Applying gaming technology to health care student education

University of HUDDERSFIELD

Inspiring tomorrow's professionals

Jonathan Flynn
Senior Lecturer in Physiotherapy

Overview of presentation

University of HUDDERSFIELD

- Introduction
- Historical perspectives in relation to technology & health
- Rationale for using *'Nintendo Wii & Balance Board'* in health education & practice
- The equipment and basic costings
- The science behind innovative technology and health care

- Examples of contextually how the *'Wii Fit & Balance Board'* are being used in rehabilitation

- Acknowledgements
- Any questions
- References

Introduction

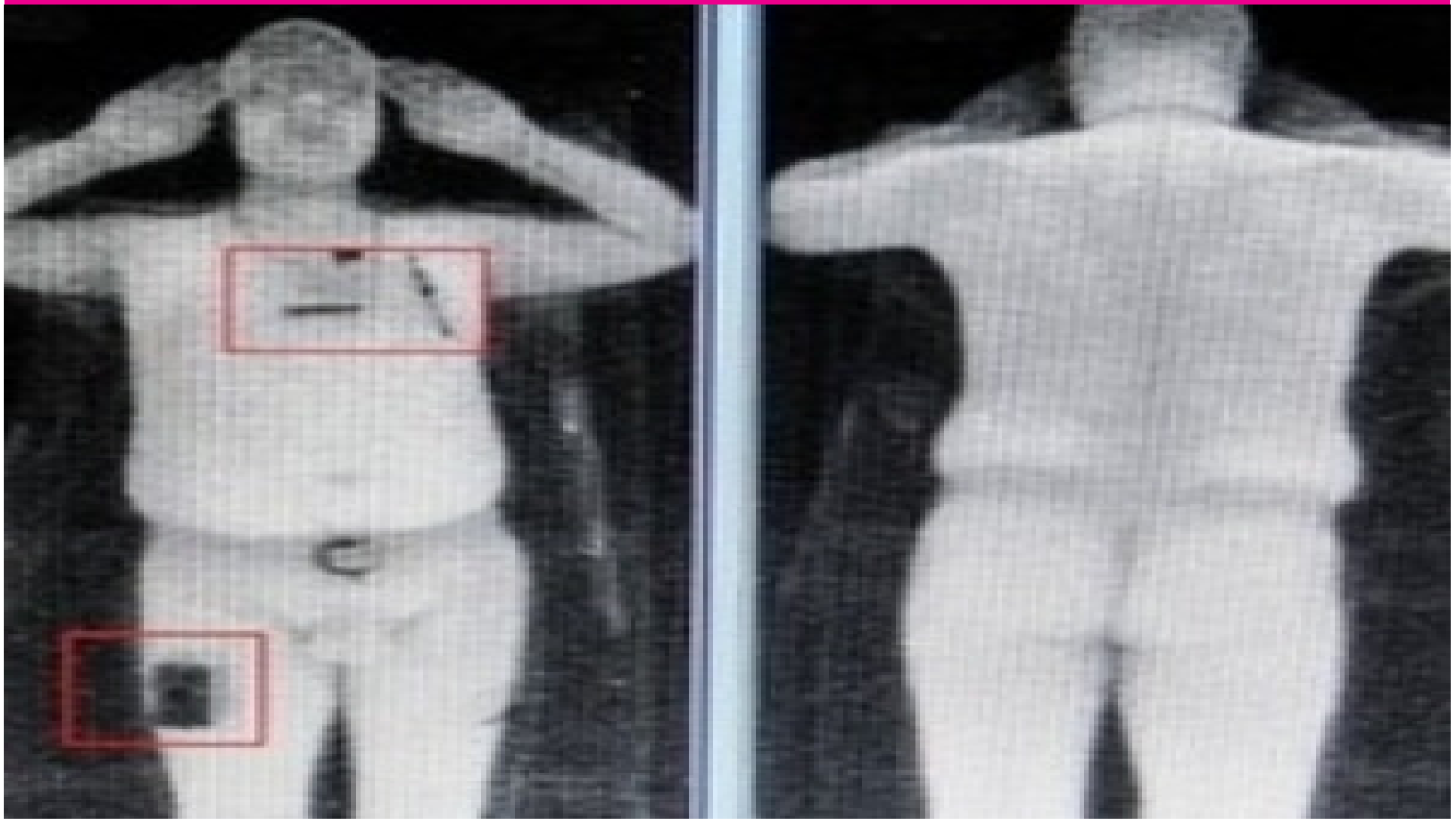
University of HUDDERSFIELD

- Firstly thank you to the eLearning Alliance, Scotland for the opportunity to present today

- My background & interest in technology in health care

Historical perspectives

University of HUDDERSFIELD



Existing technology examples

University of HUDDERSFIELD

What is *'Nintendo Wii & Balance Board'*

University of HUDDERSFIELD

So why use *'Nintendo Wii & Balance Board'* in education & clinical practice

University of HUDDERSFIELD

- Over the last 3 years or so practitioners, namely physiotherapist's have been experimenting and using the 'Nintendo Wii & Balance Board' with their patients.
- Examples include:
  - Amputee rehabilitation
  - Cerebral palsy
  - Scoliosis mid line re-training
  - Balance re-training in the elderly

So why use *'Nintendo Wii & Balance Board'* in education & clinical practice

University of HUDDERSFIELD

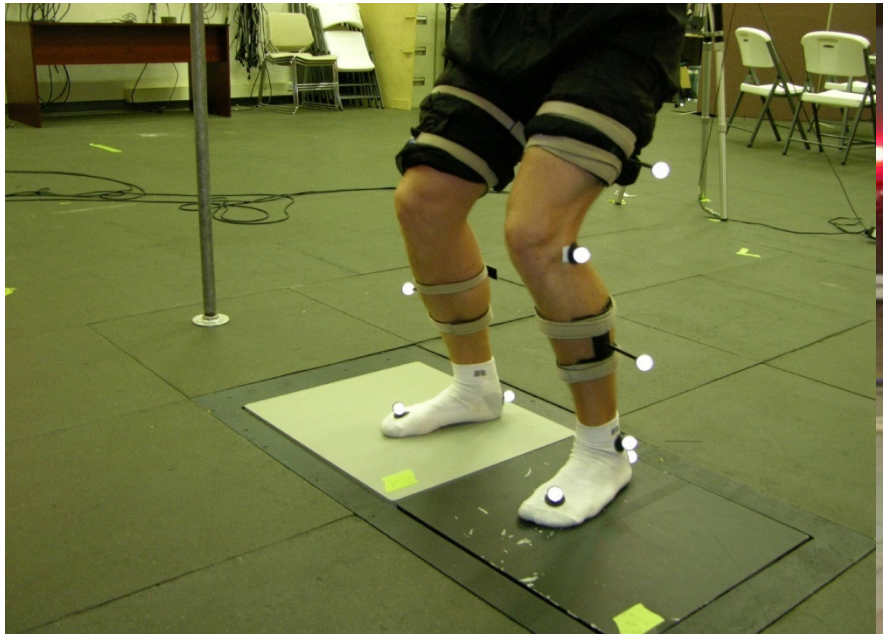
- Commercially this games console has sold millions of units world wide and although debate exists, it is currently reported as outselling popular brands such as Sony's play station 3 & Microsoft's xbox.

- It's distinguishing features including a wireless controller, the '*Wii remote'* which can be held as a pointer & in conjunction with console can assist with the detection of movement in 3 dimension's.

