

Increase of glucocorticoid receptor expression after environmental enrichment: Relations to spatial memory, exploration and anxiety-related behaviors.



II CONGRESO INTERNACIONAL DE PSICOBIOLOGÍA

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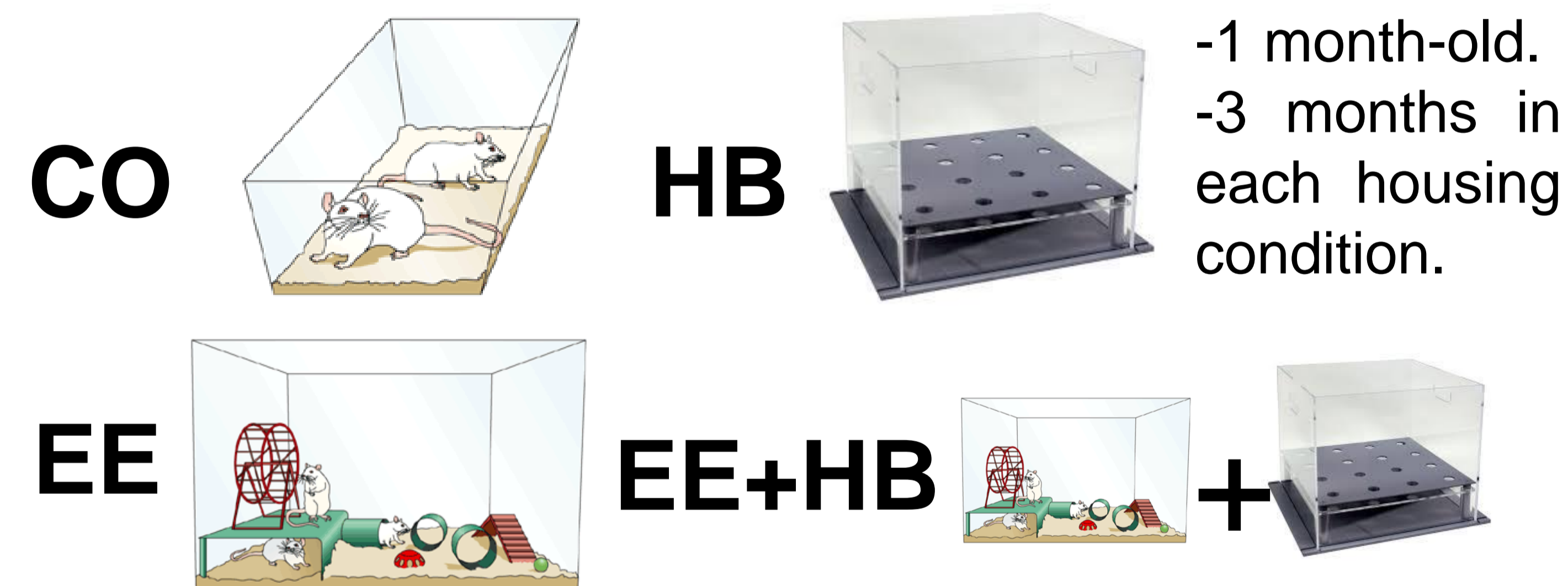


INTRODUCTION

Environmental enrichment (EE) produces a remarkable degree of structural and functional plasticity in the hippocampus and possible mediators of these changes, such as glucocorticoid receptors (GRs), are of considerable interest. GRs are richly expressed in the hippocampus and they are involved in the adaptation to stressors and facilitate active coping in anxious situations.

