

## The Impact of Neuroscience and Genetics on the Law: A Recent Italian Case

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**Abstract** The use of genetic testing and neuroscientific evidence in legal trials raises several issues. Often their interpretation is controversial: the same evidence can be used to sustain both the prosecution's and defense's argument. A recent Italian case confirms such concerns and stresses other relevant related questions.

**Keywords** Neuroscience · Genetics · Law · Biolaw

### The Facts

Since 2007 S.A., a 28-year-old Italian woman, has been causing a financial crisis for her family. In particular, she has been stealing money from her relatives and she has been wasting it through a form of compulsive shopping she is affected by. In 2009 S.A. killed her sister through an overdose of psychopharmaceuticals and burned her body. She then falsified a suicide note in order to shift all responsibility to the victim. Moreover, because of her

mother's suspicions, she tried to strangle and burn her and to escape. The mother survived and the police arrested the young woman.

The first psychiatric evaluation pointed out the partial mental insanity of S.A., but the experts did not define a specific diagnosis. For this reason the court required a second psychiatric evaluation, which upheld the full decisional competence of the defendant. At this point the defense attorney demanded a new consultation from other experts. The medical examinations were executed by the cognitive neuroscientist and the psychiatrist and behavioral geneticist who had already been appointed by the Court of Appeal of Trieste in 2009 for a similar case. The sentence at Trieste introduced behavioral genetics in Italian courts and led to a reduction of the sentence on the basis of an absolutely unprecedented "genetic vulnerability" [1, 2].

In this case, the experts concluded S.A. is affected by a dissociative identity disorder, confirmed both by a behavioral and instrumental test (*Autobiographical Implicit Association Test* and *Time Antagonistic Response Aletimeter*). The two technologies used to confirm the psychiatric assessment of the defendant's tendency to criminal behavior are relevant and problematic at the same time: a neuroscientific and a genetic 'measurement' of culpability. Through EEG (*Electroencephalogram*) and VBM (*Voxel Based Morphometry*) the experts observed a lack of integrity and functionality of the anterior cingulate cortex, potentially associated with obsessive-compulsive disorder and with aggressiveness. According to the geneticist

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this tendency is confirmed by genetic testing showing MAOA-uVNTR gene polymorphism, usually associated to the risk of increasing aggressiveness and compulsiveness.

From these medical examinations the Court in Como sentenced S.A. to a lighter imprisonment than requested by the prosecution: 20 years of incarceration rather than lifetime imprisonment. Moreover S.A. must spend 3 of the 20 years of imprisonment in a mental hospital and she must serve 3 years of probation after release.

In the explanatory report appended to the verdict, the judge stated that the neuro/genetic evidence, assumed as legally relevant not only for this case but for the court's reasoning in general, does not have a deterministic value but is a tool for a more objective evaluation of an increased risk of criminal behavior. According to the judge, in fact, the psychiatric evaluation, traditionally admitted in the courtroom, is generally affected by a fundamental epistemological limitation: it depends on the subjectivity of the psychiatrist so that it is not able to objectively diagnose mental pathologies and consequently to clearly distinguish between a behavior legally and morally accountable as right and a behavior legally and morally accountable as wrong. For this reason in the case in question the neuro/genetic evidence was presented and used in the determination of guilt which was the starting point of the sentencing phase.

Even if the neuro/genetic evidence is assumed as merely a confirmation of the psychiatric evaluation, it is evident that the judge was heavily affected in his sentencing by the biological evaluations, so that several issues arise from this sentence with regards to the ethical, legal and social assessment of scientific knowledge.

### A Few Emerging Issues

There is a relevant difference between this case and the usual procedure of civil law on the Continent systems: the sentence is usually based on the expert report of the Court-appointed appraisers, not on the report of the defense-appointed expert as in this case. This could set a precedent for a new practice within civil law systems.

The content of the decision raises issues similar to the case heard in Trieste. A first problem regards the

cognitive value of the neuro/genetic evidence: though some people, like the judge of the case in question, think that neuroscience and genetics should be admitted in legal trials because such sciences offer a legally relevant objectivity that is highly precise and reliable [3, 4], others claim that both neuroscience and genetics are still hypothetical and uncertain.

In particular, the scientific interpretation of the correlation between genes, neurons and behavior is controversial, so that neuro/genetic evidence does not guarantee overcoming the difficulties in defining a precise diagnosis of mental pathologies emerging from the interpretation of the traditional clinical evidence. This means that in the case of conflicting positions, the judge or the jury have the responsibility to make a decision which cannot be absolutely objective because their decisions always start from a scientific information which is hypothetical and uncertain, both because science does not yield absolute certainty and because there is controversy about the interpretation of the scientific data. Therefore, despite the opinion of the judge of court in Como, genetics and neuroscience are not really able to guarantee "objective" sentences.

Another problematic issue is the role of environment, which is not taken into account in S.A.'s sentence. For instance, as outlined by Caspi and colleagues [5], the predisposition to antisocial behavior emerging from MAO-A polymorphism is modulated by the environment, so that there is not a deterministic relationship between genes and behavior.

Another problematic issue is that, even if we assumed that genetics and neuroscience objectively show a predisposition to criminal behavior, it is questionable what would be the best decision to take: to mitigate the sentence or to require different forms of deterrence, prevention and rehabilitation for "at-risk" subjects? The first option would be in accordance with a retributivist assessment of justice, according to which legal responsibility can be assumed as liability, that is personal responsibility [6], which is grounded on the full possession of one's faculties: if these are reduced, responsibility is reduced.

The second hypothesis could determine an overcoming of the retributive system defining a new integration between law and science: assuming responsibility as outcome and causal responsibility [6], what is at stake is not the personal intentionality to criminal behavior, but the social danger of the defendant which can be measured through scientific evidence.

In any case, this hypothetical post-retributivist assessment of justice is problematic, because the scientific recognition of a subjective higher risk of criminal behavior could be assessed within the framework of liability or personal responsibility. In fact if the tendency to criminal behavior is scientifically proven, the individual could be judged to be more than usually “self-aware”, and so more responsible to manage this personal inclination, at least regarding his future actions [2].

## Conclusion

The use of neuro/genetic information in courts raises several relevant issues [7].

The correlation between genes and behavior is not a simple cause–effect relationship: besides the influence of environmental factors, each gene acts in complex combinations with other genes and may influence more than one trait, so that it is misleading to talk about a gene “for” a specific character [8].

The validity of neuroimaging is questionable because of its implicit instrumental, procedural and conceptual limitations. It cannot be assumed to be a ‘pictures of mentation’ [9]; as a consequence it may be misleading for the judge or the jury; it is affected by a chronological gap, because it shows the present neural activity of the defendant, not the brain activity at the time of the presumed crime [10]; the activation of a cerebral area does not necessarily imply the cognitive function commonly associated with it [11]; trying to extract information directly from the mind of people may not respect their right to privacy [12].

Finally the potential impact of neurogenetics on the law deserves an urgent multidisciplinary and interdisciplinary reflection, particularly focused on the limitations of genetic and neuroscientific techniques as legally relevant evidence.

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