

TABLE S1 | Overview and characteristics of all studies included in the meta-analysis

Paper	Field strength	Participants (Female)	Smoothing level (mm)	Type of stimuli	Affective / sensory state targeted	Cognitive/evaluative or affective/perceptual	If C/E: task	Relevant contrast(s)
Akitsuki et al., 2009	3T	26 (14F)	6	Pain infliction to body part (animated)	Pain	A/P		Pain > no pain
Arbuckle et al., 2017	3T	26 (1F)	9	Pain infliction to body part (animated)	Pain	C/E	Rate pain experienced by other person	Pain > no pain
Azevedo et al., 2013	3T	27 (16F)	8	Pain infliction to body part (animated)	Pain	A/P		Pain > no pain
Azevedo et al., 2014	3T	12 (12F)	8	Pain infliction to body part (animated) plus facial pain expression	Pain	A/P		Pain > no pain
Aziz-Zedah et al., 2012	3T	13 (13F)	7.5	Pain infliction to body part (animated)	Pain	A/P		Pain > no pain
Bagozzi et al., 2013	3T	24 (8F)	8	Facial expressions (photos)	Anger, disgust, happiness, surprise	A/P		Negative (angry, disgust) > neutral Positive (happy, surprised) > neutral
Benuzzi et al., 2008	3T	15 (15F)	6x6x9	Pain infliction to body part (animated), as well as disgusting stimulus	Pain, disgust	C/E	Rate unpleasantness of videos	Pain > neutral Disgust > neutral
Berlingeri et al., 2016	1.5T	25 (13F)	8	Pain infliction to body part (animated)	Pain	C/E	Rate pain experienced by other person	Pain > no pain
Bodden et al., 2013	1.5T	30 (15F)	8	Drawings of faces	Undefined	C/E	Affective ToM: complete sentences by inferring affect of face	Emotional > control (physical causality inference)
Bos et al., 2015	3T	24 (0F)	8	Pain infliction to body part (animated)	Pain	A/P		Pain > no pain

Botvinick et al., 2005	1.5 T	12 (12F)	12	Facial expressions (video clips)	Pain	A/P		Pain > neutral
Bruneau et al., 2012	3T	49 (18F)	5	Written scenarios	Pain, emotional pain (suffering)	C/E	Rate compassion felt for the protagonist	Pain > neutral Emotional pain > neutral
Bruneau et al., 2012	3T	41 (25F)	5	Written scenarios	Pain, emotional pain (suffering)	C/E	Rate pain intensity or actively empathize (results are collapsed across instructions)	Pain > neutral Emotional pain > neutral
Brunnlieb et al., 2013	3T	18 (0F)	8	Drawings	Anger, sadness, pain, anxiety	C/E	Imagine how they would feel	Negative emotion/pain > neutral
Budell et al., 2010	3T	18 (9F)	8	Facial expressions (video clips)	Pain	C/E	Rate pain intensity	Pain > no pain
Cheng et al., 2007	3T	14 (7F)	8	Pain infliction to body part (animated)	Pain	A/P		Pain > no pain
Cheng et al., 2010	3T	36 (18F)	8	Pain infliction to body part (animated)	Pain	C/E	Observe scenes with perspective of loved one or stranger	Pain loved one > no pain loved one Pain stranger > no pain stranger
Chiao et al., 2009	NR	14 (14F)	8	Natural scenes (faces plus context)	Emotional pain (suffering)	A/P		Emotional Pain > no pain
Cheon et al., 2013	3T	27 (5F)	8	Natural scenes (faces plus context)	Emotional pain (suffering)	A/P		Emotional Pain > no pain
Choe et al., 2015	3T	178 (0F)	6	Facial expressions (photos)	Fear, anger	C/E	Select the face identical to the target face	Fear > control Anger > control
Coll et al., 2017	3T	30 (20 F)	8	Facial expressions (video clips)	Pain	A/P		Pain > no pain
Corradi-Dell'Acqua et al., 2011	3T	28 (28F)	8	Pain infliction to body part (photos)	Pain	A/P		Pain > no pain
Danziger et al., 2009	1.5T	13 (7F)	8	Pain infliction to body part (cue; photos) plus facial expressions (photos)	Pain	C/E	Imagine how the other person feels	Pain > no pain (cue) Pain > no pain (face)
Dapretto et al., 2006	3T	10 (1F)	AIR	Facial expressions (photos)	Anger, fear, happiness, neutrality, sadness	A/P		Emotional > baseline
De Greck et al., 2012a	1.5T	20 (12F)	6	Facial expressions (photos)	Anger, disgust, happy, neutral	C/E	Empathize with person in photo	Anger > control Disgust > control Joy > control