MATERIAL AND METHODS

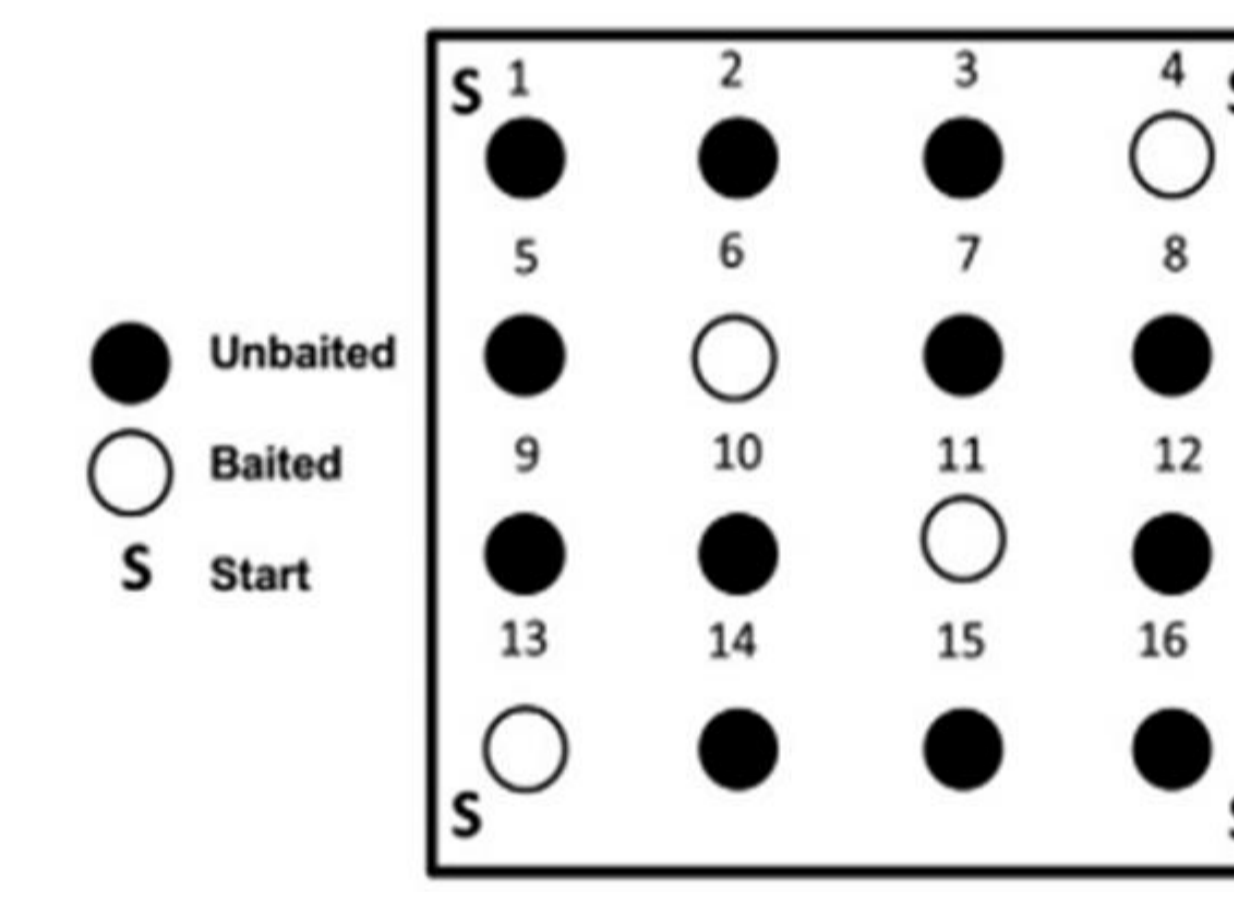
Groups



Behavioral testing

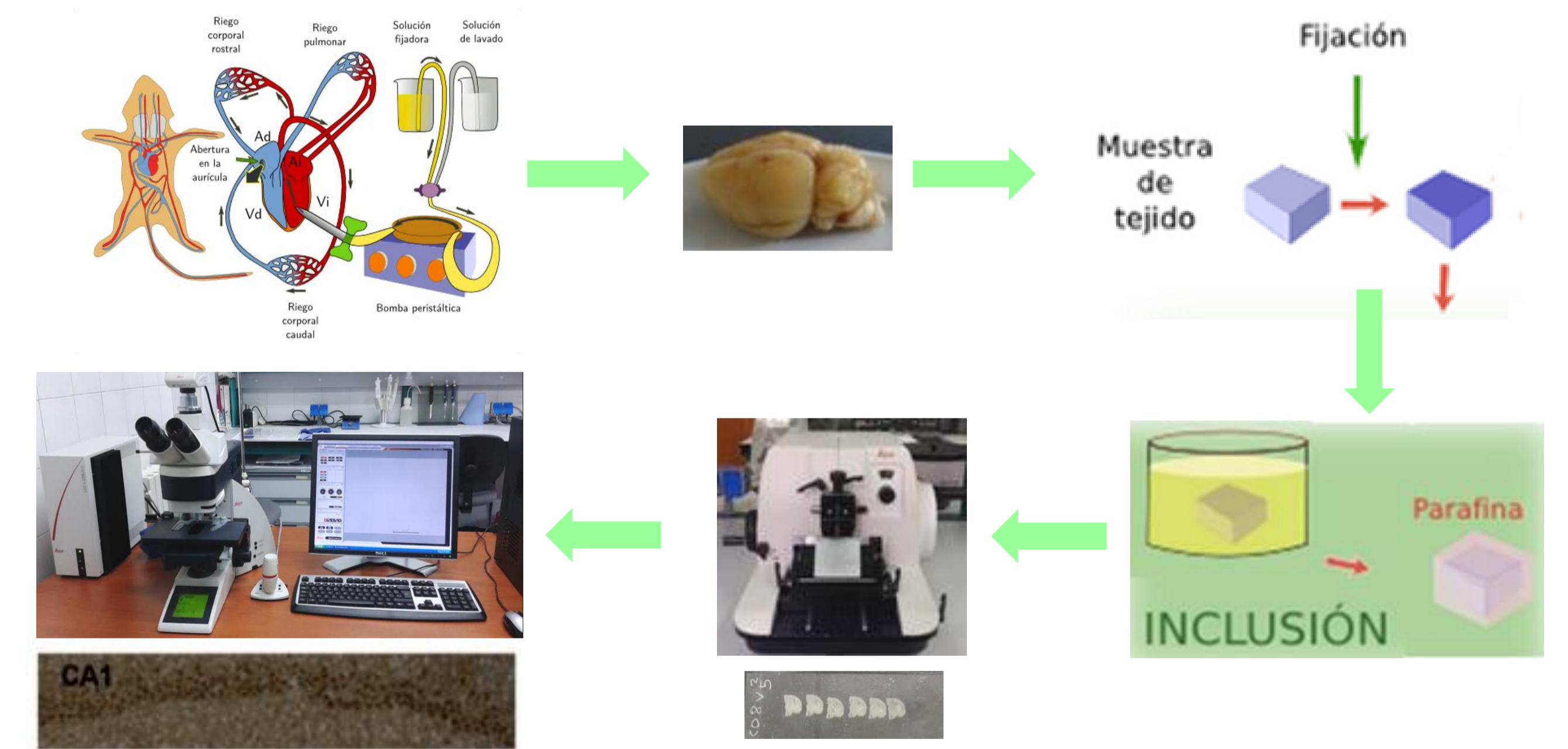


Elevated-zero maze
-1 session
-5 minutes
-unconditioned stress



Holeboard test
-2 habituation sessions.
-6 sessions.
-6 trials/day

GR Immunohistochemistry



RESULTS

Mean values of the activity in the elevated zero-maze for each group.

