

EMBODIED FREEDOM AS A KEY TO MORAL NEUROEDUCATION

La libertad incorporada como clave para la neuroeducación moral

JAVIER GRACIA*

Universitat de València, España

Javier.Gracia@uv.es

ORCID Code <https://orcid.org/0000-0001-9260-5274>

VICENT GOZÁLVEZ**

Universitat de València, España

Vicent.Gozalvez@uv.es

ORCID Code <https://orcid.org/0000-0002-7952-8347>

Abstract

Freedom is one of the main attributes with which the human being has traditionally been characterized. The objective of this paper is to analyse whether, in the light of neuroscientific research and experiments, it is possible to continue characterizing the human being as a being with freedom. To this end, the well-known Benjamin Libet experiment and the reductionist conclusions that influential authors such as Patricia S. Churchland or Michael Gazzaniga extract for philosophy are mentioned. From a hermeneutical methodology, it is denounced the neuroscientific reductionism that aims to deny freedom based on empirical evidence. Faced with this reductionism, it is proposed a hermeneutic approach that complements the neuroscientific discoveries about the functioning of the brain with the moral perspective of the agent. From this approach it is possible to speak of 'embodied freedom', which overcomes both an irreconcilable vision between nature and freedom and a reductionist vision of the nature of freedom. The application of this embodied freedom into the plane of moral neuroeducation is especially important since it allows us to understand moral learning as a synergistic action of the corporal substrates and the moral ideas. By taking into account both the phylogenetic explanation of morality (focusing on the neurobiology of the moral nature) and the cultural dimension of moral education (focusing on moral progress from education), it is possible to achieve a more comprehensively approach to the phenomenon of neuroeducation moral. Both the concept of coevolution and the neuroeducation of care and justice contribute to recognizing the embodied freedom as a fundamental key to moral neuroeducation.

Keywords

Freedom, brain, ethics, education, evolution and care.

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* PhD in Philosophy from the University of Valencia, extraordinary Doctorate Award, European PhD degree and teaching in the area of Moral, Political and Social Philosophy of the Department of Philosophy at the same university. He has recently published "The ethical challenge of education" (Madrid, Dykinson, 2018).

** PhD in Philosophy and Educational Sciences, Master in Psychoethics for Civic-Moral Education. Professor of the Department of Theory of Education at the University of Valencia. Author of "Moral Intelligence" (Bilbao, Desclée, 2000) and "Media Citizenship. An educational look" (Madrid, Dykinson, 2013).

Resumen

La libertad es uno de los principales atributos con los que tradicionalmente se ha caracterizado al ser humano. El objetivo de este artículo es analizar si a la luz de las investigaciones y los experimentos neurocientíficos es posible seguir caracterizando al ser humano como un ser con libertad. Para ello se alude al conocido experimento de Benjamin Libet y las conclusiones reduccionistas que influyentes autores como Patricia S. Churchland o Michael Gazzaniga extraen para la filosofía práctica. Desde una metodología hermenéutica, se denuncia el reduccionismo neurocientífico que pretende negar la libertad basándose en evidencias empíricas. Frente a dicho reduccionismo se propone un enfoque hermenéutico que permita complementar los descubrimientos neurocientíficos acerca del funcionamiento del cerebro con la perspectiva moral de un sujeto activo. Desde dicho enfoque es posible hablar de 'libertad incorporada', que supera tanto una visión irreconciliable entre naturaleza y libertad como una visión reduccionista de la naturaleza de la libertad. La aplicación de dicha libertad incorporada al plano de la neuroeducación moral es especialmente importante ya que permite entender el aprendizaje moral como acción sinérgica de los sustratos corporales y de las ideas morales. Al tener en cuenta tanto la explicación filogenética de la moral (incidiendo en la neurobiología de la naturaleza moral) como la dimensión cultural de la educación moral (incidiendo en el progreso moral desde la educación), es posible alumbrar más comprensivamente el fenómeno de la neuroeducación moral. Tanto el concepto de coevolución como el de neuroeducación del cuidado y la justicia contribuyen a reconocer la libertad incorporada como clave fundamental de la neuroeducación moral.

Palabras clave

Libertad, cerebro, ética, educación, evolución y cuidado.

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Introduction: Neuroeducation, moral learning and freedom

Neuroeducation is part of the neurosciences, a discipline that marked the end of the decade of the last century and continues its trajectory through many research and publications in this first period of the 21st century. In fact, as Codina (2015) recalls, the decade that runs from the 90s to the year 2000 has been called the decade of the brain. Of course, research in education could not be left out of such scientific interest by the human brain, interest that has been increasing especially in recent years, according to Francisco Mora (2013).

This article is precisely part of this impulse to know the biological and neuronal basis that explain educational and the learning processes, although its interest specifically lies in the reflection on the cerebral basis of moral learning.

Neuroeducation has been defined as the area of knowledge that combines the findings about the brain and its functioning with the objectives of the educational sciences, so that educators find in this field a fruitful repertoire of information to improve the practice of their profession. That is, it is not only about knowing the neurocognitive development of the person, but about finding ways to facilitate educational praxis. Codina (2015) states that:

The goal of neuroeducation, unlike the objectives of cognitive neuroscience and neuropsychology, is not only to understand how human beings learn better, but also to determine how they can be taught to maximize their potential (p. 17).

