

Differential Effects of Oxytocin on Agency and Communion for Anxiously and Avoidantly Attached Individuals

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Abstract

Oxytocin promotes prosocial behavior, especially in those individuals who are low in affiliation (e.g., avoidantly attached individuals), but can exacerbate interpersonal insecurities in those preoccupied with closeness (e.g., anxiously attached individuals). One explanation for these opposing observations is that oxytocin induces a communal, other-orientation. Becoming more other oriented should help those people who focus on the self to the exclusion of others, but could be detrimental to those who are other focused but have little sense of an agentic self. Using a within-subjects design, we administered intranasal oxytocin and placebo to 40 males and measured their agency (self-orientation) and communion (other-orientation). Oxytocin produced a slight increase in communion for the average participant; however, as predicted, avoidantly attached individuals were especially likely to perceive themselves as more communal (“kind,” “warm,” “gentle,” etc.) after receiving oxytocin than after receiving the placebo. There was no main effect of oxytocin on agency for the average participant; however, anxiously attached individuals showed a selective decrease in agency (“independent,” “self-confident,” etc.) following administration of oxytocin. These data help explain the complex social effects of oxytocin.

Keywords

oxytocin, attachment, agency, communion, social bonds, individual differences, human, intranasal

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Oxytocin has emerged as a key regulator of human social cognition and behavior. Intranasally administered oxytocin can facilitate trust, liking, and several other social phenomena. However, oxytocin’s effects are not universally prosocial; indeed, oxytocin can produce positive, neutral, or negative effects depending on the context and the person (Bartz, Zaki, Bolger, & Ochsner, 2011). On the positive side, prior work showed that oxytocin selectively improved social cognition for participants low in social proficiency (Bartz, Zaki, Bolger, et al., 2010) and high in alexithymia (Luminet, Grynberg, Ruzette, & Mikolajczak, 2011), and selectively increased cooperation for avoidantly attached individuals (De Dreu, 2012) and those with a “proself value orientation” (Declerck, Boone, &

Kiyonari, 2014, p. 803). Additionally, oxytocin appears to augment sociality in clinical populations characterized by diminished sociality—in particular, those with autism spectrum disorder (e.g., Anagnostou et al., 2012).

Conversely, oxytocin appears to exacerbate interpersonal insecurities in individuals who are chronically preoccupied with, and ambivalent about, close relationships. For example, in previous studies, oxytocin negatively biased memories of maternal care among anxiously

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attached individuals (Bartz, Zaki, Ochsner, et al., 2010) and decreased trust among individuals with borderline personality disorder (Bartz, Simeon, et al., 2011). Oxytocin also induced more negative experiences during a compassion-focused imagery task among participants low, as opposed to high, in “social safeness” (Rockliff et al., 2011). Finally, men who had experienced prolonged separation from one parent early in life failed to show the typical oxytocin-induced cortisol decline that control subjects showed, which suggests altered central sensitivity to the effects of oxytocin (Meinlschmidt & Heim, 2007).

This variability in effects raises questions about the mechanism (or mechanisms) by which oxytocin modulates social cognition and behavior in humans. How can oxytocin enhance socially oriented cognitions and goals for some individuals but not others? One hypothesis is that oxytocin may induce a motivation to focus on, be concerned with, and care for others; becoming more other oriented would explain why individuals who are low in affiliation are especially likely to benefit socially from oxytocin. However, becoming more other oriented could be detrimental to those whose focus on others and social preoccupation conflicts with their sense of an agentic self.

Oxytocin and Other-Oriented Motivation and Behavior

Abundant evidence—from research on partner-preference formation, alloparental care, and maternal behavior—indicates that oxytocin induces a motivational state to attend to others in nonhuman animals (see Ross & Young, 2009). Notably, variation in such communal behaviors is associated with oxytocin receptor density in brain regions implicated in reinforcement, which suggests that oxytocin’s prosocial effects are, partly, motivationally driven (Ross & Young, 2009). The precise neural pathways by which oxytocin modulates sociality in humans are not well established (see Bethlehem, van Honk, Auyeung, & Baron-Cohen, 2013); however, the priming hypothesis (Ludwig & Leng, 2006) is pertinent to the current work. According to this hypothesis, exogenously manipulated (or endogenously released) oxytocin induces changes in intrinsic brain activity, predisposing the organism toward a certain response—for example, a communal, other-orientation. Given the work linking oxytocin with communal motives in nonhuman animals, we asked whether oxytocin might similarly promote such an other-orientation in humans.

Agency and Communion

Personality psychologists have long made the distinction between self- and other-oriented cognition and behavior. In his seminal work, Bakan (1966) maintained that human experience can be characterized by the two fundamental modalities of *agency* and *communion*. Agency concerns

one’s existence as an individual and involves focusing on the self, separating oneself from others, and striving for mastery and power. Communion concerns one’s existence as part of a larger entity and involves focusing on and connecting with others, and striving for intimacy, harmony, and solidarity.

Since Bakan (1966), these constructs have been validated and linked with numerous psychological phenomena (Helgeson, 1994, 2015). Agency is associated with dominance, self-esteem, and mental and physical well-being; by contrast, communion is associated with nurturance and such interpersonal processes as empathy, relationship maintenance, and attachment security (see Helgeson, 2015). Although agency and communion are essential ingredients of well-being, the presence of one modality can have negative effects if not balanced by the presence of the other modality; that is, having at least sufficient levels of both is critical, as there is potential for excess in one modality if it is unchecked by the other (Bakan, 1966; Helgeson, 1994, 2015; for discussion, see Wiggins, 1991). Indeed, whereas high agency is associated with high self-esteem and low hostility, agency without communion—focusing on the self to the exclusion of others—is associated with low self-esteem, high hostility, and problematic interpersonal behaviors, including being domineering, vindictive, and cold (Helgeson, 1993; Helgeson & Fritz, 1999). Similarly, whereas communion is associated with positive relationship behaviors and secure attachment, communion without agency—focusing on others to the exclusion of the self—is associated with being intrusive, being overly involved in other people’s problems, and low self-esteem (Fritz & Helgeson, 1998; Helgeson & Fritz, 1999).

