The hippocampus (Hc) is of great importance in various psychiatric diseases in adults, children and adolescents. Automated Hc segmentation has been widely used in adults, implying sufficient overlap with manual segmentation. However, estimation biases related to the Hc volume have been pointed out. This may particularly apply to children who show age-related Hc volume changes, thus, questioning the accuracy of automated Hc segmentation in this age group. The aim of this study was to compare manual segmentation with automated segmentation using the widely adopted FreeSurfer (FS) and MAGeT-Brain software. In 70 children and adolescents (5-16 years, mean age 10.6 years), T1-weighted images were acquired on one of two identical 3T scanners. Automated segmentation was performed using the FS subcortical segmentation, the FS hippocampal subfields segmentation and the MAGeT-Brain software. In comparison with manual segmentation, volume differences, Dice similarity coefficient (DSC), Bland-Altman plot, intraclass correlation coefficient (ICC) and left-right consistency of automated segmentation were calculated. The average percentage of volume differences (PVD) with manual segmentation was 56.8% for FS standard segmentation, 32.2% for FS subfield segmentation and -15.6% for MAGeT-Brain. The FS Hc subfields segmentation (left/right DSC = 0.86/0.87) and MAGeT-Brain (both hemispheres DSC = 0.91) resulted in a higher volume overlap with manual segmentation compared with the FS subcortical segmentation (DSC = 0.79/0.78). In children aged 5-10.5 years, MAGeT-Brain yielded the highest overlap (DSC = 0.92/0.93). Contrary volume estimation biases were detected in FS and MAGeT-Brain: FS showed larger volume overestimation in smaller Hc volumes, while MAGeT-Brain showed more pronounced volume underestimation in larger Hc volumes. While automated Hc segmentation using FS hippocampal subfields or MAGeT-Brain resulted in adequate volume overlap with manual segmentation, estimation biases compromised the reliability of automated procedures in children and adolescents [1)].

The hippocampus is one of the most interesting and studied brain regions because of its involvement in memory functions and its vulnerability in pathological conditions, such as neurodegenerative processes. In the recent years, the increasing availability of Magnetic Resonance Imaging (MRI) scanners that operate at ultra-high field (UHF), that is, with static magnetic field strength ≥7T, has opened new research perspectives. Compared to conventional high-field scanners, these systems can provide new contrasts, increased signal-to-noise ratio and higher spatial resolution, thus they may improve the visualization of very small structures of the brain, such as the hippocampal subfields. Studying the morphometry of the hippocampus is crucial in neuroimaging research because changes in volume and thickness of hippocampal subregions may be relevant in the early assessment of pathological cognitive decline and Alzheimer's Disease (AD). The present review provides an overview of the manual, semi-automated and fully automated methods that allow the assessment of hippocampal subfield morphometry at UHF MRI, focusing on the different hippocampal segmentation produced [2)].

1)
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