Now, can neuroeducation shed light on the functioning of the brain with the aim of improving moral learning? Or more specifically, how to combine the discoveries of neuroeducation with philosophical reflection about human freedom, with the aim of finding new keys for moral education?

In research on the guiding principles of the human brain we can observe, indeed, a body floor for moral learning and of course for the experience and deployment of human freedom, which is why it referred as a built-in freedom, that is, a freedom that takes root in the body and in the biological structure of the human brain. In this sense, a critique of deterministic reductionism is reconstructed, according to which to speak of freedom is simply to formulate a fiction without real basis in the behavior of the human being. Contrarily, the argumentation of this article goes through the search of cerebral foundations that allow to understand the meaning and the real scope of the freedom, human capacity that will be key in the moral neuroeducation. In fact, the discourse we present is somewhere between neuroethics and neuroeducation, seeking a necessary and fruitful meeting point between these two disciplines, which share, from science and philosophy, a special interest in human praxis.

Throughout this journey, a hermeneutical and critical methodology is used, as Jesús Conill (2006) points out, the method based on the search, reading and interpretation of texts and scientific contributions applying the criteria of a critical and normative philosophy, criteria that come from the ethical discursive or dialogical tradition defended by authors such as Jürgen Habermas (2000) and Adela Cortina (1993), and who are also nourished by the axiological foundations of a radically democratic civic education in light of what Cortina, Escámez and Pérez-Delgado (1996), Gracia and Gozávez (2016) and Gracia (2018a) note.

This article is structured in four sections. After the introduction, the second section criticizes the reductionist neuroscientific prism that denies human freedom. It analyzes the experiment of Libet (2012) and considers the need to delve into the hermeneutical assumptions that all human understanding and explanation entails. In the third section, considering the advances of neuroscientific research, we explore how it is possible to refer to the roots of freedom in the brain. In the fourth and last section we analyze how embodied freedom is a fundamental key for

moral neuroeducation. For this, in the first place, distancing oneself from reductionist naturalistic approaches, the concept of ‘coevolution’ is articulated. In a second moment, it is considered the need to attend educational contexts that favor an approach to an adequate moral development of the personality of the individuals.

Criticism of neuroscientific reductionism denier of freedom

There are many ways in which the existence of freedom of human beings has been denied throughout history: the cosmological determinism of authors of Antiquity such as Heraclitus and the Stoics, the theological determinism of Luther and the Reformation, and Above all, scientific determinism has taken center stage since the scientific revolution in modernity. Each of the scientific versions has had its own determinist version denying human freedom. The physical determinism that mechanically conceives the world with causal laws of physical phenomena, the biological determinism of living organisms without a self-determining conscience, the genetic determinism of codes that are prescribed from birth, etc.

In recent times it has been neuroscience that has transited, with some frequency, through the denial speech of the existence of freedom in human beings, based on the already famous and well-known experiment of Benjamin Libet. It should be remembered, however, that its emergence dates back to the work of the German neurologists Kornhuber and Deecke, who had already argued that the ‘potential for non-conscious disposition’ precedes voluntary acts in about a second.

Despite the intention of Libet himself (2012) to demonstrate the existence of freedom in humans, his experiments were disappointing because they seemed to demonstrate just the opposite. The conscious decision to carry out an action is preceded by an electrical impulse in the brain itself, which he called ‘disposition potential’. Thus, with the help of an electromyogram (a technique that deciphers the electrical activity of the muscles), it could be determined that the process of the will began a few thousandths of a second after the individual was aware of it. Specifically, what Libet and, all those who have reproduced his experiment have proven, is that the ‘potential of disposition’ usually precedes the decision of the will in approximately half a second. This seems to prove that the



neural processes determine the conscious actions, without the act of the will playing a causal role.

There are many authors who have taken for granted Libet's experiments, but whose readings have gone beyond Libet himself, claiming that we must get rid of the 'metaphysics of freedom' that permeates social reality and replace it with a 'neurobiology of self-control'. According to Patricia S. Churchland (2006), for example, we must "move the debate away from the mysterious metaphysics of the causal vacuum to the neurobiology of self-control" (p 43)¹. Churchland's position may have been diminishing over time, but it remains weighed down by a neuroscientist reductionist bias incapable of understanding the difference between 'cause' and 'condition' given that it does not consider the ethical-hermeneutical framework in which to understand freedom, so that their statements easily fall into what Habermas (2006) calls 'bad metaphysics'². For example, when referring to the naturalistic fallacy as 'unfortunate Moore's legacy' that feeds 'strange ideas' and is 'mystical moat around moral conduct' (Churchland, 2012, pp. 204-208). On the contrary, following Ayala (2006), Gracia (2016) and Cela and Ayala (2018), Moore's argument against the naturalistic fallacy that avoids incurring the neurobiological reductionism that many authors adhere to since the emergence of sociobiology since the late nineteenth century to the present day.

On the other hand, Michael Gazzaniga (2005) takes Libet's experiment as good and considers that neuroscientifically speaking is not possible to talk about freedom and that, at the most, it would be necessary to speak of the capacity to veto the act once initiated, which is what the Libet's experiment had already shown. For Gazzaniga (2005), free will must be understood as the capacity of the individual to control the impulses that can be transmitted. His conclusion is that the fault does not lay on the brain but the individual, because "neuroscience will never find the cerebral correlate of responsibility, because it is something that we attribute to humans - to people - not to brains [...]. The question of responsibility is a social issue" (pp. 111-112).