So why use *'Nintendo Wii & Balance Board'* in education & clinical practice

University of HUDDERSFIELD

- In itself it's nothing new



So why use *'Nintendo Wii & Balance Board'* in education & clinical practice

University of HUDDERSFIELD

- Advantages
  - Cost (commercially)
  - Already in peoples home
  - Current generations familiar with
  - Ease of use
  - Avoids joining the lycra clad brigade
  - Encourages some level of participation & therefore compliance
  - Certain populations, prefer to exercise in isolation
- Disadvantages
  - Cost
  - Can create dependency
  - May be inappropriate for some patients
  - Can over do it & cause injuries
  - Potential health & safety issues
  - Lack of social context
  - Risk that exercises / activities are being carried out incorrectly

A note on equipment & set-up costs

University of HUDDERSFIELD

Games Console
(includes hand input devices)
Approx £170

Balance Board
(includes software)
Approx £85

Not including cost of TV or display screen

Equipment & set up costs (in context)

University of HUDDERSFIELD

- Typical medical trolley

Can be in excess of £500

So lets look at the ‘Nintendo Wii & Balance Board’ in more context in relation to teaching & rehabilitation use

University of HUDDERSFIELD

- Earlier I mentioned that practitioners (mainly physiotherapists) have been using this COTS device in rehabilitation.

- This included (but not exclusively):
  - Amputee rehabilitation
  - Cerebral palsy
  - Scoliosis mid line re-training
  - Balance re-training in the elderly

Rehabilitation in context

University of HUDDERSFIELD

- To understand why it is used & what the attraction is to therapists you need to understand a little bit about how I & my colleagues look at a game console & in this case the *'Nintendo Wii Fit & Balance Board'*.

- For us, its much more than the entertainment value, we are far more interested in the scientific potential of using gaming technology in relation to rehabilitation.

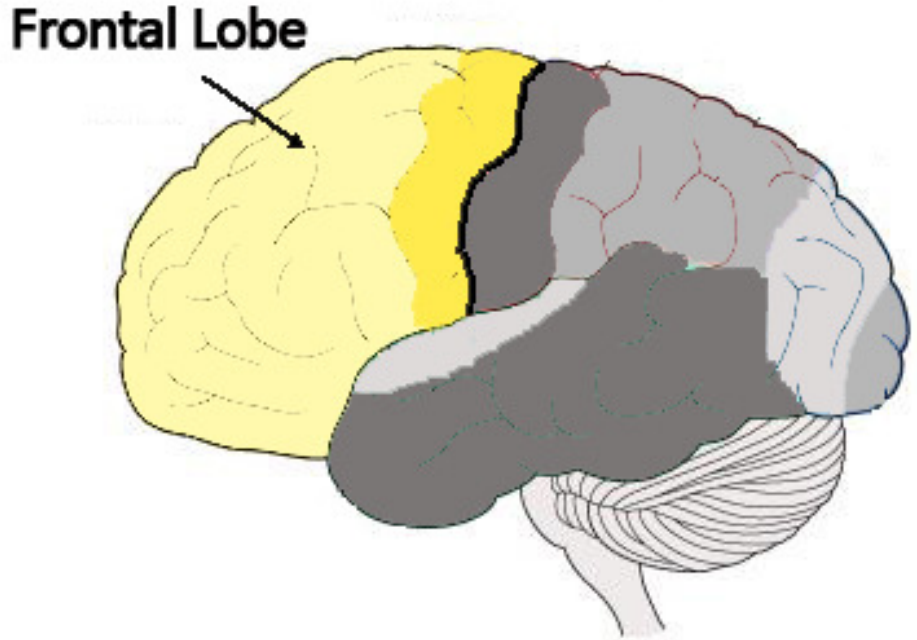
Rehabilitation in context

University of HUDDERSFIELD

To explain this I need to explain a little bit about the science behind it.