If oxytocin renders people more other oriented, or communal, one would expect it to benefit individuals lacking communion. However, increasing a communal, other-orientation should not be especially helpful to those who are already communal; moreover, it could be detrimental to those who are communal but who lack agency, because such individuals may believe that closeness (communion) requires submission (suppressing agency). Indeed, in addition to being overly involved with others, individuals who are communal but who lack agency are characterized by difficulties asserting their needs, self-neglect, and being exploited by others (Fritz & Helgeson, 1998; Helgeson & Fritz, 1999). Thus, if oxytocin increases communal strivings, it may elicit ideas about self-subordination among individuals who are communal but who lack agency.

Attachment and Its Relation to Agency and Communion

With a few exceptions (e.g., Fritz & Helgeson, 1998), there is little research on the relationship between attachment,

on the one hand, and agency and communion, on the other. However, given that attachment is about regulating oneself in relation to significant others (Bowlby, 1969; Mikulincer & Shaver, 2007), attachment should be associated with these two modes of being. Attachment varies along two dimensions: avoidance and anxiety. Avoidance arises as a mechanism to cope with unavailable or rejecting caregivers; avoidant individuals deactivate the attachment system by devaluing emotional attachments and intimacy, and striving for independence and self-reliance (Mikulincer & Shaver, 2007). Indeed, avoidance is associated with being self-focused, indifferent to others, aloof (e.g., Bartholomew & Horowitz, 1991), and selfish (Schachner & Shaver, 2004); in short, avoidance is associated with a focus on the self to the exclusion of others, or a lack of communion to temper agency.

By contrast, attachment anxiety arises as a mechanism to cope with inconsistently responsive caregivers; the attachment system is hyperactivated to secure attention and care from the elusive caregiver. Anxious individuals thus have a strong desire for closeness but concomitant concerns about abandonment, which results in a preoccupation with, and ambivalence about, close relationships (Mikulincer & Shaver, 2007). Empirically, attachment anxiety is associated with heightened sensitivity to proximity of a caregiver or significant other and interpersonal closeness more generally (Mikulincer, Birnbaum, Woddis, & Nachmias, 2000), as well as with negative self views and low self-esteem (Mikulincer, 1998); in short, attachment anxiety is associated with a focus on others to the exclusion of the self, or a lack of agency to temper communion.

The Present Investigation

We used the “meta-concepts” (Wiggins, 1991, p. 106) of agency and communion as a framework for examining the prosocial effects of oxytocin in humans, theorizing that one way in which oxytocin might induce prosocial behavior is by encouraging a communal, other-orientation characterized by a focus on others and interpersonal affiliation. Further, we sought to use this framework to understand the seemingly contradictory findings that oxytocin promotes prosocial cognition and behavior in people who are low in affiliation (e.g., avoidant individuals), but not in those who are preoccupied with closeness (e.g., anxiously attached individuals). We reasoned that increasing a communal, other-orientation should be especially helpful (socially) to individuals who lack communion because, as suggested by the work of Bakan (1966) and other researchers, increasing their communal strivings should assuage the effects of their agency-communion imbalance. Additionally, we speculated that inducing a communal orientation could be detrimental to individuals who are communal but

who lack agency. As noted, these individuals may experience a tension such that communal strivings are associated with self-subordination. Thus, augmenting communal motivations in individuals who focus on others to the exclusion of the self might have the effect of further diminishing the priority of the self (agency), which could increase feelings of vulnerability in social situations.

Preliminary Study: Associations of Attachment With Agency and Communion

As noted, we hypothesized that oxytocin is especially helpful socially to avoidant individuals because they lack communion, whereas oxytocin may be detrimental to anxious individuals because they lack agency. Although there is indirect evidence suggesting that avoidant individuals lack communion and anxious individuals lack agency, as we have discussed, we first aimed to directly confirm these associations.

Method

Participants. We recruited undergraduate students to voluntarily participate in one of four mass-testing sessions (taking place from 1999 to 2001), during which they completed self-report questionnaires, including measures of attachment and agency and communion. Participants with incomplete data were excluded; the final sample consisted of 483 participants (382 female, 99 male, 2 whose gender was unreported), with a mean age of 21.19 years ($SD = 2.51$). Because of the variability of the mass-testing environment, we recruited another sample of undergraduates who completed only measures of attachment and agency and communion, via e-mail; as compensation, they were entered into a lottery in which 2 participants would each win \$25. The final sample consisted of 51 participants (36 female, 15 male), with a mean age of 19.05 years ($SD = 1.06$).

