Review

Biological Psychiatry

Oxytocin Conditions Intergroup Relations Through Upregulated In-Group Empathy, Cooperation, Conformity, and Defense

Carsten K.W. De Dreu and Mariska E. Kret

ABSTRACT

Humans live in, rely on, and contribute to groups. Evolution may have biologically prepared them to quickly identify others as belonging to the in-group (vs. not), to decode emotional states, and to empathize with in-group members; to learn and conform to group norms and cultural practices; to extend and reciprocate trust and cooperation; and to aggressively protect the in-group against outside threat. We review evidence that these components of human group psychology rest on and are modulated by the hypothalamic neuropeptide oxytocin. It appears that oxytocin motivates and enables humans to 1) like and empathize with others in their groups, 2) comply with group norms and cultural practices, and 3) extend and reciprocate trust and cooperation, which may give rise to intergroup discrimination and sometimes defensive aggression against threatening (members of) out-groups. We explore the possibility that deficiencies in (components of) group psychology, seen in autistic spectrum disorder, schizophrenia, and borderline personality and social anxiety disorders, may be reduced by oxytocin administration. Avenues for new research are highlighted, and implications for the role of oxytocin in cooperation and competition within and between groups are discussed.

Keywords: Cognitive neuroscience, Cooperation, Intergroup discrimination, Neuropeptides, Psychopathology, Social cognition

http://dx.doi.org/10.1016/j.biopsych.2015.03.020

Humans are social animals and much of their evolutionary success has been attributed to their strong capacity for cooperation within groups (1,2). Relative to other species, humans are more likely to cooperate with unfamiliar and genetically nonrelated others and to create cohesive groups that include genetically unrelated others (3). It is within such groups, where members are interconnected and share a common fate, that humans developed artistic expressions, cultural rituals, and language (4); perfected ways to disseminate knowledge, insights, values, and preferences (5); learned to negotiate and trade (6); and designed and implemented social and technological innovations (7,8).

Because groups have been, and continue to be, pivotal to human survival and prosperity, evolution may have biologically prepared humans for developing a sophisticated group psychology that enables them to live in, rely on, and contribute to social groups (1). Such group psychology includes, but is not limited to, the ability to distinguish others on the basis of group membership, to signal and decode emotional states and empathize with others within one's group, to learn and comply with group norms and cultural practices, and, last but not least, to extend and reciprocate trust and cooperation with fellow group members (1,9–13). Importantly, these interrelated facets of human group psychology not only oil group functioning both absolutely and relative to other groups but also enable the individual to fit into a group, to profit from the safety and security it provides against outside threat, to be included in potentially beneficial exchanges with others, and to receive social support. Vice versa, impairments in (components of) such group psychology undermine social inclusion and fitting in (14). Individuals chronically suffering from such impairments, including those diagnosed with autism spectrum disorder, schizophrenia, borderline personality disorder, or social anxiety disorder, risk lack of social support and have reduced well-being and poor health (15–17).

Here, we review evidence that key components of human group psychology rest on and are modulated by the evolutionary ancient hypothalamic neuropeptide oxytocin. We explore the role of oxytocin in combatting deficiencies in (components of) group psychology seen in autism spectrum disorder, schizophrenia, borderline personality disorder, and social phobia (18). We conclude that oxytocin motivates and enables tendencies to 1) like and empathize with others in their groups, 2) comply with group norms and cultural practices, 3) extend and reciprocate trust and cooperation, and 4) discriminate against and aggress rivaling out-groups and that oxytocin administration may effectively challenge dysfunctional deficiencies in these tendencies, as typically seen in a range of psychiatric disorders.

FEAR DAMPENING, SOCIAL SALIENCE, AND BIASED BIOBEHAVIORAL APPROACH AVOIDANCE

Oxytocin is a nine-amino-acid peptide hormone that is synthesized primarily in the paraventricular and supraoptic nuclei

ISSN: 0006-3223

of the hypothalamus (19–22). Upon its release from neuronal soma, axons, and dendrites, oxytocin acts as a neuromodulator—it flows through neural tissue by a process termed volume transmission, which allows the oxytocin molecule to quickly modulate social emotional functions of the amygdala and brain stem (19,23,24). In addition, oxytocin targets the hippocampus and interacts with reward processing circuitries including the caudate nucleus, the nucleus accumbens, and the inferior frontal gyrus (20,21,25).

