TASC talk – Brain Science in the Real World

By Dr Ellie Dommett of the Open University

The most recent talk "Brain Science in the Real World" was presented by Dr Ellie Dommett, a lecturer in Brain and Behavioural Science from the Open University in Milton Keynes. She discussed the ways in which our latest knowledge and understanding of neuroscience is being both used and abused.

During her talk, Dr Dommett used a number of videos and slides for illustration. One of these was particularly memorable. It showed the various stages of development of neurons (nerve cells) from an embryo (picture far left), a foetus, an infant's brain, through adolescence and into middle age and finally to old age and senility. What struck me, and most other people who saw these slides, was that "senior moments" are definitely going to get a lot more frequent.

THE ADSTOCK SCIENCE CLUB

The Adstock Science Club invites you to its first Public Lecture on

Tuesday 11th September 2012 at 07:30pm
in the Adstock Village Hall

Brain Science in the Real World
Dr Ellie Dommett.

Dr Dommett currently lectures in Brain and Behavioural Sciences for the Faculty of Science at The Open University in Milton Keynes, and has a degree in Psychology from Sheffield University as well as an MSc and a doctorate in Neuroscience.

This fascinating talk will look at some of the latest research into neuroscience and how this offers an insight into human behavior and its impact on different stages of our lives through education, Law and medical treatments.

Dr. Dommett hopes to bring with her some sample brains for a hands on presentation.

This lecture will be of particular interest to teachers and those people who have to live or work with teenagers or the elderly.

Admission £2 per person. Tickets available from 1, Greenfields

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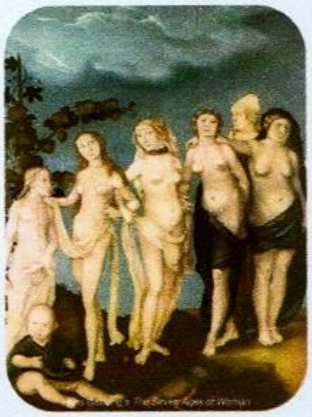
Below are shots of the slides which were used to illustrate and explain the subject –

Neuroscience: beyond the laboratory



Dr Ellie Dommett

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What's science got to do with it?

- What does the brain do?
- Neuroscience in the classroom
- Modern technologies
- Cognitive enhancement
- Neuro-legal issues
- Curing Parkinson's disease

The context: your brain and what it does

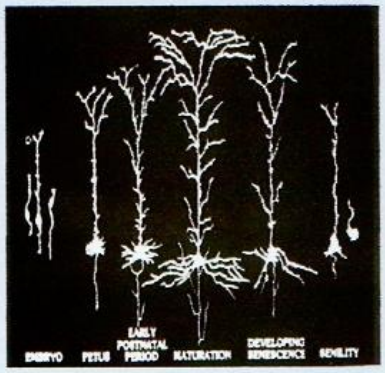
What does our brain do?

- Controls vital bodily functions
- Interprets sensory inputs
- Controls our movements
- Houses our thoughts?
- Makes us who we are?

The building blocks of the brain

- Our bodies contain very specialized cells called neurons (100,000,000,000 – 100 billion).
- They are just like other cells in that they require energy and have all the main components found in other cells.
- But they are special because they are "excitable".
- This excitation allows us to transmit nerve impulses.

Your changing brain: growing your brain to losing your mind



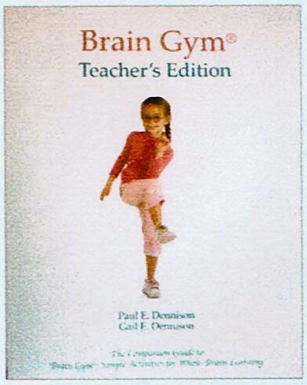
Neuroscience in the classroom

- Teachers use tried-and-tested, implicit models of brain function every day
- It follows that there be a natural curiosity for explicit models (surveys support this)
- Neuroscience/education research is already beginning; vital that teachers be involved to guide research in useful and practical directions

Satisfy natural curiosity, and thereby:

- Educate teachers to be in a better position to evaluate brain-based learning programmes
- Develop collaborative research
- Debunk neuromyths

Neuroscience in the classroom?

