

Checking AT Fit for the Home: Strategies for Specific Areas of the Home

16 June, 2021



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Share-a-Smile Becky

- An instant hit when introduced in 1997
- But there was a problem....Becky's wheelchair did not fit in the Barbie Dream House
- Mattel did not change the house they changed Becky "it became too complicated to redesign the Barbie world to fit Becky"

Previously focus has been on "**fixing disability**" but there has been a gradual shift to focus on "**fixing society**".





I am designed to help people with disabilities.

I am designed for the greatest access of all people.

AT versus Universal Design
(round one)

Contents

- HAAT Model Introduction
- Assessments
- Considerations for all areas of the home
- Bathroom
- Bedroom
- Kitchen
- Laundry
- Outdoors
- AT on Telehealth

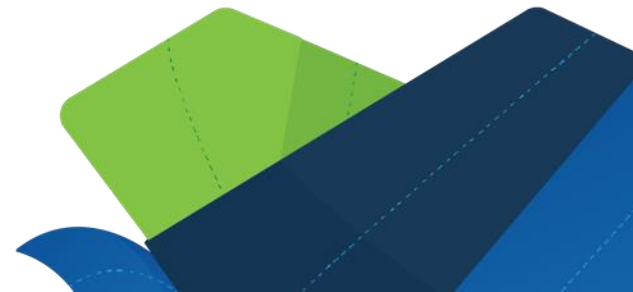


What is Assistive Technology?

Assistive products are ‘any external product (including devices, equipment, instruments or software)...the primary purpose of which is to maintain or improve an individual’s functioning and independence, and thereby promote their well-being’.

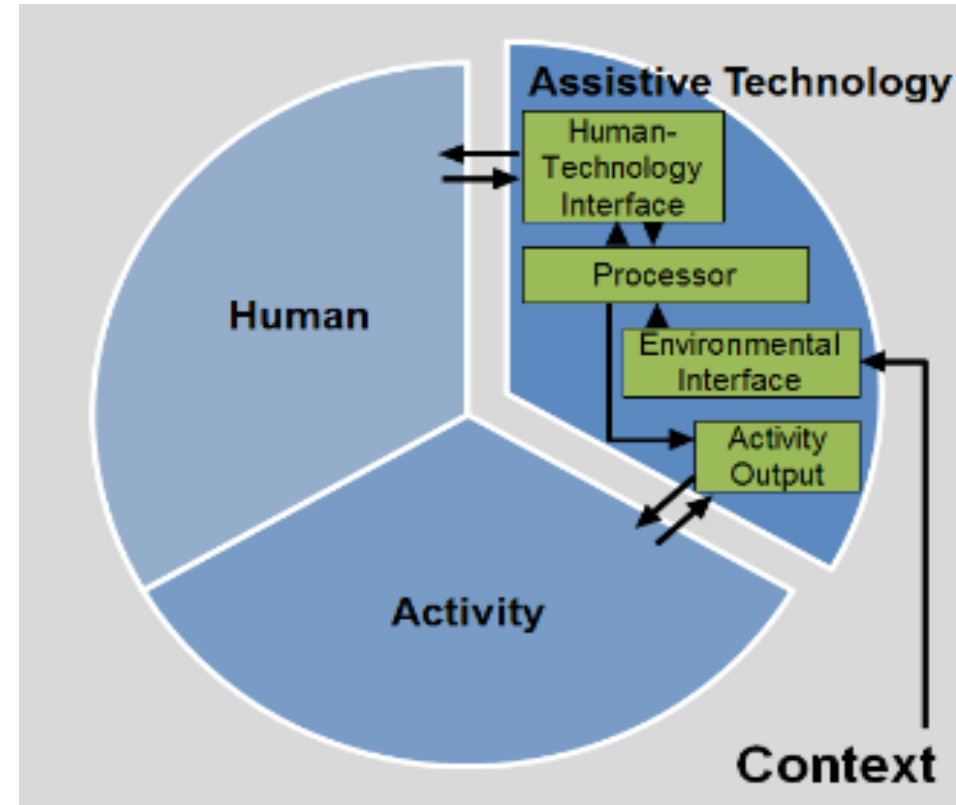
Assistive technology is ‘the application of organized knowledge and skills related to assistive products, including systems and services.’

[World Health Organisation \(WHO\)](#)



Human Activity Assistive Technology (HAAT) Model¹

- 4 components
 1. Human
 2. Activity
 3. Assistive Technology (AT)
 4. The context in which these integrated factors exist
- A framework for understanding the place of AT in a persons life.



Human

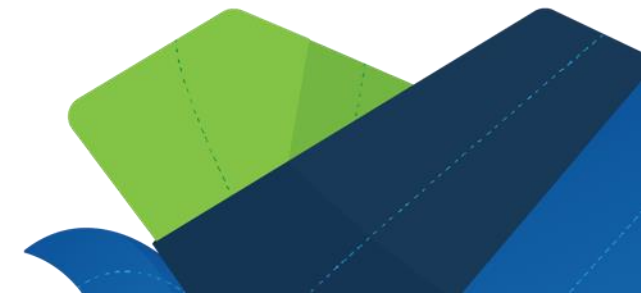
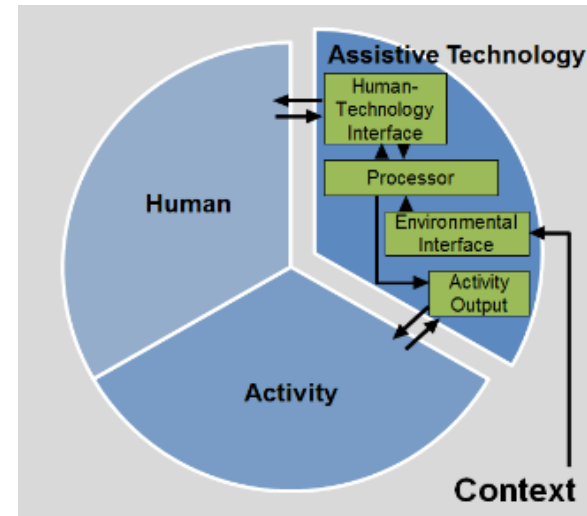
AT starts with the centres on the person

Considerations

- Age
- Gender
- Cultural/social background
- Weight
- Height
- Other physical dimensions
- Diagnoses
- Roles
- Interests, activities
- Attitudes

Assessment

- Functional capabilities
- Contenance management
- Skin integrity
- Motor skills
- Posture
- Cognition
- Behaviour
- Sensory skills
- Mental health
- Pain

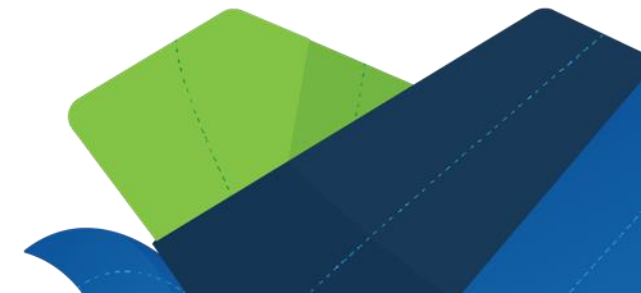
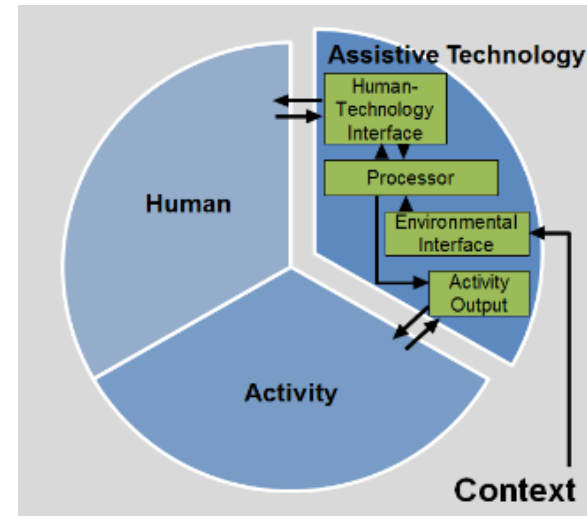


Activity

The occupations that are meaningful to the person.
This will define the goal of the AT system.

