

AR and VR Serious Games

Creating new immersive possibilities



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Medical Contact Cybermind



- Cybermind
- Burn wounds
- VR Immersion
- Serious games
- SnowWorld
- Why does VR work
 - Pain pathway
 - theories
- VR treatments
- AR applications
- Conclusion
- Gravilo Project
- Questions

Products/applications



Our Visette HMD series is used intensively by leading universities in several research projects.



Our Cyber-I series is designed to optimally support hands-free applications in medical procedures.

Products

- Linking gestures and movements to a more interactive environment



Company locations

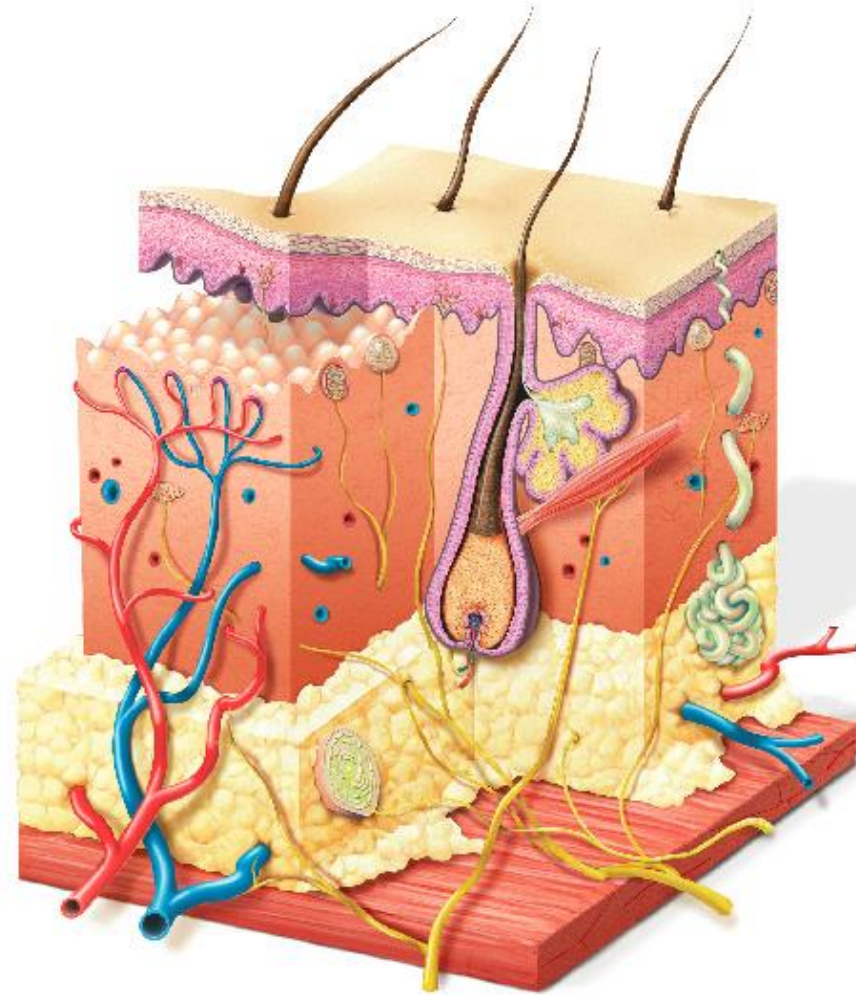


- Leeuwarden, electronics assembly
- Maastricht, Head office/optics assembly
- Delft/Enschede: research projects and development
- Almere: sales office



