

Meta-analysis Protocol

Attention bias for pain-related information

Authors: Jemma Todd, Dimitri Van Ryckeghem, Louise Sharpe & Geert Crombez

Objective

To investigate the influence of study conditions and dot probe task parameters on the detection of attentional biases related to pain in adults.

Research questions

There are two primary research questions:

- Do attentional biases differ as a function of current concern about pain, as a function of experiencing pain, or as a risk factor for chronic pain? Or are attentional biases towards pain ubiquitous?
 - *Current concern*: Do those for which pain is a current concern (chronic, acute, anticipating procedural, anticipating experimental, social concern) differ in attentional bias from which pain is not a current concern (healthy participants)
 - *Experience of pain*: Do those currently experiencing pain (chronic, acute) differ in attentional bias from those not currently experiencing pain (anticipating experimental or procedural pain, social concern, healthy participants)
 - *Risk factor*: Do those with chronic pain differ in attentional bias from those without chronic pain (acute pain, anticipating experimental or procedural pain, social concern, healthy participants)? Do those with chronic pain differ in attentional bias from healthy participants?
 - *Ubiquitous*: Are attentional biases present for all participants regardless of pain (significantly different to zero)
- Which version of task parameters are best for observing these differences in attentional biases?
 - Category of pain-related information (e.g. facial expressions, words, pictures)
 - Type of pain-related words (e.g. sensory vs affective)
 - Category of comparison (non-pain) information
 - Stimulus presentation time
 - Proportion of critical trials that are pain related
 - Proportion of catch/digit (non-active) trials
 - Presence of gaze maintenance methods (e.g. digit trials or eye tracking)
 - Orientation of stimuli presentation
 - Explicit instructions about cue processing
 - Priming of pain schemata by presentation of the pain-related information before experiment (instructions, rating of pain words before study, completing pain-related questionnaires...)

- Explicit cue processing instructions: whether instructed to process the cue (e.g. reading words/studying picture) or not
- Probe action instructions: probe detection, discrimination or localisation
- Response method

Study selection criteria

Type of studies

- Studies using experimental and behavioural paradigms with at least 20 participants per arm/cell as recommended by Simmons, Nelson, and Simonsohn (2011).
- Studies must be explicitly investigating attentional biases in relation to pain.
- If a clinical intervention is present, then it is necessary to use a baseline (pre-intervention) measure of attentional bias; if only post-intervention measures are present then the study is excluded

Type of participants

Participants must be adults with an age of 18 or older. However, when studies include individuals of younger age, the mean age of participants should be 18 or older.

Type of attentional bias task

- Studies must have used a dot probe task to measure attentional biases. A task is defined as being a dot probe task if it presents two types of stimuli simultaneously, followed by a single visual target in the same position of one of the two stimuli presented, that requires a response.
- Some of the dot probe stimuli must be pain-related, or pain relevant such as health related or threat related.

Type of attentional bias outcome measure

The primary attentional bias measure is the attentional bias index, which is based upon a difference score reflecting the relative superiority of the attentional selection of pain-related information over the attentional selection of non-pain related information. Effects sizes will be Cohen's *d*. A random effects model will be used.

Type of pain experienced

We will distinguish between following subgroups:

- *Adults with acute pain*: Participants are individuals who experience a clinical form of pain that lasts between 0 and 3 months. Most often these adults are patients who seek medical help. However, it is also possible that participants are recruited via advertisement and self-identify as adults with pain. It will be assumed that those classified as having acute pain will be experiencing pain at the time of testing, although average pain rating information will also be extracted from studies.
- *Adults with chronic pain*: Participants are individuals who experience a clinical form of pain that lasts longer than 3 months. Most often these adults are patients who seek medical help. However, it is also possible that participants are recruited via advertisement

and self-identify as adults with pain. It will be assumed that those classified as having chronic pain will be experiencing pain at the time of testing, although average pain rating information will also be extracted from studies.

- *Adults who anticipate procedural pain:* Individuals are patients who expect to experience pain that is needed for clinical purposes (dental procedure, operation, painful investigation). It will be assumed (but not guaranteed) that those classified as anticipating procedural pain will not be experiencing pain at the time of dot probe testing, although average pain rating information will also be extracted from studies.
- *Adults who anticipate experimental pain:* Participants who expect to experience pain that is induced by the experimenter for the purpose of the study. Studies in which pain is administered at the same time as the dot probe is being conducted will be excluded. It will be assumed (but not guaranteed) that those classified as anticipating experimental pain will not be experiencing pain at the time of dot probe testing, although average pain rating information will also be extracted from studies.
- *Adults with a current concern of pain in the social context:* Participants who are caregivers or who have close family members who experience or anticipate pain. Therefore, whilst pain is not a current concern for that particular individual, it is a current concern for someone close to them who they have responsibility over.
- *Adults without pain:* Participants do not experience pain, and will not experience pain at the moment of testing. One should be mindful of the finding that pain is a common, almost daily experience. Consequently, it is probably more correct to state that individuals in this category currently do not experience a form of pain that interferes with daily life, requires use of analgesics, or for which individuals seek medical help.
- *Other:* Category will be used for samples that do not fit into one of the above categories

