Supplementary Material

S1 Participants

Forty-eight healthy females (healthy controls, HC) and 51 females with a DSM-IV diagnosis of BPD were recruited for this study. However, only 46 HC and 47 BPD participants provided valid data and could be considered in the subsequent analyses. The data of two HC and four BPD participants could not be used for the analyses because of difficulties during unblinding of the nasal sprays (i.e., erroneous documentation of used nasal sprays precluded any inferences about the administered substance, HC: $n = 2$, BPD: $n = 1$) or difficulties during the analysis of the functional magnetic resonance imaging data (i.e., movements that exceeded 3 mm or 3° across the whole imaging session, BPD: $n = 2$, or artifacts in the magnetic resonance imaging data, BPD: $n = 1$). Nonetheless, the number of participants exceeded those of similar studies investigating oxytocin-induced changes in emotion processing in BPD (Bartz et al., 2011; Simeon et al., 2011; Bertsch et al., 2013). In this respect, it is important to note that participants of the present study were recruited at the Department of Psychiatry and Psychotherapy of the University of Rostock, whereas participants of a previous study of our group had been recruited at the General Psychiatry of the University of Heidelberg (Bertsch et al., 2013). As a consequence, the participants of the present study were distinct from the participants of our previous study.

S2 Diagnostic assessment

Following an initial screening regarding the utilization of psychiatric and somatic care, including the use of medication, structured clinical interviews and self-report questionnaires were administered to determine inclusion and exclusion criteria. Structured clinical interviews were used for the assessment of Axis I (Structured Clinical Interview for DSM-IV Axis I Disorders, SCID-I; Wittchen *et al.*, 1997) and Axis II disorders (International Personality

Disorder Examination, IPDE; Loranger *et al.*, 1998) according to DSM-IV criteria. Self-report questionnaires were administered to assess the severity of general (Symptom Checklist 90 Revised, SCL-90-R; Franke, 1995), anxious (State Trait Anxiety Inventory, STAI; Laux *et al.*, 1981), depressive (Beck Depression Inventory, BDI; Hautzinger *et al.*, 1995), posttraumatic (Posttraumatic Diagnostic Scale, PDS; Ehlers *et al.*, 1996) and borderline pathology (Borderline Symptom List, BSL-23; Bohus *et al.*, 2009). In addition, a multiple-choice vocabulary test was applied for the assessment of general intelligence (Mehrfach-Wortwahl-Test B, MWT-B; Lehrl, 2005).

S3 Urine and hormone assessment

After arrival at the laboratory, a urine pregnancy test was conducted to rule out that the participants were pregnant at the time of testing. Thereafter, a venous catheter was inserted into the participants' forearm for continuous blood-sampling throughout the experiment. Following a 30 min catheter habituation period, blood samples were obtained to determine participants' menstrual cycle phase via progesterone and estrogen levels. Further blood samples were collected to control for differences in participants' oxytocin levels before and after substance application. These blood samples were obtained 5 min before and 45 min after administration of the nasal spray. All samples were drawn into chilled EDTA vacutainer tubes (5 ml) and prepared for assay within 30 min after collection. Details regarding sample collection and assay preparation can be found elsewhere (Domes *et al.*, 2010; Lischke *et al.*, 2012a; Lischke *et al.*, 2012c, b). In brief, electrochemiluminescene immunoassays (Roche, Risch, Switzerland) were used to determine participants' estrogen and progesterone levels in the samples. Assay detection limit was 0.03 ng/ml for progesterone and 5 pg/ml for estrogen (17β-estradiol), cross-reactivity with other related compounds was minimal, intra-assay and

inter-assay precision were < 3% and < 6% for progesterone and < 6% and < 7% for estrogen (17β-estradiol).

