

Supplementary Tables and Figures

Table S1 Region of Interest Analyses for Effects of Oxytocin on Left and Right Amygdala Activity. Analysis of Variance on the Emotion-Induced Signal Increase (Emotion – Neutral) as a Function of Emotional Valence (Angry, Happy), Stimulus Duration (17, 68 ms), Attentional Focus (Eyes, Mouth), and Drug (Placebo, Oxytocin)

	Left amygdala		Right amygdala	
	F-value	Significance	F-value	Significance
<i>Main Effects</i>				
Focus (Eyes vs. Mouth)	.031	.861	.683	.413
Emotion (Angry vs. Happy)	.025	.874	.157	.694
Duration (17 ms vs. 68 ms)	.842	.364	.143	.707
Drug (Placebo vs. Oxytocin)	.919	.343	.604	.441
<i>Interaction Effects</i>				
Focus * Drug	1.179	.283	.000	.997
Emotion * Drug	.395	.533	.048	.828
Duration * Drug	.009	.924	.405	.528
Focus * Emotion	.012	.912	.137	.713
Focus * Duration	.368	.547	.326	.571
Emotion * duration	.050	.824	.183	.671
Focus * Emotion * Drug	4.661	.036	12.944	.001
Focus * Duration * Drug	.081	.778	.476	.494
Emotion * Duration * Drug	.139	.711	.068	.795
Focus * Emotion * Duration	1.127	.294	.343	.561
Focus * Emotion * Duration * Drug	.659	.421	.707	.405

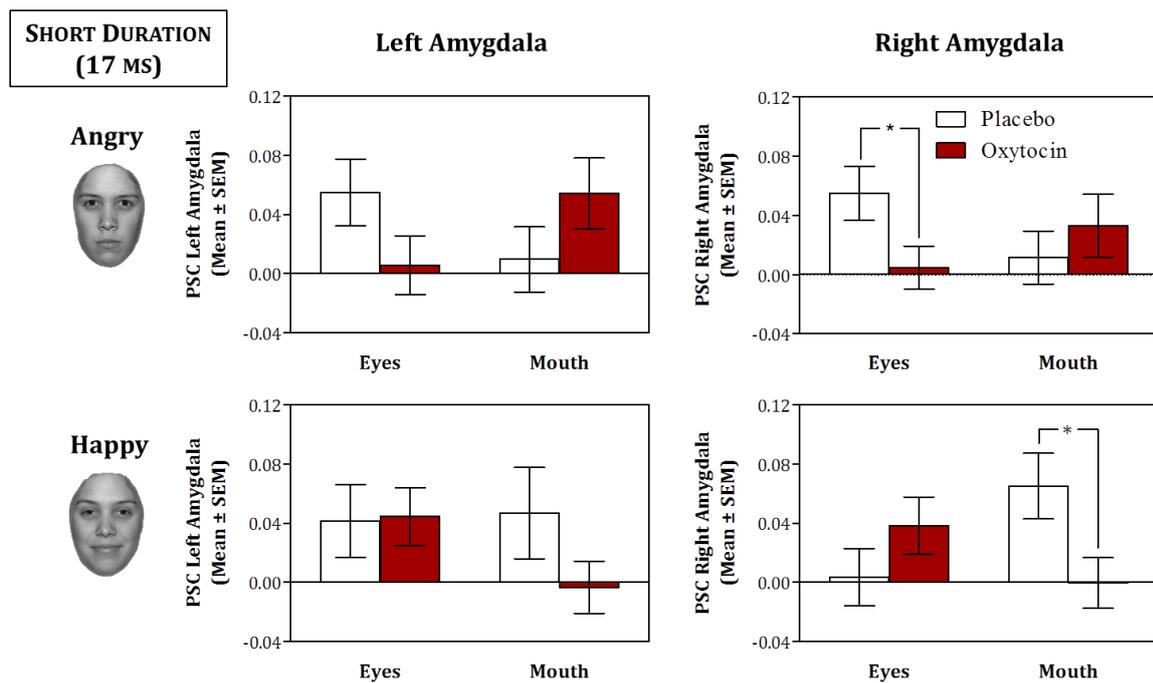


Figure S2 Reactivity of left and right amygdala to masked angry (upper graphs) and happy (lower graphs) faces for the short duration condition (17 ms). Percent signal change within the left and right amygdala ROI as a function of emotional valence, attentional focus and drug condition. For angry faces, oxytocin reduced amygdala responses when attending to the eye region. For happy faces, oxytocin decreased amygdala responses when attending to the mouth region. Error bars represent the standard error of the mean.

