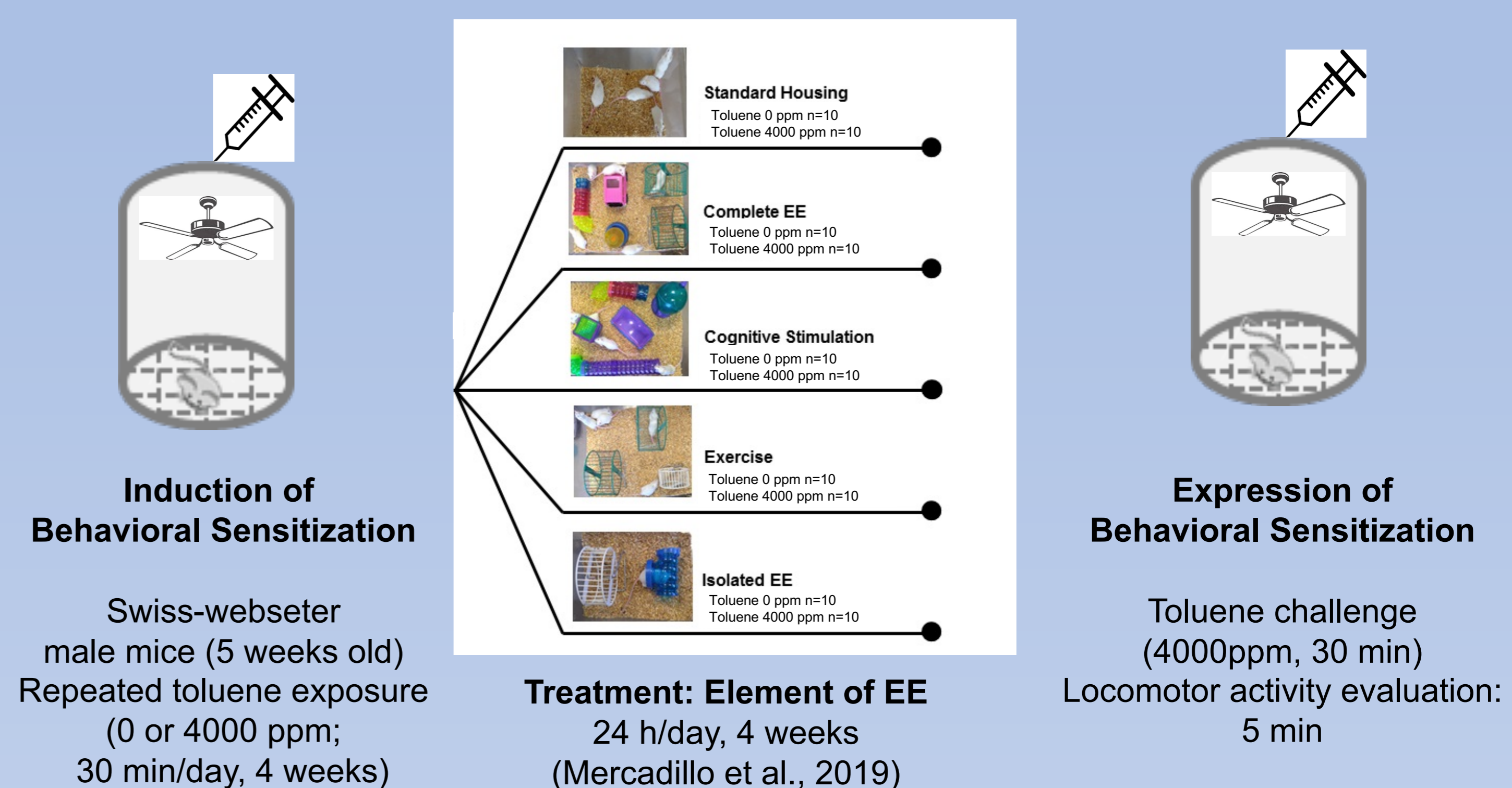


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Introduction

Inhalants are volatile substances used for recreational purposes by many populations around the world and are available in common industrial products such as, solvents, gasoline, varnishes; paint thinner, adhesives and inks (Dell et al., 2011). Toluene is the main chemical constituent of these substances used to induce psychoactive effects and its repeated consumption may lead to addiction, particularly in young people (Villatoro et al., 2011; Medina-Mora and Real, 2008; Howard et al., 2011). Preclinical studies in animal models have revealed that housing in an environmental enrichment (EE), consisting of physical exercise, cognitive stimulation and social interaction, may reverse some behavioral effects produced by toluene, including its addictive-like responses (Paez-Martinez et al., 2003; 2019; Montes, 2017; 2019). However, it is unclear which of the components included in the complex enrichment are responsible for reverse those addictive behaviors. Thus, the objective of this study was to evaluate the effect of the different components shaping a complex environmental enrichment over the expression of behavioral sensitization in mice previously exposed to toluene.

