

# **Harmonization of protocols for the manual tracing of the hippocampus - an EADC-ADNI joint effort**

## **AUTHOR-CERTIFIED PROTOCOL FEATURES AND TRACINGS**

**Malykhin NV, Bouchard TP, Ogilvie CJ, et al. Three-dimensional volumetric analysis and reconstruction of amygdala and hippocampal head, body and tail. Psychiatry Res 2007; 155: 155-65.**

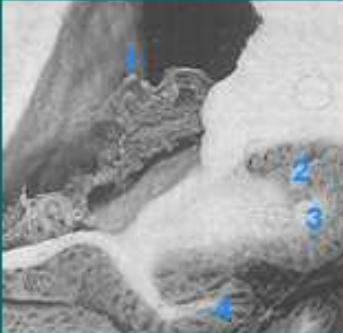
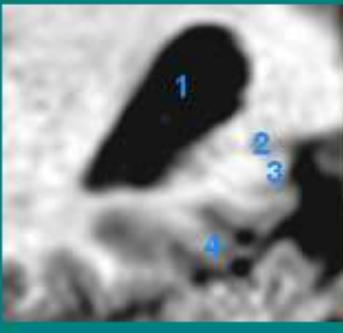
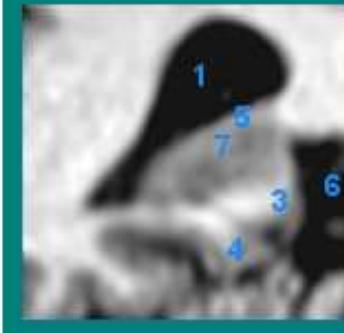
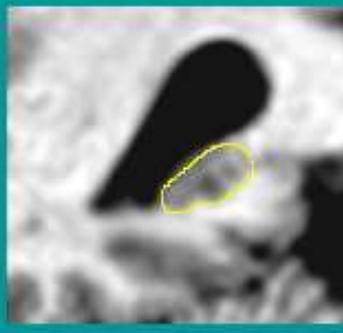
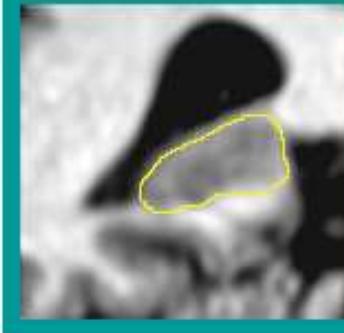
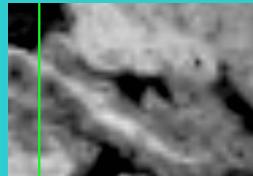
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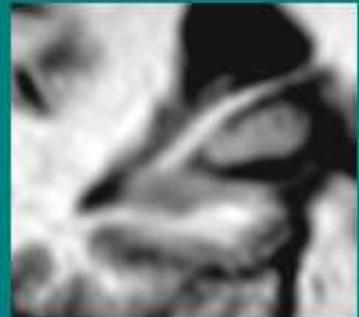
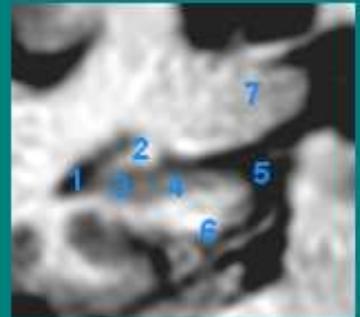
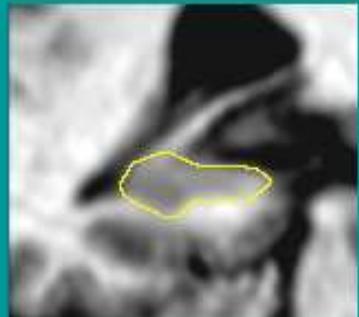
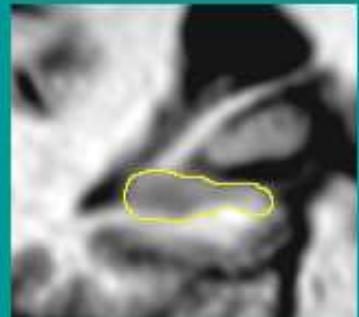
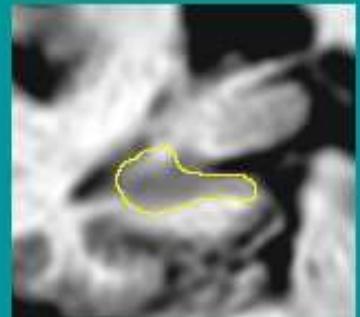
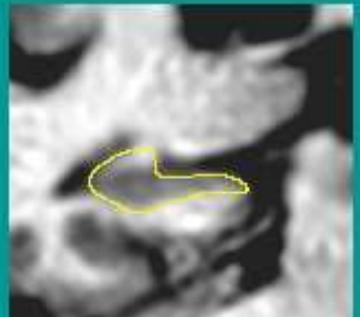
- 1) An excerpt of the Survey of anatomical landmarks according to Malykhin et al.'s criteria.
- 2)The hippocampal tracing on consecutive coronal slices of a 1.5T ADNI control subject (**2A**) and AD patient (**2B**).

