

# **Technology Assessment of Elite Sports. A Systems Theoretical Approach to Doping of the Next Society**

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In hardly any other part of modern society the idea of "pushing the boundaries" is as obvious and concrete as in modern elite sports: in competitive sports the boundaries of today regularly turn into the mediocrity of tomorrow. In some disciplines like cycling, 100 meter sprint or pole vault we can observe rates of performance enhancement between 24 and 221 percent since the first modern Olympic Games in Athens 1896 (Nature Materials, 2012, p. 651). As such, performance enhancement is a well-known phenomenon in elite sports, and not at least a question of technology (Fuss, Subic & Mehta, 2010). However, some technologies and methods are prohibited and sanctioned as doping. Doping is currently negotiated as the crisis of modern sports – by developing a dynamic of communication that is typical for crisis. In theoretical distance to moral judgement and public scandalization the contribution questions the doping of the next society. It is argued that doping in elite sports is highly functional and as such structurally expectable. After giving a brief description of main structural features of modern elite sports, doping will be illustrated as “functional illegality” (Luhmann, 1976). By addressing molecular target points, especially gene doping is associated with serious consequences for modern sports and society. Focussing on the future of doping the role of another risky technology has to be considered: the internet.

## **Introduction**

In hardly any other part of modern society the idea of pushing the boundaries is as obvious and concrete as in modern elite sports: in competitive sports the boundaries of today regularly turn into the mediocrity of tomorrow. In some disciplines like cycling, 100 meter sprint or pole vault we can observe rates of performance enhancement between 24 and 221 percent since the first modern Olympic Games in Athens 1896 (Nature Materials, 2012, p. 651). As such, performance enhancement is a well-known phenomenon in elite sports, and not at least a question of emerging technologies (Fuss, Subic & Mehta 2010). However, some technologies and methods are prohibited and sanctioned as doping. Like in other fields of behavioral regulation the ban of doping

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produces conformity and deviance. Social observers, and likewise we as spectators, not only consume sports but deviance as well by scandalizing and moral sizing the convicted athlete – the so-called doping sinner. In contrast to comparatively invincible social structures, athletes of flesh, mind and blood can be visited, controlled, blamed, sanctioned and condemned. In theoretical distance to moral judgement and public scandalization the contribution questions the doping of the next society, following the scientific paradigm of technology assessment.

In modern society scientific and technological progress leads to a type of decision making, Calabresi & Bobbit (1978) called *tragic choices*: the tragedy is situated in the fact that decision for and against technology can be treated as a risk. Nuclear accidents e.g. call in remembrance that besides the very desired effects, the unintended, unanticipated and non-expected ones (Merton 1998) have to be taken into consideration as well (Lelieveld, Kunkel & Lawrence 2012). In response to uncertainty and insecurity as typical values of modern societies technology assessment (TA) comes into play (Grunwald 2010, p. 65). By the means of prospective analysis TA aims to deliver a theoretically and empirically viable basis for orientation, management and control. However, the knowledge generated by TA is always the result of a current operation, importing future as present future. The future presence remains unknown and is „nothing outside the present“ (dt. „*nichts außerhalb der Gegenwart*“, Grunwald 2010, p. 145) - right down to the last decimal place of risk calculations. Like other social systems, elite sports rejuvenates by the recursion of its operations, guided by rather time resistant structures. In other words: in the system of elite sports happens what happens – on a horizon of structure which can be estimated.

In sense of a reflexive and modest claim of an "order with foresight" (dt. „*Ordnung mit Voraussicht*“, Luhmann 2003, p. 57) the contribution argues that doping in elite sports is and will be highly functional and as such structurally expectable (Körner 2014; Körner 2013a; Körner 2013b; Körner & Schardien 2012). After giving a brief description of main structural features of present global elite sports (2), doping will be outlined as „functional illegality“ (dt. „*brauchbare Illegalität*“, Luhmann 1976). (3). By addressing molecular target points, especially gene doping (4) is associated with serious consequences for modern sports and society (5). Focussing on the future of doping the role of another risky technology has to be considered: the internet (6).

