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# Behavioral Intervention Technologies – Historical, Medical, Philosophical, and Ethical Perspectives

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**Abstract**: *In this study, we will analyze, from philosophical, medical and bioethical points of view, the genetic ways in which the biological foundations of human behavior can be identified, as well as the technologies that can contribute to the modification of certain human behaviors, especially aggressive ones.*
*Ideas about the inheritance of a certain behavior have been identified since Greek antiquity, but in the 20th century, along with sequencing and mapping of all genes of the members of our species, the possibility of identifying possible genes for learning and memory has emerged and therefore the ability to act on them through "behavioral genetics" could develop. In the dawn of the 21st century, researchers begin to consider that abnormal behaviors had a certain genetic mutation located on the "X" chromosome or on the "Y" chromosome and the concept of "genetics of intellectual disability" was introduced in the medical literature. After the identification of the genes or the constellation of genes that underlie the occurrence of psychiatric disorders, the researchers developed genetic engineering to be performed on certain groups of neuronal cells, but these activities lead to the question: how useful or dangerous these new genome editing technologies will be, especially in terms of conservation and perpetuation of the human species.*
*We conclude that the chimera-type people, whose genetic structure is artificially constructed, would raise issues primarily about their identity, their integration into traditional societies, but also about the need for a new legislation. However, the future society will have, at some point, to accept the reality of genetic interventions, the purpose of which is to achieve much more radical transformations in human nature.*

**Keywords:** *behavior, genetic selection, genetic intervention, ethical challenges.*

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## Introduction

The Human Genome Project is a remarkable scientific achievement (Roushan et al., 2014), which has fulfilled its purpose of determining the base pairs that make up human DNA and to identify and map all genes in the human genome, both physically and functionally. For researchers in the field of behavioral sciences, this is particularly interesting, because dimensions and behavioral disorders are the most complex features of all. Therefore, it was considered that, in order to understand these traits, one must first identify the possible roles that certain genes may play in the development of different human behaviors.

In this study, we will address the genetic ways in which the biological foundations of human behavior can be identified, as well as the technologies that can contribute to the modification of certain human behaviors, especially aggressive ones.

## Historical vignettes on the significance of genetics in human behaviors

Viewed with suspicion since antiquity, genetic intervention has however made its way to the present day.

In *Book V* of the *Republic* dialogue, Plato considered that, in an ideal state, the "guardians", i.e. the ruling elite, are the result of both a genetic inheritance and a good education (Grote, 1867). Taking into consideration the example of how valuable specimens can be obtained in the case of dogs and poultry, he considers that, in the case of marriages and the procreation of the ruling class in the ideal state, the following imperative law must be considered: "*We must copy the example of those who regulate the copulation of horses, dogs, and other animals: we must bring together those who will give existence to the best offspring. We must couple, as often as we can, the men who are best, with the women who are best, both in mind and body; and the men who are least good with the women who are least good*". The children of the first couples must be raised, but the others – no, because only a good ancestry can lead to superior characters, and those who have it can be included in the elite class (Plato, 2008).

Ideas about the inheritance of a certain behavior could be also identified in the Shakespearean works. *The Countess de Roussilon*, from the play *All'S Well That Ends Well*, presents *Helena*, her protégée, as a young woman characterized both by good upbringing, which was to ensure a bright future, but also by the moral qualities acquired from her parents: "*this young gentlewoman had a father… whose skill was almost as great as his honesty… his sole*

*child, my lord; I have those hopes of her good that her education promises: her dispositions she inherits, which makes fair gifts fairer; ... in her they are the better for their simpleness; she derives her honesty and achieves her goodness*" (Shakespeare, 1894).

However, the cases in which the observance of ethical requirements and happiness harmonize with each other give way to other situations in which these requirements are not necessarily sufficient for a person to consider himself happy. This is also the case of the character *Faust* in the eponymous poem written by Goethe, in the eighteenth century, which captures the contradiction between a life lived according to moral precepts, - in accordance with the customs of society, but which does not bring happiness and fulfillment to the subject-, and a life in which desires, even if they are illicit from the point of view of the collective mind, are satisfied, making the individual a damned person, but who pays for that damnation with a moment of happiness.

This eternal ambivalence between inclination and duty is perhaps best reflected in the monologue of the respected *Professor Faust* of the University of Wittenberg: "*I've studied, alas, Philosophy/ Law and Medicine, recto and verso/ And how I regret it, theology also,/ Oh God, how hard I've slaved away/ With what result? Poor foolish old man,/ I'm no whit wiser than when I began!*" (von Goethe, 2014). After all these endeavors in the realm of knowledge and the practice of virtue, the bitter conclusion of the old *Professor Faust* is that he has nothing in this world: "I've got no money or property,/ Worldly honors or celebrity;/ A dog wouldn't put up with this life!" (von Goethe, 2014).

