

18 Ethical Caveats Surrounding Mental Performance Enhancement

*Marion Trousselard, Koen Hogenelst, and
Nicholas van den Berg*

Introduction

Ethics is often considered the science of morality, or the art of good conduct and moral behaviour. This behaviour is determined by the decisions we make, thus ethical considerations are akin to moral decision-making. Indeed, whereas the Greek etymology for “ethics” (*ethos*) means behaviour or custom, “decided” (*prohaireton*) refers to something that is chosen (*-haireton*) before any other (*pro-*). A decision is therefore a preferential choice, and the use of ethics we question this preference. For elite professionals such as military personnel, ethics can, in some way, be considered the ultimate objective, insofar as “positioning itself one degree higher than morals. It is what is required from everyone outside of the sense of obligation” (Briole, 1996).

Ethics falls within the realm of moral philosophy. This branch of philosophy aims to understand three components: (i) what is right and wrong (i.e., fundamental or meta-ethics); (ii) what to do or not to do, (i.e., normative ethics); and (iii) how to apply normative ethics to specific areas, such as the workplace (i.e., applied ethics). The second component – normative ethics – is prescriptive, and therefore judges. This component can be further divided into three major families, all of which have implications for the military. The first is *deontology*. This Kantian-inspired field refers to absolute norms, obligations, and prohibitions. This ethics of conviction provides a code of conduct that requires universal rules of behaviour to be respected (e.g., dignity), whatever the consequences. The second is *consequentialism*, which unlike deontology, judges an action by its foreseeable consequences at the time it is taken. Here, the aim is to achieve the best possible results for the community. Finally, *virtue ethics* is inherited from Aristotelian thought. It focuses on the individual, and his or her perfection as a virtuous moral agent. These three families coexist without a hierarchical structure or order of precedence.

In many military situations, conflicting decisions can arise depending on the ethical framework to which the decisions apply. Applied ethics frameworks help us to answer ethical questions, also known as ethical dilemmas. Ethical dilemmas arise when the theory does not help us to map out a rational way forward, but a decision must be made. They arise when a moral value or principle is at stake in the context of a question or situation that requires a definitive response. For military personnel, both their status and their missions can evoke situations which raise ethical dilemmas and in turn, increase risk of error and misjudgement. Examples of the latter include the use of child soldiers and human shields, invisible enemies, and a mismatch between orders and reality on the ground.

In this chapter, we apply ethical frameworks that help guide moral decisions on the use of scientific and technological advances in the military context. We do not attempt to provide a clear answer to ethical dilemmas, rather we raise several considerations that can be found regarding

mental performance enhancement in humans. The ethical frameworks as described above are woven throughout the present chapter, particularly when reviewing examples of the various tools used to enhance mental performance. Indeed, several of these tools rely on identifying norms and convictions of society or the individual (i.e., deontology), weighing cost–benefit analysis of applied methods (i.e., consequentialism), and through emphasis on the individual as an autonomous moral agent capable of making decisions (i.e., virtue ethics).

Human optimization: enhancement, modification, or adaptation?

A recent report by the Multinational Capability Development Campaigns (MCDCC) outlines the use of science and technology to optimize or even exceed the biological potential of individuals, to enhance operational effectiveness among soldiers (Haggenmiller, 2021). The report distinguishes between Human Performance Optimization (HPO) as *reaching* the individual's biological potential, in contrast to Human Performance Enhancement (HPE) as *exceeding* the biological potential. This distinction has implications for ethical considerations when manipulating mental performance.

The operational demands of military personnel can be challenged by expectations that breach societal or personal rules for ethically acceptable behaviour. Importantly, these challenges are not exclusive to the military setting, as the same challenges can be found among athletic, academic, industrial, religious, and other domains. The ethical considerations for an operational demand differ between at least three actors: (i) the command – or manager in the broadest sense – who formulates the demand, mission, purpose or ambition; (ii) the individual(s) involved as an autonomous person, who determines their own level of contribution; and (iii) the practitioner, doctor, coach, or mental trainer, who monitors the autonomous individual's optimization or enhancement process.