Participants' estrogen and progesterone levels were in a range that is typical for the early follicular phase (Nelson, 2005). A series of 2 × 2 ANOVAs (Group × Substance) confirmed that there were no group differences in participants' estrogen and progesterone levels [all p >.19, η_p^2 < .03; see Table S1]. Of note, the early follicular phase is characterized by comparably low estrogen and progesterone levels (Nelson, 2005), indicating that interactions between estrogen, progesterone and oxytocin levels are quite unlikely at this stage of the menstrual cycle.

S4 Non-specific substance effects and differences in substance assimilation

To track substance-induced changes in participants' mental state, a multidimensional mood questionnaire (Multidimensionaler Befindlichkeitsfragebogen, MDBF; Steyer *et al.*, 1997) was administered 5 min before and 45 min after substance administration. However, a series of 2 × 2 ANVOAs (Group × Substance) revealed no evidence for substance effects on participants' mood, calmness or wakefulness [all p > .46, all η_p^2 < .01; see Table S2]. Accordingly, participants reported no side-effects following substance administration.

To control for differences in substance assimilation, blood samples were obtained 5 min before and 45 min after administration of the nasal spray. All samples were drawn into chilled EDTA vacutainer tubes (5 ml) and prepared for assay within 30 min after collection. Details regarding sample collection and assay preparation can be found elsewhere (Domes *et al.*, 2010; Lischke *et al.*, 2012a; Lischke *et al.*, 2012c, b). In brief, we used a sensitive radioimmunoassay (Landgraf *et al.*, 1995) to determine participants' oxytocin levels in samples that had been centrifuged (at 4°C at 4000 rpm for 5 min), aliquoted and extracted.

Assay detection limit was 0.1 pg/sample, cross-reactivity with other related neuropeptides was < 0.7%, intra-assay and inter-assay precision were < 7-10% and < 12-15%.

A 2 × 2 × 2 ANOVA (Group × Substance × Time) indicated that participants did not differ in their oxytocin levels before but after substance application, with participants receiving oxytocin showing higher oxytocin levels than participants receiving placebo [effect of time: $F(1,85) = 6.00$, $p = .02$, $\eta_p^2 = .066$; interaction of time and substance: $F(1,85) = 4.93$, $p = .03$, $\eta_p^2 = .055$; all other effects and interactions: all $p > .26$ all $\eta_p^2 < .02$; see Table S2].

S5 Experimental task

For the experimental task, scenes were selected from the International Affective Picture System (IAPS; Lang *et al.*, 2005). The selection process involved several stages: On the first stage, two independent raters pre-selected a large variety of scenes depicting everyday experiences of ordinary people (i.e., scenes people may experience themselves or scenes people may watch in the news). For this reason, scenes showing severe mutilations, war atrocities or pornographic acts were excluded from the further selection process. On the second stage, the independent rates used normative valence and arousal ratings for the selection of positive scenes that differed maximally in valence and minimally in arousal from negative scenes and for the selection of neutral scenes that differed maximally in valence and arousal from positive as well as negative scenes. Following established guidelines (Colden *et al.*, 2008), the selected scenes were matched for social (e.g., athletes, passengers, patients) and non-social content (e.g. flowers, dishes, guns).

The final set of scenes comprised 72 scenes, 36 positive, 36 negative and 36 neutral scenes (see Table S3). The distribution of social and non-social content was counter-balanced across the scenes. A series of chi-square tests confirmed that neither the distribution of general types of social content (i.e., humans) nor the distribution of specific types of social