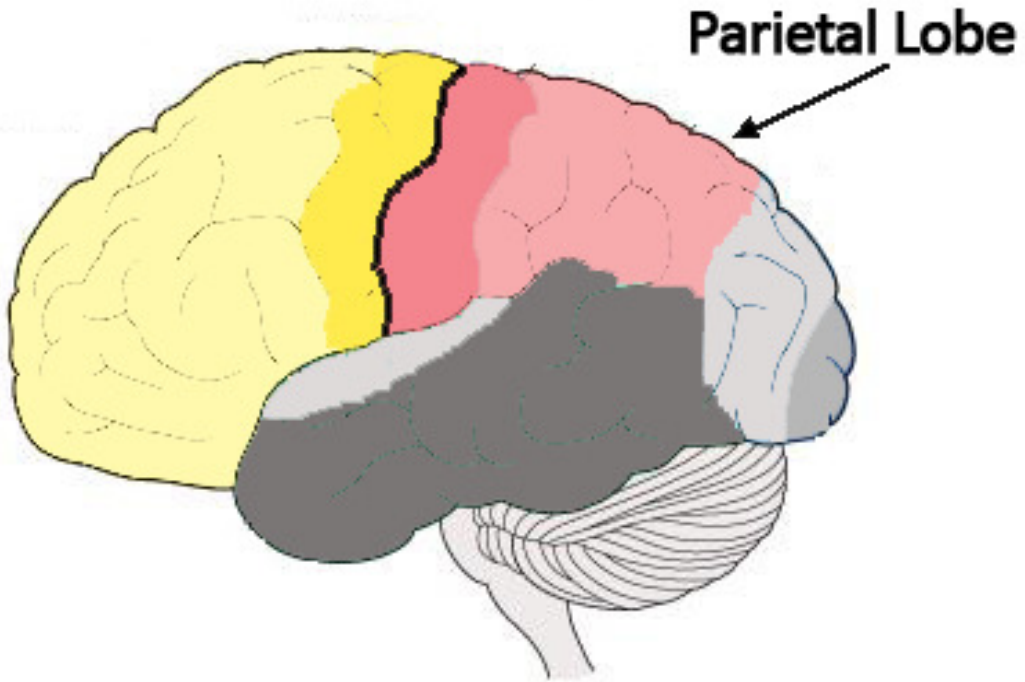
Composition of the brain

University of HUDDERSFIELD



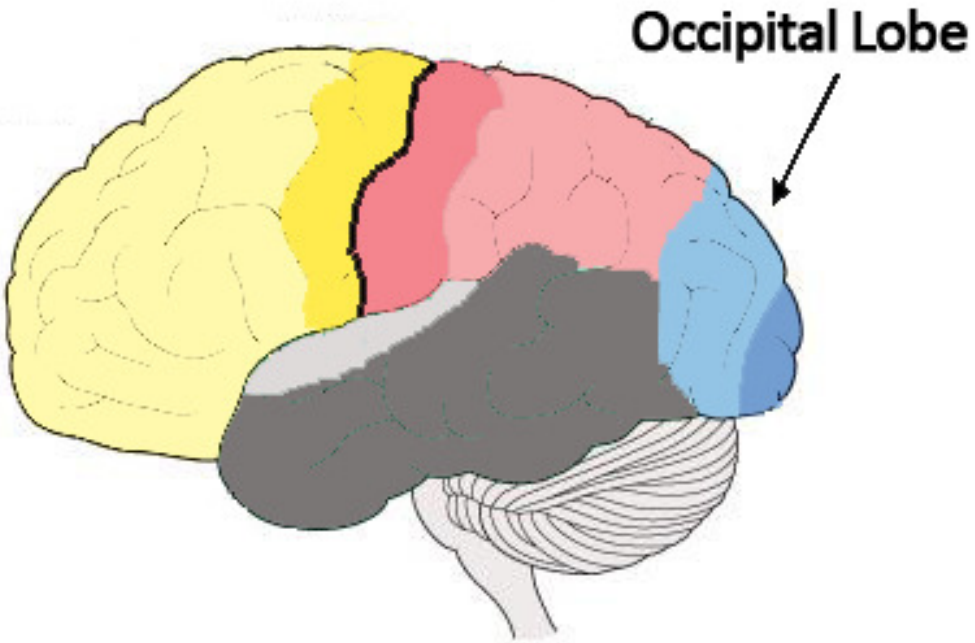
Composition of the brain

University of HUDDERSFIELD



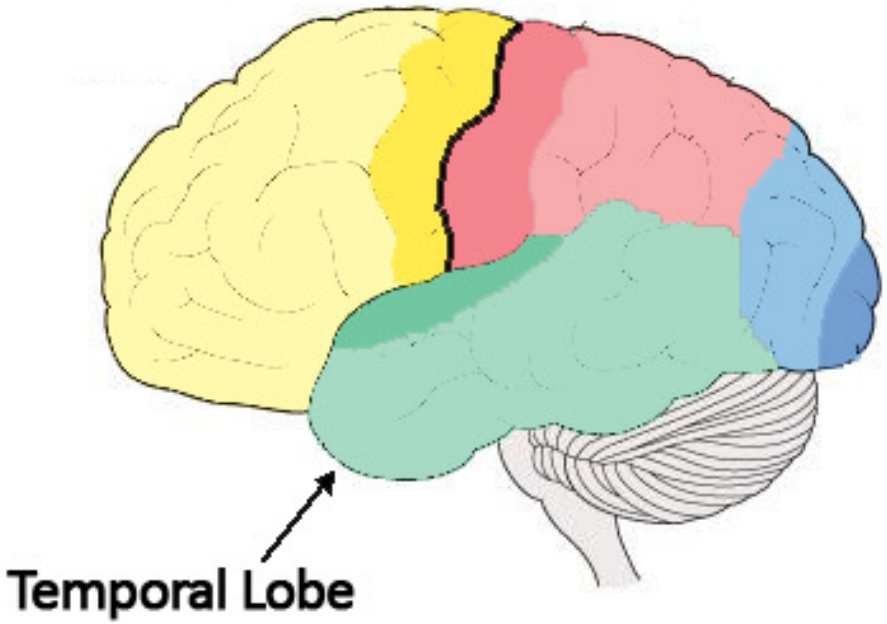
Composition of the brain

University of HUDDERSFIELD



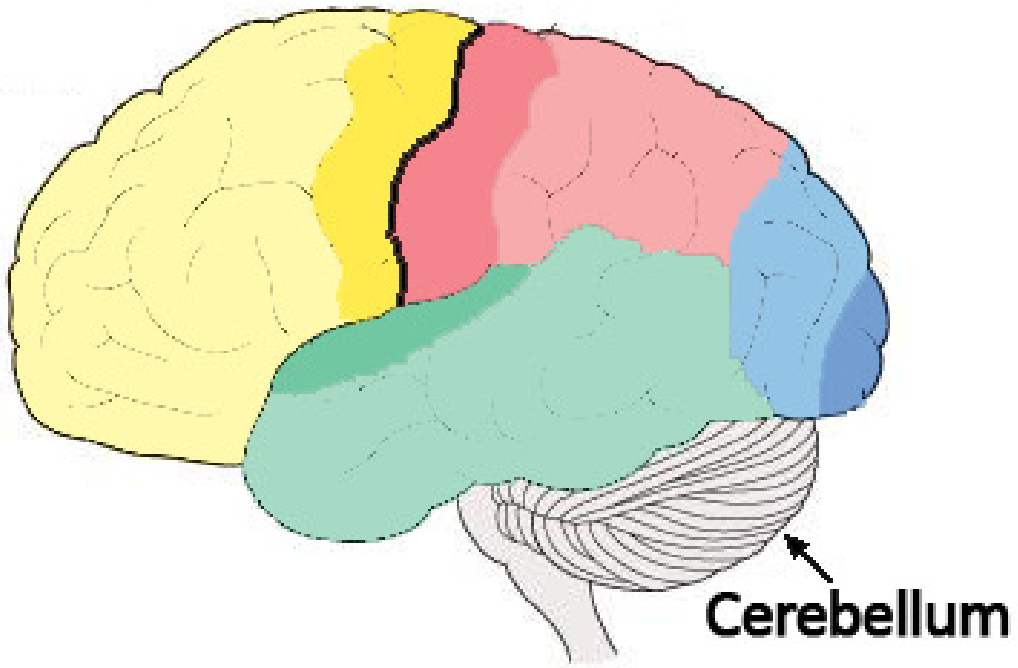
Composition of the brain

University of HUDDERSFIELD



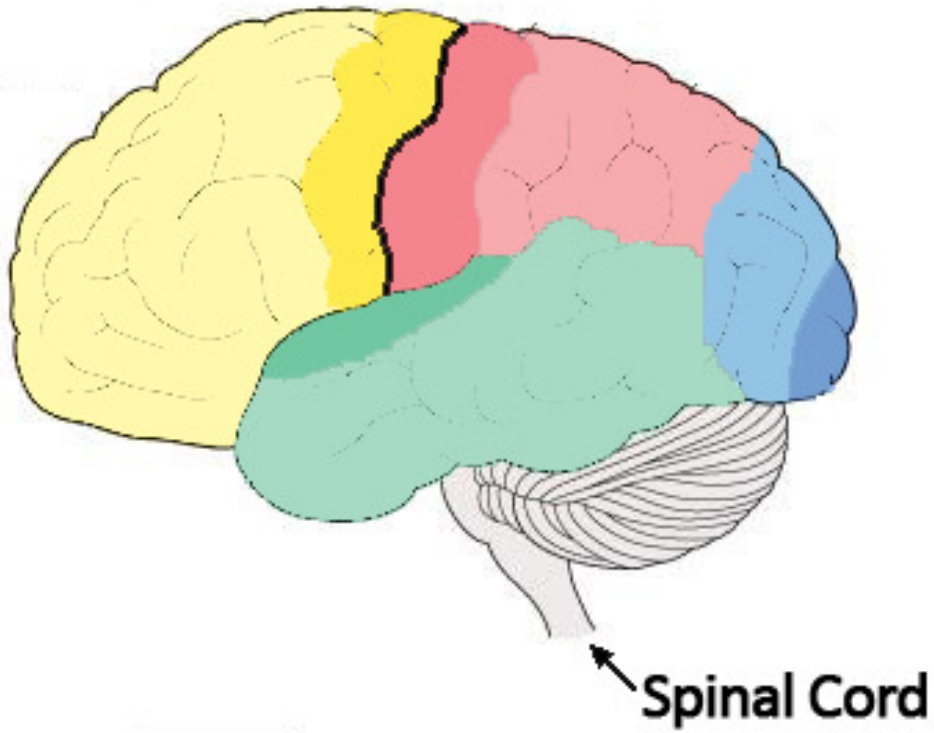
Composition of the brain

University of HUDDERSFIELD



