



Influence of Environmental Enrichment on Morphine-Exposed Neonate Rats: Effect on Neurodevelopment and Long-term Memory

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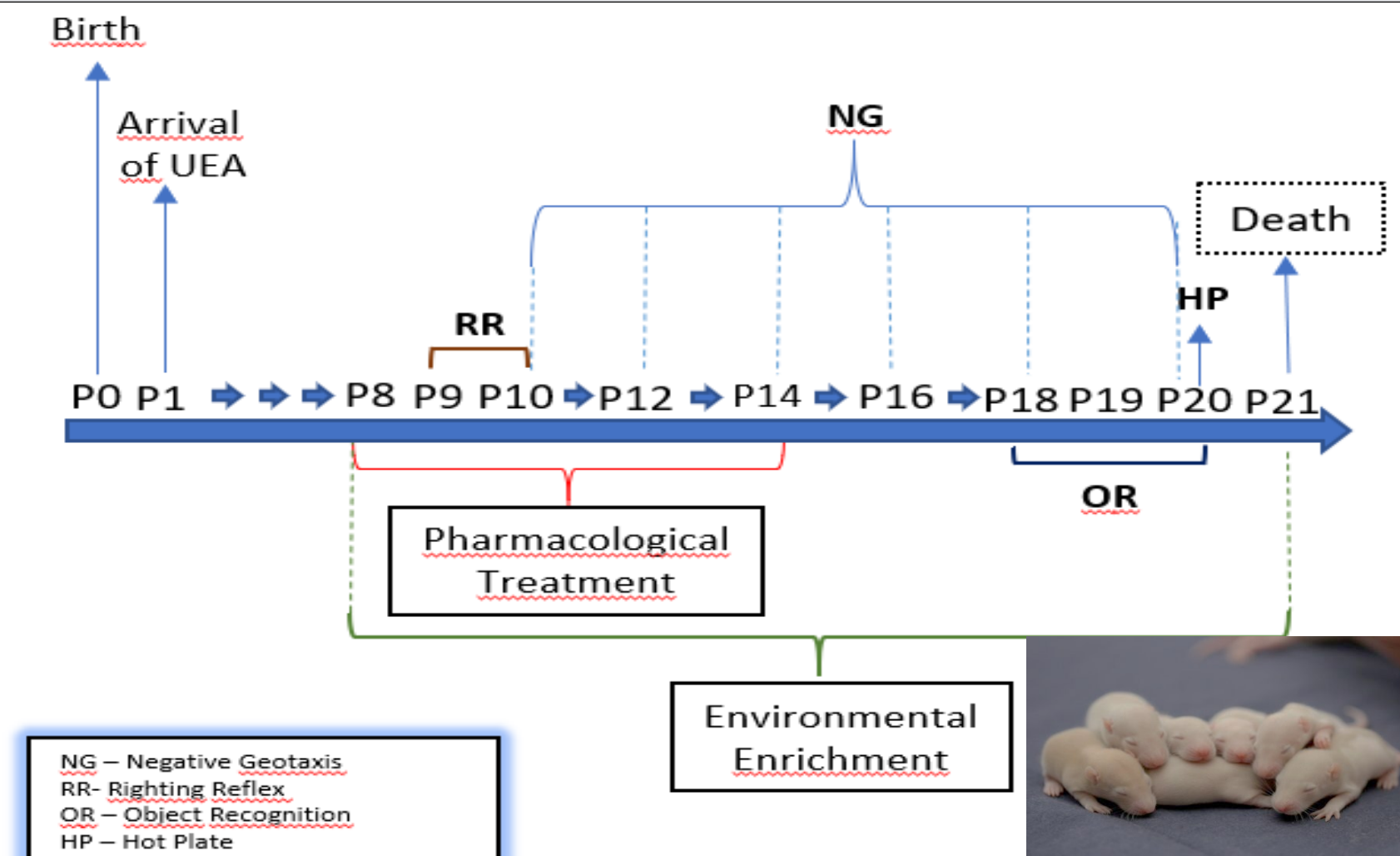
Introduction

Stressful stimuli and the use of drugs in early life may affect neurodevelopment, altering behaviors, memory and nociceptive response. Environmental enrichment (EE) may be a non-pharmacological alternative to avoid the deleterious effects caused by repeated administration of morphine in a period of high neuroplasticity.