The ethical considerations of HPE compared to HPO, and the potential breach of ethics to consider for all actors, are both exemplified through the field of psychopharmacology (see also *Pharmaceuticals*, below). Indeed, with recent developments in this field, use of pharmaceuticals is no longer limited to simply treating issues (i.e., HPO), but has moved towards enhancing human performance (i.e., HPE). This example of HPE involves all three actors: the autonomous individual who receives the treatment does so on the demands of the command, and through execution of the practitioner. This introduces ethical considerations from several perspectives: (i) transcendental, i.e., whether the modification is morally acceptable as considered by the human community; (ii) behavioural, to ensure the various actors behave according to their social mandate (e.g., the laws of the country, the professional code of ethics, etc.); and (iii) emotional, i.e., the recognition of an otherness that establishes the medical act as a loyal partnership. These ethical perspectives can occasionally conflict, for example, the absolute autonomy of the individual might be at odds with an organizational “push” towards enhancement. Nevertheless, the prerequisite for each of these standpoints is the absolute autonomy of the individual, as this is the only way a true “informed consent” can be given.

Importantly, the outcomes of HPE must be considered holistically. If several factors are not considered, any attempt at HPE risks either deterioration of the individual's functioning, or costs outweighing the benefit. For example, improving particular brain functions in support of one effect might result in another imbalance, suggesting the overall systemic functioning will not necessarily be improved. In this way, human performance might be *modifiable*, but pure *enhancement* is hard to obtain if the change is not considerate of the holistic effects. From a Kantian ethics perspective, this suggests that enhancement is not an end in itself, therefore HPE as a means requires holistic ethical considerations. These holistic considerations can be grouped into three categories: increasing a biological capacity at the risk of functional impairment, enhancing human nature (stimulating evolution if we perceive it has plateaued), and improving the way that an individual finds fulfilment in their life. Ideally, an individual's performance is enhanced while maintaining holistic biological potential, without harming human nature. None of this has currently been achieved.

Part of the holistic considerations necessary for successful HPE regards the enactive framework, i.e., humans' dynamic interaction with the environment (Varela et al., 1991). In fact, the decision of whether to engage in HPE often occurs when the environment is no longer suitable. Accordingly, HPE as it relates to the environment requires adaptation. Adaptation can be measured through allostatic load – a psychological homeostatic process which minimizes the effects of environmental stressors (McEwen, 1998). If we consider adaptation in this way, an “enhanced” human with little allostatic load would demonstrate proactive adaptation to the stressors of their environment. However, psychological adaptation involves an interplay between individual perception and collective norms (e.g., the decision to wear a coat to protect from the cold could be impaired if nobody else is wearing one). This leads to geographical adaptation (e.g., migration, or technological advances in habitat or clothing development), to better guarantee homeostasis, in turn preventing allostatic overload. Thus, the ethics surrounding HPE not only requires an enhancement of the factor in question, but to do so while maintaining low allostatic load from the stressors of the constantly-changing environment.

The case of cognitive optimization and enhancement

What is cognition?

Mental performance encompasses a range of cognitive processes. Cognition is extensively described in Chapter 2 of this handbook, and specific methods for increasing the cognitive potential of an individual are described throughout Part 2. Here, we regard cognition as a collective process that encompasses various skills to successfully engage with information and realize cognitive tasks. Such skills include acquiring information (perception), selection (attention), consideration (representation), remembering (memory), and by confronting what is expected of oneself (detection and error) or others (social confrontation). These skills are used to engage in managing our behaviour, resolving problems, and making decisions (executive functions) in the anticipation of – and reaction to – reward and punishment. To realize a simple cognitive task, the performance is assessed by what is expected of oneself or others (i.e., the “error rate”). For complex tasks, measuring the error rate relies on carrying out specific simple tasks which scaffold the overall problem. This involves several cognitive functions to help make sense of the task at hand (e.g., supported and shared attention, distraction, auto-calculation, judgement, executive functions, etc.). In this way, cognitive capabilities are shaped by societal norms, often within a population holding shared socio-demographic characteristics.