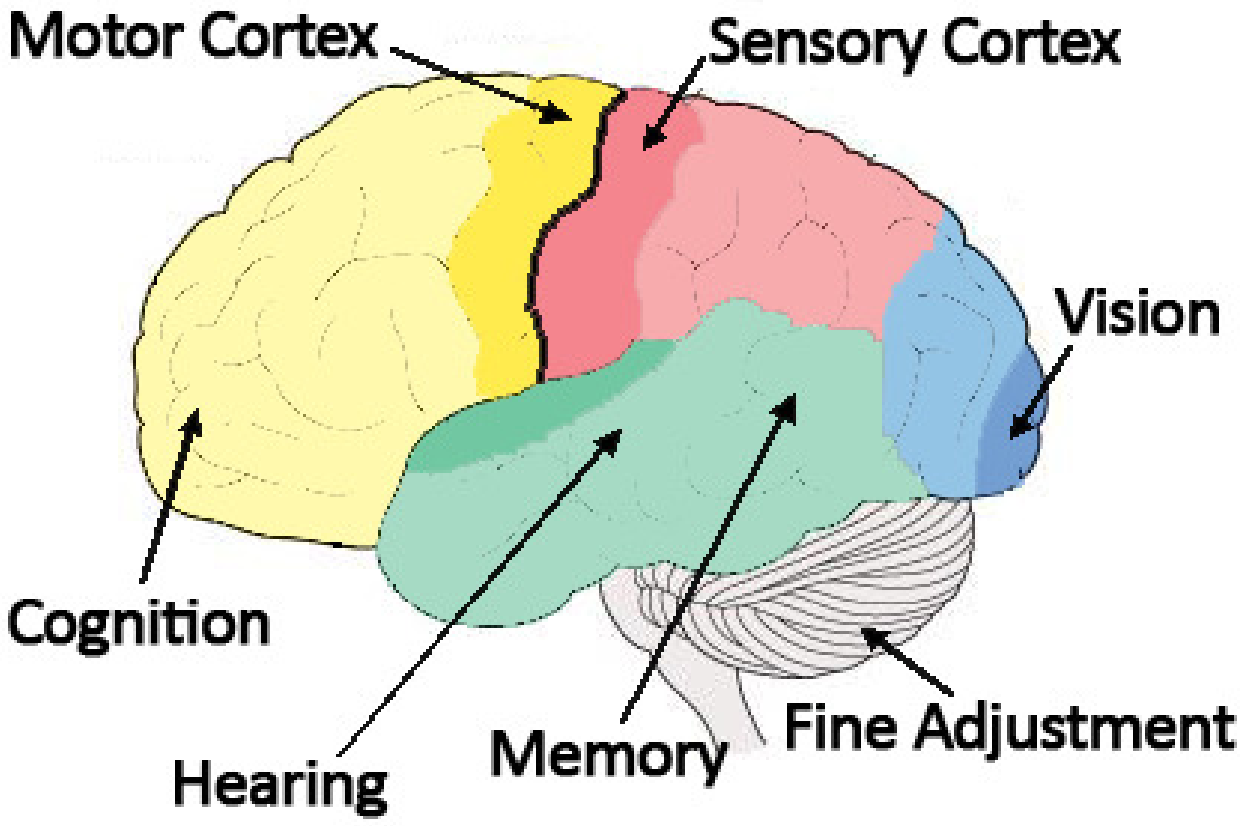
Composition of the brain

University of HUDDERSFIELD



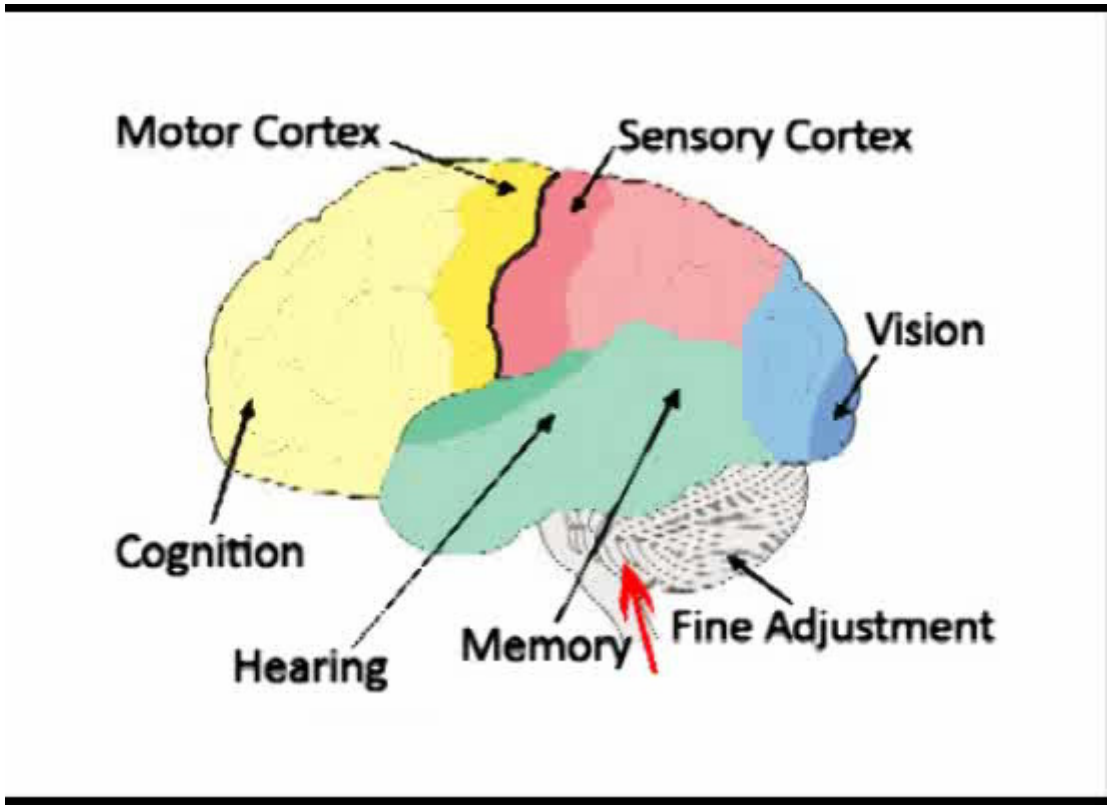
Specific functions with the lobes

University of HUDDERSFIELD



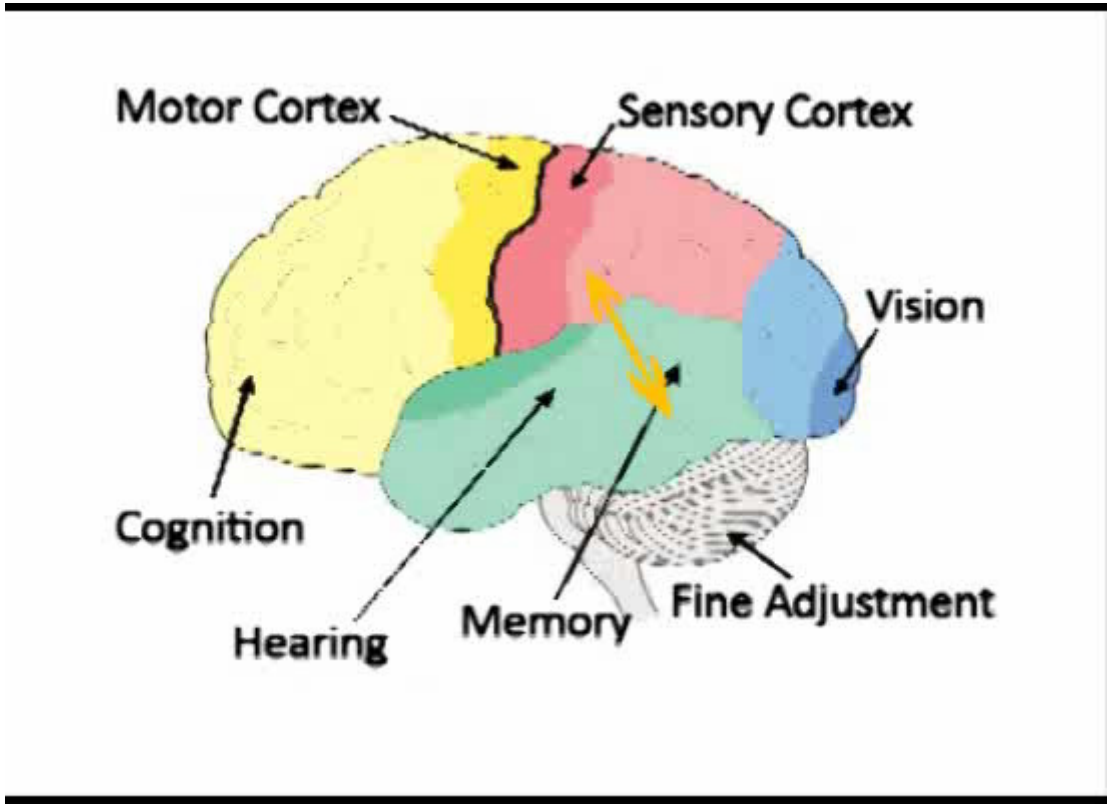
Information being received

University of HUDDERSFIELD



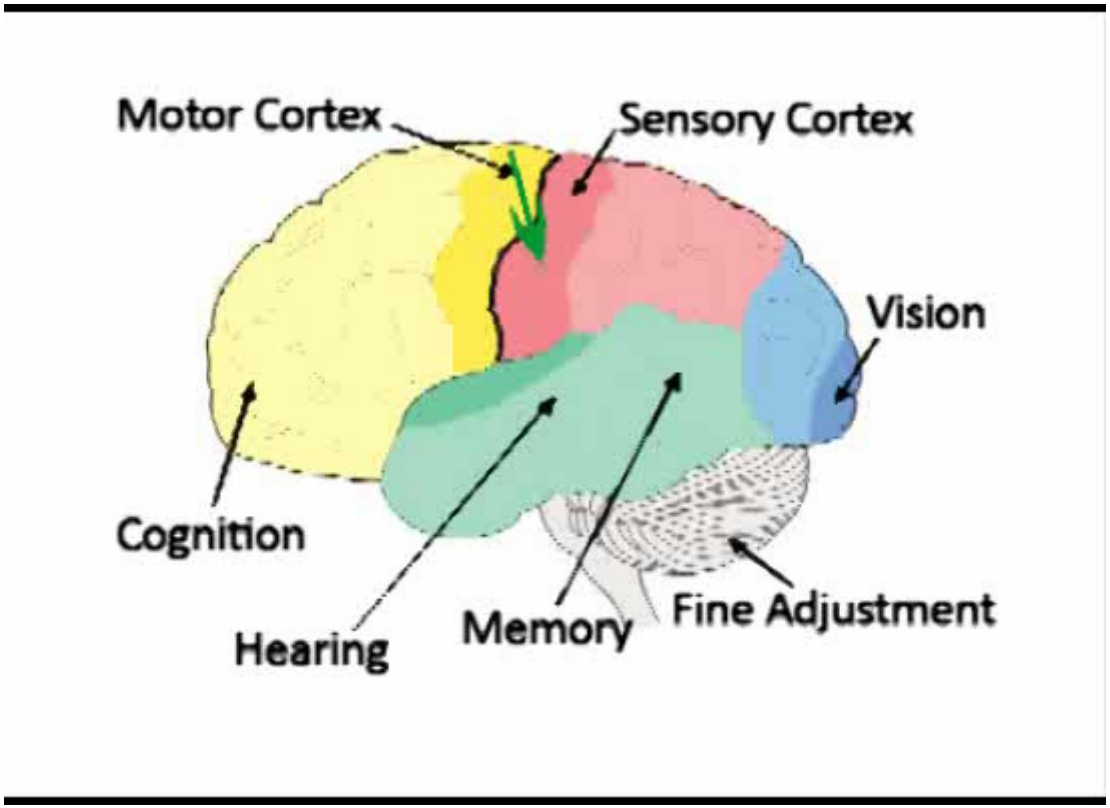
Information being processed

University of HUDDERSFIELD



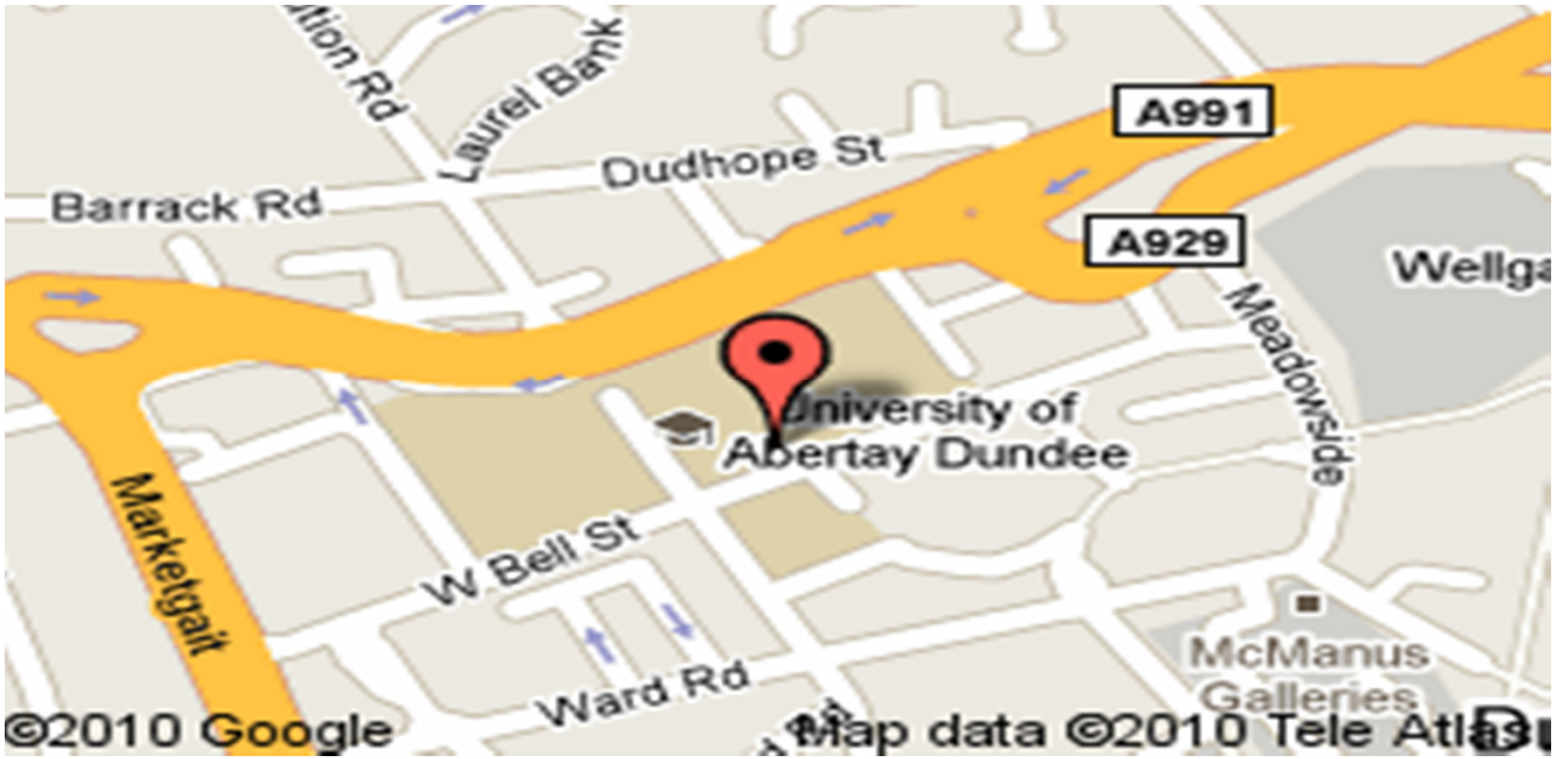
Information being executed