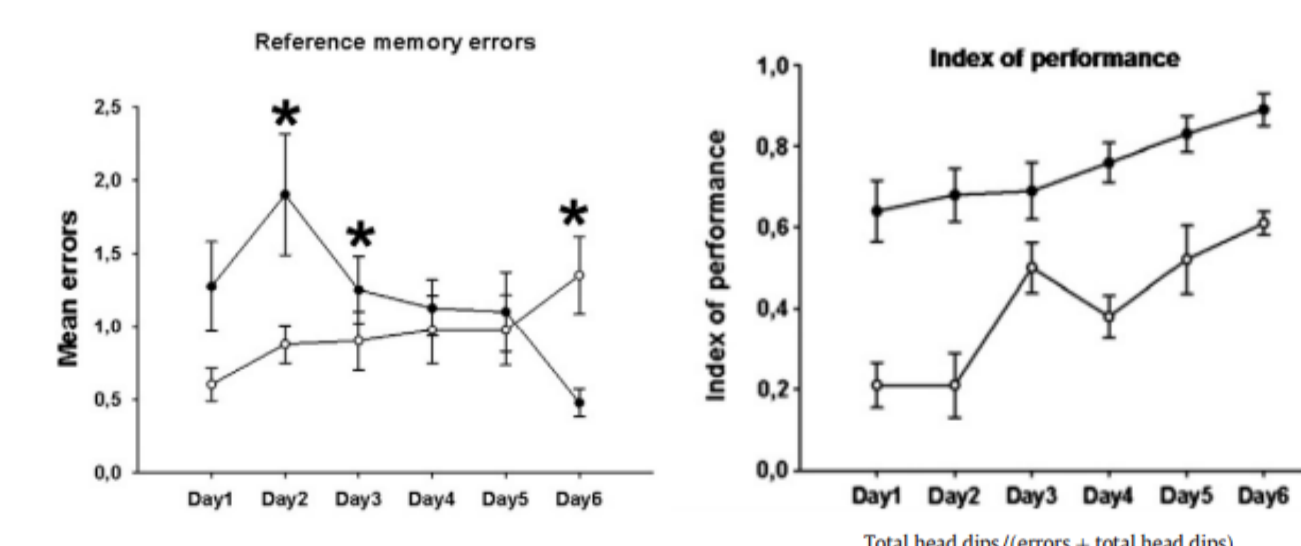
	EE	No EE
Closed head dips	2.30 ± 0.56*	0.50 ± 0.31
Open head dips	7.30 ± 0.72	7.30 ± 0.45
Duration in open sections (s)	151.70 ± 12.41*	38.79 ± 15.46
Latency (s)	4.25 ± 1.11*	128.10 ± 39.57
Entries into open sections	11.50 ± 0.58*	2.00 ± 0.67
Climbing	10.30 ± 1.41*	4.70 ± 0.60
Fecal boli	0.30 ± 0.21*	4.30 ± 0.50
Duration in contracted body elongation (s)	73.02 ± 6.27*	127.98 ± 10.72
Duration in normal body elongation (s)	217.50 ± 6.62*	163.06 ± 10.72
Duration in stretched body elongation (s)	8.34 ± 0.97	8.96 ± 2.65
Velocity (cm/s)	12.03 ± 1.84	7.89 ± 0.92
Distance traveled (cm)	2814.91 ± 11.03*	1317.69 ± 30.48

Data represent mean ± SEM values.

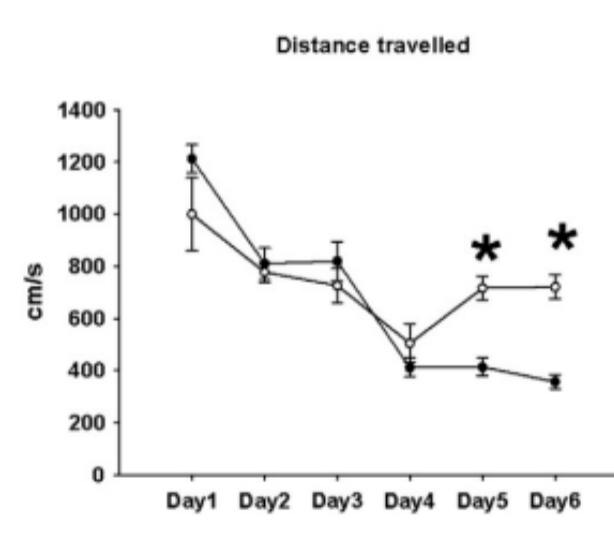
* p < 0.05 significant differences.

Our EE protocol reduced anxious behaviors in the EZM, so the animals spent more time and made more entries into the open sections.