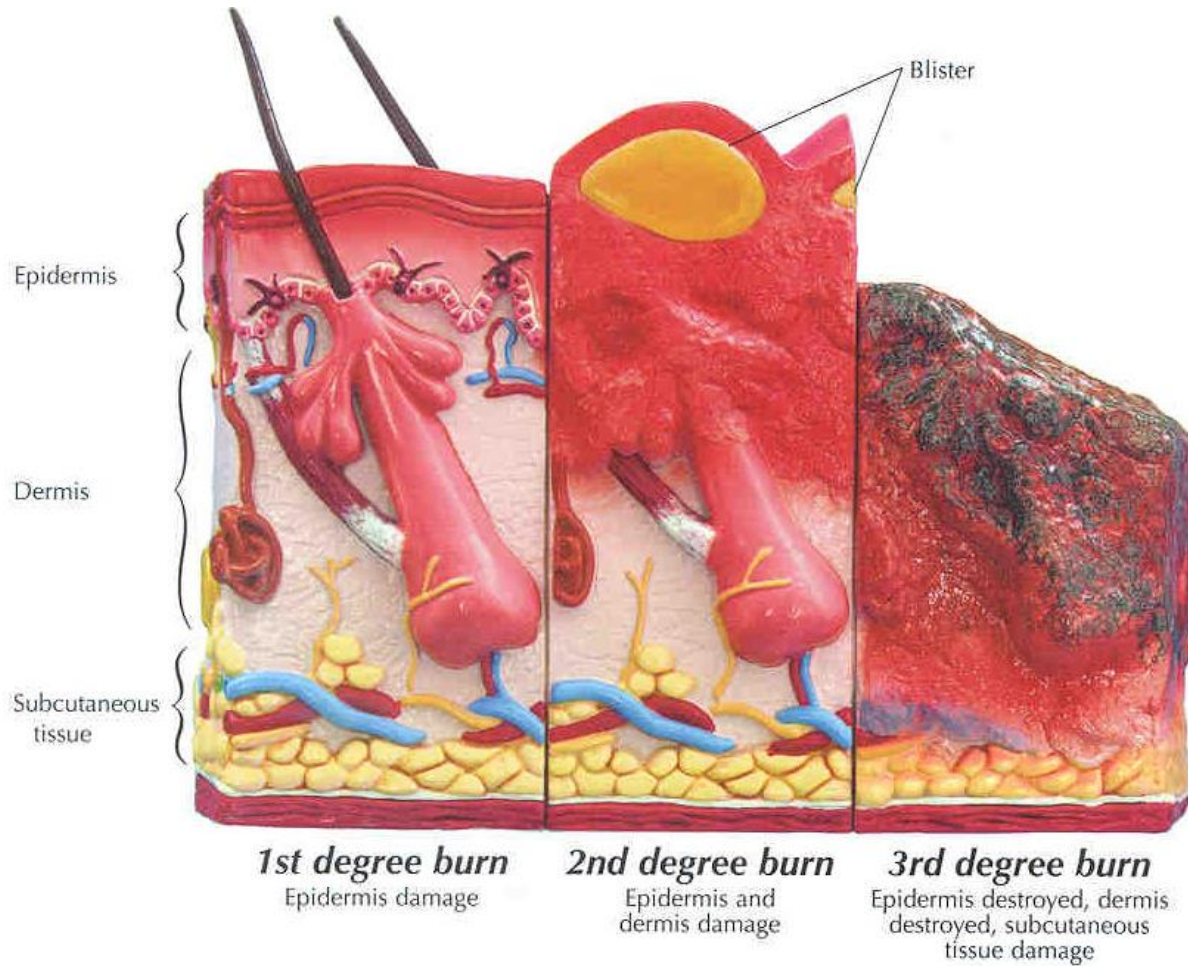
Burn wounds I

- Skin functions: protection, maintain fluid ballance and heath balance
- Sensory function





Burn Wounds II





Burn Wounds III

- Silver bandages
- Physical therapy
- Extensive cleaning
- Opioid analgesics
- Skin transplantations
- Multiple hospital visits
- Excruciating pain



Pain

“Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage”





Distraction methods

- Staff/family members distract subject from pain
- Sing a song
- Watch TV
- Video projections





VR immersion

- Person 'immersed' in sounds and sights other than hospital environment
- Interaction with virtual 3D environment
- Movement
- Haptic feedback
- Hardware input
- Voice control