However, it is important not to forget that the conclusions that Libet (2012) draws from his experiment are far from deterministic, unilateral and reductionist readings. "We must recognize that both alternatives (determinism of natural laws versus non-determinism) are unproven theories, that is, unproven in relation to the existence of free will" (p.227). And towards the end of the article very eloquently states:

My conclusion about the conscious will, a genuinely free in the sense of undetermined, is then that its existence is a scientific option at least as

good, if not better, than its deterministic negation. Given the speculative nature of both deterministic and non-deterministic theories, why not adopt the assumption that we have free will (until actual contradictory evidence appears, if ever). A perspective of such characteristics would allow us, at least, to proceed in a way that accepts and accommodates our own deep feeling that we have free will. We do not need to see ourselves as machines that act in a way totally controlled by known physical laws (Libet, 2012, p.229).

Libet's assessment of not deriving the affirmation or denial of the existence of the freedom on his experiments is certainly very accurate. This is guarding oneself against the neuroscientist reductionism that considers that the only existing reality is one that can be demonstrated empirically and is verified by neuroimaging. But indeed, we must remember with Libet (2012) that "there has been no proposed experimental test design, which conclusively or convincingly demonstrates the validity of the determinism of natural law as mediator or instrument of free will" (p.227).

Indeed, the question of whether freedom or determinism is a philosophical and nonscientific issue and pretending to derive a conclusion from the scientific method does not cease to be a fallacy that muddies the scientific discourse of bad metaphysics. That is why neuroscience must give way to philosophy to address the problem of freedom. Trying to dismiss the point of view of the agent in a stroke of the pen, thus breaking down the self-understanding of their own actions, is still an attitude charged with arrogance on the part of a certain reductionist neurophilosophy. It would be better to recover a radical scientific attitude like the one already proposed by Husserl (1991) and which implies, precisely, taking charge and delving into the foundations of the 'world of life'.

Among the main charges against the scientific reductionism is the clamorous hermeneutic deficit consisting of the 'naturalistic illusion' to consider that 'the natural' is the explanation offered by science for any other type of explanation, which is not based on the method of natural sciences, then is rejected as 'interpretation' of an arbitrary and merely illusory nature. As Conill (2010) points out, is the meaning of human nature so unilateral? One would have to think with Habermas (1986) that the empirical sciences respond to a clear interest in reason, but that it is neither the only nor the principal. This interest deliberately seeks the objectivity and quantification of phenomena in order to subdue and control them. Or going to the root of the fundamental hermeneutical problem, it would be possible to recognize with Heidegger (2007) that all science already involves certain hermeneutical presuppositions from

which its own task acquires meaning and by omitting them one incurs in the fallacious scientific reductionism.

The physics data is correct. Science conceives thanks to them something real, according to which is objectively governed. But science [...] concerns only what her mode of conception has previously admitted as a possible object for her (p.239).

For neuroscience and from neuroscience, it is important to pay attention to this self-understanding because contemporary naturalism attempts to naturalize traditional philosophical concepts to the point of rejecting everything that does not enter the narrow margins of its scientific paradigm, according to Gracia (2018c). An example of this conceptual colonization of the 'world of life' is that 'neuro' has become, for many, the new hermeneutics of present times, as Tomás Domingo (2017) warns in one of the meanings of the term 'neuro-hermeneutics'. It is intended that all types of behavior of human beings can be explained in terms of neuronal connections. Result of this myopia is precisely the denial of the existence of freedom or its relegation to empty epiphenomena, which implies that the term moral and all the semantic field that accompanies it has no real roots in the brain nature of human beings, but which is merely a secondary and illusory element without the ability to influence actions. But as Adela Cortina (2011) denounces, the "misery of epiphenomenalism" (p.192) is that it reduces human beings by depriving them of authentic free will. Do the reasons and arguments that occur in the discourse and in the dialogue do not influence, in a real way, the actions that make some things or others happen? As Habermas (2006) argues, the myopia of neuroscientific reductionism is that it is unable to distinguish between causes and reasons; is unable to recognize the agent's point of view.

But there is another way of understanding "neuro-hermeneutics" as a hermeneutic of neuroscience that is of great benefit for education and that consists in fixing the hermeneutical presuppositions of all neuroscientific discourse. And this implies that stating that there is neural basis of moral behavior, this whole network of explanations only makes sense on the horizon in a unique way and 'interested' to understand nature. To repair this hermeneutic dimension of neuroscientific explanations makes it possible to avoid incurring the neuroscientific reductionist denial of freedom.

On the contrary, if neuroethics repairs not only the neuronal basis but also the hermeneutical presuppositions of moral behavior, it is possible to avoid the neuroscientific reductionism that leads to denying freedom as a feature of said behavior. Therefore, faced with the pretensions



of naturalizing morality to the point of denying freedom, it is necessary to rethink once again the place that corresponds to the cerebral nature of the human being and from it to find the neural basis that make the exercise of freedom possible. It is necessary to rethink the incorporation of freedom in non-reductionist terms but to reopen the famous dialogue between philosophy and science, to unravel how it is possible to give a better explanation, understanding and reason for the behavior of people. This is what a good part of intellectuals have looked for and what we will dedicate ourselves to in the next section.