Measures of attachment. Attachment was measured with the Relationship Questionnaire (RQ; Bartholomew & Horowitz, 1991) and the Experience in Close Relationships Scale (ECR; Brennan, Clark, & Shaver, 1998), which was added in 2001. The RQ describes the secure, dismissive, preoccupied, and fearful attachment styles; participants rate on a 5-point scale the extent to which each description characterizes their close relationships in general. Following Griffin and Bartholomew (1994), we calculated scores for *model of self* (to index anxiety) and *model of other* (to index avoidance); higher scores indicated more negative self-views, or anxiety, and more negative other-views, or avoidance, respectively. The ECR

Table 1. Partial Correlations Between the Key Variables in the Preliminary Study

Attachment dimension	Agency	Communion
Sample 1 (<i>N</i> = 315)		
Anxiety (controlling for avoidance)	-.27**	.11 [†]
Avoidance (controlling for anxiety)	-.01	-.22**
Sample 2 (<i>N</i> = 219)		
Anxiety (controlling for avoidance)	-.30**	.17*
Avoidance (controlling for anxiety)	.00	-.46**

Note: Attachment was measured with the Relationship Questionnaire (Bartholomew & Horowitz, 1991) in Sample 1 and with the short version of the Experience in Close Relationships Scale (Brennan, Clark, & Shaver, 1998) in Sample 2. Results did not change significantly when analyses of agency controlled for communion and when analyses of communion controlled for agency.

[†]*p* < .10. **p* < .01. ***p* < .001.

(which was developed more recently than the RQ and is now one of the most widely used measures of adult attachment) is also a self-report measure, but does not require respondents to endorse specific styles. Rather, the ECR consists of a series of statements reflecting avoidance (i.e., discomfort with or fear of closeness and dependency) and anxiety (i.e., concerns about being abandoned). Participants use a 7-point scale to rate how well each statement describes how they generally experience close relationships. For the sake of brevity, we used a seven-item version of the ECR (ECR-short), which included three anxiety and four avoidance items (for details, see Bartz & Lydon, 2004).

Measures of agency and communion. We assessed agency and communion using the Personality Attributes Questionnaire (PAQ; Spence & Helmreich, 1978). Each item on the PAQ presents a term indicating agency or communion, along with its antonym, and participants indicate where they fall on the continuum between these terms, using a 5-point scale. Example agency items include “independent,” “self-confident,” “competitive,” “superior,” and “active”; example communion items include “aware of feelings of others,” “helpful to others,” “warm in relations with others,” “able to devote self completely to others,” “kind,” and “gentle.” Scores for agency and communion were calculated by averaging each participant’s responses for the items in each category. Note that in the e-mail survey, we used the extended PAQ (EPAQ; Spence, Helmreich, & Holahan, 1979), which also assesses socially undesirable forms of agency and communion (see the Supplemental Material available online for exploratory analyses on negative-agency and negative-communion subscales).

Results

To test our hypotheses, we calculated partial correlations assessing the relationships between (a) attachment

anxiety (controlling for avoidance) and (b) agency and communion, and the relationships between (a) attachment avoidance (controlling for anxiety) and (b) agency and communion. We conducted separate analyses for (a) participants who completed the mass testing with the RQ (Sample 1; *N* = 315) and (b) participants who completed the mass testing with the ECR-short or who completed the e-mail survey, which also used the ECR-short (Sample 2; *N* = 219; note that effects in Sample 2 did not differ reliably between students who participated in the mass testing and those who completed the e-mail survey).

As Table 1 shows, our hypotheses were supported regardless of how we measured attachment, a result underscoring the robustness of the associations. Specifically, in both samples, attachment avoidance was negatively associated with communion, and attachment anxiety was negatively associated with agency. Additionally, anxiety was positively associated with communion, although this effect was weaker than the anxiety-agency association, a finding consistent with theory and prior research: That is, although individuals who are communal but who lack agency tend to, for example, place other people’s needs above their own, their lack of self-regard may hinder their ability to engage in the prosocial behaviors that characterize communion (see Fritz & Helgeson, 1998). Finally, the results were consistent with prior work, and with the theorized orthogonal nature of the agency and communion constructs, in that these constructs were not reliably associated in either Sample 1, $r(313) = .07$, *n.s.*, or Sample 2, $r(217) = .08$, *n.s.*

Main Study

Having established that avoidance is characterized by low communion and anxiety is characterized by low agency, we conducted our main study to investigate the effects of oxytocin on agency and communion, and whether oxytocin differentially affects agency and communion as a function of attachment—that is, whether oxytocin (a) “balances” the agency-communion dynamic in avoidant individuals by augmenting communion and (b) aggravates the agency-communion dynamic in anxious individuals by weakening agency.

Method

Participants. Participants were required to be mentally and physically healthy (confirmed through an interview with a study psychiatrist). Exclusion criteria included regular use of any psychotropic medications and use of any over-the-counter medications during the 12 hr prior to the study. Additionally, only males were studied because it was not feasible to employ the additional procedures (e.g., pregnancy screening) required for administering intranasal oxytocin to females. The final sample consisted

of 40 participants, ages 19 to 45 ($M = 28.32$, $SD = 8.05$). All participants gave informed consent and were compensated \$120.

Design and procedure. We used a randomized, double-blind, counterbalanced, placebo-controlled, cross-over challenge, in which participants received a single dose of intranasal oxytocin on one occasion and placebo on another. Following the eligibility interview, but before drug administration, participants completed a variety of self-report inventories, including the ECR (Brennan et al., 1998; note that in this study, we used a more comprehensive, 29-item version of the ECR).