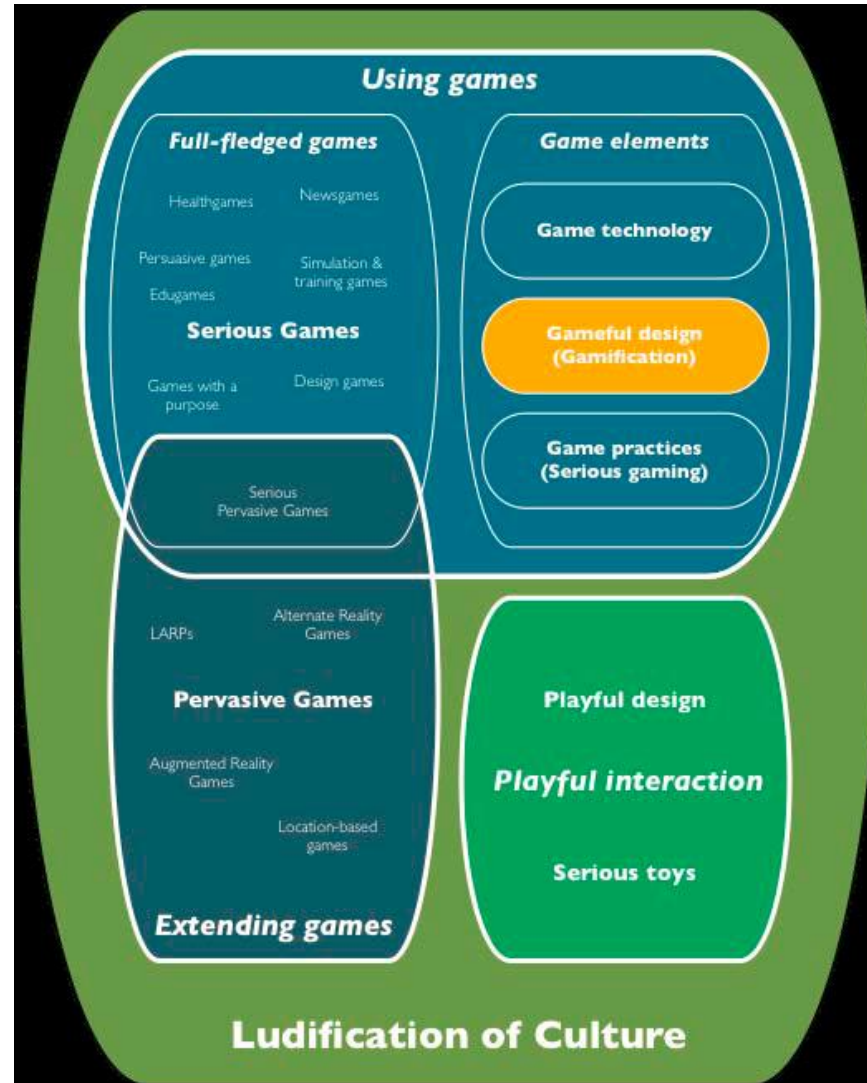
Serious Games

- Games that do not have entertainment, enjoyment or fun as their primary purpose
- Sawyer & Rejeski (2002)
- Before: learning as a second goal of a game

- Specific design of a game to attend learning curves
- Better Skills, more knowledge, less fear/anxiety, or less pain



Serious Games



SnowWorld

- Hunter Hoffman
- Hitlab Seattle
- Washington University



Why does VR work?

Minder pijn in virtuele wereld

Een driedimensionaal computerspel vermindert de pijnervaring bij de behandeling van brandwonden. Met een helm op 'verdwijnt' de patiënt in een virtuele wereld. Het Groningse Martini Ziekenhuis spreekt van een doorbraak. „Het is echt revolutionair.”

GEZONDHEIDSZORG

van onze correspondent

GRONINGEN – Razend enthousiast is klinisch psycholoog Bertus Faber over het uit Amerika overgewaaide fenomeen. Sinds januari dit jaar krijgen Groningse patiënten met ernstige brandwonden tijdens de pijnlijke wondverzorging een helm op hun hoofd, die een driedimensionale fantasiewereld oproept. Drie keer per dag maten Faber en zijn collega's de pijnbeleving. De ene dag met helm op, de andere dag zonder. Bij de meeste van veertien patiënten verminderde de pijn na gebruik van de helm.