Objective

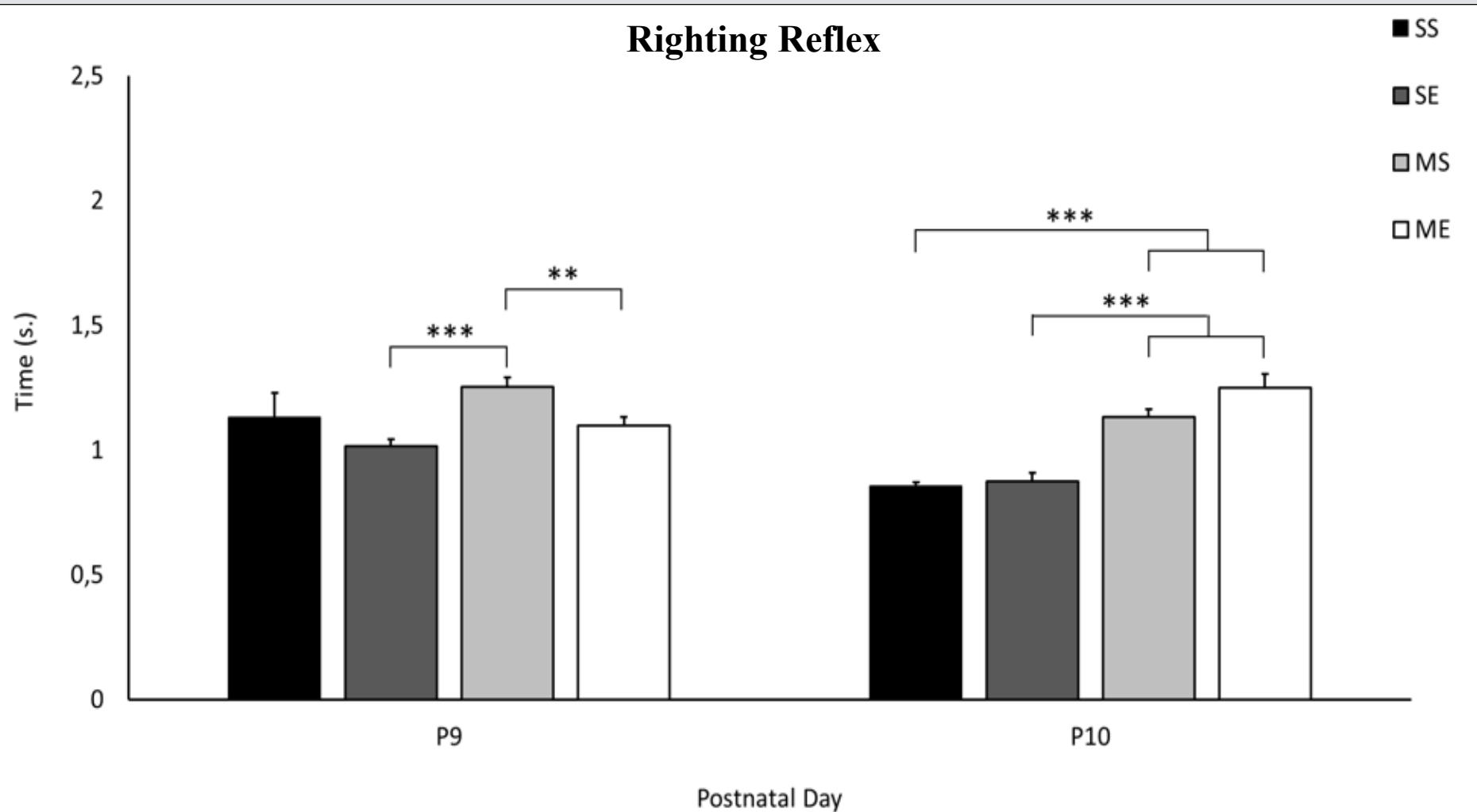
This study aimed to evaluate the short term effects of early EE in neurodevelopment, long-term memory and nociceptive response after neonatal morphine exposure in male rats.

