National University of Ireland, Galway
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Virtual Reality and Audiovisual Technology in the Management of Acute Pain – A review of the literature

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Attention and Pain

- Focus of attention shown to have a mediational role in the perception of pain

- **Distraction**
  - Reduced pain perception (e.g., Devine & Spanos, 1990)
  - Increased pain tolerance (e.g. Piira et al., 2005; James & Hardardottir, 2002)

- **Limited Capacity Resource Theory of Attention** (Kahneman, 1973)
  - Attention is of limited capacity
  - Distraction reduces the available resources to process pain stimulus

Virtual Reality and Audio-Visual Distraction

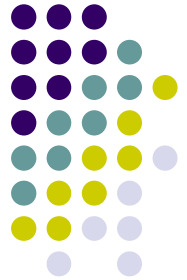
- Technological advances in recent years have led to use of audio-visual and VR technology in acute pain management
  - Audio-visual: virtual i-glasses with headphones, 2D images
  - VR: highly immersive 3D environments

- Stimuli include fantasy worlds, video games, special 2D and 3D videos, simulated 3D 'virtual' real life situations

Summary of Evidence

- Audiovisual and virtual reality distraction has been used in a variety of settings with positive results
  - **Medical procedures**
    - Burn wound cleaning (Hoffman et al., 2000, 2001)
    - Colonoscopy (Lee et al., 2004)
    - Flexible sigmoidoscopy (Lembo et al., 1998)
    - Routine gastric testing (Kozarek et al., 1997)
    - Cleaning and dressing of leg ulcers (Tse et al., 2003)

Summary of Evidence

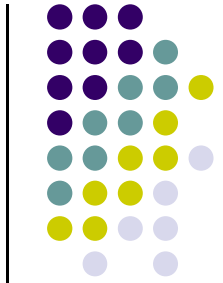


- **Medical Procedures with Pediatric Patients**
  - Port access procedure, virtual reality distraction vs. control (Wolitzky et al., 2005)
  - Port access procedure, virtual reality distraction vs. non-VR distraction vs. control (Gershon et al., 2004)

<u>But</u>

  - Lumbar puncture with conscious sedation found no significant difference between those in VR distraction compared to control (Sander et al., 2002)

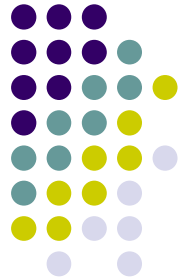
Summary of Evidence



- **Dental Procedures**
  - Dental scaling (Frere et al., 2001)

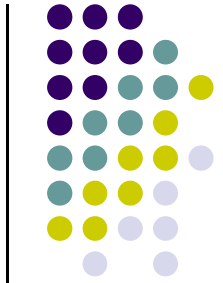
  <u>But</u>
  - No significant difference in perceived pain intensity or pain unpleasantness in patients undergoing dental scaling with audiovisual distraction and N_2O or audiovisual distraction and no distraction (Bentsen, Wenzel & Svensson, 2003)
  - No significant difference in pain intensity or pain unpleasantness between patients having teeth drilled with audiovisual distraction compared with control (Bentsen, Svensson, & Wenzel, 2001)

Summary of Evidence



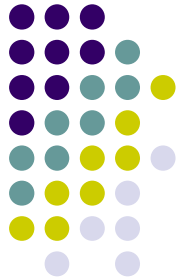
- **Experimental studies**
  - Blood pressure ischemia pain (Tse et al., 2002)
  - Blood pressure ischemia pain – in last two minutes randomised to enter virtual reality world or not (Hoffman et al., 2003)
  - Thermal pain to foot, Hi-Tech vs. Lo-Tech VR (Hoffman et al., 2004)

Limitations



- Very small sample sizes
- Poor outcome measures
- Lack of adequate and equivalent control groups
- Different protocols used makes it difficult to compare studies
- Lack of standardisation in virtual reality and audiovisual devices and software used
- In some studies, patients have received some form of analgesia or sedation

Future Research Directions



- The studies to date strongly suggest that both virtual reality and audiovisual technology can be a very promising analgesic distraction technique

However,

- Larger scale randomised controlled trials needed
- Comparison groups need to be more adequate and equivalent
- Inclusion of individual difference variables