



Oxytocin biases men to be more or less tolerant of others' dislike dependent upon their relationship status

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ABSTRACT

The experience of being liked or disliked by others strongly influences our liking for and willingness to socialize with them. The neuropeptide oxytocin is involved in social bonding and can modify social preferences for others dependent upon their characteristics. However, it is unclear whether oxytocin affects individuals' reactions to social evaluations made by others (i.e., being liked or disliked) and if this is influenced by already having a secure partner bond (i.e., being single or in a relationship). We therefore performed a double-blind, between-subject, placebo controlled design study on 86 healthy males to investigate the effects of intranasal oxytocin (40IU) on the respective impact of being liked or disliked by others, and whether this was influenced by current relationship status.

Results: showed while oxytocin decreased negative reactions to being disliked in single men it had the opposite effect on men in a relationship, and this occurred primarily when dislike was expressed by females rather than males. In contrast, for men in a relationship oxytocin enhanced mood and affiliation tendency following being liked independent of the gender of the feedback provider. Thus, oxytocin may make single men looking for a potential partner more positive socially even towards females who dislike them, but has the opposite effect in men in a relationship who are not looking for a partner. These results provide further support for the context-dependency of oxytocin effects' on social preferences, and thereby the social salience hypothesis-based explanation of its actions.

1. Introduction

Receiving social feedback influences our willingness to establish affiliations with others (Davey et al., 2010), and relates to the fundamental human need to belong, and be accepted by others (Vanderhasselt et al., 2015). The experience of positive social feedback such as being liked, accepted, included or praised is associated with reward and positive self-esteem (Davey et al., 2010) whereas negative social feedback such as being disliked, rejected, excluded or criticized is distressing and promotes negative self-related thoughts and reduced self-esteem (Vanderhasselt et al., 2015). However, whereas reciprocity in responses to being liked are well established in non-romantic context, in romantic ones lack of reciprocity, “playing hard to get”, can also increase attraction in some contexts (Eastwick et al., 2007), possibly as a result of more attractive individuals using this strategy in order to interest the most confident and attractive partners.

The neuropeptide oxytocin (OXT) is a key modulator of social-emotional processes and promotes attraction, affiliation and social bonding in animals (Hammock and Young, 2006). In humans OXT facilitates social approach and attraction (Feldman, 2012), promoting the initiation and maintenance of social bonds (Scheele et al., 2012). Oxytocin also plays a role in repairing damaged ones between partners (Ditzen et al., 2009) and increases efforts to restore social connection with individuals who reject us in men, but not in women (Xu et al., 2017).

Oxytocin modifies social preferences and approach behavior during initial social encounters in both a context- and person-specific manner (Gao et al., 2016; Preckel et al., 2014; Scheele et al., 2012). Most notably differences between the sexes occur in their respective behavioral responses towards individuals with positive and negative social attributes and their associated responses in the amygdala and its functional connections with the insula (Gao et al., 2016). These findings, together

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with its modulatory effects on the brain salience network during processing of social stimuli (Yao et al., 2018), support the hypothesis that OXT primarily acts to enhance the salience of social cues (Shamay-Tsoory and Abu-Akel, 2016). Oxytocin effects can also be modulated by factors related to the presence and/or security of attachment bonds with others, such as whether an individual is single or in a stable romantic relationship or if they have a secure or insecure attachment style. Thus, for example, OXT influenced men in a relationship, but not single men, to be less willing to approach an attractive female stranger (Scheele et al., 2012).

Despite the importance of social evaluation in approach behavior, the effects of OXT on emotional reactivity towards positive and negative social feedback as a function of relationship status have not been investigated. In the current study, we therefore examined the effects of intranasal OXT on the emotional response of male subjects towards individual males or females who express either like or dislike for them. Based on previous findings that single men can find women who play “hard to get” attractive and that OXT enhances attempts by men to restore social connections with individuals who have rejected them as well as approach behavior towards unfamiliar attractive women, we hypothesized that in single men it would both increase the positive impact of being liked and decrease that of being disliked by unfamiliar women. In men in a relationship however, we hypothesized that oxytocin would increase reciprocal responses towards both sexes and therefore increase the positive impact of being liked and the negative impact of being disliked.

2. Materials and methods

2.1. Participants

In a double-blind, between-subject placebo (PLC) controlled design, 86 healthy heterosexual male University students (mean age $\pm$ sem = 22.14 ± 2.31 years and mainly from Science and Engineering majors) were randomly assigned to treatment with either intranasal OXT or PLC before receiving positive and negative feedback during a social evaluation paradigm. To examine whether the effects of OXT on social evaluation depend on relationship status the treatment groups were balanced for this factor (PLC, $n = 21$ singles, $n = 22$ in a relationship; OXT, $n = 21$ singles, $n = 22$ in a relationship). Subjects in the relationship group had all been in an exclusive relationship for > 6 months (range 6 months to 7 years, mean $\pm$ sem duration = 27.43 ± 4.4 months) and none of the subjects had children. In an initial interview all subjects reported being free of medical or psychiatric disorders, current or regular medication and did not consume caffeine-containing drinks on the day of the experiment. The study had full approval from the local ethics committee of the University of Electronic Science and Technology of China and procedures were in accordance with the latest revision of the declaration of Helsinki. All subjects provided written informed consent.