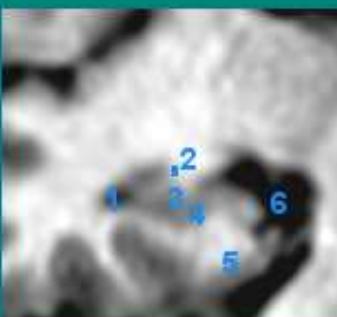
# 1) Excerpt of the Survey of the anatomical landmarks according to Malykhin et al.'s criteria.

Plane				
AC-PC line				
Start tracing				
from body to tail and from posterior part of the head to rostral part				
Areas explicitly included	Areas explicitly excluded	Most anterior slice	Most posterior slice	
subiculum, dentate gyrus, uncinate gyrus, fimbria, alveus	fornix, pulvinar of thalamus, choroid plexus, subsplenial gyrus, tail of the caudate nucleus	Along the anterior - posterior axis of hippocampus, level where the parahippocampal white matter becomes visible	Slice where an ovoid mass of gray matter started to appear inferomedially to the trigone of lateral ventricle	
BOUNDARIES				
HEAD	Lateral border	Inferior border	Medial border	Superior border
	temporal horn of the lateral ventricle/adjacent WM of temporal stem	WM of the parahippocampal gyrus	alveus/a oblique line following the same inclination of WM of PG connect the inferior part of the subiculum to the quadrigeminal cistern	alveus/temporal horn of lateral ventricle
BODY	temporal horn of the lateral ventricle/adjacent WM of temporal stem	WM of the parahippocampal gyrus	WM of parahippocampal gyrus/a oblique line following the same inclination of WM of PG connect the inferior part of the subiculum to the quadrigeminal cistern	fimbria/quadrigeminal cystern
TAIL	crus of fornix	WM of the parahippocampal gyrus	CSF of quadrigeminal cistern	crus of fornix/pulvinar of the thalamus

## 2A)CTRL

	113	112	111	110	109
Anatomical section					
Native MRI					
Tracing					
Notes	<p><u>Most posterior slice</u>: slice where an ovoid mass of gray matter started to appear inferomedially to the trigone of lateral ventricle</p>  <p>Sagittal view</p>	<p>1=atrium of the lateral ventricle 2=cornu Ammonis (subsplenial gyrus) 3=isthmus 4=parahippocampal gyrus</p>		<p>1=atrium of the lateral ventricle 3=isthmus 4=parahippocampal gyrus 5=crus of fornix 6=CSF of quadrigeminal cistern 7=hippocampal tail, gyrus dentatus</p>	

2A)CTRL	108	107	106	105	104
Anatomical section					
Native MRI					
Tracing					
Notes				<p>1=atrium of the lateral ventricle      2=fimbria (included in the tracing)      3=gyrus dentatus      4=subiculum      5=CSF of ambient cistern      6=parahippocampal gyrus      7=pulvinar</p>	

2A)CTRL	103	102	101	100	99
Anatomical section					
Native MRI					
Tracing					
Notes		MEDIAL BORDER: a line outlining the contour of white matter of parahippocampal gyrus. If the superior border of the WM of parahippocampal gyrus is not a horizontal line, a oblique line following the same inclination of WM of PG connecting the subiculum to the quarigeminal cistern was used.	1= temporal horn of lateral ventricle 2=fimbria (included) 3=gyrus dentatus 4=subiculum 5= parahippocampal gyrus 6=CSF of quadrigeminal cistern	As for the comment you made during the TC regarding the partial volume, we analysed the image by exploring it in 3D. We believe that the choroid plexus is above the alveus.	