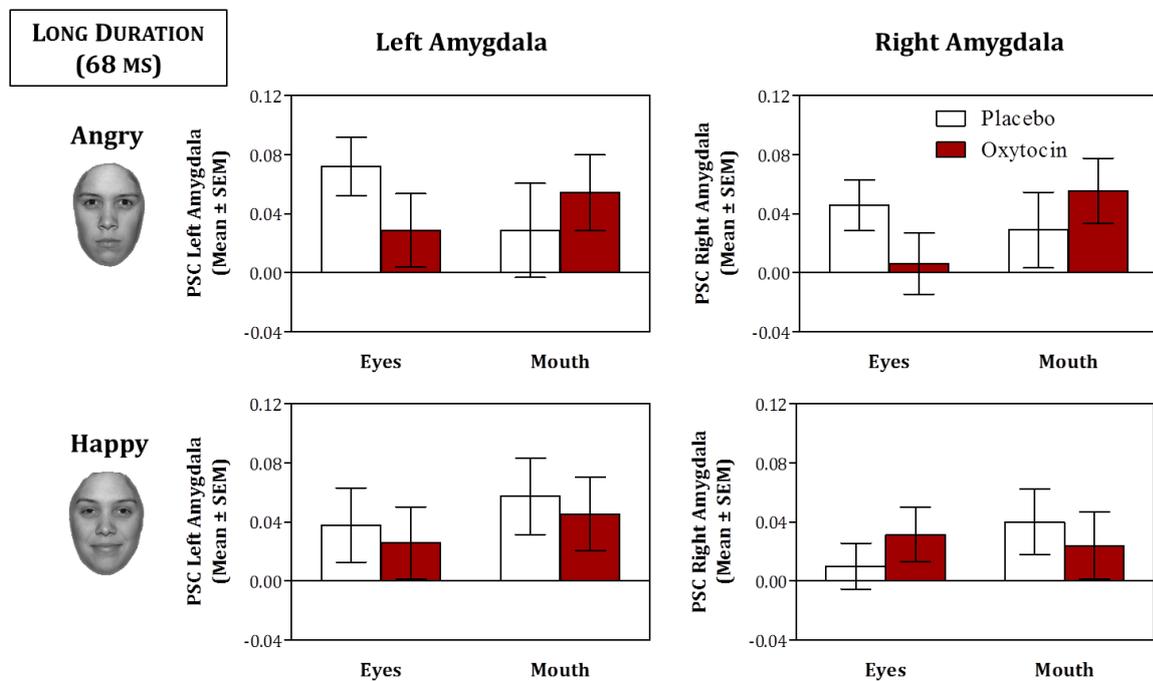


Figure S3 Reactivity of left and right amygdala to masked angry (upper graphs) and happy (lower graphs) faces for the long duration condition (68 ms). Percent signal change within the left and right amygdala ROI as a function of emotional valence, attentional focus and drug condition. For angry faces, oxytocin reduced amygdala responses when attending to the eye region. For happy faces, oxytocin decreased amygdala responses when attending to the mouth region. Error bars represent the standard error of the mean.

Table S4 Whole Brain Analysis for the Effects of Oxytocin on Brain Responses when Attending to the Eye Region or to the Mouth Region of Masked Angry Faces (contrast: angry > neutral; $p < .001$, $k \geq 10$)

