Psychoneuroendocrinology 66 (2016) 159–165

Contents lists available at ScienceDirect

Psychoneuroendocrinology

journal homepage: www.elsevier.com/locate/psyneuen

The effect of oxytocin on the anthropomorphism of touch

Leehe Peled-Avron[a,*], Anat Perry[b,c], Simone G. Shamay-Tsoory[a]

[a] Department of Psychology, University of Haifa, Haifa 3498838, Israel
[b] The Psychology department, University of California, Berkeley, CA 94720, USA
[c] Helen Wills Neuroscience Institute, University of California, Berkeley, CA 94720, USA

ARTICLE INFO

Article history:
Received 10 November 2015
Received in revised form
24 December 2015
Accepted 15 January 2016

Keywords:
Interpersonal touch
Oxytocin
Anthropomorphism
Social Cognition

ABSTRACT

One of the leading hypotheses regarding the mechanism underlying the social effects of oxytocin (OT) is the "social salience hypothesis", which proposes that OT alters the attentional salience of social cues in a context-dependent manner. Recently, OT was implicated in the process of anthropomorphism; specifically, OT was found to increase the tendency to ascribe social meaning to inanimate stimuli. However, the precise component of social interaction that contributes to this effect remains unclear. Because OT plays a role in the response to touch, whether or not objects are touching in a social context may represent the prominent trigger. Given that OT plays a major role in both anthropomorphism and touch, it is reasonable to assume that OT enhances anthropomorphism specifically for non-human touch, further clarifying its role in altering the perceptual salience of social cues. Here, we examined whether intranasal delivery of OT influences anthropomorphism for touch in inanimate objects. To that end, we implicitly measured the emotional reactions of participants ($N = 51$) to photos that depicted two humans or two inanimate objects either touching or not touching. We asked them to rate whether they will include each photo in an emotional album and found that OT treatment increased the likelihood of inclusion in an emotional album to photos that contain touch, particularly between inanimate objects. In a follow-up experiment we found that the more human the inanimate objects were perceived, the more included they were in the emotional album. Our findings demonstrate that OT can enhance the social meaning of touch between two inanimate objects and advance our understanding of the mechanisms underlying the ability of OT to anthropomorphize environmental cues.

1. Introduction

Oxytocin (OT) is a neuropeptide hormone that plays an essential role in mammalian reproduction, particularly during birth and lactation. The oxytocinergic system also promotes mammalian bonding (Bales and Carter, 2003; Bielsky and Young, 2004; Cho et al., 1999; Insel and Hulihan, 1995; Insel, 2010) and enhances social, cognitive, and emotional functions in humans (Kirsch et al., 2005; Lee et al., 2009). These improved functions include the recognition of complex mental states and emotions (Domes et al., 2007), memory of faces (Rimmele et al., 2009), eye contact (Guastella et al., 2008), encoding of positive social memories and words (Guastella et al., 2008; Unkelbach et al., 2008), trust, and altruism (Zak et al., 2005). OT also reduces endocrine responses to social stress (Heinrichs et al., 2003), increases feelings of envy and gloating (Shamay-Tsoory et al., 2009), and increases fear recognition (Fischer-Shofty et al., 2010). Although there is conflicting evidence regarding the effects of OT on social behavior, one leading theory is the "social salience hypothesis", which postulates that OT alters the attentional salience of social cues in a context-dependent manner (Bartz et al., 2011; Shamay-Tsoory and Abu-Akel, 2016; Shamay-Tsoory et al., 2009).

In line with the social salience hypothesis, OT was recently reported to enhance the anthropomorphism of inanimate, non-social stimuli in a social context, indicating that OT may increase salience of social signals even in non-social objects. Scheele et al. (2015) examined the effects of OT using a classic paradigm that examines anthropomorphic attributions. The authors presented a short film (adapted from Heider and Simmel, 1944) that depicts three moving geometric shapes while the movements are described by the viewer as a social interaction. Previous findings showed that viewers as young as five years of age can ascribe intentions, emotions, relationships, personality traits, and even gender to the geometric shapes (Berry and Springer, 1993), and these responses are not specific to a given culture (Marek, 1966). Scheele et al.

* Corresponding author at: Department of Psychology, University of Haifa, Mount Carmel, Haifa 3498838, Israel.
E-mail address: Leehee.peled@gmail.com (L. Peled-Avron).