content (i.e., adults, children, groups, individuals) differed between positive, negative and neutral scenes [all $p > .130$]. The scenes were, thus, well matched for social and non-social content, ruling out that differences in social and non-social content may have affected participants' emotional reactions to positive, negative and neutral scenes. There were, however, marked differences in valence and arousal between positive, negative and neutral scenes (see Table S4). A series of *t*-tests indicated that positive and negative scenes differed in valence [$t(70) = 54.17$, $p < .001$] but not arousal [$t(61.75) = 1.19$, $p = .24$], whereas neutral scenes differed in both, valence and arousal, from positive [valence: $t(70) = 26.69$, $p < .001$; arousal: $t(70) = 24.89$, $p < .001$] and negative scenes [valence: $t(70) = 30.57$, $p < .001$; arousal: $t(53.89) = 20.32$, $p < .001$]. A similar pattern of differences emerged after taking the scenes' social and non-social content into account as indicated by another series of *t*-tests. Participants' emotional reactions to positive, negative and neutral scenes may, thus, have been affected by differences in valence and arousal rather than by differences in social and non-social content. Of note, positive, negative and neutral scenes did not differ in their physical properties (e.g., color composition, feature congestion, subband entropy and edge density) as indicated by a series of ANOVAs [all $p > .128$, all $\eta_p^2 < .04$; see Table S5]. Color composition, visual complexity and visual clutter were, thus, comparable between positive, negative and neutral scenes.

It should be noted that the aforementioned selection process resulted in set of scenes that differed markedly from the sets of scenes used in previous studies investigating scene processing in BPD (e.g., Herpertz *et al.*, 2001; Koenigsberg *et al.*, 2009a; Niedtfeld *et al.*, 2010; Schulze *et al.*, 2011; Hazlett *et al.*, 2012; Krause-Utz *et al.*, 2012; Goodman *et al.*, 2014; Koenigsberg *et al.*, 2014; Soloff *et al.*, 2015). Previous sets of scenes usually comprised scenes that varied extremely in valence and arousal. For this reason, most sets consisted of negative and neutral (e.g., Herpertz *et al.*, 2001; Schulze *et al.*, 2011; Krause-Utz *et al.*, 2012;

Koenigsberg *et al.*, 2014) rather than negative, positive and neutral (e.g., Niedtfeld *et al.*, 2010; Hazlett *et al.*, 2012; Goodman *et al.*, 2014; Soloff *et al.*, 2015) scenes. As a consequence, most evidence regarding BPD patients' hypersensitivity to emotionally relevant stimuli has been gathered from studies investigating emotional reactions to negative scenes (e.g., Herpertz *et al.*, 2001; Niedtfeld *et al.*, 2010; Schulze *et al.*, 2011; Krause-Utz *et al.*, 2012; Koenigsberg *et al.*, 2014). However, studies investigating emotional reactions to negative as well as positive and neutral scenes revealed that BPD patients' show (para-)limbic hyperreactivity and prefrontal hypoactivity to all types of scenes, irrespective of the scenes' valence (e.g., Koenigsberg *et al.*, 2009a; Koenigsberg *et al.*, 2009b; Niedtfeld *et al.*, 2010; Hazlett *et al.*, 2012; Goodman *et al.*, 2014; Soloff *et al.*, 2015). Accordingly, it has been reported that BPD patients provide abnormal valence and arousal ratings for negative as well as positive and neutral scenes (e.g., Koenigsberg *et al.*, 2009a; Jayaro *et al.*, 2011; Schulze *et al.*, 2011; Krause-Utz *et al.*, 2012), indicating that a wide variety of scenes are perceived as emotionally relevant on the neural as well as behavioral level in BPD.

It is also important to note that the present set of scenes showing a large variety of social and non-social content may represent a more ecologically valid stimulus class than faces showing a restricted variety of prototypical expressions. This is particularly true if the faces are cropped to hide expression-irrelevant features, which is standard practice in studies investigating face processing in BPD (e.g., Domes *et al.*, 2008; Bertsch *et al.*, 2013; Hidalgo *et al.*, 2016). The present set of scenes may, therefore, be well suited to investigate oxytocin-induced changes in BPD patients' hypersensitivity for emotional and neutral stimuli under ecologically more valid conditions.