Cluster region	k	Z	MNI coordinates		
			x	y	z
<i>EYES</i>					
<i>Placebo</i>					
L Fusiform Gyrus / Inferior Temporal Gyrus	1108	6.76	-42	-61	-17
R Inferior Temporal Gyrus/ Inferior Occipital Gyrus	633	5.41	45	-40	-17
L Cerebellum	51	4.27	-21	-76	-41
L Olfactory Cortex	33	4.18	-21	11	-17
R Superior Occipital Gyrus	92	4.00	27	-79	34
R Olfactory Cortex	18	3.86	18	11	-14
L Mid-Temporal Gyrus	30	3.71	-54	-52	7
R Inferior Frontal Gyrus	17	3.66	54	38	1
L Inferior Parietal Cortex	16	3.41	-60	-46	46
<i>Oxytocin</i>					
No significant cluster					
<i>Placebo > Oxytocin</i>					
L Fusiform Gyrus	330	4.69	-42	-82	-14
L Cerebellum	16	3.93	-24	-76	-41
L Midbrain / Thalamus	29	3.93	-9	-13	-11
L Hippocampus / Thalamus	44	3.93	-18	-31	-2
R Thalamus	14	3.85	12	-16	13
L Mid-Frontal Gyrus	24	3.84	-39	59	19
Striate Cortex	39	3.83	0	-73	4
L Fusiform Gyrus / Cerebellum	16	3.64	-24	-31	-23
L Midbrain	14	3.63	-3	-22	-20
R Inferior Parietal Cortex	41	3.63	48	-55	49
R Caudate	25	3.58	9	14	7
L Mid-Frontal Gyrus	20	3.56	-54	17	40
R Inferior Frontal Gyrus	19	3.55	60	14	19
R Mid-Frontal Gyrus	16	3.51	51	44	19
R Cerebellum	46	3.51	21	-67	-17
<i>Oxytocin > Placebo</i>					
No significant cluster					
<i>MOUTH</i>					
<i>Placebo</i>					
R Inferior Temporal Gyrus / Fusiform Gyrus	68	4.67	45	-49	-17
L Caudate	16	4.02	-9	8	10
<i>Oxytocin</i>					
R Inferior Occipital Gyrus	117	4.56	48	-70	-5
L Superior Occipital Gyrus	113	4.19	-24	-91	31
L Fusiform Gyrus	29	3.95	-42	-52	-17
R Superior Occipital Gyrus	44	3.89	24	-82	43
L Inferior Occipital Gyrus	14	3.81	-48	-73	-2
R Mid-Occipital Gyrus	15	3.76	36	-91	13
L Lateral Orbitofrontal Cortex	25	3.68	-33	26	-14
L Lingual Gyrus	57	3.68	-15	-67	-8
R Superior Occipital Gyrus	11	3.63	21	-94	28
R Amygdala	13	3.61	27	-1	-23
L Mid-Temporal Gyrus	10	3.45	-54	-73	13
<i>Placebo > Oxytocin</i>					
No significant cluster					
<i>Oxytocin > Placebo</i>					
L Temporal Pole	11	3.44	-51	14	-20

Table S5 Whole Brain Analysis for Differential Effects of Oxytocin on Brain Responses when Attending to the Eye as Compared to the Mouth Region of Masked Angry Faces or Vice Versa (contrast: angry > neutral; $p < .001$, $k \geq 10$)

Cluster region	k	Z	MNI coordinates		
			x	y	z
<i>EYES > MOUTH</i>					
<i>Placebo</i>					
L Fusiform Gyrus / Inferior Occipital Gyrus	150	4.65	-45	-67	-17
L Medial Orbitofrontal Cortex	11	3.80	-18	23	-17
L Inferior Temporal Gyrus	16	3.64	-45	-19	-32
L Mid-Temporal Gyrus	11	3.45	-51	-19	-8
<i>Oxytocin</i>					
No significant cluster					
<i>Placebo > Oxytocin</i>					
L Fusiform Gyrus / Inferior Occipital Gyrus	31	4.48	-45	-67	-14
R Fusiform	5	4.33	30	-61	-2
L Cerebellum	78	4.17	-24	-76	-41
L Medial Orbitofrontal Cortex	23	4.17	-24	-76	-41
L Medial Orbitofrontal Cortex	11	3.94	-18	23	-14
L Midbrain	13	3.92	-9	-16	-11
L Superior Occipital Gyrus	63	3.92	-18	-85	37
L Inferior Temporal Gyrus	32	3.85	-45	-13	-29
L Mid-Temporal Gyrus	15	3.69	-42	2	-26
R Cuneus	90	3.68	9	-82	40
Striate Cortex	23	3.65	9	-64	4
R Cerebellum	14	3.58	-48	44	19
L Inferior Frontal Gyrus	10	3.45	-39	26	28
R Cerebellum	22	3.40	45	-49	-41
L Mid-Temporal Gyrus	10	3.37	-48	-19	-11
<i>MOUTH > EYES</i>					
<i>Placebo</i>					
No significant cluster					
<i>Oxytocin</i>					
L Mid-Occipital Gyrus	16	3.55	-21	-100	4
<i>Placebo > Oxytocin</i>					
No significant cluster					