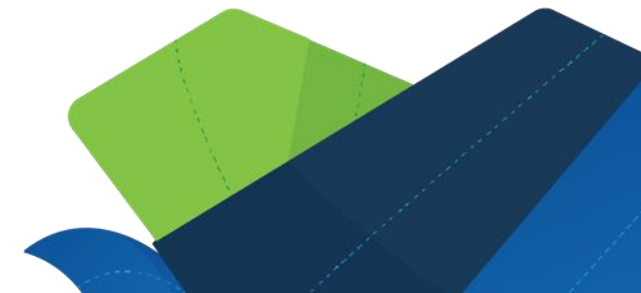
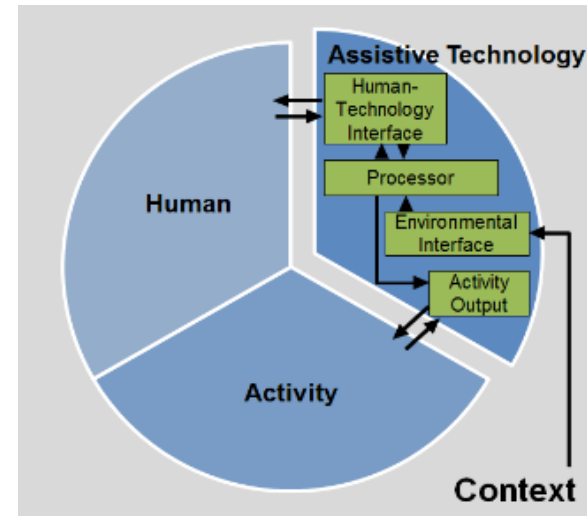
Goal setting

- Person centred
- What are the client 's goals?
- What is the client's outcomes with the assistive technology?
- What are the carer's goals?
- What are the therapist goals?
- What are the supplier goals?



Assistive Technology

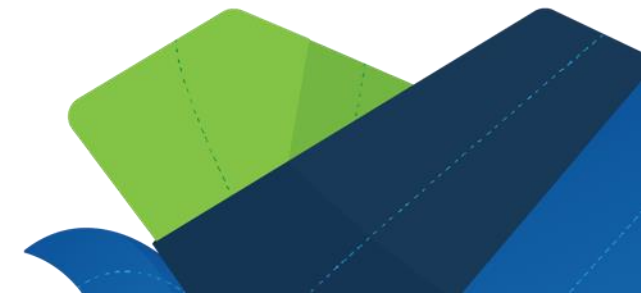
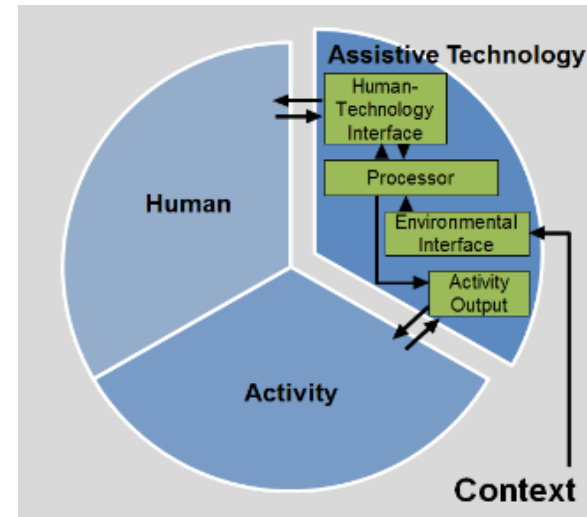
- Human technology interface
How the technology and the human exchange interact (a 2 way interaction)
- Activity output
The activity/performance the AT facilitates – cognitive, communication, ambulation, object manipulation
- Processor
The system that links the human technology interface and the activity output
- Environmental interface
Linkage of the AT to the context



Context

Environment/circumstances affecting the AT system and user.

- Physical
Including the home environment
- Social
All individuals who interact (directly or indirectly) with the AT
AT can lead to further stigmatization in the social environment
- Cultural
The cultural screen that people view the world based on their experiences, family, heritage etc.
- Institutional
Policy, processes and procedures (e.g. funding)



Assessment Tools

- Built environment assessment tool – dementia (BEAT-D App)
- Functioning Everyday with a Wheelchair (FEW)
- Spinal Outreach Team (SPOT) evaluation forms
 - Hoist Trail Evaluation Form
 - Mobile Shower Commode in Home
 - Mattress in Home
- Australian Therapy Outcome Measure (AusTOMS)
- Mounts for Speech Generating Devices (MAT-doc)
- Comprehensive Assessment and Solutions Process for Aging Residents (CASPAR)
- MASS home access checklist PWC



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Considerations for all areas of the home



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Building Standards and Guidelines

AS 1428.1-2009 Design for access and mobility

- Required for new public building work.
- Can use to guide AT/home modification (circulation space, ramps, dimensional for structures/fittings/fixtures).

LHA Liveable Housing Guidelines

- Guidelines (not requirements) to assist persons and organisations to avoid discrimination. 3 levels based level of adaptability and accessible elements to more people.

