Background. Muscle condition, size and degeneration and their relationship with spinal disorders have become primary research questions in recent years. Quantifying such parameters requires the segmentation of the muscles in the images, which is very labour-intensive if performed manually and poses a practical limit to the number of investigated subjects. This study aimed at developing a deep learning-based tool able to fully automatically perform an accurate segmentation of the lumbar muscles in axial MRI, and at validating it on a dataset of prospectively acquired images of a group of healthy volunteers. Methods. A set of 60 axial MRI studies of the lumbar spine was retrospectively collected from a clinical database. Psoas major, quadratus lumborum, erector spinae, and multifidus were manually segmented by an expert operator in all available slices, using a published method as a reference. The dataset was used to train and validate a deep neural network able to segment muscles automatically, with an architecture derived from the U-Net and incorporating several modifications. Subsequently, the performance of the network was validated on images purposely acquired from 22 healthy volunteers. Results. The neural network provided excellent outputs from a qualitative point of view with no gross errors (Figure). The three-dimensional reconstruction of the shape of the paravertebral muscles showed realistic anatomies from a perceptual point of view, with smooth surfaces and limited artefacts (Figure). The Jaccard index for the individual paravertebral muscles calculated for the 22 subjects of the external validation set ranged between 0.862 and 0.935 with respect to the segmentations performed manually by an expert operator, demonstrating a generally excellent performance of the network. Cross-sectional area and fat fraction of the muscles were in agreement with published data; male subjects showed generally higher cross-sectional areas of all muscles with respect to females, while the fat fraction was larger in females than in males and generally increased with age. Conclusions. The validated deep neural network was able to perform the segmentation of the paravertebral muscles in axial MRI scans in an accurate and fully automated manner, and is therefore a suitable tool to perform large-scale studies in the field of spinal disorders and sarcopenia, overcoming the limitations of non-automated methods. Figure caption. Exemplary segmentations performed on axial T2-weighted slices of the lumbar spine showing the relative Jaccard index (“IoU”) (lef). Exemplary three-dimensional reconstruction of the paravertebral muscles of a healthy volunteer (right).