While this definition of cognitive performance might apply to an average population, it does not necessarily apply to members of an extreme population, including specialized military personnel. Indeed, although this definition applies to the military context insofar as it avoids deterioration of performance when under stress (i.e., maintaining HPO), it remains unclear whether the classical view of cognitive performance is appropriate when the goal is to enhance mental performance (i.e., HPE). One must therefore ask what the objective of mental performance training is: to develop exceptional performances in a situation of psychic calm but extreme fragility in a situation of duress, or to develop a long-term resistance by protecting the standard performances of which he is disposed (i.e., hardening existing traits)? These remarks are valid for certain elites such as military personnel who might face life-threatening situations, but also top athletes or elites in certain high-stakes negotiations. The one who remains calm and capable of discernment is often the one who prevails.

Available arsenal of means to enhance mental performance

The available arsenal of methods to increase an individual's cognitive potential is vast. Whereas several of these methods are described in depth in Part 2 of the present handbook, here we consider

Table 18.1 Non-exhaustive list of the existing arsenal according to its societal acceptance

<i>Conventional means of cognitive enhancement largely accepted</i>	<i>Unconventional means tend to evoke moral and social concerns</i>
Education, enriched environments and general health	External hardware software systems
Prenatal and perinatal enhancement	Nanotechnologies Nanomedicine
Mental training & coaching	Collective intelligence Connective intelligence
	Genetic modifications
Drugs	

the ethics of what is and what is not acceptable when considering different types of techniques used to enhance cognition. The increase in human capacities in the context of cognitive enhancement includes tools of societal norms (e.g., education), but primarily mechanisms of the traditional pharmacological approach, as well as those of neurobiological conditioning. Some tools are commonly accepted, others much less so, regardless of the cultural, religious, and ethical reasons (Table 18.1).

Education, enriched environment, and state of health

Education is a strategy that trains an individual to better participate in an independent or societal activity. Children who grow up in an area of enriched development with little biological or psychological stress will optimize their biopsychosocial capabilities and increase their capability to resist duress. This optimization that installs itself in prenatal, perinatal, or post-natal periods has the advantage of being perennial (Roubertoux, 2004). Basic education is a pre-requirement so that armies, sports teams, or corporations can employ personnel with the emotional stability facing duress. It enables the development of a thought process to allow for clear judgement when deciding on acts to undertake. Developing individual citizens to be fully responsible for their actions is therefore the first means of ethically improving cognitive performances under duress. Put differently, education can instil one's moral compass regarding individual and societal norms.

Mental training

Whereas education focuses on general knowledge, mental training is a vast collection of grouping techniques aimed at acquiring specific aptitudes. Mental training can be directed towards controlling emotional states, through controlling the cerebral activation level by mastering the body awareness and/or breathing control. This training for mental control improves performance by mitigating stressors. Contrary to training for specific cognitive tasks, this type of exercise improves overall quality of life to better manage reactions to a breadth of phenomena. In this way, mental training can strengthen awareness and emotional control to optimize ethics-related faculties such as decision-making.

Nutritional supplements

Cognitive performance has benefitted from a nutritional approach coupled with genetics, as ideal supplements can be identified according to the genome of each individual (Helland et al., 2003). In a military context, nutritional supplements can be taken during the time of exposition to stress, which can inhibit deleterious effects while maximizing performance (e.g., caffeine to increase vigilance) to the threat.

The ethical question regards the right moment to use a (nutritional) substance. The ethics of its use does not reside in the substance itself, but in the intentions of the act. For example, if the aim is HPO, alleviation is justified. By contrast, if the intention is HPE, ethical considerations must occur on a case-by-case basis. This requires best judgment from the actors involved at the time of the constraint, to consider the situation itself as well as the cost–benefit of using the substance in the short and long term. Generally, nutritional supplements are low-risk for violating ethical standards.