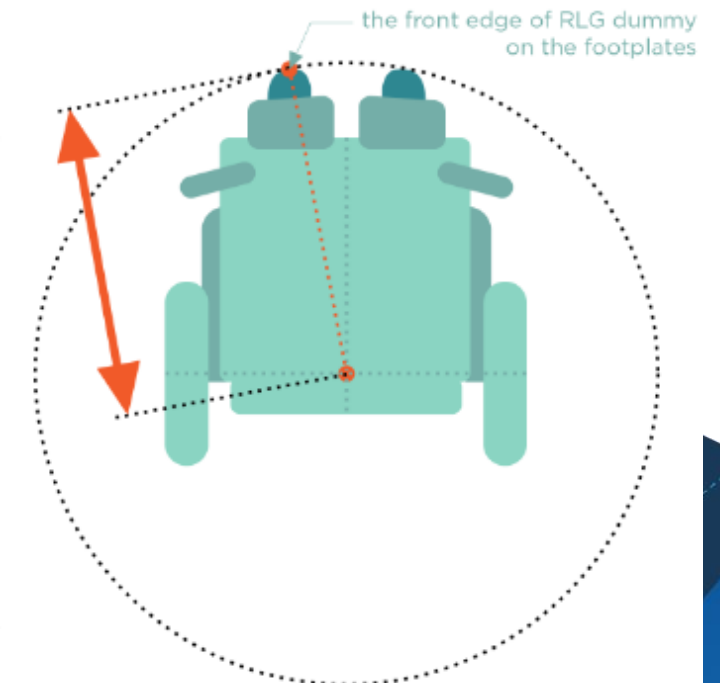
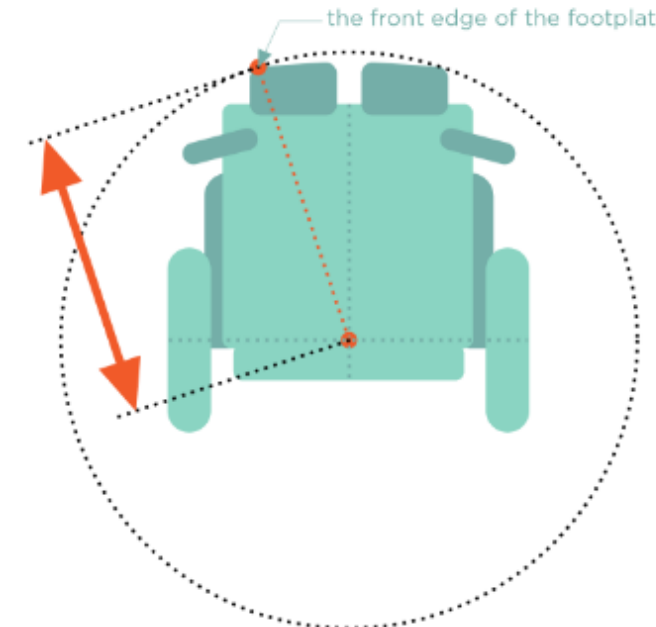
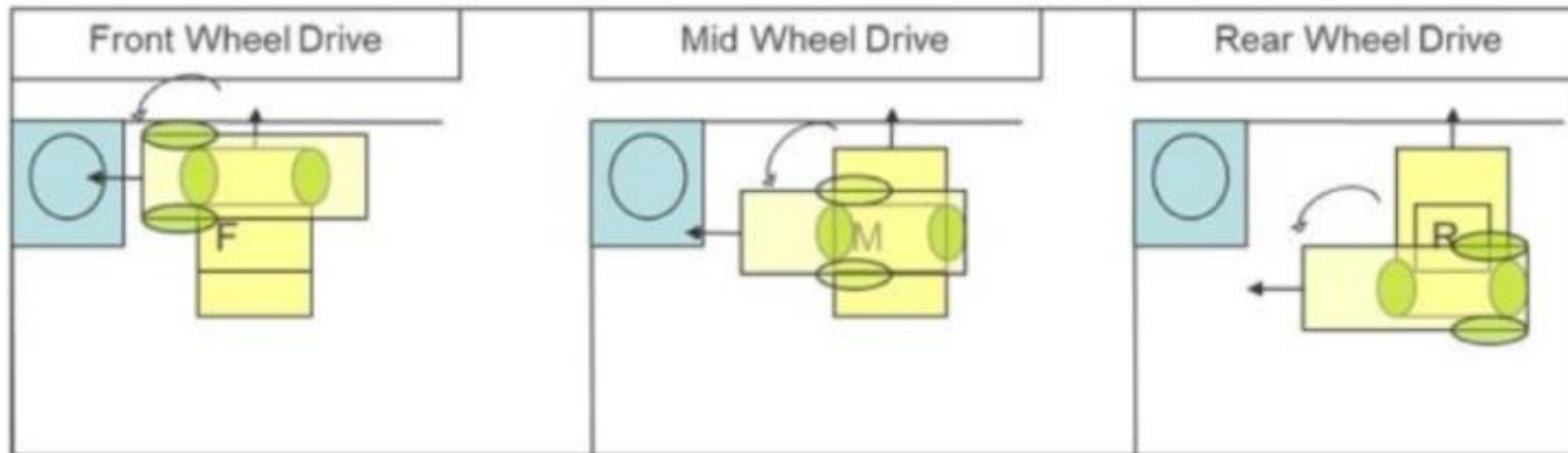
AS 4299-1995 Adaptable Housing (currently pending revision)

- The objectives and principles of adaptable housing. Guidelines for designing or building new dwelling of renovations (private and public). 3 classes based on % of desirable accessible and desirable features of adaptability.



Turning Circles

- Sufficient space for AT in the environment
- Additional features (e.g. increasing chamber to assist turning/propulsion) increases the width and thus turning circle
- Body parts (e.g. feet)
- Power wheelchair drive styles



Turning Circles

- Power wheelchair drive styles

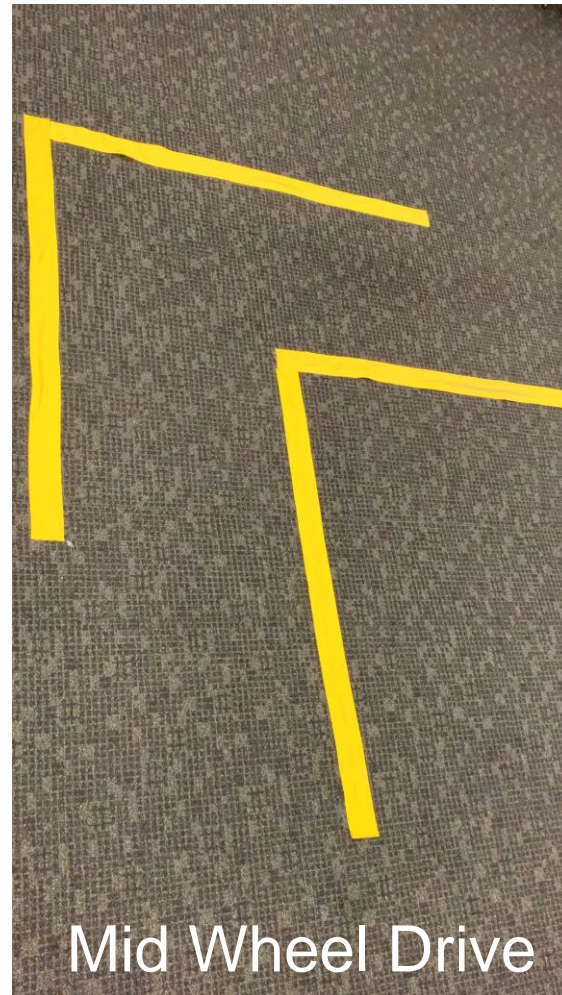
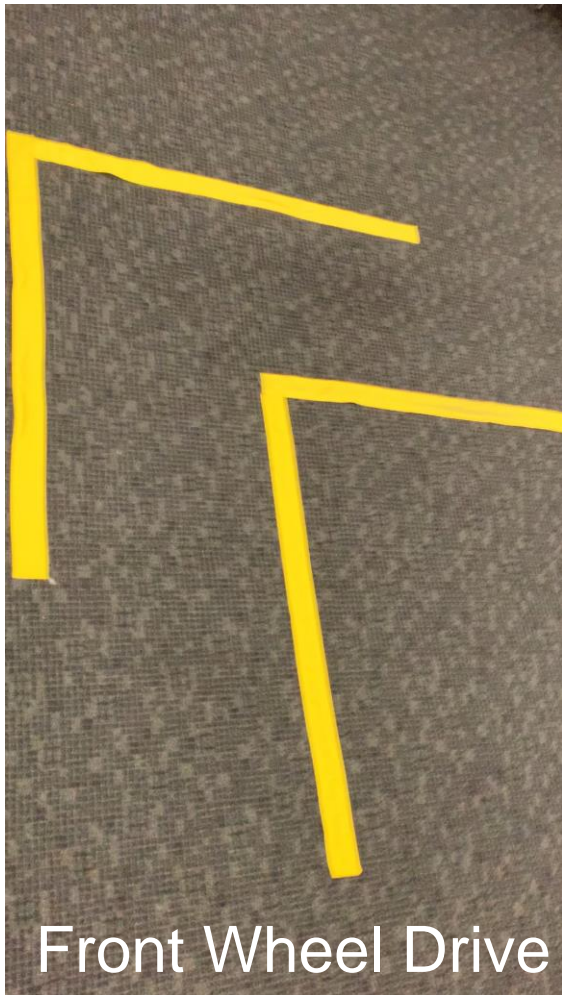


PWC 360 Degree Turn Comparison

Turning Circles

PWC 90 Degree Turn Comparison

- Power wheelchair drive styles

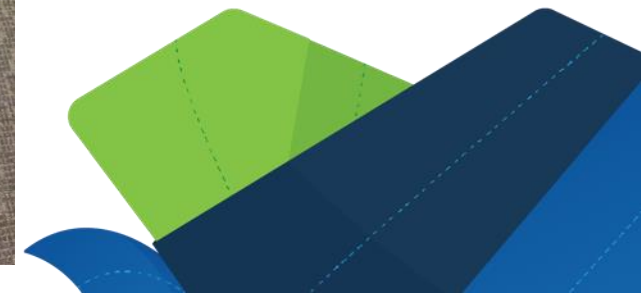


[PWC Selection Life Mobility](#)

