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# First *in vivo* evidence of the involvement of the noradrenergic system in olfactory dysfunction in Parkinson's disease

Chloé Laurencin<sup>a,b</sup>, Sarah Brosse<sup>a</sup>, Sophie Lancelot<sup>a,b,c</sup>, Jérôme Redouté<sup>c</sup>, Inés Mérida<sup>c</sup>, Didier Le Bars<sup>c</sup>, Nicolas Costes<sup>c</sup>, Stéphane Thobois<sup>a,b</sup>, Philippe Boulinguez<sup>a</sup>, Bénédicte Ballanger<sup>a</sup>.

<sup>a</sup>Lyon Neuroscience Research Center (CRNL), INSERM U1028, CNRS UMR5292, University Lyon 1, F-69000, Lyon, France <sup>b</sup>Pierre Wertheimer Neurological Hospital, Hospices Civils de Lyon (HCL), Lyon, France <sup>c</sup>CERMEP, Lyon, France



## INTRODUCTION

### Parkinson's disease (PD)

**Degeneration of the noradrenergic (NA) system**  
[1,2,3]

**Olfactory dysfunction**

- Early non-motor symptom [4]
- Prevalence between 50-90% [5]
- No effect of Ldopa [6]

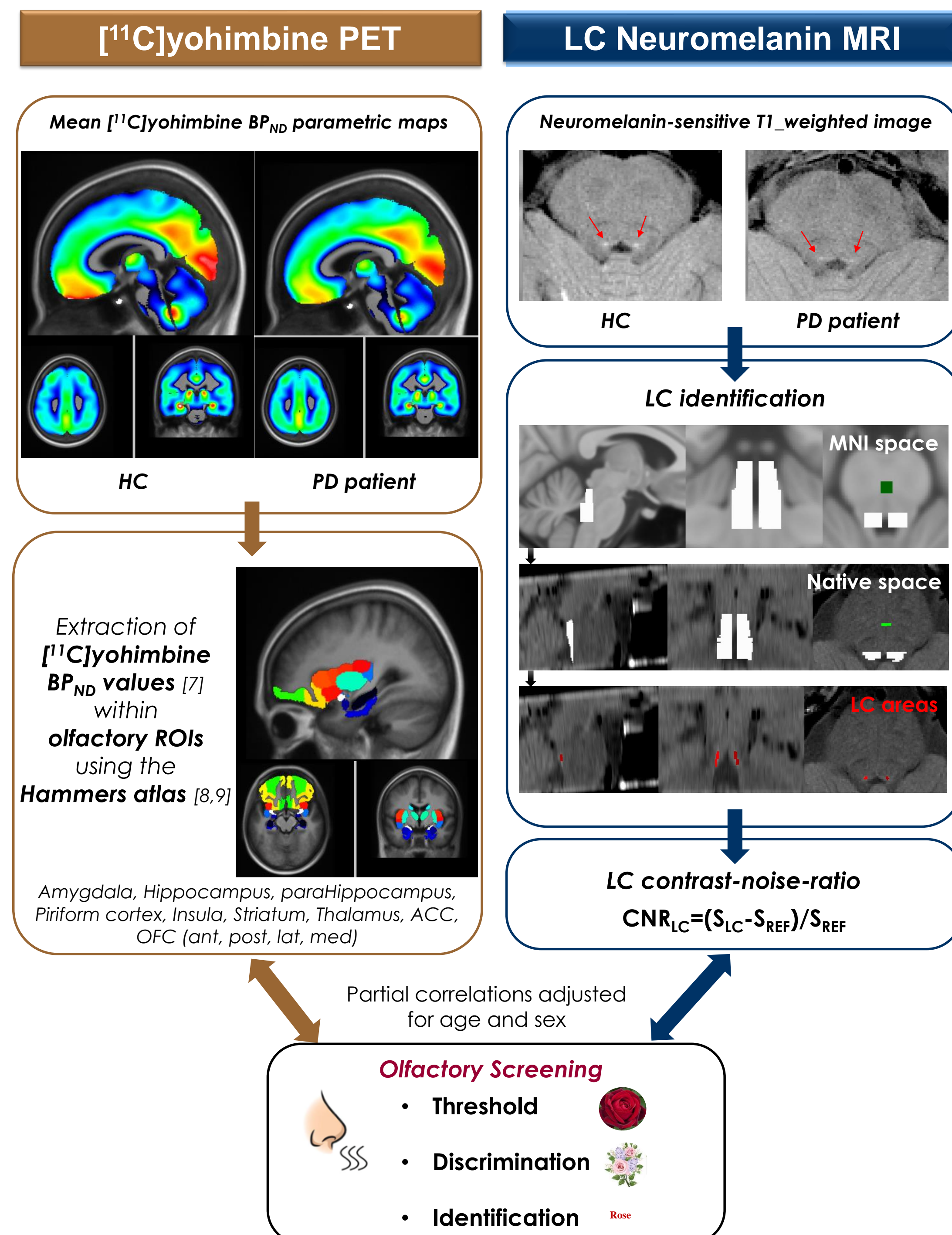


## OBJECTIVES

Investigate the relationship between *in vivo* NA markers and olfactory impairment in patients with PD

