INSTITUT D'ÉTUDES
AVANCÉES DE PARIS

3rd Paris conference
on Syndrome E

The Brains that Pull the Triggers

Wednesday, 10, Thursday, 11 and Friday, 12 May 2017

International conference convened by
Itzhak Fried (Paris IAS / UCLA / Tel Aviv University)
and **Alain Berthoz** (Collège de France)

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Presentation

The conference will bring together scientists and scholars from the human, social and brain sciences to bear upon the question of transformation of seemingly ordinary individuals to repetitive agents of extreme violence in groups (Syndrome E). The menacing specter of such transformation in the human condition that has caused immense loss of life in the past, is a matter of grave concerns in contemporary civilization with the increase in global radicalization and discontent. In a special editorial, *Nature* magazine has described the first conference as **"...a bold and important attempt to bring interdisciplinary approach to one of the biggest questions facing humanity"**.

The aim of the upcoming conference is to foster a multidisciplinary approach trying to elucidate the brain mechanisms of this behavior and its collective characteristics, and also to evoke the social, psychological, ethical and juridical aspects. The conference will be a culmination and synthesis of three years of studies and discussions and will conclude with plans for further actions.

Program

Wednesday, May 10th

Introduction

09h00 Introduction and welcome
Gretty MIRDAL (IEA Paris), **Alain BERTHOZ** (Collège de France)

09h15 *The Brains that Pull the Triggers: Syndrome E, 2017*
Itzhak FRIED (IEA Paris – UCLA and Tel Aviv University)

Session 1: Heart of Darkness: Ordinary and Extraordinary Perpetrators

10:00 *How Ordinary People Become Violent: Frustration and Dehumanization*
Susan FISKE (Princeton University)

10:40 Break

11:00 *How Ordinary are 'Ordinary Perpetrators'? Notes on the Genocidal Mentality*
Abram DE SWAAN (University of Amsterdam)

11:40 *How Does one Become a Torturer? The Case of Duch in Cambodia*
Françoise SIRONI (Université Paris 8 Saint-Denis)

12:20 Discussion

13:00 Lunch break

14:15 *Radovan Karadzic and the Role of Fear*
Jessica STERN (Boston University)

14:55 *The Hermeneutics of Darkness: Interpreting Perpetrators on their Crimes*
Brian SCHIFF (American University of Paris)

15:35 Discussion

16:15 Break

Session 2: Self and Group

16:30 *Identity Versus Self: Tensions Between Group, Radicalization and Individual Violence*
JM BERGER (International Center for Counter-Terrorism)

17:10 *A Neural Mechanism for Empathy and the Role of Society in its Modifications*
Giaccomo RIZZOLATTI (University of Parma)

17:50 Discussion

18:30 Cocktail

Session 3: The Will to Die and Kill

09:00 *Devoted Actors and the Spiritual Dimension of Conflict on the ISIS Frontline and Elsewhere*
Scott ATRAN (CNRS - University of Michigan)

09:40 *Stereotyped Behaviour of Perpetrators: "Critical Period" during Pre-adolescence for Tolerance and Empathy?*
Alain BERTHOZ (Collège de France)

10:20 Discussion

10:50 Break

Session 4: Brains that Pull the Triggers: Plasticity of Behavior

11:10 *The Roles of the Orbitofrontal Cortex in Changing and Stopping Behaviour*
Edmund ROLLS (Oxford Centre for Computational Neuroscience)

11:50 *Plasticity of Empathy and Prosocial Motivation: From Outgroup Hate to Ingroup Favouritism*
Tania SINGER (Max Planck Institute for Human cognitive and Brain Sciences)

12:30 Discussion

13:00 Lunch break

Session 5: Brains that Pull the Triggers: Under the Influence

14:15 *Brains on Drugs: Lessons from the Third Reich*
Norman OHLER (Berlin – author of *Blitzed, Drugs in the Third Reich*)

15:00 *Are there Similarities Between the Effects of Drugs and Syndrome E?*
Jean-Pol TASSIN (Collège de France)

15:40 Discussion

16:20 Break

Session 6: Morality, Law, and Neuroscience

16:35 *Moral Flexibility: Insights From Neuroscience*
Molly CROCKETT (University of Oxford)

17:15 *Bringing Together Neuroscience and the Law: Some Reflections*
Jean-Paul COSTA (International Institute of Human Rights)

17:55 Discussion

18:20 Concluding Remarks
Itzhak FRIED (IEA Paris – UCLA and Tel Aviv University)

Session 7: Where Do We Go from Here?