Pharmaceuticals

The use of mind-altering substances to benefit from their effects has been found even in ancient customs. From a technical point of view, this topic is described in detail in Chapter 6. The field of pharmaceuticals has changed radically with the use of stimulants such as amphetamines and modafinil. Their use for enhancement illustrates certain ethical issues to a larger scale than nutritional supplements. Indeed, these substances were developed by the pharmaceutical industry with therapeutic purposes in mind. Independent of any ethical considerations or efficiency criteria, the use of these substances – particularly in an elite and competitive context – presents ethical considerations.

First, these substances were evaluated in a pathological context, for both their therapeutic efficiency and in a physiological context for their harmlessness for daily usage. By contrast, their use in an acute or threatening environment poses the problem of the pharmacology of a brain under stress; not only does stress modify pharmacokinetic characteristics and thus pharmacodynamics, it modifies the function of the brain independent of the intended customs or actions of the substance. This can produce potential effects that transition from a controlled and harmless dose into risk. It is necessary to know their pharmacological characteristics under stress so that whoever takes them in a state of stress does not risk any unwanted side effects.

The second neurophysiological problem lies in their neurobiological specificity and their selective impact on certain functions. This returns to the idea of considering the holistic effects of HPE, rather than just the targeted effect. For example, the dopaminergic system is strongly involved in the evaluation of risk and reward. Modifying this specific function by these substances directly impacts safety, particularly in the event of decision-making under intense psychological duress. It is therefore essential to know the impact of these substances on the elementary cerebral function in a stressful situation. Furthermore, the same dose of a substance does not necessarily have the same effects from one individual to another. This variability must be accounted for in evaluating individual risk.

Overall, with the emergence of nootropics, we as ethical actors must understand the risk/benefit balance. Keeping an individual stimulated carries obvious benefits in a survival situation, but stimulation can be questionable when this is not the case, especially in sporting or corporate environments. Nonetheless, competitive humans will always aim to gain an advantage over their peers, and we currently see these nootropics being accessed almost freely through the digital economy.

Genetic modifications

Since performance is a direct consequence from the brain's function, it is obvious that any modulation of the genome can have an impact on certain aspects of this performance. Still, there is no direct and linear relationship between the importance of genetic modification and impact on behaviour (de Quervain & Papassotiropoulos, 2006). Among animals, relationships exist between expression modes of the glutamatergic receptors NMDA and memory capability, but human studies on the same genetic targets calculate their role in the modifications on the capabilities at 5% (Craig & Plomin, 2006; de Quervain & Papassotiropoulos, 2006).

Alternatively, alleles of certain genes crucial to behaviour (e.g., glucocorticoid MR receptors, and recapture sites for serotonin) can become modification carriers which affect a small number of nucleotides. This in turn can deeply modify the function of the resulting protein, thus altering human behaviour. This modification can be an advantage, or can be deleterious, but naturally, individuals are typically selected if they are most apt at a particular function; however, the modification to support the function can either be advantageous or deleterious. The biomedical perspective can in no way caution this selection. Instead, it remains that the use of genetic knowledge can only be therapeutic (an individual carrying such a polymorphism and presenting a pathology could need a heavier treatment) or possibly preventative to a recurrence (the presence of this polymorphism increases the chances of risk of recurrence).

Collective intelligence

Improving cognitive capabilities concerns not only the individual, but also their community. Tools and procedures are developed to improve the intellectual collaboration between individuals by focusing on communication systems and representations formed within the group. Currently, connective intelligence is taking advantage of information communication (Surowiecki, 2004; Warwick et al., 2003). It is the objective of the digital giants Google, Apple, Facebook (Meta), and Amazon to advocate such collective advantage of social networks while reassuring the benefits (e.g., social connection) outweigh the costs (e.g., privacy and security).

