contemporary society, illustrates just some of the ways in which individuals have sought to improve their performance through pharmaceutical technologies. It also points to two key interrelating factors in the acceptance of such technologies. First, there is the importance of societal opinion in shaping the policy and motivations for drug use. This can be seen in the variety of contemporary applications of performance-enhancing drugs across society, reflecting a growing medicalization of Western culture, and an increasing acceptance of prescription medication in general. Almost half of all UK adults now take prescription drugs on a regular basis, and the threshold for providing them has lowered.[26] Second, advancements in medical technology have increased our understanding of the side effects and safety of drugs. And with greater government oversight regulating the standards of safety for their approval, the public have better assurances that harmful medical products will not receive licence approval.[27] The question then remains, if these technologies are considered safe, is there any reason to reject their use by soldiers?

26 NHS (2014), 'Almost half of all adults take prescription drugs', 11 December 2014, https://www.nhs.uk/news/medication/almost-half-of-all-adults-take-prescription-drugs (accessed 13 Jun. 2019); Fritz, Z. and Holton, R. (2019), 'Too much medicine: not enough trust?' *Journal of Medical Ethics*, 45(1): pp. 31–5.
27 Drug and Therapeutics Bulletin (2009), 'The licensing of medicines in the UK', *Drug and Therapeutics Bulletin*, 47(4): pp. 45–7, doi:10.1136/dtb.2009.03.0012 (accessed 15 Jun. 2020).

03
Ethical and legal parameters

A unique accord exists between the limitations war places on the individual human rights of armed forces personnel, and their role in upholding these rights.

Using drugs to enhance performance in sport may be cheating, but war is not a sporting event. Uniquely in military operations, technology and training aim to achieve a competitive advantage, not a fair chance of success. What is more, the nature of warfare involves far higher stakes than a podium position. Performance in war can have life-and-death consequences, not only for the individual soldier, but for those around them, and those on behalf of whom they have been entrusted to fight. The physical survivability and the moral responsibility demanded of soldiers in combat has implications far beyond the individual, as soldiers not only represent society and its values, but are relied on to protect and preserve them, and the civilians who are under the protection of the armed forces tolerate a very different level of ethics (including deceit and self-sacrifice) when the stakes are high. As representatives of the state, soldiers are required to respect both human rights and international humanitarian law (also known as the laws of armed conflict) in the conduct of their actions. This demands a higher standard of behaviour than that expected of those who are not soldiers, and it underpins the state's moral legitimacy to use armed force.[28]

In accepting the authority of military command, soldiers sacrifice some of their civilian freedoms.[29] They are bound by service law to obey lawful commands, and to preserve service discipline, which means that a soldier's individual agency can,

28 British Army (2018), *Values and Standards of the British Army*, https://www.army.mod.uk/media/5219/20180910-values_standards_2018_final.pdf (accessed 13 Jun. 2019).
29 Ministry of Defence (2016), *The Armed Forces Covenant*, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/49469/the_armed_forces_covenant.pdf (accessed 13 Jun. 2019).

in the course of their duties, be overridden.[30] A unique accord therefore exists between the limitations war places on the individual human rights of armed forces personnel, and their role in upholding these rights. Furthermore, when soldiers are sent to war, they are required to face danger and risks that are not comparable to those encountered in most other walks of civilian life. This places a liability on commanders to accept responsibility for the duty of care and actions of soldiers who they may ultimately require to take life, or to sacrifice it. It also requires that the governments who send them have a moral obligation to ensure that soldiers are adequately prepared, and necessarily protected. Furthermore, the long-term health of those who have served must be provided for as veterans transition back into civilian life on completion of their service.[31]

The moral and ethical thresholds in war are different from those in peacetime society, but they are not independent from it. Decisions made in conflict reflect the values of the society on whose behalf soldiers fight, and in introducing new technologies, such as the pharmacological enhancement of soldiers, these ethical values must be protected. In addition, any new technology introduced to the military must consider the legal framework under which soldiers operate, including international humanitarian law, human rights law, and relevant domestic laws. In addition, what is seemingly acceptable in one place and time may later be deemed unethical, immoral and illegal.

To assess the implications of the use of pharmacological performance-enhancing drugs by the military,[32] the following chapters evaluate the associated ethical and legal considerations in five areas:

- Would drug use by soldiers dehumanize warfare?
- Would the enhanced soldier be capable of complying with the laws of war? And would that soldier be legally responsible?
- What are the ethically permissible scenarios for enhancement?
- What level of consent would enhancement require?
- What are the implications of military drug use for wider society, notably including veteran care?

As this technology is still emergent, the outcome of this enquiry will be to define a legally and ethically justifiable framework for the research and development of pharmacological technologies in the military setting.

For the purposes of this paper, 'pharmacology' relates to drugs that are available only on prescription: it excludes both illicit and over-the-counter (OTC) drugs. It also includes drugs that are yet to be developed but that would be covered by similar regulatory controls. In the UK, these 'controlled drugs' are defined

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30 Ministry of Defence (2016), *Joint Service Publication 830: Manual of Service Law (MSL)*, https://www.gov.uk/government/collections/manual-of-service-law-msl (accessed 8 Jul. 2019); OSCE Office for Democratic Institutions and Human Rights (ODIHR) (2008), *Handbook on Human Rights and Fundamental Freedoms of Armed Forces Personnel*, Warsaw: ODIHR, https://www.dcaf.ch/sites/default/files/publications/documents/HandbookHumanRightsArmedForces-080409.pdf (accessed 13 Jun. 2019).
31 Ministry of Defence (2016), *The Armed Forces Covenant*.
32 As already noted, the author is a serving member of the British Army. Some considerations therefore take specific account of the UK context, but much of the analysis is applicable for militaries and policymakers more widely.

and listed under the Misuse of Drugs Act 1971. They are subject to strict legal governance, according to the Controlled Drugs (Supervision of Management and Use) Regulations 2013, which determine how they are prescribed, supplied, stored and destroyed.[33] These drugs are tightly managed because they present a greater risk of abuse, particularly where they have addictive properties, and their misuse can cause harm. However, this paper will not concentrate on the safety risks associated with prescription drugs, and instead assumes that any drugs agreed for use by the military would have already been accepted as safe and approved for use by the relevant body responsible. In the UK, this is the Medicines and Healthcare Products Regulatory Agency (MHRA).[34] Making an assumption about the approved safety standards of drugs for military use will allow the discussion to move beyond the safety concerns, which often cloud such considerations, to explore instead the broader ethical and legal implications raised by their use. Debate on this issue has hitherto been deficient.[35]

33 Department of Health (2013), *Controlled Drugs (Supervision of management and use) Regulations 2013: Information about the Regulations*, London: HMSO, https://www.legislation.gov.uk/uksi/2013/373/contents/made (accessed 10 Jul. 2019).
34 Medicines and Healthcare Products Regulatory Agency (undated), 'About us', https://www.gov.uk/government/organisations/medicines-and-healthcare-products-regulatory-agency/about (accessed 10 Jul. 2019).
35 Although it should be noted that there have been drugs deemed safe for use that have proved, at a later date, to have long-term or unforeseen dangers to health and have consequently been withdrawn from medical use.

04
The dangers of dehumanizing warfare

Changing brain chemistry to alter soldiers' experiences of war may avoid mental suffering, but could change the very nature of conflict.