From this, four comparison groups will be generated: Those currently in acute pain, those currently in chronic pain, those who anticipate pain (procedural or experimental pain), those for whom pain is a current social concern, and those without pain (i.e. the control group). Although this differs from the categories used by Crombez, Van Ryckeghem, Eccleston, and Van Damme (2013), we sought to expand on and further clarify whether there were differences between those currently in pain and those not currently in pain but anticipating pain and those without pain.

Notes

- The above categories are not mutually exclusive. For example it is possible to both be experiencing pain and anticipating pain. However, in this case participants will be classified according to the highest pain category (e.g. anticipating procedural or experimental pain + acute pain present at time of attentional bias measurement will be classified as acute pain, acute pain + chronic pain will be classified as chronic pain).
- When studies include a mixture of individuals with both acute and chronic pain, the mean duration of pain will be used to categorize studies, with chronic pain being defined as pain that has lasted for three months or longer.

Search methods for identification of studies

Published studies were identified by using electronic databases. Only papers that are published in English were selected.

Electronic databases:

- MEDLINE (1966-present)
- PsychINFO (1887-present)
- Web of Science (1980- present)

Following keywords were entered for first search (14-10-2010):

1. Attention
 - Selective attention*
 - Attention* bias*
 - Vigilance
 - Hypervigilance
 - Stroop
 - Dot probe
 - Probe detection
 - Posner
 - (Spatial) Cueing or spatial cuing
2. Pain
 - Pain
3. (1 AND 2)

The following keywords were entered for the second and third search (08-08-2015; 28-11-2017):

1. Attention
 - Selective attention*
 - Attention* bias*
 - Vigilance
 - Hypervigilance
 - Dot probe
 - Probe detection
2. Pain
 - Pain
3. (1 AND 2)

Data extraction & coding

Data-extraction will be conducted using a data extraction form specifically designed for this meta-analysis. This extraction protocol was iteratively developed by the researchers involved. An initial coding sheet was developed and distributed amongst the authors, who gave feedback on content after piloting the coding sheet with a sample of articles. This process was repeated until a consensus amongst the authors was reached.

Attentional bias measure calculation

Data-calculation, in specific calculation of the effect sizes by means of the standardized mean differences, will be calculated using a data extraction form specifically designed for this meta-analysis.

Dot probe bias index

During critical trials of a dot probe experiment, a pain-related cue is simultaneously presented with a matched control cue. Differential effects of the cue upon detection of the target (dot probe) reflect effects of processing the pain-related cue relative to the matched control cue. It is therefore sufficient to compare reaction times of incongruent trials with the reaction times of congruent trials. Incongruent trials are those trials in which the target appears at the opposite location as the pain-related cue. Congruent trials are those trials in which the target appears at the same location of the pain-related cue. A larger score indicates more preferential processing of pain-related information.

In the pain domain, the AB index in many dot probe studies is often computed based upon a formula described by MacLeod, Mathews & Tata (1986).

$$\mathbf{AB\ index = ((pu_tl - pl_tl) + (pl_tu - pu_tu)) / 2}$$

p = pain-related cue

t = target (dot probe)

u = at upper position

l = at lower position

*For left-right presentations, the following formula will be used:

$$\mathbf{AB\ index = ((pl_tr - pr_tr) + (pr_tl - pl_tl)) / 2}$$

p = pain-related cue

t = target (dot probe)

l = at left position

r = at right position

Data extraction

Source characteristics

- Bibliographic reference
- Study ID (STID xxx.xx)
If a report presents two independent studies then add a decimal to the study ID number.
For example, STID:100.1, and STID:100.2
- Publication year:
- Country of publication (1st author):.....
- Email address of corresponding author:.....
- Attentional bias ID (ABID xx)
Studies often report several attentional bias indices using the same sample. Separate sheets will be coded for each attentional bias index, when multiple indices are measured within-study . The attentional bias index is then increased by 1. For example ABID:001, ABID:002, ABID:003
- Web of science Journal?
 - YES
 - NO
- Web of science category (including ranking in that category):

Experimental design

- Cross-over design (within subject design or repeated measures design)
- Cross-over and parallel groups design (a combination of repeated measures and between subject design)

