

## **Manual segmentation certification platform for the EADC-ADNI harmonized protocol for the hippocampal volumetry project**

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### **Background**

An effort has been undertaken by EADC and ADNI centers to develop a harmonized protocol for the manual segmentation of the hippocampus (HC) on MR scans ([www.hippocampal-protocol.net](http://www.hippocampal-protocol.net)). A small group of “master tracers” segmented a set of benchmark images according to the consensual definition of a Harmonized Protocol (HP). We implemented an interactive web system allowing protocol learning, segmentation training and qualification.

### **Methods**

To assess a new tracer's performance, we relied on three different metrics: (a) Total HC volumes: we calculated volumes stereologically. New tracers volumes can be compared to the average masters' volume on a pairwise basis; (b) Spatial overlap: for purposes of comparison, we calculated the Jaccard similarity index between the new tracers' contour and the mean masters' contour. The final statistic consists in the average Jaccard similarity index over all slices for a given HC; and (c) Spatial distance: to ensure further compliance with HP definitions, we required a distance metric to assess whether or not the new tracers espoused the same contour than defined by the masters. We computed a distance ratio map from Euclidean distance maps of the regions delimited by the masters' minimum, mean and maximum contours. From map, the distance ratio is interpolated for each point of the tracer contour, and a color assigned according to the distance ratio value in the contour plots, providing useful visual feedback to tracers ([Figure 1](#)).

### **Results**

Ten tracers from laboratories participating in the HP Project, completed three training rounds and qualification to date. Based on their progressive improvement and check for compliance with HP criteria, we estimated preliminary thresholds for qualification, namely: (a) tracer total volume for any hippocampi must fall within minimum and maximum masters' volumes; (b) minimum Jaccard similarity index for any hippocampus  $> 0.75$ ; (c) average Jaccard similarity index for all hippocampi  $> 80$ ; (d) maximum distance ratio summation for any hippocampus  $< 15$ ; and (e) average distance ratio summation for all hippocampi  $< 20$ .

### **Conclusions**

This study will enable fine-tuning of a web-platform for public learning and periodical certification of the ability of new tracers to segment the HC according to the HP.