Through its interaction with the hypothalamic-pituitary-adrenal axis, oxytocin attenuates stress responses at both the body and neural level (19,26,27). For example, intranasal administration of oxytocin reduces cortisol levels after exposure to stressors (28–30) and inhibits cardiovascular stress responses (31,32). There is evidence too that intranasal oxytocin dampens amygdala responses to fear-provoking stimuli (33,34), although this is seen especially in male subjects (35,36) and may be contingent on early life experiences (16,37,38). Finally, oxytocin blunts attention to negative social cues such as angry faces and displays of dominance (38–41), and in patients with anxiety disorders, intranasal oxytocin attenuates hyperactivity in the amygdala when social cues conveying threat are displayed (42). Accordingly, in Vietnam veterans with posttraumatic stress disorder, oxytocin attenuated physiological responses during personal combat imagery (31). Oxytocin also protects against negative behavioral and autonomic consequences of long-term social isolation (43). The combination of intranasal oxytocin and social support reduces stress indexed by both self-report and endogenous cortisol (44).

In addition to its anxiolytic effects, oxytocin also modulates dopaminergic circuitries involved in reward processing and empathic responding (20,21,25,45–47). Accordingly, intranasal oxytocin strengthens general tendencies in social-cognitive processing. This social-salience account implies that what is usually considered positive and interesting becomes more positive and interesting under oxytocin, and what is commonly considered negative and aversive becomes more negative and aversive under oxytocin (48–50). Thus, when given oxytocin (vs. matching placebo) and asked to recall memories of maternal care and closeness, securely attached male subjects recalled more positive events, while anxiously attached male subjects recalled more negative experiences (48,51). Also, oxytocin stimulated positive responding to friendly faces and negative responding to unfriendly faces (49), and following an interpersonal competition, oxytocin enhanced envy when the competition was lost and Schadenfreude (gloating) when the competition was won (50).

Possibly through the combination of fear dampening and increased social salience, oxytocin 1) acts on the wanting mesocorticolimbic circuitry promoting (affiliative) approach, especially when (social) targets or events have positive valence; and 2) acts on the cortico-amygdala circuitry to reduce withdrawal from (social) threat, thus permitting alternative responses to danger and threat than flight (52–56) (Figure 1). Such oxytocin-biased biobehavioral approach avoidance resonates with a wealth of research showing that, first of all, oxytocin promotes social bonding between sexual partners (57–60) and enables positive parent-offspring interactions such as play and caring (61–63). This, as shown in Figure 1, translates also into enhanced tendencies to empathize, affiliate, conform, and cooperate with others, especially when these others are seen as familiar and in-group (Figure 1). Second, oxytocin-biased biobehavioral approach avoidance fits evidence that intranasal oxytocin potentiates startle reactivity to threat stimuli, especially when these are unpredictable (35,56,64) and the growing evidence that oxytocin prepares for and enables aggressive responding to threat, especially threat to offspring (viz. maternal defense) (65–69). One recent study showed that in humans, intranasal administration of oxytocin reduces calculated aggression to subordinate others and acquire their resources but does not incapacitate defensive aggression aimed at protecting against predation (53). Thus, through its dampening of the cortico-amygdala circuitry, oxytocin permits alternative responses to threat than flight and may upregulate vigilance and defense-motivated aggression aimed at protecting oneself and in-group members against outside threats, including those posed by human enemies (Figure 1).

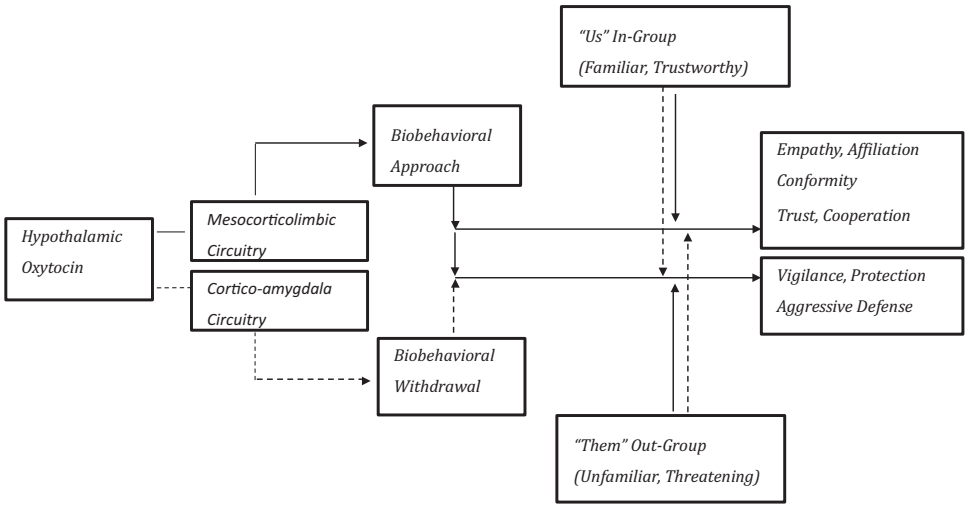

Figure 1. Oxytocin modulates group psychology through biased biobehavioral approach/withdrawal. Dashed (solid) lines are inhibitory (facilitating).