Sample characteristics (PER GROUP if more than one)

- Sample size:..... (after drop-out)
- Mean age:.....
- Data includes participants under 18yrs old?
 - Yes
 - No
- Proportion of females:.....
- Type of Pain
 - Chronic Pain
 - Acute Pain
 - Anticipating Procedural Pain
 - Anticipating Experimental Pain
 - Social Concern for Pain
 - Other
 - No pain

The above categories are not mutually exclusive. Where there are multiple types of pain, participants will be considered belonging to the primary pain group, when ordered according to the above list. i.e. a group with chronic pain and experimental pain would be classified as chronic pain
- Level of pain at time of experiment

- Rating (/10 or via standard pain questionnaire) of current pain intensity (Included where possible for both pain and pain free groups). Where multiple pain ratings are included, use the one that most closely resembles a VAS. Report the mean, standard deviation, the scale used, and the range for that group.
- Duration of pain
 - Length of time that person identifies that they have been experiencing their current pain (for acute and chronic pain only; may not be available in all studies)
 - Measured in months
- Primary location of clinical pain (for acute and chronic pain only)
 - Back pain & other musculoskeletal pains
 - Headache and migraine
 - Whole body pain
 - Neuropathic pain
 - Miscellaneous
 - Mixed:
- Use of Exclusion criteria:.....
 - Psychoactive medications
 - Substance abuse/dependence
 - Severe psychiatric disorders, e.g. psychosis
 - CONTROL GROUP: must not be currently in pain

Task characteristics (can be within or between studies)

Stimuli- categorised based on >50% fitting in to one of these categories

Words - Primary

- Type of pain stimuli
 - Sensory words
 - Affective words
- Type of health word stimuli
 - Health threat
 - Health general (includes disability, disease, and injury)
- Type of threat stimuli
 - General threat
 - Social threat
- Positive stimuli
 - Happy, Positive affect
- Other/mixed (specify.....)

Words- Comparison

- Neutral
- Health
- Threat
- Positive
- Other/mixed (specify.....)

Pictures- Primary

- Faces
 - Pain

- Health
- Threat
- Positive
- Other/mixed (specify...)
- Pictures
 - Pain
 - Health
 - Threat
 - Positive
 - Other/mixed

Pictures- Comparison

- Faces
 - Neutral
 - Pain
 - Health
 - Threat
 - Positive
 - Other/mixed (specify...)
- Pictures
 - Neutral
 - Pain
 - Health
 - Threat
 - Positive
 - Other/mixed (specify...)
- Relevance of task stimuli to sample
 - Relevant to specific sample (e.g. relevance determined in same sample)
 - Relevant to similar pain problem (Same pain source and category, e.g. both samples with chronic lower back pain)
 - Relevant to different pain problem (e.g. different pain source and/or category, or pain in general)
 - Undetermined/ no relevance check

Moderators (within or between studies)

- Stimulus exposure time
 - Actual value for continuous measure
 - Categorical value, consistent with previous meta-analyses (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van Ijzendoorn, 2007; Crombez et al., 2013)
 - <500 ms
 - 500-1000 ms
 - >1000ms
- Inter-trial interval
 - Actual value (continuous measure)
 - Where ITI varies, provide average value and specify this
- Numbers of each type of trials:
 - Number of primary active trials, for specific category of stimuli
 - Number of neutral-neutral trials
 - Number of catch trials (in which no probe appears)

- Number of gaze trials (no probe; participant response to information e.g. digit presented in the centre of the screen or at the fixation cross location)
- NOTE: proportions of pain-related trials and critical trials will be calculated from this information.
- Presence of gaze maintenance methods
 - Gaze maintenance absent
 - Gaze maintenance present
 - Digit trials present
 - Eye movement registration
 - Other form of gaze maintenance
- Orientation of stimuli presentation
 - Top-bottom
 - Left-right
- Explicit instructions regarding processing of cues (*likely to involve contacting authors*)
 - Participants told to actively engage with stimuli (read words or look at pictures)
 - Told to attend to or process one cue e.g. upper word
 - Told to attend or process two cues
 - Participants not given explicit instruction
 - Participants told to not actively engage with stimuli
- Cue-probe contingency
 - Number of congruent trials
 - Number of incongruent trials
 - NOTE: ratio of congruent to incongruent will be calculated to determine how consistently the cue will prime the probe location.
- Target action
 - Probe detection (respond if probe detected)
 - Probe discrimination (discriminating between two targets; identifying the probe rather than probe location)
 - Probe localisation (responding to the location of the probe, e.g. left/right)
- Response method
 - Voice key
 - Keyboard press
 - One hand
 - Two hands
 - Mouse
 - Joystick
 - Response box