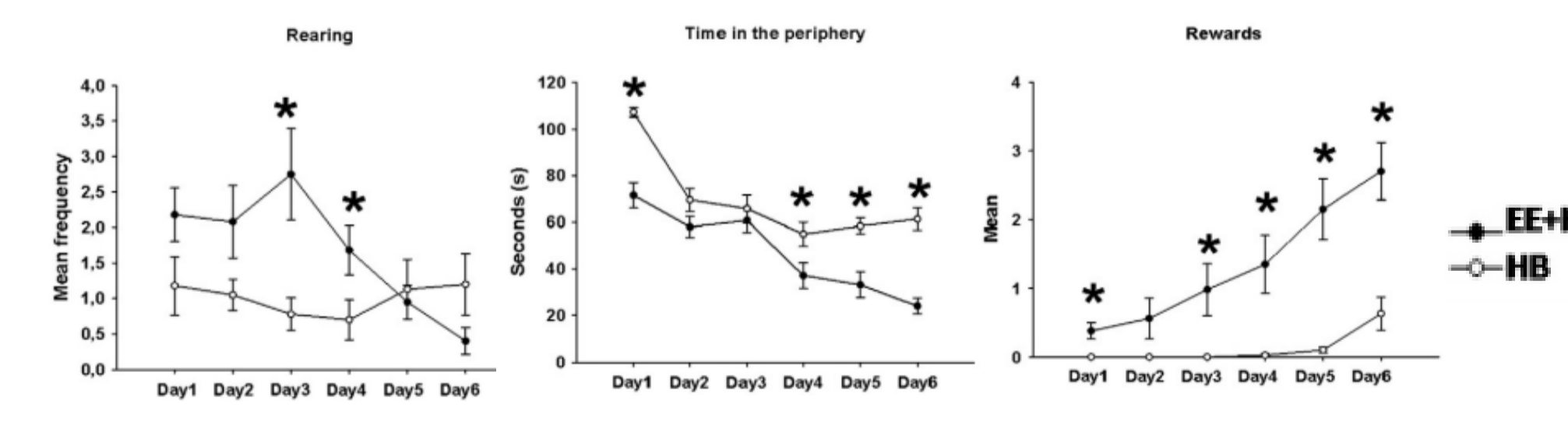
Cognition



Exploration



Anxiety



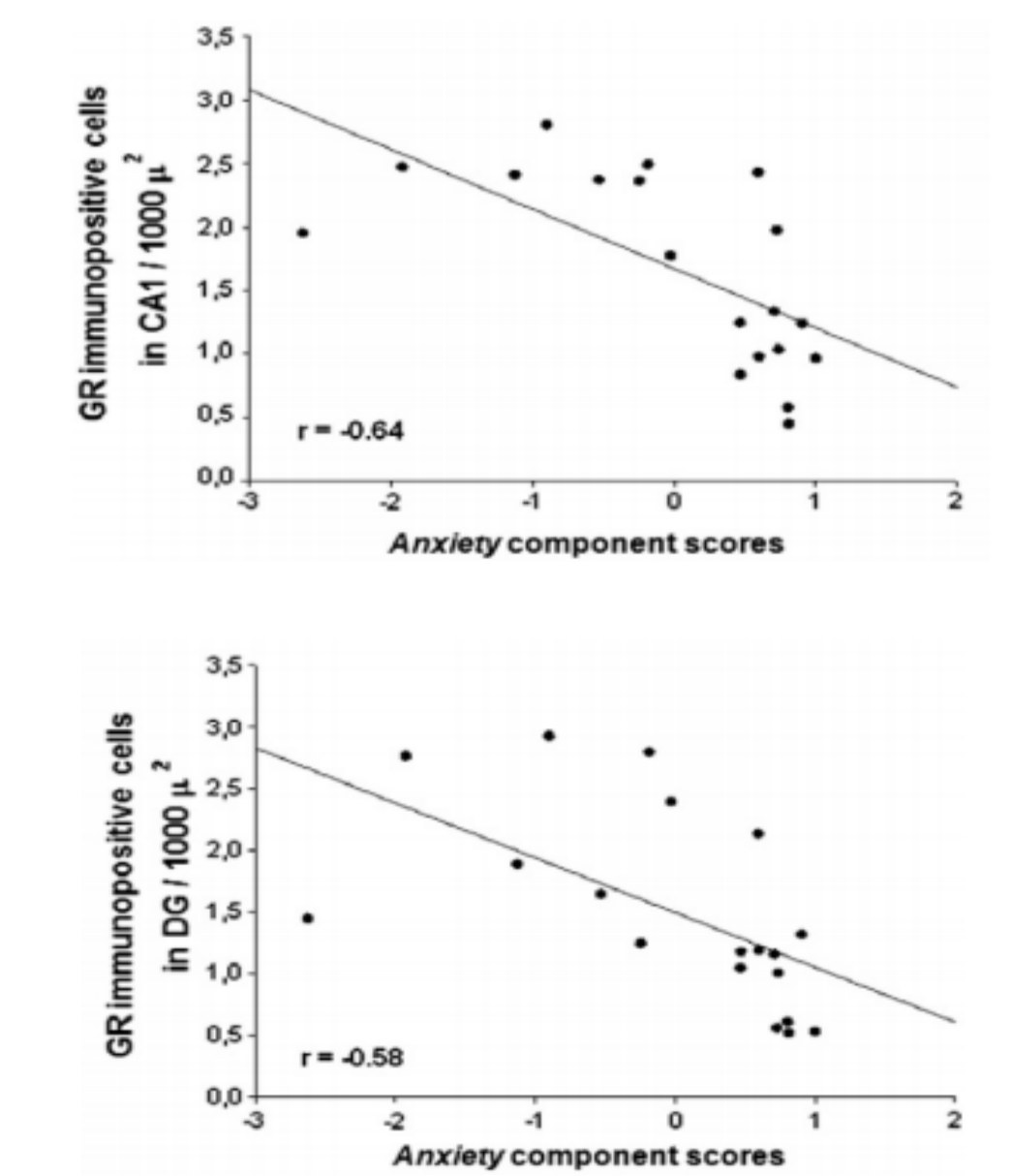
Components of HB measures revealed by PCA.