### **Elite Sports: Producing Differences**

Elite sports is a function system in modern world society – next to arts, economics, politics, science or religion. It is the achievement of modern society, which, at the latest since the 19th century, expects its future as basically open, shapeable and in the light of constant growth. While science radicalizes the idea of scientific progress, economics changes over to the growth paradigm and education discovers the human being as an „enhanceable

reality“ (dt. „*steigerbare Realität*“, Luhmann & Schorr 1979, p. 65), sports and especially elite sports puts into effect the transfer of the principle of enhancement onto the human body. In contrast to the call for equality and quota systems in family, work, science and politics, elite sports flags out clear differences. At the end of each sports competition it is certain what should not at all be certain in the beginning and thus has to be brought artificially to zero: the difference between superior and inferior bodily performances. Based on the fictional precept of equality, elite sports produces personally attributable differences – here we can still observe, cheer and admire winners and losers, men and women, first and second classes of bodily achievement.

When performances are measured, comparisons are the result. Human Enhancement is a logical consequence. Elite sports sets this logic of comparisons and enhancement in series. Its distinctive feature for society lies exactly within the fact that elite sports is concerned with performances and their comparison in pure form, self-referential, and not a means to an end. Records create the possibility of comparing performances beyond time and space. As „brilliant abstractions“ (dt. „*geniale Abstraktionen*“, Guttman 1979, p. 59) they allow for the comparison of past and present, of living and dead – and they motivate to be broken. Every shooting, hitting, throwing, running or playing against each other is directly or indirectly related to record levels, stored in lists, tables and graphs. Records respond to records.

This overall pretty anti-egalitarian move on the level of structure compares to the fact that actors of the elite sports system are not seldom praised by social observers in the language of antique heroes. The elite athlete as a hero promises superhuman potential. But in contrast to the antique antecessor he is in the focus of a double-expectation that is full of tension: athletes are supposed to deliver top performances, but with a pure heart which means not to dope. The antique hero is, as known, not a moral hero at all. However, the modern athlete is supposed to be just that: for him the expectation of maximum bodily performances is paired with the expectation of maximum moral behavior. The elite athlete is a role model, a unique but likely varnished function within modern society.

Elite sports takes hold of the human being in the narrow corridor of just that dimension that is of interest for the comparison and coding of superior and inferior performance. The support system of an elite athlete consists typically of medical doctors, exercise scientists, physiotherapists and more and more of psychologists as well – thus of experts for the regulation and optimization of performance-limiting physical and mental processes. Ethics counselors or philosophers are usually looked for in vain.

### **Doping as Technology**

Enhancement is the great aspiration of modern elite sports. In order to functionalize human bodies and minds according to its needs, elite sports looks for technologies. The self-directed proximity of elite sports to technology is

based on a simple promise: namely, to isolate defined areas of complex system-environment-relations within which in turn defined elements can be systematically linked according to the scheme of cause-and-effect. Technologies promise control, regulation and prognosis. They allow the expectation that differences and enhancement can be shown precisely even at a point where the potential of human physiology and biomechanics are exhausted.

This is not only the trivial basis of the relation of elite sports to other disciplines of applied exercise science, but also the basis for its close relationship with doping: expectation and promise of „functional simplification in the medium of causality“ (dt. *„funktionierende Simplifikation im Medium der Kausalität“*, Luhmann 2003, p. 97) of precise turning on and off of enhancement capacities. Following this logic, the application of for example EPO leads to an increase in red blood cells, which in turn leads to a heightened capacity for oxygen intake, which ultimately leads to an increased probability of athletic success. There is of course a lot of legend in this vision, like many times when we talk about technology – thus, the belief that doping is always effective in the desired manner lacks empirical support. Doping has to count in non intended side-effects, which in turn, in order to become controllable, require the costly use of more technology in terms of a containment. For example, the blood thickening which goes along with the use of EPO needs to be contained by the application of blood plasma expanders or legal blood thinners. However, as performance enhancing technology doping in elite sports is highly functional and can be outlined as „functional illegality“ (dt. *„brauchbare Illegalität“*, Luhmann 1976). Last not least the control of doping is functional as well. While every positive sample stabilizes public confidence in the effectiveness of the control system and thus in the controllability of the problem, every negative sample confirms the expectation of a clean, fair and still natural and healthy sport.