Post-traumatic stress disorder (PTSD) is one condition that has recently generated interest in the application of pharmacological enhancement in the military. The symptoms of traumatic stress are a common reaction to the violence of war, and as a consequence combat soldiers are at greater risk of suffering PTSD than the general population.[36] PTSD can have devastating effects on the individual, and their family, as sufferers experience sleep disturbance, anxiety, depression, hypervigilance and an inability to adjust back to civilian or non-combat military life.[37] In extreme cases, it can result in suicide and the collateral trauma that is then induced in family members, friends and colleagues. PTSD also reduces the combat effectiveness of the armed forces by removing soldiers from the battlefield and has implications for military manning as soldiers are lost from the services, either through medical discharge or the voluntary early termination of their careers. Furthermore, PTSD places additional pressure on health services and social care services, as veterans require treatment and additional support in civilian society.

36 Stevelink, S. A. M., Jones, M., Hull, L. et al. (2018), 'Mental health outcomes at the end of the British involvement in the Iraq and Afghanistan conflicts: a cohort study', *The British Journal of Psychiatry*, 213(6): pp. 690–697. doi:10.1192/bjp.2018.175 (accessed 16 Jun. 2020).
37 Combat Stress (2019), 'What is PTSD?', https://www.combatstress.org.uk/what-ptsd (accessed 15 Jun. 2020).

In 2018 the UK Ministry of Defence committed the sum of £220 million to funding mental health services within the armed forces.[38] In the US in 2012, the Department of Defense spent some $294 million on PTSD care for service members, while spending by the Department of Veterans Affairs on PTSD care of veterans exceeded $3 billion.[39] One such treatment is propranolol, a beta blocker used to treat anxiety and heart problems.[40] (It is also used by some professional musicians seeking to manage stage fright.[41]) When administered during or immediately after a traumatic event, propranolol has been found to block the series of biochemical processes initiated in the body by stress hormones such as adrenaline.[42] Following a traumatic event, these hormones cause an increase in brain elasticity in which neural changes occur that lead to the consolidation of memory, and enhance our learning from the event.[43] Propranolol does not blank out such memories; rather, it detaches them from their strong emotional connection, making them less emotionally stressful – one of the key causes of PTSD. Soldiers taking propranolol would still recall the traumatic incident, but would not associate it with any emotional memories of their experience.[44]

The use of propranolol could reduce the 'mental casualties' of war, by reducing soldiers' emotional suffering and therefore making war more humane.

The use of propranolol could reduce the 'mental casualties' of war, by reducing soldiers' emotional suffering and therefore making war more humane.[45] Technological developments in armour and battlefield medicine have long sought to protect soldiers' bodies, so why not protect their minds as well? The prevention and treatment of physical injury is a priority in conflict, and avoiding mental injury should be equally as important. Furthermore, preventing PTSD with propranolol would be far more cost-effective for a society than treating the condition, in terms of enduring socioeconomic costs. Therefore the long-term costs of war could be reduced in terms of both lives and public money.[46]

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38 Ministry of Defence (2018), 'Defence Secretary shows commitment to Armed Forces mental health with over £220-million funding and new helpline', https://www.gov.uk/government/news/defence-secretary-shows-commitment-to-armed-forces-mental-health-with-over-220-million-funding-and-new-helpline (accessed 18 Jun. 2019).
39 Institute of Medicine (2014), *Treatment for Posttraumatic Stress Disorder in Military and Veteran Populations: Final Assessment*, Washington, DC: National Academies Press, https://doi.org/10.17226/18724 (accessed 20 Aug. 2020).
40 NHS (2018), 'Propranolol', https://www.nhs.uk/medicines/propranolol (accessed 18 Jun. 2019)
41 Tindall (2004), 'Better Playing Through Chemistry'.
42 Vaiva, G., Ducrocq, F., Jezequel, K., Averland, B., Lestavel, P., Brunet, A. and Marmar, C. R. (2003), 'Immediate treatment with propranolol decreases posttraumatic stress disorder two months after trauma', *Biological Psychiatry*, 54(9): pp. 947–9; doi:10.1016/S0006-3223(03)00412-8 (accessed 16 Jun. 2020); Johnson, K. (2010), 'Propranolol shows early promise for PTSD', *Clinical Psychiatry News*, 38(12): pp. 10–1; Fletcher, S., Creamer, M. and Forbes, D. (2010), 'Preventing Post Traumatic Stress Disorder: Are Drugs the Answer?', *Australian and New Zealand Journal of Psychiatry*, 44(12): pp. 1064–71.
43 Shalev, A. Y. (2000), 'Biological Responses to Disasters', *Psychiatric Quarterly*, 71(3): pp. 277–88.
44 Kamieński, L. (2012), 'Helping the Postmodern Ajax: Is Managing Combat Trauma through Pharmacology a Faustian Bargain?', *Armed Forces & Society*, 39(3): pp. 395–414, doi:10.1177/0095327X12451558 (accessed 15 Jun. 2020).
45 Coker, C. (2001), *Humane Warfare*, London: Routledge.
46 Kamieński (2012), 'Helping the Postmodern Ajax'.

However, although research into the use of propranolol to forestall PTSD is still in its nascent phase, it poses a number of ethical dilemmas about the application of such neurological drugs in warfare. Changing brain chemistry to alter soldiers' experiences of war could change the very character of conflict itself. The passion and primordial violence that characterize war could be lost where drugs deny soldiers the ability to experience the existential elements of conflict. Desensitizing soldiers through neurological interventions would risk turning conflict into a soulless endeavour, whereby soldiers would be conscious of their actions, but feel no connected emotions, and be unable to recognize the psychological consequences of their behaviour. This blunting of the senses in war could have damaging potential for the honourable conduct of soldiers.

The development of propranolol demonstrates the complex challenges affecting the human nature of soldiers in conflict, particularly in relation to brain chemistry. Emotions are an important element of war: they play a vital role in learning from experiences, and are fundamental to a soldier's moral development.[47] If soldiers were not to experience an emotional response to situations in warfare, then they would be deprived of the vital learning opportunities that are essential for both their own development and that of the armed forces as an institution. At an individual level, therapeutic 'forgetting' could affect soldiers' primal 'fight or flight' mechanism, leading to greater risk-taking and to less rational behaviour.[48] Moreover, the loss of emotional connections with the historical memories of conflict would deny the armed forces, as an institution, the social bonding and trust that their legacy fosters, as the lessons of war do not just transform tactics and technology, but also contribute to the institutional identity of militaries. This learning extends to the national level, too, where war is a 'most violent teacher'.[49] The horrors of war are something that nations as a whole must not be allowed to forget. Desensitizing soldiers would also desensitize the public to some of the harsh realities of conflict, as the experiences of returning soldiers would no longer communicate the emotional impact of war to wider society. And, at the very highest level, a change in societal sentiment towards conflict could even shape the way politicians approach decisions about going to war.

In researching and developing neuropharmacological agents for use by the military, the consequences of changing the psychological experience of conflict must be recognized. For all its inhumanity, war is a profoundly human phenomenon, and any drug that removes the emotions from war risks dehumanizing conflict. Soldiers are already becoming increasingly dislocated from the battlefield, through technological advancements in long-range weapon systems, unmanned drones and satellite technology, which have facilitated killing at distance.[50] And while this may be acceptable in certain types of warfare, where soldiers are required to deploy on the ground it is imperative that they retain an empathetic understanding of the consequences of their actions. Any pharmacological performance-enhancing technology introduced to the military must be tested to ensure that it does not change the psychological experience of conflict.