## METHODS

18 healthy subjects and 14 PD patients included



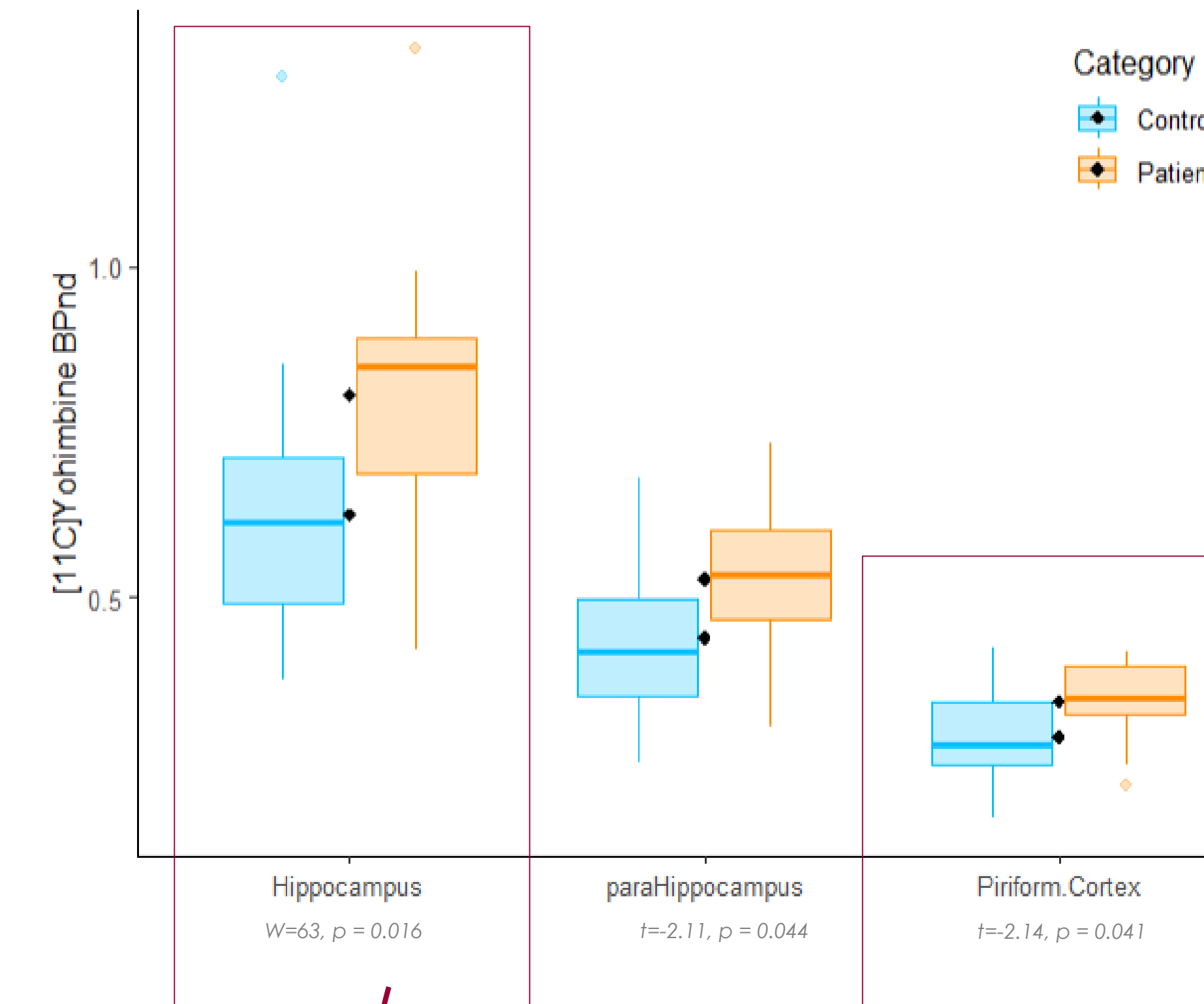
## RESULTS

### Worse olfactory performance of PD patients

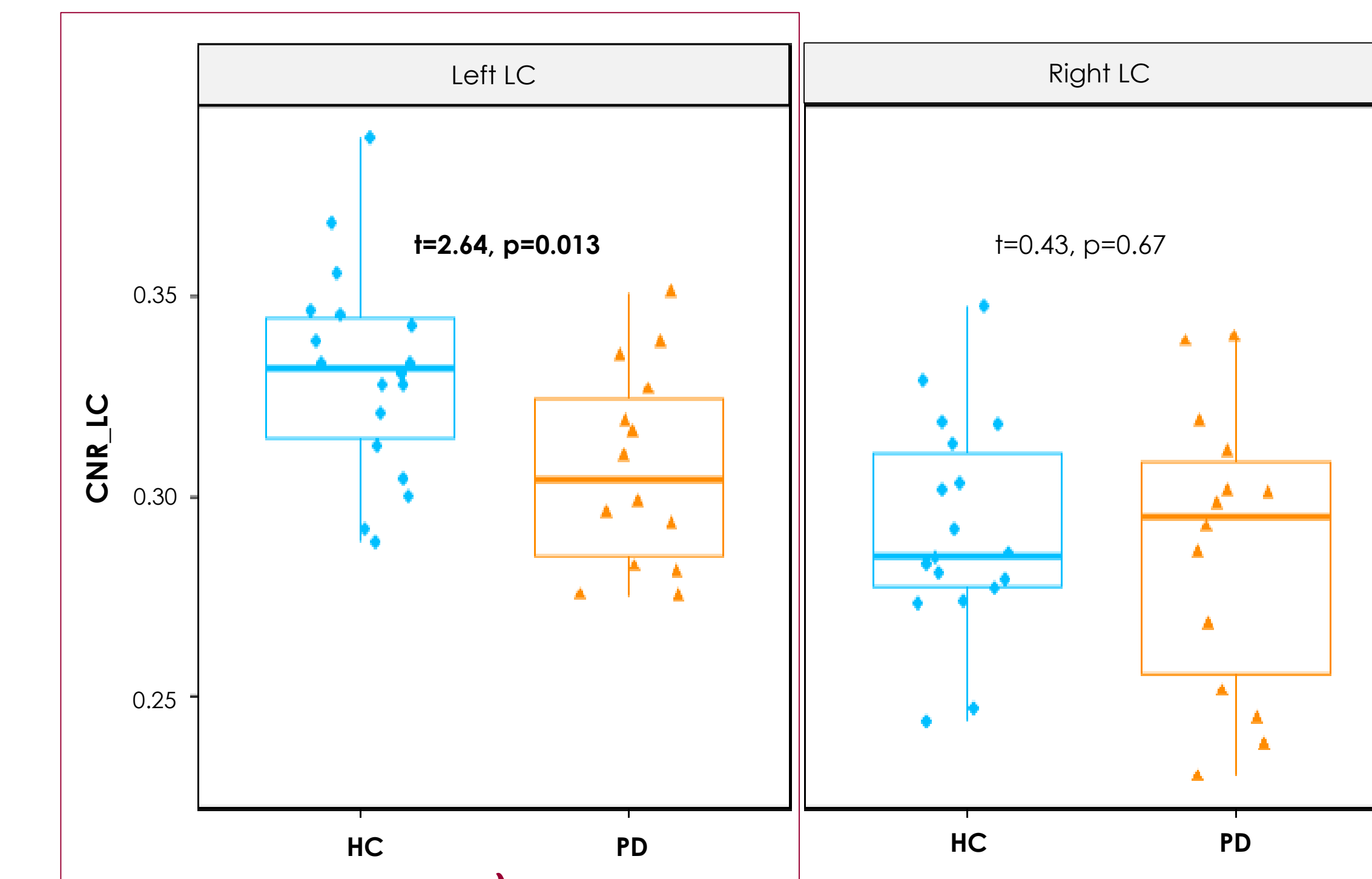
	Healthy controls	PD patients	Stat.
N (F/M)	18 (10/8)	14 (4/10)	*
Age	59.7 (7.2)	61.3 (9.6)	ns <sup>#</sup>
MoCA	27.9 (1.5)	27.9 (2)	ns <sup>§</sup>
<b>PD characteristics</b>			
Disease duration (years)	-	6.9 (4.2)	
LEDD (mg/day)	-	910 (668)	
Hoehn & Yahr	-	1.8 (0.4)	
MDS-UPDRS I	-	8.5 (5.1)	
MDS-UPDRS III	-	17.7 (12.3)	
<b>Olfaction</b>			
Threshold	10.1 (2.8)	4.7 (2.9)	<0.001 <sup>#</sup>
Discrimination	13.3 (2.1)	10.8 (2.1)	0.002 <sup>#</sup>
Identification	14.1 (1.8)	6.9 (2.9)	<0.001 <sup>§</sup>
TDI composite score	37.4 (3.4)	22.3 (4.5)	<0.001 <sup>#</sup>