Materials and Methods



Results

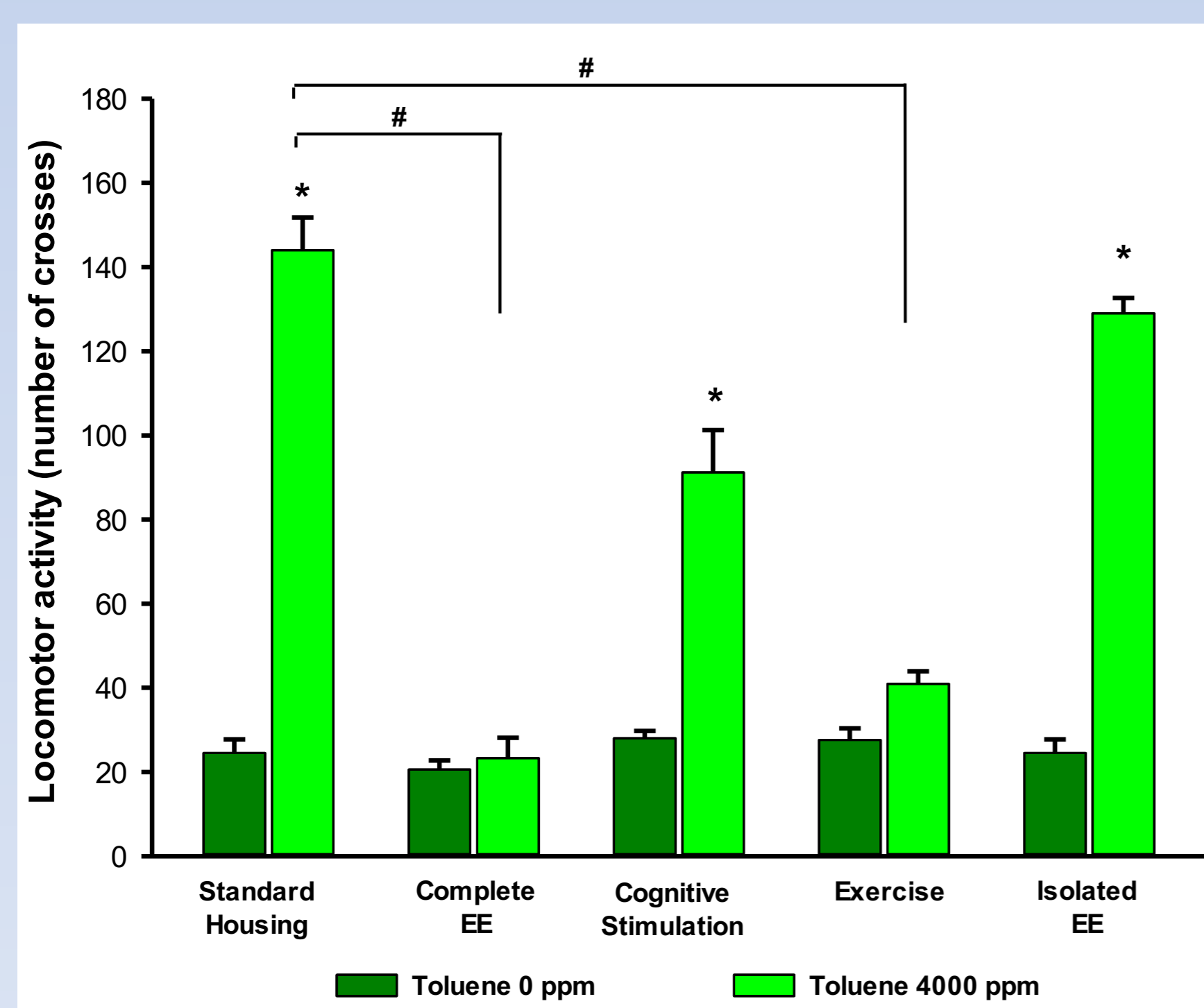


Fig. 1. Effect of the elements of EE on the expression of behavioral sensitization in mice previously exposed to toluene. Data represent the mean \pm standard error of the mean of group values * $p < 0.05$ vs toluene 0 ppm; # $p < 0.05$ vs toluene under standard housing. Two Way ANOVA followed by Tukey Test.

