# CORRESPONDENCE

## Oxytocin, Social Salience, and Social Approach

To the Editor:

The interesting response by Kemp and Guastella to our article titled "Intranasal Administration of Oxytocin Increases Envy and Schadenfreude (Gloating)" suggests that the approach-withdrawal theory of emotion may serve as an alternative framework for the interpretation of our results.

In the article, we argue that oxytocin may have a pivotal role in enhancing the salience of social agents. The oxytocinergic system is primarily involved in social emotions. Accordingly, administration of oxytocin may increase trustworthiness (1), generosity, and altruism (2) in positive social contexts, and elevate levels of envy and Schadenfreude (3) in competitive situations. Kemp and Gustella present an alternative explanation, suggesting that the reported increase in levels of envy and Schadenfreude following administration of oxytocin may be attributed to activation of the approach system, rather than to a general increase in the salience of social behavior.

Although our social salience explanation and the proposed approach-withdrawal interpretation are not mutually exclusive, the latter theoretical framework involves two major limitations. The first concern is the use of the approach-avoidance model to explain complex emotions. Much theory in contemporary neuroscience and psychology rests on the idea that appetitive and aversive motivational mechanisms represent central elements in the organization of emotions and behaviors. The appetitive system organizes behavior involved in approaching desired incentives (rewards, goals), whereas the aversive system organizes behavior involved in avoiding threats (4). According to the approach-withdrawal model, emotions such as disgust and fear involve avoidance, whereas other emotions, such as happiness, involve approach (5). Indeed, several emotions, such as disgust, include a clear withdrawal component (e.g., avoiding a bad smell). The experience of envy, by contrast, is complex and may engage several negative primary emotions, including anger, as well as other emotions, such as sadness and fear (6). Although anger has been associated with approach (4), fear is most often linked to withdrawal (7). Thus, the key difficulty with the approach-withdrawal model is that it is not clear whether complex emotions such as envy and Schadenfreude, among others, involve approach, withdrawal, or both.

Moreover, although the approach-withdrawal account of emotion deals with approaching or avoiding human or physical stimuli, the oxytocinergic system appears to have a selective role in the social domain. The approach-withdrawal theory organizes emotions according to the behavioral responses that are generated toward an object, which can be human or nonhuman (e.g., smell, animal, loud noise). Recent evidence demonstrates that although the oxytocinergic system reacts to social agents, it does not respond to objects. In rodents, oxytocin enhances social recognition, as indicated by decreased investigative behavior toward a conspecific rodent during a second encounter (8,9). Notably, it has recently been reported that intranasal administration of oxytocin to 44 men specifically improved their recognition memory for human faces, but not for nonsocial stimuli, suggesting that oxytocin modulates social but not nonsocial, memory (10).

Nonetheless, although the oxytocinergic system is clearly involved in modulating social emotions, it remains possible that envy and Schadenfreude are indeed approach-related emotions and that the oxytocinergic system activates a "social approach" mechanism. Thus, the analysis of our results presented by Kemp and Guastella is plausible under the condition that the approach system is activated toward a social agent. Although this "social approach" account is feasible, the social salience hypothesis may still be a more parsimonious explanation regarding the role of oxytocin in emotions.

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