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47 Kabasenche, W. P. (2007), 'Emotions, Memory Suppression, and Identity', *The American Journal of Bioethics*, 7(9): pp. 33–4, doi: 10.1080/15265160701518581 (accessed 15 Jun. 2020).
48 Kamieński (2012), 'Helping the Postmodern Ajax'.
49 Grene, D. (ed.) (1989), *Thucydides: The Peloponnesian War – The Complete Hobbes Translation*, Chicago and London: The University of Chicago Press.
50 McMahan, J. and Strawser, B. (2013), *Killing by Remote Control: The Ethics of an Unmanned Military*, Oxford: Oxford University Press; Coffey, A. (2018), 'What Does the Future of Land Fires Look Like?', *RUSI Defence Systems*, 20(1), https://rusi.org/publication/rusi-defence-systems/what-does-future-land-fires-look (accessed 15 Jun. 2020).

05
Soldier and state responsibility

For soldiers to be compliant with the laws that apply during armed conflict, they must have independent moral agency, to be capable of understanding and acting on reason.

In 2002 Canadian troops were conducting a night-time training exercise on a live firing range at Tarnak Farms, outside Kandahar in Afghanistan. Overhead, the pilots of two US F-16 fighter aircraft mistook the live gunfire for an attack by Taliban insurgents and dropped a bomb, killing four Canadian soldiers and wounding a further eight.[51] At the time, the pilots were returning to their home base in Kuwait following a 10-hour long-range patrol mission, and interpreted the live fire as a threat to their aircraft, engaging under self-defence.[52] However, two subsequent boards of inquiry found that the pilots had failed to follow appropriate flight procedures.[53] In the debate that followed the incident, discussions focused on the pilots' defence – that their judgment had been impaired as a result of using amphetamines to combat fatigue, the drugs having been issued to them by the US Air Force.[54]

Although the precise role of amphetamines in the Tarnak Farms incident is unlikely to ever be fully understood, it raises some key concerns regarding the effects of drugs on individual responsibility in conflict. For soldiers to be compliant with the laws that apply during armed conflict, they must have independent moral agency, to be capable of understanding and acting on reason. This requirement underpins

51 Canadian Department of National Defence (2002), *Tarnak Farm Board of Inquiry Final Report*, https://web.archive.org/web/20050707210858/http://www.vcds.forces.gc.ca/boi/00native/final-report.doc (accessed 1 Jul. 2019); Mcinerney, T. (2003), 'Friendly Fire: From Tragedy to Justice', *Wall Street Journal*, 21 January 2003, https://www.wsj.com/articles/SB1043111510420989064 (accessed 7 Aug. 2020).
52 Friscolanti, M. (2005), *Friendly Fire: The Untold Story of the U.S. Bombing that Killed Four Canadian Soldiers in Afghanistan*, Mississauga, ON: John Wiley & Sons.
53 Canadian Department of National Defence (2002), *Tarnak Farm Board of Inquiry Final Report*.
54 Bower, E. A. and Phelan, J. R. (2003), 'Use of amphetamines in the military environment', *Lancet*, 362 (Supplement): pp. S18–19, doi: 10.1016/S0140-6736(03)15060-X (accessed 14 Jun. 2020); Burkeman, O. and Norton-Taylor, R. (2003), 'US pilots blame drug for friendly fire deaths', *Guardian*, 4 January 2003, https://www.theguardian.com/world/2003/jan/04/afghanistan.richardnortontaylor (accessed 1 Jul. 2019).

the legal basis for their conduct in war.[55] Any inability for soldiers to make rational choices – or to act freely on these choices – could render them not legally responsible for their actions under international criminal law.[56]

It is plausible that pharmacological interventions could interfere with the ability of soldiers to form the *mens rea*.

The key issue of responsibility and drug use in conflict concerns two possible effects; 1) the influence of drugs on soldiers' mental capacity, and 2) their influence on soldiers' ability to control their behaviour. On the point of mental capacity, it is plausible that pharmacological interventions could interfere with the ability of soldiers to form the *mens rea* (literally, 'guilty mind') necessary to be held accountable for their actions in war.[57] *Mens rea* refers to the mental state of criminal intent that is required for criminal responsibility: its absence when committing an offence precludes the attribution of criminal responsibility to the perpetrator.[58] The distinction of *mens rea* varies according to jurisdiction, but Article 30 of the Rome Statute of the International Criminal Court (ICC) determines that this mental element comprises two components; intent and knowledge.[59] An individual has intent where they mean to engage in the conduct, and mean to cause, or were aware of, the consequences,[60] while knowledge concerns the awareness that a circumstance exists or the consequence will occur.[61] For the pharmacologically enhanced soldier, any drug that were to considerably affect mental capacity – to the extent that it interfered with their awareness and ability to appreciate the consequences of their actions – could therefore render them no longer legally responsible. An example of this can be seen in the Rome Statute exemption for intoxication, whereby defendants are excluded from criminal responsibility if they were to be 'in a state of intoxication' (as long as the intoxication was involuntary).[62] Therefore, where a soldier no longer has

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55 Wolfendale, J. (2008), 'Performance-Enhancing Technologies and Moral Responsibility in the Military', *The American Journal of Bioethics*, 8(2): pp. 28–38. doi: 10.1080/15265160802014969 (accessed 16 Jun. 2020).
56 UN General Assembly (2011), *Rome Statute of the International Criminal Court*, Article 31 – Grounds for Excluding Criminal Responsibility, https://www.icc-cpi.int/resourcelibrary/official-journal/rome-statute.aspx (accessed 2 Jul. 2019).
57 Harrison Dinniss, H. and Kleffner, J. (2016), 'Soldier 2.0: Military Human Enhancement and International Law', *International Law Studies*, 92(1): pp. 432–82.
58 Law Commission of England and Wales (1978), 'Report on the Mental Element in Crime', Law Commission Report No. 89, London: HMSO.
59 'Unless otherwise provided, a person shall be criminally responsible and liable for punishment for a crime within the jurisdiction of the Court only if the material elements are committed with intent and knowledge.' UN General Assembly (2011), *Rome Statute of the International Criminal Court*, Article 30 – Mental Element, https://www.icc-cpi.int/resourcelibrary/official-journal/rome-statute.aspx (accessed 2 Jul. 2019).
60 Ibid.
61 Ibid.
62 '[A] person shall not be criminally responsible if, at the time of that person's conduct: […] (b) The person is in a state of intoxication that destroys that person's capacity to appreciate the unlawfulness or nature of his or her conduct, or capacity to control his or her conduct to conform to the requirements of law, unless the person has become voluntarily intoxicated under such circumstances that the person knew, or disregarded the risk, that, as a result of the intoxication, he or she was likely to engage in conduct constituting a crime within the jurisdiction of the Court'. UN General Assembly (2011), *Rome Statute of the International Criminal Court*, Article 31 – Grounds for Excluding Criminal Responsibility, https://www.icc-cpi.int/resourcelibrary/official-journal/rome-statute.aspx (accessed 2 Jul. 2019).

the mental capacity to determine the rational consequences of their actions, they would not be able to uphold their moral obligations under international humanitarian law.