Table S6 Whole Brain Analysis for the Effects of Oxytocin on Brain Responses when Attending to the Eye Region or to the Mouth Region of Masked Happy Faces (contrast: happy > neutral; $p < .001$, $k \geq 10$)

Cluster region	k	Z	MNI coordinates		
			x	y	z
<i>EYES</i>					
<i>Placebo</i>					
L Inferior Temporal Gyrus / Fusiform Gyrus	65	4.57	-51	-52	-20
R Inferior Occipital Gyrus	134	4.37	45	-76	-14
R Inferior Temporal Gyrus / Fusiform Gyrus	16	4.10	48	-43	-20
L Mid- / Superior Occipital Gyrus	28	3.59	-27	-79	31
L Inferior Frontal Gyrus	17	3.58	-42	32	13
R Superior Occipital Gyrus	10	3.54	27	-79	37
<i>Oxytocin</i>					
L Mid/Superior Occipital Gyrus	379	4.92	-33	-79	16
R Mid-Temporal Gyrus	186	4.46	54	-58	10
R Inferior Occipital Gyrus / Fusiform Gyrus	45	4.42	45	-73	-11
R Inferior Temporal Gyrus / Fusiform Gyrus	44	4.31	45	-49	-17
R Postcentral Lobule	37	3.96	24	-28	61
L Fusiform / Lingual Gyrus	48	3.88	-27	-67	-11
L Inferior Temporal Gyrus	32	3.84	-60	-46	-14
Striate Cortex	74	3.78	-3	-100	16
L Hippocampus / Amygdala	11	3.72	-33	-1	-17
L Putamen	14	3.70	-24	14	-8
L Lingual Gyrus / Striate Cortex	15	3.70	-9	-79	-11
L Precuneus	10	3.60	-3	-46	52
L Postcentral Lobule	12	3.58	-42	-13	34
R Superior Occipital Gyrus	22	3.49	24	-76	34
R Hippocampus	10	3.32	24	-10	-17
<i>Placebo > Oxytocin</i>					
No significant cluster					
<i>Oxytocin > Placebo</i>					
No significant cluster					
<i>MOUTH</i>					
<i>Placebo</i>					
L Fusiform Gyrus	66	4.57	-36	-55	-17
L Fusiform Gyrus / Lingual Gyrus	61	4.51	-27	-73	-8
L Insula	44	4.34	-27	23	-11
R Insula	59	4.31	27	20	-17
Superior Medial Frontal Gyrus	77	4.30	0	50	37
L Hippocampus	58	4.22	-24	-10	-14
R Inferior Occipital Gyrus / Fusiform Gyrus	39	4.11	42	-64	-14
L Mid-Occipital Gyrus	58	3.96	-24	-79	16
R Amygdala	16	3.88	30	-1	-23
R Mid-Occipital Gyrus	33	3.84	24	-97	10
R Precentral Lobule	21	3.82	33	-25	58
L Inferior Parietal Cortex / Mid-Occipital Gyrus	39	3.49	-30	-76	43
R Fusiform Gyrus	10	3.46	39	-40	-20
R Superior Occipital Gyrus	21	3.37	24	-82	37
<i>Oxytocin</i>					
L Fusiform Gyrus / Lingual Gyrus	75	4.33	-24	-76	-11
L Mid- / Inferior Occipital Gyrus	16	3.69	-51	-79	-2
<i>Placebo > Oxytocin</i>					
L Insula	25	4.21	-27	23	-11
Superior Medial Frontal Gyrus	30	3.73	0	50	37
<i>Oxytocin > Placebo</i>					
No significant cluster					