2A)CTRL

	98	97	96	95	94
Anatomical section					
Native MRI					
Tracing					
Notes					

2A)CTRL

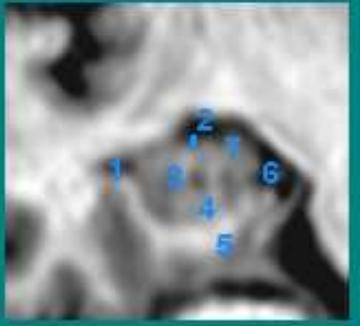
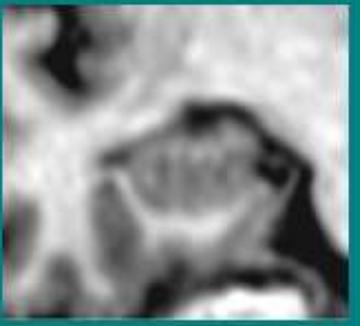
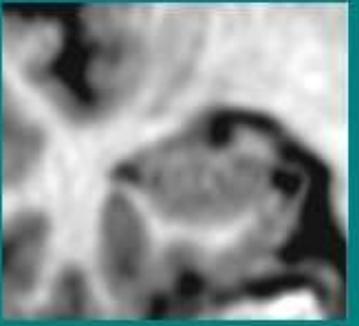
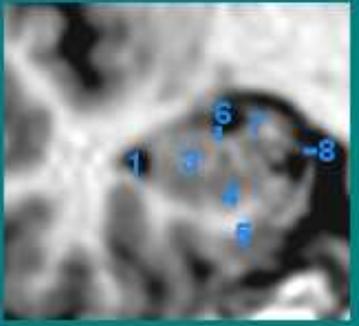
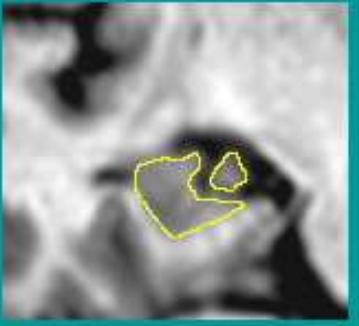
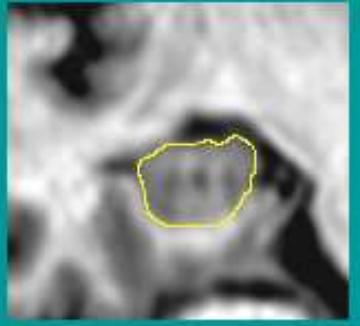
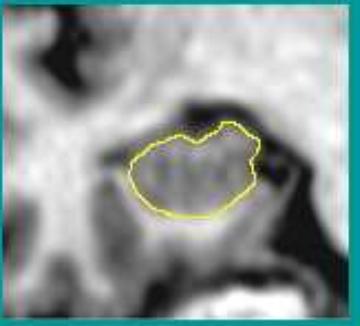
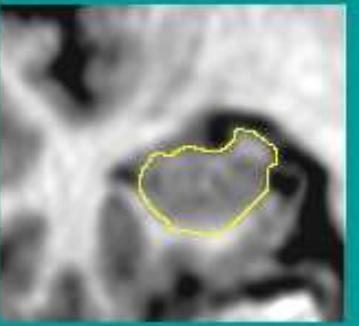
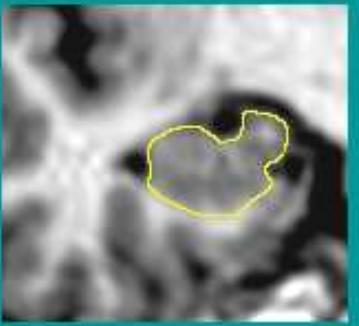
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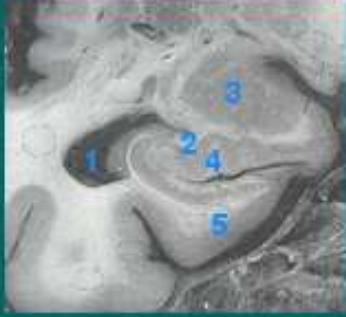
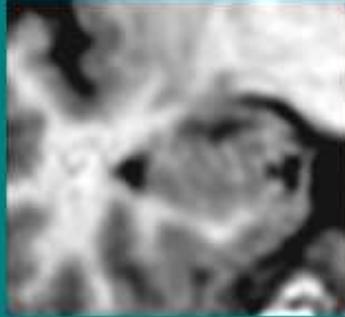
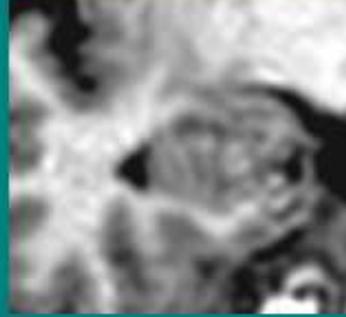
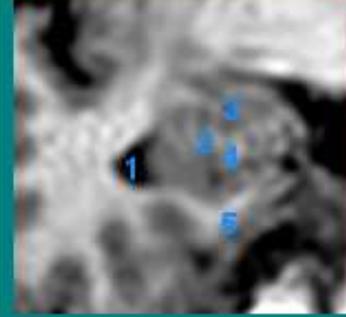
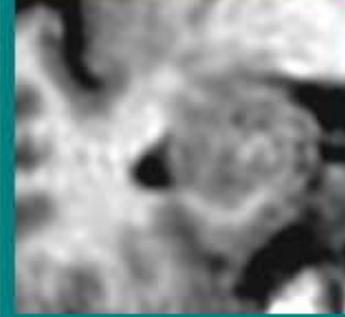
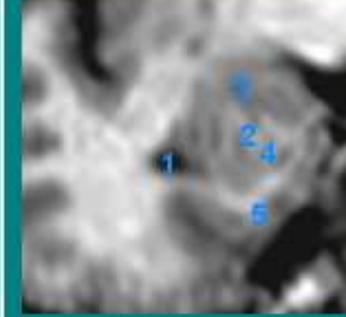
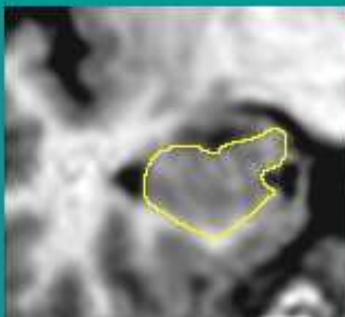
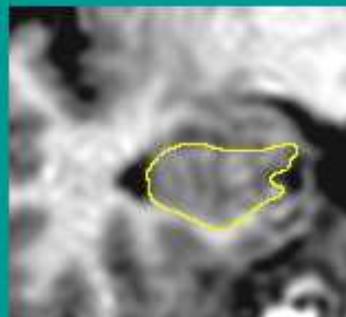
