Data Pre-processing:

Blinks were automatically identified and removed according to standard criteria using EyeLink Data Viewer software (SR Research Ltd.). A blink is defined as a period of saccade detector activity with the pupil data missing for three or more samples in a sequence. Following the removal of blinks, artefacts around gaps in the data may remain, which may cause pupil size underestimation due to eyelid occlusion. We therefore rejected samples within the 50ms preceding and following blinks and off-screen data gaps using the EyeLink Data Viewer Blink Correction Data Filter option.

For binocular data, if data from both eyes were available, a third “mean pupil size” time series can be generated. Doing so for the time points at which one pupil’s data are missing, however, requires that the dynamic offset between the sizes of the two pupils be taken into consideration. Since the pupil diameters of both eyes are highly correlated, especially locally (Jackson & Sirois, 2009), this dynamic offset can be calculated at the time points that have both pupils’ data, interpolated to the time points at which only a single pupil’s size is available, and used to generate the “mean” pupil size in the presence of missing samples. We therefore created two regression models, one for the right pupil size predicted by left pupil size and one for the left pupil size predicted by right pupil size. These regression models were then used to interpolate missing values for each pupil where data from the other pupil was available. The average pupil size for each sample was then calculated as the mean of the left and right pupils.

Two interest periods were then identified for each trial. The first interest period was labelled ‘baseline’ and spanned the 0-200ms period following stimulus presentation. The second interest period was labelled ‘experimental’ and spanned the 200-1500ms period following stimulus presentations (ending when the rating scale appeared). Any trials with more than 20% missing sample data were removed. We then removed any trials where the mean baseline pupil size was unreasonably small or unreasonably large (i.e. mean baseline across all trials +/- 3 \* SD). Each trial was then baseline corrected by subtracting the mean pupil size value across the baseline period from the mean for the experimental period.

We then calculated the within-participant percentage-change difference scores for each trial. First, we calculated the average baseline corrected pupil diameter across all individual fixations for each trial. We then used these values to calculate the mean baseline corrected pupil diameter for each participant, across all trials. The percentage difference in pupil diameter for each trial compared with the overall mean was then calculated using the following formula:

ΔPT =

Where xT denotes the mean pupil size for a specific trial, ∑xAT denotes the mean pupil size across all trials, and ΔPT denotes the overall change in pupil diameter for a specific trial (T) compared with the overall mean. According to the equation, no change in pupil size is indicated by zero, whereas positive or negative values indicate larger (dilation) or smaller (constriction) pupil dimeters in response to each stimulus.

Pupil Data Variables:

Trial – trial number

Subject – participant number

Block – arousal = arousal ratings, intensity = intensity ratings

Image – file name of image presented

Pain – pain condition: pain or neutral

Perspective – perspective condition, first person (1PP) or third person (3PP)

EYE\_TRACKER – recording either monocular or binocular

Baseline – average pupil size across first 200ms of recording

Experimental – average pupil size across last 1300ms of recording

BC\_Av\_Pupil – average pupil size across the trial corrected for baseline pupil size (i.e. experimental – baseline)

Change – Change in pupil size. Individually for each participant, subtract mean pupil size for all trials from mean baseline corrected pupil size for current trial, divided by mean pupil size for all trials. To calculate percentage difference in pupil diameter for each trial relative to the overall mean.

ΔPT =

Response Data:

Trial – trial number

Subject – participant number

Block – arousal = arousal ratings, intensity = intensity ratings

Image – file name of image presented

Pain – pain condition: pain or neutral

Perspective – perspective condition, first person (1PP) or third person (3PP)

Gender – gender of the person in the image

Response – participant rating

Rating – Arousal\_Rating.png = arousal rating, Intensity\_Rating.png = intensity rating