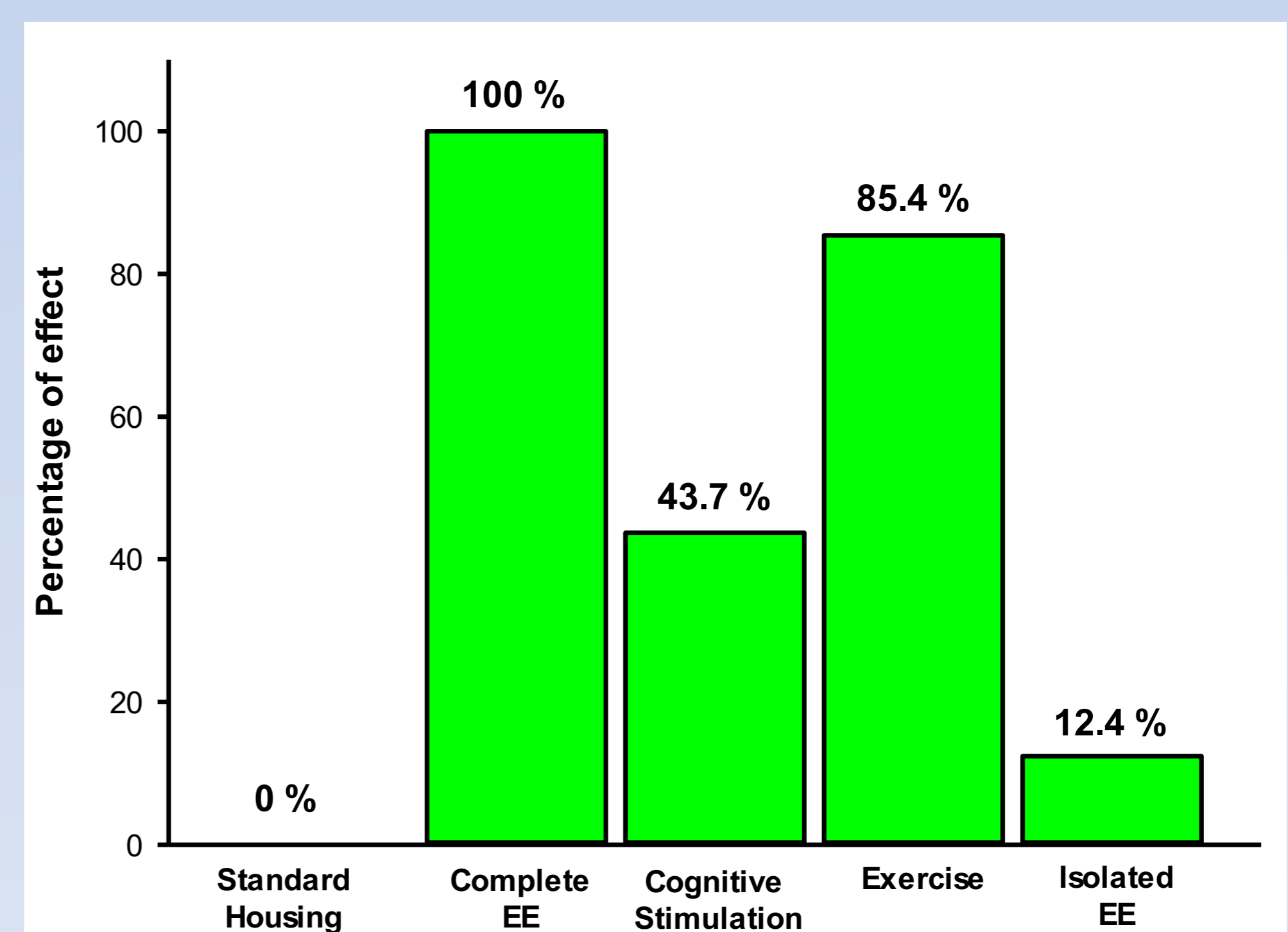


Fig. 2. Percentage of attenuation of behavioral sensitization in mice previously exposed to toluene and treated under different housing conditions. Data were obtained making a lineal approach where a 100% arbitrary value was given to the Complete EE and 0% to Standard Housing.

Conclusions

Elements of environmental enrichment, reduce addictive-like behaviors produced by inhalants, but in different levels. Physical exercise may be the main component provoking this effect. However, social interaction may be an imperative element to get benefits induced by EE. Present findings from basic preclinical models can be used to advise on interventions for inhalant abusers based on physical activities and social relationships.

Disclosure and Funding

The authors declare that they have no conflicts of interest.

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References

- Howard et al. *Addict Sci Clin Pract.* 6(1):18-31. 2011.
- Medina-Mora and Real. *Curr Opin Psychiatry* 21:247-251. 2008.
- Mercadillo et al. *Adaptive Behavior.* 27(4):277-282. 2019.
- Montes et al. *Brain Res Bull.* 144:58-67. 2019.
- Montes et al. *Neurotoxicol Teratol.* 61:7-16. 2017.
- Paez-Martinez et al. *Behav Brain Res.* 256:432-40. 2013.
- Paez-Martinez et al. Submitted. 2019.
- Villatoro et al. *Subst Use Misuse.* 46 Suppl 1:40-5. 2011.