

Supplementary information

Supplementary Table 1. Statistics of all factors from models tested during the Doctor-Patient Interaction phase in Study 1. Factors highlighted in bold were reported in the result section.

Phase	Doctor or Patient	Dependent variable	Factor	Random effect	β	t val	df	p
					F (df1, df2)			
Doctor-Patient Interaction	Doctor	Belief of effectiveness	Time* Condition		F(1, 23.00) = 8.06			0.01
			Condition	V	61.92	11.05	26.54	<.001
			Time		4.94	2.04	43.66	0.05
		Predicted pain z-score from facial expression	Condition	V	-0.10	-2.43	17.78	0.03
			Trial order	V	-0.03	-3.49	21.63	0.002
			Color		-0.08	-2.24	23.52	0.03
			Site		F(3, 251.60) = 0.46			0.71
	Patient	Belief of effectiveness	Time* Condition		F(1, 23.00) = 5.63			0.03
			Condition	V	3.56	0.64	45.01	0.53
			Time		4.54	0.83	45.46	0.41
		Overall pain rating	Condition	V	-7.30	-4.78	22.00	<.001
			Trial order	V	0.77	3.09	22.80	0.01
			Color		2.60	1.67	22.10	0.11
			Site		F(3, 299.67) = 0.88			0.45
		Maximal continuous Pain rating	Condition	V	-11.52	-5.63	22.00	<.001
			Trial order	V	0.70	2.25	83.30	0.03
			Color		3.82	1.89	22.10	0.07
			Site		F(3, 299.67) = 1.05			0.37

		Skin conductance response (AUC)	Condition	V	-1.67	-3.20	20.14	.004
			Trial order	V	-0.26	-4.59	60.05	<.001
			Color		-0.20	-0.59	76.17	0.56
			Site		F(3, 308.80) = 0.51			0.68
		Predicted pain z-score from facial expression	Condition	V	-0.14	-2.86	17.02	0.01
			Trial order	V	-0.02	-2.67	17.91	0.02
			Color		0.01	0.13	17.00	0.90
			Site		F(3, 246.29) = 0.31			0.82
		Doctor's perceived empathy	Time* Condition		F(1, 23.00) = 0.07			0.79
			Condition	V	9.61	2.86	33.67	0.007
			Time		-1.59	-0.56	38.23	0.58

Supplementary Table 2. Coefficients for the pain expression model.

Features	Coefs	Features	Coefs	Features	Coefs
s_tmaxAU4	0.040	s_max_Yaw	0.010	s_tmaxAU18	-0.005
s_min_AU12	0.037	s_min_Yaw	0.010	s_min_AU24	-0.006
s_min_Pitch	0.035	s_tmaxAU2	0.010	s_tmaxAU24	-0.008
s_max_AU1	0.032	s_tmaxAU20	0.009	s_max_AU17	-0.009
s_max_AU2	0.029	s_tmaxAU14	0.008	s_tmaxAU6	-0.010
s_max_AU10	0.028	s_min_AU20	0.007	s_min_AU5	-0.010
s_max_AU9	0.027	s_tmaxAU43	0.007	s_min_AU23	-0.011
s_tmaxAU28	0.026	s_min_AU26	0.005	s_tmaxAU9	-0.014
s_max_AU24	0.025	s_tmaxRoll	0.005	s_tmaxAU7	-0.016
s_tmaxAU10	0.025	s_max_AU43	0.004	s_min_AU2	-0.018
s_max_AU20	0.025	s_min_AU28	0.004	s_tmaxAU23	-0.018
s_max_AU28	0.024	s_min_AU7	0.003	s_max_AU18	-0.019
s_max_AU12	0.023	s_min_AU6	0.002	s_tmaxAU15	-0.023
s_tmaxAU12	0.023	s_min_Roll	0.001	s_min_AU9	-0.026
s_max_Pitch	0.022	s_tmaxAU1	0.001	s_max_AU5	-0.027
s_max_AU14	0.018	s_min_AU43	0.000	s_min_AU15	-0.030
s_tmaxAU25	0.018	s_min_AU10	0.000	s_tmaxPitch	-0.033
s_min_AU14	0.016	s_min_AU25	0.000	s_min_AU18	-0.038
s_max_AU4	0.015	s_max_AU23	0.000	s_min_AU17	-0.040
s_tmaxAU26	0.015	s_max_AU7	-0.002	s_tmaxYaw	-0.048
s_max_AU6	0.014	s_min_AU1	-0.003	s_min_AU4	-0.048
s_max_AU25	0.013	s_max_Roll	-0.004	s_max_AU15	-0.048
s_tmaxAU17	0.012	s_max_AU26	-0.005	s_tmaxAU5	-0.055

Supplementary Table 3. Statistics of all factors from models tested during the Doctor-Patient Interaction phase in Study 2. Factors highlighted in bold were reported in the result section.