Methods



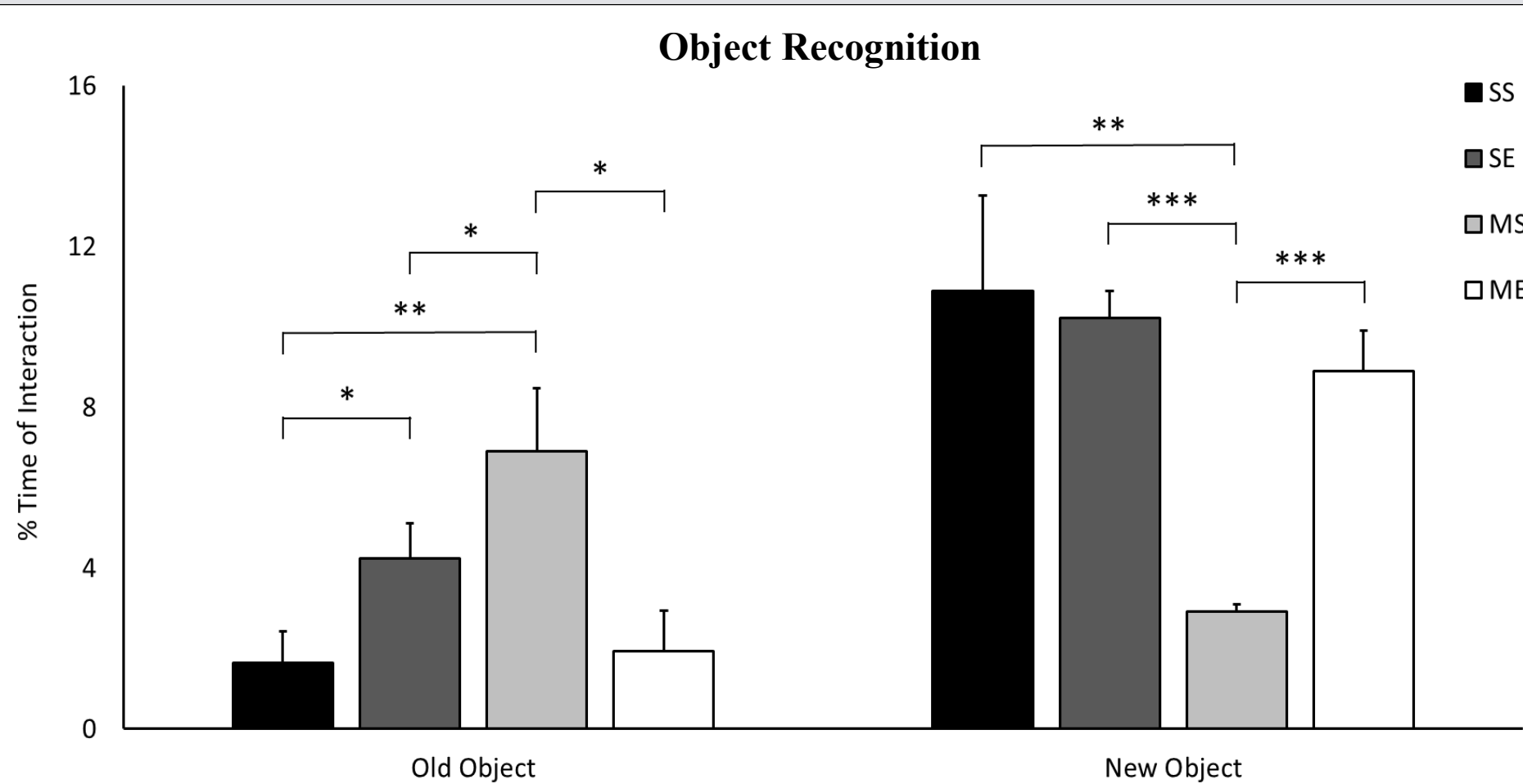
A total of 28 male Wistar rat pups were used in the present study;
N=7 animals/group;
CEUA/HCPA: 2018-0187.