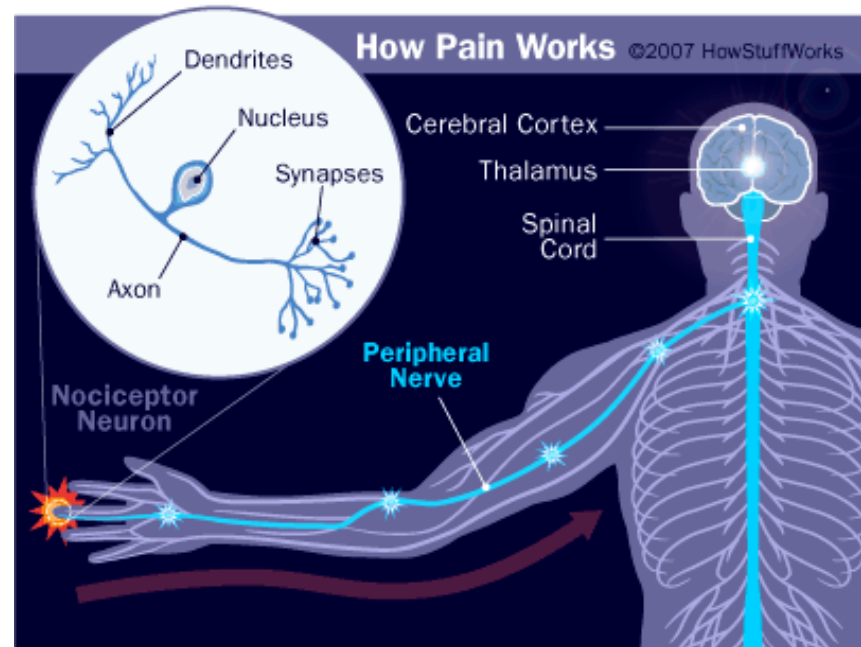
De 13-jarige Dennis Kaya beaamt de bevinding van de onderzoekers en demonstreert de werking van 'Snow World 2.1 virtual reality pain control'. Door met zijn hoofd te bewegen, baant Dennis zich een weg door een voor hem geprojecteerde ijsgrot. Met zijn linkerhand bestookt hij met enkele muiskliks pinguïns en ijsberen met sneeuwballen. Na af-