S6 Eye-tracking

GazeAlyze (Berger *et al.*, 2012), a software package written in Matlab 7.7 (MathWorks Inc., Natick MA, USA), was used to analyze the eye-tracking data. After smoothing of the data, blinks were detected and interpolated whenever possible. Due to massive blink artifacts, the data of one HC and three BPD participants could not be considered in the analysis. However, a 2 × 2 × 3 ANOVA (Group × Substance × Valence) revealed no differences regarding the amount of valid data provided by the remaining participants [all $p > .21$, all $\eta_p^2 < .02$]. Fixations were coded when gaze remained for at least 100 ms within an area with a 14-pixel diameter. For each scene, the number of fixations to the entire scene and to predefined regions of the scene was determined. To obtain a relative index of participants' gaze behavior during scene processing, the number of fixations to predefined regions was dived by the number of fixations to the entire scene. Of note, the predefined regions of interest had previously been identified by independent raters as regions that are crucial for an understanding of the scenes' content. Details regarding the rationale for identifying and validating these regions can be found elsewhere (Lischke *et al.*, 2012c).

S7 Participant characteristics

A series of 2 × 2 ANOVAs (Group × Substance) revealed substance-independent differences in psychopathology between HC and BPD participants [all $p > .31$, all $\eta_p^2 < .01$, see Table 1], with BPD participants reporting more psychopathology than HC participants. Follow-up ANOVAs confirmed the absence of substance-related differences in self-reported [all $p > .26$; all $\eta_p^2 < .03$; see Table S6] psychopathology between BPD-PLC and BPD-OXT participants. Accordingly, there were no substantial differences in the rates of comorbid Axis I [all $p > .06$, see Table S7] and Axis II [all $p > .42$, see Table S7] disorders between BPD-PLC and BPD-OXT participants as indicated by a series of Chi-Square tests with continuity

correction. Likewise, there were no differences in the number of comorbid Axis I and Axis II disorders [all $p > .48$, see Table S7] between BPD-PLC and BPD-OXT participants as indicated by a one-way ANOVA.

Supplementary References

Bartz, J. A., Simeon, D., Hamilton, H., Kim, S., Crystal, S., Braun, A., Vicens, V. & Hollander, E. (2011) 'Oxytocin can hinder trust and cooperation in borderline personality disorder', *Soc Cogn Affect Neurosci*, **6**(5), pp. 556-563.

Berger, C., Winkels, M., Lischke, A. & Hoppner, J. (2012) 'GazeAlyze: a MATLAB toolbox for the analysis of eye movement data', *Behav Res Methods*, **44**(2), pp. 404-419.

Bertsch, K., Gamer, M., Schmidt, B., Schmidinger, I., Walther, S., Kastel, T., Schnell, K., Buchel, C., Domes, G. & Herpertz, S. C. (2013) 'Oxytocin and reduction of social threat hypersensitivity in women with borderline personality disorder', *Am J Psychiatry*.

Bohus, M., Kleindienst, N., Limberger, M. F., Stieglitz, R. D., Domsalla, M., Chapman, A. L., Steil, R., Philipsen, A. & Wolf, M. (2009) 'The short version of the Borderline Symptom List (BSL-23): development and initial data on psychometric properties', *Psychopathology*, **42**(1), pp. 32-39.

Colden, A., Bruder, M. & Manstead, A. (2008) 'Human content in affect-inducing stimuli: A secondary analysis of the international affective picture system', *Motiv Emot*, **32**(4), pp. 260-269.

Domes, G., Czieschnek, D., Weidler, F., Berger, C., Fast, K. & Herpertz, S. C. (2008) 'Recognition of facial affect in Borderline Personality Disorder', *J Pers Disord*, **22**(2), pp. 135-147.

Domes, G., Lischke, A., Berger, C., Grossmann, A., Hauenstein, K., Heinrichs, M. & Herpertz, S. C. (2010) 'Effects of intranasal oxytocin on emotional face processing in women', *Psychoneuroendocrinology*, **35**(1), pp. 83-93.