An individual's competencies can be shared in a group to increase the group's cognitive performance. However, leveraging collective intelligence to heighten the potential of a group can evoke ethical considerations. For example, an excessive specialization reduces the individual to a tool for the group's service (i.e., a means to an end) rather than working synergistically. This tailoring strategy has possible repercussions on mental health and, subsequently, on physical health. Human society assumes that individuals work in intelligence, that is, that they use their knowledge and know-how for a common aim and they react to the consequences of their actions. Everything resides in the balance between specialization and versatility. This balance should be kept in mind when considering individual or group enhancement.

Nanotechnologies and nanomedicine

Nanomedicine equates to "a domain consecrated to health, which uses knowledge acquired in medicine, biology and nanotechnology" (Chouard et al., 2008). It opens up a myriad of possibilities of encapsulating cells, which under electromagnetic stimulation, could free neurotransmitters, in turn increasing cognitive capabilities. The potential health and well-being benefits of nanomedicine is fascinating, yet the risks are often unknown. The stakes are both complex and major, ethically, legally, socially, and politically.

The nanosciences are not necessarily a product of a scientific revolution, but the inevitable result of technological development. The exponential rate at which this technology is developing risks cutting short formal sociological reflection that is indispensable to ethical consideration. This question goes back to the source of ethical thought, which confronts how technological development – as stimulated by medical interests – may help or hinder either society or small group goals when attempting to achieve their aims. The ethical risk of agreeing to these advances is the neglect to consider the cultural and societal norms to which they belong.

Furthermore, the use of technological developments by professional elites stretches the limitations on these ethical considerations. Aside from the limitations in efficiency, the use of such technologies may represent limits to societal acceptance. Though the ethical considerations for professional elites vary by context and necessity of its use (e.g., sports vs. national security or survival), it is again important to consider the cost–benefit on a case-by-case basis.

Enhancement and doping

Having explored our arsenal of tools used to enhance mental performance, the ethical considerations for some of the tools test the differentiation between acceptable enhancement and doping. The etymology of the word “doping” refers to the word “doop” which means broth, mixture, or blend and is said to come from a patois used by Dutch immigrants who, in 1666, built the city of New Amsterdam (present-day New York). This broth possessed exceptional stimulating qualities that made it possible to work tirelessly and without apparent fatigue. The composition of this drink is not known, but it is known that it sometimes caused fatal tachycardia, which forced the bosses of these tireless pioneers to prohibit its use.

The professionalization of sport has led to the emergence of doping, even as the development of the practice of sport has revolved around this quest to surpass oneself “naturally”. Doping was considered an aberration that was taken into account by the legislator as early as 1965. The Public Health Code defines doping as “the use, during or with a view to participating in competitions and sporting events, of substances or procedures likely to artificially modify performance which may be detrimental to sporting ethics and to the physical and psychological integrity of the athlete.” From this definition, it follows that an athlete who resorts to doping harms not only sport as a whole by failing to respect equal opportunities, but the athlete and their individual health. This law has a repressive side which sanctions the use of stimulants in competitions. Whereas the ban on doping currently concerns only the profession of athletes, the use of doping substances concerns society as a whole, and particularly the working environment in situations of professional overwork.

Whereas doping in athletic competition invokes unfair advantage to human performance (i.e., an HPE rather than HPO), the threshold for what is ethically acceptable is higher in other areas such as the military context, which involves life-threatening situations and the prevention thereof. *Thou shalt not dope* is thus not a universally acknowledged ethical commandment for all pursuits of performance enhancement. The etymology, “per-formare”, means to give form, to make real, or to give life to ideas and projects. Performance thus calls on specific abilities – as the linguistic use of the word “performance” attests – which is tantamount to putting “skills” to work. “Skills” therefore also define its scope: there can be no performance without the corresponding competence. Moreover, the prefix *per-* indicates that the necessary shaping or implementation required by performance is part of a process of progress or surpassing. Performance must therefore be seen as an essential property of *homo faber*, and therefore of the sportsman who surpasses himself. Performance calls to mind the idea of man as machine; perhaps the legislator wanted to emphasize the utilitarian nature of doping, which distances man from his *homo faber* qualities.