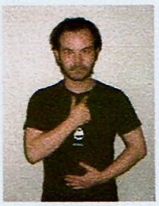


Brain Gym states:

- The brain is in two halves
- Learning problems stem from impaired communication
- Brain Gym exercises can enhance pathways between the hemispheres so learning becomes easier!

… or an example of a 'Neuromyth' ?

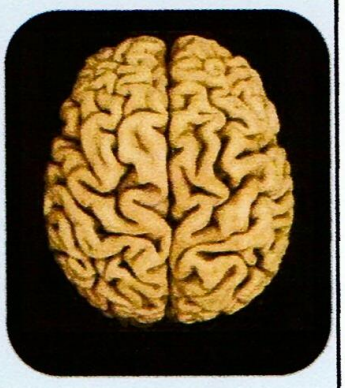
Brain buttons: to improve brain blood flow. Lace your index fingers and thumbs into the indentations below the collar bone on each side of the sternum, and press lightly using a pulsing action. Then place your other hand over your belly-buttons and gently press.



Hook-ups: to shift electrical energy from the survival centers in the hindbrain to the reasoning centers in the midbrain and neocortex, thus activating hemispheric integration. Cross right wrist over the left wrist and link up the fingers so that the right wrist is on top; then, bending the elbows out, turn our fingers towards our bodies until they rested in the centre of our chests.

Brain Gym – the evidence

- There is no evidence for the information in promotional material being true.
- Any positive effects observed are likely to be due to reasons very different to those used in promotions (e.g. aerobic exercise, a fun way to break up lessons)… and NOT integration of cerebral hemispheres.



Modern Technologies

Modern Technologies – the fears

- Suggestions that increased use of screen technologies could result in:
  - decreased attention span
  - reduced empathy
  - focus on the process rather than the meaning
- Does this sound familiar?
  - Socrates warned that writing would damage memory
  - Pritchard suggested that excessive study could cause insanity
- Lack of firm and controlled experimental evidence to date.
- Does the fear stem from the idea that the technology itself if damaging or that the content is damaging?

Modern Technologies – the evidence

- Is it damaging in itself?
  - Reduced reaction time in attention tasks
  - Not at the expense of accuracy
  - With no increased impulsivity
  - The benefits generalise and are not specific to playing computer games (surgeons)
  - Increased brain efficiency (performance: metabolic load)
  - Increased grey matter
  - BUT can be correlated with poorer academic performance if displacing academic activities and gaming can in some individuals become an addictive behaviour

Modern Technologies – the evidence

- Is the content damaging?
  - Violent video games thought to be risk factor for aggressive behaviour and aggressive thoughts
  - Violent video games linked to decreased empathy and positive social behaviour

Cognitive Enhancers

- So-called cognitive enhancers
  - Improve attention
  - Improve concentration
  - Boost brain power
- Similar effects to caffeine and Red Bull™
- Three main "illegally" used cognitive enhancers:
  - Methylphenidate (Concerta®, Ritalin®)
  - Amphetamine (Adderall®, Dextran®)
  - Modafanil (Provigil®)

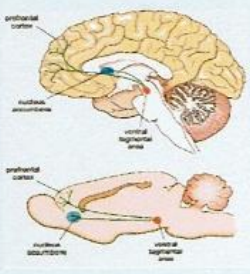
A risk or a right: social implications

- Would you take a tablet to help you get a 1st in your degree?
- Can they be equated to steroids in sports - is it cheating?
- Should university students be screened for this "kiddie cocaine"?
- Is it only fair to be able to allowed to optimise your abilities?
- What are the long-term effects of these drugs on the brain?
- Will their enhancements come at the cost of natural ability?
- Should society depend on drugs to become optimal?
- When does ability then become a product of finance and not intelligence/skill?