Ehlers, A., Steil, R., Winter, H. & Foa, E. B. (1996) *Deutsche Übersetzung der Posttraumatic Diagnostic Scale (PDS)*, Oxford, University, Warneford Hospital.

Franke, G. H. (1995) *SCL-90-R - Die Symptom-Checkliste von Derogatis, Deutsche Version*, Göttingen, Testzentrale.

Fydrich, T., Renneberg, B., Schmitz, B. & Wittchen, H. U. (1997) *SKID-II - Strukturiertes Klinisches Interview für DSM-IV Achse II: Persönlichkeitsstörungen*, Göttingen, Hogrefe.

Goodman, M., Carpenter, D., Tang, C. Y., Goldstein, K. E., Avedon, J., Fernandez, N., Mascitelli, K. A., Blair, N. J., New, A. S., Triebwasser, J., Siever, L. J. & Hazlett, E. A. (2014) 'Dialectical behavior therapy alters emotion regulation and amygdala activity in patients with borderline personality disorder', *J Psychiatr Res*, **57**, pp. 108-116.

Hautzinger, M., Bailer, M., Worall, H. & Keller, F. (1995) *Beck-Depressions-Inventar (BDI). Testhandbuch*, Bern, Huber.

Hazlett, E. A., Zhang, J., New, A. S., Zelmanova, Y., Goldstein, K. E., Haznedar, M. M., Meyerson, D., Goodman, M., Siever, L. J. & Chu, K. W. (2012) 'Potentiated amygdala response to repeated emotional pictures in borderline personality disorder', *Biol Psychiatry*, **72**(6), pp. 448-456.

Herpertz, S. C., Dietrich, T. M., Wenning, B., Krings, T., Erberich, S. G., Willmes, K., Thron, A. & Sass, H. (2001) 'Evidence of abnormal amygdala functioning in borderline personality disorder: a functional MRI study', *Biol Psychiatry*, **50**(4), pp. 292-298.

Hidalgo, N. A. I., Oelkers-Ax, R., Nagy, K., Mancke, F., Bohus, M., Herpertz, S. C. & Bertsch, K. (2016) 'Time course of facial emotion processing in women with borderline personality disorder: an ERP study', *Journal of Psychiatry & Neuroscience*, **41**(1), pp. 16-26.

Jayaro, C., De La Vega, I., Bayon-Palomino, C., Diaz-Marsa, M., Montes, A., Tajima, K., Lopez-Ibor, J. J. & Carrasco, J. L. (2011) 'Depressive-type emotional response pattern in impulsive-aggressive patients with borderline personality disorder', *J Affect Disord*, **135**(1-3), pp. 37-42.

Koenigsberg, H. W., Denny, B. T., Fan, J., Liu, X., Guerreri, S., Mayson, S. J., Rimsky, L., New, A. S., Goodman, M. & Siever, L. J. (2014) 'The neural correlates of anomalous habituation to negative emotional pictures in borderline and avoidant personality disorder patients', *Am J Psychiatry*, **171**(1), pp. 82-90.

Koenigsberg, H. W., Fan, J., Ochsner, K. N., Liu, X., Guise, K. G., Pizzarello, S., Dorantes, C., Guerreri, S., Tecuta, L., Goodman, M., New, A. & Siever, L. J. (2009a) 'Neural correlates of the use of psychological distancing to regulate responses to negative social cues: a study of patients with borderline personality disorder', *Biol Psychiatry*, **66**(9), pp. 854-863.

Koenigsberg, H. W., Siever, L. J., Lee, H., Pizzarello, S., New, A. S., Goodman, M., Cheng, H., Flory, J. & Prohovnik, I. (2009b) 'Neural correlates of emotion processing in borderline personality disorder', *Psychiatry Res*, **172**(3), pp. 192-199.

