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Applying gaming technology to health care student education

Inspiring tomorrow’s professionals

Jonathan Flynn
Senior Lecturer in Physiotherapy
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
• 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

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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 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

• In itself it’s nothing new
So why use ‘Nintendo Wii & Balance Board’ in education & clinical practice

- **Advantages**
  - Cost (commercially)
  - Already in people's homes
  - 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 overdo 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
So let's look at the ‘Nintendo Wii & Balance Board’ in more context in relation to teaching & rehabilitation use.

• 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, it’s 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

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

Parietal Lobe

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Composition of the brain

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Composition of the brain
Composition of the brain

Cerebellum

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Composition of the brain
Specific functions with the lobes

Motor Cortex

Sensory Cortex

Vision

Cognition

Hearing

Memory

Fine Adjustment

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Information being received

Motor Cortex  Sensory Cortex

Cognition  Vision

Hearing  Memory  Fine Adjustment

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Information being processed

Motor Cortex  Sensory Cortex

Cognition  Fine Adjustment

Vision

Hearing  Memory

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Information being executed

Motor Cortex  
Sensory Cortex

Cognition  
Vision

Hearing  
Memory  
Fine Adjustment

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Mapping within the brain

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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 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
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

Motor Cortex

Sensory Cortex

Cognition

Vision

Hearing

Memory

Fine Adjustment

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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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Thank you for listening

• Any questions

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Further reading