### **Gene Doping: Push a Button Technology**

In the area of emerging doping technologies the most promising form of illegitimate performance enhancement is the so called gene doping – the World Anti-Doping Agency listed gene doping already 10 years ago as a prohibited method in the World Anti-Doping Code. The term "gene doping" is used in a narrow and a wide sense of meaning. In a narrow sense it is to be understood as the precise transfer of genetic information (DNA or RNA) into a cell, organ or organism by gene and cell therapeutic procedures. In a wider understanding, gene doping means the targeted expression of gene activity by other methods, for example by taking pharmacological agents.

Among medicals the actual and future potential as well as the risks of gene doping, which is necessarily linked to the achievements in gene-therapeutical research, is evaluated very controversial. Nevertheless, in the public-media space the cloned athlete has in fact already entered the stage – as a real utopia

of elite sports of tomorrow. Contrary to populist "Freakshow" scenarios three molecular target points of gene doping can currently be identified (Gerlinger, Petermann & Sauter 2008). Specific control and improvement of *energy supply* (1) are provided by methods for the overexpression of fat- and glucose-transport-proteins. The therapeutic application of FATP1, CD36 or GLUT is intended for the treatment of obesity and diabetes, but nevertheless serves as an attractive technology for sports performances.

Another likely application field of gene technological enhancement lies in the range of oxygen supply (2). Since the isolation of the human EPO gene in 1983, the attention is focused in particular on strategies to increase the concentration of erythrocytes, which indirectly lead to an improvement in the oxygen uptake and transport capacity. Numerous doping cases of recent years demonstrate the use of pharmacologically produced EPO, particularly in intensive endurance sports. The next stage involves gene therapy methods for intramuscular administration of the Epo gene, which has already appeared in the context of an investigation of a prominent former athletics coach (under the brand name Repoxygen™, Oxford BioMedica).

Finally, the *skeletal muscle system* (3) can be regarded as a main target point for gene doping methods. Besides the use of genetically engineered growth hormones such as HGH (Human Growth Hormone) and IGF-1 (insulin like growth factors) primarily strategies for build-up processes deserve special attention, e.g. through the overexpression of the receptor protein PPAR-delta or through the blockage of the extracellular messenger myostatin by inhibiting RNA. The conversion of type II muscle fibers (fast fibers) into type I fibers (slow fibers) by modulation of PPAR delta receptors as well as the inhibition of the myostatin gene through inhibitory RNA lead to a hypertrophy of the muscle and an increase of the number of fibers (hyperplasia). Both processes have already been demonstrated in animal experiments ("marathon mice", "knock-out" mice) and were partially converted into clinical trials.

In case of gene doping the typical causal argument of a processing unit obviously has to face uncertainties. The use of methods and substances for the modification of gene activity is, despite a few promising results in animal and clinical studies, linked to risks that are difficult to calculate. Known side effects like immune reactions or uncontrollable cell growth hint to potentially massive health problems which can lead to death (Beiter & Velders 2012). Like conventional doping gene doping is a risky technology which has to count in the boundaries of simplification: on the one hand by taking a look at the tremendous complexity of its most important reference point: the human body; on the other hand given the complexity of athletic success, a plurality of variables like genes, training, nutrition, environmental and social conditions come into play.

The elite sports system is a part of the modern society which holds up performance, its comparison and enhancement within a rigid logic of competition and records to its highest inner norm. The idea of Fair-Play has to be contrasted with the comparative „citius, altius, fortius“. One would maybe have to consider this as irony that there is a split of sportsmanship: finding

itself between doping-promoting expectations for top performances and a doping-prohibiting fairness-moral. At this point it only takes the simple hint at the fact, that there is a ban of doping and ever since this ban came into effect, deviance has been recorded on a regular basis. Indeed, doping seems to increase inversely proportional to its abatement – the more prevention and control, the more deviance.