Similarly, if a pharmacological intervention were to destroy a soldier's capacity to control their behaviour, they would equally be excluded from criminal responsibility.[63] Although beyond the scope of this research paper, the possibility of soldiers no longer controlling their own individual behaviour is a particularly important consideration in the development of some alternative military enhancement technologies, such as neurostimulation,[64] or exoskeletons,[65] where enhancement could remove control of a soldier's actions to a third party – whether intentionally or unintentionally (for example if such technology were to be hacked by an adversary).

The issue of moral responsibility is significant because the state has a responsibility for the conduct of its state 'organs', including those organizations and individuals acting on its behalf, such as the armed forces and service personnel.[66] Therefore, were an enhanced soldier to commit a wrongful act, and were such an enhancement to be the product of a state intervention, i.e. to form part of an armed forces enhancement programme, this could constitute a breach of a state's international obligation. Such a failure would challenge the legal responsibility of the state, and therefore dispute its legitimacy to engage in warfare. If a state could not account for the responsible actions of its military, its justification to use armed force would be ethically and legally undermined. Therefore, any pharmacological performance-enhancing technology introduced to the military must not degrade a soldier's mental capacity or ability to act according to his/her own free will.

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63 '[A] person shall not be criminally responsible if, at the time of that person's conduct: […] (a) The person suffers from a mental disease or defect that destroys that person's […] capacity to control his or her conduct to conform to the requirements of law'. UN General Assembly (2011), *Rome Statute of the International Criminal Court*, Article 31 – Grounds for Excluding Criminal Responsibility, https://www.icc-cpi.int/resourcelibrary/official-journal/rome-statute.aspx (accessed 2 Jul. 2019).
64 Royal Society (2012), *Brain Waves 3: Neuroscience, conflict and security*.
65 Lockheed Martin (2020), 'Strength To Go The Distance', https://www.lockheedmartin.com/en-us/products/exoskeleton-technologies/military.html (accessed 7 Aug. 2020).
66 International Law Commission (2001), *Responsibility of States for Internationally Wrongful Acts*, Article 4 – Conduct of organs of a State, http://legal.un.org/ilc/texts/instruments/english/draft_articles/9_6_2001.pdf (accessed 2 Jul. 2019); ICRC, *Customary IHL Database*, Rule 149, Responsibility for Violations of International Humanitarian Law, https://ihl-databases.icrc.org/customary-ihl/eng/docs/v1_rul_rule149 (accessed 2 Jul. 2019).

06
Ethical scenarios for enhancement

The ethical arguments around pharmaceutical use in the military centres on concerns over the use of drugs by otherwise healthy individuals.

The Tarnak Farms incident described above illustrates the complex nature of decision-making in conflict. The US pilots involved had been airborne for more than 10 hours when they found themselves in the position of having only moments to make a life-and-death decision. The cognitive load experienced in the cockpit of an F-16 fighter aircraft is not to be underestimated, and pilots are required to be mentally alert at all times in order to process the large volume of critical detail necessary to make such split decisions. Many military tasks, particularly in combat, require personnel to remain vigilant for long periods of time in anticipation of an attack or a requirement to act. Furthermore, military activities often take place during hours when the circadian rhythm is at its trough: either early in the morning, or late at night. The cumulative effects of this over several months on operations – often in arduous conditions, with poor sleep – inevitably lead armed forces personnel to suffer from sleep deprivation, which can have significant effects on their cognitive performance.[67] The long-term impact of such partial sleep deprivation has been shown to impair moral judgment and elevate the risk of human error, as well as reducing innovation and increasing pressure on individuals to conform with 'group thinking'.[68] Therefore, if bad decisions are made when tired in combat, is there even an ethical obligation to enhance soldiers in such circumstances?

The use of amphetamines, in the form of Dexedrine, by the pilots at Tarnak Farms had been sanctioned by the US Air Force as a part of its fatigue management programme, to overcome the negative effects of tiredness on long combat

67 Royal Society (2012), *Brain Waves 3: Neuroscience, conflict and security*.
68 Kjellevold Olsen, O., Pallesen, S. and Eid, J. (2010), 'The Impact of Partial Sleep Deprivation on Moral Reasoning in Military Officers', *Sleep*, 33(8): pp. 1086–90, doi: 10.1093/sleep/33.8.1086 (accessed 15 Jun. 2020).

missions.[69] The US is the only Western military to officially authorize the use of amphetamines in operations, and following the events at Tarnak Farms the US Air Force strongly defended its decision to prescribe the drug, calling it 'the gold standard for anti-fatigue'.[70] The dose taken by the pilots involved was low, equivalent to drinking several cups of coffee. Furthermore, pilots are required to undertake ground testing of the drug to check for potential adverse side effects before using it on operations. Following the events at Tarnak Farms, the US Air Force emphasized that the drug had been used in hundreds of missions without incident.[71] This position has been verified by clinical trials, which proved that Dexedrine did not increase risk-taking behaviour during long periods of wakefulness.[72]

The controversy surrounding the use of amphetamines in this instance has clouded debate over their use, preventing a more considered discussion of the broader ethical case for improving human performance in combat. The concerns over safety and negative side effects are one of the principal reasons why performance-enhancing drugs have not been more widely pursued by the military. But what if a drug were to achieve the operational benefits desired, without negative side effects or potential for abuse?

One such drug is Modafinil. Developed to treat narcolepsy and sleep apnoea, Modafinil promotes wakefulness and has been found to significantly improve vigilance, alertness and cognitive performance.[73] In the US, it is available on prescription for the treatment of shift-work sleep disorder.[74] No clinically significant side effects have been observed in the drug's use.[75] Modafinil also does not prohibit the ability to reinitiate sleep following treatment.[76] It has been approved for use by the Republic of Singapore Air Force, and has been tested for military application in both the US and the UK.[77] Furthermore, when compared with caffeine, which is widely used as a stimulant in the military, Modafinil was recommended as preferred by the US Committee on Military Nutrition Research, which described it as far superior, and with fewer side effects.[78]

