

Special Article

New threats of genetic research in sport

PAWEL CIESZCZYK¹ , AGNIESZKA MACIEJEWSKA², MAREK SAWCZUK²

¹*Szczecin University, Institute of Physical Culture, Poland*

²*Szczecin University, Genetics Faculty, Poland*

ABSTRACT

Cieszczyk P, Maciejewska A, Sawczuk M. New threats of genetic research in sport. *J. Hum. Sport Exerc.* Vol. 5, No. 3, pp. 322-327, 2010. The main goal of this paper is to show the main threats and ethical controversies associated with the application of molecular biology in sport. Such ethical reservations are presently the most important obstacle to wider application of genetics in training and only a small fraction of its remarkable potential is used in sport practice. However, the increasing availability of molecular research and associated possibilities create a situation where the moral questions need to be comprehensively addressed. **Key words:** SPORT, GENETICS, ETHICS, GENE DOPING.

 **Corresponding author.** Institute of Physical Culture, ul. Piastow 40b, blok 6, 70-067 Szczecin, Poland.

Phone: +48914442735, Fax: +48914442736

E-mail: cieszczyk@poczta.onet.pl

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Until recently, all types of scientific research in sport have been able to be included within generally accepted ethical frames (Loland, 2002), but with the application of new technologies, including achievements in molecular biology, this has changed.

The practical possibility of using human DNA information in sport has started to emerge gradually, in line with the development of molecular techniques (Bouchard et al., 1997). Despite the enormous potential of such methods, their legal application in sport has been very small, mainly due to ethical considerations (Chrostowski, 2005), where the questions of moral nature are as complicated as the already intricate subject matter of genetics.

It is symptomatic that from the very inception of the Human Genome Project, it has been accompanied by a special advisory body, the ELSI (Ethical, Legal and Social Implications), to tackle the potential consequences of nascent studies on the human genome. Since the very beginning, ELSI had a considerable budget of 3-5% of all the resources spent on the Project. Its main areas of interest were the intellectual property of genetic information, application of genetic information for non-medical purposes, significance of the human genotype information for racial and ethnic issues, and the ethical aspects of using genetic research by other scientific disciplines.

In sport, the issue that has unanimously been regarded as unethical and morally reprehensible is the use of gene therapy in doping (Breivik, 2005). The World Anti-Doping Agency (WADA) decided to include a prohibition on gene doping within their World Anti-Doping Code as early as 2003 (WADA, 2005).

However, gene doping seems to be a more complicated moral issue than previously known methods of illegal doping. The main question here is the incomparably greater risk to the health and life of the competitors, and hence the immense responsibility of physicians and coaches who decide to use it. In contrast to previous doping methods, the present level of knowledge does not give a 100% certainty on a specific response of a body to the applied gene doping.

Additionally, no effective methods have been developed to control changes initiated by the introduction of genes into the human body (Schjerling, 2005). The associated response of the body cannot be halted by anyone and anything, and additionally, the minimization of these effects is also impossible. If during a gene doping process something goes contrary to the assumptions, the doctor could only helplessly witness the tragedy that would entail. In other words, the moral questions that have so far been just a matter of fair play, have reached a new level of a direct responsibility for human health and life.

Still more complicated are the ethical questions associated with genetic research in sport. The key issues are connected with the use of information obtained during such research.

Fears concerning the appropriate protection of genetic results are closely associated with the character of the obtained information. Human DNA, present in all the cells of the human body, stays the same from the moment of birth until death. The information included in it determines all the processes occurring in the body and may be used to estimate the probability of disease, or even to define a certain type of human character.

Making the study samples available to any third party is, similarly to gene doping, unethical and morally reprehensible [Encyclopedia of Bioethics, 1995]. Scientists that carry out research on human DNA are perfectly aware of that moral dimension and the significance of the genetic material they collect. That is

why each new project on the human genome is first submitted for approval to an ethical committee, which always emphasizes the problem of protecting the material used in research. Illegal and unethical behavior could be very profitable for any dishonest scientist.

DNA information could be very interesting for insurance companies (Radetzki & Juth, 2003), as their 'policies for life' are an important part of their offer. The information in the human genes, e.g. concerning the probability of chronic or lethal diseases, could minimize the risk of signing 'unfavorable' contracts. Knowledge on the genotype of a potential customer could help insurance companies carry out precise economic calculations based on the probability calculus. In extreme cases, a life policy could be sold only to a 'genetically proper' client, and people from any high risk group could be denied such contracts (or signed at higher rates).

The commercial value of genetic information seems to be even higher if we realize that it may concern even several persons simultaneously. A DNA sample provides information about the members of the direct family (Roth, 2007). One famous example is the case of the English Queen Victoria, who, after a spontaneous mutation, became a hemophilia carrier. It is inherited in the same way as, e.g. hair loss, the knowledge of the basic heredity laws made it possible to track changes induced by that mutation in the genotype of the next generations of a few European monarchies. In the 21st century, already called the age of information, knowledge of this kind could be priceless. Therefore before our genetic material is given for any study, it is justified to make certain who, and to what end, will examine the DNA that includes a lot of information about ourselves and our family.