Table S7 Whole Brain Analysis for Differential Effects of Oxytocin on Brain Responses when Attending to the Eye as Compared to the Mouth Region of Masked Happy Faces or Vice Versa (contrast: happy > neutral; $p < .001$, $k \geq 10$)

Cluster region	k	Z	MNI coordinates		
			x	y	z
<i>EYES > MOUTH</i>					
<i>Placebo</i>					
No significant cluster					
<i>Oxytocin</i>					
R Precentral Lobule	11	3.74	33	-22	61
Striate Cortex	17	3.63	3	-91	4
R Primary Auditory Cortex	11	3.53	39	-22	16
<i>Placebo > Oxytocin</i>					
No significant cluster					
<i>MOUTH > EYES</i>					
<i>Placebo</i>					
R Parahippocampal Gyrus / Lingual Gyrus	16	4.14	18	-40	-5
<i>Oxytocin</i>					
No significant cluster					
<i>Placebo > Oxytocin</i>					
L Pallidum	35	4.49	-18	-1	1
R Inferior Temporal Gyrus	16	4.02	54	-25	-20
L Putamen	13	3.86	-24	20	-2
R Superior Medial Frontal Gyrus	17	3.79	3	50	40
R Hippocampus	11	3.67	21	-22	-11
R Superior Frontal Gyrus	12	3.62	18	41	34

Table S8 Whole Brain Analysis for Differential Effects of Oxytocin on Brain Responses when Attending to the Eye as Compared to the Mouth Region of Masked Angry Faces or Vice Versa (contrast: angry > neutral; $p < .001$, $k \geq 10$) for the Brief Stimulus Duration Condition (17 ms)

Cluster region	k	Z	MNI coordinates		
			x	y	z
<i>EYES > MOUTH</i>					
<i>Placebo</i>					
R Fusiform Gyrus	19	4.32	36	-4	-29
L Cerebellum	71	4.27	-42	-79	-44
L Inferior Temporal / Fusiform Gyrus	45	3.99	-36	-4	-32
R Inferior Temporal Gyrus	12	3.89	51	-19	-26
L Medial Orbitofrontal Cortex	10	3.73	-12	35	-20
<i>Oxytocin</i>					
No significant cluster					
<i>Placebo > Oxytocin</i>					
R Inferior Temporal Gyrus	15	4.50	51	-19	-26
L Mid-Occipital Gyrus / Fusiform Gyrus	225	4.22	-36	-91	1
L Cerebellum	103	4.21	-42	-76	-44
L Mid-Temporal Gyrus	16	4.21	-39	2	-29
R Fusiform Gyrus	40	4.09	30	-79	1
R Medial Orbitofrontal Cortex	19	4.06	15	44	-14
R Hippocampus	25	3.85	15	-7	-11
L Orbitofrontal Cortex	10	3.84	-18	23	-14
R Midbrain	25	3.76	3	-25	-20
L Inferior Temporal / Fusiform Gyrus	26	3.70	-36	-16	-32
R Cerebellum	24	3.68	39	-73	-41
L Mid-Frontal Gyrus	10	3.63	-51	41	19
L Hippocampus / Amygdala	11	3.63	-15	-4	-14
R Angular Gyrus	15	3.48	51	-58	52
L Superior Occipital Gyrus	15	3.45	-24	-88	37
Striate Cortex	11	3.34	-6	-88	-8
<i>MOUTH > EYES</i>					
<i>Placebo</i>					
No significant cluster					
<i>Oxytocin</i>					
L Inferior / Mid-Occipital Gyrus	209	4.58	-24	-94	4
R Superior Occipital Gyrus	14	4.02	24	-82	4
L Inferior Frontal Gyrus	20	3.93	-48	11	13
L Mid-Frontal Gyrus	35	3.87	-42	53	13
Midbrain	18	3.87	-12	-16	-14
L Thalamus	21	3.86	-18	-4	13
L Pallidum	13	3.82	-18	-1	-8
R Inferior Occipital Gyrus	34	3.78	39	-76	-8
R Hippocampus	11	3.66	15	-7	-11
R Putamen / Caudate	13	3.60	18	11	4
R Inferior Frontal Gyrus	15	3.40	42	26	19
<i>Placebo > Oxytocin</i>					
No significant cluster					

