# NEUROSCIENCE, PSYCHOLOGY AND PSYCHIATRY: NEW VERSIONS OF OLD ISSUES IN RESEARCH ETHICS

Neuroscience focuses upon the brain (in the biological sense) for understanding psychology and psychiatry. It includes the use of neuroimaging (brain scans), "brain enhancement" drugs, and neurotechnology (eg: neurosurgery). Each of these areas will be considered in more detail, particularly in terms of the ethical issues raised by them.

## NEUROIMAGING

Neuroscience makes use of modern technology, like neuroimaging (1), to understand the physiology of the brain. This technology allows researchers to "see" the brain working in a way that previous technologies, like X-rays, did not. This could be seen as the age of the "technology of consciousness" (Fuchs 2006).

"There exists no doubt about the fact that neuroimaging, despite its relative youth, is a potent and exciting tool to explore the working of the brain" (Fusar-Poli and Broome 2006 p609).

Recent developments in neuroimaging include diffusion tensor imaging (DTI) (examining the white matter in the brain), magnetoencephalography (MEG), and the combination of other methods (eg: EEG/MEG and Functional Magnetic Resonance Imaging/Positron Emission Tomography). There can be technical difficulties with the combination of methods; eg: magnetic field interfering with EEG signals (Fusar-Poli and Broome 2006).

Most neuroimaging studies use small samples. But attempts to pool data and apply meta-analysis (eg: coordinate-based voxel-wise mega-analysis; CMV) are being developed (Fusar-Poli and Broome 2006).

The technology of neuroimaging has implications related to free will, agency, and personality among other things, and it requires an ethical awareness for their use by researchers. This ethical awareness has been called "neuroethics" (Marcus 2002).

Fuchs (2006) distinguished two main areas of ethical concerns with neuroimaging:

i) The "new methods and technologies, by laying bare neural correlates of personal identity, cause problems of individual rights on privacy, non-interference and inviolability" (p600);

ii) The findings are reductionist in that everything is reduced to neurons firing and electrochemical processes.

For example, Libet (1985) showed that electrical activity in the brain ("readiness potential") occurs 500ms before an individual consciously chooses to do an action. Individuals, wired to EEG sensors, were told to pick up items when they wanted. If free will is nothing more than this, than is an individual ever truly responsible for their behaviour?

## Responsibility

So many of the findings using neuroimaging questions the responsibility of the individual for their behaviour. The assumption of biological determinism is implicit (and explicit) in the research.

Adrian Raine (eg: Raine et al 1998), for example, using PET scans with convicted murderers, has found poor prefrontal cortex functioning compared to the general population. Relevant abilities in the prefrontal cortex include controlling impulses, awareness of future consequences, and empathy which all discourage murderous behaviour. The first thing is the distinguishing in terms of physiology between offenders and non-offenders.

The prefrontal cortex can be damaged in subtle ways by childhood physical abuse and maltreatment (Teicher 2002). So the abuse leads to brain damage which leads to violence (directly or indirectly), can the perpetrator be held responsible for their actions? If an individual has no impulse control through damage to the prefrontal cortex, what is to stop them committing impulsive behaviour? Who is to blame when a car without brakes crashes?

## Knowing More Than the Individual Themselves

Another issue is that the sophistication of the technology has led to inferences about mental states outside of conscious awareness. In other words, neuroimaging is telling us something that the individual does not consciously know themselves. The idea of the "transparent brain" (Fuchs 2006).

One example of this is unconscious attitudes. The idea that there is a conscious attitude (what the individual reports on attitude questionnaires) and an unconscious attitude (what they really believe). The two may, of course, be in agreement. But more interesting when they are not, as in the case of racial attitudes.

For example, white participants who did not report

racist attitudes, showed greater activity in the amygdala in response to black people's faces than whites (Phelps et al 2000). This would suggest fear of these faces, and the inference of unconscious racist attitudes.