Perspectives

Interoception: a target of enhancement guaranteeing human integrity?

Recent neuroscience data pose two relevant frameworks for reflections on enhanced man. The first is the enactivism framework – the interplay between the body/environment (Varela et al., 1991). If the individual “gives shape to his environment”, “he is at the same time shaped by it”. Literally, our environment constitutes us. In fact, each event leaves a trace in the brain and any intense or prolonged constraint transforms the brain morphology durably. Indeed, the brain is, permanently, enacted; the increase can thus only be thought of in an incarnated and situated way. The second framework is that of the probabilistic human brain. The individual does not tolerate uncertainty; he constantly makes inferences from the information that his brain filters and interprets to make predictions about the state of the world. In return, he adjusts these predictions according to the deviation from what he expected from his predictions. A high-level individual is therefore an individual who predicts well, as well as perceives and judges the smallest deviation to improve

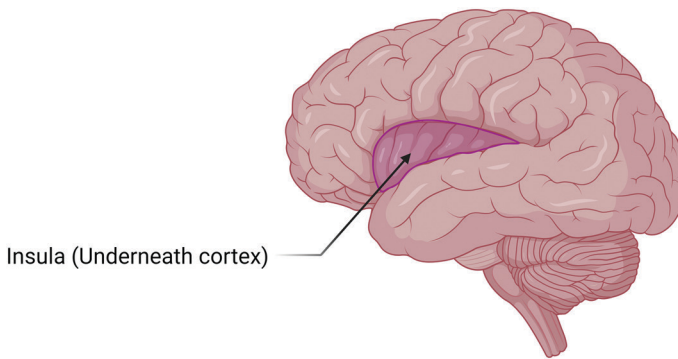


Figure 18.1 Sagittal view of the insula.

subsequent predictions. These inference loops are based on an adjusted perception of the state of interoception – the perception of information coming from the body, or the ability to perceive the physiological state of the body (heartbeat and breathing rhythm, state of satiety, etc.). Awareness of one’s physiological state, moment-by-moment, allows for appropriate inferences to be made.

This ability to relate to one’s internal feelings has a well identified neurofunctional substrate. Specifically, the insula is nested at the front of the brain between each hemisphere, and is dedicated to the integration of interoceptive information (Figure 18.1). The insula is a probabilistic brain supervisor at the heart of the prediction system. It allows for a moment-by-moment estimate of the balance between the body’s available functional resources and needs (metabolic, immunological, etc.). Concurrently, the insula participates in the emergence of emotions and the resulting behaviours in order to restore/maintain the balance between the demands of the environment and the subject evolved (Riva et al., 2019). Given its functions, it is tempting to consider the insula as a principal substrate for weighing ethical considerations in the face of threatening situations.

Care ethic and stakeholder ethic as a safeguard?

Recent years have seen the emergence of reflections on the value of developing an ethic of care within competitive structures. Subscribing to a care ethic implies “being aware that relationships between individuals give rise to a recognition of the responsibilities we have towards one another, and a perception of the need to respond to the needs of others” (Garrau, 2010, p. 43). This ethical framework offers an analytical tool for enriching reflections on what the ethics of augmentation can be to open up new organizational and social practices. However, the values underlying these virtues can also be discussed in the theory of moral philosophy known as the “ethic of care”. This ethical framework places “The Other” at the centre of our actions, based on the assumption that individual autonomy is not independent but, on the contrary, completely interdependent on our relationships with others. In other words, this ethic leads us to give priority to satisfying the needs of those for whom we feel responsible. This kind of responsibility towards others is fully reflected in the solidarity between athletes in a competitive team or in corporate governance.

