Alternative medicine and doping in sports
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REVIEW
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Abstract
Athletes are high achievers who may seek creative or unconventional methods to improve performance. The literature indicates that athletes are among the heaviest users of complementary and alternative medicine (CAM) and thus may pioneer population trends in CAM use. Unlike non-athletes, athletes may use CAM not just for prevention, treatment or rehabilitation from illness or injuries, but also for performance enhancement. Assuming that athletes’ creative use of anything unconventional is aimed at “legally” improving performance, CAM may be used because it is perceived as more “natural” and erroneously assumed as not potentially doping. This failure to recognise CAMs as pharmacological agents puts athletes at risk of inadvertent doping.

The general position of the World Anti-Doping Authority (WADA) is one of strict liability, an application of the legal proposition that ignorance is no excuse and the ultimate responsibility is on the athlete to ensure at all times whatever is swallowed, injected or applied to the athlete is both safe and legal for use. This means that a violation occurs whether or not the athlete intentionally or unintentionally, knowingly or unknowingly, used a prohibited substance/method or was negligent or otherwise at fault. Athletes are therefore expected to understand not only what is prohibited, but also what might potentially cause an inadvertent doping violation. Yet, as will be discussed, athlete knowledge on doping is deficient and WADA itself sometimes changes its position on prohibited methods or substances. The situation is further confounded by the conflicting stance of anti-doping experts in the media. These highly publicised disagreements may further portray inconsistencies in anti-doping guidelines and suggest to athletes that what is considered doping is dependent on the dominant political zeitgeist. Taken together, athletes may believe that unless a specific and explicit ruling is made, guidelines are open to interpretation. Therefore doping risk-taking behaviours may occur because of the potential financial, social and performance gains and the optimistically biased interpretation (that trying alternatives is part of the “spirit of sport”) and doping risk-taking behaviours may occur.

This discussion paper seeks to situate the reader in a world where elite level sports and CAM intersects. It posits that an understanding of the underlying motivation for CAM use and doping is currently lacking and that anti-doping rules need to be repositioned in the context of the emerging phenomenon and prevalence of CAM use.

Key Words
Doping, complementary and alternative medicine, sports law, biopsychology

Background
Western medicine as is practiced in many industrialised countries is generally regarded as conventional, or orthodox, and its use has a long-established history in these societies. Interest and use of complementary and alternative medicine (CAM) has, however, been growing in recent times in Western countries, as reflected by the increasing number of research papers in medical and scientific journals [unpublished literature search by the
Authors. Interested readers are referred also to the following for further details.[2,10]

Surveys in many countries have suggested a high use of CAM: in the United States, about a third of adults aged 18 years or older use CAM.9,11 Despite this growing interest, the definition of what is complementary or alternative remains very subjective and is certainly not universally accepted.12

While individual organisations have their own definitions, the perceptions of the general population or the end-users and even the practitioners of the various forms of medicine of what constitutes CAM vary tremendously.12 In addition, CAM techniques could become co-opted as they enter the mainstream.13 More physicians are also seeking training in CAM: there is an estimated 3,000 American physicians who integrate acupuncture into their practice14 and an estimated one-third of homeopaths who are physicians or osteopaths.15 The confusion of what constitute CAM (and the increasing penetration of CAM in everyday life) – either as a distinct treatment modality that consumers actively choose, or through the integration of CAM into Western medicine – may have serious implications for athletes.

Athletes are highly motivated and many seek new methods to improve performance. The literature indicates that athletes may also be the highest users of CAM and may help pioneer population trends in CAM use.16-18 While non-athletes may use CAM for prevention, treatment or rehabilitation from illness/injuries, athletes may possibly also use CAM for performance enhancement. If links between sport motivation and doping exist, and athletes’ sport motivation and CAM use are related, a connection between athletes’ CAM use and doping may also occur. This paper seeks to situate the reader in a world where elite level sports and CAM intersects and posits that anti-doping rules need to be repositioned in the context of an emerging phenomena and ubiquitous prevalence of CAM use. This paper discusses the concept of doping, the issue of using natural substances as a doping violation, how acupuncture as a type of CAM works, and how the use of CAM may be related to doping in the formal context of the spirit of sport.

It is important to note that most international sports are governed by rules of Western nations and Western culture and philosophies. For example, the rules for competitive swimming and all aquatic sports are governed by Fédération Internationale de Natation (FINA), while anti-doping rules in all sports are governed by the World Anti-Doping Agency (WADA). The official languages (and the inherent culture and worldview) of FINA and the WADA rules are English and French and where the interpretations of the rules are in doubt, the English language shall prevail.19-21

With an increase in the participation of non-Westernised countries in international sports, these rules (especially those regarding anti-doping) and their interpretation need to be sensitive to a multi-cultural environment. This paper will also explore how biopsychological evidence in the contexts of CAM use and WADA rules need to be more consistent and better explained to the sporting community.

