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 Royal Berkshire NHS Foundation Trust

How can we ensure that robots will be acceptable to older people?

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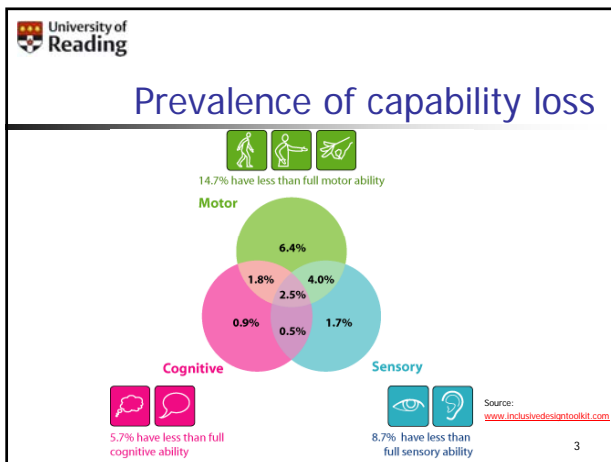
SPARC Workshop 24th of November 2009

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NBC TV's Sam Waterston said it, so it must be true!

... Older people may also be uncomfortable around robots because robots "eat old people's medicine for fuel... and when they grab you with those metal claws, you can't break free, because they're made of metal, and robots are strong."...

Source: <http://www.nbc.com/saturday-night-live/video/clips/old-glory-insurance/229049/>

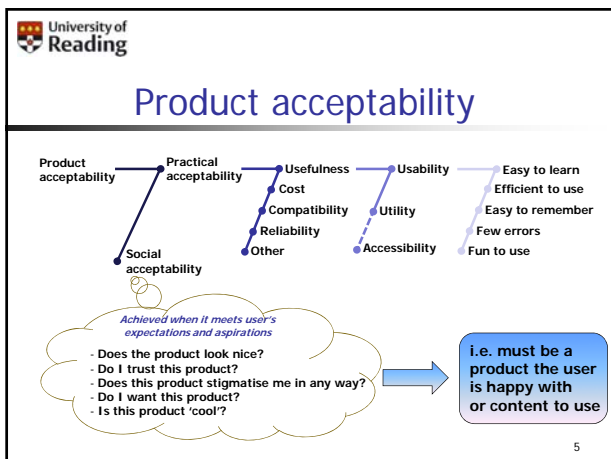


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Have you tried eating soup with a fork?

- Using technology should not be as frustrating as trying to eat soup with a fork!
- The principles of a successful design should focus on simplicity, in addition to an understanding of what users *really* want from the product.

Source: <http://www.inclusivedesigntoolkit.com>



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Examples from society

Unnecessary complexity excludes many potential users

Ticket machine has to be usable and accessible for many people as possible

Source: Keates and Clarkson, Countering design exclusion, an introduction to inclusive design, Springer-Verlag London, 2003

University of Reading **Examples from society**

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Source: <http://www.inclusivedesigntoolkit.com>

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University of Reading **Examples from society**

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University of Reading **Factors in the acceptance of healthcare robots**

- Appearance – very important as it contributes to the elder's sense of identity
 - Careful design consideration is needed to minimise the stigma of disability [Forlizzi et al 2004]
- Humanness – how human a robot should look?
 - Many people prefer a less humanlike appearance
 - A health robot does not need to look human at all, but non-humanoid robots raise different issues
- Facial dimensions and expressions
 - Just as people react to facial expressions on other people, they react to expressions on a robot's face [Breazeal 2000]
 - Dimensions of robot's head can affect how people perceive the robot [Powers and Kiesler 2006]

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University of Reading **Factors in the acceptance of healthcare robots**