Results



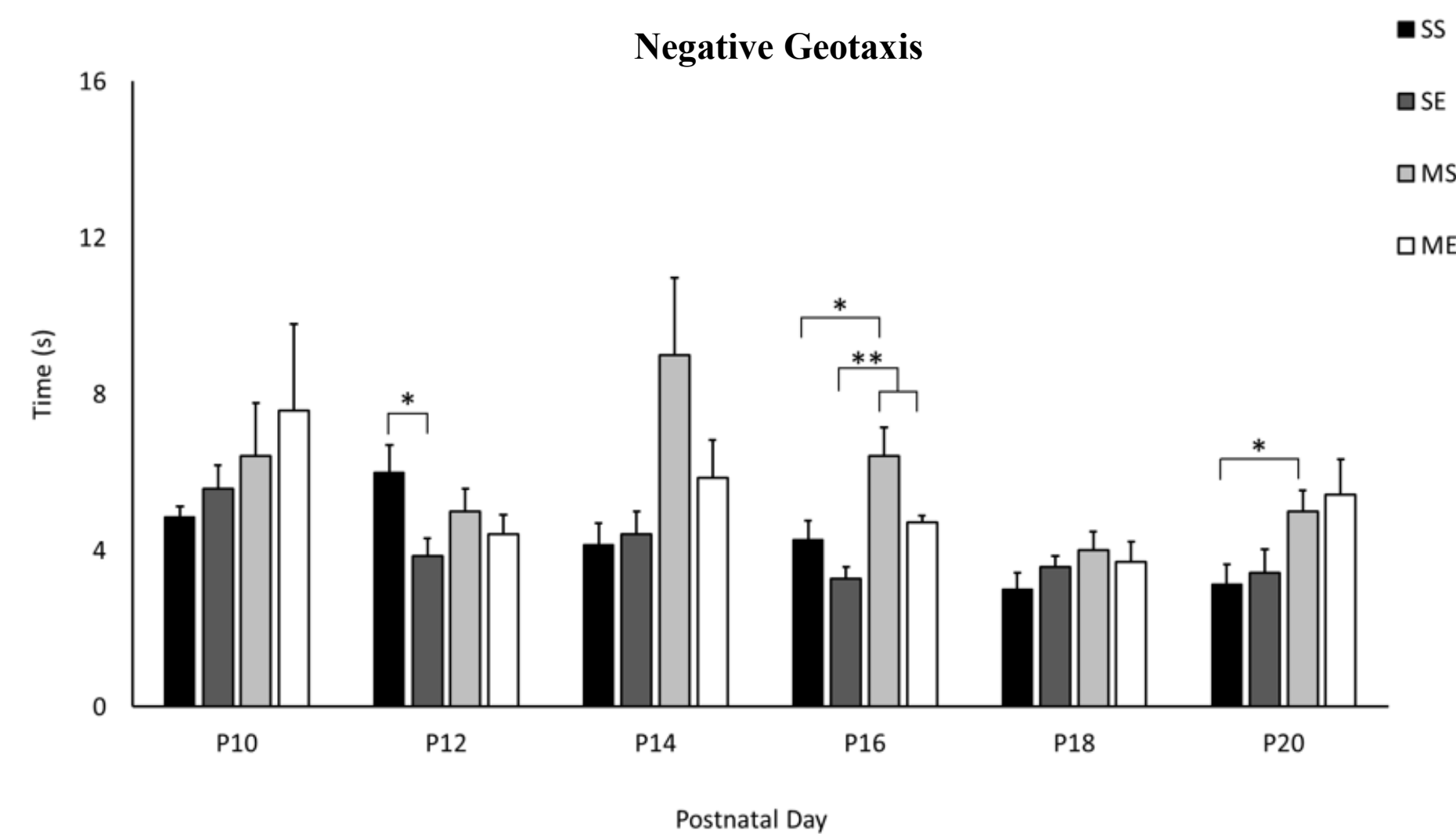
GEE showed interaction group \times time (Wald $\chi^2 = 33,107; 3, p < 0.05$). The differences between groups were assessed at each time point (P9-P10) separately, and number of different symbols. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

SS: saline + standard housing ; SE: saline + enriched housing ; MS: morphine + standard housing; ME: morphine + enriched housing.



GEE indicated statistically significant differences between the groups, there is interaction group \times object (Wald $\chi^2 = 43,351; 3, p < 0,05$).

SS: saline + standard housing ; SE: saline + enriched housing ; MS: morphine + standard housing; ME: morphine + enriched housing.



GEE showed an effect of group GEE: Wald $\chi^2 = 100,465; 15, p < 0.05$. The differences between groups were assessed at each time point (P9-P20) separately, and number of different symbols. * $p < 0.05$; ** $p < 0.01$

SS: saline + standard housing ; SE: saline + enriched housing ; MS: morphine + standard housing; ME: morphine + enriched housing.

Table 1 – Hot Plate test.

Group	Latency (s)			N
	Median	Minimum	Maximum	
SS	7.00	5.00	8.00	7
SE	7.60	6.00	9.00	7
MS	7.33	3.00	10.00	7
ME	7.00	6.00	11.00	7

The nonparametric Kruskal Wallis test showed no significant difference between groups in the thermal nociception test (Wald $\chi^2 = 1,004; 3, p = 0,791$)

SS: saline + standard housing ; SE: saline + enriched housing ; MS: morphine + standard housing; ME: morphine + enriched housing.

Conclusion

Animals that received morphine showed slower response in the neuromotor reflexes compared to the saline group, an effect that was age-dependent. Animals that received morphine showed less ability to recognize a new object in the environment, an effect that was partially reversed by EE. Nociceptive response was not altered for morphine or EE groups.