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69 Caldwell, J. (2003), *An Overview of the Utility of Stimulants as a Fatigue Countermeasure for Aviators*, US Air Force Research Laboratory Technical Report, Brooks City AFB, Texas: Air Force Research Laboratory, https://apps.dtic.mil/sti/pdfs/ADA413128.pdf (accessed 7 Aug. 2020).
70 Kamieński (2017), *Shooting Up*; Hart, L. (2003), 'Air force rushes to defend amphetamine use', *The Age*, 18 January 2003, https://www.theage.com.au/world/air-force-rushes-to-defend-amphetamine-use-20030118-gdv328.html (accessed 3 Jul. 2019).
71 Kamieński (2017), *Shooting Up*.
72 Killgore, W., Grugle, N., Killgore, D., Leavitt, B., Watlington, G., McNair, S. and Balkin, T. (2008), 'Restoration of risk-propensity during sleep deprivation: caffeine, dextroamphetamine, and modafinil', *Aviation, Space, and Environmental Medicine*, 79(9): pp. 867–74, doi 10.3357/ASEM.2259.2008 (accessed 15 Jun. 2020).
73 Ravelingien, A. and Sandberg, A. (2008), 'Sleep better than medicine? Ethical issues related to "wake enhancement"', *Journal of Medical Ethics*, 34(9): pp. e9, doi: 10.1136/jme.2007.022590; Westcott, K. (2005), 'Modafinil, Sleep Deprivation, and Cognitive Function in Military and Medical Settings', *Military Medicine*, 170(4): pp. 333–5.
74 Czeisler, C., Walsh, J., Roth, T., Hughes, R., Wright, K., Kingsbury, L., Arora, S., Schwartz, J., Niebler, G., and Dinges, D. (2005), 'Modafinil for Excessive Sleepiness Associated with Shift-Work Sleep Disorder', *New England Journal of Medicine*, 353(5): pp. 476–86, doi: nejm.org/doi/full/10.1056/nejmoa041292 (accessed 15 Jun. 2020).
75 Ravelingien and Sandberg (2008), 'Sleep better than medicine?'
76 Ibid.
77 Ooi, T., Wong, S. and See, B. (2019), 'Modafinil as a Stimulant for Military Aviators', *Aerospace Medicine and Human Performance*, 90(5): pp. 480–3; Estrada, A., Kelley, A., Webb, C., Athy, J. and Crowley, J. (2012), 'Modafinil as a Replacement for Dextroamphetamine for Sustaining Alertness in Military Helicopter Pilots', *Aviation, Space, and Environmental Medicine*, 83(6): pp. 556–64; Wheeler, B. (2006), 'UK army tested "stay awake" pills', BBC News, 26 October 2006, http://news.bbc.co.uk/1/hi/uk_politics/6083840.stm (accessed 3 Jul. 2019).
78 Committee on Military Nutrition Research, Food and Nutrition Board, Institute of Medicine (2001), 'Caffeine for the Sustainment of Mental Task Performance: Formulations for Military Operations', Washington, DC: National Academy Press, https://www.nap.edu/read/10219/chapter/1 (accessed 15 Jun. 2020).

As pharmacological technology advances, there is likely to be further development of drugs such as Modafinil, which can be approved as safe when used appropriately. But the ethical argument for their use by the military goes beyond the specific properties of the pharmaceutical, and centres on concerns over the use of drugs by otherwise healthy individuals. The medical cost–benefit analysis for taking prescription drugs usually balances safety considerations against the benefits of overcoming disease or illness. But soldiers receiving pharmacological performance enhancements would not be unwell, and therefore a different cost–benefit framework needs to be applied. The salient ethical question here is whether it would be legitimate to administer drugs to healthy individuals in a military context. In answer to this, I propose three categories of scenario where this would be ethically permissible: 1) in 'life vs death' situations; 2) in cases of strategically exceptional mission requirement, and 3) within restorative limits.

During a military operation it is understood that life, limb and health are at greater risk than in a normal civilian environment. The perils and consequences of conflict situations present unique ethical scenarios in which extreme measures like pharmacological enhancement could sway the outcome between life and death. For example, would it be acceptable for a fatigued military surgeon who is suddenly inundated with conflict casualties to take a stimulant to deal with the situation?[79] Or for a military pilot shot down over hostile territory to take an alertness-enhancing drug to facilitate their escape to safety?[80] Or should the drug be kept as an 'insurance policy' by soldiers operating in isolated outposts, as a tool to be used in limited circumstances where the danger dictates?

In these life-and-death scenarios, which are not uncommon in conflict, it would seem ethical that the balance of risk would make the use of performance-enhancing drugs permissible. The key characteristics which define such acceptance are the grave consequences of potential outcome, and the lack of available alternatives. This would not be routine, but instead would regard pharmacological options as akin to other articles of specialist military equipment, deployed according to their specialism and role.[81] In these scenarios, drugs could be utilized for specific purposes under particular circumstances where no alternatives are available – or when alternatives are deemed worse – and limited to the duration of the mission. If such an approach were adopted by the military, individuals would be required to test and train with the drug prior to deployment, as with any piece of military equipment, in order that its effects are understood by the soldier and the dosage is determined by a medical professional.

This is not to excuse poor prior planning. Military doctrine and procedures would need to be developed in order to ensure that drug-taking was not abused, and drugs were only issued as a last resort in these 'life vs death' circumstances, once alternative options had been exhausted. Such application would need to be unanticipated, and unplanned, rather than being a fall-back solution to address

79 Russo, M. (2007), 'Recommendations for the Ethical Use of Pharmacological Fatigue Countermeasures in the U.S. Military', *Aviation, Space and Environmental Medicine*, 78(5): pp. 119–27.
80 Ibid.
81 Ibid.

manageable variables such as manning shortfalls, or crew rest. It would be unethical for routine, planned missions to be reliant on the use of 'life vs death' drugs for their success.[82]

If a planned mission required the use of pharmacological measures, this would only be ethical in cases of exceptional mission requirement, where not using drugs would result in a mission failure of strategic importance. An example of one such mission would be the deployment of Vulcan bombers by the RAF to destroy the runway at Port Stanley during the Falklands War in 1982. Operation Black Buck involved a series of long-range bombing missions, flown from Ascension Island in the South Atlantic to the Falklands, a return journey of nearly 8,000 miles that took a record-breaking 16 hours to fly.[83] The aim of the mission was to deny the use of the airport to Argentine fighter jets, thus allowing British Royal Navy aircraft to operate from aircraft carriers in the area, in order to support troops on the ground. An *in extremis* mission such as this, where the gains to the overall operation are of strategic importance and are exceptional, could be planned to involve the use of pharmacological enhancement, where the aforementioned gains had been approved at the highest level, the drug had met safety approval and those taking it had trained to use it. Indeed, in the case of Operation Black Buck, the pilots were provided with the benzodiazepine Temazepam to aid sleep prior to the mission, to ensure they were fully rested before their departure.[84]

The demands of combat operations are physically and mentally debilitating, particularly for troops deployed on the ground in arduous conditions.

The final category of scenario where drugs would be ethically permissible would be to restore degraded soldiers to previous performance levels. The demands of combat operations are physically and mentally debilitating, particularly for troops deployed on the ground in arduous conditions, such as those experienced in Afghanistan and Iraq, where daytime temperatures could exceed 50°C and the average weight of equipment carried by a soldier on patrol was 52 kg.[85] Operating under these conditions for prolonged periods of time can result in a loss of performance below normal healthy levels, although the soldiers would not necessarily be classified as unwell. Synthetically facilitating the speed of the body's recovery in such circumstances could bring a measurable advantage for operational effectiveness, without changing the predefined limits of a soldier's natural physiology. This application of pharmacological enhancing technologies – to restore function to previous standards – would increase performance, but changes to the body would remain within the boundaries of what is anatomically normal.

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82 Ibid.
83 Blackman, T. (2014), *Vulcan Boys: From the Cold War to the Falklands: True Tales from the Iconic Delta V Bomber*, London: Grub Street.
84 Price, J. (2003), 'Ascension Island – Gateway to the Falklands', *Royal Air Force Historical Society Journal*, 30: pp. 36–46; Squire, P. (2003), 'Harrier Operations – No. 1 Sqn', *Royal Air Force Historical Society Journal*, 30: pp. 102–120, https://www.rafmuseum.org.uk/documents/Research/RAF-Historical-Society-Journals/Journal-30-Seminar-The-Falklands-Campaign.pdf (accessed 10 Jul. 2019).
85 Anon (2010), 'Donkeys led by Lions', *British Army Review*, 150 (Winter 2010/11).

