Supplementary Information

An oxytocin-induced facilitation of neural and emotional responses to social touch correlates inversely with autism traits

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Supplementary Experimental Procedures:

1. Study subjects

All subjects completed a comprehensive neuropsychological test battery. Cognitive performance was assessed using the Cambridge Neuropsychological Test Automated Battery (CANTAB), a computerized neurocognitive assessment presented through a touch-screen computer (Sahakian and Owen, 1992). For details of the outcome measure see CANTABeclipse™ Test Administration Guide (CANTABeclipse, 2011). Subjects' speed of response to a visual target, the ability to retain spatial information, and visual memory were measured with the simple and reaction time task (RTI), the spatial working memory task (SWM; eight boxes version), and the paired associates learning task (PAL), respectively. All subjects were within a normal range of cognitive performance (*Supplementary Table S1*). Furthermore, we assessed the attitude towards social distance and social touch. We administered a German version (Stangier *et al*, 1999) of the Social Interaction Anxiety Scale and the Social Phobia Scale (Mattick and Clarke, 1998) as well as a Social Touch questionnaire (Wilhelm *et al*, 2001). Autistic traits and the adult attachment style were measured via the Autism Spectrum Quotient questionnaire (Baron-Cohen *et al*, 2001; Freitag, 2007) and the Attachment Style Questionnaire (Hazan and Shaver, 1987; Hexel, 2004).

All subjects were naive to prescription-strength psychoactive medication and had not taken any over-the-counter psychoactive medication in the past four weeks. Contraindications for MRI scanning were additional exclusion criteria. The participants were asked to maintain their regular bed and waking times and to abstain from caffeine and alcohol intake on the day of the experiment. To control for potentially confounding effects of oxytocin (OXT) on state anxiety and mood, all subjects completed the State-Trait Anxiety Inventory (STAI) (Spielberger *et al*, 1970) and the Positive and Negative Affective Scale (PANAS)(Watson *et al*, 1988) immediately before OXT/placebo administration and after the experimental task. Furthermore, all subjects completed the d2 Test of Attention (Aufmerksamkeits- und Belastungstest d2)(Brickenkamp and Zillmer, 1998) after the experimental task. Three repeated-measures analysis of variance (ANOVA) with 'measurement' (before and after the experiment) and 'treatment' (OXT and placebo) as within-subjects factors and 'state anxiety', 'positive affect' or 'negative affect' as dependent variables revealed no significant main or interaction effects (all *P*s > 0.10). There was also no

significant difference between the d2 attention performance of the OXT and placebo (PLC) sessions (all *P*s > 0.15, cf. *Supplementary Table S4*). Thus, OXT did not influence subjective anxiety, mood ratings, or attention. After completing the task, subjects were debriefed and asked to guess whether they had received OXT or PLC. The estimation of the received treatment was comparable between the OXT and PLC session ($\chi^2_{(1)} = 0.30$; $P = 0.58$), showing that the subjects were unaware of whether they had received OXT or PLC. The mean interval between the two fMRI sessions was 13 days (minimum 3 days, maximum 35 days). Two subjects in the PLC session and two different subjects in the OXT sessions reported side effects (slight headache). All behavioral and fMRI data were collected in Bonn, Germany.

2. FMRI paradigm

Using Presentation 14 (Neurobehavioral Systems, Albany, CA), stimuli were presented, via liquid crystal display (LCD) video goggles (Nordic NeuroLab, Bergen, Norway). The photographs used in this paradigm displayed the female and male experimenter wearing the same clothes as during the actual test session and standing in front of a white wall, that is no touch was shown. In the 'Home' position the subject was informed that the experimenter was roughly 2 m away and at a 45° angle from the junction between the MRI table and the opening of the magnet. We chose to include this baseline condition to make the occurrence of the close and touch events less common, thus reducing effects of habituation and boredom. We asked the subjects to imagine that the close contact or touch would happen during a friend's party. The experimenters did not know any of the participants. On average, 384 functional volumes were acquired each in the OXT and PLC session. The behavioral ratings of one subject in the PLC session (male condition) were lost due to technical problems.