University of HUDDERSFIELD



Mapping within the brain

University of HUDDERSFIELD



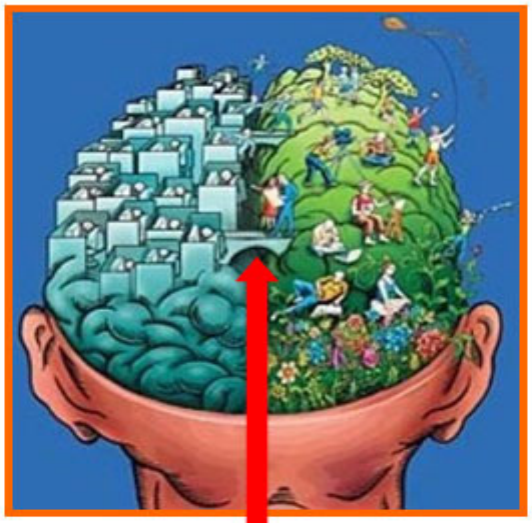
Inspiring tomorrow's professionals

Mapping within the brain

University of HUDDERSFIELD

Left Brain Functions

uses logic
detailed orientation
facts rule
words & language
past & present
math & science
can comprehend
knowing (facts)
acknowledges
order & pattern perception
knows object name
reality based
forms strategies
practical
conservative (cautious)