For example, high-intensity exercise leads to a reduction in normal levels of testosterone, a key hormone required for the development of muscle and bone mass.[86] Taking a synthetic testosterone, similar to anabolic steroids, could facilitate the replacement of lean muscle mass in soldiers after prolonged intensive military operations.[87] A similar scenario would involve the use of melatonin to overcome jet lag, which occurs where soldiers travel across a number of time zones and are required to operate shortly following their arrival.[88] Melatonin is a naturally produced hormone that regulates circadian rhythm, and, taken correctly, is an effective antidote to jet lag.[89] In these circumstances, the drug administered must be taken in doses appropriate to restore the soldier to their previous level of function. Therefore, operating within this range of healthy physiology can be argued to not alter the essence of the individual, and could be considered ethically permissible.[90]

The key ethical question that extends across all three of these categories is what it is we value in soldier performance, and to what extent we are willing to alter their physiology to achieve this, rather than developing equipment and procedures to augment and assist soldiers in their task.[91] In order to respect the boundaries of what is human, any pharmacological performance-enhancing technology introduced to the military must be used under a risk–benefit analysis that balances the mission requirements against the use of alternative non-pharmacological options. Taking performance-enhancing drugs should not become routine in the military as a replacement for either poor planning or shortfalls in equipment and training.

86 Friedl, K. E. (2015), 'U.S. Army Research on Pharmacological Enhancement of Soldier Performance: Stimulants, Anabolic Hormones, and Blood Doping', *Journal of Strength and Conditioning Research*, 29(11): pp. S71–S76.
87 Ibid.
88 Waterhouse, J., Reilly, T. and Atkinson, G. (1998), 'Melatonin and Jet Lag', *British Journal of Sports Medicine*, 32(2): pp. 98–9.
89 Waterhouse, J., Reilly, T. Atkinson, G. and Edwards, B. (2007), 'Jet lag: trends and coping strategies', *Lancet*, 369(9567): pp. 1117–29, doi: 10.1016/S0140-6736(07)60529-7 (accessed 16 Jun. 2020).
90 Russo (2007), 'Recommendations for the Ethical Use of Pharmacological Fatigue Countermeasures in the U.S. Military'.
91 Friedl (2015), 'U.S. Army Research on Pharmacological Enhancement of Soldier Performance'.

07 Consent to enhance

National security and the secrecy surrounding military operations present a challenge to affording soldiers the information they require to inform their consent.

One of the principal concerns regarding the use of performance-enhancing drugs by the military is the issue of consent. In the UK, the government and its armed forces have a legal and moral duty of care to soldiers.[92] This includes the prevention of sickness and the maintenance of health of all service personnel, as well as protection against infection diseases, lethal agents and a range of other hazards.[93] The government also owes soldiers a duty of care to allow them voluntary and informed consent to medical procedures.[94] This level of consent is set out legally in the European Convention on Human Rights and Biomedicine, which states that a medical intervention 'may only be carried out after the person concerned has given free and informed consent to it'.[95] However, the nature of the military organization is such that achieving fully voluntary and informed consent is challenging for a number of reasons.

92 House of Commons Defence Committee (2005), 'Duty of Care: Third Report of Session 2004–05 Volume I', London: The Stationery Office Limited, https://publications.parliament.uk/pa/cm200405/cmselect/cmdfence/63/63.pdf (accessed 5 Jul. 2019).
93 Ministry of Defence (2007), *The Queen's Regulations for the Army 1975*, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/440632/20150529-QR_Army_Amdt_31_Jul_2013.pdf (accessed 6 Jul. 2019); Ministry of Defence (2018), *Joint Service Manual of Medical Fitness*; Ministry of Defence (1997), 'Background to the use of Medical Countermeasures to protect British forces during the Gulf War (Operation Granby)', https://webarchive.nationalarchives.gov.uk/20051115023018/http://www.mod.uk/issues/gulfwar/info/medical/mcm.htm (accessed 6 Jul. 2019); Gibson (2002), 'A Shot in the Arm for the Military'.
94 Ministry of Defence (2018), *Joint Service Manual of Medical Fitness*.
95 Council of Europe (1997), 'European Treaty Series No. 164, Convention for the protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine: Convention on Human Rights and Biomedicine', https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/164 (accessed 15 Jun. 2020).

The hierarchical structure of the armed forces means that soldiers are likely to perceive a degree of coercion from the chain of command – whether coercion genuinely exists or not – to undergo treatment, particularly where failure to do so will render them unfit for operational duty. Such decisions can affect a soldier's career, as well as military capability, especially where the individual is a specialist who is critical to the mission, such as a bomb-disposal expert or front-line pilot. In addition to chain of command and career pressure, soldiers are likely to experience peer pressure or guilt, where failure to accept medical intervention places an additional burden on their colleagues.

There is latitude within human rights law to compel soldiers to undergo medical intervention without the requirement for consent, but strictly on the basis of public safety and in circumstances where this is necessary for the protection of the rights and freedoms of others.[96] These are termed exceptional circumstances: in the US, such measures require presidential authorization and are only permitted under conditions where obtaining consent is not feasible, is contrary to the best interests of the soldier, or is not in the interests of national security.[97]

National security and the secrecy surrounding military operations present another challenge to affording soldiers the information they require to inform their consent. An example of this can be found in the implementation of the immunization programme against biological warfare agents for UK troops during the Gulf War in 1990–91. Soldiers deploying to the Gulf faced the possibility that Iraq might use chemical and biological weapons of mass destruction against them, and the UK government embarked on a programme of medical countermeasures to protect its troops. Soldiers received vaccinations against anthrax, bubonic plague and whooping cough (pertussis), but due to the requirement to prevent Iraq from learning of the nature of these medical countermeasures, the programme was classified as secret.[98] This security classification had the unintended effect of inhibiting the flow of information within the armed forces, and much less information was provided to soldiers than would satisfy the requirements of informed consent.[99] The outcome at the time was that, due to operational security measures, many soldiers had no real understanding of what the immunization programme involved, or what vaccines they were given.

It can be expected that any pharmacological performance-enhancing programme in the military is likely to have a similar security classification, which places greater onus on those authorizing and administering their use. One key cohort is military medical officers – those doctors and medical practitioners employed within

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96 Council of Europe (1997), 'European Treaty Series No. 164, Convention for the protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine: Convention on Human Rights and Biomedicine'; Council of Europe (1997), 'European Treaty Series No. 164, Explanatory Report to the Convention for the protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine: Convention on Human Rights and Biomedicine', https://rm.coe.int/16800ccde5 (accessed 15 Jun. 2020).
97 FitzPatrick, W. and Zwanziger, L. (2003), 'Defending Against Biochemical Warfare: Ethical Issues Involving the Coercive Use of Investigational Drugs and Biologics in the Military', *The Journal of Philosophy, Science and Law,* 3(2): doi:10.5840/jpsl2003323 (accessed 6 Jul. 2019).
98 Ministry of Defence (1997), 'Background to the use of Medical Countermeasures to protect British forces during the Gulf War (Operation Granby)'.
99 Ministry of Defence (2000), 'Implementation of the Immunisation Programme against Biological Warfare Agents for the UK Forces During the Gulf Conflict 1990/91', https://webarchive.nationalarchives.gov.uk/20050329011707/http://www.mod.uk/issues/gulfwar/info/medical/bwa.htm (accessed 15 Jun. 2020).