De Greck et al., 2012b	3T	20 (11F)	8	Facial expressions (photos)	Anger	C/E	Empathize with person in photo	Anger > baseline
Decety et al., 2008	3T	17 (9F)	6	Pain infliction to body part (animated)	Pain	A/P		Pain > no pain
Decety et al., 2009	3T	8	6	Pain infliction to body part (animated)	Pain	A/P		Pain > no pain
Decety et al., 2010	3T	57 (28F)	6	Pain infliction to body part (animated)	Pain	A/P		Pain > no pain
Deeley et al., 2006	1.5T	9 (0F)	NR	Facial expressions (photos)	Fear	A/P		Fear > neutral <i>Neutral > fear</i>
De Gelder et al., 2004	3T	7 (3F)	6	Emotionally expressive gestures (photos)	Fear, happy	A/P		Fear > neutral Happy > neutral
Dong et al., 2016	3T	36 (0F)	6	Facial expressions (photos)	Pain	C/E	Evaluate whether person is experiencing pain	Pain > no pain
Enzi et al., 2016	3T	20 (0F)	8	Pain infliction to body part (animated)	Pain	C/E	Evaluate whether person is experiencing pain	Pain > no pain
Ernst et al., 2013	3T	18 (12F)	8	Facial expressions (photos)	Happiness, sadness, disgust, fear, surprise, anger, contempt	A/P		Emotional (all together) > control
Fan et al., 2014	3T	21 (0 F)	10	Pain infliction to body part (photos)	Pain	C/E	Evaluate whether photo depicts pain	Pain > no pain
Feng et al., 2016	3T	22 (11F)	5	Pain infliction to body part (including face; photo)	Pain	C/E	Empathize and rate how much pain other person experiences	Pain > no pain <i>No pain > pain</i>
Fourie et al., 2017	3T	38 (21F)	NR	Facial expressions (video clips)	Pain, emotional pain (distress)	C/E	Empathize with person in video clip and for emotional pain: rate their empathic concern	Pain > no pain Social pain > no pain
Fujino et al., 2014	3T	11 (9F)	NR	Pain infliction to body part (animated)	Pain	A/P		Pain > no pain
Gao et al., 2017	3T	35 (0F)	6	Pain infliction to body part (photos)	Pain	C/E	Rate how much pain other person experiences	Pain > no pain