Krause-Utz, A., Oei, N. Y., Niedtfeld, I., Bohus, M., Spinhoven, P., Schmahl, C. & Elzinga, B. M. (2012) 'Influence of emotional distraction on working memory performance in borderline personality disorder', *Psychol Med*, pp. 1-12.

Landgraf, R., Neumann, I., Holsboer, F. & Pittman, Q. J. (1995) 'Interleukin-1 beta stimulates both central and peripheral release of vasopressin and oxytocin in the rat', *Eur J Neurosci*, **7**(4), pp. 592-598.

Lang, P. J., Bradley, M. M. & Cuthbert, B. N. (2005) *International affective picture system (IAPS): Affective ratings of pictures and instruction manual. Technical Report A-6.*, University of Florida, Gainesville, FL.

Laux, L., Glanzmann, P., Schaffner, P. & Spielberger, C. D. (1981) *Das State-Trait-Angstinventar*, Weinheim, Beltz.

Lehrl, S. (2005) *Mehrfach-Wortschatz-Intelligenztest (MWT-B)*, Balingen, Spitta.

Lischke, A., Berger, C., Prehn, K., Heinrichs, M., Herpertz, S. C. & Domes, G. (2012a) 'Intranasal oxytocin enhances emotion recognition from dynamic facial expressions and leaves eye-gaze unaffected', *Psychoneuroendocrinology*, **37**(4), pp. 475-481.

Lischke, A., Gamer, M., Berger, C., Grossmann, A., Hauenstein, K., Heinrichs, M., Herpertz, S. C. & Domes, G. (2012b) 'Oxytocin increases amygdala-dependent threat-processing in females', *Eur J Psychotraumatology*, **3**(Suppl), pp. 46-47.

Lischke, A., Gamer, M., Berger, C., Grossmann, A., Hauenstein, K., Heinrichs, M., Herpertz, S. C. & Domes, G. (2012c) 'Oxytocin increases amygdala reactivity to threatening scenes in females', *Psychoneuroendocrinology*, **37**(9), pp. 1431-1438.

Loranger, A., Sartorius, N., Andreoli, A., Berger, P., Buchheim, P., Channabasavanna, S., Coid, B., Dahl, A., Diekstra, R., Ferguson, B., Jakobsberg, L., Mombour, W., Pull, C., Ono, Y. & Regier, D. (1998) *Deutschsprachige Fassung der International Personality Disorder Examination: IPDE*, Geneva, World Health Organization.

Nelson, R. J. (2005) *An introduction to behavioral neuroendocrinology*, Sunderland, Sinauer Associates.

Niedtfeld, I., Schulze, L., Kirsch, P., Herpertz, S. C., Bohus, M. & Schmahl, C. (2010) 'Affect regulation and pain in borderline personality disorder: a possible link to the understanding of self-injury', *Biol Psychiatry*, **68**(4), pp. 383-391.

Rosenholtz, R., Li, Y. & Nakano, L. (2007) 'Measuring visual clutter', *J Vis*, **7**(2), pp. 17 11-22.

Schulze, L., Domes, G., Kruger, A., Berger, C., Fleischer, M., Prehn, K., Schmahl, C., Grossmann, A., Hauenstein, K. & Herpertz, S. C. (2011) 'Neuronal correlates of cognitive reappraisal in borderline patients with affective instability', *Biol Psychiatry*, **69**(6), pp. 564-573.

Simeon, D., Bartz, J., Hamilton, H., Crystal, S., Braun, A., Ketay, S. & Hollander, E. (2011) 'Oxytocin administration attenuates stress reactivity in borderline personality disorder: a pilot study', *Psychoneuroendocrinology*, **36**(9), pp. 1418-1421.

Soloff, P. H., White, R., Omari, A., Ramaseshan, K. & Diwadkar, V. A. (2015) 'Affective context interferes with brain responses during cognitive processing in borderline personality disorder: fMRI evidence', *Psychiatry Res*, **233**(1), pp. 23-35.