http://dx.doi.org/10.1016/j.psyneuen.2016.01.015
0306-4530/

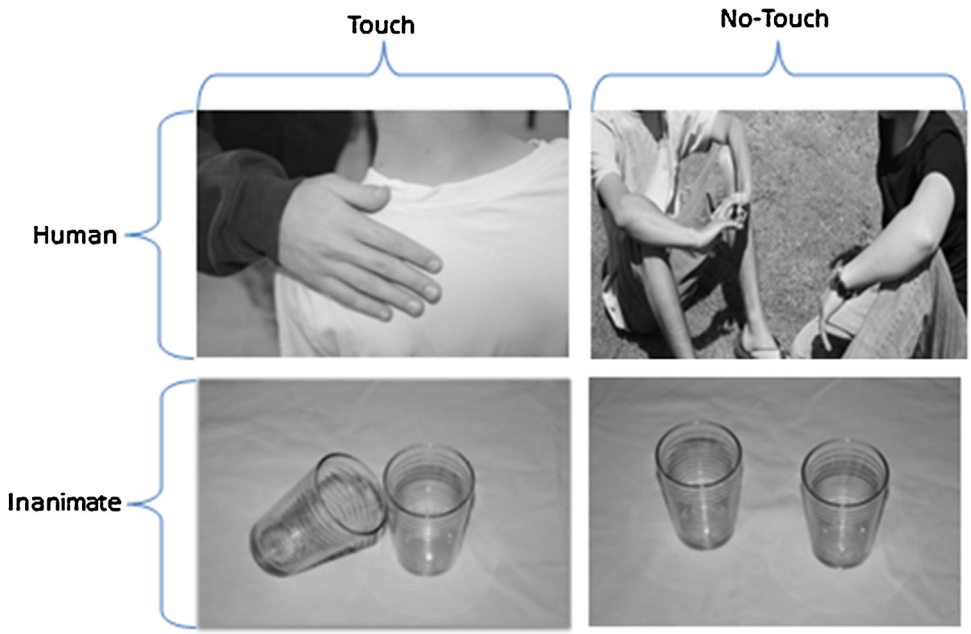

Fig. 1. The photos presented to the participants depicted the following four scenarios: two humans touching, two inanimate objects touching, two humans not touching, and two inanimate objects not touching. All photos were black-and-white and did not include faces.

(2015) reported that intranasal administration of OT increased the anthropomorphic response to the social stimuli (Scheele et al., 2015). Anthropomorphism entails the attribution of human thoughts and emotions, human behavioral characteristics, and/or human shapes to non-human agents, including animals, objects, natural scenery, and even religious gods (for review see Epley et al., 2008). Although Scheele et al. (2015) reported increased anthropomorphism of the interactions between shapes, it was unclear which aspect of social interaction contributed to this effect. One possibility is that *touch* between objects in a social context is the prominent trigger for the anthropomorphism of interactions between interacting shapes. Indeed, touch is the first of our senses to develop, and touch provides us with our most fundamental means of achieving contact with the external world (Barnett, 1972). Pleasant social touch is an essential part of social interactions and provides a nonverbal means to express thoughts and feelings (Hertenstein et al., 2009, 2006). Touch also promotes the formation and maintenance of social bonds (Löken and Olausson, 2010). Importantly, humans possess the innate ability to convert an image of touch into an inner representation of touch (Gallese, 2003; Keysers et al., 2010). This ability may be mediated by a visuo-tactile mirror system that integrates our personal experience of touch, as well as our experience of touch observed in other individuals (Keysers et al., 2004). Given that interpersonal touch has a powerful emotional effect, it is possible that touch between inanimate objects may also be experienced as both emotional and moving. Indeed, OT increases the pleasant feeling following human touch by strengthening the associated neural responses within the insula, precuneus, and orbitofrontal and pregenual anterior cingulate cortices (Scheele et al., 2014), suggesting that OT plays a role in the neural processing of touch.

Given that OT plays major roles in both anthropomorphism and touch, OT may alter the perceptual salience of social cues in part by enhancing the anthropomorphism of non-human touch. In order to study the role of OT in the anthropomorphism of social touch, we examined whether intranasal delivery of OT can modulate the perceived emotionality of inanimate objects touching in a human context. We presented 51 participants with photos depicting two humans or two inanimate objects that were either touching or not touching. To examine the emotional reaction of participants to the photos in an ecological manner, we asked the participants to rate whether they would include each photo in an emotional album, thus pertaining to the perceived emotional level of each photo without directly addressing it. We hypothesized that participants who received intranasal OT would perceive inanimate objects touching with an emotional response that is similar to seeing two humans touching. To confirm that the levels of inclusion in an emotional album were related to the degree in which the objects in the photos seemed human to the participants, we carried out an additional experiment that examined if the likelihood of the photo being included in an emotional album predicts the level of human characteristics ascribed to the objects in the photo.

2. Materials and methods

2.1. Experiment 1

2.1.1. Participants

Fifty-one male participants took part in the study (mean age: 25.59 years; standard deviation: 2.72 years; range: 18–30 years). Each participant received either course credit or payment. Five of the participants were left-handed. All participants reported normal or corrected-to-normal visual acuity and had no reported history of any psychiatric or neurological disorders (confirmed during their screening interview). The OT and PL groups where not different in terms of age (mean age OT group ($n = 25$) = 25.21 years, S.D = 2.77; mean age PL group ($n = 26$) = 25.35 years, S.D. = 2.14 [$t(49) = -0.203$, $p = 0.84$]) or years of education (mean education OT group ($n = 25$) = 13.23 years, S.D. = 2.1; mean education PL group ($n = 26$) = 13.51 years, S.D.= 2.2 [$t(49) = 0.52$, $p = 0.527$]). Written informed consent was obtained from each participant, and approval for the study was provided by the respective ethics committees of the Hadassah Medical Center and the University of Haifa.

2.1.2. Stimuli task and design

This study followed a randomized, double-blind, placebo-controlled, between subject design. E-Prime version 2.0 (Psychological Software Tools) was used to present the test and control images. The participants were presented with images in 64 trials