09:15 Roundtable 1: Past and Present Perpetrators: Issues of Interpretation and Prevention
With JM BERGER, Gretty MIRDAL, Norman OHLER, Abram DE SWAAN, Brian SCHIFF, Françoise SIRONI, Jessica STERN

10:30 Break

11:00 Roundtable 2: The Place of Neuroscience in Future Research on Perpetrators of Extreme Violence
With Alain BERTHOZ, Itzhak FREID, Etienne KOECHLIN (ENS Paris, tbc), Tania SINGER, Edmund ROLLS

12:15 General Conclusion
Itzhak FRIED (IEA Paris – UCLA and Tel Aviv University) and **Gretty MIRDAL** (IEA Paris)

Abstracts

Introduction

The Brains that Pull the Triggers: Syndrome E, 2017

Itzhak FRIED (IEA Paris – UCLA and Tel Aviv University)

The transformation of groups of previously nonviolent individuals into repetitive killers of defenseless members of society has been a recurring phenomenon throughout history, continuing at the present era. This apparent transition of seemingly normal, "ordinary" individuals, to perpetrators of extreme atrocities is one of the most striking variants of human behavior. This transition is characterized by a set of symptoms and signs for which a common syndrome has been proposed, Syndrome E, as well as a pathophysiological model of a "cognitive fracture" (Fried, Lancet, 1997). A summary of the last two conferences and a survey of the syndrome manifestation in past times and in the current era will be presented.

I will present the main challenges for this third Paris conference on "The Brains that Pull the Triggers". In this meeting, we have an extraordinary mix of individuals. We have experts who have observed and studied perpetrators of past and present times and have drawn conclusions and formulated models to explain their behavior.

Concurrently we have neuroscientists who have studied complex behavior at the individual and group level from perception to action and from dehumanization to empathy, and have examined the plasticity and fragility of human perception, value representation, decision and action. These biological vulnerabilities are highlighted by the effects of neuroactive drugs in facilitating some of the symptoms and signs of Syndrome E.

The central questions before the conference are:

1. How can we explain the transformation of seemingly ordinary individuals to repetitive perpetrators of extreme violence? Can we begin to formulate a unifying model that will tie the phenomenology of perpetrators with the growing understanding of brain mechanisms of cognitive and affective behavior in individuals and groups.
2. How amenable are the "Brains that Pull the Triggers" to modulation? Are there means of intervention or prevention?

Session 1: Heart of Darkness: Ordinary and Extraordinary Perpetrators

How Ordinary People Become Violent: Frustration and Dehumanization

Susan FISKE (Princeton University)

Stereotyping dehumanizes others and provides a potential pathway to violence when people are frustrated. Stereotypes vary in content and neural correlates, but systematic patterns emerge across cultures. The first dimension reflects perceived intent—warm and trustworthy (or not)—as when the sentry cries, "Friend or foe?" The second dimension, competence, reflects ability to enact the benign or malign intent.

Warmth and competence combine to produce four validated clusters of the rich outgroups. The stereotypical ingroup, middle-class or citizens, are stereotyped as both warm and competent; they are sources of pride and admiration. The worst outgroups—homeless people, nomads, or undocumented immigrants—are stereotyped as both untrustworthy and incompetent; they evoke disgust. Mixed stereotypes include older or disabled people, viewed as warm but incompetent; they receive pity. Another mixed stereotype targets rich people, who seem competent but cold, and they provoke envy. Distinct forms of dehumanizing discrimination target each cluster, and the emotional prejudices (pride, disgust, pity, envy) best predict behavior.

Each of the three outgroup quadrants shows distinctive neural correlates. Disgusting outgroups fail to activate medial prefrontal cortex, implicated in (not)attributing a mind to another, but disgusting outgroups do activate insula, implicated in disgust. Pitied outgroups also fail to activate theory-of-mind areas, except when perceivers try to sympathize. The most volatile quadrant contains envy: Competent-but-cold outgroups elicit Schadenfreude (malicious pleasure at their misfortune) which correlates with neural reward-area activation and reported harms.