Table S9 Whole Brain Analysis for Differential Effects of Oxytocin on Brain Responses when Attending to the Eye as Compared to the Mouth Region of Masked Angry Faces or Vice Versa (contrast: angry > neutral; $p < .001$, $k \geq 10$) for the Long Stimulus Duration Condition (68 ms)

Cluster region	k	Z	MNI coordinates		
			x	y	z
<i>EYES > MOUTH</i>					
<i>Placebo</i>					
L Fusiform Gyrus / Inferior Occipital Gyrus	86	4.17	-45	-67	-17
Paracentral Lobule	35	4.12	0	-19	73
R Supplementary Motor Area	21	3.82	9	5	64
L Rolandic Operculum	19	3.62	-63	2	13
<i>Oxytocin</i>					
No significant cluster					
<i>Placebo > Oxytocin</i>					
L Mid-Temporal Gyrus	20	4.23	-57	-70	10
R Cuneus / Striate Cortex	115	4.03	6	-79	37
Superior Colliculi	15	3.95	6	-28	-8
L Rolandic Operculum	47	3.89	-60	2	13
L Inferior Frontal Gyrus	20	3.87	-42	23	31
Paracentral Lobule	25	3.82	0	-22	73
L Superior Occipital Gyrus	34	3.71	-6	-82	46
L Fusiform Gyrus	35	3.63	-45	-67	-17
R Precuneus	14	3.51	3	-61	64
<i>MOUTH > EYES</i>					
<i>Placebo</i>					
No significant cluster					
<i>Oxytocin</i>					
R Mid-Frontal Gyrus	22	3.86	45	32	34
L Superior Frontal Gyrus	17	3.75	-18	-1	73
<i>Placebo > Oxytocin</i>					
No significant cluster					

Table S10 Effects of Intranasal Oxytocin on Detection of Masked Facial Emotions (d') as a Function of Emotional Valence (Angry, Happy), Stimulus Duration (17, 68 ms), and Attentional Focus (Eyes, Mouth)

	Placebo (n = 22)		Oxytocin (n = 21)		T	df	p
	M	SD	M	SD			
<i>Angry</i>							
17ms Eyes	1.02	.86	.97	.94	-.191	41	.849
17ms Mouth	1.07	.68	.88	.66	-.941	41	.352
68ms Eyes	3.27	.88	2.90	1.13	-1.214	41	.232
68ms Mouth	2.89	.97	2.59	1.12	-.930	41	.358
<i>Happy</i>							
17ms Eyes	2.02	.91	2.03	.84	.048	41	.962
17ms Mouth	1.72	.78	1.78	.77	.230	41	.819
68ms Eyes	3.99	.65	3.73	1.06	-.982	41	.332
68ms Mouth	3.87	.70	3.82	.96	-.200	41	.842

Table S11 Effects of Intranasal Oxytocin on Response Latencies as a Function of Emotional Valence (Angry, Happy), Stimulus Duration (17, 68 ms), and Attentional Focus (Eyes, Mouth). Values Represent Reaction Time Differences (ms) Between Emotional and Neutral Face Trials with Positive Values Indicating Faster Responses to Emotional as Compared to Neutral Faces)

	Placebo (n = 22)		Oxytocin (n = 21)		T	df	p
	M	SD	M	SD			
<i>Angry</i>							
17ms Eyes	70.46	276.09	153.65	140.97	1.235	41	.224
17ms Mouth	122.48	178.52	152.78	157.85	.589	41	.559
68ms Eyes	178.67	173.47	124.61	280.14	-.765	41	.449
68ms Mouth	145.56	173.27	160.13	156.37	.289	41	.774
<i>Happy</i>							
17ms Eyes	131.91	176.15	197.37	165.90	1.253	41	.217
17ms Mouth	119.05	162.38	150.48	124.77	.709	41	.482
68ms Eyes	159.39	117.04	97.32	240.97	-1.082	41	.286
68ms Mouth	148.13	109.25	129.77	95.31	-.586	41	.561