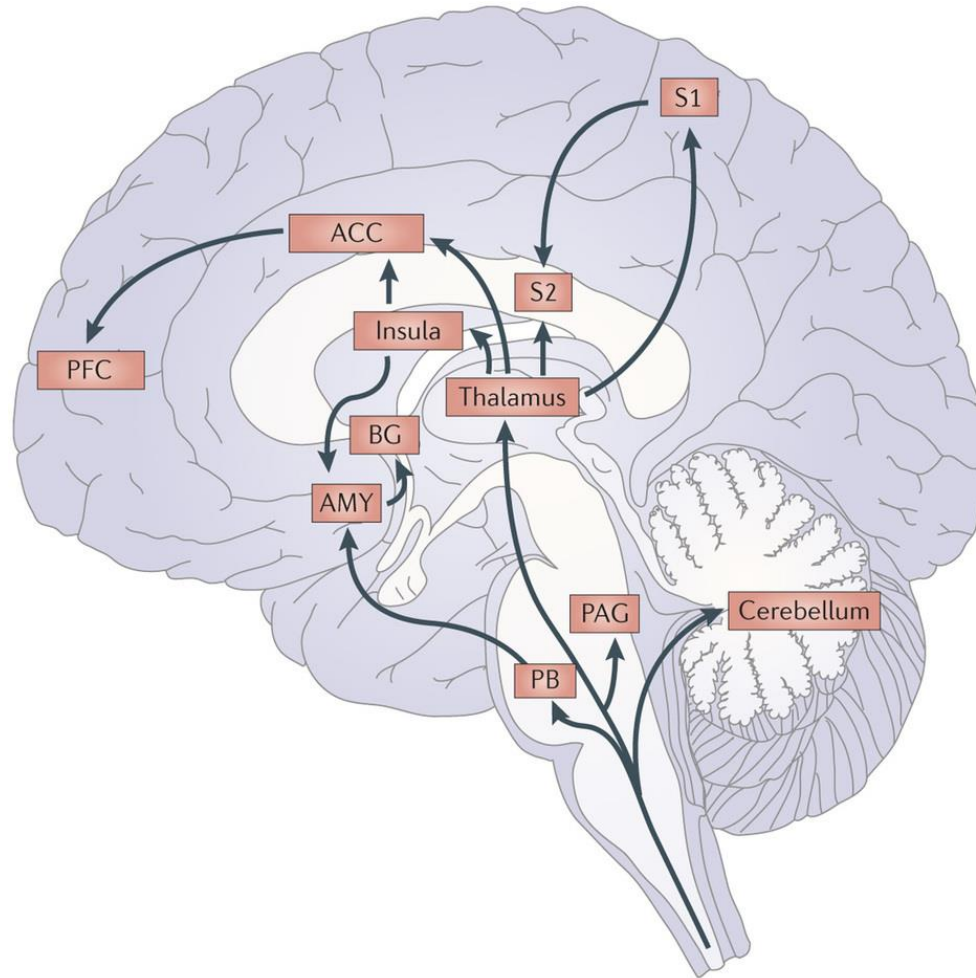
Pain Pathways I

- Nociception: the perception of mechanical, thermal or chemical change at a certain threshold