Steyer, R., Schwenkmezger, P., Notz, P. & Eid, M. (1997) *Der Mehrdimensionale Befindlichkeitsfragebogen (MDBF)*, Göttingen, Hogrefe.

Tkalcic, M. & Tasic, J. F. (2003) 'Colour spaces: perceptual, historical and applicational background', *Proceedings of EUROCON 2003: Computer as a Tool*, Piscataway, NJ, IEEE.

Wittchen, H. U., Wunderlich, U., Gruschwitz, S. & Zaudig, M. (1997) *SKID-I - Strukturiertes Klinisches Interview für DSM-IV Achse I: Psychische Störungen*, Göttingen, Hogrefe.

Supplementary Tables

Table S1

Estrogen and progesterone levels of healthy control (HC) and borderline personality disorder (BPD) participants receiving placebo (PLC) or oxytocin (OXT)

	HC				BPD			
	PLC (n = 24)		OXT (n = 22)		PLC (n = 24)		OXT (n = 23)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Estrogen (pg/ml)	38.68	18.00	50.22	33.75	53.46	28.54	55.35	34.25
Progesterone (ng/ml)	0.54	0.30	0.64	0.33	0.57	0.39	0.67	0.44

Table S2

Mental state and substance assimilation in healthy control (HC) and borderline personality disorder (BPD) participants receiving placebo (PLC) or oxytocin (OXT)

	HC				BPD			
	PLC (n = 24)		OXT (n = 22)		PLC (n = 24)		OXT (n = 23)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Mood (ΔMDBF-M)	-0.02	0.31	-0.07	0.38	-0.04	0.62	-0.01	0.60
Calmness (ΔMDBF-C)	-0.08	0.46	-0.02	0.61	0.05	0.70	-0.02	0.88
Wakefulness (ΔMDBF-W)	-0.20	0.38	-0.09	0.37	-0.24	0.74	-0.18	0.57
Oxytocin pre-application (pg/ml)	28.75	19.77	26.28	19.27	28.58	17.69	27.48	21.14
Oxytocin post-application (pg/ml)	27.03	18.43	36.84	16.90	31.14	16.87	33.97	16.13

Note. ΔMDBF = Multidimensional mood questionnaire [difference between post- and pre-values].

Table S3

Identification numbers of the scenes

	Identification number
Positive scenes	2058, 2208, 2224, 2344, 2345, 2398, 2550, 4599, 4610, 4614, 4626, 5260, 5270, 5450, 5480, 5600, 5660, 5700, 5814, 5849, 5910, 7501, 7508, 7570, 8170, 8200, 8300, 8350, 8420, 8496, 8499, 8500, 8501, 8502, 8531, 8540
Negative scenes	2120, 2141, 2205, 2900, 3180, 3181, 3300, 3301, 3350, 3530, 3550, 6315, 6530, 6540, 6561, 6562, 9421, 9429, 6610, 9471, 9000, 9290, 9300, 9301, 9320, 9340, 9470, 9600, 9611, 9620, 9621, 9622, 9830, 9901, 9902, 9911
Neutral scenes	2102, 2104, 2190, 2215, 2383, 2393, 2396, 2397, 2440, 2480, 2506, 2512, 2593, 2840, 2870, 2890, 5130, 5471, 5731, 5740, 7036, 7037, 7041, 7057, 7100, 7130, 7140, 7217, 7242, 7490, 7491, 7493, 7500, 7546, 7547, 8311

Note. Scenes were selected from the International Affective Picture System (IAPS; Lang et al., 2005)

Table S4

Normative valence and arousal ratings for the scenes

	Positive scenes		Negative scenes		Neutral scenes	
	M	*SD*	*M*	*SD*	*M*	*SD*
Valence	7.50	0.40	2.22	0.42	5.08	0.37
Arousal	5.49	0.47	5.66	0.69	2.99	0.38