The MRI room was air-conditioned and temperature and air humidity were kept constant throughout the sessions (mean temperature: 24°C, range 21 – 26 °C; mean air humidity: 39%, range 34 – 45%). After the fMRI task, the subjects used a visual analog scale from 0 (very unattractive) to 100 (very attractive) to rate the attractiveness of the female and male experimenter. The ratings of six subjects were lost due to technical problems. A repeated-measures ANOVA with treatment (OXT/PLC) and sex (female/male) as within-subject factors and the attractiveness ratings as dependent variable revealed a main effect of sex ($F_{(1,33)} = 122.60$, $P < 0.01$, $\eta^2 = 0.79$), but no main or interaction effect of treatment (all

*P*s > 0.56). The female experimenter (81.17 ± 12.63) was rated as highly more attractive than the male experimenter (39.28 ± 14.97).

3. Acquisition of fMRI data

A Siemens Trio MRI system (Siemens, Erlangen, Germany) operating at 3T was used to obtain T2*-weighted echoplanar (EPI) images with blood-oxygen-level-dependent contrast (TR = 3000 ms, TE = 35 ms, matrix size: 64 x 64, pixel size: 3 x 3 x 3 mm, slice thickness= 3.0 mm, distance factor = 10%, FoV = 192, flip angle = 90°, 36 axial slices). In addition, high-resolution anatomical images were acquired on the same scanner using a T1-weighted 3D MPRAGE sequence (imaging parameters: TR = 1570 ms, TE = 3.42 ms, matrix size: 256 x 256, pixel size: 1 x 1 x 1 mm, slice thickness = 1.0 mm, FoV = 256, flip angle = 15°, 160 sagital slices).

4. Analysis of fMRI data

fMRI data were preprocessed and analyzed using SPM8 software (Wellcome Trust Centre for Neuroimaging, London, UK; http://www.fil.ion.ucl.ac.uk/spm) implemented in Matlab 7 (The MathWorks Inc., Natick, MA).The first five volumes of each functional time series were discarded to allow for T1 equilibration. Images were corrected for head movement between scans by an affine registration. For realignment, a two-pass procedure was used, by which images were initially realigned to the first image of the time-series and subsequently re-realigned to the mean of all images. For spatial normalization the mean EPI image of each subject was normalized to the current Montreal Neurological Institute (MNI) template (Evans *et al*, 1992; Holmes *et al*, 1998) using the unified segmentation function in SPM8. This algorithm combines image registration, tissue classification, and bias correction within the same generative model. All images were hereby transformed into standard stereotaxic space and resampled at 2 x 2 x 2 mm voxel size. The normalized images were spatially smoothed using a 6-mm FWHM Gaussian kernel. Raw time series were detrended by the application of a high-pass filter (cut-off period, 128 s). A two-level random effects approach based on the general linear model as implemented in SPM8 was used for statistical analyses.

On the first level, eight conditions (‘Female Touch$_{OXT}$’, ‘Female Close$_{OXT}$’, ‘Male Touch$_{OXT}$’, ‘Male Close$_{OXT}$’ ‘Female Touch$_{PLC}$’, ‘Female Close$_{PLC}$’, ‘Male Touch$_{PLC}$’, ‘Male Close$_{PLC}$’) were modeled by a

boxcar function convolved with a hemodynamic response function (Friston, 1995). The movement parameters were included as confounds in the design matrix. Each condition was compared relative to the low level baseline ('Home condition') and non-specific effects of OXT (i.e. the main effect of treatment) were analyzed by comparing all items with the low level baseline ([OXT>PLC] and [OXT<PLC]). Differences between each condition were computed separately for the OXT and PLC sessions and to examine specifically the modulatory effects of OXT, we built the contrasts [Female $Touch_{OXT}$] > [Female $Touch_{PLC}$], [Female $Close_{OXT}$] > [Female $Close_{PLC}$], [Male $Touch_{OXT}$] > [Male $Touch_{PLC}$] and [Male $Close_{OXT}$] > [Male $Close_{PLC}$]. To compare the OXT effect on female and male touch, we computed the contrast [Female $Touch_{OXT}$>Female $Touch_{PLC}$]> [Male $Touch_{OXT}$>Male $Touch_{PLC}$]. Parameter estimates for each contrast were subjected to one-sample *t*-tests on the second level for the whole-brain with a significance threshold of $P < 0.05$ corrected for multiple comparisons (family-wise error (FWE)). 5