The word “care” has two facets. First, it is a way of expressing concern and worry for others (a disposition) and, secondly, it expresses taking practical action (Tronto, 2013). The two sentences “I care for you” (care as a moral disposition) and “I take care of you” (a concrete action) reflect an engagement in the individual’s personal and professional daily life. This interdependence between individuals, alongside its mutual responsibility, has consequences at the institutional level insofar

as it posits a social contract in general and, in the competitive context, a contract that binds the fate of individuals to the institution they serve. Care ethics can be understood as a voluntary effort to de-centre oneself in an attempt to understand reality from the perspective of another (Noël, 2018). “It is the person, not his or her actions or traits subsumed under general rules, that constitutes a guide in our motivation to act; hence, the attention we pay to him or her, our reactions to him or her reflect a moral commitment oriented towards the person rather than based on the observance of rules” (Paperman & Laugier, 2005, p. 65).

This voluntary effort to take account of the other’s point of view chimes calls for a certain change in perspective. Rather than evaluating the elite’s actions with reference to independent growth virtues that are ingrained by training and correspond to social and entrepreneurial ideals (e.g., own it, do better than perfect, be successful, be courageous), the focus is on raising awareness of, and even embodying, interdependence at all levels – from the memberships, to his or her leaders. The aim is to provide neither a predetermined content, nor a theoretical answer, but to lead each elite to consider their responsibilities towards their partners, along with other stakeholders, whether in a context of confrontation or competition (Murat, 2013).

When applied to the complex, tense, and often inextricable situations that elite personnel repeatedly find themselves in, care ethics provides a more comprehensive understanding of the challenges for each stakeholder, and can improve decision-making. A moral dialectic acts as a counterbalance to the means-ends dialectic, in that it challenges each person’s commitment both as a moral agent, and as an end in itself. More than any other elite leader, the ethical elite must be fully aware of his or her responsibilities, which are interdependent with those of others: On the one hand, the leader must take care of the partners and colleagues under their command insofar as he or she is accountable for decisions that involve them; on the other hand, they must also take into account interdependencies with other mission stakeholders, be they allies, religious, political or intellectual leaders, or even the media (Noël, 2018). Finally, while the leader is part of the institutional system, he or she must be recognized as a legitimate and autonomous actor; hence, they cannot turn a blind eye to an order, action, or policy that is unjust or contrary to human ethics. Any oversight in this respect must have consequences for the functioning of the system, consisting of each of the actors involved, given that they have a responsibility towards everyone else.

An ethical–legal–societal aspects framework for application in military context

As mentioned previously, enhancing military capability and survivability in threatening situations carries obvious benefits. Moreover, as opposed to other fields including sports, a military organization does not seek a level playing field but a strategic and tactical advantage over its opponents. It is therefore not surprising that in order to maximize human performance, defence forces continue to explore, develop, and apply HPE methods, ranging from pharmaceuticals to (bio)technological enhancement. Yet, even though the military context differs in many ways from civil contexts, ethical, legal, as well as societal concerns need to be addressed. This requires the organization of a careful reflection and deliberation process, with relevant stakeholders at an institutional level. A framework deriving ethical aspects from various streams of thought (deontology, consequentialism, virtue ethics), legal aspects from legislation and conventions (e.g., international law, human rights law), and societal aspects drawing from technology assessment and responsible innovation (Rip & Robinson, 2013; van Est, 2017), may guide such a careful reflection and deliberation process.

Ethical aspects may include:

- Necessity: is this HPE technology or application a military necessity? This is one of the primary concerns to be addressed by the military. Necessity closely follows a (proportionate) benefit to risk analysis, including effectiveness of HPE, potential side effects, and potential negative

health impacts. It also includes the discussion of subsidiarity, i.e., can the effect not be achieved by other means. If the necessity of HPE is not clear, there is no further need to consider the military use of a certain HPE.

- Dignity: how does the HPE affect human dignity of soldiers who use/undergo it?
- Fairness: are benefits (pluses) and costs (minuses) of this technology distributed fairly, e.g., between different units of the military organization, or between individual soldiers?
- Agency and Autonomy: considering the agency of soldiers, do they possess the ability of to make his or her own decisions?
- Responsibility: how does the HPE affect the responsibility of soldiers, e.g., during an operation?