[PWC Types Innova](#)

[PWC Base and Turning Radius Sunrise Medical](#)

[PWC Comparison Karma Medical](#)



Other Equipment



Sonata 150 Lifter Hoist



Alto Lift 200 Hoist



Sonata 150 Lifter Hoist

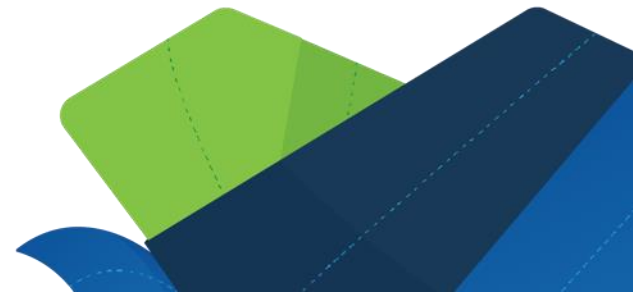


Alto List 200 Hoist



Flooring/surfaces

- Same flooring in adjacent rooms to eliminate threshold steps.
- Threshold ramps for door thresholds/tracks of sliding doors.
- Low-pile dense carpeting (e.g. industrial carpeting) rather than high-pile/shedding carpet (can get stuck in wheels).
- Non-slip wood or tile.

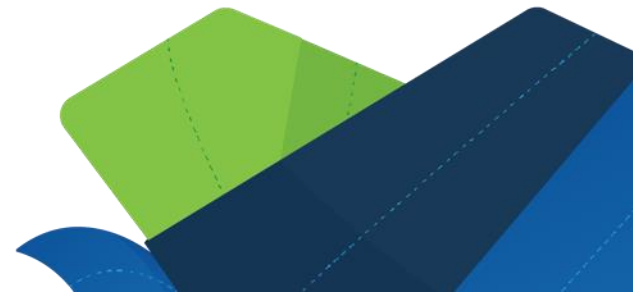
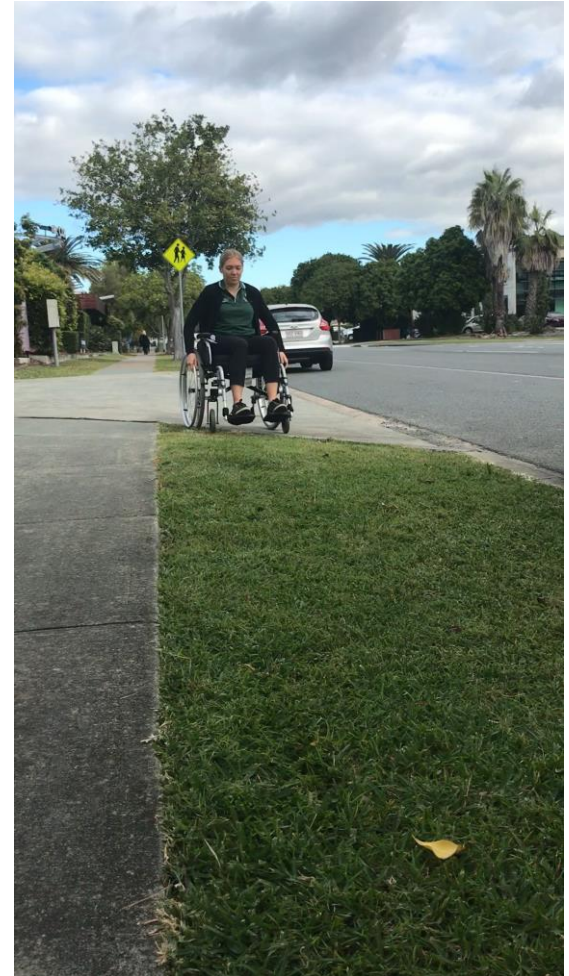


Flooring/surfaces

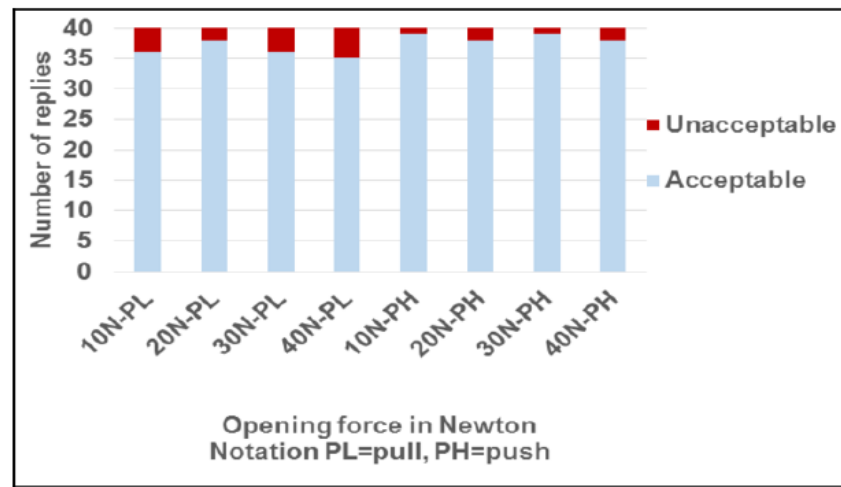
A kinetic analysis of manual wheelchair propulsion during start-up on select indoor and outdoor surfaces²

- Surfaces: high-pile carpet, tile, smooth level concrete, low-pile carpet, hardwood flooring, grass, and interlocking concrete pavers
- Surfaces with greater resistance to propulsion (ramp, interlocking pavers, grass) = greater force and torque to propel
- Regardless of surface type, greater force and torque required to start propelling rather than maintaining a pace

Implication: evaluate propulsion ability on a variety of surfaces



Doors



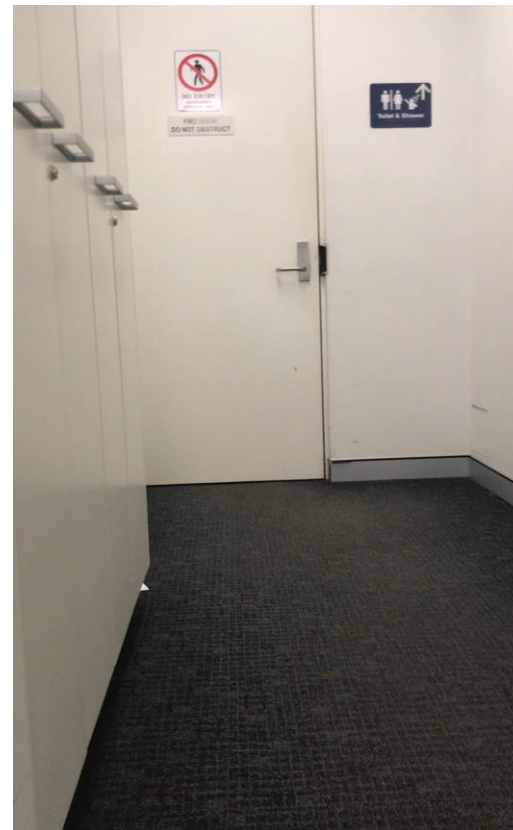
Wheelchair users ability to open doors³

Higher level of difficulty when pulling rather than pushing.

