

The neglected role of reward in rehabilitation

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Why do we do what we do, day to day? Getting up on dark winter mornings, sitting through tedious meetings, and doing all the rest of these things that are part of the grind of everyday life? Sheer habit plays a part, but habits tend not to continue indefinitely unless there is some reinforcement from time to time. The monthly pay cheque is one example, but professional successes and the recognition and status that go with them are also effective, among other things.

When someone suffers damage to the brain, whether through trauma or disease, many things happen to them, but perhaps among the less recognised are the loss of rewards in their lives: jobs evaporate, social and leisure activities are curtailed, and relationships—sometimes even with those closest—are diminished or even lost. This creates an enormous challenge for motivating patients to engage in the day-to-day grind—some have simply lost the crucial motivating rewards to spur them on.

If people go to hospital for treatment (likely in sudden onset problems, like traumatic brain injury and stroke, less likely for insidious onset disorders like, schizophrenia or Alzheimer's disease), then the moral-boosting social rewards offered by professional therapists and staff can replace some of these natural motivators, and spur patients on to efforts of practice and learning that help their brains reorganise, and for new adaptive behaviour patterns to emerge. This is true even in progressive degenerative conditions such as Alzheimer's disease.¹

It is, however, difficult to maintain the intensity or frequency of such reinforcers once people return home, and so, the motivation for them to continue the arduous, continuous practice and learning of new skills to build their independence often diminishes in the medium term, unless new reinforcers can be found. The risk then arises of a lack of progress through insufficient stimulative input to the brain at best, or a deterioration at worse. A stimulating environment, particularly with some novelty built into it, can trigger increased release of optimal levels of the neurotransmitter, noradrenaline, which has both neuromodulating and neuroprotective effects in optimal doses.²

The role of reinforcements and motivation tend to be somewhat neglected in rehabilitation, understandably enough, given the difficulty in controlling credible levels of truly motivating natural reinforcers in peoples' lives. Measurement of motivation, clinically, is also a problem, and is at quite primitive levels in routine practice compared with the relative precision with which we can now measure cognitive and even emotional functions.

For many decades, psychological science was dominated by research on motivation and its effects on learning, exemplified by the work of Clark Hull and BF Skinner, but then the cognitive revolution of the fifties and sixties relegated this work to a relative unfashionable obscurity from which it is only now beginning to recover, thanks largely to the role of brain imaging which is now able to pinpoint the brain's reward systems at work with as much precision as it can for cognitive systems.³

Unilateral spatial neglect is a significant clinical problem which greatly impairs recovery of daily function following stroke usually affecting multiple regions of the right hemisphere. The focus on neglect rehabilitation has been largely cognitive, or motoric, in orientation, with very little focus on the role of reward and motivation; but research in health and human attention has shown that rewarded targets result in enhanced attentional processing.^{4, 5}

Now Malhotra and colleagues⁶ have shown that some individuals suffering from unilateral neglect show a significant enhancement in their attention to the neglected side when they were rewarded with money for correct performance. Importantly, the individuals who did not respond had suffered damage to the striatum, which is known to be a key structure in mediating reward.⁷

Malhotra and colleagues acknowledge that there could be a number of different processes underlying this improvement, including increased arousal, but suggest that measuring the change in behaviour in response to reward could be an important assessment tool that may lead to better selection of treatments, both pharmacological and behavioural. Rehabilitation of all brain disorders will likely benefit if the great advances in understanding reward and motivation that have been made in cognitive neuroscience can now be translated, and Malhotra *et al's* paper is an excellent first step.

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