Based on previous studies investigating the neural correlates of social touch (Lindgren *et al*, 2012; Voos *et al*, 2013), we used 6-mm spheres as regions of interest (ROI) centered at the coordinates of the reported maximum value for the pregenual anterior cingulate cortex (MNI x, y, z: 0, 42, 4) and orbitofrontal cortex (left MNI x, y, z: -36, 32, 1; right MNI x, y, z: 36, 32, 1). For an exploratory analysis of possible OXT effects on the ventral striatum (left MNI x, y, z: -12, 9, -6; right MNI x, y, z: 9, 6, -9) and the midbrain (left MNI: -3, -24, -24), we used ROIs centered at the coordinates reported by Sescousee and colleagues (2010). ROI-based one-sample *t*-tests were computed with a threshold of $P < 0.05$ and FWE-corrected for multiple comparisons based on the size of the ROI.

5. Salivary oxytocin collection and analysis

Saliva samples were collected using pre-chilled Salivettes (Sarstedt, Rommelsdorf, Germany). One sample was collected before administration of the nasal spray both in the OXT and PLC session and another sample was collected after the fMRI task. Salivettes were immediately centrifuged at 4180 g for 2 min and aliquoted samples were stored at -80°C until assayed. Salivary OXT concentrations were determined by using a 96 well commercial OXT-ELISA kit (ENZO, NY, USA). Measurements were performed in duplicate, and samples were treated following kit instructions. According to the manufacturer, the sensitivity limit of the assay is 11.7 pg/mL and 12% of the samples fell below the lower level of

sensitivity. The assay's reported intra-assay and inter-assay coefficients of variability are 9.1 – 12.4% and 5.2 - 14.5%, respectively.

6. Statistical analysis

Demographical, neuropsychological, and behavioral data were analyzed using IBM SPSS Statistic 20 (IBM, New York, NY, USA). Quantitative behavioral data were compared by dependent *t*-tests and Pearson's product-moment correlation was used for correlation analysis. Eta-squared and Cohen's *d* were calculated as measures of effect size. The assumption of normality for all target variables was assessed separately for the OXT and PLC sessions using Kolmogorov-Smirnov tests. All target data were derived from normally distributed populations (all *P*s > 0.06). For qualitative variables Pearson's chi-squared tests were used. All reported *P*-values are two-tailed, if not otherwise noted, and *P*-values of $P < 0.05$ were considered significant.

Supplementary Results:

1. Behavioral Results

To further examine this negative association, we median dichotomized the AQ score (13.20 ± 4.64) and carried out paired-*t* tests separately for the AQ high (16.48 ± 3.71) and low scorers (9.58 ± 2.21). The OXT effect on pleasantness ratings for female touch was significant for subjects with lower AQ scores (OXT: 14.48 ± 2.52, PLC: 13.56 ± 1.85, $t_{(39)} = 2.55$, $P = 0.02$, $d = 0.42$), but not with higher ones (OXT: 13.88 ± 3.05, PLC: 13.44 ± 3.00, $t_{(39)} = 1.36$, $P = 0.19$, $d = 0.15$).

Pleasantness ratings of female touch were negatively correlated with social touch anxiety both under OXT ($r = -0.34$, $P = 0.03$) and PLC ($r = -0.39$, $P = 0.02$). There was no significant association between social touch anxiety and autistic traits ($P = 0.33$) suggesting that healthy subjects with higher autistic traits were not *per se* more afraid of social touch. Only under OXT did subjects with high autistic traits assign lower pleasantness ratings to female touch ($r = -0.31$, $P = 0.054$). To examine a possible moderation of the behavioral effects by the adult attachment style, trait anxiety, or depressive symptoms, we correlated the five scales of the Attachment Style Questionnaire, the STAI trait scores and the BDI scores with pleasantness ratings of female and male touch and the OXT effect. We found no significant association (all *P*s > 0.09), indicating that the observed moderation was truly specific for autistic-like traits.

Interestingly, there was no correlation between the pleasantness ratings of the 'close' condition and social phobia scores (all *P*s > 0.13). Thus, it appears that these ratings of interpersonal closeness do not reflect the attitude towards social distance in the same manner as the spatial distance measured in a previous study (Scheele *et al*, 2012). In the present study, the subjects were lying horizontally in an MRI scanner and did not face the experimenter as opposed to (Scheele *et al*, 2012) where we found an effect of OXT on the chosen social distance.