Table S12 Raw differences scores for percent signal change induced by emotional as compared to neutral masked faces within the left and right amygdala ROIs (e.g. [Angry Eyes 17 ms – Neutral Eyes 17 ms])

			Left Amygdala		Right Amygdala	
			T	p	T	p
<i>Whole sample (df = 45)</i>						
Angry						
Eyes	Short		1.98	0.05	2.45	.02
	Long		3.13	0.00	1.90	.06
Mouth	Short		1.93	0.06	1.60	.12
	Long		2.04	0.05	2.50	.02
Happy						
Eyes	Short		2.75	0.01	1.51	.14
	Long		1.83	0.07	1.71	.09
Mouth	Short		1.20	0.23	2.18	.03
	Long		2.88	0.01	2.03	.05
<i>Placebo group (df = 22)</i>						
Angry						
Eyes	Short		2.44	.02	3.00	.01
	Long		3.65	.00	2.65	.02
Mouth	Short		.44	.67	.64	.53
	Long		.90	.38	1.13	.27
Happy						
Eyes	Short		1.68	.11	.18	.86
	Long		1.50	.15	.64	.53
Mouth	Short		1.51	.14	2.91	.01
	Long		2.21	.04	1.80	.09
<i>Oxytocin group (df = 22)</i>						
Angry						
Eyes	Short		.28	.78	.32	.75
	Long		1.15	.26	.30	.77
Mouth	Short		2.25	.03	1.54	.14
	Long		2.11	.05	2.50	.02
Happy						
Eyes	Short		2.25	.03	1.96	.06
	Long		1.05	.31	1.69	.11
Mouth	Short		-.20	.85	-.04	.97
	Long		1.82	.08	1.05	.30

Table S13 Hit rates and false alarm rates for each condition in both substance groups

	Placebo (n = 22)				Oxytocin (n = 21)			
	Hit rate		False alarm rate		Hit rate		False alarm rate	
	M	SD	M	SD	M	SD	M	SD
<i>Angry</i>								
17ms Eyes	0.57	0.24	0.27	0.26	0.59	0.15	0.28	0.20
17ms Mouth	0.59	0.27	0.30	0.23	0.64	0.14	0.33	0.18
68ms Eyes	0.93	0.06	0.10	0.13	0.93	0.08	0.17	0.23
68ms Mouth	0.93	0.06	0.15	0.14	0.91	0.06	0.21	0.23
<i>Happy</i>								
17ms Eyes	0.79	0.18	0.23	0.19	0.85	0.13	0.27	0.18
17ms Mouth	0.70	0.21	0.19	0.13	0.79	0.15	0.25	0.18
68ms Eyes	0.98	0.03	0.05	0.04	0.98	0.02	0.11	0.22
68ms Mouth	0.97	0.04	0.07	0.11	0.97	0.04	0.08	0.18

Table S14 Response latencies (in ms) for each condition in both substance groups

	Placebo (n = 22)				Oxytocin (n = 21)			
	Angry		Neutral		Angry		Neutral	
	M	SD	M	SD	M	SD	M	SD
17ms Eyes	1011.61	158.04	1082.07	306.32	1029.92	200.89	1183.57	174.44
17ms Mouth	1021.73	211.54	1144.21	195.79	1031.70	155.25	1184.48	177.63
68ms Eyes	904.39	120.71	1083.06	167.24	870.42	125.46	995.03	277.14
68ms Mouth	909.75	124.81	1055.31	169.59	881.14	136.52	1041.27	158.78
	Happy		Neutral		Happy		Neutral	
	M	SD	M	SD	M	SD	M	SD
	M	SD	M	SD	M	SD	M	SD
17ms Eyes	942.82	143.41	1074.73	186.05	887.95	144.34	1085.32	192.94
17ms Mouth	944.57	159.91	1063.61	205.44	917.55	150.76	1068.03	165.47
68ms Eyes	821.64	133.42	981.03	120.85	787.88	115.85	885.20	231.24
68ms Mouth	816.11	134.54	964.24	123.68	778.36	133.21	908.13	116.03