Obviously, economic loss is not the most dangerous consequence of a potential unauthorized access to our DNA. One of the most drastic cases, very often cited in literature on the subject, was the Race Office in Nazi Germany (Tännsjö, 2005).

Unfortunately, despite so many years since these dark moments of European history, there are places in the world where racial segregation is still a real existing problem. Mass media reports many court cases and even open conflicts between people of different races. Genetic material could be an unquestionably serious threat for society; information obtained during its analysis could be used by racially prejudiced individuals to reject someone's application for work or thwart undesired marriages.

So far only a few countries have established legal regulations on genetic discrimination (e.g. Austria and Belgium). Also the European Parliament took on the issue of genetic segregation, passing the Convention on Human Rights and Biomedicine, which has not been ratified by all the member states (e.g. Germany and Ireland) (Miah, 2003; Roth, 2007).

A specific case of segregation based on the human genome is an attempt at determining a predisposition to certain kinds of effort, and consequently specific sport disciplines. The history of genetic research in sport has a relatively short but rich history. One of the main directions in this area is an effort to build a genetic version of the 'master's model' (Hilvoorde, 2005). In this case, the main goal was to show the most desirable forms of individual genes (Munthe, 1996). Although research of this kind is being carried out in several scientific centers, their ethical implications are ambiguous and give rise to many controversies.

One of the questions that is posed during such research, is the problem of the sporting future of individuals with genotypes different from those that scientists deem the most favorable for the particular sport career. Should such people be excluded from further stages of sport training and left out. Should they only be given

a chance to train as non-professionals? The genotypes of such people deny them any chance to become future olympic masters, which undermines the sensibility of their professional involvement. But do scientists have the moral authority to block someone's sport career based on the results of genetic research? (McNamee, 1995).

The present state of molecular biology does not allow the determination of a 'golden' set of genes, which with 100% certainty would predispose a given individual to a master's title. Most genes associated with sport achievements are 'candidate genes' (Roth, 2007). Their role in sport is highly probable, but not proven beyond doubt. Additionally, one should consider the fact that given predispositions (e.g. speed) may be coded by a few or even ten or so genes (polygenicity). Hence, the unfavorable set of alleles of one gene does not need to discredit a given competitor when it comes his specific predispositions. Additionally, one needs to be aware of the fact that success in sport is not decided purely by genetic factors, but also by ambition and willpower. So, even the 'best genotype' alone will not make a given sportsperson an olympic master. Therefore is it ethical or morally justified to plan someone's sport career based on genetic results? Not all the possibilities of utilizing the latest achievements in molecular biology are so morally unambiguous as gene doping or 'genetic selection'. No reservations are expressed with regard to the application of gene therapy in the treatment of injuries and traumas. A bit more controversial is the use of genetics in individualizing the diet (nutrigenomics), as it has been proven that people with a certain set of alleles can metabolize some types of food in a distinctly faster fashion (including doping preparations), which is known to have a tremendous significance in modern sport (Chadwick, 2005). Is this morally justified? According to some, the control of the quantity and quality of food based on genetic research has nothing to do with supporting the competitors, but is mere breeding (Miah, 2002). How can this be related to the theory of sport training, in which the main goal should be education through sport and the cultivation of deeper values? Olympic laurels should not be a goal in themselves, to be pursued at any price. It is very easy to ruthlessly subordinate all things in order to obtain a desired goal, and lose a greater and deeper sense of one's behavior (Allison, 2005).

It is also interesting to consider potential situations that might occur during the analysis of genetic research Results. The issue of protection against unauthorized access to human DNA samples has been described earlier and is beyond any doubt. Researchers should always start their work by informing the participant about how the collected material will be used. Each time, after the completion of a given project, the samples should be utilized. But how should one behave in the case of discoveries not associated with the subject matter of the study? Should scientists that examine the genetic aspects of sport, inform the participant about an accidentally discovered risk of a disease in a given player? (Munthe, 2005). A genetic scientist is not a doctor. Usually, there is no pattern for reacting to such discoveries, and the scientist has no experience and authority to present such information. A further example is the question of how a scientist should behave after a discovery that the participant in the research is not the biological father of children raised by him. Would not that be a too far-fetched interference with someone else's life or could it be morally justified and on the other hand, would it be ethical to withhold the truth?

One of the papers on genetic research in sport argued that it is still at the level of a kindergarten (Sanocka & Kurpisz, 2004). In this context it is really worrisome that already we need to answer many questions connected with the application of the newest genetic achievements in sport. It seems certain that in the future, together with the development of molecular techniques, the number of moral and ethical problems will definitely increase (Miah, 2004; Tännjö, 2005). Scientists are already able to clone individuals, say, olympic masters (Robertson, 2000). In the near future, it will probably be possible to substitute specific

genes in the genome or even perform a permanent change of entire phenotypes (Kmiec, 2003). The aforementioned charge of 'sportsmen breeding' gets a wider and more uneasy dimension.

If the application of molecular biology in sport will almost certainly be associated with problems of moral and ethical nature, is it sensible to continue such research at all? Stopping the already started projects and fighting with the inevitable progress of discovery seem pointless. Such attempts would be nothing but tilting at windmills. It seems much better to use the greatest sources possible for the prevention and tackling of the illegal application of genetics in sport.

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