Figure 3. Experienced difficulty for opening and passing door both ways for wheelchair users

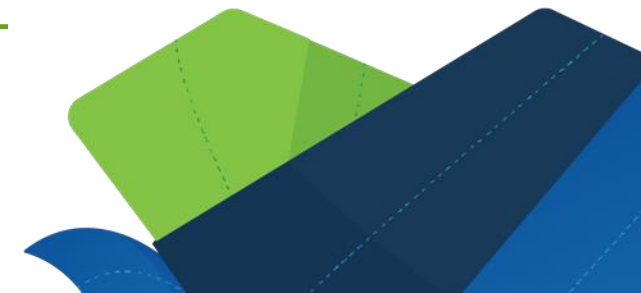
Strategies

- Automatic opener door
- Smart door
- Removal of internal doors
- Sliding rather than hinge



Users with poor sensation or limited/no movement in lower limbs?

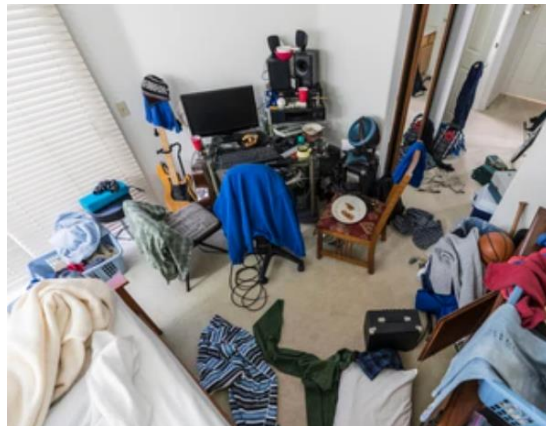
[MWC Fire Door](#)



Hazards

Other considerations

- Other AT
- Power cords
- Social environment (children/pets)
- Clutter
- Unhelpful environment stimulation (e.g. traffic, machinery)



Every home had at least 1 hazardous home feature⁴

Outside the home

Poor features

No ramp for a wheelchair

Uneven/cracked area of ground around the home

Good features

No holes or muddy ground around the home

Inside the home

Poor features

Width of the door being smaller than 90 cm.

High door threshold

Tall stair steps

No bedside rails

Inappropriate height of the toilet pan

Door step being higher than 2 cm.

Stairs on the staircase being higher than 15 cm.

Good features

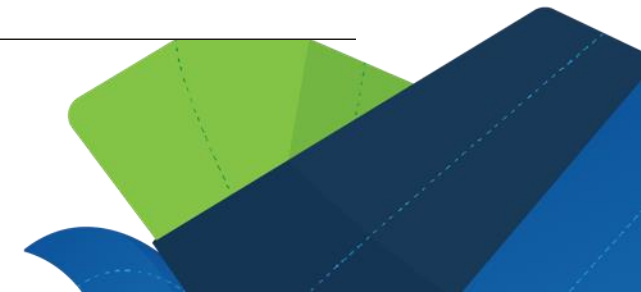
Low level floors inside the home

Nonslippery floors

Adequate lighting

No obstacles in the walkway

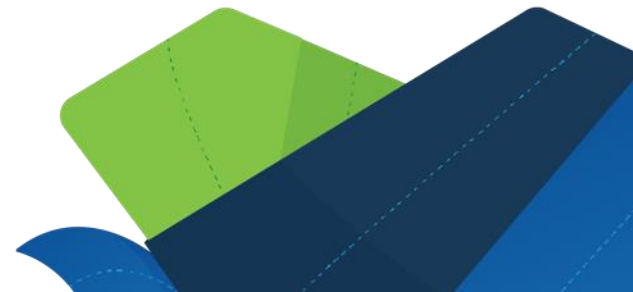
Grab bars in the bathroom



Poll

Which area of the home poses the most difficulty when prescribing assistive products?

- A) Bathroom
- B) Bedroom
- C) Kitchen
- D) Laundry
- E) Outdoors
- F) Other (please type answer in chat box)



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Bathroom



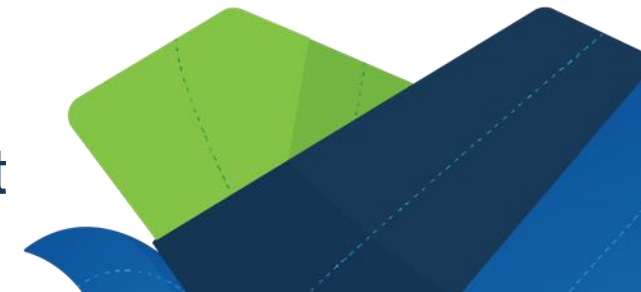
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Mobile Shower Commode (MSC)

9 activities performed in MSC's⁵

- Transfers
- Propelling and manoeuvring
- Bowel care
- Showering
- (Un)dressing and drying
- (Re)positioning
- MSC cleaning, inspection and maintenance
- Preparing for travel
- Other activities (cleaning teeth, shaving)

Therefore important to get the AT environment person fit right



Practical fit for environment

- Sliding platform smaller turning circle than swing away foot plates
- Space for attendant vs self-propelled
- Consider propelling may be more difficult in a wet environment – may become more slippery and lose grip
- Pneumatic vs solid tyres (pneumatic better grip but need pumping)
- Mobile shower commode in the home (SPOT)

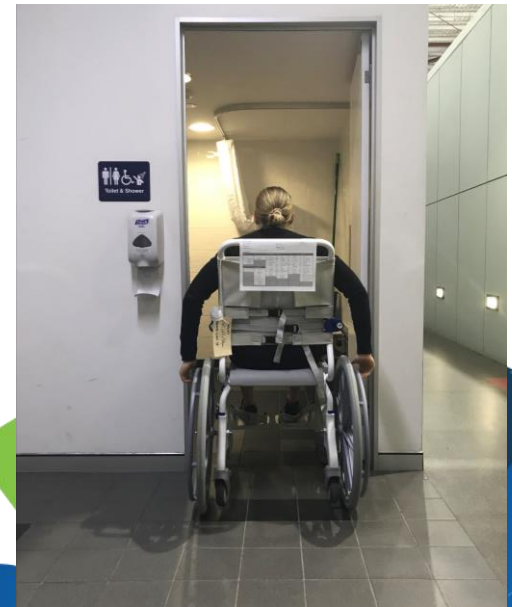


Pneumatic Tyres

Attended Propelled



Self Propelled



Practical fit for environment

- Consider seat height and purpose of MSC. Does it need to go over the toilet? Will it be used as a bedside commode? Will it need to be used in the shower recess?
- Consider space limitations for placement of bite to access for hygiene
- Consider bedside commode placement and emptying controls
- Circulation space increases when in tilt



Practical fit for environment

- Alignment over the toilet

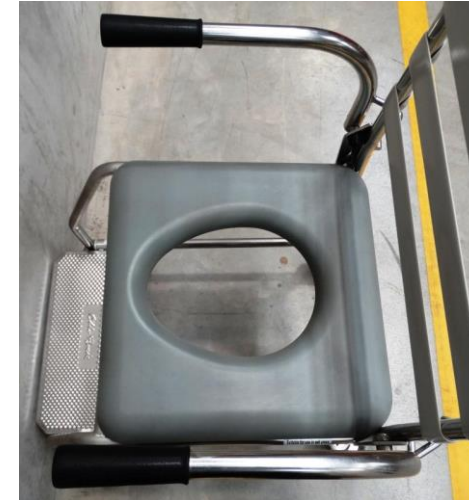
Good alignment with standard toilet



Bar behind backrest holding chair forward



Child width collide with toilet pan

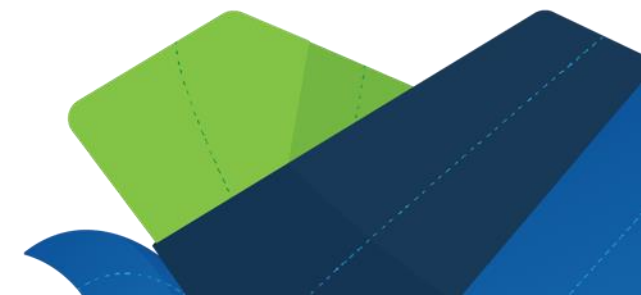


Adjustability to fit to environment

Swivel Bath Seat

Practical fit for environment

- Bath edges sufficient to support
- Bath width compatible with range on swivel seat
- Transfer: how far back is seat to “land” bottom on
- Location of swivel mechanism: user’s ability to reach/operate
- Bath edge seat height: higher seat can facilitate swinging legs over edge of bath
- Safe working load of swivel bath seats are often relatively low
- Consider depth of the bath – if too low user may be unable to transfer. N.b. some models do have a raiser.