The roots of freedom in the brain

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The same formulation of this section is already controversial: to try to justify the reality of freedom in the life of the human being supposes, in the first place, falling off with the deterministic reductionism, in the terms in which it has been addressed in the previous section. But it also means looking for a support for freedom precisely in what was its opposite: nature, in particular, in the body.

And it is not possible to arrive at this without revisiting the Kantian aporia regarding the contradiction or antinomy established by the Prussian philosopher between the realm of nature and the realm of freedom when we refer to the life and conduct of human beings. Indeed, in the Critique of Pure Reason, Kant (KrV, A 445 B 473) exposes in a diaphanous and convincing manner, a philosophical conflict that in the eighteenth century had reached an almost dramatic point: in the third antinomy of pure reason, Kant it alludes to the contradiction of affirming on the one hand the determination of natural processes, and that of affirming on the other the freedom of the human spirit. There is nothing in nature that does not obey laws and preset causes, but on the other hand human nature induces us to speak of freedom understood as the causation of an action by the will.

As Arana (2004) points out, Kant faced a theoretical problem that in Modernity had been relegated or superficially solved, because either clear limits were established to the power of physical reality, or it was considered that between natural necessity and freedom there was no such contradiction.

In one way or another, this conflict was positioning the different philosophers in one of the sides, from Hobbes, Spinoza, Wolff, Hume or Leibniz in the denial of freedom, to Descartes, Locke, Newton and Kant himself in defense of freedom without denying the causal rigidity of the

physical world. But Kant tackles this antinomy face to face and in all its consequences, trying to overcome it with the search for a turning point between the philosophy of nature and moral or practical philosophy, so that from the Kantian transcendental idealism the practical reason requires in an unappealable way the recourse to freedom of the will as the fundamental presupposition of human action, a solution that remains valid today for the ethical sphere, and also for politics and law, that is, for the creation and application of laws when these have been consciously and voluntarily infringed: freedom is an essential assumption in the legal ordering and in the application of penalties before conflicts of action.

The moral order is permeable, however, to the order of natural causation, so that it would be possible to distinguish between causes and motives, conditions and defenses of action, but without ever denying the possibility of a motivation of a fully free action (that is, limitedly free, humanly free). Within the (narrow) margins of human freedom as the guiding principle of voluntary actions and decisions, new meanings can be deployed to the concept of freedom, so valid and operative today, especially as a normative theoretical framework to face, for example, the governmental tyranny (freedom as participation), external imposition in terms of expression, movement, association, sexual and religious option... (freedom as independence or non-interference), mental manipulation, apathy for taking the reins of one's own life and thinking for oneself, to the lack of proper but maximally responsible and universal criteria (freedom as autonomy of Kant himself), to the absence of conditions to choose a dignified and realized life (freedom as development), or arbitrary abuses of power in the absence of a coordinated and vigorous citizen action (republican freedom or freedom as non-domination), just as they include authors such as Cortina, Escámez and Pérez-Delgado, (1996), García-Medina (2007), Cortina and Pereira, (2009) and Nussbaum (2012). The practical order, referred to human action and interaction (an order of interpersonal relationships) cannot do without recourse to the idea of freedom, as a normative horizon - creative, constructed and reconstructed - necessary for the adjustment and conditioning of Social life.

However, the reductionism linked to current neuroscience, as we saw in the previous section, somehow reproduces and simplifies a philosophical conflict that, since science has exclusively been solved in favor of a new affirmation of the absolute empire over the nature and the consequent denial of freedom. Now, can the question of freedom be resolved in this way from an entirely scientific perspective, from a reductive neuroscience?

No, basically for two reasons. First, because experiments such as the one carried out by Libet do not lead to deny directly the possibility of human freedom, and secondly and related to the above, because the definition of the concept of nature that manages science is basically a constructed concept, that requires interpretation, and not an exact reflection of a compact and finished reality.

Indeed, Libet's experiment, repeated and subsequently validated, seems to demonstrate that it is the neurons that decide human action before it is conscious and realized; but with this, one falls into the trap of language by attributing autonomy or capacity for self-determined action to neurons. In fact, as pointed out by Rivera de Rosales (2016), rather than the action of the neurons, what takes place is the planning of the experiment, the awareness and acceptance of the experienced subject that must perform this or that action, a circumstance prior to the detection of 'neurons' order'. Determinism cannot be endorsed by experience, since experience is limited, it occurs in a spatial-temporal and causal context, and therefore it does not reach to revalidate a concept of reason such as that of determination or that of physical or cosmological determinism. In any case, according to Conill (2017), experiments such as Libet's would basically serve to detect different levels of consciousness in the human brain, not to deny human freedom.

But it is also that, as Conill (2017) argues, neuroscience is playing with an idea of nature (human) that, for the indicated reason, cannot be analyzed only from an empirical or scientific perspective, because such an abstract concept, with so many Implications must be the object of philosophical analysis, specifically hermeneutics, since 'nature' is a historical construct, culturally defined and capable of being interpreted rather than being objectified: "The very notion of nature is already an interpretive concept (neither real nor objective). Therefore, the paradigm of objectification must be replaced by that of interpretation" (p. 496).