What did the old *Doctor and Professor Faust* actually do that made him so unhappy? Nothing but that he deliberately changed his innate behavior, which inhibited his tendencies, his inclinations, those *Neigungen* - as Kant calls them, or the impulses - as called by Freud, on the basis of his casuistry in medical practice, as *Treib* - which in German means *deviations* (from the consciously assumed path) or *drives* in English, in the sense of forces that lead us independently of our consciously assumed will. Freud, like Kant, correlates *inclinations* with the idea of *desire*.

His entire life, *Faust*, the old Professor at the University, geared his behavior in the direction that *his duty to humanity*, to the species, we might say, conducted him. *Faust*'s behavior thus becomes a moral one, accepted by other people and, even more, considered exemplary by his disciples. The old teacher taught philosophy and even theology. *Faust* the theologian, however, considers himself unhappy as an individual; he is on the verge of suicide, willing to sell his soul to *Mephistopheles* in order to experience the happiness marked by that moment when he can say: "*Linger awhile, you are so fair*!" (von Goethe, 2014).

Nowadays, scientists do not inquire themselves if they can invoke Mephistopheles to satisfy their most eccentric desires, but whether if human behaviors can be artificially altered in order to be improved. In recent decades, it has been found that there are two ways in which this operation can become achievable: either through genetic interventions, or through substances that alter the natural chemistry of living organisms. In both cases, "improved" behaviors can be induced through advanced technologies, thus becoming socially acceptable.

## The limits of eugenics

The identification of methods by which certain human behaviors could be modified aroused great interest since the beginning of the twentieth century, when two theories were in vogue. One of these argued the importance of genetic determinism of behavior, based on the research of Charles Darwin, the founder of evolutionary theory, and the famous laws of heredity discovered by Gregor Mendel. The second represents the opinions of two American anthropologists, Franz Boas and Margaret Mead, who supported the social origins of human behavior. One of the proponents of the theory of heredity, the American psychologist and eugenicist Henry H. Goddard published in 1912 the book *The Kallikak Family: A Study in the Heredity of Feeble-Mindedness*. This book presented the results of the research carried out in an institution where «"feeble-minded children" were raised, in order to determine the mental and physical peculiarities of the different deficiencies identified in the children there, with the hope that they will be correlated with the condition of the child's nervous system», as the author announced in the book's *Preface* (Goddard, 1912). The author presents an extensive case study on the legacy of the "mental weakness" of young Deborah Kallikak, a patient admitted to the institution where the author worked. Goddard presents her family tree, starting with her distant ancestor, Martin Kallikak, an American hero who had a family with his wife, which included prosperous and well-positioned individuals. Prior to his marriage, during the war, young Martin had a short-term relationship with a bartender girl, which resulted in a son. Out of his 408 descendants, including Deborah, 153 were alcoholics, prostitutes, criminals, or epileptic (Goddard, 1912), because, according to the author, they had inherited their ancestor, the bartender girl, described by him as "*the nameless feeble-minded girl*" (Goddard, 1912). The German eugenicist thus wanted to show that a variety of mental traits are hereditary and that society should limit the reproduction of people who possess such traits.

During the Second World War, perhaps inspired by this book, the Nazis tried to improve the genetic quality of the Aryan German population by excluding people and groups considered inferior and by promoting those considered superior. Adolf Hitler promoted legislation under which people with physical or mental "defects" had to be removed from the ranks of the German people. Such "defective" people were the poor, the mentally ill, the blind, the deaf, those with various developmental disabilities, promiscuous women, homosexuals, and racial groups (such as Roma and Jews in Nazi Germany) who had to be sterilized and even killed.

Much later, in 1994, *The Bell Curve: Intelligence and Class Structure in American Life* (Herrnstein & Murry, 1994) claimed the existence of correlations between genetics, class, race and intelligence, obtained on the basis of extensive documentation and extensive statistical analysis. Framed by critics as promoting a Nazi ethic, the book was considered dangerous for its results as it disadvantaged certain social categories.

## Methods for identifying the genetic basis of memory and learning

After the Second World War, a whole literature dedicated to the artificial modification of behaviors emerged, starting with the science fiction, satirical and dystopian novel entitled *A Clockwork Orange* written in 1962 by an English author (Burgess, 1962) and ending up to the famous *Our Posthuman Future: Consequences of the Biotechnology Revolution* (Fukuyama, 2002), published four decades later by the American sociologist and political scientist Francis Fukuyama.