	Component 1 Anxiety component	Component 2 Exploration component	Component 3 Cognitive component
Distance traveled	0.85	0.66	
Latency	0.95		
Frequency rearing	0.90	0.74	
Latency first head dip	-0.98		
Frequency head dips		0.80	
Frequency climbing	-0.92		
Rewards ratio	0.75		
Fecal boli			0.74
Reference memory errors			0.88
Working memory errors			

Obtained rotated values from PCA.
% Explained variance (Component 1): 49.2%.
% Explained variance (Component 2): 19.8%.
% Explained variance (Component 3): 14.1%.

Mean values of the number of GRs' expression quantified and estimation of the CE and CV in the different experimental groups.

Groups	N	Mean GRs	CE	CV	CE ² /CV ²
CA1					
CO	9	1.07 ± 0.60	0.12	0.56	0.05 (5%)
HB	10	1.06 ± 0.43	0.11	0.40	0.08 (8%)
EE	10	2.62 ± 1.25	0.10	0.45	0.05 (5%)
EE + HB	9	2.34 ± 0.31	0.10	0.37	0.07 (7%)
CA3					
CO	9	0.72 ± 0.30	0.10	0.42	0.06 (6%)
HB	10	0.45 ± 0.32	0.12	0.71	0.03 (3%)
EE	10	1.48 ± 0.80	0.08	0.54	0.02 (2%)
EE + HB	9	1.10 ± 0.34	0.11	0.30	0.13 (13%)
DG					
CO	9	0.95 ± 0.61	0.11	0.50	0.05 (5%)
HB	10	0.90 ± 0.32	0.12	0.36	0.11 (11%)
EE	10	2.64 ± 1.33	0.09	0.50	0.03 (3%)
EE + HB	9	2.13 ± 0.62	0.19	0.29	0.42 (42%)



CONCLUSIONS

These results suggest that the better performance of enriched animals could be mediated in part, by the increase of GRs in the dorsal hippocampus which may alter the hippocampal neuronal function and accordingly, the anxiety levels, the spatial memory performance and the exploration levels in these animals.

Sampedro-Piquero, P.; Begega, A.; Arias, J.L. (2014). Increase of glucocorticoid receptor expression after environmental enrichment: Relations to spatial memory, exploration and anxiety-related behaviors. *Physiology & Behavior*, 129, 118-129.