We also examined whether the repeated measurements affected the pleasantness ratings. Neither for the male nor for the female condition there were any differences between the first and the second measurement (all *P*s > 0.40). Furthermore, we tested a potential effect of habituation by computing a repeated-measures ANOVA with 'time' (20 trials) and 'treatment' (OXT/PLC) as within subject factors and pleasantness ratings as dependent variable. For female touch, there was only a main effect of treatment ($F_{(1,39)} = 7.65$, $P < 0.01$, $\eta^2 = 0.16$), but no main or interaction effect of time (all *P*s > 0.23). For

male touch, there was no main or interaction effect of treatment (all *P*s > 0.43), but a trend for a main effect of time ($F_{(19,722)}$ = 2.22, P = 0.095, η^2 = 0.06). This effect of time is characterized by a decline of pleasantness rating of male touch over time.

2. Salivary OXT concentrations

We measured salivary OXT concentrations before the nasal spray administration (pre) and again after the fMRI task (post) to examine potential changes in the endogenous OXT levels in the PLC session due to interpersonal touch. In the OXT session, the concentration rose dramatically (pre: 33 ± 20 pg/ml, post: 407 ± 931 pg/ml, Z = 4.95, P < 0.01) which is consistent with previous studies (Weisman *et al*, 2012), but may also partly be attributed to OXT leaking from the nasal cavity into the mouth. More importantly, after the fMRI task the endogenous OXT levels were not increased in the PLC session (pre: 28 ± 15 pg/ml, post: 33 ± 29 pg/ml, Z = 1.20, P = 0.23) which may indicate that the short social touch in our fMRI paradigm was not sufficient to induce endogenous OXT changes. There were no significant associations between the pre OXT levels and pleasantness ratings or autistic traits (all *P*s > 0.06).

Peripheral saliva samples have been used in previous studies (Huffmeijer *et al*, 2012; van Ijzendoorn *et al*, 2012; Weisman *et al*, 2012), but the validity of saliva OXT measurement for quantification purposes has been questioned (Carter *et al*, 2007; Horvat-Gordon *et al*, 2005) and the association between peripheral and central OXT level in the brain is highly controversial (Kagerbauer *et al*, 2013; McCullough *et al*, 2013; Wang *et al*, 2013). Thus, these data should be interpreted as reflecting relative change rather than indicating absolute quantities.

3. FMRI results

To gauge OXT's influence on the higher hedonic value of female compared to male touch, we also computed the contrast [Female Touch_{OXT} > Male Touch_{OXT}] > [Female Touch_{PLC} > Male Touch_{PLC}]. OXT increased activations in the precuneus (24, -86, 34, $t_{(39)}$ = 5.73, k = 469, P_{FWE} = 0.03) and in the pACC (-2, 38, 6, $t_{(39)}$ = 3.24, k = 79, P_{FWE} = 0.03). On the whole brain level, there was no OXT effect on the insula, but an exploratory analysis with an anatomical ROI also revealed a trend for an enhanced activation (40, 6, 12, $t_{(39)}$ = 3.77, k = 71, P_{FWE} = 0.09).

In an exploratory analysis, we also tested whether OXT affects neural responses to female and male touch in the bilateral ventral striatum and the midbrain which have been previously implicated in reward processing (Sescousse *et al*, 2010). However, there were no further significant results (all *P*s > 0.05).

To further explore the relationship between the behavioral pleasantness ratings and the neural response to social touch, we conducted a correlation analysis and found that differences in the pleasantness ratings for female compared with male touch were positively associated with the magnitude of a differential response to them in the caudate (MNI x, y, z: 26, -12, 24, $t_{(39)}$ = 5.76, k = 92, P_{FWE} = 0.03). If we restricted our analysis to the pACC and OFC as hypothesis-driven predefined regions of interest (ROI), we observed a trend for a positive correlation in the pACC (4, 42, 2, $t_{(39)}$ = 2.82, k = 83, P_{FWE} = 0.067). Within the pACC and OFC ROIs, we also detected a significant positive correlation between pleasantness ratings and the neural response to female touch in the pACC (4, 40, 0, $t_{(39)}$ = 3.08, k = 77, P_{FWE} = 0.04) and a trend for a positive correlation in the OFC (32, 32, 4, $t_{(39)}$ = 2.89, k = 49, P_{FWE} = 0.06).