Bath Lift

Practical fit for environment

- Consider if legs in first or bottom in first
- Consider the seat height, leg room, backrest (reclining/upright/no backrest) – impact immersion depth
- Consider the stability of the bath lift for transfers and seated posture

Mangar Archimedes Bath lift



Mangar cushion bath lift



Freedom Molly Bather



Aquatec Orca bath lift



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Bedroom



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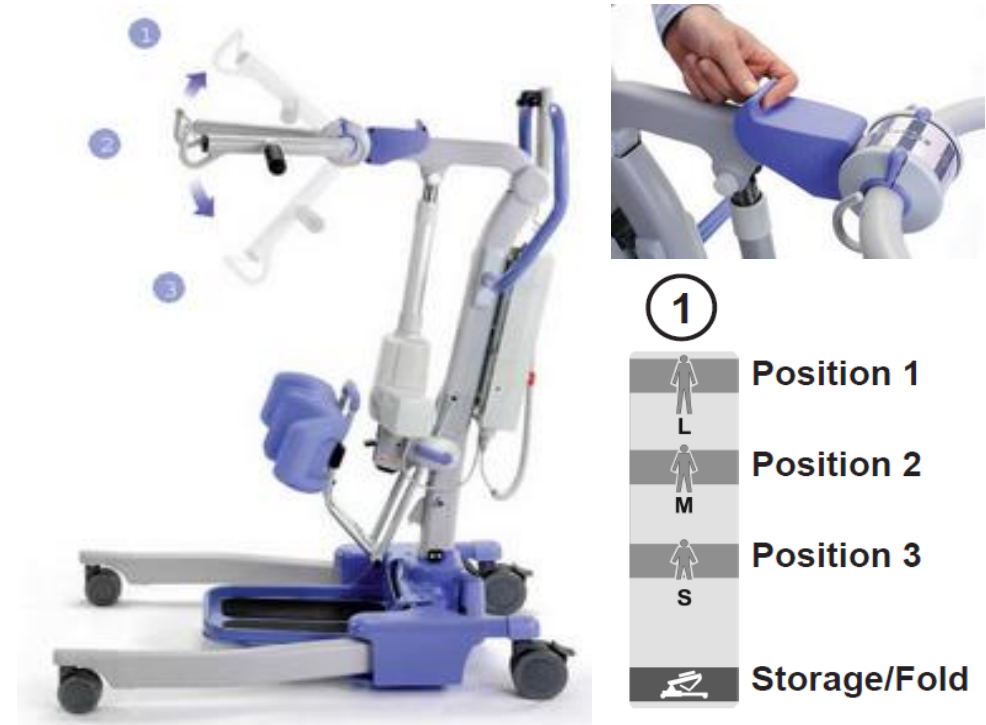
Patient Transfer Platform/Standing Hoist

Practical fit for environment

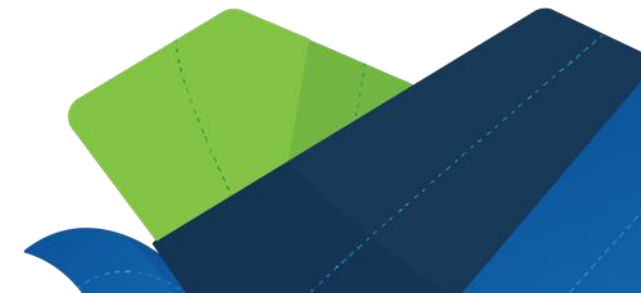
- Overall dimensions (e.g. circulation space needed)
- Lift clearance and lifting arc
- Fit with other AT
- Bed clearance (height of legs/base)



Romedic ReTurn and Molift Raiser – low profile and cut out for toilet pan



Oxford Journey – Cow horn



Mobile Floor Hoist

Practical fit for environment

- Lift clearance
- Frame: pivot frames typically allow lower transfer height
- Length and shape of boom (reach over bed, power wheelchairs, tilt-in-space wheelchairs, lounge chairs)
- Consider that even with measurements, photos, footage, discussion of the floor surface and carer trial of hoist in another environment – difficult to know if it will absolutely work in the home



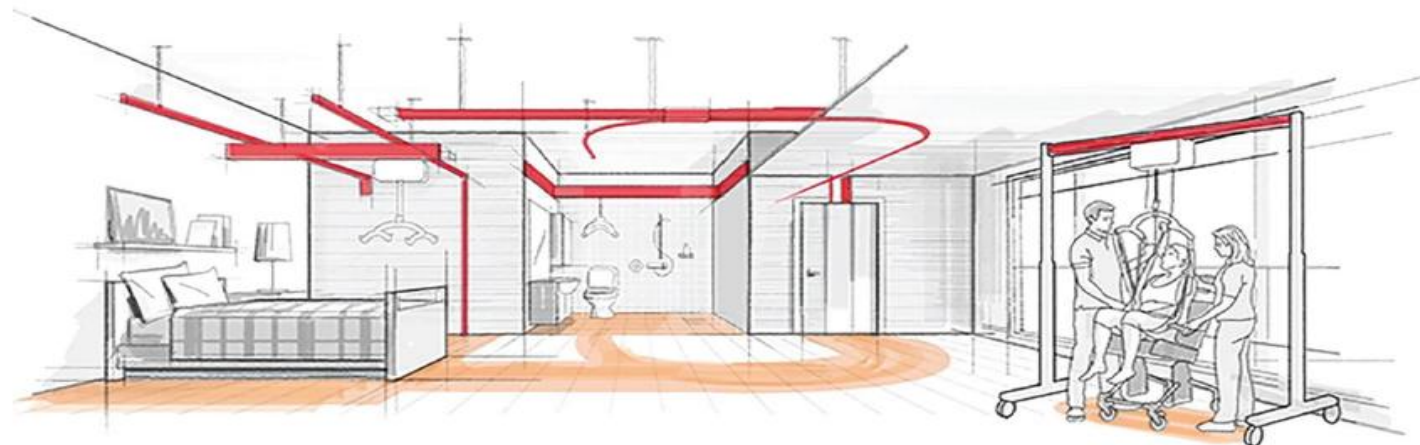
Kerry KH404F Swift Lift and Invacare Birdie Evo
– more curved boom



Oxford advance and Molift 180 – straighter boom for increased reach

Full Lift Hoist

Ceiling vs Floor⁶



Ceiling

- + Reduce injury to carers
- + Takes up no floor space
- + Independent or 1 assist transfers
- Track is predetermined
- Cost of installation
- Environment fit for installation (reinforcements, ceiling height)
- Structural engineer

Floor

- + No installation cost
- + More flexible to location
- Ability of carer to operate
- Circulation space
- Storage in the home

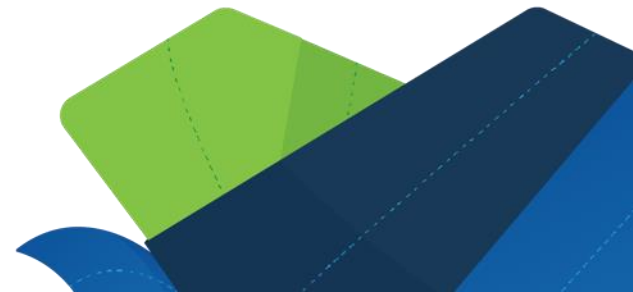
[MASS Ceiling Hoist Checklist](#)