Kant himself, for example, affects the *Metaphysics of customs* in the complexity and duality of nature, to distinguish moral dispositions that have a natural component, and that therefore can be found in any human being: Kant speaks of moral feeling, compassion, love, even self-respect (self-esteem) as a feeling in which reason also intervenes. These dispositions are those that enable an educational and ethical development of practical reason, as a reason that captures and acts freely, that is, according to the moral law. It is about predispositions to be affected by the notion of universalizable duty, which is why we can speak of a distinguishable moral nature of physical nature. As Gozávez and Jover (2016)

point out, it is precisely there, in that interstice between the moral and the physical where the bridge between nature and freedom can be observed: where freedom and human autonomy are bodily rooted, opening the link between the world of feelings and the world of judgment and reason, between care and justice, a necessary link in moral education and a situated ethic of human rights.

In this context and inspired by the idea of zubirian sentient intelligence, Aranguren (1994) elaborates his concept of 'structural freedom', freedom that tilts in the intelligent action of which is naturally predisposed the human being: our structural freedom lies in the fact that we are born to do or before time, as Reboul (2009) would say. Our nature is open and unfinished precisely to demand the creation of a second nature of immensely variable cultural contents: The human organism, too complicated, cannot spontaneously and immediately give a prefixed response and remains in suspense before the stimulus, is free before it. Aranguren will say that, by intelligence, taken this word in the sense of 'take charge of the situation', the human being responds intelligently with a wide range of responses to the stimulus. It is the intelligence itself that, thanks to its projecting function, invents or extracts possibilities from the stimuli, thus making its life.

Subsequently, the biology of behavior, neuroscience and neuroeducation scientifically confirm these philosophical assumptions, establishing the principle of behavioral flexibility, together with the cerebral flexibility, as indicated by Codina (2015). The behavioral margins in which our behavior could be moved have been evolutionarily expanded, at the mercy of that greater structural flexibility, of behavioral plasticity. In fact, thus seen, the phylogenesis of the human species can be read as the history of freedom, at least of a structural freedom, as indicated by Aranguren (1994) or Cela and Ayala (2018) or a free will from which other forms of freedom more united to the responsible conscience, to the critical sense and to human development is established.

Raised in other terms, the evolutionary trajectory of the human being reproduces and catapults the evolution of mammals, capable not only of reacting to the environment, but of acting on it, influencing it and transforming it according to their needs - and interests, we could add in relationship with human mammals. As explained by Fuster (2014), the key region of the brain, the result of such evolution that involves an increase in complexity and behavioral flexibility, is the cortex of the prefrontal lobe. Theredraws on its natural roots human freedom, understood in a primordial, minimum sense, as the capacity to recognize one's

actions, and to predict future actions, peering at its consequence, which allows readjusting such actions (cycle of perception-action), a capacity that will have a decisive impact on the construction of the future (of oneself and, as a whole, of society).

Freedom takes root in the brain operations of *pre-dicting* and, from there, of *pre-adapting* human behavior, adjusting it to human interests in all its immense range of possibilities. Our freedom rests, then, on the projective dimension of our brain. In addition, this predictive and projective capacity is linked to our communicative capacity, associated with articulated and symbolic language and, therefore, also to the area of the prefrontal cortex of the human brain: the ability to communicate future actions, to bring together projects, allows us to calibrate them from more perspectives, which opens the field of action in which our freedom is expressed, as the alternatives and options within our reach grow. In the words of Fuster (2014), freedom is a phenomenon in which the brain makes a choice between alternatives, from the neuronal activity (networks of cortical cells) that calibrates between the experiences of a convergent past and the possibilities of a divergent future.

In the cortical PTO region (parietal, temporal and occipital lobes) associative processes related to knowledge and memory (cognits) are produced. The other associative region related to these processes is the prefrontal cortex, which serves for the execution of processes of cognition, especially language and reasoning. This executive cortex “is developed to the maximum in the human brain, which occupies almost a third of the totality of the neocortex” (Fuster, 2014, p.33). It is precisely in these regions where the human function of language, projective capacity and recognition, and the ability to make decisions (freedom) take place in an interrelated way.

Flores and Ostrosky-Solís (2008) already alluded to different studies that more generally explained the moral life of the human being by linking it with the processing of emotions (limbic system: amygdala, and anterior cingulate gyrus, medial prefrontal cortex, and singular posterior cortex), brain region that is related to a reflective use of freedom (analysis of the situation, assessment of the convenience and inconvenience of an action, weighting of the future consequences thereof, coordination of thought and behavior...).

As Stuss and Alexander (2000), Stuss and Levine (2000) and Flores and Ostrosky-Solís (2008) point out, the racioaffective human capacity occurs especially in the region of the dorsolateral prefrontal cortex, associated with planning processes, cognitive or significant memory, ver-

bal fluency, the resolution of complex problems, mental plasticity, the construction of hypotheses, social cognition and ethical awareness (self-awareness and autobiographical knowledge), also enabling an integration of the emotional and cognitive experiential field, processes and capacities so decisive in reasoning and moral behavior linked to the use of freedom.