Structural features of modern elite sports creates a social constellation in which individuals are drawn into a specific dynamic of deviance. It is known from empirical researches on doping that the biographical fixation in modern professional sports, the dependency on the limited resource body as well as the undamped inflation of performance standards and expectations – on part of the sports organizations, politics, economic system, media and the spectators – create a constellation to which quite a few athletes react by deviance. For German elite sports there are estimates of doping prevalence of between 6 to 45% (Breuer & Hallmann 2013; Pitsch, Maats & Emrich 2009). On the basis of this conditional matrix an individual coping by doping and gene doping (if available) is anything less but unlikely. As we know from crime research findings, it is precisely an opportunity structure consisting of availability, less control and high gratification which increases the likelihood of deviant behavior (Seipel & Eifler 2010). Even if its exact dimensions are currently only vaguely predictable, gene doping promises a kind of *push the button technology* which according to „the law of increasing penetrance of residuals“ (dt. „Gesetz der zunehmenden Penetranz der Reste“, Marquard 1986, p. 15) proposes to answer the last questions of human performance enhancement within the micro-cosm of genes.

## Consequences

Gene doping promises the continuation of athletic enhancement by innovative means. More discreet than the secret use of beta-blockers, gene doping applies where the legitimate influence of coaches and psychologists, medicals and exercise scientists on the achievement potential of their athletes faces creditable boundaries. And more than conventional doping, gene doping brings up questions which reach the scope of the entire society and overstrain the organized sports.

For elite sports the question about its explicit or implicit images of man is up for discussion. These images would be worth an analysis of their own. We can assume the homo sportivus somewhere between the reasonable man who is said to have rational motives for his behavior, the gentleman who has to act in a fair manner and finally the image of the human being as a *mortal engine* (Hoberman 1992). Of course, society, mass media and spectators are fascinated by modern sporting heroes running on maximum power, regardless of the question, how they can cope with the multiple expectations those different images represent. As a matter of fact, society, mass media and spectators not only consume sports but deviance as well by scandalizing and moralizing the

convicted doper. Society has to face the question what kind of sports do we really want? Accordingly modern polycontextural society itself has to answer key questions on enhancement and moral standards: how much of a constitutive moral is there in economics, politics, religion, science or mass media? What growth rates in business and education do we treat as satisfying?

Closely related to the question about images of man and sportsman questions about performance standard which are posed on the elite athletes are touched, for example the questionability of incentive structures such as the so-called „chance to be in the final“ (dt. „*Endkampfchance*“) within the process of nomination. Nomination and funding decisions are currently exclusively executed along performance-related criteria. National and international sports organisations, e.g. the German Olympic Sports Confederation (dt. „*Deutscher Olympischer Sportbund*“, DOSB), are known for rewarding ranking positions, titles and records – not for playing fair or being part of the competition, whilst both of them, fair play and taking part, are strongly emphasized and stylized as true spirit of Olympic Sports through official programmatic statements. The idea of fairness has to face the trinity of *citius, altius, fortius*. At least it can be noted as irony that modern "sport spirit" is splitted into a doping supporting expectation of maximum bodily performance and a doping forbidding morality of fairness, a double bind which leads to a decoupling of speech, decision and action and a state of organized hypocrisy (Brunsson 1989). By rethinking and adjusting the very incentive structures of doping (such as the criterion of so-called „chance to be in the final“, monetary awards of medals, titles and records, the instrument of target agreements) an enormous and so far untapped potential of sports governance comes into range.

Especially gene doping provokes new discussions about ban, control and their rationale in sports. The boundary of doped or not-doped by which today's elite sports is notorically supercoded is a boundary of meaning. It runs on a fine line. This is already shown by taking a look at discussions about maximum permissible values and opportunities which emerge from the field of gene technology. A seldom looked upon paradox of the doping control lies within the fact that in the effort of the supervision of compliance with *natural* boundaries (or boundaries of fairness, health) it is also reported that nature (fairness, health) is only possible by the effort of a fluid sociocultural demarcation – thus by biostatistically determined normal ranges. The control system itself draws the lines which it is based upon, sometimes it shifts them. To sanction gene doping in organized sport a court-proof verifiability of tests is needed. They i.a. have to deal with the question of natural and artificial boundaries (van Hilvoorde, Vos & de Wert 2007).