Participants were then given 24 IU of intranasal oxytocin (Syntocinon, Novartis, Basel, Switzerland) or a matching placebo. Approximately 75 min later (a delay sufficient for the uptake of neuropeptides into the central nervous system; Born et al., 2002), and after participants performed tasks reported elsewhere (Bartz, Zaki, Bolger, et al., 2010), they completed the EPAQ (Spence et al., 1979; as in the preliminary study, we focused on positive agency and communion items, but see the Supplemental Material for results of analyses on the negative items). In addition to this well-validated measure of agency and communion, participants completed an exploratory word-fragments task that measured changes in the implicit accessibility of agency and communion; no significant effects were observed, so we do not discuss this task further. Participants returned 3 to 5 weeks later for the second challenge, during which they performed the same tasks after receiving the alternate compound.

Sample-size determination. To our knowledge, no one has measured the effects of oxytocin on agency and communion, so we had no prior work to refer to when estimating power for this study. We used the following considerations to determine our sample size and stopping rule. First, although we could not reliably estimate the effect of oxytocin on agency and communion, another experimental manipulation producing changes in self-conceptions of communion (as measured with the EPAQ) in men was associated with an effect size just short of medium (Cohen's $d = 0.45$; Bartz & Lydon, 2004). Second, from a practical standpoint, it was not feasible to recruit a large sample (e.g., $N > 100$) for this initial investigation because of the regulatory and institutional requirements associated with administering intranasal oxytocin. With the goal of detecting a medium to large effect, we therefore aimed to recruit 40 participants, recognizing that our within-subjects design and statistical approach would help offset any limitations of our sample size. We note that although we were unable to conduct an a priori power analysis, our post hoc power analysis indicated that we had power of 60% to detect the

avoidance moderation effect and 78% to detect the anxiety moderation effect reported later.

Statistical analyses. The dependent variables for this study were repeated measurements of communion and agency; each construct was measured on a day when oxytocin was administered and on a day when the placebo was administered. In analyzing the data, to take into account the likely nonindependence due to the repeated measurements, we used multilevel modeling as implemented in the MIXED procedure in SAS 9.4. The independent variables were drug (oxytocin = 1, placebo = 0), attachment avoidance and attachment anxiety (both mean-centered), the interaction of attachment avoidance and anxiety with one another (which is commonly included in adult attachment research), and the interactions of the attachment variables with drug. Given our hypotheses, we expected to observe interactions of the attachment variables with drug, with avoidance moderating drug effects on communion and anxiety moderating drug effects on agency. Because age influences the endorsement of agency and communion (Chapman, Duberstein, Sorensen, & Lyness, 2007; Diehl, Owen, & Youngblade, 2004), and because this was a community sample with a considerable age range (19–45 years), we included age (mean-centered) as a covariate in our analyses. Although the order in which oxytocin and the placebo were administered was initially included as a predictor, it had no effect on the results, so we did not include this variable in the final analyses.

Results

Table 2 presents the multilevel-modeling results for both communion and agency. Given that all predictors were mean-centered (with the exception of drug, which was dummy coded), the intercept in each model is the level of the outcome (communion or agency) for the average person on the placebo day, and the coefficient for drug is the difference in the outcome associated with drug (oxytocin minus placebo) for the average person.

Communion. The typical person had a communion score of 3.75 (on a scale from 1 to 5) on the placebo day;¹ the coefficient for drug indicates that communion scores were on average 0.12 units greater on the oxytocin day than on the placebo day, 95% confidence interval (CI) = $[-0.02, 0.25]$, $t(36) = 1.79$, $p = .08$. Although the 95% CI includes a zero difference, the majority of the plausible values were positive, and therefore the results suggest that the average participant tended to describe himself as more “kind,” “gentle,” and “warm in relations with others” after receiving oxytocin than after receiving the placebo. Critically, as predicted, there was a significant Drug \times

Table 2. Results of Multilevel Model Analyses Predicting Communion and Agency in the Main Study

Predictor	Model predicting communion					Model predicting agency				
	<i>b</i>	<i>SE</i>	Confidence interval	<i>t</i> ^a	<i>p</i>	<i>b</i>	<i>SE</i>	Confidence interval	<i>t</i> ^a	<i>p</i>
Intercept	3.75	0.07	[3.61, 3.89]	55.05	< .001	3.89	0.08	[3.72, 4.06]	46.64	< .001
Age	0.01	0.01	[-0.00, 0.03]	1.70	.098	-0.01	0.01	[-0.03, 0.01]	-1.48	.15
Drug (oxytocin vs. placebo)	0.12	0.06	[-0.02, 0.25]	1.79	.08	-0.05	0.05	[-0.16, 0.06]	-0.95	.35
Attachment avoidance	-0.39	0.09	[-0.58, -0.21]	-4.32	< .001	0.03	0.11	[-0.20, 0.26]	0.28	.78
Attachment anxiety	0.15	0.06	[0.03, 0.28]	2.46	.02	-0.00	0.08	[-0.16, 0.15]	-0.02	.98
Attachment	0.18	0.09	[0.01, 0.36]	2.11	.04	0.08	0.07	[-0.06, 0.23]	1.18	.24
Avoidance × Drug										
Attachment Anxiety × Drug	-0.04	0.06	[-0.16, 0.08]	-0.64	.53	-0.13	0.05	[-0.23, -0.03]	-2.72	< .01

Note: A restricted maximum likelihood estimation method was used. Boldface highlights the results of tests of the hypothesized Drug × Attachment effects on agency and communion. The Attachment Anxiety × Attachment Avoidance and Attachment Anxiety × Attachment Avoidance × Drug interactions were included as predictors in the mixed-model analyses but were not significantly associated with either communion or agency and so are not included in this table.

^aThe number of degrees of freedom was 35 for the intercept and 36 for all other predictors.