In conclusion, the same concept of nature applied to human behavior has been changing in meaning and interpretation until reaching the interpretation of neuroscience that, overcoming the scientific reductionism and assuming the hermeneutical presuppositions of any explanation, situates in the physiology and functioning of the brain the seed of freedom; understood not only as free will or structural freedom, but as moral freedom (autonomy) given the natural (cerebral) predisposition for empathic emotions (the so-called 'mirror neurons'), and for the projection of balanced acts, morally reversible and equitable, projection that occurs in specific areas of the brain that act functionally in an inter-related way, establishing bridges between reasoning and affect, between judgment and action in relation to the moral life of the human being.

Freedom embodied in moral neuroeducation

After having explained how facing neuroscientific reductionism is possible to speak of human freedom in terms of 'embodied freedom', in this last section the implications of freedom embodied in the field of moral neuroeducation are presented. In the first place, we will analyze the concept of 'coevolution' as an alternative to the reductionist vision of moral behavior as a product of the process of neurobiological evolution, thus giving way to the influence of education in the conformation of the brain. Secondly, it emphasizes the importance of an educational environment that encourages care in the family and members of the community in order to develop appropriate moral behavior.

Embodied freedom and coevolution from moral neuroeducation

Freedom is the key to moral neuro-education, in the first place, because educating is not the same as training. While training consists of training someone (usually an animal) to act in the way that the trainer wants, when we refer to education, we consider a type of human formation that leads to the full development of the personality of individuals, from their

autonomy and for the sake of a just and happy life. Freedom constitutes a differential feature between education and training, but also, indoctrination, or mere instruction, as Gracia points out (2018a, chapters 3 and 7).

Recognizing freedom as a fundamental element of neuroeducation is not to build a castle in the air, as if it were an illusion. On the contrary, and as we have stated, moral neuroeducation must start from the recognition of the roots that freedom has in the brain. Freedom is embodied because there is some cerebral basis that act as conditions of bodily possibility (a priori corporal) for the exercise of this. It is important to think of freedom from the body and the body, but not primarily as a physical body (*Körper*, in German) but as a lived body (*Leib*, in German). The distinction is substantive because only in the light of this second model of conditioned freedom will it be possible to understand that the lived body shapes indelibly conditions the freedom of the individual that are key to moral neuroeducation. Freedom, at least human freedom, is neither found nor operates in a vacuum, it is anchored in a body that feels, suffers and thinks; that suffers, that enjoys, that creates and recreates the world. It is in this framework that we think that neuroeducation must incorporate freedom.

Education and more specifically moral education is possible due to the unfinished character of the human brain. After birth, human beings develop around 70 percent of the brain in constant interaction with the people around us and the environment in general. It is through education and culture that functions and even brain structures are formed. As explained by Nieto (2011), the modifications affect different levels of the nervous system and the result of this process of brain configuration does not reside in the genetic pattern that each individual carry, nor arises spontaneously by the simple evolution or development of the organism, but rather It takes place under education.

Accepting neuroplasticity or what is the same as the brain is cultivated and in doing so is modified throughout life (more significantly in some periods such as childhood) implies opposing the idea of sociobiology that the human being is only the result of biological evolution or that biological evolution has set the tone for moral development. Faced with this position, as pointed out by Ayala (2006) and Gracia (2016) ends up falling into the void of the naturalistic fallacy, it would be better to speak more properly of moral development in terms irreducible to those of evolutionary development. This is what authors like José Antonio Marina (2011) have called 'coevolution':

Culture changes the brain that, in turn, will change the culture. This is how coevolution works and, in this process, educators have a defined role. The end of the 20th century was the era of genetics, but the beginning of our century is the era of epigenetics. The fact that genetic expression depends on the environment - that is, on experience and education - and the conviction that the human species can direct its own evolution, makes education the great scholar of this evolutionary process. Its object of study is the understanding and orientation of the relationship between biology and culture, that is, coevolution (p.9).

Effectively, to educate is to change the brain because learning involves activity and really substantive neuronal changes. The pattern of behavior is not marked by a genetic code or by a certain evolutionary line explained from biology. By virtue of education it is possible to mark the way to human evolution and in this sense, as Gracia (2018b) points out, the ethical end of neuroeducation is not naturalistic. While biological changes have been the result of millions of years, cultural changes exponentially increase human development. Morality is not marked by the ability to adapt to an environment, according to the evolutionary paradigm of biology. On the contrary, moral neuroeducation recognizes that moral capacities are the result of biological evolution, but the type of norms and moral codes proper to each society are the result of education and the culture of that society. It is in this second aspect in which freedom allows incarnation. If in the first sense biological evolution allows us to determine the intellectual capacities that having reached a certain threshold of development make possible the moral capacity of choice between alternatives, in the second sense, the educational or cultural evolution or development allows to specify said freedom in certain life forms, beliefs, thoughts, practices or habits.

Recently, in his book *Evolution of the learning brain*, Paul Howard-Jones (2018) has wondered about the evolutionary dimension of the brain that learns and has remembered that evolution does not follow the direction of what people have considered, in different, times as moral progress. It is well known to use the theory of evolution to justify 'scientific racism', for example, by the Nazis in Germany or apartheid in South Africa. But like other powerful scientific ideas, the theory of evolution can be used for the good and for the bad. Everything depends on the ethical conception one has, and it is this debate that is introduced with eugenics and the different ways of understanding human improvement. In large part, here lies the differences between Darwin's theory of evolution and the eugenics theories initiated by Galton.



