A tool for upper limb rehabilitation

Recovery of function in the affected arm and hand typically receives little attention in early stroke rehabilitation, which focuses instead on the retraining of standing balance and walking. It is estimated up to 60% of stroke patients do not achieve adequate upper limb function with current interventions [1], which impacts on long term independence, quality of life and cost of care. Furthermore, a recent systematic review of observational studies [2] found that, particularly in stroke patients 0-14 days post stroke, most of their day is spent inactive (median 48.1%). Nevertheless it is not always possible to increase exercise practice time and compliance, due to time and staff constraints, or due to inability or lack of motivation of patients to exercise.

Computer game devices, which can provide a stimulating and engaging option, are able to fill this gap effectively [3], often with a minimum of supervision [4,5], and they can also easily be combined with conventional rehabilitation. Reinthal et al. [6] observed clinically significant benefits for chronic stroke patients from less than 9 hours of guided computer gaming.

The ableX device, in combination with the ableX therapy games, is a versatile rehabilitation tool that has been shown to be effective in providing repetitive, intense and engaging exercise that improves upper limb function [7]. It can be used as an adjunct to conventional clinical rehabilitation, and accompany the discharged patient into outpatient or home care for independent use.

Foundation principles

Neural plasticity continues to be a focus of research into post-stroke recovery. Targeted rehabilitation has been observed to promote changes in the brain that support recovery and motor relearning. This training must be intensive, repetitive, challenging and demand a patient’s attention [8,9]. Intensive bilateral training, where both arms move together, can promote re-activation in the lesioned hemisphere and is associated with improvements in chronic stroke patients’ upper limb function [9,10].

Studies of animals after stroke [11] suggest that the levels of exercise required to generate functional neuroplastic change are far higher than the average 32 repetitions per session of conventional therapy recorded by Lang [12]. A meta-analysis of 17 RCTs on the effects of augmented exercise therapy time found that at least 16 hours of additional exercise was required beyond background (control) therapy to effect significant improvement in Activities of Daily Living [13]. Indications are that such rehabilitation is more effective if supplied earlier after stroke.
Clinical evidence for the ableX system

1. A pilot study [7] of 14 participants post-stroke, who completed 8-10 sessions of no longer than an hour each over 2½wks, showed a statistically significant improvement in their arm function by an average of 4.2 points on the Fugl Meyer scale (p<0.001; 95% CI: 1.81 – 6.66). The same study found ableX generates an estimated 500 to 800 upper limb movement repetitions during a standard 45 to 60 minute session. No participant deteriorated as a result of using the ableX.

2. Stroke survivors are well motivated to use the ableX independently or with minimal supervision in the home. A study showed that patients engage in over 30 hours of practice over an 8 week period [14].

3. ableX may also produce secondary benefits: Hale et al [15] found that participants who played hand-held computer games with the ableX not only improved their upper limb function, but they also perceived benefits in concentration, coordination and balance. All participants enjoyed using the ableX.

Impact on rehabilitation practice

Healthcare providers and care teams are under pressure to make ever-better use of contact time and adopt tools which can both accelerate patient recovery and improve clinical productivity. The ableX system integrates readily into routine workflows using existing staff in a range of settings from acute inpatient to community and self-care.

A standard ableX intervention of 45-60 minutes per session aligns with current clinical recommendations for stroke. Effectiveness will be optimised by a therapist assessment to guide the choice of exercises, following which most patients become self-directed within a few sessions. This offers the potential to significantly improve clinical productivity.

Stroke recovery is a long-term process which begins in hospital and continues long after discharge. ableX is designed specifically for stroke and brain injuries, catering for a wide range of abilities through an extended recovery journey.

- ableX is easy to install and use, with oversized icons, cursor and text. Game design is simple to avoid confusion and frustration, yet still provides enough challenge for users to benefit [7].

- Each game provides a progression of repeated movements at an intensity controlled by the therapist or user. The games address the key motivations for patient compliance [5,6], gradually developing in difficulty, and requiring greater accuracy, concentration and speed.

- The ableX device can be used in a number of different ways, to progressively improve range of movement in multiple joints, strength, fine motor skills, and finger function. Patients with no movement in the affected arm have recovered function with the ableX.
- Patients quickly become self-directed and require minimal to no supervision, making efficient use of nursing and aid staff, and encouraging positive recovery habits.

- Feedback is automatically provided to patients during training. Data showing activity time (adherence), intensity and progress are easily accessible to the therapist.

- Training, programme design and prescription support is available to assist optimal use.

The ableX system is developed and supplied by Im-Able Limited. It is authorised for sale as a Class I medical device throughout the EU, Australia, New Zealand, USA and Korea. We have representatives in UK, China (Beijing), Hong Kong, Singapore and Greece.

Visit our website [www.imable.com](http://www.imable.com) to find out more, or email info@im-able.com. A full list of publications is available on request.

References