More than this, inferences are made about future behaviour. For example, Arnow et al (2002) showed a link between particular sexual preferences and physiological correlates in "healthy heterosexual men". In other words, if a non-offender shows the physiological correlates associated with sexual violence in an experiment, the prediction could be made that such an individual will perpetrate sexual violence in the future. But should it be made in terms of labelling individuals before they offend?

If it is possible to know more from brain scans than the individual knows themselves, it could be inferred if they are lying. "Brain fingerprinting" is based on this assumption. Developed by Lawrence Farwell (Farwell and Smith 2001), it measures P300 waves by EEG in response to knowledge of facts about a crime.

The P300 wave response to crime-related words flashed on a screen are classed as "guilty knowledge" which the offender cannot hide. The key is that there will be information that is only known to the offender and the "guilty knowledge test" will find it among hundreds of questions asked. The technology is being used in the US legal system (eg: murder conviction reversal in Iowa; Fuchs 2006).

One major problem stands out with "brain fingerprinting". It measures recognition, and this recognition may be from elsewhere than the "guilty knowledge" of the offender (Innovation 2004).

Neuroimaging has also been used to detect deception by showing the physiological correlates of intentional deception (eg: in anterior cingulate cortex in functional magnetic resonance imaging; Langleben et al 2002).

## Wider Ethical Issues with Neuroimaging

There are a number of critical issues in using neuroimaging, particularly when it goes beyond the simple description of physiology.

### 1. The gap between subjective experience and electromagnetic signals.

"Imaging studies are based on probabilistic co-variances and not on causal connections. Their interpretation depends on the design and theory behind

the study.." (Fuchs 2006 p601).

It is one thing to see the brain activated during certain behaviour, and another to say what is actually going on, particularly in terms of subjective experience. This is even more so with complex social issues - eg: showing a reaction in the amygdala to a photograph flashed on a screen briefly is a very poor way of measuring racial attitudes. Attitudes, at least, involve different components - cognitive, affective, and behavioural (Secord and Backman 1964).

If neuroscience comes to dominate in psychiatry, as in cognitive neuropsychiatry (CNP) (Halligan and David 2001), then diagnosis of mental disorders will depend on neuroimaging techniques. Such an approach would lead to changes in the clustering of symptoms, and the elimination of classifications like "schizophrenia", "bipolar disorder" etc.

They will be replaced by "neurological explanations and to the entities that make up such explanations instead" (Fuser-Poli and Broome 2006 p610).

So at the moment, depression would be diagnosed based on the presence of behavioural symptoms like low mood and suicidal thoughts, diagnosis in CNP would revolve around brain abnormalities. Depression would equal the specified abnormalities in the particular areas of the brain. Behavioural symptoms would simply be a product of these brain abnormalities. The mind, as in subjective experience, is removed from the process. This has been called "eliminative mindless psychiatry" (Jablensky and Kendell 2002).

## 2. From potential to actual.

It is one thing to say that the individual has the physiology for potential violence and another for them to show it. There are many factors between the potential and actual.

Brewer (2003) distinguished three groups of factors (individual, group and social) that lead to a general level of aggression, but then disinhibitions and environmental triggers that explain the specific aggression shown. This move from general to specific is similar to the move from potential to actual.

There are a lot of concerns if individuals are punished for having the potential to be dangerous. Though we live in a society that is trying to pursue such ideas. The ability to predict future behaviour is the holy grail of psychology and psychiatry. Sometimes it is done well, many other times done badly.

"The wide-spread misunderstanding of brain scans as

direct measures of psychological states or even traits, however, carries the risk that courts, parole boards, immigration services, insurance companies and others will use these technologies prematurely" (Fuchs 2006 p601).

3. Acting on the knowledge.

In the area of mental illness, studies have looked for pre-onset factors to predict the mental disorders. For example, functional magnetic resonance scans of adolescents with a high family risk of schizophrenia show brain differences (eg: Pantelis et al 2003).

To act upon this knowledge could mean giving these adolescents anti-psychotic drugs before any behavioural symptoms have appeared. Such drugs have effects on the brain as well as producing side-effects. How long to remain on the medication? Not to mention the potential for discrimination from others, and the effects of the knowledge on the individual's self-esteem (Fuchs 2006).