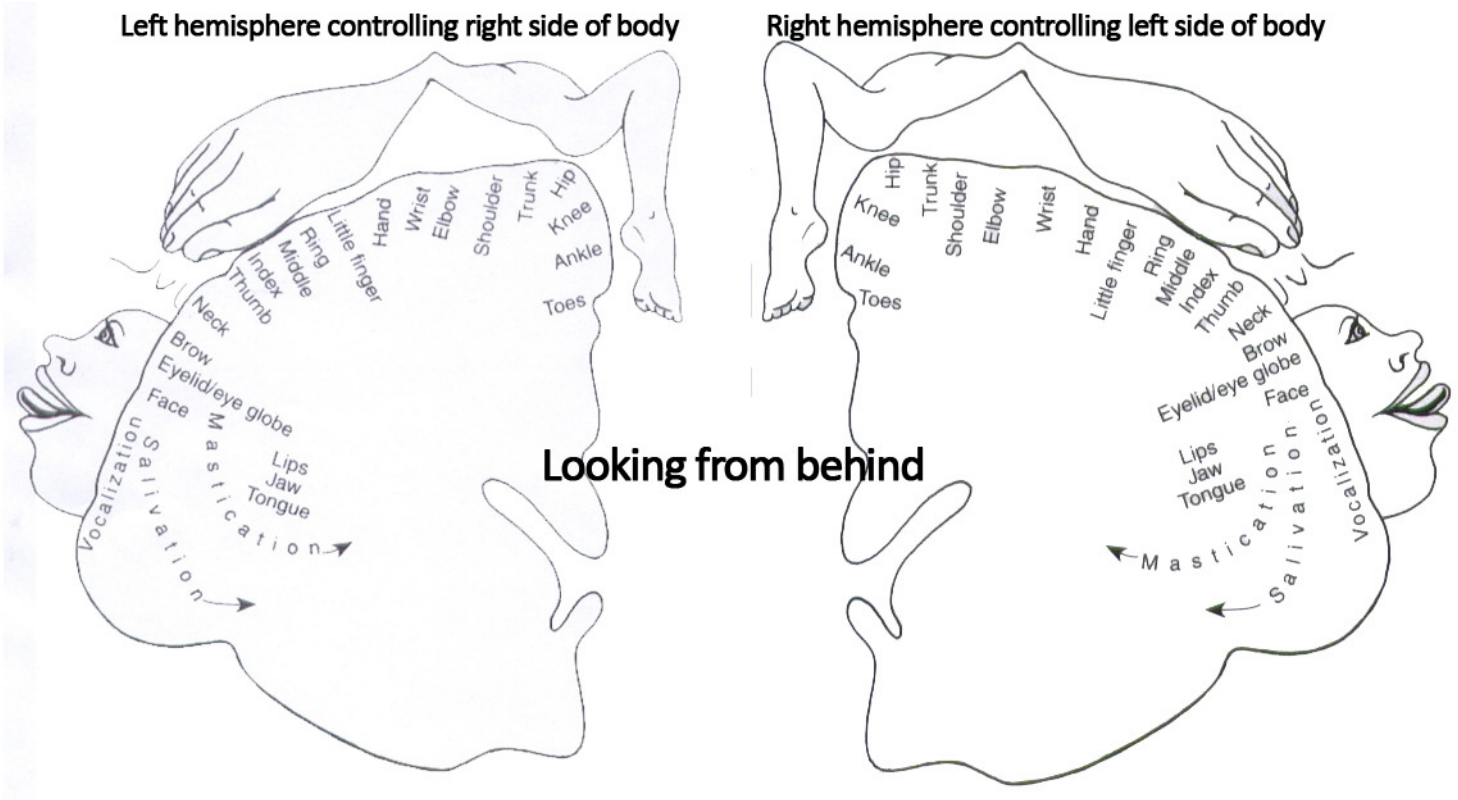
Right Brain Functions

uses feeling
'big picture' oriented
imagination rules
symbols & image
present & future
philosophy & religion
can 'get it !' (i.e. meaning)
believes (intuition)
appreciates
spatial perception
knows object function
fantasy based
presents possibilities
impetuous (impulsive)
risk taking (gut feeling)

The left and right hemispheres play an equally important role during a child's growing stage. At times, the functions of both hemispheres overlap and complement each other as shown in this photo where information 'crosses the bridge' from one hemisphere to another. BC believes that **equal emphasis should be given to both hemispheres.**