**What is doping?**

It was mentioned earlier how the WADA is the current international governing body that oversees the issue of doping in all sports. The WADA has defined doping in their World Anti-Doping Code (the “Code”, 22). Under the Code, a violation of one or more of the following rules is considered doping and may result in sanction: (i) the presence of a prohibited substance or its metabolites or markers in an athlete’s bodily specimen, (ii) the use or attempted use of a prohibited substance or a prohibited method, (iii) possession of prohibited substances and methods, (iv) administration or attempted administration of a prohibited substance or prohibited method to any athlete, or (v) assisting, encouraging, aiding, abetting, covering up or any other type of complicity involving an anti-doping rule violation or any attempted rule violation.

A substance or method is considered for inclusion on the WADA’s prohibited list if the WADA determines that the substance or method meets any two of the following three criteria (italics emphasis by this author):22

1. Medical or other scientific evidence, pharmacological effect, or experience that the substance or method has the potential to enhance or enhances sport performance.
2. Medical or other scientific evidence, pharmacological effect, or experience that the use of the substance or method represents an actual or potential health risk to the athlete.
3. Determination by the WADA that the use of the substance or method violates the spirit of sport as described in the ‘Introduction to the Code’ (further explored below).22

The current emphasis of prohibition also appears to be based on four factors:

1. Substances within the athlete’s body.
2. Methods that enhance oxygen transfer through blood doping or artificial measures.
3. Altering collected body fluid samples.
4. Genetic manipulation.

This paper discusses the first two factors. Controversy exists as to what are acceptable levels of naturally occurring endogenous compounds and also what is a method that is not considered doping.

The interpretation of the Code is a legal one and largely untested. The broad interpretation of the principles behind the Code would seem to be related to any substance or method that (potentially or actually) enhances sport performance, becomes a health threat to the athlete, or is against the spirit of the sport. If the motivation, and indeed, the imperative, of an athlete is to constantly seek creative ways to improve the sporting performance, what then is the spirit of sport, and what actions are deemed to have violated that spirit? Using a biopsychological perspective, issues of what are acceptable levels of naturally occurring endogenous compounds, what is a method that is not considered doping, and what is the spirit of sport are explored below.

What is unnatural about natural substances?
Calf-derived deproteinised haemodialysate, Actovegin (Nycomed Austria), is a component in calves’ blood that gained attention when its use by the Australian rugby teams was reported to improve endurance and recovery from injuries. Although the medical research suggests some evidence (i.e. ‘potential’) of efficacy in the treatment of soft tissue injuries, the Australian Sports Anti-Doping Authority (ASADA, as a national representative of the international parent, WADA) said that Actovegin was not then on the WADA’s list of prohibited substances. Thus its use as a substance when restricted to intra-muscular injections is therefore not prohibited. However, it is illegal as a method when injected into a vein.

Actovegin was initially listed on the banned list by the International Olympic Committee (IOC) (the leading authority in anti-doping prior to the formation of the WADA) in December 2000 because of the concerns about its abuse in cycling. It was, however, removed from the IOC banned list in February 2001 pending further research. Actovegin is not a prohibited substance in WADA’s most current lists, although these lists do have an inclusion statement not present in previous versions: the prohibition of any growth factor(s) affecting muscle, tendon or ligament protein synthesis/degradation, vascularisation, energy utilisation, regenerative capacity or fibre type switching (p. 4). This inclusion statement has, however, created more uncertainty over other therapeutic substances, besides Actovegin, used in sports medicine settings [e.g. platelet-rich plasma: discussed in more detail by Engebretsen et al]. So far, the lawful challenge of using Actovegin as a tendon healing substance has not been made, although this legal issue is evolving at the time of writing.

According to the latest 2012 WADA prohibited list, Actovegin is not prohibited in any sports. However, to complicate matters, WADA has issued specific guidance on Actovegin on its website that, according to section M2 of the WADA code, the volume of intravenous injection of any non-prohibited substance must not exceed 50 ml with a simple syringe, and further serial injections must be at least six hours apart. This means that under the latest (2012) interpretation of the Code, Actovegin cannot be administered by intravenous infusion or single intravenous injection with a volume exceeding 50 ml.

