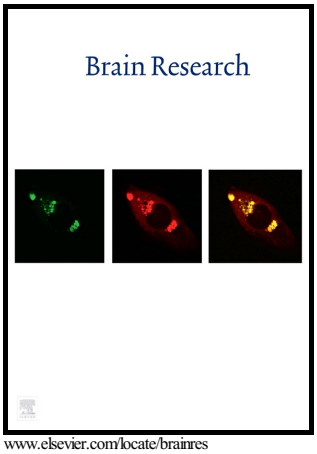

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Mental and Physical Skill Training Increases Neurogenesis via Cell Survival in the Adolescent Hippocampus

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Abstract

The adolescent hippocampus produces approximately 7,000-10,000 new neurons each day, although many of the new cells die within weeks of their generation. Learning new skills can increase their survival. The present study tested the effects of physical skill training on the survival of these newly generated cells in males and female rodents during puberty. Newly generated cells were labeled with BrdU, a marker of cell mitosis, and training began one week later, just as the new cells begin to die. Significantly more BrdU-labeled cells were present in the hippocampus of both sexes after engaging in the physical training experiences. The young animals were able to maintain their balance throughout most of the trials of training and as a consequence expended considerable energy and endurance during each training trial. These data suggest that a combination of both mental and physical training skills can increase brain plasticity through increases in neurogenesis in the adolescent hippocampus.

Keywords: learning and memory; exercise; sex differences; hippocampus; neurogenesis; puberty

Introduction

Most young adults, especially adolescents enjoy learning new skills that require physical effort and training. It is assumed that engaging in these activities is beneficial for their normal growth and development but the benefits of these activities for brain health are less well described. It is well known that the adult brain as well as the adolescent brain continues to produce new neurons, most of which are produced in the dentate gyrus of the hippocampus. In previous studies, we determined that physical skill training in a rodent model of learning increased the survival of newly-generated neurons in the adult hippocampus, a brain region necessary for many types of learning (Beylin et al., 2001; Curlik and Shors, 2011; Shors et al.,