Mapping within the brain

University of HUDDERSFIELD



Mapping within the brain

University of HUDDERSFIELD

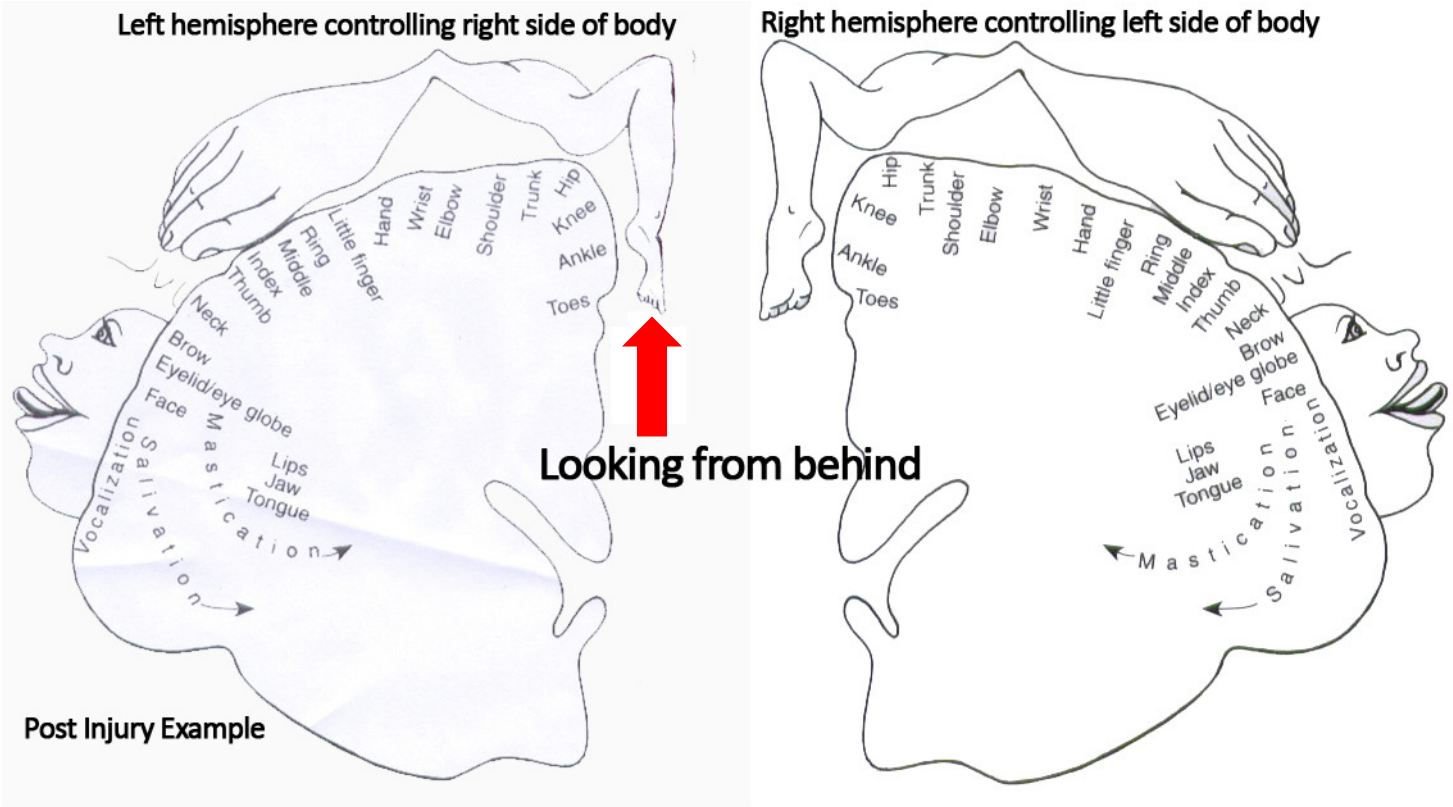
Typical Injury – sprained ankle

University of HUDDERSFIELD

- Initially lots of pain, bruising & loss of function
- Following the recovery stage, we start to rehabilitate
- This is where internal mechanisms such as proprioceptors are stressed & re-trained

