

Habituation to virtual simulation sickness when volunteers are tested at weekly intervals

Stacy A. Clemes and Peter A. Howarth
Visual Ergonomics Research Group (VISERG)
Loughborough University, UK

Abstract

During immersion in virtual environments people often experience unpleasant symptoms resembling those of motion sickness. As with true motion, repeated exposures to a nauseogenic virtual environment will usually result in habituation. For true motion, habituation is impeded if the inter-session interval is longer than one week, however the maximum interval between immersions in a virtual environment for habituation to still occur is unknown. The present study examined symptom reports collected from 80 participants who were immersed, at weekly intervals, in a nauseogenic virtual environment on five occasions. Habituation, seen as both a reduction in symptom reports and an increase in symptom onset time, occurred consistently over the first four weeks ($p < 0.01$). These findings do not mirror the accepted habituation response to true motion, and suggest that the habituation process which occurs with the appearance of motion differs from that which occurs in response to true motion.

Introduction

Since the introduction of immersive virtual reality (VR) equipment, a number of studies have found that users can experience unpleasant side effects. The major focus of VR research and development has been on head-mounted display (HMD) based systems. Incorporation of an HMD provides the user with a sensation of immersion and presence in the virtual environment (VE) and it has been these systems that have attracted the most attention over the last ten years (see Stanney, 2002).

One of the most important health and safety concerns associated with the use of immersive VR is VR-induced sickness. The symptoms experienced by users resemble those of motion sickness and have been referred to as virtual simulation sickness (VSS) (Howarth and Costello, 1996). Indeed, VSS appears to be a form of visually-induced motion sickness associated with the occurrence ofvection (an illusion of self motion) (Hettinger and Riccio, 1992).

When people are repeatedly exposed to provocative motion, in the real world, a reduction in motion-induced sickness is almost always reported. It is believed that repeated exposures result in new sensory patterns being incorporated into a neural