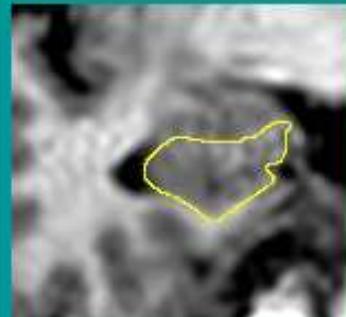
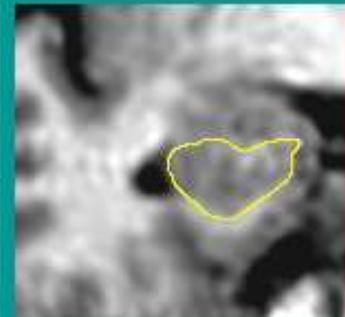
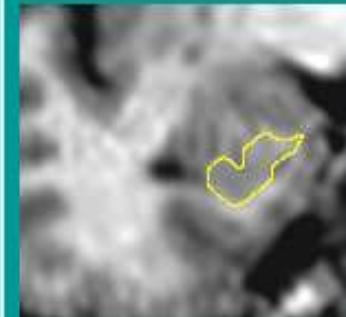
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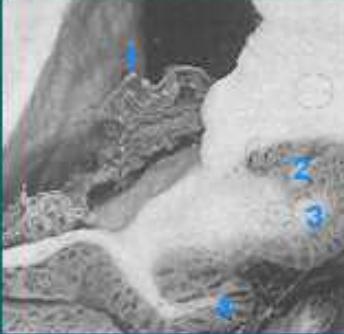
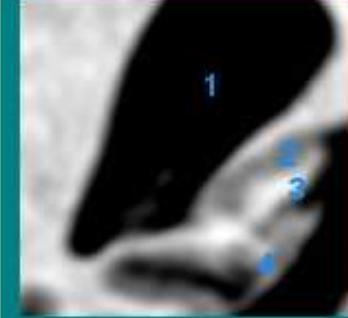
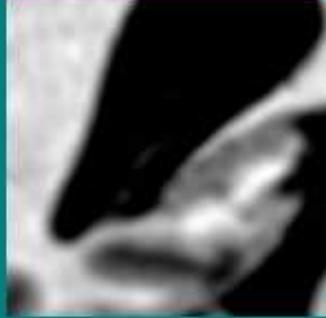
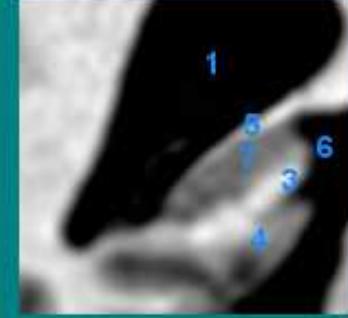
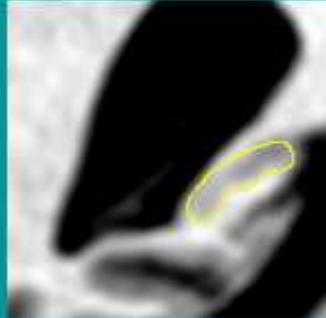
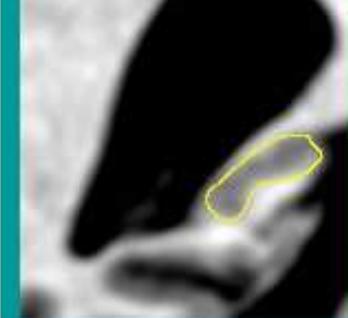
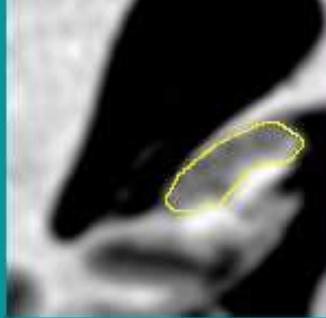
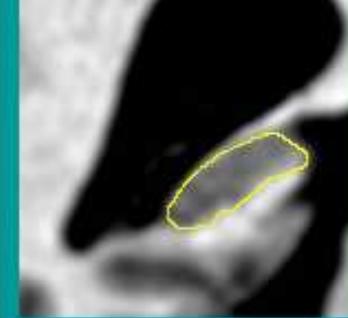
Anatomical section					
Native MRI					
Tracing					
Notes		1=inferior horn of lateral ventricle 2=fimbria 3=gyrus dentatus 4=subiculum 5=parahippocampal gyrus 6=CSF of ambient cistern 7=uncal apex		Alveus was included in the tracing	1=inferior horn of lateral ventricle 3=gyrus dentatus 4=subiculum 5=parahippocampal gyrus 6=alveus 7=vertical digitation 8=posterior cerebral artery