Frustration underlies these stereotyped intergroup tensions. First, perceived warmth results from cooperation, but competition leads to lack of trust because it aims to block ingroup goals. Competition entails both tangible economic resources and symbolic values. Competition explains distrust of both low-status immigrants and the high-status rich, each seen as exploitative.

Marginalized minorities who feel frustrated with their economic situation, particularly those with success in sight, but just out of reach, should be especially frustrated, given relative deprivation. If they become violent, their first targets would be the competitive envied outgroups, such as outsider bankers and foreign business owners. So, the first dimension, perceived warmth follows from cooperation and competition—inherently frustrating.

Turning to the second dimension, status predicts stereotypical competence, which multiplies the effects of warmth or its lack. Because bankers are not only competitive but also high status, they should be particular targets of frustrated minorities. Other envied, high-status (competent) and competitive (cold) groups include outsider

entrepreneurs, a role currently filled by Chinese and Korean business people and formerly filled by Jewish ones. Often, envied outgroups are the targets of mass killing in collective frustration.
Theory, cross-national data, and neural data combine to suggest that dehumanization and frustration are risk factors for violence.

How Ordinary are 'Ordinary Perpetrators'? Notes on the Genocidal Mentality

Abram DE SWAAN (University of Amsterdam)

Very little is known about perpetrators of mass annihilation. They cannot be observed or interviewed 'in the field', while at work, and only very rarely afterwards in postgenocidal society, where they prefer to remain silent and anonymous.
Almost all that is known about them comes from judicial evidence. Only the mass murderers of regimes that have been defeated are ever brought before their judges. That leaves a few cases at best (Nazi-Germany, Rwanda and the former Yugoslavia). Even in these defeated countries, only a small minority of perpetrators are ever tried. Trial documents tend to present a very distorted picture of the defendants who try to reduce their responsibility as much they can.
Nevertheless there is an almost complete consensus in the social sciences – a rarity in that field that mass murderers are ordinary people who in extraordinary circumstances have committed extraordinary evil. ('you and I under the same circumstances might have done the same thing').
The leading proponents of this 'situationist' view were Hannah Arendt, Stanley Milgram, and, Christopher Browning, whose evidence provides it with the most important support. This near unanimity has blocked inquiry into the personal biography (the 'disposition'), which increases the odds for the perpetrators to find themselves in a genocidal situation and helps to shapem their behavior, also in the postgenocidal setting.
To the degree that recruitment of the genocidaires is more compulsory or depends more on self-selection, personal dispositions plays a lesser or larger role. Obviously, an authoritarian upbringing and a conformist stance contribute to the odds of joining the ranks of the perpetrators. A prior career as a violence specialist (in the police or the military, or in crime) also adds to these odds.
The differences with people who did not become mass murderers are gradual and statistical.
From the literature it appears moreover, that genocidal perpetrators tend to have a moral conscience, but much more restricted to their kin, comrades and superiors; beyond that narrow circle moral obligation counts for much less than it does for most others. Moreover, the perpetrators appear to have a lower sense of agency. Finally, they show less empathy, let alone compassion, to anyone beyond their first circle.
After all, even mass murderers are persons, different persons, distinct like everyone else.

How Does one Become a Torturer? The Case of Duch in Cambodia

Françoise SIRONI (Université Paris 8 Saint-Denis)

Duch, chief of S-21, a center of torture and death during the Khmer rouge regime, has been judged by the Special International Court for the Khmers rouges in Cambodia in 2009. I was appointed by the Court to analyze the psychology of Duch. Therefore, I met him 16 times in detention. Articulating individual and geopolitical factors are fundamental in order to understand the making of a torturer. The role of traumatic initiations, as well as the way of becoming desempathic are central. We will also see if it is possible to come out of disempathy, and how?
In conclusion we will examine the nature of the psychologist's counter-transference in front of criminals against humanity. It is an additional reliable inner captor that informs us of the unconscious mind of perpetrators.

Radovan Karadzic and the Role of Fear

Jessica STERN (Boston University)

Dr. Radovan Karadžić is a former president, a psychiatrist, a convicted war criminal, a prize-winning poet, and a Christian mystic. He served as President of Republika Srpska during the Bosnian war, and was later found guilty of overseeing the 1995 Srebrenica massacre, which resulted in the deaths of some 8000 men and boys. He was indicted by the International Criminal Tribunal for the former Yugoslavia in 1996, but managed to live as a fugitive for 12 years, during which he transformed himself into a new-age energy healer specializing in "bioenergetics." In 2016, he was sentenced to 40 years imprisonment for genocide and other war crimes. My talk will focus on my interviews of him, and what happens in the room between us when we speak.