Bed + Mattress



Practical fit for environment

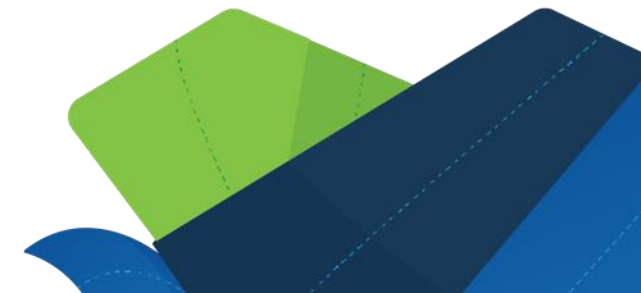
- Interface of bed with mattress e.g. location of alternating air pumps and CPR valve fit with bedrails on bedframe
- Hook for air pump?
- Consider noise of pump in home – can sit against bedframe and vibrate
- Bed size – consider space requirements for carer to assist/increased load on carer for transferring/sliding in bigger bed)
- [SPOT mattress in the home checklist](#)



Other furniture

Practical fit for environment

- Often fixed furniture in place
- Can be difficult to practically fit a grabrail (e.g. location of windows, bed-side table in place, over-bed table)
- Bed-stick
- Often the place in the house that has high-pile carpet and rugs – consider impact on mobility aids



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Kitchen



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Smart Kitchen⁷

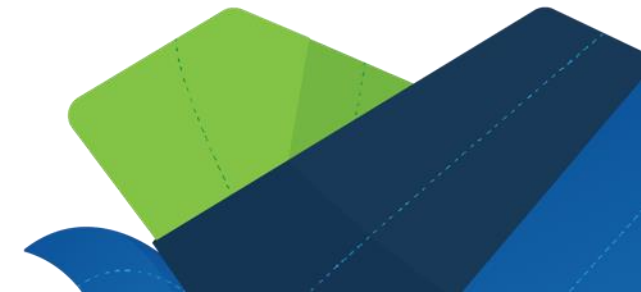
- No-touch automatic sensor faucet in the sink
- Smart fridge (screen and message centres – can take voice notes rather than had written)
- Internet-controlled refrigerator-oven
- Smart-controlled microwave (autodetect cooking times from scanning the packaging)
- Alexa, Siri, google home etc.



Appliances

Universal design^{8,9}

- Buttons: easy to reach, large graphics, contrasting colours
- Handles: loop handles rather than knobs
- Hardware: easy to use
- Controls: low push force and minimum sustained effort, front or side mounted
- Cook tops: induction for safety
- Oven doors: side opening or retractable
- Microwave convection oven: saves bench space, often side opening
- ‘Cognitive Kitchen’ for dementia patients – safety, control, simplicity, guidance¹⁰



Home Modifications

- Home modifications can maximise AT interface with the environment
- **MASS does not fund home modifications**

Universal design¹¹

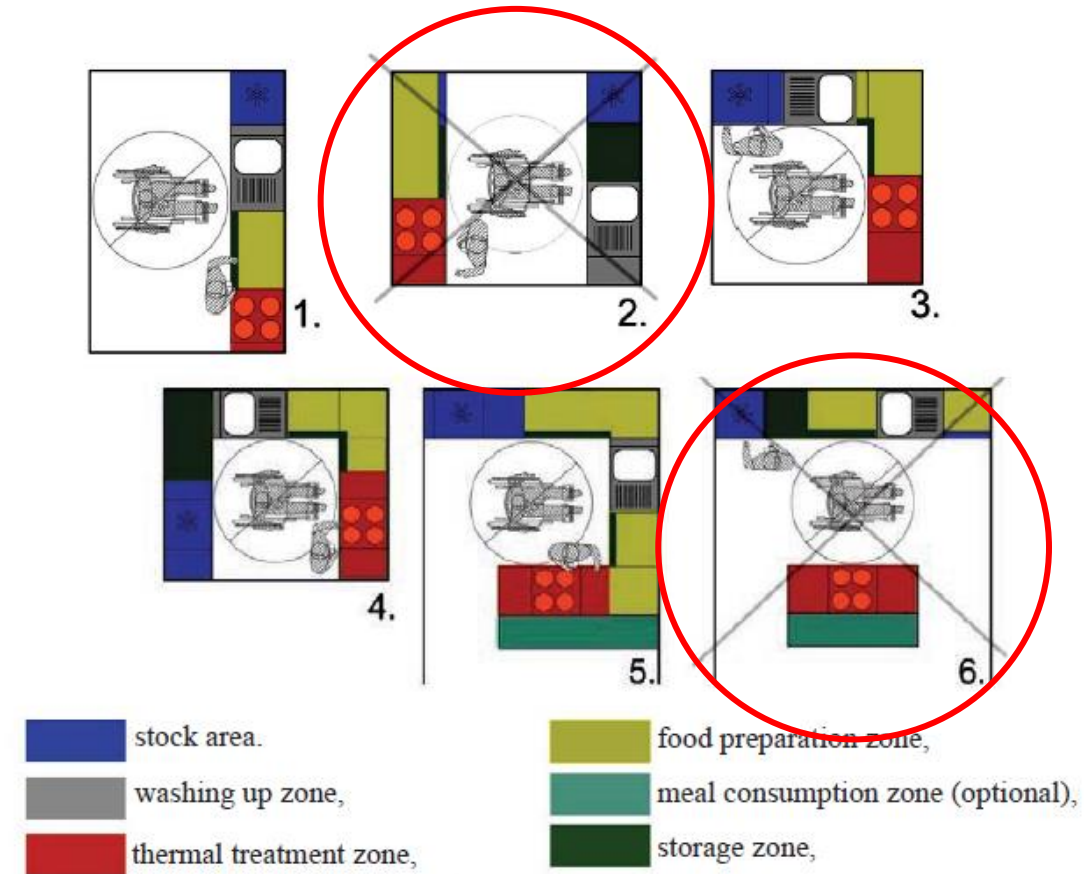
- Roll under sink and lever handle
- Roll-under cook top stove with front controls
- Remote control fan and light
- Dishwasher elevated



Home Modifications

Functional layout kitchen design¹²

- A. Optimum spatial layout
- B. Determination of functional zones and distances and the relations between the functional zones
- C. Ergonomics of accessibility zone levels in kitchen furniture
- D. Lateralization in designing working space
- E. Continuity of working surface and the concept of mobile surfaces.



Mobile Elevate Power Wheelchair



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Laundry



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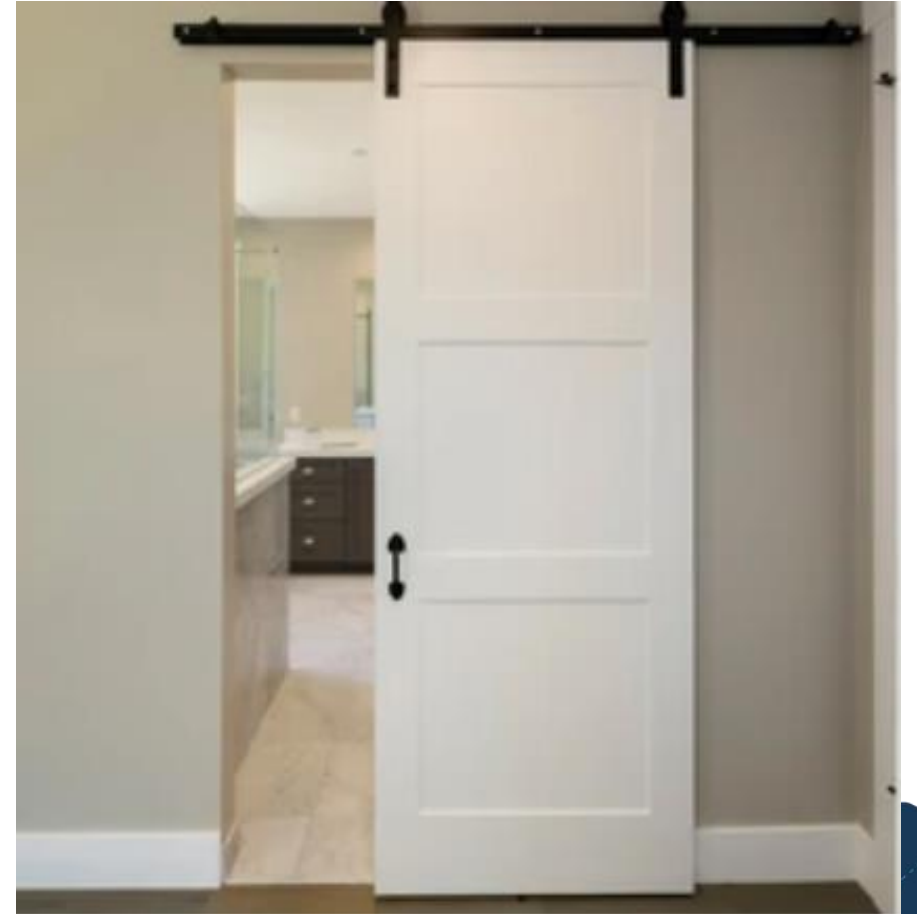
Appliances