2.2. Experimental design

The study employed a two-step social evaluation paradigm adapted from Davey et al. (2010) whereby subjects gave likeability ratings for individuals before and after they provided social evaluations of them (like, dislike or no opinion) (see Fig. 2). Subjects attended a first session where they were informed that they would be part of a study investigating how first impressions influence how much a person is liked. All subjects were first asked to rate how much they liked 60 different unfamiliar individuals (30 males, 30 females) based on their neutral expression face photographs and using a 9-point scale. They also had their own face photo (Fig. 1) taken and were told that the 60 individuals would also rate how much they liked them. All 60 facial pictures (30 males and 30 females) used in the study were evaluated for likeability on a 9 point scale (1 = “not at all”, 9 = “very much”) by an

independent group of subjects ($n = 17$, males) to establish that there was an equal distribution of high, medium and low likeability ones. Based on their likeability ratings, the stimuli could be divided into three sets of 20 [M (high) = 5.63, SE = 0.08, M (middle) = 4.54, SE = 0.04, M (low) = 3.51, SE = 0.04].

During the experimental session one week later subjects initially completed a set of questionnaires to control for between-group differences in mood and personality traits (see Table 1). To further familiarize subjects with the individuals providing social feedback, and to ensure rating consistency, they first re-rated the same 60 faces. Each subject was then individually assigned 48 of these pictures based on their own ratings of the faces: the 16 ranked highest for likeability, the 16 ranked lowest and the 16 in the middle (in each case comprising 8 males and 8 females). For the male and female pictures chosen from the high and low likeable groups, 4 male and 4 female pictures from each group were randomly assigned to provide either a positive or negative evaluation of the subject (“This person likes you” or “This person dislikes you”). For the face pictures from the medium likeable controls no evaluation was assigned (i.e. “unknown attitude”). Subjects were then administered either intranasal OXT (40 IU OXT in water, 0.9% sodium chloride and glycerol supplied by the Sichuan Meike Pharmaceutical Company, China—5 puffs of 4IU per nostril with 30 s between each puff) or PLC (supplied by the same company and containing all the same ingredients other than OXT, also 5 puffs per nostril) according to a standardized protocol (Guastella et al., 2013). We chose to use a 40IU dose since this was the same as in our previous study showing OXT effects on men in response to social rejection (Xu et al., 2017) and on processing of social stimuli in the brain salience system (Yao et al., 2018). Although many intranasal OXT studies have used a 24IU dose (Guastella et al., 2013) we have found no significant difference between the neural and behavioral functional effects of 24 vs 40IU doses (Zhao et al., 2017). OXT Post-experiment interviews confirmed that subjects were unable to identify which treatment they received ($\chi^2 = 0.05$, $p = 0.83$).

Forty-five minutes after treatment, each subject received verbal social evaluations by combining their designated facial stimuli with text stating either positive, negative or unknown feedback or balanced across the subject-specific pre-feedback likeability ratings and stimulus gender. The subjects were simply instructed to pay attention to the feedback provided. Following the social evaluation paradigm, subjects completed a surprise memory test, where the faces of the 48 individuals (without feedback information) were intermixed with those of 48 new ones. They were also asked to rate their likeability, how good they felt about the person (feeling), and how much they would like to have them as a friend (affiliation tendency) on 9-point scales. Finally, participants were debriefed and the deceptive nature of the task discussed with them.

The impact of the feedback on social preference was determined by first calculating the change in likeability ratings before and after feedback [post-feedback–pre-feedback (mean of first two ratings difference)] for each subject. To control for feedback-independent effects of OXT and individual differences in likeability the difference scores for ratings of individuals providing no feedback were then subtracted (in a gender-specific manner) from those providing positive or negative feedback evaluations. The post-evaluation feeling and affiliation tendency subjects’ ratings were also expressed as difference scores from those for the face stimuli where no evaluation feedback was provided.

3. Results

An intra-class correlation coefficient (ICC) confirmed that ratings were stable across the across the first two sessions (ICC = 0.68, SD = 0.17) in both treatment groups [$t_{(84)} = 0.04$, $p = 0.97$]. There were no effects of OXT on the ratings of faces in the feedback control condition for likeability, feeling, affiliation or recognition accuracy (all $ps > 0.67$), arguing against any potential effects of OXT on faces

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