Erythropoietin (EPO) is a peptide hormone and another compound that is found in the blood. EPO occurs naturally in the human body. To boost the amount of EPO in the human body with the aim of improving endurance performance or to improve recovery from anaerobic exercise, some athletes (e.g. cyclists) may use recombinant EPO. Recombinant EPO is prohibited both in and out of competition under the World Anti-Doping Code Prohibited List, although raising endogenous EPO in an athlete’s body through the method of high altitude training is not prohibited.

Recombinant EPO use, traditionally difficult to detect in the athlete, has recently been successfully tested in athletes as a result of collaboration of WADA and the pharmaceutical companies in uncovering a molecular marker of the drug. This uncovering process helps differentiate naturally occurring EPO and those artificially introduced. A similar technique to detect Actovegin would not be useful if the artificial introduction into the human body intramuscularly or using less than 50ml volume (no specification of concentration by WADA) intravenously were not prohibited. This means that the detection of doping of Actovegin would depend on catching athletes in the act of performing the banned method (not adhering to the rule of an intravenous injection of less than 50ml or an intramuscular injection of Actovegin) and not simply detecting Actovegin in the athlete’s body.

The inclusion and subsequent exclusion from the prohibited list, coupled with confusing biological evidence and scientific perspective is not unique to Actovegin: caffeine, considered a performance enhancing substance, was also previously classified as a banned substance by WADA if it
was detected in urine above a concentration of 12 micrograms per millilitre. Subsequent scientific evidence suggests that caffeine actually decreases performance above that 12 micrograms per millilitre threshold,\textsuperscript{33} and is known to be metabolised at very different rates in individuals. Thus the risks of sanctioning athletes for simply consuming social amounts of caffeine common in drinks and food\textsuperscript{33} led to the removal of caffeine from WADA’s list of banned substance in 2004.\textsuperscript{33}

The inconsistent stances on substances and methods illustrated above may confuse athletes, particularly when interpreted in the context of the spirit of sport (discussed later). This confusion may be exacerbated by consistent media portrayal of differences on the legalities of using Actovegin and caffeine in sports by anti-doping experts.\textsuperscript{33,34}

The next section will discuss various possible ways that acupuncture (as a form of CAM) works physiologically. In the setting of expert debate on acceptable levels of naturally occurring endogenous compounds and what is a method that is not considered doping, it provides a biopsychological basis in the context of doping and spirit of sport.

**CAM physiology and methods**

Acupuncture [and the field of traditional Chinese medicine (TCM)] is arguably an archetype of what is considered CAM in Westernised societies.\textsuperscript{35} Acupuncture is also increasingly being integrated into conventional medicine in these communities and is one of the most extensively scientifically studied forms of CAM.\textsuperscript{32}

While there is still debate on the actual physiological mechanism of how acupuncture works, many scientists believe that several mechanisms are possible. Because these proposed mechanisms are different from the underlying ethos and philosophy that govern acupuncture and TCM – the presence of the life energy (or “Qi”) flowing through channels (or “meridians”) in the human body\textsuperscript{36} – and how disease occur, direct comparisons with the scientific paradigms of biomedicine are not always possible.\textsuperscript{37} Also, individuals may use CAM and TCM due to their beliefs in the underlying traditional philosophies rather than any scientific motivation.\textsuperscript{38}

There are several ways in which acupuncture may work. Local anaesthesia at needle insertion sites may block the analgesic effects of acupuncture which suggests that acupuncture is dependent upon neural innervation.\textsuperscript{39} Acupuncture may also cause the release of endogenous opioids in brain-stem, subcortical, and limbic structures\textsuperscript{40,41} or induce the secretion of adrenocorticotropic hormone and cortisol from the pituitary gland thereby creating a systemic anti-inflammatory response.\textsuperscript{42} Indeed, functional MRI studies in humans show that acupuncture modulates limbic and basal forebrain areas involved in pain processing,\textsuperscript{43} while PET (positron-emission tomography) scans have shown that acupuncture is able to increase the opioid binding potential in the brain for several days.\textsuperscript{44}

Other proposed mechanisms of how acupuncture works are through its ability to mechanically stimulate connective tissues,\textsuperscript{45} release adenosine at the site of needle stimulation,\textsuperscript{46} or increase local blood flow.\textsuperscript{47} Ahmedov\textsuperscript{48} provides a more detailed discussion of the potential ergogenic effects of acupuncture in sport and exercise. As an example, an athlete sustained a ruptured muscle fibre (traditionally requiring prolonged treatment periods) less than three weeks before the 1998 European track and field championship. Treated with acupuncture, the athlete went on to win a silver medal and maintained a high performance level without pain.\textsuperscript{49}

Evidence-based medicine requires large sample sizes and preferably randomised-controlled trials to provide statistical evidence of significant effects. The issue of doping, however, is as much an interpretation of the law, as it is about the scientific and statistical evidence. The Code states that “...regardless of whether the expectation of performance enhancement is realistic...”.\textsuperscript{22} This is discussed in the next section.