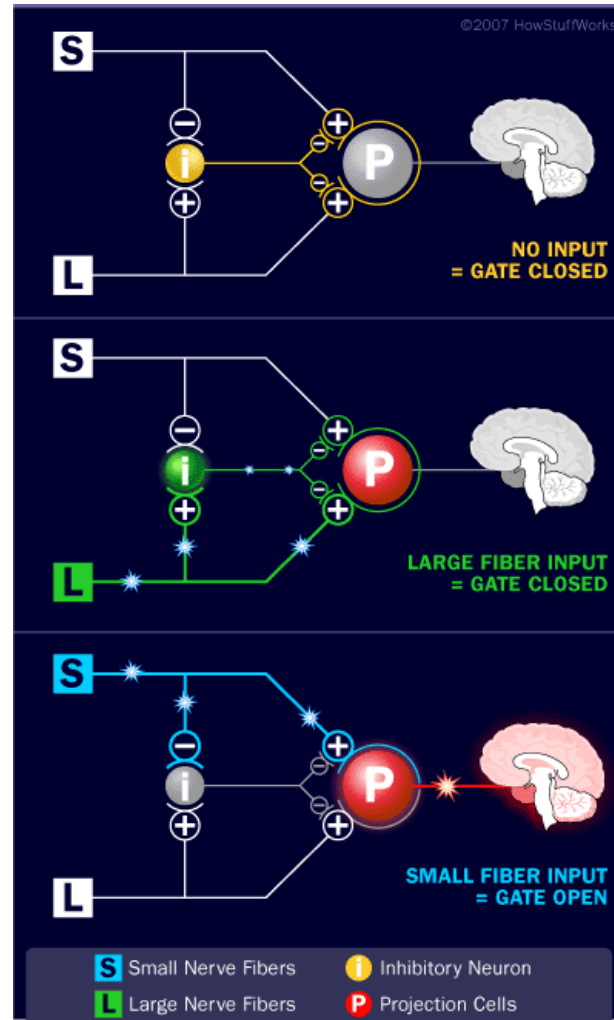
Pain Pathways II





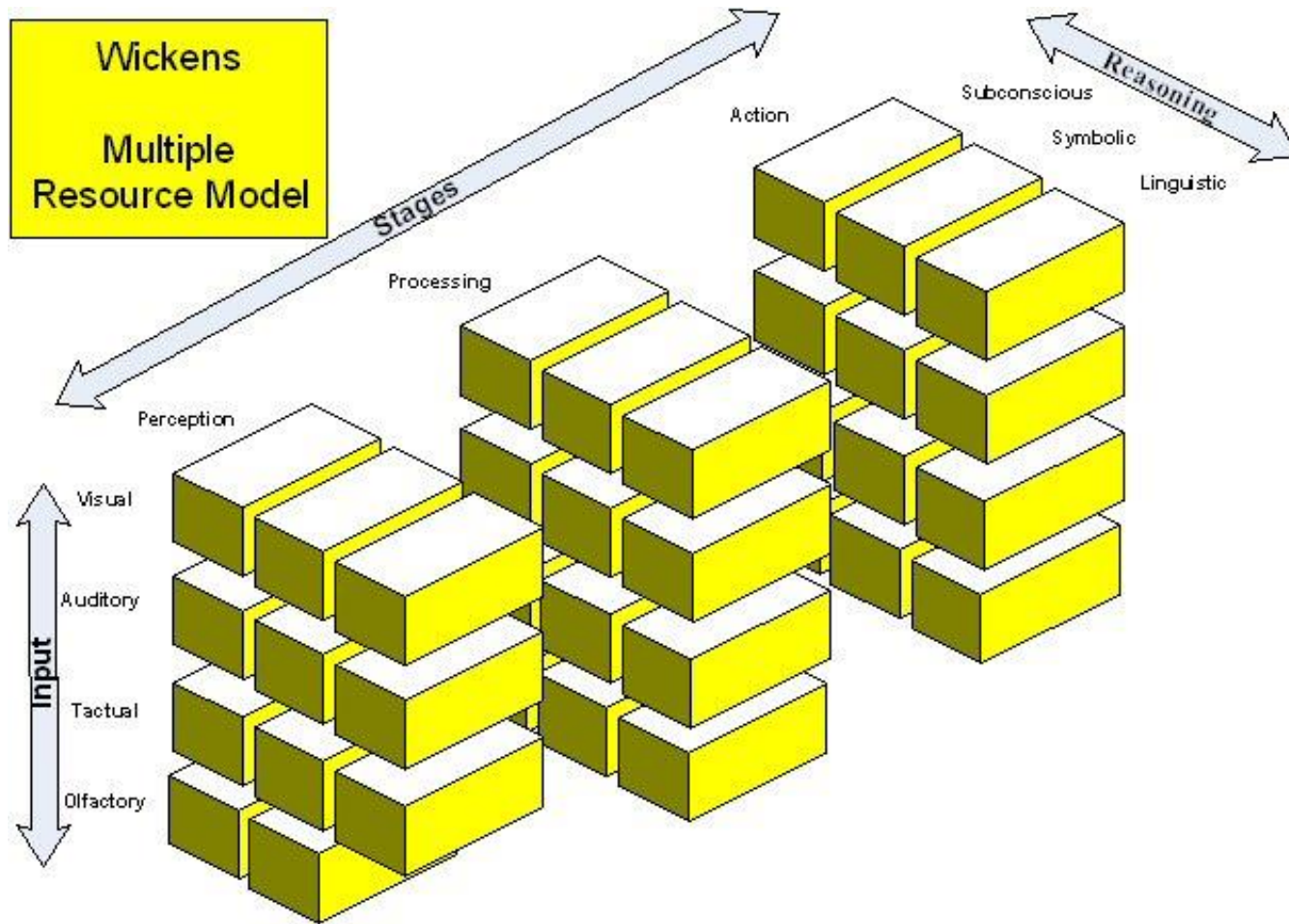
Gate Control Theory

- Melzack and wall (1965)





Multiple Resources theory





VR case studies/trials

Rendering of the VR image delivery system to a subject within the bore of an MRI magnet