4. Technology as threatening.

"Our sense of privacy may be threatened by technologies that can reveal the neural correlates of our innermost thoughts and unconscious attitudes" (Fuchs 2006 pp601-602).

At the moment, such technology is relatively limited in this, but what if it becomes more reliable and accurate in the future. This is a threat to "cognitive liberty" - an individual's right over their own brain and its contents (Sententia 2004).

BRAIN ENHANCEMENT

"Brain enhancement" is the term used for new psychotropic drugs designed to combat mental disorders being used to improve the psychological and cognitive functioning of healthy individual (Fuchs 2006). In the past, such drugs were prescribed for the unhealthy (mentally ill), but there is now the option of cognitive improvements through legal drug use for healthy individuals.

Amphetamine-based drugs (eg: methylphenidate) are used to treat attention deficit hyperactivity disorder (ADHD), but such stimulants can also improve attention and alertness in healthy individuals. For example, Turner et al (2003) described the use of modafinil to improve cognitive abilities among shiftworkers.

Another area that is prone to "cosmetic neurology"

(Chatterjee 2004) is memory improvement. The focus of drug research here is initially for memory loss in dementia, but the market for the products can be widened to include individuals with small memory declines due to ageing.

While there may be a market for drugs to remove undesirable memories based on drugs to prevent traumatic memories in post-traumatic stress disorder (eg: Pitman et al 2002 propanolol (2)).

The desire to increase legal drug use by pharmaceutical companies began in full in the 1990s with "Prozac". The expansion of this selective serotonin reuptake inhibitor (SSRI) anti-depressant to include "mood brightening" and personality alteration for non-depressed individuals was aided by the evangelistic "Listening to Prozac" (Kramer 1993).

This book is full of positive stories about the benefits of "Prozac" for everyone: "It is one thing for a doctor to be able to transform a patient with medication, quite another for the doctor to be able to sculpt the patients' personality trait by trait" (Kramer 1993 p97).

Fuchs (2006) noted relatively few studies (eg: Tse and Bond 2002) on the effects of SSRIs on non-depressed individuals. Any positive benefits (like confidence) can be outweighed by attenuated negative feelings, like disappointment and guilt. Brewer (1999) questioned the motives of the makers of "Prozac", Eli Lilley, when there is so much money involved in sales (ie: billions of dollars).

## Ethical Issues with Brain Enhancement

The use of drugs, aimed at specific mental disorders, by healthy individuals have far-reaching implications.

### 1. Side-effects

Taking the drugs either as a healthy or unhealthy individual, they have side-effects, and particularly long-term consequences. For example, methylphenidate can increase short-term memory, but lead to long-term memory organisation problems (Fuchs 2006).

To some degree, it could be argued that when drugs are taken as brain enhancement, the individuals choose to accept the side-effects. For example, Fieve (1994) recorded nausea and headaches in one-fifth of "Prozac" takers in clinical trials.

## 2. Future societies.

Western societies are highly competitive, especially the USA, where brain enhancers are growing in use. If some adults/children are taking them, it creates the pressure on others to take them in order to compete. Will the future include drug tests for brain enhancers before school examinations as in sports for performance enhancing drugs today?

Furthermore, those who cannot afford the drugs become disadvantaged, and, in the case, of low income groups more disadvantaged (Fuchs 2006).

## 3. Threats from brain enhancers

If a society develops where taking brain enhancers was a normal way of life, it would raise the question of what being human means. Like many areas of biotechnology, normal human imperfection is presented as failure: "It nurtures an illusionary outlook of constant happiness and productivity while pathologizing negative moods, a normal attention span or natural forgetfulness" (Fuchs 2006 p603).

But in the world of "consumer capitalism" (Brewer 2001a), where almost anything can be purchased, there is a (disturbing) logic to purchasing a permanent happiness, unbroken, endless concentration, or unforgetful memory. For Fuchs (2006), "Medicalising human efforts may weaken our sense of responsibility for ourselves and undermine our readiness to solve the problems of life" (p603).