Attachment Avoidance interaction, $b = 0.18$, 95% CI = [0.01, 0.36], $t(36) = 2.11$, $p < .05$; avoidant individuals, who are generally low in communion (see our results in the preliminary study), were especially likely to show an increase in communal traits following administration of oxytocin.

Figure 1 displays the model-predicted drug effects across the observed range of avoidance, as well as the observed drug effects for each person. The 95% confidence band around the predicted effects indicates that participants below the mean on avoidance showed at most small decrements in communion: The simple slope for drug at 1 standard deviation below the sample mean on avoidance was -0.05 units, 95% CI = [-0.26, 0.16], $t(36) = -0.49$, $p = .63$; at 2 standard deviations below the sample mean on avoidance, the simple slope was -0.21 units, 95% CI = [-0.56, 0.13], $t(36) = -1.27$, $p = .21$. By contrast, at practically all values of avoidance above the sample mean, there was a significant boost in communion on the oxytocin day compared with the placebo day (the lower bound of the confidence band excludes zero difference as a plausible value). The simple slope for drug at 1 standard deviation above the mean on avoidance was 0.28 units, 95% CI = [0.08, 0.49], $t(36) = 2.77$, $p = .009$; at 2 standard deviations above the sample mean, it was 0.45 units, 95% CI = [0.10, 0.79], $t(36) = 2.64$, $p = .01$.

Attachment anxiety did not interact with drug to predict differences in communion, $b = -0.04$, 95% CI = [-0.16, 0.08], $t(36) = -0.64$, $p = .53$, nor was there a three-way interaction of anxiety, avoidance, and drug (not shown in Table 2), $b = 0.12$, 95% CI = [-0.03, 0.26], $t(36) = 1.60$, $p = .12$.

Agency. Table 2 shows that, as in the case of communion, the level of agency for the typical person on the placebo day was close to 4 on the 5-point scale ($b = 3.89$). In contrast to the results for communion, there was no evidence that drug status affected agency for the typical person, $b = -0.05$, 95% CI = [-0.16, 0.06]. As predicted, however, there was an Attachment Anxiety × Drug interaction; the higher the attachment anxiety, the more likely it was that oxytocin, compared with placebo, reduced the experience of agency, $b = -0.13$, 95% CI = [-0.23, -0.03], $t(36) = -2.72$, $p < .01$. Figure 2 presents the model-predicted drug effects as a function of attachment anxiety, together with the observed drug effects for each person. The model predicted that persons below the mean on attachment anxiety (2.6 units) did not show a significant drug effect (in that range, the 95% CI band always included zero). By contrast, for persons with raw scores of 3.1 units or above, the model predicted significant negative effects of drug on agency. For example, persons at 1 standard deviation above the mean for anxiety were predicted to be 0.21 units lower in agency on oxytocin days than on placebo days, 95% CI = [-0.37, -0.05], $t(36) = -2.66$, $p = .012$. At 2 standard deviations above the mean for anxiety, the predicted drug effect was -0.37 units, 95% CI = [-0.64, -0.11], $t(36) = -2.87$, $p = .007$. At the highest observed value of anxiety, 2.75 standard deviations above the mean, the predicted effect was -0.49 units, 95% CI = [-0.84, -0.15], $t(36) = -2.88$, $p = .007$.

Attachment avoidance did not interact with drug to predict differences in agency, $b = 0.08$, 95% CI = [-0.06, 0.23], $t(36) = 1.18$, $p = .24$, nor was there a three-way interaction

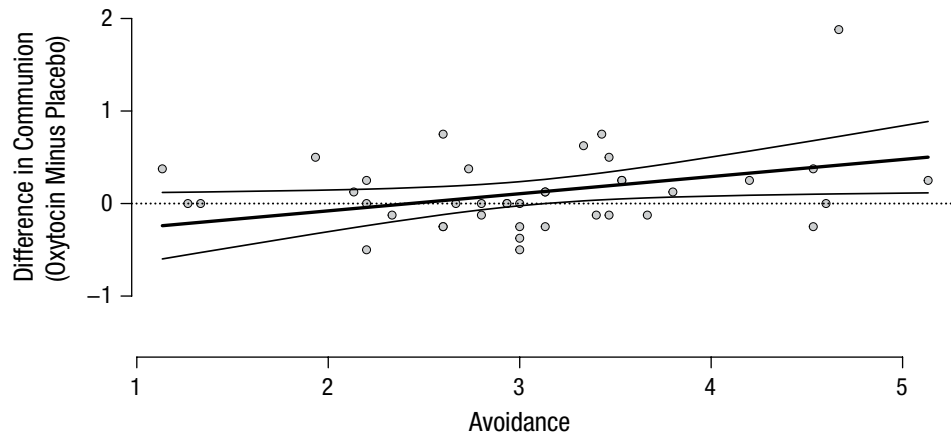


Fig. 1. Scatterplot showing the change in communion (oxytocin day minus placebo day) as a function of attachment avoidance. The heavy solid line is the best-fitting regression line, and the curved lines indicate the 95% confidence interval. Positive numbers on the *y*-axis indicate an increase, and negative numbers indicate a decrease, in endorsement of communal traits following administration of oxytocin. Higher numbers on the *x*-axis indicate greater attachment avoidance.

of anxiety, avoidance, and drug (not shown in Table 2), $b = 0.03$, 95% CI = $[-0.09, 0.15]$, $t(36) = 0.48$, $p = .63$.

