

PREDICTING HUMAN INTELLIGENCE

Is it a near future?



Universitat Autònoma de Barcelona

Clara Casas Cascante **Grau de Biologia**

ONE CAN ONLY HOPE THAT IF WE EVER POSSESS THE COMPLETE KNOWLEDGE OF HUMAN INTELLIGENCE GENETICS
...ETHICS IS WALKING A STEP FORWARD

INTRODUCTION: INTELLIGENCE AND SOCIETY

Intelligence has been a major pillar in societies since Greeks and Romans until now.

The first evidence of selection of individuals due to their intelligence is reported from 2357aC, where Chinese servants were chosen by cognitive tests. We find a peak of individual selection regarding cognitive aspects in the late XIX century, when the eugenic movement started to flourish.



Source: pinterest.com

The **eugenic movement**, which was born in Great Britain, is in favor of artificial selection to improve the human race. It enhances the reproduction of those individuals who are considered to have "normal" genetic traits.

Intelligence was also a target for eugenics. Starting in the USA and followed by countries all over the globe, citizens had to take the recently elaborated Simon-Binet test so that their IQ was recorded. **Reproduction restrictions** were implemented to those who performed lower than what was considered "normal"; such as prohibitions to marry, segregation and sterilization.



HUMAN GENOME PROJECT

The **HGP** was an international research project whose aim was to sequence the whole human DNA. The complete genome was published on 2003 with approximately 20.500 genes.

- CONSEQUENCES**
- The cost of sequencing an individuals' genetic information is getting cheaper.
 - It contributes to scientific research by making the finding and understanding of genes easier.
 - Genetic tests on individuals for some diseases is now possible and can be broadened. This can encourage personalized medicine, when sequencing the whole genome of an individual systematically.

ETHICS

Genetic discrimination is that addressed to an individual due to his/her genetic information

PRE-NATAL SCREENING AND GENETIC DISCRIMINATION

Pre-natal screening is the realization of tests regarding diseases or conditions of the fetus before it is born. This tests are more precise with new molecular techniques that start to replace conventional karyotyping.

- CONSEQUENCES**
- More information can be given → information overload
 - Testing for non life-risking or health-related traits
 - Information given that is not relevant for the child's immediate health can infringe his or her right to *not know* and condition their psychosocial development.

IF THE GENETICS OF INTELLIGENCE IS EVER DECODED, WILL WE TEST INDIVIDUALS ON THEIR COGNITIVE ABILITIES?

BUT... WHAT IS INTELLIGENCE?

The general definition for the term intelligence raises a lot of controversy. Generally, all scientific research in this field is based on Charles Spearman's definition of **general intelligence (g)** which is measured with the IQ. The *g* factor stands for a broad mental capacity that influences the specific cognitive abilities of an individual.

IQ tests are still questioned with different arguments: some experts say they are **elitist** and **intended for individuals from where the tests were designed** and others argue that the results can be **conditioned by external factors** such as the motivation of the individual when doing the test. More complex factors such as the **social and economic status** can influence the results; these are used to argue the differences between ethnic groups.

RESEARCH IN INTELLIGENCE GENETICS

-Intelligence is one of the first human behavior traits to be studied. Shortly after the rediscovery of Mendel's heritability's laws, Francis Galton published a book in which he related intelligence and heritability, arguing that they are highly correlated.

-Galton's proposed study with MZ and DZ twins later proved that his statement was true; MZ have a higher correlation (0.86) in their intelligence than DZ (0.60).

-Intelligence is a complex trait, so finding which genes affect it is very tortuous. Scientific research has been able to connect some genes to cognitive ability but there is still a long way to go.

EFFECT OF THE ENVIRONMENT

- The environment accounts for approximately 50% of the development of intelligence during the first years of life
- This influence decreases until practically zero in adolescence and adulthood.

WILL SCIENCE BE ABLE TO IDENTIFY WHICH AND HOW EXTERNAL FACTORS INFLUENCE OUR COGNITIVE DEVELOPMENT?

FUTURE OF RESEARCH

- Research of intelligence is based in finding QTLs: multiple gene systems for quantitative traits
- Discovering GENES → Discovering HOW genes work (functional genomics)
- Animal models which have Spearman's *g* as a key have been developed. In these, the environment and genetics can be manipulated.

CONCLUSIONS: FUTURE SCENARIO

The tools that can make the prediction of intelligence a reality are already being developed. This scenario has already been foreseen even though there is still a lot of research to go about how cognitive processes work. Scientists and experts are arguing whether or not should we keep walking this path.

In one hand we should be aware that...

- This knowledge can bring about new forms of eugenics
- Research is based in IQ tests, and these are not universally accepted as an objective measurement
- It is unlikely that we will ever know all the genes and environmental factors that affect intelligence

On the other hand we can benefit from this knowledge because...

- Intelligence can be correlated with epidemiology
- We will be able to understand neurodegenerative diseases or learning disabilities, among other cognitive disorders
- Predicting cognitive abilities and disabilities early in life can help children be raised in the most suitable way

Relevant References

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