2A)CTRL	88	87	86	85	84
Anatomical section					
Native MRI					
Tracing					
Notes		The sagittal plane was also used to help delineate the superior and anterior boundaries of the hippocampal head when the uncal recess was no longer present in the coronal plane	1=inferior horn of lateral ventricle 2=alveus 3=amygdala 4=hippocampal head 5=parahippocampal gyrus		1=inferior horn of lateral ventricle 2=alveus 3=amygdala 4=hippocampal head 5=parahippocampal gyrus

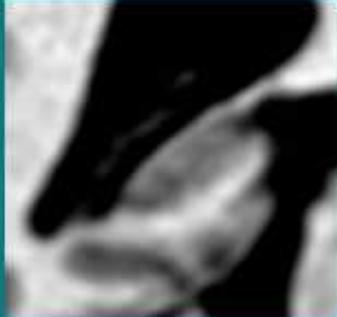
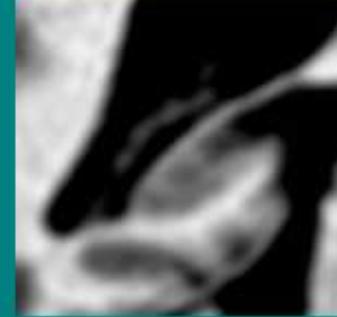
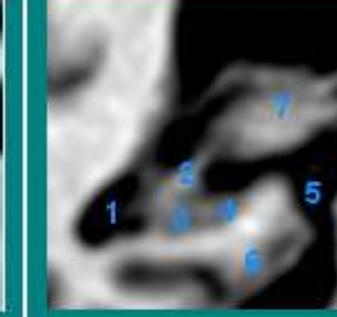
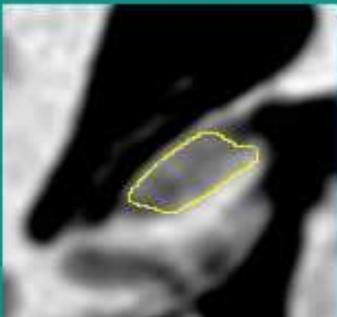
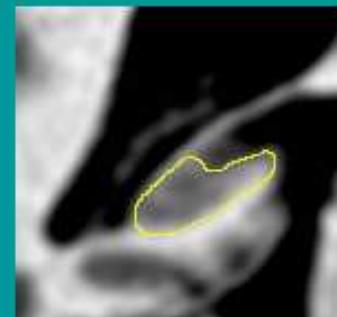
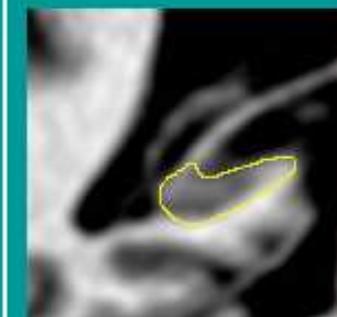
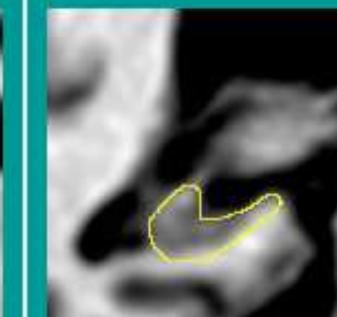
2A)CTRL