# NEUROTECHNOLOGY

This is the use of modern technology to physically change the brain. For example, the surgical implanting of electrodes in specific areas of the brain (deep brain stimulation - "brain pace-maker"; Fuchs 2006) to restore co-ordination of movement in Parkinson's disease or with Obsessive-Compulsive Disorder sufferers (eg: Kopell et al 2004). If this technology does produce personality change (as observed by eg: Berney et al 2002), on the positive side, it is reversible.

Neuroengineering is a developing area connecting the brain to electronic devices from cochlear implants to EEG-controlled computers. The fact that the latter is largely funded by the US military, "conjures up sinister scenarios involving mind control, hybrid brains and cyborgs" (Fuchs 2006 p603).

## REDUCTIONIST CONCEPTION OF HUMANS

Neuroscience holds the reductionist view that all subjective experience and mental states are brain states. But such a view has implications for the understanding of being human. This can be seen in three areas of debate.

### 1. Free will versus determinism.

Neuroscience presents all behaviour as determined by brain functions. The traditional view of free will behind our actions, as characterised by explainable motives, experiencing oneself as the originator of the behaviour, and the choice of different behaviours, are all illusions (Fuch 2006).

Libet's research mentioned earlier, suggested that unconscious physiological processes cause conscious free will. While the use of transcranial magnetic stimulation (TMS) determines behaviour and takes away the originator of the action.

Boyce (1999) reported research by Grafton et al that asked volunteers to point to a light in a dark room, which moved as they pointed, and compensation took place (ie: moving the finger to the new position). With TMS to a particular area of the brain, pointing was made to the original position with no compensation. These studies and others have led Wegner (2003) to suggest that choice control and free will were illusions added by the brain after the event.

The alternative to such a reductionist and deterministic view is that "free will is not something attributable to a single mental state but rather to the person as a whole" (Fuchs 2006 p604) - a holistic view.

If all behaviour is determined, many things related to conscious change, like therapy, are meaningless.

### 2. What is mental illness?

Any abnormal behaviour becomes seen as mental illness, and specifically as caused by brain abnormalities with neuroscience. More than that, the origin of the mental disorder can be localised to specific areas of the brain.

The individual with all their behaviour and complexity is reduced to an illness or disease, which is reduced to a small area of the brain that functions incorrectly or is structurally damaged. The abnormal brain causes the abnormal behaviour. But what is a normal brain exactly? All brains are different in minute areas because we are individuals.

And, by the way, what is normal behaviour? This is very difficult to define (Brewer 2001a). "Normal and abnormal themselves are normatively defined and are not properties of the brain" (Fusar-Poli and Broome 2006 p611).

If the physiology of the brain is the cause of the mental illness, then the solution is a physical one. Fuchs (2006) mentioned, worryingly, the renewed use of neurosurgery for anxiety disorders.

Also it is important to emphasise that individuals suffering from a mental disorder are more than their disorder. Despite the disorder, they are, like everybody else, trying to make sense of the world.

## 3. What is the self?

Neuroscience sees the self as the "electrochemical and computational processes inside the brain" (Fuchs 2006) as characterised by the, for example, "synaptic self" (LeDoux 2002). In the main, an illusion.

Bennett and Hacker (2003) warned of the "mereological fallacy". This is the taking of part of the person as the whole; in this case, the brain.

The self does not exist in isolation in the brain, but in relation to the world and others. This is the social constructionist view of the self (Brewer 2001b).

In conclusion:

> Mental states depend upon the patient's relations to numerous other entities and to the world as a meaningful whole. These relations are certainly not contained in neuroimaging data. Neither the mind nor the self is to be found inside the skull (Fuchs 2006 p605).

## FOOTNOTES

1. The main areas of neuroimaging are:

   - computerised axial technology (CAT)
   - positron emission tomgraphy (PET)
   - nuclear magnetic resonance imaging (NMRI)
   - functional magnetic resoance imaging (fMRI)

2. Propanolol is a type of beta-blocker, and it produces a tranquillising effect on the body.

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