Chapter 3.10
Cognition Meets Assistive Technology:
Insights from Load Theory of Selective Attention

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ABSTRACT

This chapter deals with the issue of treating disorders with the help of virtual reality (VR) technology. To this end, it highlights the concept of transdiagnostic processes (like cognitive biases and perceptual processes) that need to be targeted for intervention and are at the risk of becoming atypical across disorders. There have been previous theoretical attempts to explain such common processes, but such theoretical exercises have not been conducted with a rehabilitative focus. Therefore, this chapter urges greater cooperation between researchers and therapists and stresses the intimate links between cognitive and emotional functioning that should be targeted for intervention. This chapter concludes by providing future directions for helping VR to become a popular tool and highlights issues in three different areas: (a) clinical, (b) social and (c) technological. Coordinated research efforts orchestrated in these directions will be beneficial for an understanding of cognitive architecture and rehabilitation alike.

INTRODUCTION

This chapter will begin with background on the concept of cognitive rehabilitation and will serve to illustrate a recently successful popular example of it. It will then describe cognitive models that explain cognitive and emotional functioning and how these could give rise to disorders. A major focus of the chapter is to highlight the manner in which various disorders could be treated in a similar manner and how technology could aid this process—bringing in the concept of trans-diagnostic approach—the basic tenet of which is to emphasize that the processes that serve to maintain disorders cut across these disorders and hence could be dealt with a single appropriately built technology. Though there has not been much research in this direction because therapists prefer to specialize in particular treatment approaches and disorders, this kind of work has picked up momentum (due to the recent scientific focus on an interdisciplinary framework). This chapter will make an initial attempt in this direction by describing how cognitive theories could be applied in understanding the transdiagnostic processes like attentional biases and perceptual processing.

This chapter will also attempt to describe the merger of cognitive architecture, specially the transdiagnostic processes and recent rehabilitative tools. Since there remains much work to be done in this direction, this chapter will highlight the areas that require much needed research attention, and at the same time, will provide future directions for embarking upon this process. This chapter will provide an important resource for understanding the transdiagnostic process in terms of assistive technology to psychologists, cognitive scientists, teachers, parents, students of psychology, neuroscientists and rehabilitation professionals.

BACKGROUND

Cognitive Rehabilitation

The aim of rehabilitation is to maintain an optimal level of functioning in domains like physical, social and psychological (McLellan, 1991). Therefore, a rehabilitation program is designed for a particular individual and is conducted over a period of time based on the nature of impairment. The basic goal is not to enhance performance on a set of standardized cognitive tasks, but instead to improve functioning in the day-to-day context (Wilson, 1997). Models of cognitive rehabilitation stress the need to address cognitive and emotional difficulties in an integrated manner and not as isolated domains (Prigatano, 1999). Therefore, cognitive training could be of immense help in this endeavor. Cognitive tasks could thus be designed to deal with cognitive functions like memory, attention, language, and so on, and the level of difficulty could also be varied to suit individual specification (Clare & Woods, 2004).

Techniques for Cognitive Rehabilitation

An exciting new development in the field of cognitive rehabilitation is the use of virtual reality (VR). Virtual environments (VE) could be built by keeping in mind the needs of the individual. Examples include presenting a specific number of stimuli to an autistic child that can be gradually increased as the treatment progresses (Max & Burke, 1997) or virtual wheelchair training for people afflicted by physical disabilities (Stephenson, 1995). Schultheis and Rizzo (2001) define VR for behavioral sciences as, "an advanced form of human-computer interface that allows the user to interact with and become immersed in a computer-generated environment in a naturalistic fashion."

Virtual reality could also be viewed as an excellent example of assistive technology (AT) because it can be used to build upon the existing strengths

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