Anatomical section	83	82	81	80	
Native MRI					
Tracing					
Notes			<p><u>Most anterior slice:</u> along the anterior - posterior axis of hippocampus, level where the parahippocampal white matter becomes visible</p> <p>Sagittal view</p>		

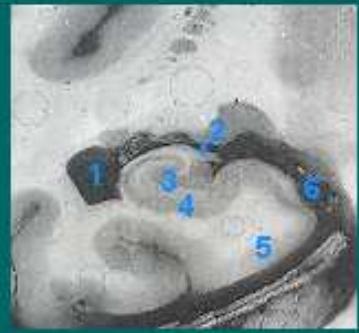
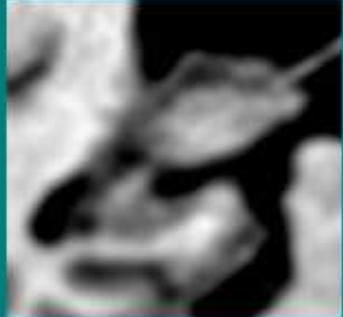
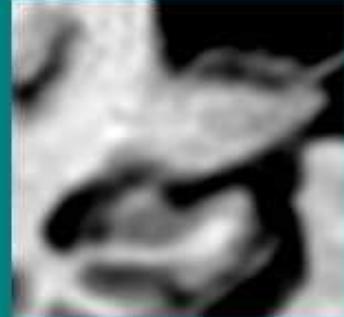
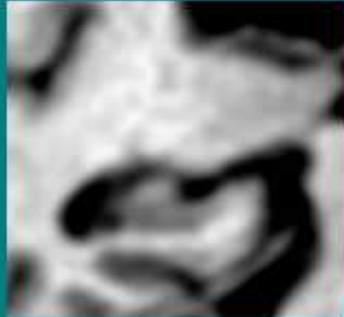
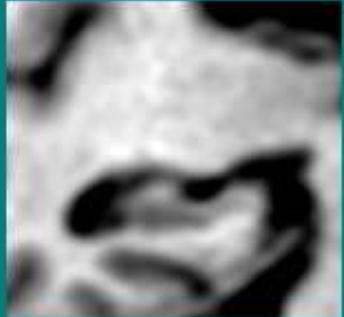
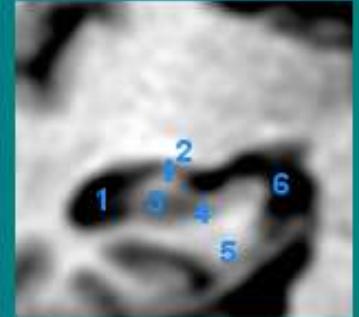
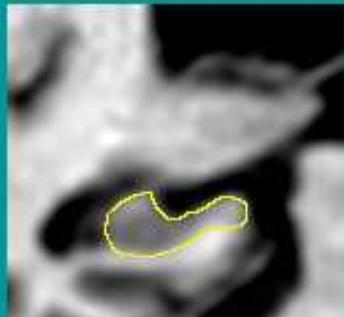
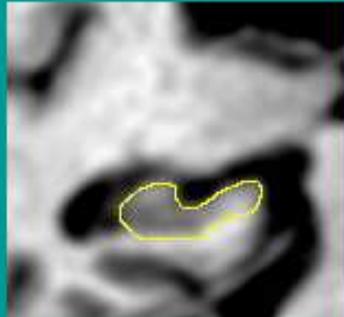
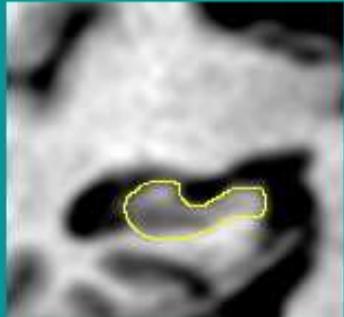
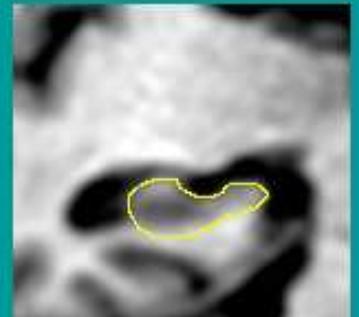
2B) AD

	123	122	121	120	119
Anatomical section					
Native MRI					
Tracing					
Notes	<p><u>Most posterior slice:</u> slice where an ovoid mass of gray matter started to appear inferomedially to the trigone of lateral ventricle</p> 	<p>Sagittal view</p> <p>1=atrium of the lateral ventricle 2=cornu Ammonis /subsplenial gyrus 3=isthmus 4=parahippocampal gyrus</p>			<p>1=atrium of the lateral ventricle 3=isthmus 4=parahippocampal gyrus 5=crus of fornix 6=CSF of quadrigeminal cistern 7=hippocampal tail, gyrus dentatus</p>

