Supplementary Material

Table 1

Descriptive data (means and standard deviations) as well as age and treatment differences in education level, sensorimotor processing speed, short-term verbal learning memory, mood, and ratings of physical and mental health (n = 102, behavioral sample)

Measures	Young M (SD)	Older M (SD)	OT M (SD)	P M (SD)	Age Differences	Treatment Differences
Education Level	15.6 (2.4)	16.5 (3.2)	16.1 (3.0)	15.9 (2.7)	$F = 2.5$, $\eta^2p = 0.03$	$F = 0.1$, $\eta^2p = 0.001$
DSST	64.3 (10.2)	44.9 (8.5)	53.3 (12.5)	54.8 (14.5)	$F = 110.0$, $\eta^2p = 0.5$*	$F = 0.3$, $\eta^2p = 0.003$
RAVLT	9.2 (2.0)	7.4 (2.5)	8.1 (2.5)	8.4 (2.3)	$F = 14.9$, $\eta^2p = 0.1$*	$F = 0.2$, $\eta^2p = 0.002$
Positive Affect	2.8 (0.7)	3.5 (0.6)	3.1 (0.7)	3.3 (0.7)	$F = 29.0$, $\eta^2p = 0.2$*	$F = 1.4$, $\eta^2p = 0.01$
Negative Affect	1.2 (0.3)	1.2 (0.3)	1.2 (0.3)	1.2 (0.3)	$F = 0.2$, $\eta^2p = 0.00$	$F = 0.002$, $\eta^2p = 0.00$
Physical Health	8.5 (1.2)	8.4 (1.1)	8.5 (1.0)	8.4 (1.2)	$F = 0.1$, $\eta^2p = 0.00$	$F = 0.1$, $\eta^2p = 0.00$
Mental Health	8.5 (1.2)	8.8 (1.2)	8.5 (1.4)	8.8 (1.0)	$F = 2.2$, $\eta^2p = 0.02$	$F = 1.4$, $\eta^2p = 0.01$

Note. df = (1,100) for all measures except education level. Education level was measured by total years of formal education, which was unavailable for one older participant, df = (1,99). Sensorimotor processing speed was measured by total items correct in the Digit Symbol Substitution Test (DSST; Wechsler, 1981). Short-term verbal memory was measured by total items correct in the Rey Auditory Verbal Learning Test (RAVLT; Rey, 1964). Mood at the present moment was measured by the Positive Affect Negative Affect Schedule (PANAS; Watson et al., 1988). Subjective ratings for physical and mental health were provided on a scale from 1-10 (1 = *Poor*, 5 = *Fair*, 10 = *Excellent*). *M* = mean, *SD* = standard deviation, OT = oxytocin, P = placebo. * indicates significance at *p* < 0.05 for the between-group comparison.

Table 2

Independent samples t-tests for reaction time (ms; for correct trials) and accuracy (%; for correct trials) (n = 102, behavioral sample)

Facial Emotion	Young *M (SD)*	Older *M (SD)*	*t*	df
Reaction Time				
Sad	10243 (2098)	12311 (3020)	-4.0*	100
Angry	8935 (2002)	10783 (3297)	-3.5*	88.9
Fearful	9006 (1717)	10825 (2841)	-4.0*	88.6
Happy	6872 (1430)	7699 (1947)	-2.4	100
Accuracy				
Sad	88.9 (9.6)	75.5 (23.1)	3.9*	72.6
Angry	93.8 (9.5)	77.6 (21.1)	5.1*	75.5
Fearful	94.8 (8.4)	79.6 (20.1)	5.1*	72.5
Happy	97.4 (5.5)	91.4 (15.5)	2.7*	67.4

Note. T-values and df for the age-group comparisons of reaction time for angry and fearful faces and of accuracy for all emotions were adjusted because the homogeneity of variance assumption was violated. Bonferroni correction was applied to p-values to correct the inflation of the type-I error rate due to multiple comparisons. OT = oxytocin, P = placebo. * indicates significant age difference at $p < 0.05$. Age-group comparison of reaction time for happy faces was marginally significant ($p = 0.06$).

Table 3

Peak activations of age-specific brain patterns relating to dynamic facial emotion identification (n = 94, fMRI sample)

Regions		MNI Coordinates				
	Hem	X(mm)	Y(mm)	Z(mm)	BSR	Lag
Young Participants (OT & P) – All Emotions						
Anterior insula	R	28	18	-12	-8.19	6
Cerebellum	L	-30	-78	-24	-7.46	6
Inferior frontal gyrus	L	-56	32	12	-4.89	6
Postcentral gyrus	L	-38	-30	72	-4.70	6
Precentral gyrus	L	-52	12	42	-4.47	6
Superior parietal lobule	L	-32	-60	62	-4.33	6
Temporoparietal junction	L	-58	-64	14	-4.31	6
Anterior cingulate cortex	R	8	40	10	-4.02	6
Thalamus	R	4	-18	2	-4.00	6
Older Participants (OT & P) – All Emotions						
Precentral gyrus	R	34	-18	60	4.78	6
Ventromedial prefrontal cortex	L	-2	24	-20	4.55	6

	Hem	X	Y	Z	BSR	Lag
Medial temporal lobe	L	-18	-40	14	4.33	6
Medial prefrontal cortex	L	-6	64	20	4.33	6
Middle temporal cortex	L	-44	-28	-12	4.22	6
Lateral cortex	R	22	-40	14	4.01	6

Note. Brain regions are organized by highest to lowest BSR (Bootstrap Ratio). BSRs greater than ±4.00 are reliable and significant ($p < 0.0001$). Minimum cluster size = 50. Lag corresponds to greatest temporal dissociation between age groups per emotion. Hem = hemisphere, L = left, R = right, X coordinate = right/left, Y coordinate = anterior/posterior, Z coordinate = superior/inferior, OT = oxytocin, P = placebo.