Within the pACC and OFC ROIs, we also detected a significant positive correlation between pleasantness ratings and the neural response to female touch under OXT in the right OFC (40, 34, -2, $t_{(39)}$ = 3.15, k = 36, P_{FWE} = 0.03). For male touch, we observed on the whole-brain level a negative association in the right precentral gyrus (44, -18, 52, $t_{(39)}$ = 5.52, k = 844, P_{FWE} < 0.01) further supporting the idea that the increased activation in the precentral gyrus during male touch reflects the aversive character of this condition. Interestingly, in our ROI-based analysis, we also found a positive correlation in the right (36, 32, -2, $t_{(39)}$ = 3.12, k = 52, P_{FWE} = 0.03) and left (-32, 28, 0, $t_{(39)}$ = 3.42, k = 18, P_{FWE} = 0.02) OFC for male touch

Table S1. Demographics and neuropsychological performance

	Mean (± SD)
Age (years)	25.75 (3.82)
Education (years)	16.86 (2.43)
RTI [a]	
Simple reaction time (ms)	293.69 (38.08)
Simple movement time (ms)	349.70 (61.72)
Five-choice movement time (ms)	318.02 (39.33)
Five-choice reaction time (ms)	366.27 (52.02)
PAL [b]	
Total errors	8.65 (6.45)
Mean errors to success	2.40 (2.18)
SWM – 8 [c]	
Between errors	7.21 (10.25)
Strategy score	13.65 (3.42)
Trait anxiety [d]	32.03 (7.90)
BDI [e]	1.93 (2.91)
Autisms Spectrum Quotient [f]	13.20 (4.64)
Social touch anxiety [g]	1.32 (0.38)
SIAS [h]	12.45 (6.15)
SPS [i]	3.05 (3.75)
ASQ Confidence [j]	67.23 (8.47)
ASQ Discomfort with Closeness [j]	24.20 (3.13)
ASQ Need for Approval [j]	13.05 (4.10)
ASQ Preoccupation with Relationships [j]	17.15 (5.35)
ASQ Relationships as Secondary [j]	13.05 (4.10)

Notes. Subjects' speed of response to a visual target, visual memory and the ability to retain spatial information were measured with the [a] simple and reaction time task (RTI), the [b] paired associates learning task (PAL) and the [c] spatial working memory task (SWM), respectively. Anxiety symptoms were assessed by the [d] State Trait Anxiety Inventory and depressive symptoms by the self-report [e] BDI (Beck´s Depression Scale, Version II). Autistic traits and social touch anxiety were assessed by the [f] Autism Spectrum Quotient and the [g] Social Touch Questionnaire. The attitude towards social distance was measured by the [h] SIAS (Social Interaction Anxiety Scale) and [i] SPS (Social Phobia Scale). Five factors of attachment were measured by the [j] Attachment Style Questionnaire (ASQ).

Table S2. Activation table for the GLM analysis under PLC

Region	Right/left	Cluster size (voxels)	*t-score*	*MNI-coordinates*		
				x	*y*	*z*
PLC: Touch > Close						
Inferior parietal lobule	R	1041	13.51	52	-28	22
Rolandic operculum	R		9.10	56	-18	18
Superior temporal gyrus	R		5.88	66	-40	12
Inferior parietal lobule	L	674	9.48	-48	-32	22
Supramarginal gyrus	L		8.87	-64	-24	22
Supramarginal gyrus	L		7.23	-62	-22	36
Rolandic operculum	R	84	7.52	52	-2	8
Rolandic operculum			6.29	60	4	6
Insula	R	275	7.26	40	-4	0
Insula	R		7.10	36	-16	0
Insula	R		6.88	36	2	8
Postcentral gyrus	L	86	7.14	-18	-48	70
Rolandic operculum	L	77	7.13	-54	2	6
Rolandic operculum	L		5.98	-46	-8	8
Anterior cingulate cortex	R	59	7.06	2	38	8
Anterior cingulate cortex	R		6.13	2	34	14
Inferior frontal gyrus	L	6	5.94	50	38	8
Insula	L	22	5.85	-36	-20	14
Insula	L	14	5.84	-38	-4	-4
Postcentral gyrus	R	10	5.79	18	-40	72
Inferior frontal gyrus	R	11	5.77	44	34	4
Anterior cingulate cortex	L/R	5	5.51	0	22	30
Insula	L	2	5.50	-34	0	12
Insula	L	2	5.47	-32	24	6
PLC: Close > Touch						
Paracentral lobule	R	639	9.23	8	-28	66
Paracentral lobule	L		8.73	-6	-30	58
Paracentral lobule	R		7.81	4	-20	62
Cuneus	R	40	6.15	26	-86	30

Notes. PLC, placebo.