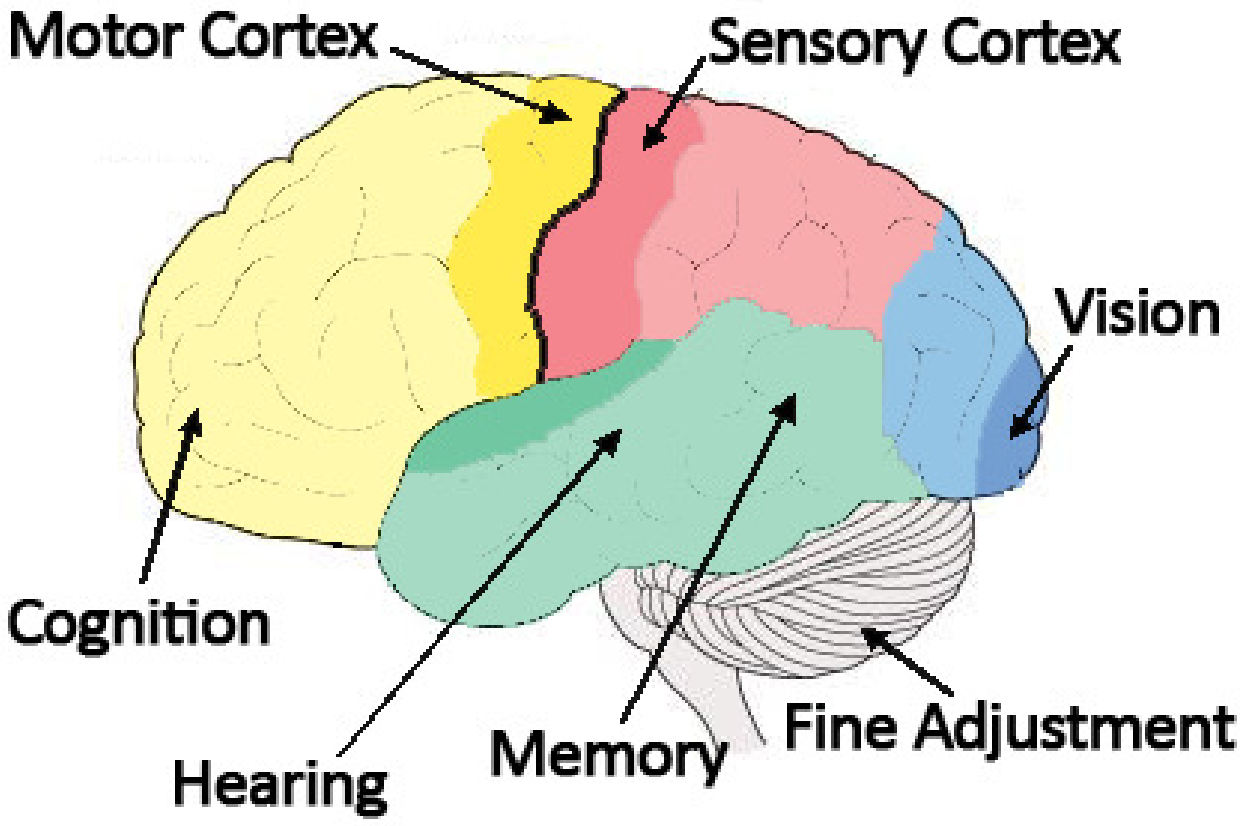
Following Injury

University of HUDDERSFIELD

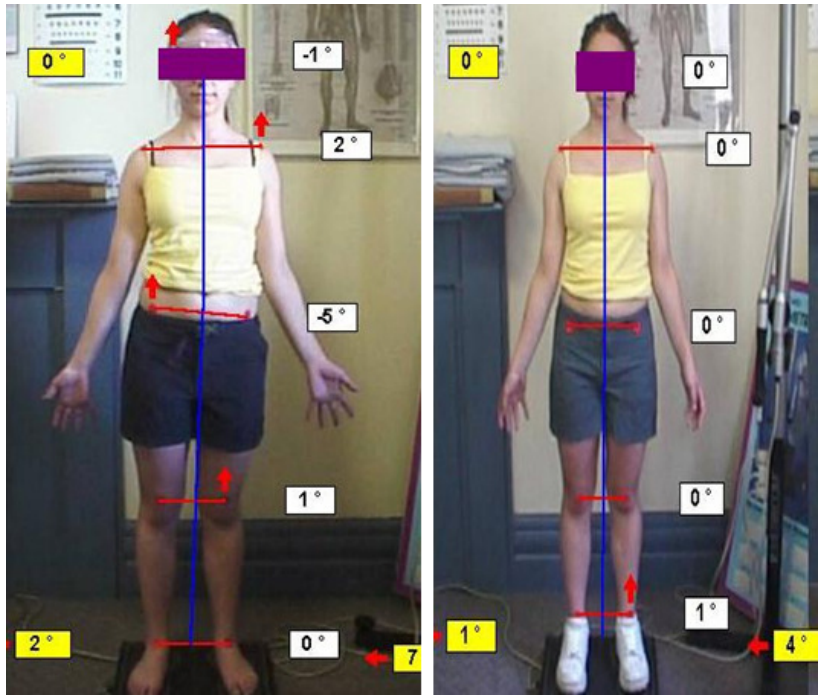


Specific functions with the lobes

University of HUDDERSFIELD



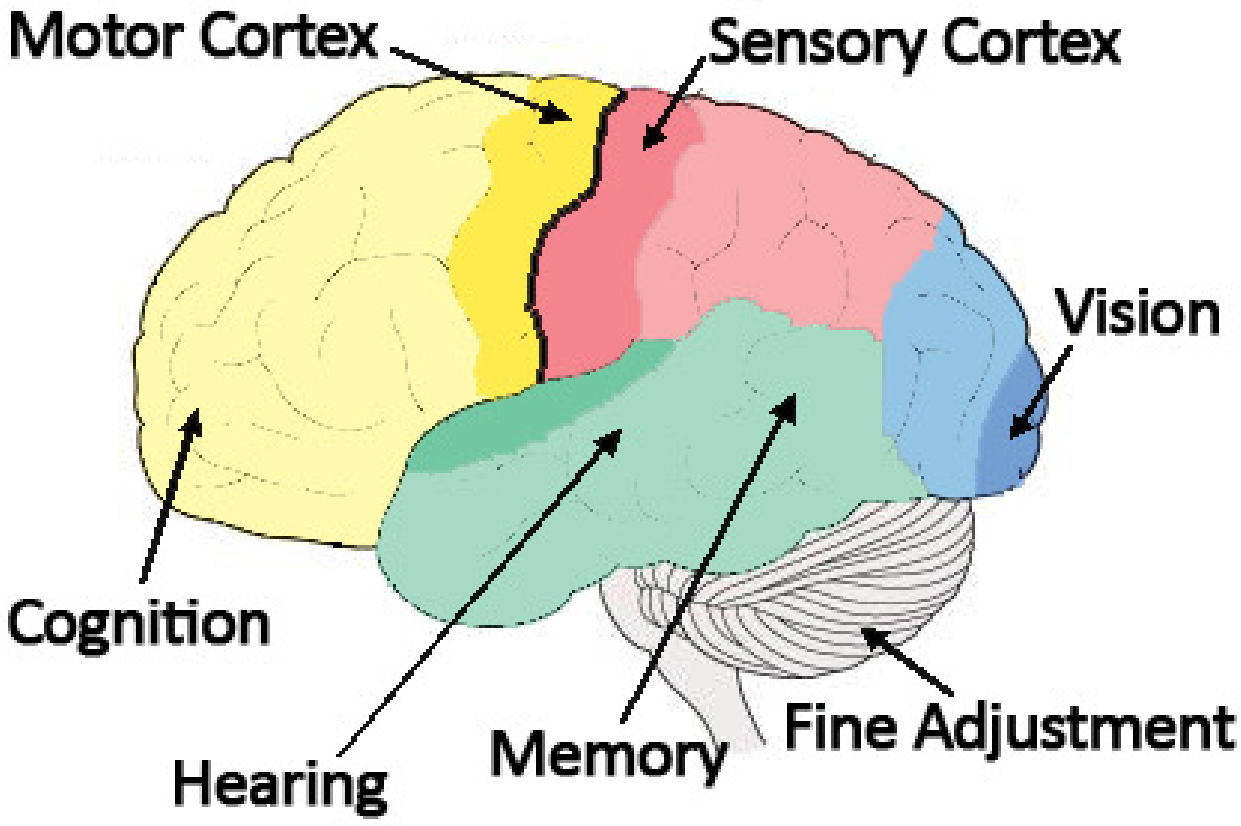
Following injury



- Idiopathic scoliosis, ‘S’ shape appearance of the spine
- Wii Fit is useful to help adjust position but really beneficial following post surgical alignment procedure

Specific functions with the lobes

University of HUDDERSFIELD



Following injury

University of HUDDERSFIELD

- Physiotherapists have used Wii Fit when rehabilitating amputee patients

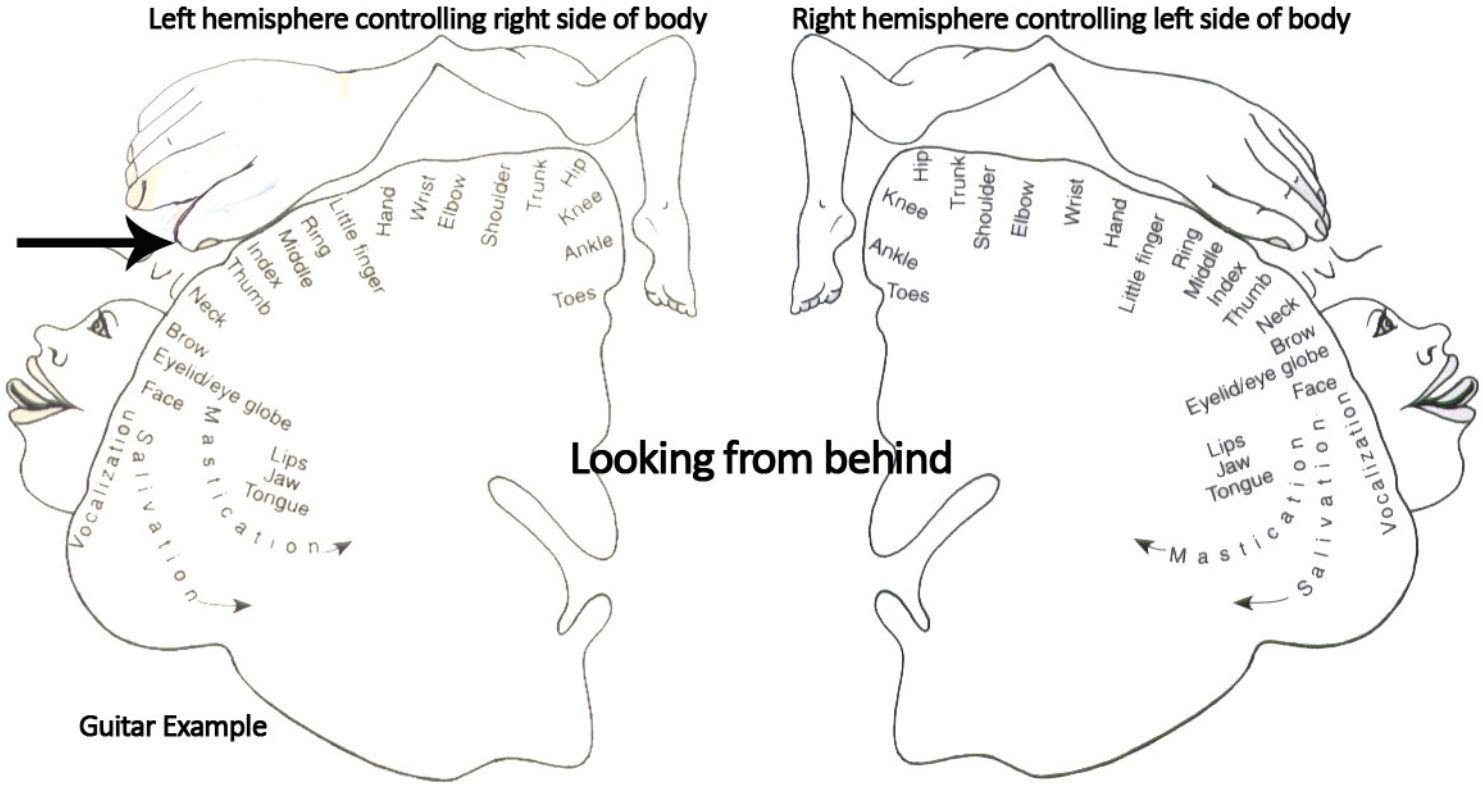
Alternatives

University of HUDDERSFIELD

Opposite can occur

- Mark Knopfler
- Formally of dire Straits
- You could argue the following occurs

Opposite can occur



Acknowledgements

- Sara Eastburn – Divisional Lead of the Division of Rehabilitation, University of Huddersfield.
- Dr Phyl Fletcher-Cook – For her Neurological Expertise
- Dr Helen Gavin – Research Supervisor, University of Huddersfield.
- Christopher Slack – IT support.
- iCSP team, Chartered Society of Physiotherapy.

Thank you for listening

University of HUDDERSFIELD

- Any questions
- Contact details:

j.m.flynn@hud.ac.uk
0044 1484 472920

Further reading

- Ching-Hsiang, S. et al (2010) 'A new standing posture detector to enable people with multiple disabilities to control environmental stimulation by changing their standing posture through a commercial Wii Balance Board' *Research in Developmental Disabilities,* 31, 1 281-286.
- Deutsch, JE. et al (2008) 'The use of a low-cost commercially available gaming console (Wii) for rehabilitation of an adolescent with cerebral palsy'. *Phys Ther,* 88,10 1196-1207.
- Haywood, K et al (2005) '*Life Span Motor Development*' USA: Human Kinetics.
- Ross, A. et al (2010) 'Validity & reliability of the Nintendo Wii Balance Board for assessment of standing balance' *Gait & Posture*, 31, 3 307-310.
- Shumway-Cook, A. et al (2007) '*Motor control – translating research into clinical practice*' Philadelphia: Lippincott Williams & Wilkins.