The Hermeneutics of Darkness: Interpreting Perpetrators on their Crimes

Brian SCHIFF (American University of Paris)

In this paper, I give a close reading to Gitta Sereny's (1974/1983) *Into that Darkness: An Examination of Conscience* and her account of the memories and reflections of Franz Stangl on his participation in the murder of the handicap, the mentally ill and Jews. Sereny's account is far-reaching—based upon over 70 hours of interviews with Stangl himself and many others. Although Stangl's actions, and reflections on these actions, is the ostensible fulcrum of her investigation, she provides us with a complex way of contextualizing Stangl in a personal history, his immediate social relationships and within an evolving system of historical-cultural meanings. Following Sereny, I present a way of understanding Stangl's involvement that focuses on understanding of his reflections on his actions during the Shoah. But, I also question some of the assumptions inherent in Sereny's characterization of moral action and present a way of thinking through presumptions of perpetrator guilt and conscience from a broader perspective.

Session 2: Self and Group

Identity Versus Self: Tensions Between Group, Radicalization and Individual Violence

JM BERGER (International Center for Counter-Terrorism)

The study of extremist radicalization typically focuses on how individuals become motivated to carry out violence through the adoption of an ideology. But extremism and ideological formulation are not typically individual ventures, with some rare exceptions. Most forms of extremism—certainly today's most pressing threats, white nationalism and jihadism—are concerned with group identities (Berger, 2017), with ideologies that develop over generations, with contributions from many different people. Attempts to understand extremist-motivated violence outside of these group processes capture only part of the picture. While the exact boundaries between group and individual motivations can be indistinct, it may be fruitful to approach this problem from a different perspective. Rather than simply asking why individuals radicalize, one avenue for enhanced investigation is to ask: "Why do groups radicalize?" and then ask "Why do people join groups?" Some answers to these questions can be found the context of social identity theory. Specifically, uncertainty identity theory (Hogg, 2004, 2007) offers a promising avenue for exploring why people join extremist groups. Uncertainty identity theory may also provide a window into why some people turn to violence, a question which is related, but not identical, to the question of why they join extremist groups.

A Neural Mechanism for Empathy and the Role of Society in its Modifications

Giaccomo RIZZOLATTI (University of Parma)

An important discovery in neurosciences over the last years has been that of a mechanism that unifies action execution and action perception. The essence of this mechanism –the mirror mechanism- is the following. When individuals observe an action belonging to their motor repertoire done by others, neurons that encode that action are activated in the observer's motor system. Since the observers are aware of the outcome of their internally generated motor acts, they also understand the goal of others' actions without the necessity of an intermediate cognitive mediation. In my talk, I will review first some data on the mirror mechanism of the monkey. I will present then evidence that also humans possess the mirror mechanism. I will show then that there is overwhelming evidence that the mirror mechanism exists also in centers related to emotions like the anterior insula and the anterior cingulate cortex. The mirror mechanism of these centers are activated by natural stimuli (e.g. disgusting odorants, painful stimuli) as well as by the observation of individuals that feel emotions determined by those stimuli. Because the same neuronal populations are activated by natural and by social stimuli, it follows that we can not only understand others' emotions cognitively, but also feel them empathically sharing them with others. This empathic mechanism may be potentiated or inhibited by cultural factors. I will posit that certain ideologies (e.g. Nazism) may inhibit it, thus transforming "the other" into a "thing". In

contrast, ethical precepts present in the Bible as well in the texts of others religions are fundamental to reinforce it.