Geday et al., 2003	PET	9 (0F)	NR	Facial expressions and complex social scenes (photos)	Sadness, disgust (unpleasant)	A/P		Unpleasant > neutral <i>Neutral > unpleasant</i>
Geday et al., 2007	PET	14 (7F)	12	Faces plus context (photos)	Positive and negative	A/P		Emotional (taken together) > neutral
Göttlich et al., 2017	3T	26 (20 F)	8	Drawings	Distress	A/P		Distress > neutral
Greimel et al., 2010	1.5T	47 (0 F)	8	Facial expressions (photos)	Happy, sad, neutral	C/E	Infer emotional state of other and evaluate own state (self)	Emotional (other) > neutral Emotional (self) > neutral
Grice-Jackson et al., 2017	1.5T	21 13 10	8	Pain infliction to body part (photo)	Pain	C/E	Evaluate whether they experience any pain while observing	Pain > no pain (control) Pain > no pain (sensory responders) Pain > no pain (affective responders)
Grosbras et al., 2006	1.5T	20 (10F)	6	Facial expressions, hand movements (video clips)	Anger	A/P		Angry > control (face) Angry > control (hand)
Gu et al., 2010	3T	18 (9F)	8	Pain infliction to body part (photo)	Pain	Both	Evaluate whether another is in pain or not; or evaluate laterality	Pain > no pain
Gu et al., 2013	3T	18 (9F)	8	Pain infliction to body part (photo)	Pain	C/E	Evaluate whether other person experiences pain or evaluate laterality	Pain (instructions collapsed) > no pain <i>No pain > pain</i>
Hadjikhani et al., 2014	3T	31 (3 F)	8	Facial expressions (photos)	Pain	A/P		Pain > no pain
Han et al., 2009	3T	24 (12F), 22 (11F)	8	Pain infliction to body part (photos)	Pain	A/P		Pain > no pain (group 1) Pain > no pain (group 2)
Han et al., 2017	3T	33 (16F)	8	Pain infliction to body part (videos)	Pain	A/P		Pain > no pain (passive) Pain > no pain (button press)
Horan et al., 2014	3T	23 (16F)	6	Facial expressions (photos)	Happy, Sad, Angry, and Afraid	A/P		Emotional > baseline
Jackson et al., 2017	4T	51 (51F)	8	Facial expressions (video clips)	Pain	C/E	Rate how much pain other person experiences	Infant pain > no pain Adult pain > no pain Adult pain > no pain (nurses)
Jankowiak-Siuda et al., 2015	3T	27 (14F)	8	Facial expressions plus pain infliction (series of photos)	Pain	C/E	Rate how much compassion they feel for other person	Pain > no pain

Jensen et al., 2014	3T	18 (10 F)	8	Real life (participant sees face of patient and the heat thermode)	Pain	A/P		Pain > no pain No pain > pain
Kana et al., 2016	3T	15	8	Emotional facial/body expressions in social interactions	Happy, Sad, Angry, and Afraid	C/E	Choose correct emotion of blurred face in interaction	Emotional (all collapsed) > neutral
Kanske et al., 2015	3T	25 (14F) 178 (102F)	8	Facial expressions (video clips)	Negative emotions	C/E	Rate how they feel and how much compassion they feel	Negative emotion > neutral Negative emotion > neutral
Kim et al., 2009a	3T	21 (12 F)	7	Facial expressions (photos)	Sad, neutral	Both	View passively or with an active compassionate attitude	Sad (collapsed both instructions) > neutral
Kim et al., 2009b	1.5T	14 (6F)	9	Facial expressions and emotional story (video clips)	Angry, happy	C/E	Make inferences about what happened (given the emotional cues)	Angry > control Happy > control
Kim et al., 2010	3T	19 (0 F)	8	Drawings	Not specified	C/E	Make inference about what characters feels	Empathy > control (physical causality inference)
Kim et al., 2011	3T	19 (0 F)	8	Emotional scenes (IAPS)	Threats (of natural and artificial origin)	C/E	Match the target to two choice stimuli	Negative emotion > control
Klimecki et al., 2013	3T	94 (94F)	6	Emotional scenes (video clips)	Distress	C/E	Rate how much empathy, positive and negative affect they experienced	High distress > control <i>Control > high distress</i>
Krach et al., 2015	3T	16 (0F)	8	Pain infliction to body part (photos) Drawings	Pain, social pain (embarrassment)	C/E	Evaluate how much pain other person experiences Evaluate level of vicarious embarrassment	Pain > no pain Social pain > no pain
Kramer et al., 2010	3T	16 (10F)	8	Drawings	Anger, sadness, pain, anxiety	A/P		Emotional > neutral <i>Neutral > emotional</i>
Labek et al., 2017	3T	17 (14 F)	8	Drawings	Negative (mourning)	A/P		Negative emotion > control
Lamm et al., 2008	3T	18 (9F)	6	Pain infliction to body part (photos)	Pain	C/E	Evaluate amount of pain inflicted	Pain > no pain
Lang et al., 2011	3T	22 (13 F)	8	Auditory stimuli	Negative emotions	A/P		Negative > control <i>Control > negative</i>

