

Mounting assistive technology to wheelchairs: challenges for service providers

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Summary

This paper considers the challenges that exist when mounting electronic assistive technology to wheelchairs, and the measures that should be in place to maximise the safety of systems. We measure the impact that adding the assistive technology has on the static stability of the wheelchair.

Aims & Objectives

The aim of this paper is to describe the development of best practice guidelines being developed by a group of experts in assistive technology provision, but specifically the work we have carried out with a load cell system to investigate the actual impact mounting assistive technology has on the position of the centre of gravity of the system, and therefore the static stability of the wheelchair.

Background

With the increase in funding of specialist augmentative and alternative communication (AAC) services, the number of devices mounted to wheelchairs is likely to increase. This could pose challenges and concerns for those services that provide manual and powered wheelchairs, but a range of measures should be in place to ensure the impact of these challenges is minimised.

There are 16 specialised AAC assessment hubs that are commissioned directly by NHS England to provide assessments and equipment for specialised communication needs. This will typically involve a full assessment, but could be an equipment-only provision where the client already has an existing device, or where skilled local services are already in place. An equipment-only provision could be for the mounting of an existing device to the client's wheelchair.

With a wide range of agencies involved in providing assistive technology, it can be difficult for the provider of the mobility base to know where the technology has come from, and the level of expertise of those fitting devices to the product they have supplied. In some cases, it may be difficult to identify where the equipment has come from at all.

This can cause issues when wheelchairs are reviewed, as it may be difficult to know how or where devices should be attached - if a wheelchair is changed for example, or seating has been reviewed.

The heaviest communication devices weigh almost 4kg and, with the mounting system weighing around 2kg, it can add a significant weight to a 20kg manual chair. The heaviest devices are typically eye gaze devices that may need to be positioned some distance in front of the user for optimum performance.

Historically a tilt test in many services has been used as a measure of safety when any modifications are made to the wheelchair, in particular when components, such as seating systems, are added. However, it may be that this is not a useful measure of safety, and it has been discouraged for a number of reasons by the Medicines & Healthcare products Regulatory Agency (MHRA).

We developed a bespoke load-cell based system that measured the weight of the wheelchair in a level, uphill and downhill position, both with and without the assistive technology in place. We used the measurements taken from the load cells to calculate the centre of gravity and predict the angle of tip in four directions. This measure was used to identify the impact on static stability, and is one component of the safety testing protocol to be used when mounting assistive technology.

Discussion

The data gathered showed that, while the addition of the assistive technology did change the position of the centre of gravity and have some impact on static stability, the effect was not significant. Other factors were felt to have greater impact.

Stability testing with a pass/fail criteria may not be a useful measure of safety at all. In any case many wheelchair manufacturers recommend a maximum gradient that is significantly less than the angles typically tested in a tilt test.

While the impact on static stability was not great, it may change the performance of the wheelchair in other areas. It could have an effect on the braking performance of powered wheelchairs (in particular braking in a downhill direction) and change how much force is required by carers to balance the load when kerb-climbing or tilting the system. These are factors that would not be captured in a tilt test, but should be identified in the safety testing protocol described, and in the wheelchair risk assessment and mounting process (WRAMP) documentation.

References

BSI (2014) BSI ISO 7176-1:2014 Wheelchairs Part 1: Determination of static stability