

BDNF/TrkB signaling in learning and memory: The effects of 7,8-dihydroxyflavone on object memory

E. Bollen, S. Akkerman, H.M.W. Steinbusch, J. Prickaerts

Dept of Psychiatry and Neuropsychology, Maastricht University, The Netherlands

Introduction

- Brain derived neurotrophic factor (BDNF) is a neurotrophin which has emerged as an important regulator of synaptic plasticity in the central nervous system. BDNF promotes neuronal survival and growth, but can also influence synaptic plasticity in a more rapid manner e.g. via interaction with glutamate receptors and Ca^{2+} release [1].
- In hippocampal long-term potentiation (LTP), one of the most commonly studied forms of plasticity which is generally considered as the cellular correlate of memory formation, BDNF has been attributed a critical role [2].
- Currently, much memory research focuses on finding memory enhancers. BDNF has poor pharmacokinetic properties and is not suited for pharmacological treatment.
- Recently, 7,8-dihydroxyflavone (7,8-DHF) was identified as the first selective agonist of TrkB, the main receptor of BDNF [3].

AIMS

- Evaluate the potential of 7,8-DHF as a memory enhancer.
- Study the involvement of BDNF signaling in early and late memory consolidation processes.

Discussion

- 7,8-DHF improves memory when administered both immediately or 3 h after learning.
- The lowest effective dose was lower, i.e. 0.3 mg/kg, when 7,8-DHF was administered during the late consolidation phase compared to 1 mg/kg during early consolidation. This may suggest a stronger involvement of BDNF/TrkB signaling in late memory consolidation.
- In future research, we will focus on gaining insight into the signaling pathways involved in memory enhancement following BDNF/TrkB upregulation.

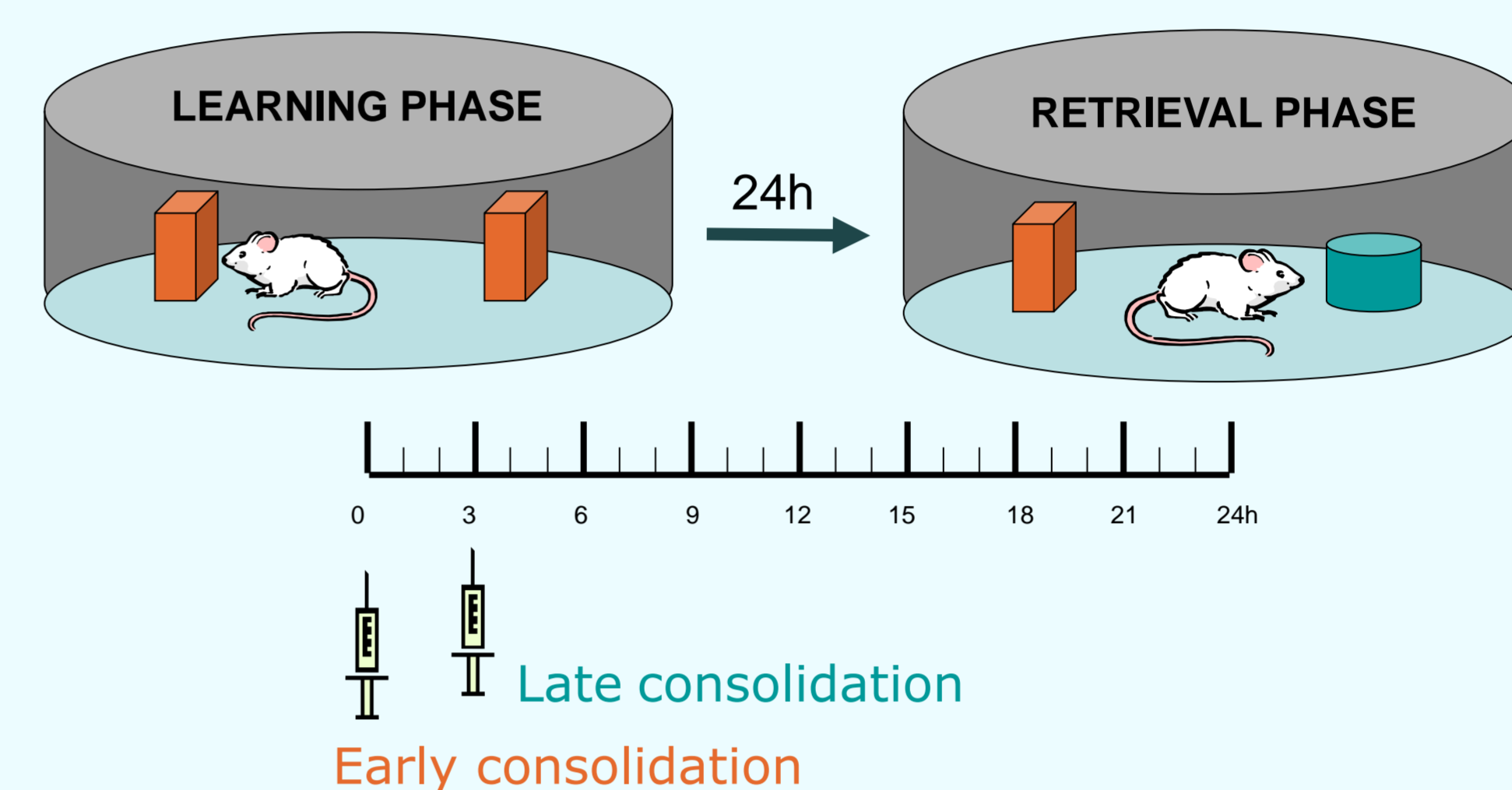
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Methods