At the latest by referring to the genetically doped athlete it is not only about the problem of court-proof verifiability or about questions of fairness, health and naturalness – it is about the big picture: the entire human being. Gene doping advances as far as the delicate zone of central questions about genus. Gene doping challenges, with a radicality that has been unknown so far, the entire occidental semantic of the human being, his nature and dignity. In the case of gene doping the crucial processes don't act upon the nature of the

human being but within the social interpretation of these processes. A gene-technologically overexpressed glucose transport protein doesn't mean anything to itself, the activated biochemical processes remain unimpressed. They just keep on going. Only the society is impressed. And the society develops historically variable visions about the question about the human being – as we know, disabled persons, pygmies and strangers have not always been considered as human beings. Answers to the question about the human being can thus be compared to castles of sand. They fade away with the next wave and turn regularly into new shapes.

For the de-differentiation of the naturally-grown and man-made which is celebrated in liberal circles and strictly rejected by critics, modern elite sports in the time of gene technology offers a trend-setting experimental field.

### **Polycontextuality and Internet**

As pointed out gene doping could be understood as innovative solution of immanent elite sports enhancement expectations: or to say it once again with Niklas Luhmann: as „functional illegality“ (dt. „*brauchbare Illegalität*“, 1976). Doping (and thus likewise gene doping) is currently negotiated as the crisis of modern sports – by developing a dynamic of communication that is typical for crisis. Society is hooked on the needle of communication and doping is its dope. In this respect doping is not just a remarkable solution within elite sports but for society as well. It can be placed within the context of polycontextual social reproduction, meaning that science, pedagogy, law, media and so on thereby create their own future: science just doesn't stop to produce scientific sentences about doping, biochemistry just doesn't stop to analyse blood and urine samples, ethics just doesn't stop to choose the good ethics among all ethics and to measure sports up to this ethics, and also media just doesn't stop its work in the face of a detected doping case – just as pedagogy doesn't stop its full of good faith work on the yet to become responsible athletes.

Focussing on the future of doping we have at least to consider the role of the internet. The next society is according to Peter F. Drucker (2002) always the very society in which we can observe the establishment of a new communication technology. With the availability of letterpress for example suddenly opinions become fixed and reproducible – one can place them next to each other and compare them. The consequences are known: traditional places and authorities like priests, churches, universities and scholars loose or compete about the exclusive right to knowledge and knowledge production. Like the letterpress in the 15th century the internet currently paves the transition to the next society and a new need for control. The production of knowledge as well as the distribution of correspondent technologies nowadays takes course in a poly-centric and collateral way – essentially favored by the world wide web. The point is: the one who wants to dope today doesn't need the words and deeds of his medical doctor or pharmacist. Doping is taking place on the backstage of sports, legitimated by a well-rehearsed underground

moral. The internet opens up a structurally advantageous room for that kind of interaction. The assumed anonymous seclusion of social networks allows for a self-directed assimilation, discussion and acquisition of real or putative performance enhancing methods largely beyond scientific, political and public control. Traditional role asymmetries between layperson and expert get blurred.

As we can observe, more and more results of scientific studies in anti-doping or pharmaceutical research are discussed in internet chatrooms – last but not least under the perspective of possible application. The expectable but hardly intended side effect of anti-doping research is its contribution to the advancement of the very development it is supposed to limit. The produced knowledge about the effects of doping specifies the knowledge about its use within the doping context. This is the risky constellation for the management of doping and anti-doping in elite sports of the next society.