Such research, which aims at the intervention of science in changing human behaviors and performance, first tackled the increase of the degree of stress resistance, memory enhancement, but also the speed of response to various external stimuli.

However, everything took shape with the launch, in 1990, of the Human Genome Project (Roushan et al., 2014) because, based on the sequencing and mapping of all genes of the members of our species, *Homo sapiens*, it was hoped that we would understand human evolution, the causes and mechanisms of diseases that an individual could suffer at some point, but also complex interactions between genes and the environment. However, later, based on the genetic map, new research was conducted in order to understand the biological foundations of human behavior (Bull & Varghese, 2020).

The first of the most significant achievements in this field of research is the discovery, in 1996, by Joe Z. Tsien et al., a biologist at Princeton University, of a possible gene for learning and memory. To make

this discovery, the American researcher developed the less ethical method called *gene knockout technology*, based on which a laboratory mouse was raised without the gene responsible for memory qualities because virtually all genes of interest in the pyramidal cells (neurons) were deleted from the hippocampal region CA1 (Tsien et al., 1996). The same researchers used genetically modified mice to demonstrate a spatial memory deficit and fear conditioning when genetic modification occurs in the striatal nerve cells and the amygdala, two anatomical structures considered to belong to the limbic system (Mayford et al., 1996). Two years later, Joe Z. Tsien introduces a concept that will impose him in the scientific community: "*behavioral genetics*" (Tsien, 1998), to emphasize the role of genetics in the development of human behavior. The problem, however, is to what extent his experiments on laboratory mice can be extended to humans because, in the case of humans, such an experiment would appear to be abominable.

Although recent studies on memory and intelligence in identical twins encourage genetic approaches to these human qualities, however, when research comes to conclusions that are too firm in this direction, they clash with the opinion of many equally knowledgeable scientists in this field of research, especially among those working in the field of pedagogical instruction. These researchers, most of them with considerable teaching experience, believe that factors related to education are more important than the genetic ones in terms of the intelligence and even the memory of an individual, which are largely constituted through various particular learning contexts.

## Technologies are changing the human behaviors

Technologies that aim to change human behavior using information from genetics or the pharmaceutical industry are still in their infancy, but this does not mean that in the near or distant future the problem data cannot progress.

Also in this embryonic research context are the studies on the control of delinquency or aberrant considered sexuality, disturbing for the social order.

Early twentieth-century research focused more on morphological elements, such as the shape of the skull, forehead, and cheekbones, the proximity of the eyes, or the size of the jaw, as this matter had been initiated since the end of the 19th century.

In the second half of the twentieth century, after the World War II, the contribution of genetics began to be recognized in the understanding of

the mechanisms of triggering violence and aberrant sexuality, even if it was difficult to accept.

Thus, the physiognomy researches of the Swiss theologian Johann Caspar Lavater (1741-1801), as well as those carried out by Franz Joseph Gall (1758-1828), which were related to the phrenological theory, or those of Cesare Lombroso (1853-1909), who focused on the study of human features to identify possible trends in criminal acts, have left room for more sophisticated analyzes, developed by geneticists in their studies at the microscopic level.

In 1993, a group of geneticists published the results of a research study on a Dutch family with several individuals with aggressive and sometimes violent behavior, some of whom were accused of committing crimes, others of arson, attempted rape, or exhibitionism. The researchers found that all those responsible for such abnormal behaviors had a certain genetic mutation located on the X chromosome, which was missing in other family members who did not show such aggressive tendencies. The affected locus was that of the structural gene for monoamine oxidase A, the enzyme involved in the metabolism of neurotransmitters, which ensure the transmission of nerve impulses from one neuron to another. In the absence of that enzyme, monoamine neurotransmitters accumulate and cause psychiatric or neurological diseases. The researchers concluded that the genetic modification they discovered may represent the biological mechanism underlying anti-social behavior, or, in other words, that aggression may be genetically conditioned (Brunner et al., 1993a). In such cases, the therapy that is required to be the most effective can only be one of a genetic nature, which would prevent the appearance of this mutation in future generations (Brunner et al., 1993b).