Regardless of how acupuncture works, if a CAM modality such as acupuncture that does not involve ingestion of (potentially prohibited) substances but operates via a physical method, is capable of (potentially) increasing an athlete’s endorphin levels or increasing the athlete’s tissue regenerative capacity [and in so doing potentially improves athlete performance],\textsuperscript{50} is it acceptable under WADA rules? Or is it against WADA’s spirit of sport?

**Spirit of sport: The ephemeral elephant in the room**

The WADA characterises spirit of sport under the Code\textsuperscript{22} (p.14) as:

1. ethics, fair play and honesty;
2. health;
3. excellence in performance;
4. character and education;
5. fun and joy;
6. teamwork; dedication and commitment;
7. respect for rules and laws;
8. respect for self and other participants;
9. courage;
10. community and solidarity.

While these objectives are noble and worthy principles for sport, their abstract nature sometimes creates confusion when applied to the day-to-day realities that athletes face. The Code cites specific issues in the context of the spirit of sport, but these add to the confusion.

The WADA states in the Code (9) that the:
“... use of genetic transfer technology to dramatically enhance sport performance should be prohibited as contrary to the spirit of sport even if it is not harmful...”

and that
“... the potentially unhealthy abuse of certain substances without therapeutic justification based on the mistaken belief they enhance performance is certainly contrary to the spirit of sport regardless of whether the expectation of performance enhancement is realistic...” (p.33, italics by this author for emphasis).

These seem at *prima facie* to contradict the guiding principle of ‘excellence in performance’ set out in the characterisation of *spirit of sport* in the introduction to the Code (p. 14).

Athletes dedicate their lives to improving their sporting skills and fitness to be better in their sport. It is acceptable (and logical) to enhance performance by physical training without adding substances to the athlete’s body. The use of varied training programs and orthotic devices by athletes (e.g. fins for swimming training) during out-of-competition training is standard practice for most sports and one of the fundamentals of training paradigms. Most such performance-enhancing devices are, however, banned during competition.

If performance enhancing devices are prohibited during competition, how is the previous acceptance of performance enhancing polyurethane swim suits by the international swimming governing body, FINA, or the recent acceptance of a performance enhancing “swimwear system” for the 2012 Olympics reconciled with WADA’s *spirit of sport* and FINA’s own rule of ‘No swimmer shall be permitted to use or wear any device that may aid his speed, buoyancy or endurance during a competition’ (FINA, 54, SW 10.8)? Extending that argument a little further, and in the context of CAM, if a CAM that uses a physical modality is able to enhance performance, regardless of whether the expectation of performance enhancement is realistic, is that deemed acceptable and in the spirit of sport, or does it violate WADA’s doping regulations? Should the use of acupuncture, for example, to speed up recovery, improve flexibility and improve performance during a competition be labelled as a prohibited method and/or against the spirit of sport?

**The finishing line**

If the psychological motivation of athletes is to excel in their sport, and there may be a biopsychological basis for using CAM to improve their performance, the implications of CAM use in the context of elite sport must be recognised.

Whether using conventional medicine or CAM, athletes utilise any means to maximise their physical potential. So when does a method that increases the athletes’ endogenous substance to improve sporting performance become illegal or against the spirit of sport? There is at present an inconsistent application of what are methods that are considered illegal or doping and what the spirit of sport really is.

Present day elite sport culture is now less about health, courage, community and solidarity, or even character and education, fun or joy. The majority of athletes presumably believe and strive for ethics, fair play, honesty, and most are mindful of respecting themselves, the other participants, and showing teamwork, and will not knowingly break the rules and the law. While few would disagree that elite athletes epitomise the virtues of dedication and commitment, their ultimate and fundamental motivation is ultimately excellence in sporting performance.

Data from non-athlete patients suggests that ingested CAM substances are not viewed as medications because they are perceived as “natural”. Thus athletes may use CAM in the belief that it is more natural and, erroneously, not potentially doping (either as a “method” or “substance” under the anti-doping Code). The lack of understanding of various forms of medicine by patients and athletes may result in their not informing doctors (or coaches) about non-conventional treatment use because it is not viewed as important or relevant to their medical management. Patients thus risk complications from CAM drugs and their interaction with prescribed medications. The additional consequence from failure to recognise CAMs as pharmacological agents puts athletes at risk of inadvertent doping.
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