Applying gaming technology to health care student education

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Overview of presentation

- 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

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

• My background & interest in technology in health care
Historical perspectives

• The use of technology in health care is not new, for many years it has been incorporated in one form or another in education & patient delivery.

• You will all be familiar with work of Wilhelm Conrad Rontgen performed on the 8th November 1895, later refined by William Coolidge.
Existing technology examples
What is ‘Nintendo Wii & Balance Board’

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So why use ‘Nintendo Wii & Balance Board’ in education & clinical practice

- 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

- Commercially this games console has sold millions of units worldwide 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.

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So why use ‘Nintendo Wii & Balance Board’ in education & clinical practice

• In itself it’s nothing new

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So why use ‘Nintendo Wii & Balance Board’ in education & clinical practice

• 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

Games Console (includes hand input devices)
Approx £170

Balance Board (includes software)
Approx £85

Not including cost of TV or display screen

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Equipment & set up costs (in context)

- Typical medical trolley

Can be in excess of £500

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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

• 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.
To explain this I need to explain a little bit about the science behind it.
Composition of the brain

Frontal Lobe

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Composition of the brain

Parietal Lobe

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Composition of the brain

Occipital Lobe
Composition of the brain

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Composition of the brain

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Composition of the brain

Spinal Cord

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Specific functions with the lobes

Motor Cortex

Sensory Cortex

Vision

Cognition

Hearing

Memory

Fine Adjustment

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Information being received
Information being processed

Motor Cortex  Sensory Cortex

Cognition  Vision

Hearing  Memory  Fine Adjustment

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Information being executed
Mapping within the brain
Mapping within the brain

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

Left hemisphere controlling right side of body

Right hemisphere controlling left side of body

Looking from behind

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Mapping within the brain

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Typical Injury – sprained ankle

- 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

Left hemisphere controlling right side of body

Right hemisphere controlling left side of body

Looking from behind

Post Injury Example

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Specific functions with the lobes

- Motor Cortex
- Sensory Cortex
- Vision
- Cognition
- Hearing
- Memory
- Fine Adjustment
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

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Following injury

- Physiotherapists have used Wii Fit when rehabilitating amputee patients
Alternatives

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Opposite can occur

• Mark Knopfler
• Formally of Dire Straits
• You could argue the following occurs
Opposite can occur

Left hemisphere controlling right side of body

Right hemisphere controlling left side of body

Looking from behind

Guitar Example

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• Sara Eastburn – Divisional Lead of the Division of Rehabilitation, University of Huddersfield.

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• Dr Helen Gavin – Research Supervisor, University of Huddersfield.

• Christopher Slack – IT support.

• iCSP team, Chartered Society of Physiotherapy.
Thank you for listening

• Any questions

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Further reading