Lee et al., 2006	1.5T	14 (1 F)	8	Written scenarios	Distress	C/E	Answer questions on empathy-related info	Distress > neutral
Lee et al., 2010	1.5T	18 (9 F)	9	Drawings (comic strips)	Happiness, fear, anger, physical distress, pity	C/E	Choose correct ending to story	Empathy inference > control (physical causality inference)
Lee et al., 2013	3T	12 (12F)	8	Facial expressions (video clips)	Happy, sad, fearful, and neutral	A/P		Emotional > neutral
Leiberg et al., 2012	1.5T	24 (24F)	12	Emotional scenes (IAPS)	Negative	A/P		Emotional > neutral
Lenzi et al., 2013		23 (23F)	8	Facial expressions (photos)	Joy and distress	C/E	Watch or imitate and empathize with the faces	Joy/Distress (collapsed across instructions) > neutral
Luo et al., 2014	3T	36	8	Pain infliction to body part (video)	Pain	C/E	Evaluate whether other person experiences pain	Pain > no pain
Luo et al., 2015	3T	30 (A/A genotype) 30 (G/G genotype)	8	Pain infliction to body part (video) using two type of models	Pain	C/E	Evaluate whether other person experiences pain	Pain > no pain (A/A, model A) Pain > no pain (A/A, model B) Pain > no pain (G/G, model A) Pain > no pain (G/G, model B)
Mascaro et al., 2014	3T	36	8	Infant crying (auditory)	Negative / Distress	A/P		Distress > control
Mathur et al., 2010	3T	28	8	Facial expressions in natural scenes (photos)	Negative	C/E	Rate the level of experienced empathy	Emotional pain > neutral
Mathur et al., 2016	3T	15	8	Facial expressions in natural scenes (photos)	Negative	C/E	Rate the level of experienced empathy	Emotional pain > neutral
Mazza et al., 2013	1.5T	10 (10F)	NR	Emotional scenes	Negative emotions	A/P		Negative emotion > control
Mazzola et al., 2010	3T	30	10	Facial expressions (photos)	Negative	A/P		Pain > no pain
Melchers et al., 2015	1.5T	60	8	Stills from a video on embarrassing scenes	Vicarious embarrassment	A/P		Vicarious embarrassment > neutral
Mercadillo et al., 2011	3T	24 (12F)	NR	Emotional scenes (photos)	Suffering	C/E	Indicate how much compassion they feel	Suffering > neutral social scenes
Mercadillo et al., 2015	3T	24 (12F)	NR	Emotional scenes (photos)	Suffering	C/E	Indicate how much compassion they feel	Suffering > neutral social scenes
Michalska et al., 2013	3T	65	6	One person hurting another (video clip)	Pain	A/P		Pain > no pain