Object recognition task (ORT)

15 Male Wistar Rats were tested repeatedly in the ORT



Memory performance is reported using the **discrimination index d2**

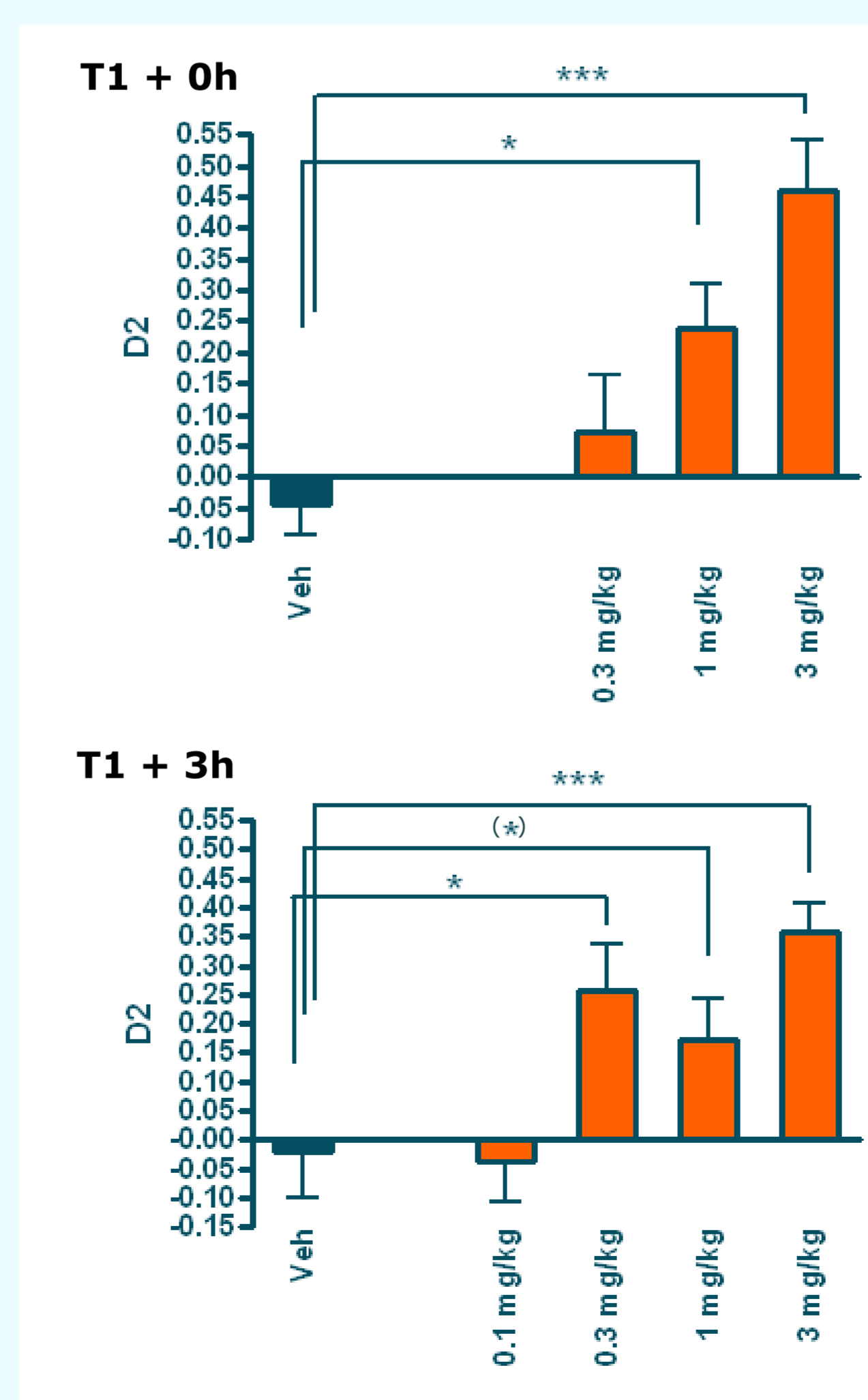
$$d2 = \frac{\text{Exploration novel} - \text{Exploration old}}{\text{Exploration novel} + \text{Exploration old}}$$

CONDITIONS	
T+0h	T+3h
Vehicle	Vehicle
	0.1 mg/kg
0.3 mg/kg	0.3 mg/kg
1 mg/kg	1 mg/kg
3 mg/kg	3 mg/kg

Treatment

7,8-dihydroxyflavone was dissolved in vehicle (96% 0.5% tylose and 4% tween80) and given p.o. immediately or 3 h after T1 (volume 2 ml/kg)

Results



(* $p < 0.1$, * $p < 0.01$; *** $p < 0.001$ using ANOVA)

7,8-DHF improves memory when given immediately after learning in a dose-dependent manner.

The lowest effective dose is 1 mg/kg.

7,8-DHF improves memory when given 3 h after learning.

The lowest effective dose is 0.3 mg/kg.

There was no potential conflict of interest for the authors in the presented research