Key findings

- Most assistants find tight turns (‘smallest turning circles’) hardest
- Most assistants find slow turns easiest
- Some assistants find turning easiest if one large wheel remains static
- Most assistants find moving backwards while turning easiest
- Some assistants are unaffected by tight or slow turns or direction of motion
- Slow turns can be carried out in narrow corridors
- Tight turns do not take smaller architectural spaces than slow turns
- Assistants are more likely to veer off path on slow turns
- The assistant size has little effect on space required for slow turns
- Some assistants apply forces more efficiently than others
- Assisted wheelchairs move in spirals
- Assisted wheelchair wheels become distorted as they roll and turn

Project aims
Create a tool that assists occupational therapists to determine specifications for adaptations for assisted wheelchairs users with large or small fixed rear-wheels and allows tailoring for wheelchair, wheelchair user and assistant in a manual-handling sensitive way.

Background
Architectural guidelines, for example BS 8300 (British Standards Institution 2010), consider assisted wheelchair users. However, occupational therapists in adaptations services will encounter situations where guidelines do not address the problem or guidance is difficult to apply because:

- the wheelchair user has a raised leg modification extending the wheelchair length,
- the wheelchair is unusually wide,
- the space in which the movement occurs cannot be adapted to conform to the advice, for example, a structural building component exists that would be impracticable to move,
- the wheelchair user or family do not like what the guidance would do to their home.

Additionally, assisting wheelchair users is manual handling and advice should be manual-handling sensitive. Furthermore, assisting wheelchair users can be difficult (Roberts et al. 2011) because:

- wheelchairs and their occupants are increasing in size,
- good manual handling practice is paramount,
- there are increasing numbers of older assistants
- the size of many British homes is small (Roberts-Hughes 2011).

These factors all emphasise the importance of understanding assisted wheelchair user space requirements. Occupational therapy tools for specifying adaptations exist for self-propelling wheelchair users (Abraham and Johnson 2006) and for four-caster vehicle users (Abraham 2012) but not for assisted wheelchair users.

Occupational therapists specify adaptations for assisted wheelchair users but there are no manual-handling sensitive tools to assist them.
Method
Wheelchair turning can be viewed as around an imaginary vertical pole on a wheel-axle parallel-line, so each imaginary pole to wheelchair distance results in a different turning space requirement. Mechanical (no subjects) handle-force investigation determined that just three pole-wheelchair distances could represent the assistant wheelchair turning task. A wheelchair was fitted with handle-force and wheel motion measuring devices. Wheel-axle parallel-line was represented by a wheelchair-mounted bar. A floor-stand with pointer indicated imaginary pole position, the point around which to turn the wheelchair. Twenty-two, manual-handling aware subjects with current experience of assisting wheelchair users made the three wheelchair turns, two in both turning directions, selecting their maximum comfortable weight for each of the turns.

Results
The tightest turn was statistically associated with lowest maximum comfortable weights with clinically important differences: mean percentage weight increased by 30% if tight turns were avoided, tight turns are harder. Results have been encapsulated into a scale drawing tool which guides design and adaptation assessment.

Recommendations
Dissemination of the output tool through workshops and publication

- Further investigation of existing data and publication relating to:
  - forces applied by subjects
  - the spiral phenomenon
  - to wheel distortion
- Further investigation into the differences between four-caster chairs and assisted wheelchairs.

Publications


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