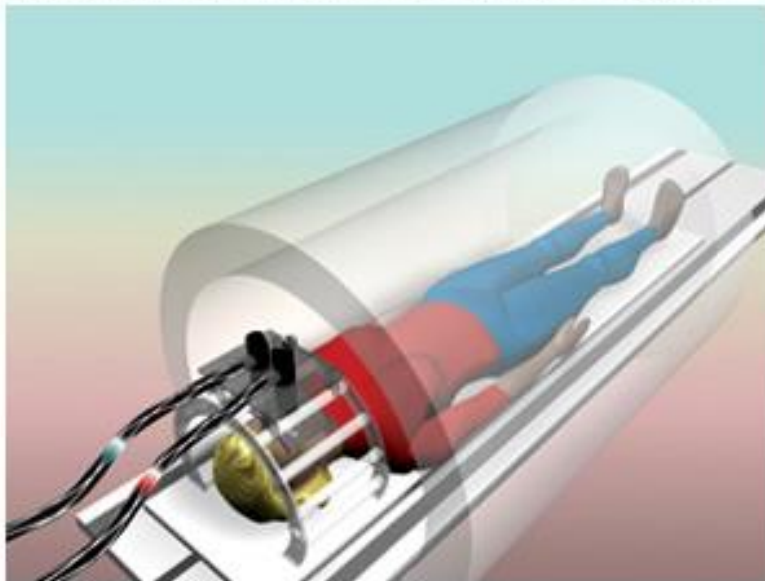
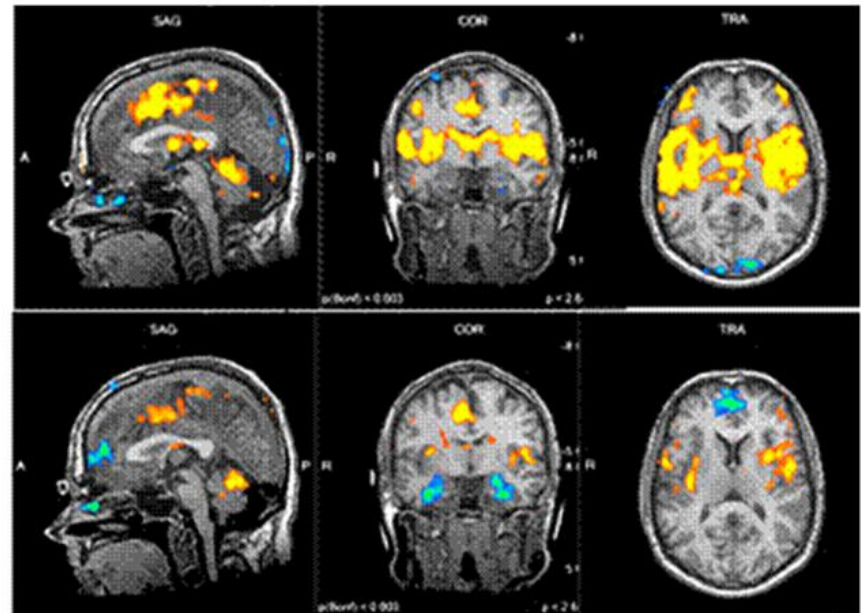


Image by Duff Hendrickson, University of Washington. Copyright Hunter G. Hoffman, PhD, University of Washington, 2004.

VR=virtual reality; MRI=magnetic resonance imaging.

Hoffman HG, Richards TL, Bills AR, Ostrom TV, Magula J, Seibel EJ, Sharar SR. *CNS Spectr.* Vol 11, No 1. 2006.