- Size – important for practical and role reasons
 - Social robots tend to be small to encourage a caring and protective response from humans [Powers et al 2005]
 - For example, the da Vinci robot is large and sometimes can get on the way of the assistant surgeons [Wasen 2005]
 - Most older people prefer a small robot in a home setting [Giulini et al 2005]
- Gender – can affect how people react to it
 - It is thought that the perceived ability and knowledge of the robot will be inferred by traditional role stereotypes and thereby influence how much people tell the robot about a related subject [Powers et al 2005]

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Factors in the acceptance of healthcare robots

- Personality – robot's personality will affect how people react
 - People preferred a robot whose personality was matched to their own in terms of extraversion [Tapus and Matraric 2006]
 - Making home robots more socially intelligent can contribute to acceptance [de Ruyter et al 2005]
 - Caring and empathic robot personality has been shown to encourage interaction [Bickmore and Picard 2004]
 - Matched to its role. – a robot designed to encourage people to exercise was programmed with two different personalities: liked fun robot more, but exercised more when robot displayed serious personality [Goetz and Kiesler 2002]

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Factors in the acceptance of healthcare robots

- Adaptability – adapt behaviour to the user's preferences and personality can improve acceptability
 - Post-stroke therapy robot designed to adapt its speed and interaction style on line to match preferences of individual user [Tapus and Matraric 2007]
 - Our own work with the Gentle/S and Gentle/G stroke therapy system - customizable to user's taste and interaction mediated to accommodate user's preferences [Loureiro et al 2003; 2007]

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Robot-mediated Neurorehabilitation

Delivery of rehabilitation exercise through the interaction with a robot

Why Robotic Rehabilitation?

- Intensive therapy
- Engaging Exercises, user owned
- Repeatable Treatment and Assessment

A tool to aid physiotherapists in the management of therapies

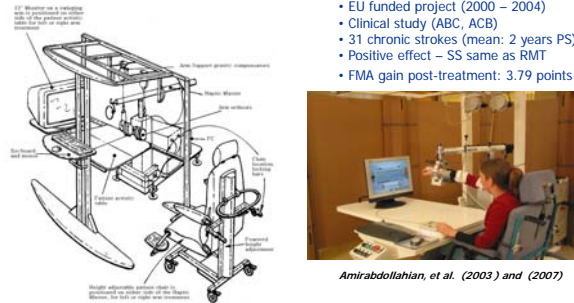
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Gentle/S system

Reach-to-touch exercises

- EU funded project (2000 – 2004)
- Clinical study (ABC, ACB)
- 31 chronic strokes (mean: 2 years PS)
- Positive effect – SS same as RMT
- FMA gain post-treatment: 3.79 points



Amirabdollahian, et al. (2003) and (2007)

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Gentle/G system

Reach & grasp therapy



Grasp retraining in combination with reaching movements in a reach-grasp-transfer-release sequence.

Loureiro, et al. (2007) and (2009)

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Virtual Exercises and Customisation



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Video of the Gentle/G system

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Collaborative Tele-rehabilitation Concepts

Enhancing motivation through social interactions

Goes beyond cooperative tasks between patient and therapist proposed by others

Laureiro, et al. (2006)

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Collaborative Tele-rehabilitation Concepts

Enhancing motivation through social interactions

Each of the two subjects is seated on a chair and play tic-tac-toe while connected to either the Gentle/s (UK) or the ADLER (USA) system. The game is played across the internet where game/user interaction is possible via the video feeds of the game and opponent's camera and audio

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Collaborative Tele-rehabilitation Concepts

Subject interaction examples

USA UK

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Expert systems enhancing social aspects of computing and gaming

Laureiro, et al. (2010) in press.

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The challenges ahead

- Research into the factors affecting responses to healthcare robots for older people is still in its infancy.
- Early findings suggest that the robot must meet the person's needs, be **slow, safe and reliable**, **small, easy to use** and have an appearance that is serious, ~~not too human-like~~, ~~not patronizing~~ and have a serious personality.
- Social gaming concepts can bring new possibilities.

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Thank you for listening!

*"If we all worked on the assumption that
what is accepted as true is really true,
there would be little hope of advance."*

Orville Wright

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