the armed forces who hold responsibility for providing treatment and medical cover to soldiers on operations and in barracks. Unlike most civilian doctors, the nature of the military doctor's role is one of dual loyalties: as a doctor, to their patients, and, as an officer, to their chain of command.[100] These loyalties have the potential to come into tension, where a doctor's ethical obligation to patients comes into conflict with the demands of military necessity. This could occur, for example, in managing the restrictions of patient confidentiality against justifiable military concerns regarding a soldier's fitness for active service, or when triaging casualties according to their clinical needs in conflict, regardless of which side they fought on.[101]

Healthcare professionals in the armed forces operate within the hierarchical military structure and are bound by service law to obey the lawful commands of those in positions of authority.[102] In the UK, they are also regulated by their statutory professional regulator, for example the General Medical Council, while the various professional bodies, such as the medical Royal Colleges, have always maintained an interest in healthcare within the armed forces and perform a role in the training of healthcare professionals working therein.[103] Involving healthcare professions in any pharmacological performance-enhancement programme risks a conflict between the dual obligations – to their professions and to the military – which would be damaging to the relationship between the two, with implications for recruiting, retention and public relations. Any plans for the implementation of a pharmacological performance-enhancement programme in the UK would need to take account of this potential tension. However, as any programme would presumably be preceded by trials, which would require the approval from the Ministry of Defence's independent Research Ethics Committee, many of the potential issues would be addressed as part of such a trials process.

Another related challenge to soldier consent in administering performance-enhancing drugs in the military is their uptake. Where uptake is mixed – and some soldiers are willing to take drugs while others are not – a situation could arise whereby a unit of soldiers has significant performance disparities among its members. This would leave commanders with a predicament over whether to entirely decline the administration of drugs, or to permit some troops to take them and bear the additional risks and burden, as well as shouldering the damage such a split may confer on unit cohesion. The decision would depend on the scenario, but could present further ethical dilemmas if those accepting performance enhancement were remunerated for doing so, as with other

100 Blair, D. (2011), 'To Whom Does a Military Medical Commander Owe a Moral Duty?', in Whetham, D. (ed.) (2011), *Ethics, Law and Military Operations*, Basingstoke: Palgrave Macmillan; British Medical Association (2020), *Ethics toolkit for armed forces doctors*, https://www.bma.org.uk/advice/employment/ethics/armed-forces-ethics-toolkit (accessed 14 Jun. 2020).
101 British Medical Association (2020), *Ethics toolkit for armed forces doctors*.
102 Ministry of Defence (2016), *Joint Service Publication 830: Manual of Service Law*.
103 General Medical Council (2019), 'Our sanctions', https://www.gmc-uk.org/concerns/information-for-doctors-under-investigation/our-sanctions (accessed 8 Jul. 2019).

higher-risk, arduous and unpleasant duties in the military.[104] Furthermore, if soldiers under the influence of performance-enhancing drugs performed acts of exceptional bravery, would they still be recognized with awards in accordance with the prevailing honours system? Such potential for additional pay and medals further clouds the nature of consent to taking performance-enhancing drugs in the military.

While the law permits occupational consent under the requirements of health and safety, pharmacological performance enhancement in the military would be unlikely to comply with such law.

One possible approach to the position of mixed uptake is to implement a system of 'occupational consent', where individuals have a right to refuse, but are excluded from the occupation if they do so.[105] This is permissible in the UK under the Health and Safety at Work etc. Act 1974 (HSW Act), where it is necessary to protect the health and safety of those at work and others who may be affected by their work activity, although the armed forces can claim exemption from some requirements of the HSW Act.[106] Such occupational consent is common among healthcare professionals, such as those undertaking exposure-prone procedures – like surgery – who are required to be vaccinated against hepatitis B, or hospital laboratory staff who may be exposed to pathogens and other hazardous substances.[107] Other examples of workers to whom occupational consent might apply include astronauts, scientists who overwinter in the Antarctic (who, if working in the Australian Antarctic, are required to have their appendix removed prior to deployment), or those who travel abroad for work to countries that mandate a yellow fever immunization certificate for visa entry.[108] However, while the law permits occupational consent under the requirements of health and safety, pharmacological performance enhancement in the military would be unlikely to comply with such law.

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104 For example, Unpleasant Work Allowance (UWA) is awarded 'to compensate Service personnel for operating in conditions involving an exceptional degree of discomfort or fatigue, or exposure to noxious substance beyond that compensated for [by normal pay]. [It] is paid for the wide range of activities that Service personnel may be expected to undertake which fall outside their normal range of military duties and are considered to be of an objectionable, or harrowing, nature.' See Ministry of Defence (2019), *Joint Service Publication 752 Tri-Service Regulations for Expenses and Allowances*, 16-1–1, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/813165/JSP_752_v39_July_2019_Final.pdf (accessed 9 Jul. 2019).
105 Gibson (2002), 'A Shot in the Arm for the Military'.
106 See United Kingdom, 'Health and Safety at Work etc. Act 1974 Chapter 37', http://www.legislation.gov.uk/ukpga/1974/37/contents (accessed 9 Jul. 2019); United Kingdom Health and Safety Executive, 'Application of health and safety legislation to the MOD', https://www.hse.gov.uk/services/armedforces/application.htm (accessed 24 Feb. 2020).
107 Department of Health (2007), *Health clearance for tuberculosis, hepatitis B, hepatitis C and HIV: New healthcare workers*, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/382152/health_clearance_tuberculosis_hepatitis_hiv.pdf (accessed 9 Jul. 2019).
108 Australian Government Department of Agriculture, Water and the Environment (2015), 'Do you need your appendix removed before you go?', Australian Antarctic Division, 27 November 2015, http://www.antarctica.gov.au/about-antarctica/people-in-antarctica/health (accessed 9 Jul. 2019); NHS (2020), 'Vaccination: Yellow Fever', 22 May 2020, https://www.nhs.uk/conditions/yellow-fever/vaccination (both accessed 14 Jun. 2020).

08 Society and veteran care

Drugs could thus be introduced from the armed forces into wider society through several channels, including prescribing to veterans and reservists for whom the military has a duty of care.

The final ethical and legal consideration of pharmacological performance enhancement by the military is how its use might affect society, and how society might affect its use. The armed forces do not exist in isolation from civil society; soldiers are recruited from society and they transition back into society on the completion of their service. Therefore, attitudes towards drug use in the military and in society are mutually constitutive. Narratives relating to amphetamine use during the Second World War show that it is ultimately societal opinion that will determine whether soldiers start taking performance-enhancing drugs. Military policy is shaped by the response of social and cultural attitudes that are themselves driven by the media to a very significant degree.[109]

There is a growing acceptance in modern UK society of the use of both prescription and illegal drugs, particularly among the younger population from which the military recruits.[110] This has the potential to influence soldiers' willingness to consent to performance-enhancing pharmaceutical programmes in the military, and underlines the need to have an informed debate now about the ethical and legal considerations of their use. Changing social attitudes also reflect the increasing availability of information, as people take more interest in their health and physical fitness, both through greater access to information online and through technology

109 Pugh (2018), 'The Royal Air Force, Bomber Command and the Use of Benzedrine Sulphate'.
110 NHS (2014), 'Almost half of all adults take prescription drugs'; Gayle, D. (2018), 'Fewer young people in treatment for drugs yet more admit to use', *Guardian*, 7 December 2018, https://www.theguardian.com/society/2018/dec/07/fewer-young-people-in-treatment-for-drugs-yet-more-admit-to-use (accessed 9 Jul. 2019); UK Focal Point on Drugs (2017), 'United Kingdom Drug Situation Focal Point Annual Report 2017', https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/713101/Focal_Point_Annual_Report.pdf (accessed 9 Jul. 2019).

such as wearable fitness trackers and smartwatches.[111] However, this improvement in the availability of information gives rise to a proviso that soldiers wish to be better informed about medical procedures, and therefore expect to have access to the relevant information.[112] The former paternalistic practice of 'doctor-knows-best' medicine is much less widely accepted.[113] However, this shift could present challenges where the details of performance-enhancing drugs are classified and such information is not releasable.