Legal aspects may include:

- Legality: what is the legal basis for using this HPE technology or application? Does it impinge on the right to life? If so, can its use be sufficiently justified?
- Autonomy: how does this HPE technology or application affect an individual's autonomy? Whereas also discussed from an ethical perspective, here the focus is on dignity from human rights perspective as well as rights to privacy and to bodily integrity.
- Accountability: how does this technology affect the accountability of the military organization? Who is ultimately accountable for a decision made to allow a certain HPE to be used?

Societal aspects may include:

- Impact: what are the technology's positive or negative effects on the broader society, e.g., through spill-over effects into the private, family or social lives of soldiers, outside or after service?
- Democratic control: to what extent and how can democratic institutions, notably the legislature and the executive branch, review and steer the development and deployment of this technology?
- Alignment: to what extent is this technology aligned with values in society, e.g., public values, and to what extent can the technology be modified to better align with these values?
- Support: is there support for this technology in society? Can we organize societal engagement, so that citizens (or CSOs or NGOs) can influence the development and deployment?

The aspects listed above may guide (military) institutions in deliberation and decision-making regarding human enhancement. Note that the process and discussion around certain aspects may vary depending on the level at which decisions are made. Indeed, deliberation and decision-making regarding policy (i.e., does military policy allow for equipping military personnel with enhancement options to be used?) is likely to differ from decision-making regarding the actual application (i.e., the decision on whether or not to apply the enhancement option that is at a commander or military operator's disposal). The former process (i.e., regarding policy formulation) likely requires a group of higher-level accountable representatives, including heads of legal, medical and operational affairs, subject matter experts, and people in communication and personnel roles. Realistic military scenarios may also be useful to guide the discussion. The latter process (i.e., regarding application) is more or less decision-making by the commander and/or military operator that follows the previously formulated policy, with accurate situation assessment, responsibility, and accountability playing an important role at this "lower" level.

It should be expressed that the military context is currently the only context that takes the human enhancement consideration process this far, i.e., to actually consider the use of HPE. As mentioned earlier, it is within the nature of Defence organizations to gain a strategic advantage over (potential) enemies and, in order to do so, have an "arsenal" at their disposal (e.g., akin to nuclear weapons) that hopefully never have to be used.

Conclusion

Effective high-level cognitive functions are crucial for adapting to the operating environment. These functions are sensitive to the frequent high-stress situations in which they are found, in turn deteriorating perception and decision-making. A minimal requirement towards any intervention targeting these functions would be to ensure these other faculties of perception and decision making are maintained. Enhancement techniques must therefore ensure that the acceptable level of mental load is maintained to allow for adjusted functioning.

Stress is inseparable from operational life, but its consequences on high-level cognition can be disastrous. This high-level cognition can be extremely effective in a nominal situation, even if it is highly dependent on individual qualities. It develops and is maintained by its permanent ecological interaction with the environment. The enactive framework suggests that any modifications of the interactions of humans with their environment are likely to be part of the very long-term perspective. This makes it necessary to take into account a risk of the increase of performances altering the natural adaptation mechanisms, among which include recovery mechanisms. This enactive framework leads one to consider the relevance of the ethic care and stakeholder ethics for the cognitive individual and collective enhancement. With military capability and survivability being important drivers of human enhancement considerations, the military setting is a sector par excellence that benefits from a framework for deliberation and decision-making regarding human enhancement. The ethical considerations and frameworks discussed in this chapter may be of great value here.

Altogether, these reflections bring our attention to the new technologies that reduce global cognitive capacity by targeting the increase of a precise function – possibly at the detriment of a systemic and respectful consideration of human beings. Any exogenous increase of cognitive function that is not aligned with homeostatic functioning actually constitutes an aggression. The only acceptable increase is when it is voluntarily chosen by the autonomous individual, and that creates a state of improved awareness of their capacities of stress regulation via an optimization of emotional skills in a stakeholder ethic.

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