The ‘new thinking about the evolution’ of Howard-Jones (2016) considers that the complexity and dynamism of the culture presupposes a series of human capacities through which the processes and messages of the culture can spread. It is these capabilities that have been handed down to us through evolution. But along with this, in the opinion of Howard-Jones (2018), neuroscience allows us to better understand evolution, helping to dissipate evolutionary neuromyths. For example, by understanding the genesis of how the emotional and motivational system interacts bidirectionally with the functioning of our plastic cerebral cortex oriented toward a more general purpose. From a ‘deep perspective of time’, the link or commitment of motivation to learning (the engagement for learning) would be originally in the evolutionary roots that lead our attention towards experiences that promise to be rewarded, although without distinguishing whether this reward attends to an intrinsic or extrinsic motivation.

In our point of view, the main contribution of the profound perspective of time on the evolution of the learning brain of Paul Howard-Jones is that the future of said brain does not lie in the pharmacological improvement, neither in eugenics, nor in the transcranial electrical stimulation, nor in sophisticated neuronal implants connected to the internet... The progress of science and technology is important but insufficient. They are not a few experts but a well-educated society that has to face the challenges that the present time planet. As Paul Howard-Jones (2018) points out:

The probability of salvation only through technology and science seems tenuous and the story of the lone scientist who can save the world is probably a matter of science fiction. More than the creation and retention of knowledge by a minority of experts, it seems that the organized distribution of knowledge through education may be the last challenge that our destiny decides (p.182).

Embodied freedom and neuroeducation of care

Embodied freedom has its roots in the neurobiology of people’s moral development. As we have pointed out above, the plasticity of the brain, the fact that the brain is not closed after birth makes it possible to modify it through interaction with the environment and especially through education. But it also affects the fact that the plasticity of the brain depends in large part on how much it is used and in what sense, with which work-

ing it is not only possible but even recommendable. A neuroeducation focused on the cultivation and care of human relations is the best way to guarantee an adequate moral development and a full exercise of freedom.

Darcia Narvaez (2014, 2016) has been in charge of influencing the importance of developing ethics that takes into account the phylogenesis of morality. Starting from the basic features or baselines of human behavior as a species focusing on the type of behavior of the primitive societies of hunters and gatherers helps - in their opinion - to criticize the false assumption that human beings are a self-centered and aggressive beings by nature. In terms of its 'tri-ethical theory' the point of view of the study of the evolution of the species contributes to overcome a type of industrialized society that has turned its back on the moral needs of human beings. The frequency with which children show stress, lack of self-control, attention deficit, anxiety, depression and aggression is a symptom that family and social contexts have not known how to create the right spaces for an adequate moral development. And this is because it has lost sight of the inheritance as a species and the 'nests or niches of evolved development'. Fundamental moral capacities such as commitment and common imagination are part of the phylogenetic inheritance and develop under the nests of evolved development, beginning in childhood. The problem is that the current industrialized societies, which constitute only one percent of the entire history of the human species, have avoided such needs by generating instead a toxic stress that undermines human development, culture and moral capabilities. A context related to early stressors can cause dysfunctions in neuronal circuits such as a defective serotonergic system or depression of oxytocin receptors that result in aggressive behaviors.

In the case of freedom, Narvaez's (2016) criticism of 'atomistic individualism' and how a 'false atomistic notion of human psychology' has been generated is very interesting. Such societies give the mistaken impression that the human being is a solitary, self-centered, self-sufficient being 'locked in the privacy of his own body' and competing in a hostile environment. For Narvaez it is time to return to the evolutionary path to ethically nurture human beings³. And for that, it takes as a model the societies of hunters and gatherers because in them everyone is considered as an agent and with his own conscience, but within a social environment that provides him with support, care, company and sustenance. This way of conceiving the individual in society is understood under the aegis of an ethics of virtue with a special importance placed on the community dimension and a 'dense vision of personality'.

The proposal of Narvaez's moral neuroeducation can be especially interesting in terms of considering the phylogenetic needs of the brain so that through education the subjects can develop their personality. The author places us on the track of the importance of care in moral education to ensure the adequate neurobiological development of the child. In response to the neurobiology of the moral development of behavior, neuroeducation of care advocates the type of education that fosters trust and not stress; affection and not indifference; social ties and not atomism; that cultivates human relationships and not the technification and instrumentalization of them. It is this type of education what matters for an adequate character formation that makes possible the proper exercise of freedom. As Gracia and Gozávez (2016) maintain, community bonds are undoubtedly key for the incorporation of freedom not to lead to atomism, but to be an authentic 'significant freedom'.

Going a little further than Darcia Narváez (2016) herself, it is possible to think that the charges that she raises against illustration in general and against Rousseau and Kant in particular suffer from a deficient and somewhat superficial reading that ignores the value of ethical legacy of these philosophers. Among other things because in these authors the psychological level does not equal the moral level and it is convenient not to forget that this distinction in Kant is key, because we must not confuse the motives for action or even the 'cerebral bases' with the rational foundation of the moral conduct that confers validity, as indicated by Cortina (2011) and Gracia (2018c). Likewise, we find serious deficiencies in which the 'evolved nest' responds satisfactorily to the cosmopolitan challenges of our current societies.