Molenberghs et al., 2016	3T	48	6	One person hurting another (photo)	Pain	A/P		Pain > no pain
Moll et al., 2007	1.5T	12 (6F)	8	Scenarios (written)	Compassion	A/P		Compassion > neutral
Montoya et al., 2012	3T	17 (17F)	6	Crying (auditory)	Distress, happy, sad	A/P		Happy > neutral Neutral > happy Sad > neutral Neutral > sad Low distress > noise Noise > low distress High distress > noise Noise > high distress
Morelli et al., 2014	3T	32	8	Facial/Body expression (photos)	Happy, anxiety, pain	C/E	Empathize with individuals on photos	Anxiety > neutral Happy > neutral Pain > no pain
Moriguchi et al., 2007	1.5T	14	6	Pain infliction to body part (photo)	Pain	C/E	Evaluate how much pain other person experiences	Pain > no pain
Morrison et al., 2004		14	5	Pain infliction to body part (photo)	Pain	A/P		Pain > rest
Morrison et al., 2007a	1.5T	12 (5F)	NR	Pain infliction to body part (photos)	Pain	A/P		Pain > no pain
Morrison et al., 2007b	1.5T	16 (8F)	6	Pain infliction to body part (photo)	Pain	C/E	Press button when nature of photo was discerned	Pain > no pain
Morrison et al., 2013	1.5T	14 (7F)	6	Pain infliction to body part (photo; grasping or withdrawing from noxious or innocuous stimuli)	Pain	C/E	Evaluate whether grasp or withdrawal was appropriate given noxious or innocuous stimulus	Pain > no pain
Nomi et al., 2008	1.5T	14 (7F)	10	Facial expressions (photos)	Happy, sad, neutral	C/E	Instructed to recognize and share emotion	Emotional > control
Nummenmaa et al., 2008		10 (10F)	8	Aversive threatening scenes (photos)	Negative	C/E	Empathize with aggressor or victim	Emotional > neutral
Osborn et al., 2010	3T	Resp: 10 (6F); non-resp 10 (6F)	6	Scenes (faces plus context)	Pain	A/P		Pain > control (resp) Pain > control (non-resp) Control > pain (non-resp)

Paulus et al., 2017	3T	17 (0F)	8	Drawings	Empathic embarrassment	C/E	Rate how much vicarious embarrassment they felt	Empathic embarrassment > neutral
Pehrs et al., 2017	3T	26 (17F)	6	Empathic film with sad music	Sadness	C/E	Rate 'moving' feeling and level of compassion	Sad > neutral
Powell et al., 2017	3T	12 (0F)	6	Drawings (comic strip)	Does not specify	C/E	Asked to choose the right ending to the comic	Empathic inference > control (physical causality inference)
Preis et al., 2013	3T	64 (32F)	8	Pain infliction to body part (photo)	Pain	C/E	Imagine how the person in photo feels	Pain > no pain <i>No pain > pain</i>
Preston et al., 2007	PET	16 (8F)	16	Emotional scenarios (imagining)	Fear or anger	C/E	Imagine emotional scenarios	Emotional > neutral (personal) Emotional > neutral (non-personal)
Prochnow et al., 2013	3T	15 (7F)	8	Facial expressions (video clips)	Anger, sadness, fear, disgust, surprise	C/E	Rate the emotion in the video clip	Emotional > control
Prochnow et al., 2014	3T	26 (12F)	6	Facial expressions (photos)	Happiness, anger, sadness, fear	C/E	Match descriptive sentences to facial expressions	Emotional > control
Regenbogen et al., 2012	3T	27 (13F)	8	Facial expressions and descriptions (video clips)	Disgust, fear, happy, sad	A/P		Emotional vs. neutral
Reniers et al., 2014	3T	15 (0F)	7x7x10	Emotional scenes	Sad vs. neutral	C/E	Imagine what another is feeling	Sad > neutral
Riecki et al., 2017	3T	38 (19F)	8	Facial expressions (photos)	Pain, injury, grief	A/P C/E	n/a Rate how emotionally touching the photo is	Emotional > neutral (passive) Emotional > neutral (active)
Riem et al., 2011	3T	42 (42F)	5	Crying (auditory)	Distress	A/P		Distress > neutral
Ruckmann et al., 2015	3T	30 (15F)	8	Pain infliction to body part (photo)	Pain	C/E	Rate the pain level of people in photo	Pain > no pain
Schneider et al., 2013	3T	28 (13F)	8	Emotional videos	Disgust, happiness, fear, anger	C/E	Asked about what they felt and what other felt	Emotional > neutral
Schulte-Ruther et al., 2008	1.5T	26 (14F)	NR	Facial expressions (photos)	Fear, anger	C/E	Self-evaluated how they felt	Fear/Anger > Neutral (self) Fear/Anger > Neutral (other)