2B) AD

	118	117	116	115	114
Anatomical section					
Native MRI					
Tracing					
Notes					<p>1=atrium of the lateral ventricle      2=fimbria (included in the tracing)      3=gyrus dentatus      4=subiculum      5=CSF of ambient cistern      6=parahippocampal gyrus      7=pulvinar</p>

2B) AD

	113	112	111	110	109
Anatomical section					
Native MRI					
Tracing					
Notes					<p>1= temporal horn of lateral ventricle      2=fimbria (included)      3=gyrus dentatus      4=subiculum      5= parahippocampal gyrus      6=CSF of quadrigeminal cistern</p>

2B) AD

Anatomical section	108	107	106	105	104
Native MRI					
Tracing	A grayscale MRI slice showing a brain region with a yellow outline highlighting a specific area.	A grayscale MRI slice showing a brain region with a yellow outline highlighting a specific area.	A grayscale MRI slice showing a brain region with a yellow outline highlighting a specific area.	A grayscale MRI slice showing a brain region with a yellow outline highlighting a specific area.	A grayscale MRI slice showing a brain region with a yellow outline highlighting a specific area.
Notes					

2B) AD

	103	102	101	100	99
Anatomical section					
Native MRI					
Tracing					
Notes					

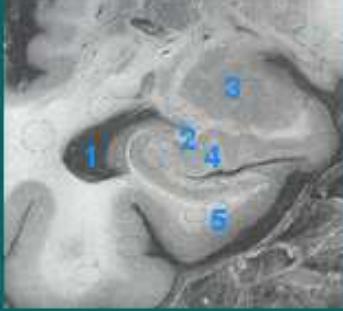
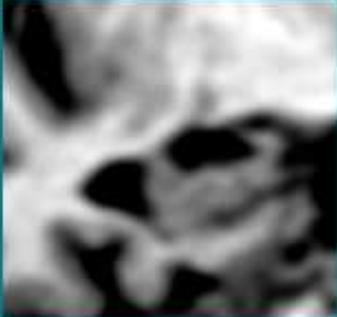
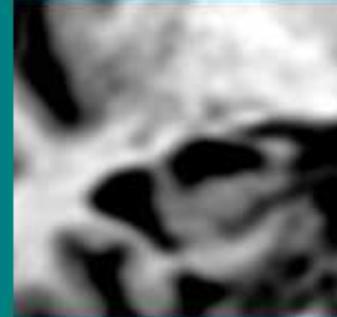
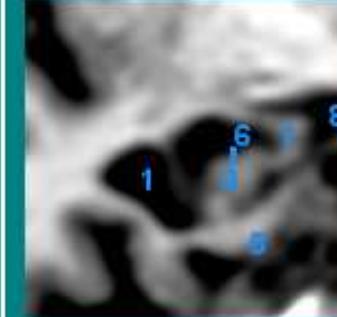
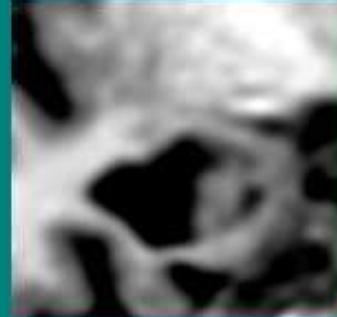
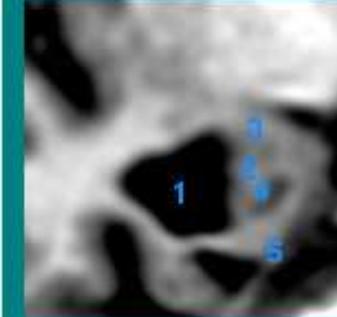
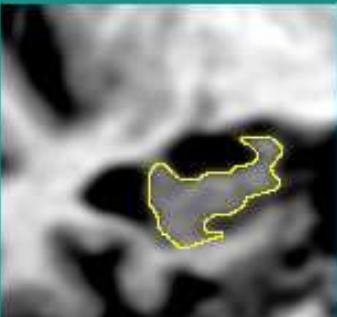
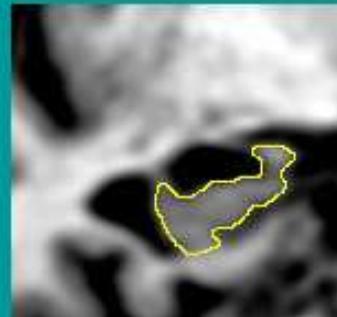
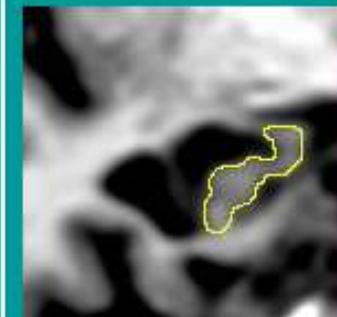
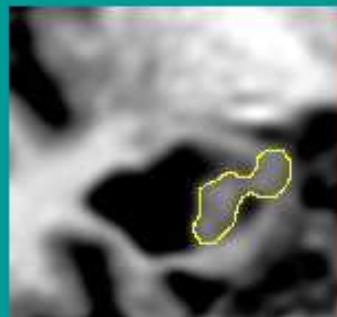
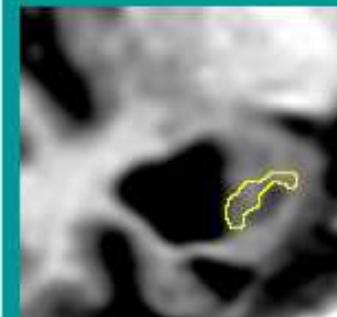
2B) AD