Session 3: The Will to Die and Kill

Devoted Actors and the Spiritual Dimension of Conflict on the ISIS Frontline and Elsewhere

Scott ATRAN (CNRS - University of Michigan)

Uncompromising wars, revolution, rights movements, and today's global terrorism are in part driven by Devoted Actors who adhere to sacred or transcendent values that generate actions independently, or all out of proportion, from rationally expected outcomes, calculated costs and consequences, or likely risks and rewards. Field-based observation, surveys and experimental studies in real-world political conflicts show ways in which Devoted Actors, who are unconditionally committed to sacred causes, and whose personal identities are fused within a unique collective identity, willingly make costly sacrifices including fighting and dying, thus enabling low-power groups to endure and often prevail against materially much stronger foes. Explaining how devoted actors come to sacrifice for cause and comrade not only is a scientific goal, but also a practical imperative to prevent and resolve seemingly intractable intergroup disputes that can spiral out of control in a rapidly interconnecting world of collapsing and conflicting cultural traditions in search of salvation and escape from the dark side of globalization. To help make the case we present field studies with combatants on the frontlines in the battle with the Islamic State in Iraq and with radicalized populations in Morocco, and brain imaging of supporters of Lashkar-e-Taiba, an Al Qaeda affiliate, among Pakistani immigrants in Spain.

Stereotyped Behaviour of Perpetrators: "Critical Period" during Pre-adolescence for Tolerance and Empathy?

Alain BERTHOZ (Collège de France)

One of the dramatic aspects of the "Syndrom E" is the involvement of children who become perpetrators. A recent film by Jonathan Littell ("Wrong Elements") has dealt with this question for Ouganda but the transformation of young children in fanatics and stereotyped killers is a very general problem extending back in history and still going on today . They are often recruited by force at preadolescence and adolescence. I have for several years proposed that there is a "Critical Period" for acquiring tolerance precisely within this age range and that an international law should protect them.
In the frame of this question I will first briefly review some brain mechanisms concerning the acquisition of stereotyped behavior. I will then present some recent studies we have done with the groups of D. Cohen and of O. Houdé in Paris, with G. Cioni in Pisa, and with some other groups in Rennes, Brest, Poitiers, Siena, using several new paradigms for self-other interactions. The studies concern the acquisition, between 5:7 and 12/15 years of age, up to adulthood, of the capacity to "*change point of view*", a fundamental basis for tolerance and empathy. I will also propose that if at this age range a child is prevented from acquiring this by ideological or any other narrowing of his view on others, he or even she, may become a perpetrator for a durable amount of time.

Session 4: Brains that Pull the Triggers: Plasticity of Behavior

The Roles of the Orbitofrontal Cortex in Changing and Stopping Behaviour

Edmund ROLLS (Oxford Centre for Computational Neuroscience)

In Rolls' theory of emotion (2014) it is argued that emotions are states elicited by instrumental reinforcers which are the goals for action, the rewards and punishers. It is argued that emotions solve a fundamental problem in Darwinian evolution, for it is much more efficient for genes to specify goals for actions, rewards and punishers, rather than actions or responses. It is shown that the orbitofrontal cortex is important in emotion and in action for it represents primary, unlearned, gene-specified, reinforcers including taste, olfactory, somatosensory, auditory, and visual rewards and punishers including face expression; performs rapid learning, and reversal, of stimulus-reward associations; and with the pregenual cingulate cortex has activations that are directly and linearly correlated with the pleasantness and unpleasantness of stimuli and events, that is with the conscious reports of the subjective state associated with rewards (Rolls 2014, 2016; Grabenhorst and Rolls 2011). Cognitive inputs, peoples' beliefs, exert a top-down modulation on these orbitofrontal cortex reward and punishment systems. These reward and punishment systems in our brains provide inputs to our value based decision-making mechanisms in the ventromedial prefrontal cortex. Decisions with this emotion-related system are in the interests of the genes. In this context, the lateral orbitofrontal cortex has an important role in changing behaviour to non-reward (i.e. not obtaining an expected reward), and to expected punishment. Neurons in the orbitofrontal cortex respond to non-reward (Thorpe, Rolls and Maddison 1983); the human lateral orbitofrontal cortex is activated by non-reward (a mismatch between expected reward and reward outcome) (Kringelbach and Rolls 2003; Rolls 2016), and in the stop-signal task in which behaviour must be stopped (Deng, Rolls et al 2017); damage to the orbitofrontal cortex impairs behavioural change in a reversal task when reward is no longer being obtained (Hornak et al 2003, 1996, 1994) and in the stop-signal task (Aron, Robbins and Poldrack, 2014) and is associated with impulsivity (Berlin, Rolls et al 2004, 2005). Moreover, it is now hypothesized that the orbitofrontal cortex and its connected structures including the amygdala and anterior cingulate cortex are the source (via the striatum and the habenula) of inputs to the brainstem dopaminergic and serotonergic neurons that then may project error-related information to other brain systems in order to correct behaviour (Rolls 2017).