Discussion

We used the metaconcepts of agency and communion to understand the complex social effects of oxytocin, namely, the fact that oxytocin facilitates prosocial cognition and behavior in some individuals but exacerbates interpersonal insecurities in others. We theorized that oxytocin should induce a communal motivation to focus on, be concerned with, and care for others; becoming

more other oriented would explain why individuals who are less socially focused or communal (e.g., avoidant individuals) are more likely to benefit (socially) from oxytocin. Additionally, we hypothesized that becoming more other oriented could be detrimental to individuals who have strong communal strivings but little sense of an agentic self (e.g., anxiously attached individuals) because becoming more other oriented may fuel their feelings of personal and interpersonal vulnerability.

Our predictions were supported. Although oxytocin produced a slight increase in communal traits (e.g., “kind” and “gentle”) for the average person, it was especially

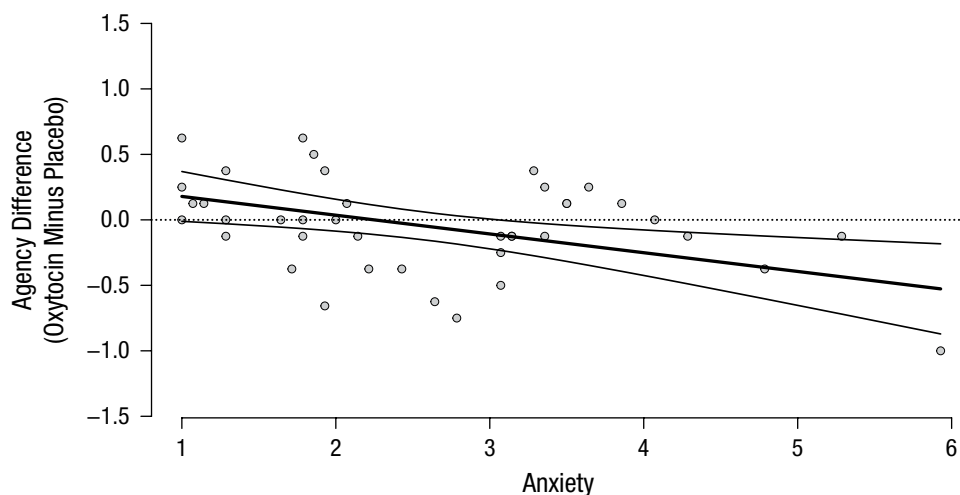


Fig. 2. Scatterplot showing the change in agency (oxytocin day minus placebo day) as a function of attachment anxiety. The heavy solid line is the best-fitting regression line, and the curved lines indicate the 95% confidence interval. Positive numbers on the *y*-axis indicate an increase, and negative numbers indicate a decrease, in endorsement of agency traits following administration of oxytocin. Higher numbers on the *x*-axis indicate greater attachment anxiety.

likely to augment communion in avoidant individuals, who lacked communion at baseline. That oxytocin affected communal strivings is consistent with animal studies linking oxytocin with, for example, the onset of maternal behavior, as well as with recent research on humans. The finding that attachment avoidance moderated these effects resonates with work showing the selectively beneficial effects of oxytocin in individuals who have low levels of social engagement (see the introduction). This finding may have implications for attachment avoidance. Essentially, avoidant individuals stifle communion to cope with the pain of rejecting or unavailable close others. Although such strategies may temporarily alleviate distress, avoidance is associated with numerous negative outcomes (Mikulincer & Shaver, 2007). The fact that oxytocin made avoidant individuals feel comfortable describing themselves as gentle and able to devote themselves completely to others is notable given that the interpersonal barriers erected by avoidant individuals are quite difficult to break down (Mikulincer & Shaver, 2007); this finding also bodes well for the possibility that oxytocin could facilitate their comfort with closeness in everyday life.

Additionally, we found that oxytocin selectively decreased agency in the anxiously attached, who described themselves as, for example, less independent and self-confident after receiving oxytocin than after receiving the placebo. Our preliminary study showed that attachment anxiety is associated with low agency; it appears that oxytocin may exacerbate anxious individuals' fragile sense of self. We suspect that this weakening of agency may then undermine their ability to be prosocial. It is well established that agency (i.e., self-efficacy, personal control) is a fundamental need and that threats to agency can result in depression, amotivation, and alienation (e.g., Deci & Ryan, 2000), all factors that could threaten prosocial action. Thus, it may be that the putative antisocial effects of oxytocin observed in anxiously attached individuals result from oxytocin's selective effects on agency in this vulnerable population. For example, a prior study showed that oxytocin decreased trust and the likelihood of cooperation in individuals with borderline personality disorder (Bartz, Simeon, et al., 2011). Notably, instability of identity and self-image is a core feature of this disorder (American Psychiatric Association, 2000). If oxytocin triggers identity disturbances in anxiously attached individuals, they may react to such feelings of vulnerability in their chronic, maladaptive ways (e.g., lashing out).

These findings offer a parsimonious explanation for the prosocial and antisocial effects of oxytocin and also are informative about the dynamics of attachment anxiety. Agency and communion are thought to be orthogonal;

however, they may be somewhat intertwined in individuals who are anxiously attached. As noted, anxious individuals may believe they need to be submissive (suppress agency) to achieve closeness (communion) with others (Fritz & Helgeson, 1998; Helgeson & Fritz, 1999). Alternatively, their chronic yearning for closeness (communion) may make them vulnerable to exploitation, which could undermine their sense of agency (Wiggins, 1991). Finally, their chronic uncertainty about achieving communal goals may also thwart the development of confidence and self-efficacy (agency).

