Title: Applying the state of the art in research and technology to train auditory processing with engaging computer games

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Abstract: The study of auditory processing after mild traumatic brain injury (mTBI) has progressed substantially in the past five years, with multiple laboratories confirming the risk to auditory function associated with both military and civilian blunt trauma injuries. The hidden nature of these injuries is due to two main factors. The first is the limited number of clinical approaches that can effectively diagnose hearing deficits in the presence of normal ability to detect pure tones in a quiet environment. The second is the general belief that blunt trauma to the head only results in long-term impairment if injury to the brain is visible on medical images. Even if the auditory dysfunction of these patients is diagnosed, however, there is little evidence for effective rehabilitation. Current clinical approaches focus on hearing aids, which are expensive and are lacking in evidence (or theory) for their effectiveness, and, to a lesser extent, auditory training.

There are two key reasons why auditory training lacks evidence of effectiveness and deployment as a rehabilitation strategy. First, none of the available approaches are based on the state-of-the-art research either in auditory neuroscience or in perceptual learning. Second, patients are reluctant to comply with training procedures that are often frustrating and boring. These issues are easily surmountable. This presentation will discuss the 1) the studies in the areas of auditory neuroscience and psychoacoustics that have advanced our understanding of the function of auditory processes beyond the cochlea, 2) the studies of perceptual learning that have advanced our understanding of plasticity in the neural systems underlying hearing and have refined behavioral procedures that engage these systems, and 3) the advances in commercial video games that, shaped by market forces, have become not only become ubiquitous, inexpensive, and sophisticated, but both perceptually engaging (rich graphics, sounds, and animations) and cognitively challenging. We believe that these three factors can be brought to bear on the issues facing patients with mTBI (and a host of other diseases) in such a way that we can help to usher in a new era of behavioral cognitive therapies that change the functioning of the brain in ways that lead to more successful real-world functioning and encourage compliance by being compelling, stimulating, and fun.