Note. Data are presented as mean (SD). Abbreviations: MoCA, Montreal Cognitive Assessment; MDS-UPDRS, Movement Disorder Society-sponsored revision of the Unified Parkinson's disease Rating Scale; <sup>#</sup>Parametric test (Student's t-test); <sup>§</sup>non-parametric test (Wilcoxon test).

### Increase [<sup>11</sup>C]yohimbine BP<sub>ND</sub> in PD patients

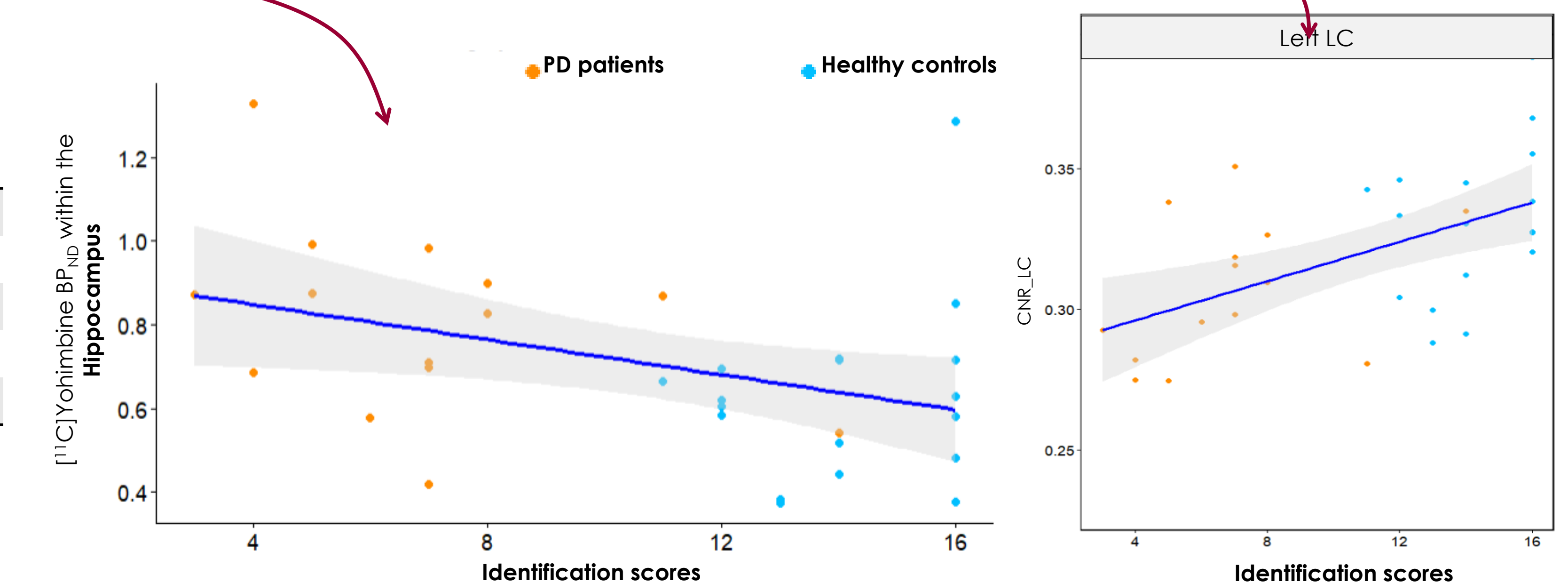


### Reduced LC signal intensity in PD



### Relationship between olfactory performances and *in vivo* imaging

	Threshold	Discrimination	Identification	TDI composite score
<b>Hippocampus</b>	r=-0.43, p=0.018	r=0.03, p=0.85	r=-0.36, p=0.047	r=-0.35, p=0.054
<b>ParaHippocampus</b>	r=-0.20, p=0.30	r=0.15, p=0.44	r=-0.21, p=0.26	r=-0.16, p=0.38
<b>Piriform Cortex</b>	r=-0.34, p=0.07	r=-0.21, p=0.27	r=-0.34, p=0.06	r=-0.39, p=0.03
<b>CNR LC left</b>	r=0.23, p=0.22	r=0.14, p=0.45	r=0.48, p=0.007	r=0.38, p=0.039



## CONCLUSIONS