Another area where drugs might impact society is in the migration of military technology into society. This is a common evolution, as advances in military technology often have valuable civilian applications – as was the case for GPS (Global Positioning System) satellites, canned food, zip fasteners, or stainless steel, which were all originally developed for military use.[114] In this way, it can be expected that new technological advances in military pharmacology will eventually make their way into broader society.[115] This could be significant where performance-enhancing drugs are created exclusively for use by the military, rather than consisting of off-label applications of previously approved prescription drugs which are already available to society. Drugs could thus be introduced from the military into wider society through several channels – including prescribing to veterans and reservists, for whom the armed forces have a duty of care.

Such soldiers who have used performance-enhancing drugs during their military careers could present a predicament when they leave the armed forces and transition back into society. Depending on their exposure and use, soldiers may wish to continue to have access to these drugs as veterans, either because of addiction or because they appreciate their benefits. Addiction would raise serious ethical concerns, and any planned exposure to drugs that resulted in addiction would be unlikely to receive ethical approval. However, misuse of drugs by soldiers could inadvertently lead to addiction, as highlighted by the following, which describes a first-hand experience from the Gulf War, as told by a former US Marine:

> We were supposed to take the PB [pyridostigmine bromide] pills three times a day for a week. I recall ingesting many more pills than twenty-one, for longer than a week. It makes sense that we would want more of the pills, even though we had no idea of the possible side effects. Why not take more of something you've been told might save your life? If twenty-one pills are good, forty-two must be better, and sixty-three will turn me golden.[116]

This experience illustrates the importance of strictly controlling the use of drugs in the military. Any performance-enhancing drugs issued to soldiers should be subject to the same sort of control restrictions that govern explosives and weapon

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111 Kirkman, A. (2017), 'The Big, Booming Business of Wellness', Self, 4 August 2017, https://www.self.com/story/the-big-booming-business-of-wellness (accessed 10 Jul. 2019).
112 Author's interview with an Army Medical Service practice manager, 27 May 2019, London.
113 Gibson (2002), 'A Shot in the Arm for the Military'.
114 BBC (undated), 'Military inventions that entered everyday life', https://www.bbc.com/bitesize/articles/zb4xd6f (accessed 9 Jul. 2019); Evans, S. (2014), '10 inventions that owe their success to World War One', BBC, 13 April 2014, https://www.bbc.co.uk/news/magazine-26935867 (accessed 9 Jul. 2019).
115 LaCroix, A., Burnam-Fink, M., Galliott, J., Vallor, S., French, S., Abney, K., Mehlman, M. and Lin, P. (2014), 'Super Soldiers: The Ethical, Legal and Operational Implications (Part 2)', in Thompson, S. (ed.) (2014), *Global Issues and Ethical Considerations in Human Enhancement Technologies*, Hershey: IGI Global, pp. 139–60.
116 Swofford, A. (2003), *Jarhead – A Marine's Chronicle of the Gulf War and Other Battles*, New York: Simon & Schuster, Inc.

safety, with specially qualified personnel responsible for their handling and issue.[117] Government and armed forces' responsibility for the long-term health of veterans in society would mean that, in the UK, civilian doctors and the National Health Service would require access to comprehensive information about what drugs soldiers had been exposed to during their service, in order that they can monitor any addiction or other long-term health concerns. Again, this could present problems where military drug programmes are classified.

One ethical difficulty concerns whether veteran soldiers should be permitted access to performance-enhancing drugs after leaving the service. Such benefit may be an attractive recruitment incentive for service, much like learning a new skill or trade.[118] However, where this would give retired soldiers an advantage over those who have not served, it would present disparities in society, and a level of special treatment that goes beyond the moral obligations of society towards the armed forces.[119] It is therefore recognized that any use of performance-enhancing drugs by the military must be reversible on discharge from the service.

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117 Ministry of Defence (2019), *Joint Service Publication 482: Ministry of Defence explosives regulations for the safe storage and processing of ordnance, munitions and explosives (OME)*, https://www.gov.uk/government/publications/jsp-482-mod-explosives-regulations (accessed 15 Jun. 2020).
118 Mehlman, M. (2019), 'Doping soldiers so they fight better – is it ethical?', *The Conversation*, 24 May 2019, https://theconversation.com/doping-soldiers-so-they-fight-better-is-it-ethical-117236 (accessed 12 Jul. 2019).
119 Ministry of Defence (2016), *The Armed Forces Covenant*.

09 Conclusion

Whether performance-enhancing drugs should be used by the military will ultimately be determined by the attitudes of civil society. These attitudes are not immutable.

There are scenarios in which the pharmacological performance enhancement of soldiers would be ethically and legally permissible. These scenarios recognize the unique nature of warfare, in which normal risk–benefit horizons are revised, making the administration of drugs to otherwise healthy individuals acceptable, given the alternative outcomes. However, drug use in the military should not become routine, in compensation for poor planning, or equipment and training shortfalls. Military doctrine and safeguarding procedures would need to ensure that performance-enhancing drugs are not abused, and that soldiers using pharmacological measures have tested and trained with the drug prior to deployment. This would require close collaboration with military healthcare professionals, and external ethical oversight, which in the UK would take place through the Ministry of Defence's Research Ethics Committee.

The implementation of a pharmacological performance-enhancement programme by the military would present a number of challenges. Significant among these is the requirement for soldiers to be afforded voluntary and informed consent to such interventions. Such consent is problematic in the military, where the organizational structure and culture make soldiers vulnerable to coercion from their superiors, peers and individual career concerns. Furthermore, the potential secrecy that would surround the use of pharmacological enhancement in the military would additionally cloud decisions to consent. And if non-acceptance led to partial uptake among soldiers, commanders would be faced with a dilemma of whether to decline the benefits of performance-enhancing drugs, or allow some soldiers to enhance while others do not – a choice that would be likely to have divisive implications for morale and unit cohesion.

Ultimately, the decision over whether pharmacological performance-enhancing drugs should be used by the military will be determined by the attitudes of civil society, and these attitudes are not immutable. Just as the use of amphetamines during the Second World War was shaped by social opinions at that time, the motivation for drug use by the modern military will be formed through changing

attitudes to drugs in our society. In this way, the evolving social norms in modern Britain towards the use of drugs – be they prescribed medications, or drugs developed for professional and recreational usage – will determine whether the UK military implements programmes of pharmacological performance enhancement in the future.

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Cover image: Soldiers resting during Exercise Templar's Triumph on the Longmoor Training Area, 2017.
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