On the other hand, the Romanian Professor Constantin Maximilian, the creator of the Romanian school of genetics, stated that studies that used genetics and certain statistical data regarding delinquent men have come to say that the Y chromosome would have significance in such cases. In the case of those men who have a structure with two "Y", i. e. the shape of "XYY" instead of the normal "XY", would predispose to such inclinations towards extreme violence and even murder (Maximilian et al., 2001). Subsequently, more and more scientific articles have appeared that have proven the role of genes at behavioral, neuroanatomical, neurochemical and neurophysiological levels, throughout the ages of development (Anagnostopoulos et al., 2001a). The experiments were performed on mice modified by transgenesis or gene deletion ("*knockouts*"), which were used to elucidate the genetic basis of the behavior (Anagnostopoulos et al, 2001b)

because they provide the model for evaluating the effectiveness of new therapies in the treatment of hereditary psychiatric and neurological disorders.

In fact, in 2007, the *Psychiatric Genomics Consortium* was established. Its purpose is to perform analyzes of genetic data identified at the human genomic level in order to identify the genes or constellation of genes that underlie the occurrence of psychiatric disorders. Its more distant goal is, of course, to be able to intervene through gene therapies to improve the diagnosis, develop a targeted treatment and enhance primary prevention (Watson et al, 2020).

In 2008, Ropers introduced the concept of "*genetics of intellectual disability*" in an article stating that early-onset intellectual disability is a health condition and not a social or educational problem because the condition is actually characterized by cytogenetically visible chromosomal abnormalities, such as trisomy 21, but also submicroscopic deletions and duplications of the X chromosome (Ropers, 2008).

## Bioethical controversies regarding the changes in the molecular structure of the nervous system

Recently, the Romanian bioethicist Antonio Sandu specified that the possibilities of intervention on human nature call for a greater amplitude of what bioethics means. Thus, this author considers that "bioethics should not be limited to providing a set of rules, or the principles of good practice for health care, but should include a specific discourse on the various scenarios in which humanity evolves, namely the nature in which research evolves, whether we are talking about an ethics of technology, a post and transhumanist ethics, an eco-ethics, an ethics of public policy, including health care" (Sandu, 2020).

Technologies that use genetics open an extremely controversial topic: whether or not parents or society have the right to determine the sex of children or, moreover, the color of their eyes or their degree of intelligence. This is possible today not so much through genetic intervention as through genetic selection. A geneticist can easily anticipate the future features of the fetus and its possible genetic problems. The question is whether, once we know these elements of the future evolution of the embryo, do we have the moral right to make a selection among these candidates for life?

Another even more controversial topic is related to genetic intervention to change the molecular structure of the human nervous system

given that recent research has shown that the malfunction of specific cell types in different regions of the brain is the basis for various neuropsychiatric symptoms, such as hallucinations, depression, or repetitive motor behavior (Heidenreich & Zhang, 2016). In 2001, the technology to modify the molecular structure of the nervous system by adding genes or deleting genes in the early stages of embryo development had already become known. The researchers were also aware of a gene therapy that consisted of delivering antisense mRNA directly to predetermined cell types, thus allowing genetic modification of selected neuronal populations in adult animals (Lowenstein, & Castro, 2001). Obviously, this genetic engineering performed on certain groups of neuronal cells will have effects on human behavior, if they are put into practice on human subjects, but the question is whether this intervention is ethical or not.

In the second decade of the third millennium, new genome editing technologies are used, such as those based on the CRISPR / Cas system (Feng et al., 2020), which is an RNA-targeted genome editing tool that allows researchers to modify multiple genes simultaneously through insertions and deletions. The consequence is a change in the germline genome in the embryo. So far, only experiments generating genetically modified models of non-human primates have been published so far, but they are useful in researching and treating brain disorders, either of a psychiatric nature or due to a defective neural development that occurs in humans.

But, because in the last decades bioethics has become "the regulatory and methodological reference factor of the activities in the most diverse fields, but with predilection in the philosophical, sociological, medical and legal one" (Ojovanu, 2020), we must consider how useful or dangerous these new genome editing technologies will be, especially in terms of conservation and perpetuation of the human species. Will they be able to increase the quality of life? Will they achieve a better human species? Or they will push us into a spiral of changes, the long-term effects of which we cannot anticipate.

## The possible consequences of genetic or artificial augmentation of the human being

*Gattaca*, the American dystopian science fiction film, made in 1997, offers a vision of a future society in which, through genetic engineering, descendants possessing only the best hereditary characteristics of their parents could be obtained. The film highlights a disturbing thing, namely that if all genetic efforts are directed only towards obtaining high-performing

individuals with exceptional qualities to work in the lucrative fields, then a world can be created in which love and the magical attraction between people disappear, who belong to other laws, much more complex and which cannot be predetermined artificially.