It is shown using integrate-and-fire neuronal networks that decision-making is inherently probabilistic because of noise caused by the random firing times of neurons in the brain (for a given mean rate), and this decision-making is non-deterministic, and this has implications for free will, and for why decisions are taken (Rolls 2012, 2014; Rolls and Deco 2010).

In addition to this emotion-related decision-making system, there is a rational decision-making system that utilizes syntactic reasoning for longer-term

planning. This system can take decisions in the interests of the phenotype, of the individual person (Rolls, 2014).
There is thus potentially an inherent conflict between these two decision-making systems, and which one wins may even be influenced by noise in the brain. Our increasing understanding of the brain mechanisms underlying this reward and punishment-related processing, and how cognitive states can influence this processing, as described above (Rolls 2014, 2016) has implications for understanding why some individuals may perform actions that are atypical; but exactly how these systems fail to inhibit behaviour in some individuals remains to be understood in terms of brain mechanisms, for most brain research is on healthy individuals or individuals with mental disorders, not on those who produce extreme behaviour.

Plasticity of Empathy and Prosocial Motivation: From Outgroup Hate to Ingroup Favouritism

Tania SINGER (Max Planck Institute for Human cognitive and Brain Sciences)

In the present talk, I will present neuroscientific and psychological findings on the functioning of social emotions and motivations such as empathy and compassion and will give evidence for their fragility and modulation by beliefs and context as well as their trainability and plasticity through mental training interventions.
The social neurosciences have focused on the question of how people relate to and understand each other. Hereby, researchers have distinguished between at least two different routes on the understanding of others: one affective-motivational route referring to our ability to feel with (empathy) and for (compassion) another person, and a cognitive route allowing to infer other people's intentions, believes, and thoughts - a capacity also referred to as Theory of Mind, mentalizing or cognitive perspective taking. After a definition of concepts, I will shortly revise the main results of neuroscientific studies investigating empathic brain responses elicited by the suffering of another being and show how these empathic brain responses can easily be modulated by several contextual and stimulus intrinsic factors such as perceived fairness of others or whether one thinks that another person is belonging to your ingroup or your outgroup. I will show how easily empathic brain responses can be turned into opposite feelings of Schadenfreude and revenge and thus lack of helping and prosocial behaviors in healthy adult population merely based on certain beliefs they have. I will also show evidence for a dissociation of the two routes of social cognition in psychopathology, namely preserved Theory of Mind but lack of empathy in aggressive male offenders. After showing conditions for the lack of empathy, I will turn to the question of the improvement and malleability of these social capacities and show first data giving evidence for brain and behavioral plasticity in the domain of empathy, compassion and Theory of Mind after short- and long-term mental training intervention programs. I will show first results of the *ReSource Project*, a large-scale multi-methodological one-year secular mental training program in which participants were trained in different 3-month mental training modules focusing on a) attention-based mindfulness, b) prosocial motivation and compassion, and c)

perspective taking on self and others. Training-related changes were assessed on measures of functional and structural brain plasticity, social cognition and prosocial behavior as well as stress and health markers. Finally, I will discuss the potential use of these scientific findings for addressing concrete societal problems as well as their limitations.

Session 5: Brains that Pull the Triggers: Under the Influence

Are there Similarities Between the Effects of Drugs and Syndrome E?

Jean-Pol TASSIN (Collège de France)

In mammalian brain, most psychic outputs are controlled by a few tens of thousands of cells which modulate the billions of our cerebral neurons. This rather small network creates, depending on entering stimuli, a functional hierarchy between brain structures in order to adapt to significance of inputs. This network is essentially constituted by neurons, called modulatory, which release noradrenaline, dopamine and serotonin. Drugs, such as anti-psychotics or anti-depressants, exert their effects through this neuronal network. Similarly, drugs of abuse, *i.e.* psychostimulants (amphetamines, cocaine...) or opiates (morphine, heroin...), specifically activate this network and trigger addiction. When taken at moderate doses, psychostimulants induce euphoria and facilitate focalisation of attention. At higher doses they create a feeling of extreme power and annihilate fear of danger. Finally, at even higher doses, they induce not only cardiovascular disturbances but also agitation, confusion, paranoia, impulsivity and violence. These effects are mostly due to peripheral and central increased noradrenergic transmission but the euphoria induced by drugs of abuse is usually related to the release of central dopamine. Indeed, the activation by dopamine of a set of interconnected cerebral structures, namely the reward circuit, induces a feeling of well-being. Physiologically, the reward circuit can be activated by food, sex, parental care or any type of extrinsic satisfaction (money, power...).