Table 4

OT-related peak activations from brain pattern relating to identification of sad and happy dynamic facial emotions (n = 94, fMRI sample)

Regions	Hem	X(mm)	Y(mm)	Z(mm)	BSR	Lag
			MNI Coordinates			
Young Participants (OT) - Sad & Happy Faces						
Older Participants (OT) - Sad Faces						
Superior frontal cortex	R	24	44	40	6.39	4
Postcentral gyrus	L	-2	-54	74	5.83	4
Fusiform gyrus	L	-30	-54	-6	5.55	4
Temporal pole	L	-40	18	-24	5.00	4
Inferior temporal gyrus	R	54	2	-36	4.80	4
Superior temporal sulcus	R	62	0	-12	4.43	4
Middle temporal gyrus	L	-50	-74	20	4.34	4
Posterior insula	L	-42	-16	10	4.24	4
Parahippocampal gyrus	L	-14	-4	-30	4.12	4
Cerebellum	R	26	-86	-28	4.09	4

Superior occipital cortex	R	24	-80	22	4.04	4
Posterior middle temporal gyrus	L	-66	-36	-12	4.04	4
Temporoparietal junction	R	48	-42	34	4.01	4

Note. Brain regions are organized by highest to lowest BSR (Bootstrap Ratio). BSRs greater than ±4.00 are reliable and significant ($p < 0.0001$). Minimum cluster size = 50. Lag corresponds to greatest temporal dissociation between treatment groups per emotion. Hem = hemisphere, L = left, R = right, X coordinate = right/left, Y coordinate = anterior/posterior, Z coordinate = superior/inferior, OT = oxytocin, P = placebo.

Table 5

Peak correlations for clusters functionally connected to the amygdala across all emotions for young participants and for angry, fearful, and happy facial emotions for older participants (n = 94, fMRI sample)

Regions	Hem	MNI Coordinates			BSR	Lag
		X(mm)	Y(mm)	Z(mm)		
Young Participants (OT & P) – All Emotions						
Older Participants (OT & P) – Angry, Fearful, & Happy Faces						
Amygdala	L	-30	-6	-12	-25.63	4
Amygdala	L	-30	-6	-10	-14.15	2
Cerebellum	R	24	-54	-24	-7.95	2
Inferior temporal gyrus	L	-40	4	-36	-6.38	2
Primary visual cortex	R	18	-92	-2	-5.30	2
Inferior occipital cortex	L	-24	-90	-6	-5.00	2
Anterior cingulate cortex	R	-10	40	4	-4.06	2

Note. Brain regions are organized by highest to lowest BSR (Bootstrap Ratio). BSRs greater than ±4.00 are reliable and significant ($p < 0.0001$). Minimum cluster size = 50. Lag corresponds to greatest temporal dissociation between age groups per emotion. Hem = hemisphere, L = left, R = right, X coordinate = right/left, Y coordinate = anterior/posterior, Z coordinate = superior/inferior, OT = oxytocin, P = placebo.

Table 6

Peak correlations for clusters functionally connected to the amygdala for angry, fearful, and happy facial emotions for older participants separately for treatment groups

		MNI Coordinates				
Regions	**Hem**	**X(mm)**	**Y(mm)**	**Z(mm)**	**BSR**	**Lag**
Older Participants (OT) – Angry, Fearful, & Happy Faces						
Medial prefrontal cortex	L	-2	64	-2	5.62	4
Subgenual anterior cingulate gyrus	L	-2	24	-6	5.27	5
Superior frontal gyrus	R	18	50	40	5.08	4
Precentral gyrus	R	22	-16	60	4.84	4
Postcentral gyrus		0	-54	74	4.79	5
Postcentral gyrus	R	2	-50	74	4.72	4
Corpus callosum		0	-28	18	4.56	5
Superior temporal sulcus	R	68	-16	-10	4.53	4
Hippocampus	R	10	-38	4	4.35	4
Caudate	R	22	-6	26	4.34	4
Superior frontal gyrus	L	-8	26	56	4.34	4

Region	Hem	x	y	z	BSR	Lag
Cerebellum	L	-4	-80	-20	4.27	4
Angular gyrus	L	-52	-64	26	4.22	4
Parahippocampal gyrus	R	22	-40	-14	4.21	4
Inferior temporal gyrus	L	-58	-60	-18	4.20	4
Inferior temporal gyrus	R	56	-62	-16	4.19	4
Cuneus	R	2	-76	32	4.12	4
Corpus callosum	L	-16	-44	24	4.06	4
Older Participants (P) – Angry, Fearful, & Happy Faces						
Precentral gyrus	R	56	10	28	-6.32	5
Precentral gyrus	R	54	8	28	-5.19	4
Putamen	L	-30	-6	-2	-4.31	5
Posterior parietal lobule	L	-26	-46	34	-4.25	5
Precentral gyrus	L	-52	2	42	-4.22	5
Postcentral gyrus	R	36	-26	40	-4.09	5
Postcentral gyrus	L	-44	-24	56	-4.06	5

Note. Brain regions are organized by highest to lowest BSR (Bootstrap Ratio). BSRs greater than ±4.00 are reliable and significant (*p* < 0.0001). Minimum cluster size = 50. Lag corresponds to greatest temporal dissociation between treatment groups per emotion. Hem

= hemisphere, L = left, R = right, X coordinate = right/left, Y coordinate = anterior/posterior, Z coordinate = superior/inferior, OT = oxytocin, P = placebo.