In fact, this is supported since antiquity, when Plato, in the *Banquet*, stated that, in the beginning, humanity would have existed in a state of perfection without knowing love. This appeared as a consequence of a punishment by which the primordial man was degraded from his condition by halving. Since then, the parts of the whole, when they meet, are attracted to each other through love, precisely to restore unity, the original state (Plato, 2001). Therefore, there can be no love between perfect beings.

The Norwegian film *Miracle* captures the conflict between changing nature or leaving it as it is, even with the risk of unfortunate genetic accidents. Such genetic accidents could be catastrophic for the fate of some people, who, innocent, can end up with a lethal genetic inheritance, which also brings disaster for those whom they became attached to in an attempt to correct this "derailment" of nature through genetic selection. The film thus raises a serious issue of morality regarding the right of people to select life artificially, thus entering into a competition with nature. The problem is how far we can push such practices. In this sense, there is reluctance about genetic modification that can really affect the nature of things, but selection can also be just as dangerous when it becomes an end in itself. Thus, the following question comes to light: "To what extent can the natural condition, in which happiness and unhappiness are equally distributed, be replaced by a society planned to be perfect, but which in fact could prove catastrophic for the human species?" The film makes direct reference to the experiments of the Nazis during World War II, which turned out to be inhuman in fact, as if recalling the famous saying: "The road to Hell is paved with good intentions".

Nowadays, this issue of genetic planning of a human being may seem exaggerated, as it is valid only for those couples where there is a genetic disease that can be avoided this way. However, in the future, - when *in vitro* fertilization and even the possibility of the existence of machine-type uteri will externalize the pregnancy, thus rendering the bonds between mother and fetus less strong-, such selections would become commonplace.

This may seem more like science fiction today, but the trend is evident in this direction if we consider the increasing working age of women, their increasing involvement in lucrative activities and, perhaps most importantly, the fact that that current science and technology are very close to making such a womb-machine.

In fact, in Israel, successful experiments are already being conducted with artificial uteri, so far only for mice, called "biobag" ("biological bag") (Romanis, 2018; Romanis, 2020), which are intended to ensure the gestation process outside the uterus of the natural mother. This "biobag" is currently used to continuing the development of premature babies as it behaves just like a mother's womb and provides oxygen, a substitute of amniotic fluid, water and all necessary nutrients. However, all these researches have triggered numerous pro- and con- discussions of an ethical and bioethical nature, focused on the clinical benefits, respectively saving premature babies, but also on disadvantages, among which more significant would be those in which the technique is used for non-medical purposes (Segers, 2021).

However, it is only a matter of time before *in vitro* fertilization technologies and those that save premature babies, born even from four to five months of pregnancy, will be able to achieve, if they have not already fulfilled, that ideal of the alchemical man obtained in the test tube, which represents in fact that *homunculus* already mentioned by Goethe in his poem.

In Goethe's *Faust*, the *homunculus* is that little man obtained in the crucible of the alchemists, at a fire that kept a temperature close to the vital one, and reflected that dream of capturing the pure soul in a natural body: « HOMUNCULUS: Here and there and out and in,/ Full of longing and impatience/ To smash my glass, enjoy a real existence.» (von Goethe, 2014). These alchemical dreams, which can frighten the man of all times, are perhaps closer than ever now to be achieved through genetic engineering and cutting-edge reproductive technologies. Thus, it will be possible to obtain people without a family identity, perfectly healthy from a physical point of view and who, if we add the cloning technologies, will be able to be even identical, at least when they are specialized for certain activities. The purpose of such a genetic selection would be to eliminate those factors related to the selfishness of the individual and to encourage cooperation in the lucrative group in which there would be no more parasitic elements.

## Conclusions

In the face of such possible achievements, which are already very close to becoming a reality, philosophy, medicine and bioethics must make a considerable contribution to understanding them and, especially, to follow the consequences of the interventions on the structure of the human being through genetic selection. This issue becomes even more important nowadays, as the dynamics of the implementation of some controversial technologies has far exceeded the philosophical /medical/ bioethical researches that would seriously study their impact for humanity.

The chimera-type people, whose genetic structure is artificially constructed, would raise issues primarily about their identity and, why not, integration into traditional societies. These challenges are to some extent already in the realm of the present, and philosophy and medicine must give them their answers in order to achieve future legislation.

As it has succeeded in integrating organ transplantation, the future society will have, at some point, to accept the reality of genetic interventions, the purpose of which is to achieve much more radical transformations in human nature.

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