

487 Emerging Neurotherapeutic Technologies

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INTRODUCTION

Neurotherapeutic technologies represent a diverse group of very promising treatment approaches with a common purpose of improving neurologic function. Decades of basic science research have paved the path for these novel technologies that have the potential to transform the lives of patients with neurologic diseases. A key goal is to minimize the consequences of lost abilities, whether they are motor, sensory, or cognitive. A common objective is to also harness the inherent plasticity of the nervous system, regardless of age, and even in the face of a degenerative process.

The technologies described below are the culmination of both an increased understanding of neural plasticity mechanisms in both the intact and the injured nervous system as well as advances in technology and computational power. There has been important progress in understanding neural plasticity at the level of the microscale (e.g., cellular and molecular processes), the mesoscale (e.g., between distinct cortical and subcortical areas), and the macroscale (e.g., at the level of brain networks). While it is also clear that there may be fundamental limits on plasticity—the closing of developmental windows—and repair mechanisms, the brain remains highly plastic regardless of age and even in the face of ongoing injury and/or degenerative processes. Collectively, there is now growing evidence to support neurologic restorative efforts for both “static” (e.g., stroke) and progressive neurologic disorders.

These technologies may not appear, at first glance, directly relevant to traditional medical care, but it is worth noting that clinicians have the most knowledge and experience about the specific disease process, the treatments available, and the expected course of illnesses affecting the nervous system. It is thus critical that neurologic specialists and other clinicians play an important role in the future adoption of these technologies for neurologic