Cognitive support technology – the missing link in assistive technologies?

Summary. The main thrust of Telecare and other electronic assistive technologies has been risk management with the objective of keeping older people and people with long term conditions at home for as long as possible. However, there is another aspect of independence which is to be able to do things for oneself. A large proportion of the cost of care is addressing this and can be as much a barrier to living independently as the risk factors themselves. This has been addressed for some physical disabilities by techniques such as Environmental Control but until recently there has been little to support people with cognitive deficits. This paper examines some of the techniques that are being developed and gives some examples of their use.

Background

Reduced executive function is a common feature of a number of conditions, learning disability and acquired brain injury being among them. The lack of ability to initiate, schedule, sequence and make decisions makes everyday life difficult and even the simplest tasks impossible without intensive supervision.

This supervision makes support for these individuals very time consuming and expensive. It also is frustrating for the individual who will often want to lead as normal a life as possible with the ability to do things for themselves at home and to be gainfully employed.

This is where Cognitive Support Technologies come in. They provide support for executive function in the same way that environmental control systems provide support for people with physical disability. They can help with the activities of daily living, the work environment and now with travelling.

The Systems use the consistency and repetition possible from automated systems to maximise learning while keeping a high level of individualisation and involvement of the user.
The careful use of technology can let support workers stand back while maintaining contact in case of difficulty.
The software can be roughly divided into four categories, simplifying complex systems, scheduling, task prompting, communications and travel support.

Scheduling

Scheduling software helps people with impaired executive skills to live more independently. By having their daily schedule on a PDA (personal digital assistant) they can be reminded of events reducing the need for supervision and the PDA can be taken with them wherever they go.

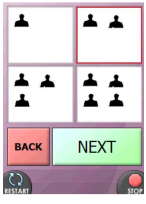
It uses a combination of pictures and spoken words to remind someone to do something, ideal if they have limited literacy. The pictures can be

Task Prompting

Task Prompting programs help people who find sequencing difficult. They can be used on PDAs or PCs and provide individualised, step by step instructions for tasks at home or in the workplace using a combination of images and spoken instructions.

The instructions use photographs of the user doing the task in the actual location and recordings of a familiar voice.

As instructions are repeated consistently each time the learning process is optimised and the instruction set can be reduced over time



A key feature is the ability to provide decision support. By offering choices in a visual form, the instructions can take into account different situations. For example in the task shown above, to make a pot of coffee, the user may be asked to choose how many people wanted coffee by choosing the number on the screen.

Once a choice has been made subsequent instructions reflect that choice by altering the amount of water and coffee used.

Case Study

Alan is married and has a young son. One day when playing with him he fell off his son's bike and sustained a serious head injury. This has left him with problems with sequencing tasks and multitasking.

Neuropsychological testing showed significant difficulties with delayed memory, particularly for complex information; his non-verbal memory and processing speed were also impaired.

Alan initially presented with anxiety and irritability once home due to his difficulty with memory of new people, places and information.

Before his accident Alan was a chef in a busy restaurant but found he was unable to cook, even at home, as he could not remember what stage he was at even if he was trying to follow a written recipe.

He was given a PDA with Task Prompting software. Alan is very computer literate and with a little training he felt he could manage to set up his own tasks.

After a couple of weeks the Rehab team got a phone call from his wife telling them that he had just cooked Sunday lunch for the family for the first time since the accident.

10 months on, Alan continues to use his PDA to remind him of appointments, take his medication, cook family meals, and find his way around local areas.

He will shortly take up some voluntary work and start a college course on computing.

Communications

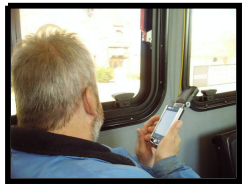
The ability to communicate using technology such as e-mail and mobile phones is problematic for many people with cognitive impairment. However cognitive support software is beginning to provide solutions that make these accessible.

An example is an accessible e-mail package which does not need reading or typing skills to operate. It has a pictorial address book and the user can select the recipient by selecting their picture. The system then prompts the user to record a voice message. This can be of fixed length or as long as the user wants. This is automatically attached to an e-mail and sent to the recipient. If there is an incoming message which is a normal text e-mail, then a voice synthesiser is used to read the message to the user. Incoming mails can be restricted to the people in the address book and are displayed along with the picture of the sender.

There is also a mobile phone application which uses a picture based phone book. Voice prompts reinforce the process. Incoming calls can be limited to people in the address book and are announced by a picture of the caller and a voice prompt. The system also helps those with limited digital dexterity who find normal mobile phones difficult to use.

Travelling

The latest development is to use a GPS enabled phone or PDA to produce prompts to help someone travel independently. By using the GPS data prompts and directions are given



which relate to the location of the user. So, for instance, if the user is on a bus, they will be told when to ring the bell for the correct stop. After leaving the bus they will be shown a photograph of the direction they have to walk. The system can also be linked to an emergency location service so that the user can be located if they get lost.

The examples used in this paper use cognitive support software from AbleLink Technologies a US Company which has specialised in developing computer systems for people with cognitive problems. The software is research based and there is published evidence for its effectiveness.

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