Supplementary material

Table 1. Cluster size and associated peak values for the main effect of perceived harm to people vs. no pain baseline, with age (in weeks) held constant.

		MNI Coordinates				
Location	Side	X	y	z	t-value	extent
People in Pain vs. Baseline						
Amygdala	L	-18	-16	-20	4.48	64
Temporal pole	R	52	2	-28	3.44	49
Periaqueductal gray	L	-6	-28	-19	2.57[1]	257
Periaqueductal gray	R	6	28	-19	2.58[1]	257
Somatosensory Cortex	L	-56	-14	18	3.34	86
Insula	L	-40	12	-8	3.30	78
Insula	R	44	0	-6	3.55	82
Anterior Cingulate Cortex	R	10	44	6	2.25	70
Anterior Cingulate Cortex	L	-4	48	10	2.21	27
Medial ACC	R	10	20	32	2.79	32
Inferior Frontal Gyrus	R	44	32	4	3.10	36

[1]Local maxima reported within a single contiguous cluster.

The statistical threshold $p < 0.001$ uncorrected for height and cluster $p < 0.05$ FWE corrected for multiple comparisons.

Table 2: Cluster size and associated peak values for regions showing age-related decreases when perceiving harm to people vs. no pain baseline.

		MNI Coordinates				
Location	Side	X	y	z	t-value	extent
People in Pain vs. Baseline						
Amygdala	R	20	2	-26	2.72	15
Temporal pole	R	-42	6	-38	3.88	29
Periaqueductal gray	L	-2	-18	-32	3.70	122
Somatosensory Cortex	R	56	-4	22	3.40	21
Somatosensory Cortex	L	-52	-12	20	2.94	13
Insula	R	42	16	-6	4.12	129
Insula	L	-40	12	-6	3.14	53
Inferior Frontal Gyrus	R	48	26	-8	3.59	194
Inferior Frontal Gyrus	L	-44	32	-8	3.43	89

Table 3. Regions showing a significant effect of intentional actions.

Location	Side	MNI Coordinates			t-value	extent
		x	y	z		
Intentional vs. Accidental						
Temporal pole	R	34	14	-42	2.52	8
Amygdala	R	22	4	-16	3.30	48
Ventromedial PFC[1]	L	-2	58	-8	3.52	710
Ventromedial PFC[1]	R	10	50	-6	3.88	710
Orbital Frontal Cortex[1]	R	16	66	-8	4.34	710
Posterior STS	L	-56	-38	18	2.12	8
Inferior frontal gyrus	R	50	46	-14	4.30	25

The statistical threshold $p < 0.001$ uncorrected for height and cluster $p < 0.05$ FWE corrected for multiple comparisons.

[1]Local maxima reported within a single contiguous cluster.

Table 4. Cluster size and associated peak values for regions showing age-related decreases when perceiving intentional vs. accidental actions.

Location	Side	MNI Coordinates			t-value	extent
		x	y	z		
Intentional vs. Accidental						
Temporal pole	R	34	14	-42	2.52	8
Amygdala	R	22	4	-16	3.30	48
Ventromedial PFC[1]	L	-2	58	-8	3.52	710
Ventromedial PFC[1]	R	10	50	-6	3.88	710
Orbital Frontal Cortex[1]	R	16	66	-8	4.34	710
Posterior STS	L	-56	-38	18	2.12	8
Inferior frontal gyrus	R	50	46	-14	4.30	25

Age changes for people intentional vs. people accidental:
The younger the higher the activity in the temporal pole and amygdala. The older, the higher activity in the vmPFC. No gender differences were observed.

Stimuli validation:

A series of dynamic visual stimuli depicting people getting hurt was created prior to the study. Each dynamic stimulus consisted of three digital color pictures, which were edited to the same size (600 x 480 pixels) and presented in a successive manner to imply motion. The durations of the first, second and third pictures in each animation were 1000 ms, 200 ms and 1000 ms, respectively. The stimuli belonged to two categories and portrayed the following: 1) A person is shown hurting another person intentionally (person intentional, PI); 2) A person is shown hurting another unintentionally (person unintentional, PU). One additional baseline stimulus category depicted people in everyday social interactions without any infliction of pain or damage (Actions; e.g., a person giving another individual a notebook). The clips showed situations of varying degrees of intensity, portrayed people of multiple races and ethnic groups, as well as various ages. Importantly, the faces of the protagonists were not visible, and thus there was no emotional reaction visible to participants. 150 dynamic visual stimuli (30 exemplars per stimulus category, plus 30 in the baseline condition) were created.

The video stimuli were validated on computerized visual analog scales for perceived intentionality and empathic concern by a group of 26 participants whose age ranged between 18 to 23 years (Hempel, 2009). Eye tracking and pupillary dilatation data were simultaneously recorded with a Tobii T120 system. Results showed that subjective ratings of empathic concern were higher when participants were watching the stimuli depicting people being hurt intentionally than when watching people whose pain was accidentally caused ($p < 0.001$). Participant's pupil dilations were analyzed using a repeated-measures ANOVA. A main effect of intentionality was found [$F(1,25) = 30.46$; $p < 0.001$], showing larger pupil dilation in response to clips depicting intentional actions and indicating that participants showed larger pupil dilations when the pain was intentionally inflicted than when it was caused by accident .

References:

Hempel, J. (2009). Eye-tracking as a method to investigate empathy and sympathy. Honors Thesis under the direction of Dr. J. Decety, University of Chicago.