- Washer/dryer
 - Front loading washers and dryers – on a bench at appropriate height¹³
 - Seat elevate feature on a PWC able to access top loading washing machine – do not need to change to front loader
 - Combination washer/dryer
 - Audible alarms for when the lint filter needs to be cleaned
- Trolley
- Clothes airer instead of washing line
- Lower clothesline
- Pull down clothing rod¹⁴



Home Modifications

- If the laundry is under the house for example and the person cannot access, consider relocation of the laundry (e.g. kitchen or a cupboard on the main floor of the house)
- Pocket door installation
 - Note cannot put grab rails onto wall
 - Difficult to retrofit to existing buildings
 - Can fit external barn door style
- Ensure sufficient turning space for mobility devices – consider can increase space with benchtops that user can roll under



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Outdoors

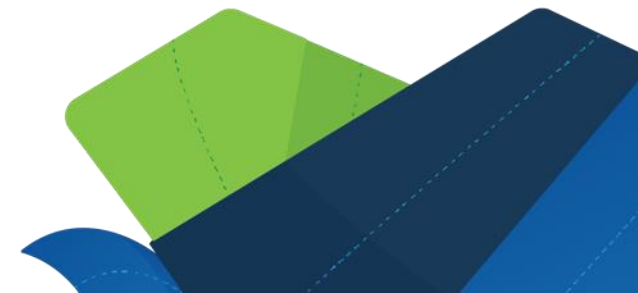
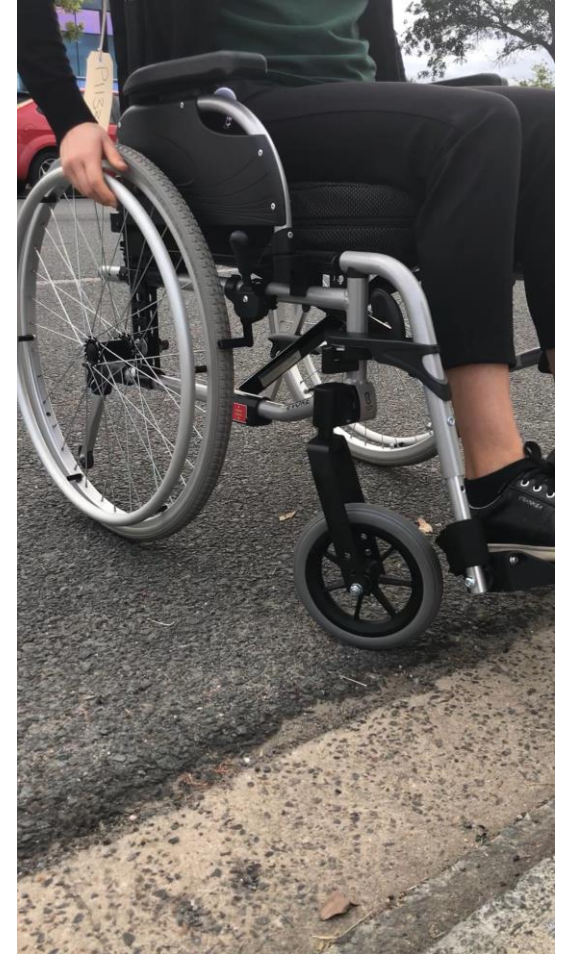


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Strategies

Mobility Aids

- Assess use of mobility aid on grass/inclines relevant to home environment and users activities
- Uneven surfaces
- Maintain access ways e.g. paths
- Remove obstacles e.g. hoses, garden tools
- Installation of retractable garden hose
- Consider tyre tread (pneumatic better grip but required pumping, solid lower maintenance compromise on grip)
- Consider caster and wheel size (smaller more difficult to manoeuvre over gutters but smoother on flat surfaces)



Strategies

Lawn mowers



Husqvarna robotic lawn mower



Tow n Mow Slasher



Gary Barnes - Outdoors

The Future of Assistive Robotics

- Study evaluating the opinions of providers of mobility AT to inform a research agenda and set priorities¹⁵

► IMPLICATIONS FOR REHABILITATION

- Research in advanced wheelchair design is needed to facilitate travel and environmental access with wheelchairs and to develop alternative power sources for wheelchairs.
- New assistive robotics and intelligent systems are needed to help wheelchairs overcome obstacles or self-adjust, assist wheelchair navigation in the community, assist caregivers and transfers, and aid ambulation.
- Innovations in human machine interfaces may help advance the control of mobility devices and robots with the brain, eye movements, facial gesture recognition or other systems.
- Development of new smart devices is needed for better control of the environment, monitoring activity and promoting healthy behaviours.



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AT on Telehealth



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Tools

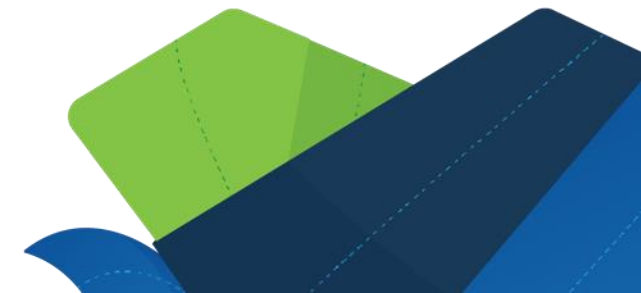
Apps for measuring

- NeoRehab
- Measure app (Apple) straight lines, dimensions
- Ruler (Android)
- Imagemeter (Android) still images
- Smart measure (Android) real time
- Photo app (Apple) angles
- Protractor (Android) angles

Previous MASS Webinar: [Telepractice Service Delivery for Assistive Technology](#)

Apps for annotating/dimensioning pictures

- Skitch (Android and Apple)
- Bosch Site measurement camera (Android only)
- Measure and Sketch (Android Only)
- Photo Measures Lite (Android and Apple)



Contacts

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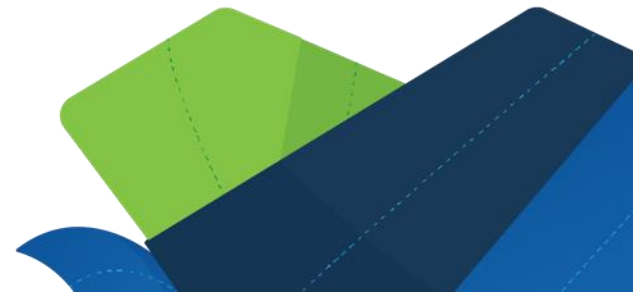
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MASS Education

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Thank you



Questions



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