

Brain Commentary

The cost to see the Wizard: buy-ins and trade-offs in neurological rehabilitation

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The key challenge in cognitive rehabilitation is ensuring that patients receive a large enough dose of the right type of therapy at the right time to optimise recovery (Doogan *et al.*, 2018). Noting—as others have done before them—that the amounts of rehabilitation completed by patients often fall “dramatically short of those required for successful recovery”, Studer and colleagues decided to try a new approach, in the form of a decision-neuroscientific intervention. Specifically, they asked patients to commit to therapy time by accepting, in advance, restrictions on alternative activities available to them (Studer *et al.*, 2021).

This contractual approach is motivated by economic field research which shows that when people have to choose between something that is good for them but less enjoyable than other alternatives, they are more likely to pick the ‘healthy’ option if they publicly commit upfront. This is the ‘Strictly Come Dancing effect’, where the amateur contestants forgo time with their families—an opportunity cost—which in turn increases the subjective value of the difficult task ahead: learning to tango. By introducing an opportunity cost that explicitly increases the value of engaging in neuro-rehabilitation, Studer *et al.* hoped to increase both time-on-task and practice-based outcomes.

In their study, in-patients with visuospatial memory impairments caused by stroke were randomised into a precommitment group or a control group. Both groups received an e-therapy, the ‘Wizard’ memory game, which has been shown to improve visuospatial working memory performance in patients with schizophrenia (Sahakian *et al.*, 2015). The precommitment group were given a choice between two different options to increase compliance: they could either restrict visitors and instead use their visiting time to do the therapy, or they could choose to be reported to the treating physician whenever they failed to reach their agreed targets (only one person chose the latter).

The precommitment group trained on the Wizard game more frequently than the control group (on average every second day compared to every fifth day over a two-week period), notched up more total minutes of practice (90 minutes compared to 33 minutes) and made greater improvements on tests of both visuospatial memory and verbal memory. In short, it worked.

Precommitment is defined by the authors as “a strategy where agents voluntarily modify their own choice ahead of time with the aim to increase the likelihood of a target action”. In many rehabilitation

units the therapists timetable interventions around their own availability and the need to fulfil obligations to see other patients for a certain amount of time every day (in the UK, the golden 45 minutes). Studer *et al.*'s precommitment group were given the opportunity to exert some control over and thus self-manage their rehabilitation. They got to make a choice about when and indeed if they were going to do the Wizard therapy, thus enabling autonomy.

Studer and colleagues argue that if we reduce the availability of attractive and less effortful activities, then adherence to rehabilitation becomes more likely. But is this the right approach in an in-patient rehabilitation setting? And will it be sustainable when patients go home? We know from studies in this area that in-patient rehabilitation can be an inactive and lonely process (Bernhardt *et al.*, 2004). Therefore, perhaps having to sacrifice time with visitors is not the optimal or even the most sensible alternative, as there is a strong evidence base for the role of social support in recovery and defending against low mood. Indeed an important part of rehabilitation is helping patients to redefine and reconnect with important core relationships. Perhaps these sorts of trade-off are more reasonable in the busy, post-discharge, real world where recovering patients have many more distractions clamouring for their attention.

Getting patients to realise that practice-based therapies require a time commitment and asking them to trade their social time for therapy time is one way of addressing the cost/value trade-off, but are there others? Can we make the e-therapy itself more highly valued? One approach has been to utilise gamification techniques to make the repetitive nature of much e-therapy more rewarding, including (but not limited to): gameplay (interspersing therapy time with game time as well as turning therapy trials into games), unlockable achievements, level progression, story arc, use of non-player characters and giving patients agency by allowing them to choose which items to practice on (e.g. Listen-In and iReadMore: <https://www.ucl.ac.uk/icn/research/research-groups/neurotherapeutics/therapy-apps>). All of these aim to increase time on task, which itself can be motivational, with the number of daily hours logged as well as total therapy time being fed back to users.

Through these processes of gamification, effort (time on task) is rewarded rather than achievement (improved scores on outcome measures), even though the latter is the aim. Clinical trials have shown this approach to be effective both in small-scale phase II trials (Woodhead *et al.*, 2018; Fleming *et al.*, 2020) and in phase III 'public-release' studies (Woodhead *et al.*, 2015; Szalados *et al.*, 2020). If patients are aware that they are indeed improving, then a further form of endogenous motivation can be harnessed, which is why there is a mechanism whereby patients can track their own outcome scores across time.

The increase in total therapy dose time in Studer *et al.*'s study is modest and nowhere near that usually required to produce functional gains. But this shouldn't detract from what is a crucial point in neurological rehabilitation: how can we best encourage patients to engage in practice-based therapy? Therapists are generally very good at motivating patients, but given their relative paucity and the multiple claims on their time (Clarke *et al.*, 2018), we need to be creative and employ a range of strategies to help patients achieve levels of compliance that will lead to functional improvements.

Some patients do not seem to need much motivation and are able to 'just get on with it', training alone or in a semi-supervised manner (Dorsch *et al.*, 2019). But this is likely to be more challenging for those with cognitive impairments. Using decision neuroscience methods to find ways of solving this problem is an approach worth pursuing, alongside other initiatives that increase patient buy-in and thus agency. These include making sure that patients understand what has happened to them and why certain therapeutic approaches are used, as well as involving patients in timetabling and offering them increased choice. In-patient units that undergo patient-focused reorganisation of therapists' working practices deliver higher doses of therapy than those that do not (Clarke *et al.*, 2018).

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