The why and how of assessing pain and suffering in animals

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Part 1: Methods used to draw inferences regarding felt emotions?

• Acute response to noxious stimuli
• Responses with and without targeted drugs
• Motivation and conditioning tests
• Drug discrimination and generalization

Part 2: How do such feelings contribute to the experience of suffering?
Acute response to noxious stimuli: e.g. heel prick in infants

Anand & Craig, 1996
Acute response to noxious stimuli: e.g. uterine palpation in metritic cows

Before palpation

During palpation

Stojkov et al. 2015. J. Dairy Sci. 98:5352-5361
Acute response to noxious stimuli: e.g. uterine palpation in metritic cows

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Acute responses to noxious stimuli are intuitively compelling, but:

• Responses may not be pain specific

• Both response and lack of response can be difficult to interpret
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Pain control: e.g. Intra-operative pain

- No relief
- Local anesthetic
- Local anesthetic and sedative

Grondahl-Nielsen et al. 1999
Pain control: e.g. post-operative pain

Earflicks (no.) vs. Time after dehorning (h)

- Sham, no NSAID (pa)
- Sham with NSAID (pA)
- Dehorn, no NSAID (Pa)
- Dehorn with NSAID (PA)

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Approach-avoidance testing

Injection method:

Ede et al., 2018. Sci. Reports 8:9443
Approach-avoidance testing

Approach latency (s)

Milk reward (L)

Route of injection
- IM
- IN
- SC
- None

Ede et al., 2018. Sci. Reports 8:9443
Motivational tests provide pre-defined response measures with high consistency, but:

• Require inferences about motivation to access reward

• Motivation may vary with type of reward

• Some tests rely on an acute response (e.g. withdraw/escape)
Conditioned place aversion

Ede et al., in prep.
Conditioned place aversion

Ede et al., in prep.
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Drug discrimination and generalization: e.g. rats on PTZ

Responses (%)

Treatment

Saline  Pentylenetetrazole

Inferences regarding felt affect?

Response measures
- Functional, specific, consistent
- Function unclear, non-specific, variable

Design features
- Drug discrimination and generalization
- Motivational testing
- Analgesics and controls
- Response to noxious stimuli

Part 1: Procedures used to draw inferences regarding felt emotions?

Part 2: How do such feelings contribute to the experience of suffering?
Usage in the medical literature

**concurrent negative affects:**

The patient required “small doses of codeine” for pain when she thought it was due to sciatica, but much higher doses were required when she was diagnosed with cancer.

*Cassell, 1982*
Usage in the medical literature

**concurrent negative affects:**

“In the month between an irregular chest X ray and results of the biopsy, I enjoyed very good health in the presence of serious illness... this turned that month into a controlled experiment in pure suffering.”

Frank, 2001, p. 354
Usage in the medical literature

**concurrent negative affects:**

“The tendonitis caused extraordinary pain ... but I knew what was happening and had reasonable assurance that the acute phase would not last long... So here is the reverse experiment: pain with more annoyance than suffering.”

Frank, 2001, p. 354
Usage in the medical literature

Mood state:

Reduced ability to perform highly motivated tasks
Anhedonia:

Reduced motivation to perform previously rewarding tasks

Usage in the medical literature

Low mood
Usage in the medical literature

Loss of control:

“Suffering can start with anguish over the possibility that if the symptom continues, the patient will be overwhelmed or lose control”

Cassell, 1999, p. 531
Applying this understanding to animals?
concurrent negative affects:

e.g. pain + fear
anhedonia:

Evidence of anhedonia:

• reduced appetite
• reduced grooming
• reduced anticipatory behaviours
Assessing mood:
Training task

Positive
approach for milk reward

Negative
do not approach; time-out
Cognitive Bias Task

Do calves approach these ambiguous screens?
Generalization curve

Screens approached (%)

positive  near positive  halfway  near negative  negative

Neave et al., 2013. PLoS ONE 8(12): e80556
Cognitive bias after disbudding

Screens approached (%)

Before disbudding

After disbudding

positive

near positive

halfway

near negative

negative

Neave et al., 2013. PLoS ONE 8(12): e80556
Lecorps et al., in prep.
Cognitive bias during post-operative pain

and anhedonia

Lecorps et al., in prep.
Control:
Suffering summary

Pain is more likely to contribute to suffering when combined with:
- Fear
- Lack of control

Suffering might be identified by:
- Reduced performance of motivated behaviours
- Other indicators of low mood
