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Basal salivary oxytocin level predicts extra- but not intra-personal dimensions of emotional intelligence

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Summary A wealth of literature suggests that oxytocin is an important mediator of social cognition, but much of the research to date has relied on pharmaceutical administration methods that can raise oxytocin to artificially high levels. The present study builds upon previous work by examining whether basal oxytocin level predicts intra- and extra-personal (i.e., self- and other-focused) elements of emotional intelligence (EI), independent of shared variance with current mood. The sample included 71 healthy young adults (46 women). Assessment measures included the Mayer—Salovey—Caruso Emotional Intelligence Test Version 2.0 (MSCEIT), the Trait Meta-Mood Scale, and the Profile of Mood States. Peripheral oxytocin levels were examined with enzyme-linked immunosorbent assay from saliva after solid phase extraction. Oxytocin level was unrelated to TMMS scores but was positively associated with performance in the Experiential EI domain of the MSCEIT. However, total mood disturbance was positively related to MSCEIT scores. Hierarchical regression analysis indicated that oxytocin level added unique variance to the prediction of MSCEIT performance beyond that of current mood. These results confirm an association between endogenous levels of oxytocin in healthy adults and a subset of EI abilities, including extra-personal emotion recognition and the channeling of emotions to enhance social proficiency.

1. Introduction

Social cognition requires the interconnection of many component processes to enable adaptive affiliations with others (Adolphs, 2001), and growing evidence highlights oxytocin (OT) as an important mediator of several of these processes. OT is thought to directly influence emotion perception by enhancing detection accuracy of emotional stimuli (Schulze et al., 2011), boosting the capacity to attend to the eye region of the face (Gamer et al., 2010), and increasing mentalization through a decoding of eye expression (MacDonald et al., 2013). Neuroimaging data have shown that OT administration attenuates activity in the amygdala during processing of fearful stimuli (Gamer et al., 2010) and dampens the functional connectivity between the amygdala and

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other brain regions involved in fear processing (Kirsch et al., 2005), which, in conjunction with behavioral measures, has been taken to suggest that OT primarily enhances the encoding of positive social information (Guastella et al., 2008). In the domain of emotional understanding, exogenous OT enhances trust and willingness to accept risks during social tasks (Kosfeld et al., 2005), increases expressions of empathy (Krueger et al., 2013), and improves empathic accuracy in those with elevated Autism Spectrum Quotient scores (Bartz et al., 2010).

An evolving view of OT, however, suggests that its behavioral effects are moderated by the social nature of the experimental context and by stable characteristics of the individuals under study (Bartz et al., 2011). Regarding context, it appears that OT facilitates approach behavior when social stimuli are salient but that some minimum number of social cues is needed; while these cues do not necessarily have to be derived from live, face-to-face encounters, the influence on prosocial behavior is contingent upon some form or expectation of a social milieu (Declerck et al., 2010). Regarding individual differences, data suggest that exogenous OT induces adverse hypersensitivity to social cues in individuals who are, for various reasons, already socially attuned (for review, see Olff et al., 2013). There is speculation that differential outcomes reflect pre-existing differences in basal OT (Bartz et al., 2011), such that negative socioemotional consequences of OT administration might be localized to individuals who already have naturally occurring high levels of OT. It is possible that inconsistencies in social cognition research in which OT levels are pharmaceutically manipulated reflect unmeasured trait-like individual variations in endogenous OT; however, to determine this, we need research that assesses the covariance between socioemotional functioning and endogenous OT levels.

As social cognition is a broad domain, there are still gaps in our knowledge about the extent to which OT is associated with enhanced emotion processing in healthy adults. In this study, we focused on emotional intelligence (EI) as a more specific indicator of social cognition. EI includes the ability to perceive and generate emotions, respond appropriately to emotions in self and others, and utilize emotions to assist cognition. Although some of the aforementioned studies have incorporated behavioral paradigms related to EI (e.g., detection of emotional content in facial expressions), there is scarce research that simultaneously examines multiple aspects of EI in relation to OT. Within the domain of EI, a further distinction can be made between the personality traits that define the construct, which are typically assessed via self-report, and aptitudes, which are usually measured with objective, performance-based tests. A second differentiation can be made of EI as a set of meta-cognitive processes that enable reflection upon one's own emotions versus those of others, two related but not perfectly overlapping activities (Dimaggio et al., 2008).

Mindful of these points of difference, we included in our behavioral protocol a self-report EI measure, the Trait Meta Mood Scale (Salovey et al., 1995), and a broadband, performance-based EI test, the Mayer—Salovey—Caruso Emotional Intelligence Test Version 2.0 (MSCEIT; Mayer et al., 2002). The TMMS parses intra-personal (i.e., self-focused) EI into three variables: attention to emotion, clarity among emotions, and mood regulation. To our knowledge, no one has examined whether systematic differences in TMMS scores co-vary with endogenous OT levels. The MSCEIT assesses both intra- and extra-personal (i.e., other-focused) EI across four discrete domains: the ability to identify emotions in self and others, use emotions to improve thinking and facilitate problem-solving, understand complex emotional meanings and situations, and manage emotions in self and others to achieve positive outcomes. In a recent study using a subset of the MSCEIT scales, Cardoso et al. (2014) found that people who received exogenous OT performed worse in facial emotion recognition than those in the placebo group, which they interpreted as supporting the idea that intranasal OT can, at times, be insalubrious by promoting emotional hypersensitivity. Because pharmaceutical administration typically elevates OT to levels many times greater than what is seen outside of the laboratory (Weisman et al., 2012), it is vital to understand the extent to which basal OT levels predict individual differences in EI.

The present study extends the work of Cardoso et al. (2014) by assessing endogenous peripheral OT concentration in conjunction with the TMMS and the full MSCEIT, while controlling for negative affect as a potential confounder. Higher OT has been associated with greater acute anxiety (MacDonald et al., 2013) and greater depression (Holt-Lunstad et al., 2011). Furthermore, emotional well-being is known to account for significant variance in performance-based EI (Webb et al., 2013). In order to determine how OT relates to EI independent of negative affect, we included the Profile of Mood States (POMS; McNair et al., 1992) in our protocol to provide an index of mood disturbance. For this study, we chose a nonclinical sample of young adults in order to capture a wide range of EI individual differences yet avoid the psychiatric comorbidities inherent in clinical samples. Given that OT enhances emotion processing in social contexts, we expected a relationship between basal OT concentration and the extra- but not intra-personal elements of EI. In other words, we expected OT level to co-vary with MSCEIT performance specifically in domains that emphasize the application of EI skills to the recognition, understanding, and management of emotions in other people; in contrast, we did not expect OT to co-vary with TMMS scores or with performance in MSCEIT domains that assess the recognition, understanding, and management of emotions within the self. Barring outlying subjects with very high OT levels, we anticipated the hypothesized relationship to be positive in direction, such that higher OT would be associated with higher extra-personal EI.

2. Method

2.1. Participants

The sample included 71 right-handed, young adults (46 women; mean age = 18.9 $\pm$ 1.2 yrs) who participated in the study for college course credit. Self-reported ethnicity was 90.8% White, 7.9% Asian/Asian-American, and 1.3% Latino/Hispanic. Individuals were excluded if they reported current or past psychiatric/neurologic illness, current significant medical illness, current use of psychotropic medication, and nonfluency in English. The protocol was consistent with Ethical Guidelines of the Declaration of Helsinki and was approved by the local Institutional Review Board.