The tri-ethical theory of Narváez (2016) rightly rediscovers the neurobiological roots of rationality and the importance of a neuroeducation of care for an adequate development of the intelligence and personality of individuals. But his model of tribalist society poses shortcomings in terms of the cultivation of a shared morality that allows to establish ties of belonging to humanity, beyond blunt nationalisms and excluding grupalisms and betting on a situated ethic of human rights, according to Gozávez and Jover (2016). Only by cultivating a civic ethic that fosters cosmopolitan hospitality along the lines of Cortina (2017) and Gracia (2018a) would it be possible to face social ills such as, for example, xenophobia or aporophobia.

Conclusions

In light of the entire journey presented in this article we draw the conclusion that human freedom is not refuted by Libet's experiments because scientific practice already presupposes a conceptual framework based on natural laws and therefore assumes a mode of discourse that it is conceived under the paradigm of natural causality. That is why those who, based on scientific experimentation, claim to deny freedom are not doing science but rather 'bad metaphysics'. And this attitude is reductionist precisely because it ignores the hermeneutical presuppositions of all scientific discourse and considers that 'the real' is only that to which the experimental sciences have access to.

Recognizing the hermeneutical presuppositions of neuroscience, however, it is possible to affirm freedom without denying the physiological basis of human behavior. The philosophical affirmation of freedom is not exempt from conditioning and one of them is the natural substrate that not only limits but also enables its exercise. It is not a question of rejecting the Kantian distinction between nature and freedom and incurring the naturalistic fallacy, but of deepening in the neuropsychic basis that morality requires in order to express itself. From them, freedom is not a 'farewell to nature', but by virtue of the cerebral bases it is possible to speak of 'morality as a structure' and the exercise of embodied freedom, based on a rereading and overcoming of the third Kantian aporia between two traditionally divided kingdoms.

Embodied freedom is in this respect a fundamental component of neuroeducation because the ability to act in one way or another depends precisely on the plasticity of the brain. Not only phylogenetic evolution shapes the brain, but education allows to configure and create the structures and functions of the brain itself. Moral neuroeducation distances itself from a reductionist naturalism and allows us to understand the evolution of the brain that learns in terms of coevolution, in which phylogenetic evolution is complemented by the capacity of education to set the pattern for the evolution of the species.

On the other hand, there is a point that is central and is that the neuroeducation of care not only makes sense in terms of a better adaptation of the individual to his environment, as the phylogenetic principle says. The key to the neuroeducation of care and justice must be the full development of the individual's autonomy and this implies considering the possible collectivist dangers that a primitive society can exert on the individuals themselves. Without a doubt, it is key to combat from the neuroeducation the atomistic individualism of liberal societies that

translates into indifference and toxic stress. But it would be a mistake that the cultivation of community bonds leads to overprotection that suffocates the ability of individuals to choose. Precisely for this reason, we cannot and should not renounce a moral neuroeducation model that, considering the embodied subject and the emotional dimension of rationality, does not settle for naturalizing ethics according to the axiological patterns of evolution.

Precisely the model of embodied freedom that has been defended in this article from neuroeducation recognizes neurobiology but does not reduce the foundational and normative capacity of ethics for a better adaptation to the environment, for an adjustment of the same according to human development criteria. Moral progress does not follow the pattern of biological evolution. Therefore, it is not the 'evolutionary system' that should set the tone to avoid violent tribalism and overprotective behavior based on domination and submission. It is the embodied freedom that confers the protagonism to the moral feelings but also to the practical rationality that guides them. It is the embodied freedom that considers the ethical benevolence towards those of the own group, but also the justice of the moral point of view. It is the embodied freedom that considers the non-instrumental value of the community, but also the protagonism of the individual who finally must empower himself. It is this kind of integrated freedom that is characteristic of an ethic at the level of a shared humanity that allows us to overcome atomistic individualism but also ethical tribalism.

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Notes

- 1 "The problem is that choices are made by brains, and brains operate causally; that is, they go from one state to the next as a function of antecedent conditions. Moreover, though brains make decisions, there is no discrete brain structure or neural network which qualifies as 'the will' let alone a neural structure operating in a causal vacuum. The unavoidable conclusion is that a philosophy dedicated to uncaused choice is as unrealistic as a philosophy dedicated to a flat Earth". Its main confusion is that it does not consider the key distinction between cause and condition (Churchland, 2006, p. 43). It is better to remember that the notion of freedom is not opposed to the notion of causality but to that of constriction (Cortina, 2011, pp. 183ff).
- 2 "The ontologization of the knowledge of the natural sciences that forms a naturalistic image of the world from this knowledge and reduces it to hard facts is not science, but bad metaphysics" (Habermas, 2006, p.214).
- 3 Narváez highlights what these baselines are in childhood to form a good nest of evolved development: maternal responsibility, breastfeeding, physical contact and proximity, family cohesion, free time to play, friendly social environment. But also,

for the adult age shows that it is important to pay attention to the beneficial results of the guidelines offered by the trina theory (Narváez, 2016, pp. 75ss)

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