At this point, three important groups of data should be emphasized:

1- It was recently found, in mice, that violence and active aggression can stimulate the reward circuit and, therefore, be rewarding.

2- In human brain, images analysis have shown that extreme pleasure, such as that felt during orgasm, activates structures of the reward circuit (*i.e.* ventral tegmental area, ventral striatum and parts of the right parietal and frontal cortices) but also deactivates other ones (left amygdala and entorhinal cortex).

3- Finally, the deactivation of these latter structures, which alert for danger and trigger fear, also occurs in human brain following a sniff of cocaine.

Altogether, this indicates that euphoria is obtained through a combination of activation and deactivation of main structures of the reward circuit. It is likely that drugs of abuse induce an intense activation of cortical areas (frontal and parietal) which, in turn, deactivate some sub-cortical structures. Most importantly, violence and active aggression stimulate the reward circuit. However, in humans, the activation of amygdala by violent and frightening situations prevents from feeling of satisfaction, unlike what is observed with drugs of abuse. Violence and

crime may nevertheless induce extreme pleasure in individuals that have been conditioned and trained to deactivate or block the activation of these latter sub-cortical structures. Some individuals may therefore become addicted to active aggression. As game is compulsory for pathological gamblers, violence would be a source of "drug-free addiction".

Session 6: Morality, Law, and Neuroscience

Moral Flexibility: Insights From Neuroscience

Molly CROCKETT (University of Oxford)

Classical models of antisocial behavior propose that violence arises out of a failure of lateral prefrontal cortex (LPFC) to "put the brakes" on aggressive impulses originating in subcortical regions such as the amygdala and striatum. A new, alternative model proposes that LPFC does not directly inhibit aggressive impulses, but instead flexibly modulates the *value* of aggressive acts via corticostriatal circuits. I will present the first empirical evidence directly supporting the alternative model. In a series of behavioral, pharmacological and neuroimaging experiments we observed healthy adults as they decided whether to anonymously inflict pain on themselves or strangers in exchange for money. We find that most people would rather harm themselves than others for profit. This moral preference correlated with neural responses to profit, where participants with stronger moral preferences had lower dorsal striatal responses to profit gained from harming others. LPFC encoded profits gained from harming others, but not self, and tracked the blameworthiness of harmful choices. Moral decisions modulated functional connectivity between LPFC and the profit-sensitive region of dorsal striatum. Increasing central dopamine levels with the dopamine precursor levodopa eliminated moral preferences. The findings suggest moral behavior is linked to a neural devaluation of reward realized by a prefrontal modulation of striatal value representations. This mechanism implies that the moral value of actions is flexibly guided by neural representations of social norms. If norms change, so then do the values that guide actions. Supporting this view, re-framing decisions to harm others as being in service of a noble cause eliminated moral preferences. The flexibility of value representations in the brain may hold the key to understanding why people with good intentions can sometimes do terrible things.

Bringing Together Neuroscience and the Law? Some Reflections

Jean-Paul COSTA (International Institute of Human Rights)

The author, a lawyer and not at all a specialist of neuroscience, tries to present some reflections about the feasibility, usefulness, and possible dangers, of bringing together neurosciences and the Law. This interconnection has already started. In some criminal trials, lawyers submit to judges neurological evidence in order to demonstrate the innocence or guilt of the accused person, or the existence of mitigating circumstances. According to French Law the legality of cerebral imaging for judicial expertise may be admitted under conditions. The age of criminal

responsibility is questioned on the grounds of brain development ecc.

However criminal law is not the only field where neurosciences are able to interfere with legal solutions to various problems. Will the legal influence of neurosciences grow on in the future like DNA, for instance? Will "Neurolaw" become more and more important? Anyhow, some legal obstacles and ethical problems exist and must be scrutinized.

Finally, as the connection between neurosciences and legal theory and practice is manifestly to develop, that means that training, education and research should include more and more interdisciplinary studies, programmes and curricula. Specialized bodies should therefore be associated in order to "bridge the gap".

Practical informations

Venue

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