Note. Scenes were selected from the International Affective Picture System (IAPS; Lang et al., 2005)

Table S5

Physical properties of the scenes

	Positive scenes		Negative scenes		Neutral scenes	
	M	*SD*	*M*	*SD*	*M*	*SD*
CIE L*	43.40	15.60	36.35	14.45	40.28	13.80
CIE a*	5.66	6.09	4.48	5.82	4.07	6.51
CIE b*	8.30	14.22	8.16	7.67	7.49	9.86
Feature congestion	4.24	1.84	3.52	1.33	3.95	1.92
Subband entropy	3.41	0.60	3.21	0.45	3.30	0.54
Edge density	4.12	2.78	3.49	2.53	3.97	2.80

Note. Scenes were selected from the International Affective Picture System (IAPS; Lang et al., 2005). SciPy 0.18.1 (www.scipy.org) was used to determine the scenes' physical properties in terms of color composition. Color composition was determined on basis of the CIE L*a*b* color space (Tkalcic and Tasic, 2003) that comprises the three dimensions L* (black-white components), a* (green-red components) and b* (blue-yellow components). For each scene and dimension, the mean across all pixels was computed. Matlab 9.1 (MathWorks Inc., Natick MA, USA) was used to determine the scenes' physical properties in terms of visual complexity and visual clutter. Visual complexity and visual clutter were determined on basis of feature congestion, subband entropy and edge density (Rosenholtz *et al.*, 2007).

Table S6

Psychopathology of borderline personality disorder (BPD) participants receiving placebo (PLC) or oxytocin (OXT)

	BPD-PLC (n = 24)		BPD-OXT (n = 23)	
	M	*SD*	*M*	*SD*
General pathology (SCL-90-R-GSI)	1.35	0.66	1.36	0.82
Depressive pathology (BDI)	24.38	12.13	23.91	11.45
Anxious pathology (STAI-T)	58.13	12.17	59.17	7.46
Posttraumatic pathology (PDS)	1.15	0.72	1.37	0.63
Borderline pathology (BSL-23)	1.78	0.94	1.65	1.15

Note. SCL-90-R-GSI = Symptom Check List 90 Revised - Global Severity Index; BDI = Beck Depression Inventory; STAI-T = State Trait Anxiety Inventory - Trait Anxiety; PDS = Posttraumatic Diagnostic Scale; BSL-23 = Borderline Symptom List 23.

Table S7

Axis I and Axis II disorders of borderline personality disorder (BPD) participants receiving placebo (PLC) or oxytocin (OXT)

	BPD-PLC (n = 24)		BPD-OXT (n = 23)	
	N	*[%]*	*N*	*[%]*
Current Axis I disorders				
Substance related disorders	2	8.33	8	34.78
Depressive disorders	5	20.83	3	13.04
Bipolar disorders	1	4.17	0	0
Generalized anxiety disorder	0	0	1	4.35
Panic disorders	0	0	2	8.70
Agoraphobia	2	8.33	1	4.35
Specific phobia	0	0	3	13.04
Social phobia	3	12.50	0	0
Posttraumatic stress disorder	4	16.67	5	21.74
Somatoform disorders	1	4.17	0	0
Eating disorders	2	8.33	1	4.35
Lifetime Axis I disorders				
Substance related disorders	8	33.33	7	30.43
Depressive disorders	7	29.17	7	30.43
Social phobia	0	0	1	4.35
Posttraumatic stress disorder	1	4.17	0	0
Eating disorders	5	20.83	4	17.39
Lifetime Axis II disorders				
Borderline	24	100	23	100
Paranoid	0	0	1	4.35
Schizoid	0	0	1	4.35
Antisocial	0	0	1	4.35
Histrionic	4	16.67	4	17.39
Narcissistic	0	0	1	4.35
Avoidant	3	12.50	6	26.09
Dependent	3	12.50	1	4.35
Obsessive-compulsive	2	8.33	1	4.35