							Other-evaluated how the person in the picture felt	
Seara-Cardoso et al., 2015	1.5T	46 (0F)	8	Pain infliction to body part (photo)	Pain	A/P		Pain > no pain
Seara-Cardoso et al., 2016	1.5T	31 (0F)	8	Facial expressions (photos)	Sad, fearful, angry, happy	A/P		Emotional > neutral
Sebastian et al., 2012	1.5T	30 (0F)	8	Drawings (comic strips)	Not specified	C/E	Choose proper ending to comic strip	Emotional inference > control (physical causality inference)
Sheng et al., 2014	3T	21 (11F)	8	Facial expressions (photos)	Pain	C/E	Judge whether or not the other person is in pain	Pain > no pain
Simon et al., 2006	1.5T	17 (9F)	10	Facial expressions (photos)	Pain, anger	A/P		Pain > no pain Angry > neutral
Simon-Thomas et al., 2012	4T	17 (11F)	8	Emotional scenes (photos)	Compassion/ distress	C/E	Rate their emotional response to scenes	Distress > neutral
Singer et al., 2004	1.5T	16 (16F)	10	Real life (heat probe on hand in mirror)	Pain	A/P		Pain > no pain
Singh et al., 2015	3T	14 (4F)	6	Emotional scenes (photos)	Suffering/distress	C/E	Rate their emotional response to scenes	Suffering > neutral
Spencer et al., 2011	3T	40 (20F)	10	Facial expressions (photos)	Fear, happiness	A/P		Happy > neutral Fear > neutral
Szicik et al., 2017	3T	30 (0F)	8	Drawings	Distress	C/E	Imagine how they would feel in situation	Distress > neutral
Toller et al., 2015	3T	30 (17F)	4	Facial expressions (video clips)	Fear	A/P		Fear > control
Tusche et al., 2016	3T	31 (15F)	8	Facial expressions and descriptions (video clips)	Negative	C/E	Rate their own affect and compassion	Emotionally negative > neutral
Ushida et al., 2008	1.5T	15 (8F)	8	Pain infliction to body part (photos)	Pain/fear	A/P		Pain > no pain
Vachon-Presseau et al., 2012	3T	20 (10F)	6	Pain infliction to body part (photo)	Pain	C/E	Evaluate whether person is in pain or not	Pain > no pain
Van der Heiden et al., 2013	1.5T	18 (9F)	8	Pain infliction to body part (photo)	Pain	A/P		Pain > no pain
Vollm et al., 2006	1.5T	13 (0F)	10	Drawings (comic strip)	Emotion - doesn't specifically say	C/E	Imagine how main character feels	Empathic inference > control (physical causality inference)

Wang et al., 2015	3T	56 (25F)	10	Drawings (comic strip)	Not specified	C/E	Infer proper ending to the comic strip	Empathic inference > control (physical causality inference)
Warren et al., 2006	3T	20 (12F)	8	Nonverbal vocal expressions (auditory)	Positive (triumph), negative (fear, disgust)	A/P		Emotion > baseline
Wicker et al., 2003	3T	14 (0F)	6	Facial expressions (video clips) plus scents	Disgust, pleasure	Not specified		Disgust > neutral Pleasure > neutral
Xu et al., 2009	3T	33 (17F)	8	Pain infliction to body part (animated)	Pain	C/E	Evaluate whether person is in pain or not	Pain > no pain

AIR = Automated Image Registration; NR = Not Reported; T = Tesla (field strength MRI scanner)

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