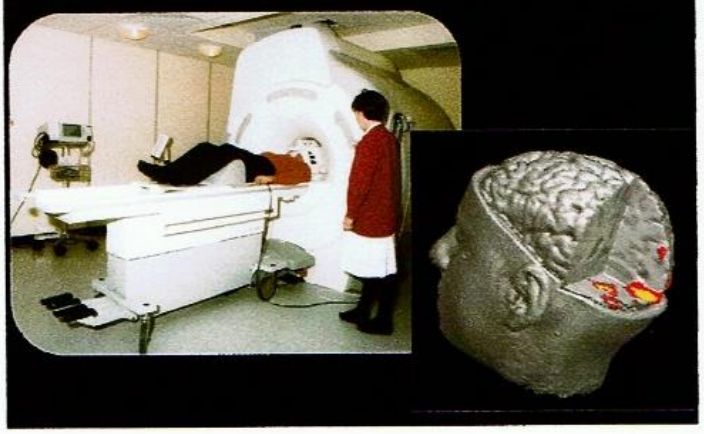
Examining effects on behaviour

Most work is done in rodents. Why?...

- Similarity basic brain circuitry to humans
- Still illegal for drug use in healthy people
- Potential risk giving healthy people addictive drugs



Can neuroscientists read minds?



Neuroscience in the courtroom

Can it be used to sentence?

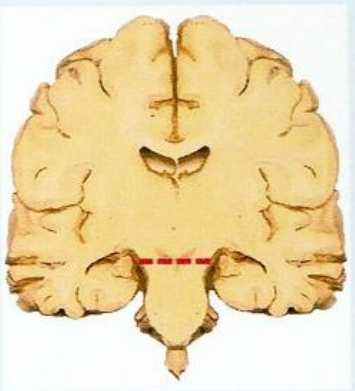
- Brian Dugan, USA – rape and murder of child
- Brain scan used to indicate psychopathy and avoid death penalty
- "Using an fMRI scan done in September of 2009 ... to indicate a thought process that was going on in 1983 could hardly be more silly."
- Sentenced to death anyway but defense lawyers believe this altered jury's deliberation
- Death penalty abolished in 2011

Neuroscience in the courtroom

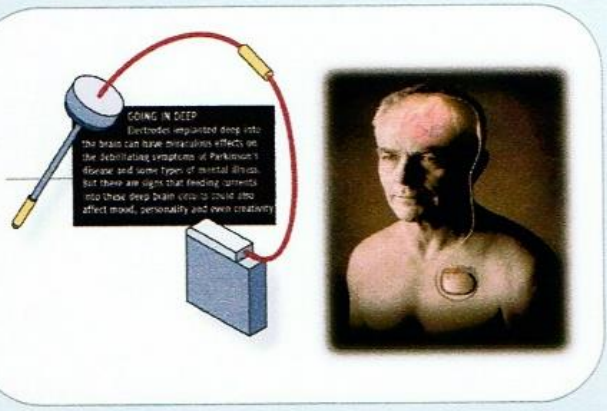
Can it be used to convict?

- Adita Sharma, India – murder of fiancé
- Brain Electrical Oscillations Signature test (BEOS) – supposed to detect if someone has memories of an event
- "I bought arsenic"; "I met Udit at McDonald's" vs "The sky is blue"
- Neuroscientists say this is untested and not suitable for use in courts yet
- She was convicted with life imprisonment

Research Focus: Parkinson's disease



Can we cure Parkinson's disease?



Take home message

- Science will impact on every stage of your life.
- As science progresses there will be some difficult ethical decisions to be made.
- Like any decision this is best made from a position of knowledge.
- This knowledge must be seated in an engagement with science on a level that suits you for example as a career scientist or lay interest.