Phase	Doctor or Patient	Dependent variable	Factor	Random effect	β	t val	df	p	
					F (df1, df2)				
Doctor-Patient Interaction	Doctor	Belief of effectiveness	Time* Condition* Order		F(1, 41.00) = 0.71			0.41	
			Condition* Order		F(1, 41.00) = 1.37			0.25	
			Time* Order		F(1, 41.00) = 0			0.99	
			Time* Condition		F(1, 41.00) = 0.56			0.46	
			Condition	V	47.00	7.10	54.09	<.001	
			Time	V	0.65	0.16	77.57	0.87	
			Order		-3.61	-0.50	44.86	0.62	
			Experimenter		2.19	0.39	39.00	0.70	
			Temperature		-1.12	-0.19	39.00	0.85	
			Overall pain rating	Order* Condition		F(1, 38.10) = 12.34			0.001
				Experimenter* Condition		F(1, 38.13) = 1.60			0.21
				Temperature* Condition		F(1, 38.08) = 0.41			0.52
				Condition	V	3.19	1.13	38.40	0.26
				Order		-1.84	-0.42	39.20	0.67

	Patient		Trial order	V	0.70	1.92	41.80	0.06
			Color		0.52	0.39	38.00	0.70
			Experimenter		-6.67	-1.37	39.20	0.18
			Temperature		13.36	2.65	39.10	0.01
			Site		F(3, 587.63) = 1.27			0.28
		Belief of effectiveness	Time* Condition* Order		F(1, 81.58) = 9.99			0.002
			Condition* Order		F(1, 66.51) = 4.59			0.04
			Time* Order		F(1, 41.03) = 0.31			0.58
			Time* Condition		F(1, 81.58) = 1.91			0.17
			Time	V	10.09	1.25	79.90	0.21
	Condition		V	2.12	0.32	82.66	0.75	
	Order			6.71	0.97	61.13	0.33	
	Experimenter			-4.43	-0.86	39.80	0.39	
	Temperature			7.73	1.46	39.80	0.15	
	Skin conductance response (AUC)	Order* Condition		F(1, 398.55) = 11.00			<.001	
		Condition	V	0.53	1.85	375.9	0.06	
		Order		0.78	2.16	38.90	0.04	
		Trial order	V	-0.34	-4.66	29.30	<.001	

			Color		-0.21	-0.99	402.9	0.33
			Experimenter		-0.91	-2.51	26.00	0.02
			Temperature		0.75	1.99	26.00	0.06
			Site		F(3, 442.14) = 0.85			0.47
		Doctor's perceived empathy	Time* Condition* Order		F(1, 81.90) = 0.02			0.88
			Condition* Order		F(1, 42.48) = 0.43			0.51
			Time* Order		F(1, 52.40) = 0.28			0.60
			Time* Condition		F(1, 81.90) = 4.43			0.04
			Condition	V	15.15	2.67	84.76	0.009
			Order		3.08	0.38	47.61	0.70
			Time	V	5.42	1.04	84.21	0.30
			Experimenter		-2.58	-0.58	39.02	0.73
			Temperature		4.44	0.58	39.02	0.56

Supplementary Table 4. Statistics of all factors from models tested during the Doctor-Patient Interaction phase in Study 3. Factors highlighted in bold were reported in the result section.

Phase	Doctor or Patient	Dependent variable	Factor	Random effect	β	t val	df	p
					F (df1, df2)			
Doctor-Patient Interaction	Doctor	Belief of effectiveness	Time* Condition		F(1, 178.00) = 2.22			0.14
			Time	V	1.12	0.68	159.56	0.50
			Condition	V	62.57	18.57	37.18	<.001
	Patient	Overall pain rating	Condition	V	-3.70	-2.42	27.30	0.02
			Color		0.89	0.59	28.00	0.56
			Trial order	V	2.62	7.48	29.00	<.001
			Site		F(3, 879.20) = 1.58			0.19
		Belief of effectiveness	Time* Condition		F(1, 178.00) = 4.98			0.03
			Condition	V	5.63	1.39	61.15	0.17
			Time		2.20	0.68	178.00	0.50
	Skin conductance response (AUC)	Condition	V	-1.37	-2.04	285.60	0.04	
		Color		-1.03	-1.54	474.30	0.12	
		Trial order	V	0.29	1.81	52.30	0.08	
		Time	V	0.15	4.28	297.90	<.001	
	Site		F(3, 734.94.00) = 0.41			0.75		

		Doctor's perceived empathy	Time* Condition		F(1, 178.00) = 2.15			0.14
			Condition	V	6.88	2.38	96.03	0.02
			Time		6.37	2.23	178.00	0.03