VR Case Studies/Trials

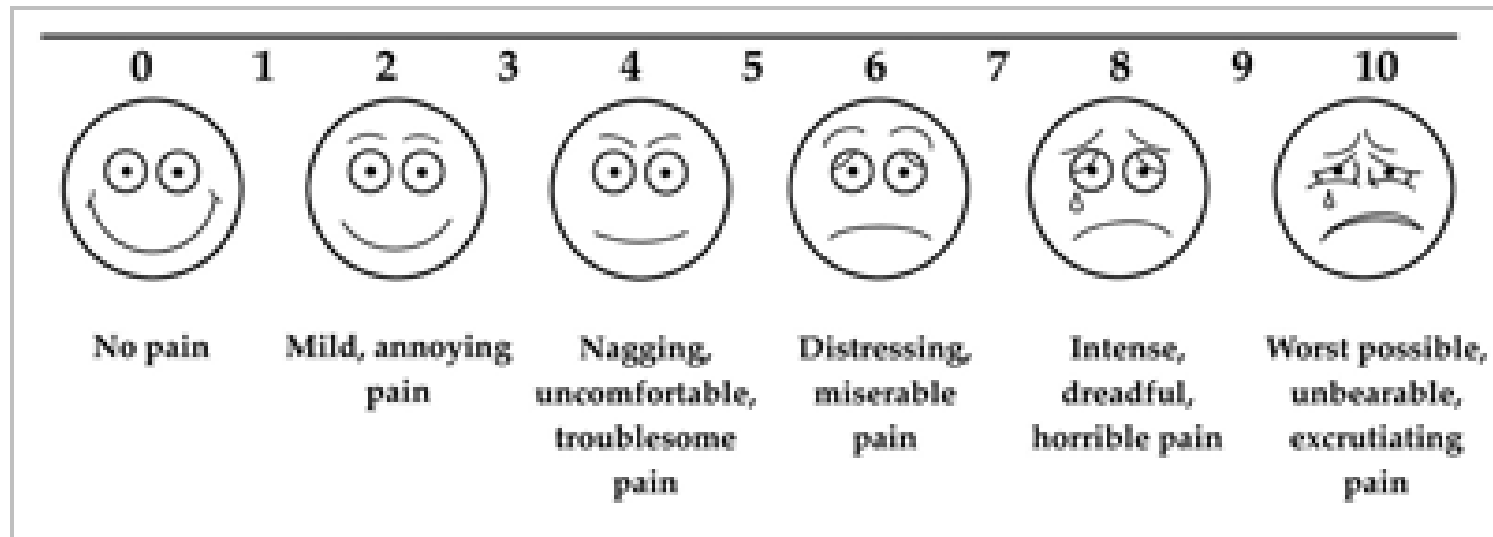
- Gold et al. (2009)
- Attention, emotion memory, touch auditory and visual perception have to be influenced by VR





VR Analgesia

- Absence of sensibility to pain by VR
- Reduction pain scores (faber et al, 2013)



AR applications

- Ditto (australia)



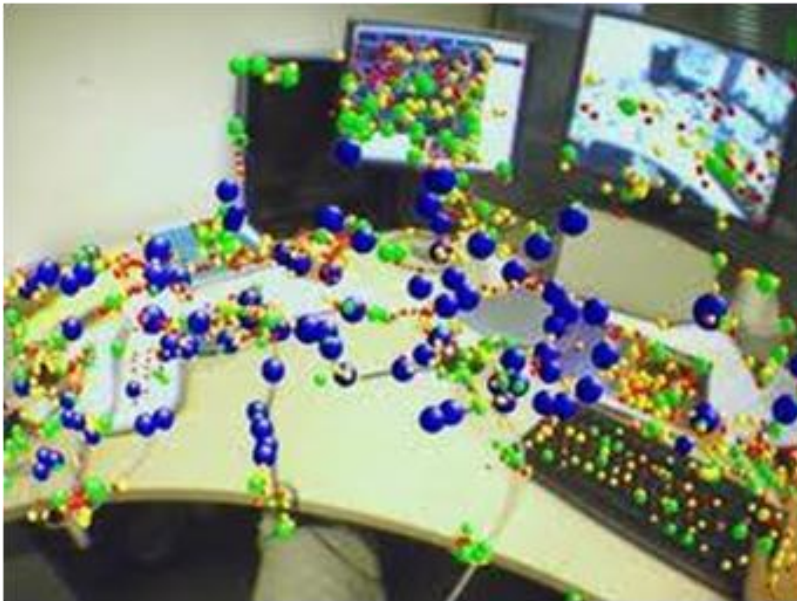
AR applications

- VR4Smile



AR applications

- Marker based tracking
- Machine vision





Conclusion

- VR works, but only if there is consideration of multi-modal distraction
- AR could work, but only if there is seen to all aspects of immersion
- Serious Games can make healthcare more efficient with “VR analgesia”
- More research is needed on neurobiology and pain perception and serious games



Gravilo

- Burn Care departments University hospitals of gent and leuven
- Foundation Help Brandwonden Kids
- Use of VR in clinic for pain distraction



Universitair Ziekenhuis Gent



UZ
LEUVEN



Questions?