Table S3. Activation table for the GLM analysis under OXT

Region	Right/left	Cluster size (voxels)	*t-score*	*MNI-coordinates*		
				x	*y*	*z*
OXT: Touch > Close						
Inferior parietal lobule	R	1407	13.43	52	-28	24
Supramarginal gyrus	R		13.06	60	-18	26
Inferior parietal lobule	R		8.70	62	-34	22
Supramarginal gyrus	L	1278	9.48	-56	-28	20
Supramarginal gyrus	L		8.87	-58	-28	26
Superior temporal gyrus	L		7.23	-40	0	-12
Insula	R	1013	9.03	40	4	14
Rolandic operculum	R		8.50	60	4	6
Insula	R		8.44	38	0	12
Anterior cingulate cortex	R	275	7.31	4	20	22
Middle cingulate cortex	R		7.18	0	20	34
Anterior cingulate cortex	R		6.61	2	32	18
Postcentral gyrus	R	34	6.80	20	-42	72
Thalamus	R	13	6.73	16	-12	12
Postcentral gyrus	L	77	6.73	-18	-42	72
Postcentral gyrus	L		5.98	-18	-52	68
Inferior frontal gyrus	R	55	6.28	38	28	0
Inferior frontal gyrus	L	19	6.25	-32	28	0
Insula	L	18	5.95	-34	4	10
Inferior frontal gyrus	L	4	5.84	-34	32	10
Middle temporal gyrus	R	1	5.54	48	-58	6
OXT: Close > Touch						
Inferior parietal lobule	L	683	8.12	-32	-64	42
Precuneus	L		7.81	-38	-72	36
Superior parietal lobule	L		6.92	-36	-66	54
Paracentral lobule	R	582	8.02	6	-26	70
Paracentral lobule	L		7.75	-2	-28	68
Paracentral lobule	L		7.38	-4	-22	58
Middle frontal gyrus	L	80	6.93	-42	52	-6
Inferior frontal gyrus	L		6.31	-42	48	2
Superior frontal gyrus	R	38	6.77	28	22	54
Inferior parietal lobule	R	23	6.53	40	-72	44
Paracentral lobule	R	14	6.50	8	-66	4
Paracentral lobule	L	15	6.11	-20	-90	30
Cuneus	R	22	5.90	48	-68	34
Middle frontal gyrus	L	18	5.85	-46	28	30
Inferior parietal lobule	L	5	5.81	-46	-60	50
Precentral gyrus	R	2	5.77	18	-24	70
Cuneus	R	13	5.72	28	-84	32
Middle occipital gyrus	R	3	5.65	34	-84	22

Precentral gyrus	R	1	5.56	22	-28	66
Middle occipital gyrus	R	1	5.50	32	-70	24
Superior parietal lobule	R	3	5.48	44	-62	50

Notes. OXT, oxytocin.

Table S4. State measurement of anxiety, mood and attention

	OXT session (n = 40) Mean (± SD)	PLC session (n = 40) Mean (± SD)	*t*	*P*
STAI – pre [a]	32.60 (5.38)	31.65 (5.87)	1.19	0.24
STAI – post [a]	33.05 (5.53)	32.08 (4.92)	1.46	0.15
PANAS – positive – pre [b]	28.61 (6.34)	28.91 (5.95)	-0.39	0.70
PANAS – positive – post [b]	27.70 (6.17)	27.87 (6.88)	-0.22	0.83
PANAS – negative – pre [b]	11.00 (1.60)	11.39 (2.50)	-0.79	0.44
PANAS – negative – post [b]	11.39 (3.14)	10.78 (1.28)	1.32	0.20
D2 [c]	229.53 (43.91)	223.40 (49.24)	1.12	0.27

Notes. State anxiety before and after the experiment was assessed using the [a]STAI = State Trait Anxiety Inventory. Mood before and after the experiment was assessed using the [b] PANAS = Positive and Negative Affect Schedule. Attention performance after the experiment was assessed using the [c] D2 = Aufmerksamkeits- und Belastungstest. Abbreviations: OXT, oxytocin; PLC, placebo.

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