Anatomical section	98	97	96	95	94
Native MRI					
Tracing					
Notes					<p>1=inferior horn of lateral ventricle 2=fimbria 3=gyrus dentatus 4=subiculum 5=parahippocampal gyrus 6=CSF of ambient cistern 7=uncal apex</p>

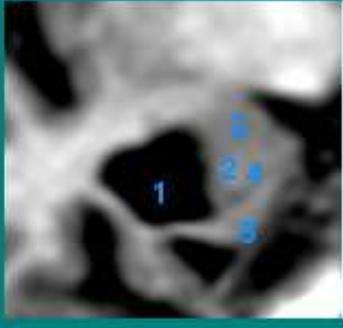
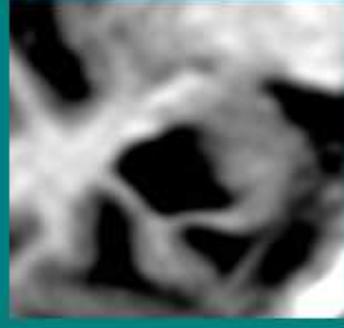
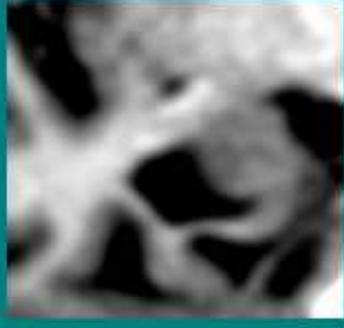
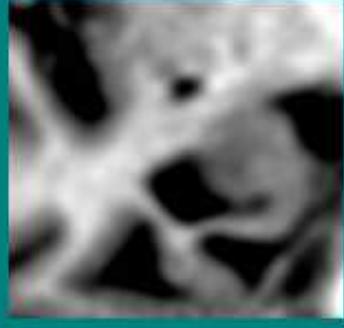
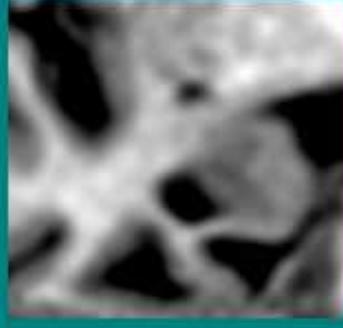
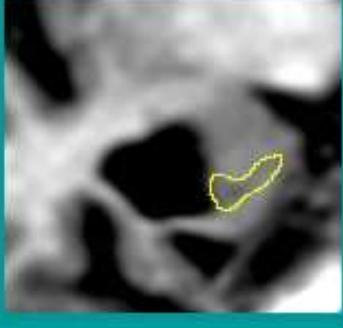
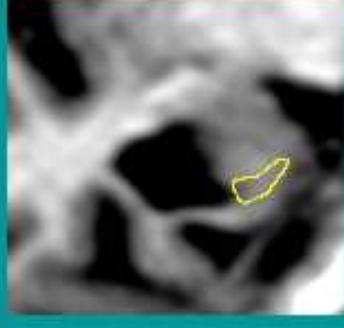
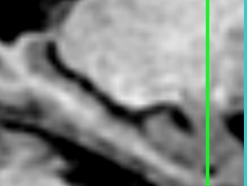
2B) AD

	93	92	91	90	89
Anatomical section					
Native MRI					
Tracing					
Notes					

2B) AD

	88	87	86	85	84
Anatomical section					
Native MRI					
Tracing					
Notes					

2B) AD

	83	82	81	80	79
Anatomical section					
Native MRI					
Tracing					
Notes	<p>1=inferior horn of lateral ventricle      2=alveus      3=amygdala      4=hippocampal head      5=parahippocampal gyrus</p>	<p><b>Most anterior slice:</b> along the anterior - posterior axis of hippocampus, level where the parahippocampal white matter becomes visible</p>  <p>Sagittal view</p>			