## References

- Beiter, T. and Velders, M. 2012. Pimp my genes – Gendoping zwischen Fakt und Fiktionen. *Deutsche Zeitschrift für Sportmedizin* 63, 5 (2012), 16-26.
- Breuer, C. and Hallmann, K. 2013. *Dysfunktionen des Spitzensports: Doping, Match-Fixing und Gesundheitsgefährdungen aus Sicht von Bevölkerung und Athleten*. Bonn 2012.
- Brunsson, N. 1989. *The Organization of Hypocrisy: Talk, Decisions, and Actions in Organizations*. John Wiley & Sons Inc.
- Calabresi, G. and Bobbitt, N. 1978. *Tragic Choices*. W. W. Norton & Company.
- Drucker, P. F. 2002. *Managing in the Next Society*. New York.
- Fuss, F.K., Subic, A. and Mehta, R. 2008. The impact of technology on sport — new frontiers. *Sports Technology* 1,1 (2008), 1-2.
- Gerlinger, K., Petermann, T. and Sauter, A. 2008. (Hrsg.). *Gendoping. Wissenschaftliche Grundlagen – Einfallstore – Kontrolle* (Studien des Büros für Technikfolgen-Abschätzung beim Deutschen Bundestag 28), Berlin.
- Grunwald, A. 2010. *Technikfolgenabschätzung – eine Einführung*. 2. edition. Berlin.
- Guttman, A. 1979. *Vom Ritual zum Rekord. Das Wesen des modernen Sports*. Schorndorf.
- Hoberman, J. 1992. *Mortal Engines: The Science of Performance and the Dehumanization of Sport: Human Engineering and the Transformation of Sport*. The Free Press.
- Körner, S. 2014, in print. Das Doping der nächsten Gesellschaft. Zur Technologiefolgenabschätzung des Spitzensports. In A. Dresen, L. Form & R. Brand (Hrsg.). *Handbuch Dopingforschung*. Schorndorf: Hofmann.
- Körner, S. 2013a. Gene Doping, internet and polycontextuality. *Elite sports of the next society. Risk Dialogue Magazine*. Re Swiss Center for Global Dialogue, 2.
- Körner, S. 2013b. Gedopt / Nicht-gedopt. Doping als Eigenwert des modernen Spitzensports. In E. Meinberg & S. Körner (Hrsg.), *Doping – kulturwissenschaftlich betrachtet. Reihe Brennpunkte der Sportwissenschaft*, St. Augustin, 63-78.
- Körner, S. and Schardien, S. 2012. (Hrsg.). *Höher – schneller – weiter. Gentechnologisches Enhancement im Spitzensport. Ethische, rechtliche und soziale Perspektivierungen*. Paderborn: Mentis.

- Lelieveld, J., Kunkel, D. and Lawrence, M. G. 2012. Global risk of radioactive fallout after nuclear reactor accidents. *Atmospheric Chemistry and Physics* 12, 4245-4258.
- Luhmann, N. 1976. *Funktionen und Folgen formaler Organisationen (4. Aufl.)*. Berlin.
- Luhmann, N. 1983. Anspruchsinflation im Krankheitssystem. Eine Stellungnahme aus gesellschaftstheoretischer Sicht. In P. Herde-Dornreich & A. Schuller (Hrsg.), *Die Anspruchsspirale: Schicksal oder Systemdefekt*, Stuttgart; Berlin; Köln; Mainz, 28-49.
- Luhmann, N. 2003. *Soziologie des Risikos*. Berlin; New York.
- Luhmann, N. and Schorr, K.E. 1979. *Reflexionsprobleme im Erziehungssystem*. Stuttgart.
- Marquard, O. 1986. *Apologie des Zufälligen*. Stuttgart.
- Merton, R. K. 1998. Unanticipated Consequences and Kindred Sociological Ideas: A Personal Gloss. In C. Mongardini & S. Tabboni (eds.), *Robert K. Merton and Contemporary Sociology*, New Brunswick: Transaction, 295-318.
- Nature Materials, *Editorial*, 11 (2012), 651.
- Pitsch, W., Maats, P. and Emrich, E. 2009. Zur Häufigkeit des Dopings im deutschen Spitzensport - eine Replikationsstudie. In E. Emrich & W. Pitsch (Hrsg.), *Sport und Doping. Zur Analyse einer antagonistischen Symbiose*, Frankfurt a. M., 19-36.
- Seipel, C. and Eifler, S. 2010. Opportunities, Rational Choice, and Self-Control: On the Interaction of Person and Situation in a General Theory of Crime. *Crime & Delinquency* 56, 167-197.
- van Hilvoorde, I., Vos, R. and de Wert, G. 2007. „Flopping, Klappin and Gene Doping: Dichotomies between ‘Natural’ and ‘Artificial’ in Elite Sport“. *Social Studies of Science* 37, 173-200.