We do not believe that an acute dose of oxytocin will permanently alter dispositional levels of communion (or agency). Rather, we suspect that oxytocin's effects are akin to other social contextual influences that activate goals related to agency and communion (e.g., Bartz & Lydon, 2004; Moskowitz, Suh, & Desaulniers, 1994); that is, we propose that oxytocin alters the working self-concept (Markus & Wurf, 1987) in a way that reflects the relative priority of agentic and communal goals.

Finally, we note that although our predictions were supported, the sample was somewhat small and restricted to males. Future work is needed to determine the generalizability of these effects.

In conclusion, oxytocin has been called the "love hormone," and our results partially support this view. Increasing oxytocin appears to induce the kind of communal, other-orientation essential for establishing and maintaining close bonds. This is not to say, however, that oxytocin is a "love drug" that invariably produces positive interpersonal outcomes; our data suggest that oxytocin's effects depend on people's beliefs about themselves in relation to others and about what is required to achieve closeness.

Author Contributions

J. A. Bartz developed the study concept and study design (the main study was designed in consultation with E. Hollander). Testing and data collection were performed by J. A. Bartz and J. E. Lydon (preliminary study) and by J. A. Bartz, A. Kolevzon, and N. Ludwig (main study). J. A. Bartz and N. Bolger performed the data analyses and interpretation. J. A. Bartz drafted the manuscript, and J. E. Lydon, N. Bolger, J. Zaki, E. Hollander, A. Kolevzon, and N. Ludwig provided critical revisions. All authors approved the final version of the manuscript for submission.

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Declaration of Conflicting Interests

A. Kolevzon receives funding from Hoffmann-LaRoche for a study of RO5285119, a vasopressin 1a receptor antagonist, in adults with autism spectrum disorder. E. Hollander has applied for a use patent for oxytocin in autism and has licensed that use patent to Turing Pharmaceutical. The authors declared that they had no other potential conflicts of interest with respect to their authorship or the publication of this article.

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Supplemental Material

Additional supporting information can be found at <http://pss.sagepub.com/content/by/supplemental-data>

Note

1. One participant's communion score after receiving the placebo was more than 3 standard deviations below the group mean; to reduce the impact of this real but influential data point, we assigned this participant a raw communion score that was 1 unit smaller than the next most extreme score in the distribution (Tabachnick & Fidell, 2007, p. 77).

References

- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text revision). Washington, DC: Author.
- Anagnostou, E., Soorya, L., Chaplin, W., Bartz, J., Halpern, D., Wasserman, S., . . . Hollander, E. (2012). Intranasal oxytocin versus placebo in the treatment of adults with autism spectrum disorders: A randomized controlled trial. *Molecular Autism*, 3, Article 16. Retrieved from <http://www.molecularautism.com/content/3/1/16>
- Bakan, D. (1966). *The duality of human existence*. Chicago, IL: Rand McNally.
- Bartholomew, K., & Horowitz, L. M. (1991). Attachment styles among young adults: A test of a four-category model. *Journal of Personality and Social Psychology*, 61, 226–244. doi:10.1037//0022-3514.61.2.226
- Bartz, J. A., & Lydon, J. E. (2004). Close relationships and the working self-concept: Implicit and explicit effects of priming attachment on agency and communion. *Personality and Social Psychology Bulletin*, 30, 1389–1401. doi:10.1177/0146167204264245
- Bartz, J. A., Simeon, D., Hamilton, H., Kim, S., Crystal, S., Braun, A., . . . Hollander, E. (2011). Oxytocin can hinder trust and cooperation in borderline personality disorder. *Social Cognitive and Affective Neuroscience*, 6, 556–563. doi:10.1093/scan/nsq085
- Bartz, J. A., Zaki, J., Bolger, N., Hollander, E., Ludwig, N. N., Kolevzon, A., & Ochsner, K. N. (2010). Oxytocin selectively improves empathic accuracy. *Psychological Science*, 21, 1426–1428. doi:10.1177/0956797610383439
- Bartz, J. A., Zaki, J., Bolger, N., & Ochsner, K. N. (2011). Social effects of oxytocin in humans: Context and person matter. *Trends in Cognitive Sciences*, 15, 301–309. doi:10.1016/J.Tics.2011.05.002
- Bartz, J. A., Zaki, J., Ochsner, K. N., Bolger, N., Kolevzon, A., Ludwig, N., & Lydon, J. E. (2010). Effects of oxytocin on recollections of maternal care and closeness. *Proceedings of the National Academy of Sciences, USA*, 107, 21371–21375. doi:10.1073/Pnas.1012669107
- Bethlehem, R. A. I., van Honk, J., Auyeung, B., & Baron-Cohen, S. (2013). Oxytocin, brain physiology, and functional connectivity: A review of intranasal oxytocin fMRI studies. *Psychoneuroendocrinology*, 38, 962–974. doi:10.1016/J.Psyneuen.2012.10.011
- Born, J., Lange, T., Kern, W., McGregor, G. P., Bickel, U., & Fehm, H. L. (2002). Sniffing neuropeptides: A transnasal approach to the human brain. *Nature Neuroscience*, 5, 514–516. doi:10.1038/Nn849
- Bowlby, J. (1969). *Attachment and loss: Vol. 1. Attachment*. New York, NY: Basic Books.
- Brennan, K. A., Clark, C. L., & Shaver, P. R. (1998). Self-report measurement of adult attachment: An integrative overview. In J. A. Simpson & W. S. Rholes (Eds.), *Attachment theory and close relationships* (pp. 46–76). New York, NY: Guilford Press.
- Chapman, B. P., Duberstein, P. R., Sorensen, S., & Lyness, J. M. (2007). Gender differences in Five Factor Model personality traits in an elderly cohort. *Personality and Individual Differences*, 43, 1594–1603. doi:10.1016/J.Paid.2007.04.028
- Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11, 227–268. doi:10.1207/S15327965pli1104_01
- Declerck, C. H., Boone, C., & Kiyonari, T. (2014). The effect of oxytocin on cooperation in a prisoner's dilemma depends on the social context and a person's social value orientation. *Social Cognitive and Affective Neuroscience*, 9, 802–809.
- De Dreu, C. K. (2012). Oxytocin modulates the link between adult attachment and cooperation through reduced betrayal aversion. *Psychoneuroendocrinology*, 37, 871–880. doi:10.1016/j.psyneuen.2011.10.003
- Diehl, M., Owen, S. K., & Youngblade, L. M. (2004). Agency and communion attributes in adults' spontaneous self-representations. *International Journal of Behavioral Development*, 28, 1–15. doi:10.1080/01650250344000226
- Fritz, H. L., & Helgeson, V. S. (1998). Distinctions of unmitigated communion from communion: Self-neglect and over-involvement with others. *Journal of Personality and Social Psychology*, 75, 121–140.
- Griffin, D., & Bartholomew, K. (1994). Models of the self and other: Fundamental dimensions underlying measures of adult attachment. *Journal of Personality and Social Psychology*, 67, 430–445. doi:10.1037/0022-3514.67.3.430
- Helgeson, V. S. (1993). Implications of agency and communion for patient and spouse adjustment to a first coronary event. *Journal of Personality and Social Psychology*, 64, 807–816.

