

Attention modulates the dorsal striatum response to love stimuli

Sandra J.E. Langeslag, Frederik M. van der Veen, & Christian H. Röder

University of Maryland, Erasmus University Rotterdam, Erasmus Medical Center

Introduction

- Lifetime prevalence of romantic love approaches 100%
- Love has major impact on the individual and the society
- Several brain areas (caudate, putamen, ventral tegmental area (VTA), insula, anterior cingulate (ACC), posterior cingulate (PCC), & inferior frontal gyrus (IFG)) are activated while passively viewing love stimuli¹⁻³
- Research question: how does the instruction to attend to, or ignore the beloved modulate the response of these brain areas?

Methods

- 15 infatuated participants (6 men; 18-25 yrs)
- Full factorial oddball task⁴, see Fig. 1
- BOLD response estimated via deconvolution from 0-14 sec
- Betas averaged within seven bilateral ROIs, see Fig. 2
- Love (beloved, friend) x Task (target, distractor) ANOVAs on the average BOLD response at 4-6 sec

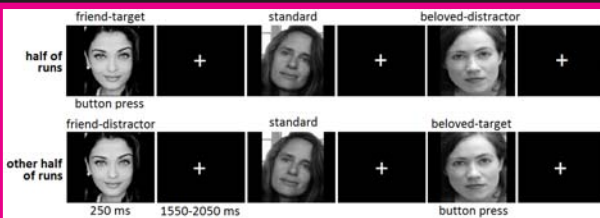


Fig. 1 Oddball task with frequent (80% of the trials) standard stimuli and rare (10%) beloved and friend stimuli serving as target and distractors in rotation

References [1] Aron et al. (2005) *J Neurophysiol*, [2] Bartels & Zeki (2000) *Neuroreport*, [3] Acevedo et al. (2012) *Soc Cogn Affect Neurosci*, [4] Langeslag et al. (2008) *Neurosci Lett*

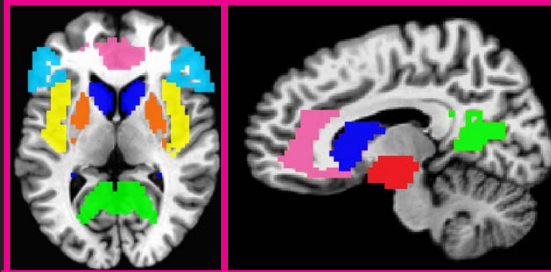


Fig. 2 Seven ROIs (dark blue = caudate, orange = putamen, red = VTA, yellow = insula, pink = ACC, green = PCC, light blue = IFG)

Behavioral results

- Similar hit rates for beloved (.98) and friends (.96)
- Higher false alarm rate for beloved (.05) than friends (.03)
- Shorter RTs for beloved (528ms) than friends (561ms)

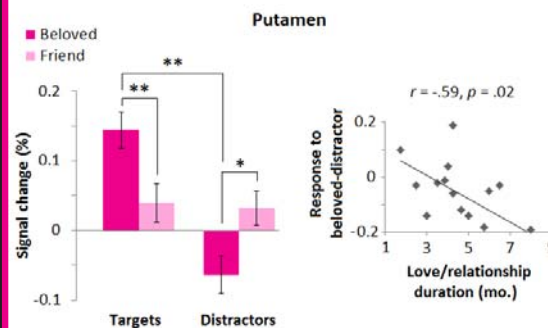


Fig. 4 left Average signal change in putamen at 4-6 sec in each of the conditions compared to the baseline (i.e. correct standard trials), ** = significant, * = trend **right** Correlation between love/relationship duration and putamen response to beloved-distractors

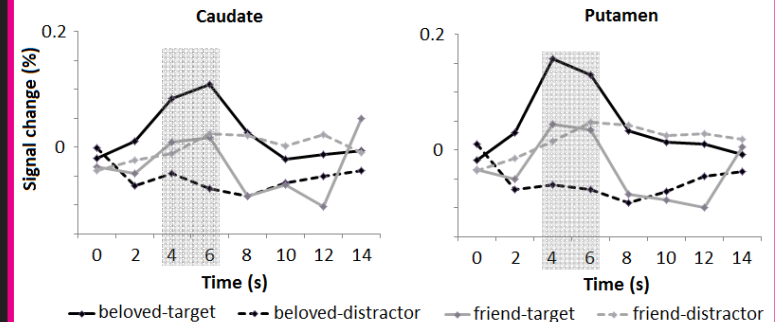


Fig. 3 Estimated BOLD responses to each of the conditions compared to the baseline (i.e. correct standard trials) in the caudate and putamen

fMRI results

- None of the ROIs showed a main effect of Love
- Significant main effects of Task in caudate, putamen, VTA, insula, & IFG; responses were larger for targets than distractors
- Significant Love x Task interaction in putamen & trend in caudate
- The dorsal striatum showed a greater response to beloved than friends, but only when they were targets, see Fig. 3 & Fig. 4 left panel
- The longer the love/relationship duration, the smaller the putamen response to beloved-distractors, see Fig. 4 right panel

Discussion

- The dorsal striatum responds to love stimuli only when they are attended
- This might reflect prior positive reinforcement of attending the beloved and prior negative reinforcement of ignoring the beloved
- This study greatly advances our understanding of the role of the dorsal striatum in romantic love
- Using cognitive tasks with full factorial designs will take the investigation of the neurocognition of romantic love to the next level

Correspondence to Sandra Langeslag, ✉ sjelang@umd.edu