# Opposing Oxytocin Effects on Intergroup Cooperative Behavior in Intuitive and Reflective Minds

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<sup>1</sup>L I B D , J H \_ \_ S M , B , MD, SA; <sup>2</sup>D P \_ \_ P \_ \_ P \_ \_ B \_ , C ; <sup>3</sup>PK -IDG/M G I B R , P \_ \_ B \_ , C ; <sup>4</sup>D P \_ \_ \_



(D et al, 2007; 9 et al, 2008; B et al, 2008), / /NA (B et al, 2008; G et al, 2013; G et al, 2013), FC (9 et al, 2008; G et al, 2013), OFC (9 et al, 2008; G et al, 2013).





## Oxytocin administration.



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Minimal group paradigm.



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Cognitive constraints on oxytocin effect Y Ma b а 30 Placebo-Intuitive Placebo-Reflective 30% Oxytocin-Intuitive Oxytocin-Reflective 25 In-group favoritism in cooperation Number of participants 25% Placebo 20 Oxytocin 20% 15 15% 10 10% 5 5% 0% 0 **Reflective Promotion** Intuitive Promotion Out-group lover Equal lover In-group lover -5%

**Figure I** Distinct oxytocin effects on ingroup favoritism when intuition or reflection was promoted. (a) Oxytocin administration significantly enhanced ingroup favoritism when intuition was encouraged, whereas oxytocin significantly decreased ingroup favoritism when reflection was favored. (b) Distribution of outgroup-favored, equal, and ingroup-favored players. The distribution of 'ingroup-favored players' and 'outgroup-favored players' differed significantly across the four conditions. Oxytocin increased the number of ingroup-favored players among the individuals who were primed with intuition, whereas oxytocin decreased the number of ingroup-favored players among the reflection.



**Figure 2** Effects on ingroup facilitation outgroup deterioration. (a) Oxytocin increased contribution to ingroup members when intuition was encouraged, but decreased ingroup cooperation when reflection was favored. However, there was no significant Treatment × Priming interaction when playing with outgroup members. (b) The Treatment × Priming interaction on ingroup favoritism was mediated by its effect on contribution amount to ingroup members. The bootstrapped sampling distribution of mediator effect was provided on the right panel.



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Cognitive constraints on oxytocin effect  $\Upsilon\ Ma$ 

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**Figure 3** Influence of intuition reflection importance in daily life on ingroup favoritism during PGGs. Oxytocin administration increased ingroup favoritism on the contribution during PGG in individuals who thought intuition-important (a) or reflection-unimportant (b) in daily-life decision-making. However, oxytocin administration reduced ingroup favoritism during PGG in those who thought intuition-unimportant (a) or valued reflection-important (b) in daily-life decision-making. <sup>†</sup>P < 0.07; <sup>\*</sup> < 0.05; <sup>\*\*</sup> < 0.01; <sup>\*\*\*\*</sup> < 0.001.



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### DISCUSSION









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