- Helgeson, V. S. (1994). Relation of agency and communion to well-being: Evidence and potential explanations. *Psychological Bulletin*, *116*, 412–428.
- Helgeson, V. S. (2015). Gender and personality. In M. Mikulincer, P. R. Shaver, M. L. Cooper, & R. J. Larsen (Eds.), *APA handbook of personality and social psychology: Vol. 4. Personality processes and individual differences* (pp. 515–534). Washington, DC: American Psychiatric Association.
- Helgeson, V. S., & Fritz, H. L. (1999). Unmitigated agency and unmitigated communion: Distinctions from agency and communion. *Journal of Research in Personality*, *33*, 131–158.
- Ludwig, M., & Leng, G. (2006). Dendritic peptide release and peptide-dependent behaviours. *Nature Reviews Neuroscience*, *7*, 126–136. doi:10.1038/Nrn1845
- Luminet, O., Grynberg, D., Ruzette, N., & Mikolajczak, M. (2011). Personality-dependent effects of oxytocin: Greater social benefits for high alexithymia scorers. *Biological Psychology*, *87*, 401–406.
- Markus, H., & Wurf, E. (1987). The dynamic self-concept: A social psychological perspective. *Annual Review of Psychology*, *38*, 299–337. doi:10.1146/Annurev.Psych.38.1.299
- Meinlschmidt, G., & Heim, C. (2007). Sensitivity to intranasal oxytocin in adult men with early parental separation. *Biological Psychiatry*, *61*, 1109–1111.
- Mikulincer, M. (1998). Adult attachment style and affect regulation: Strategic variations in self-appraisals. *Journal of Personality and Social Psychology*, *75*, 420–435. doi:10.1037/0022-3514.75.2.420
- Mikulincer, M., Birnbaum, G., Woddis, D., & Nachmias, G. (2000). Stress and accessibility of proximity-related thoughts: Exploring the normative and intraindividual components of attachment theory. *Journal of Personality and Social Psychology*, *78*, 509–523. doi:10.1037/0022-3514.78.3.509
- Mikulincer, M., & Shaver, P. R. (2007). *Attachment in adulthood: Structure, dynamics, and change*. New York, NY: Guilford Press.
- Moskowitz, D. S., Suh, E. J., & Desaulniers, J. (1994). Situational influences on gender differences in agency and communion. *Journal of Personality and Social Psychology*, *66*, 753–761. doi:10.1037//0022-3514.66.4.753
- Rockliff, H., Karl, A., McEwan, K., Gilbert, J., Matos, M., & Gilbert, P. (2011). Effects of intranasal oxytocin on 'compassion focused imagery.' *Emotion*, *11*, 1388–1396. doi:10.1037/a0023861
- Ross, H. E., & Young, L. J. (2009). Oxytocin and the neural mechanisms regulating social cognition and affiliative behavior. *Frontiers in Neuroendocrinology*, *30*, 534–547. doi:10.1016/J.Yfrne.2009.05.004
- Schachner, D. A., & Shaver, P. R. (2004). Attachment dimensions and sexual motives. *Personal Relationships*, *11*, 179–195.
- Spence, J. T., & Helmreich, R. L. (1978). *Masculinity and femininity: Their psychological dimensions, correlates, and antecedents*. Austin: University of Texas Press.
- Spence, J. T., Helmreich, R. L., & Holahan, C. K. (1979). Negative and positive components of psychological masculinity and femininity and their relationships to self-reports of neurotic and acting-out behaviors. *Journal of Personality and Social Psychology*, *37*, 1673–1682. doi:10.1037//0022-3514.37.10.1673
- Tabachnick, B. G., & Fidell, L. G. (2007). *Using multivariate statistics* (5th ed.). New York, NY: Pearson.
- Wiggins, J. S. (1991). Agency and communion as conceptual coordinates for the understanding and measurement of interpersonal behavior. In D. Cicchetti & W. M. Grove (Eds.), *Thinking clearly about psychology: Essays in honor of Paul E. Meehl* (Vol. 1, pp. 89–113). Minneapolis: University of Minnesota Press.