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UNIVERSITY OF NEW ZEALAND

SCHOOL OF VETERINARY SCIENCE
TĀWHARAU ORA

Running into problems: Equine welfare during exercise

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Acknowledgements

This presentation is based on publications:

Mellor, D. J., & Beausoleil, N. J. (2017). Equine welfare during exercise: An evaluation of breathing, breathlessness and bridles. *Animals*, *7*(41), 1–27. https://doi.org/10.3390/ani7060041

Mellor, D. J. (2020). Mouth pain in horses: Physiological foundations, behavioural indices, welfare implications, and a suggested solution. *Animals*, *10*(4), 572. https://doi.org/10.3390/ani10040572

Key Points

- Animal welfare reflects the mental experiences of an animal
- Potential for various types of breathlessness to occur in horses during exercise
- Rein & bit use are likely to influence equine breathlessness

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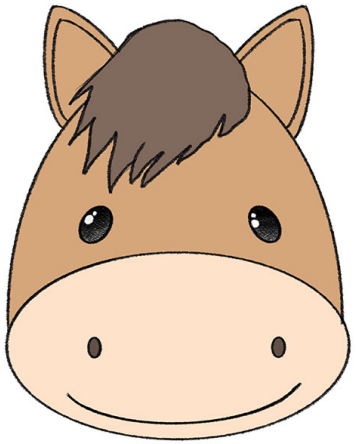
What is animal welfare?

Animal Welfare

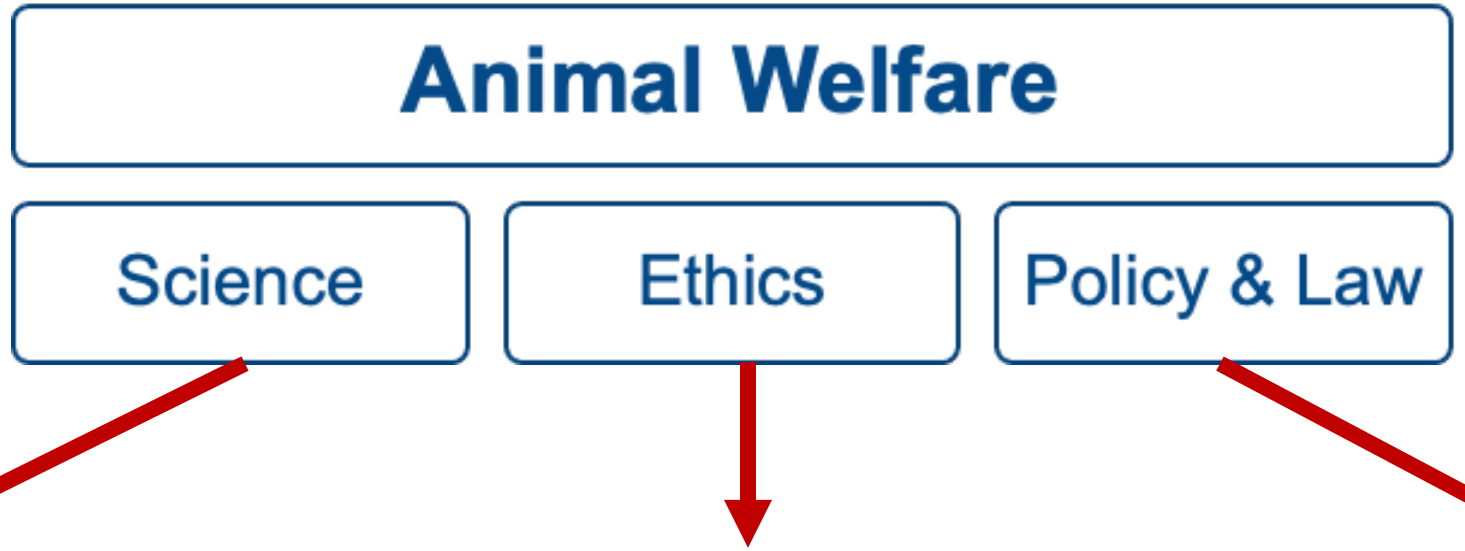
Science | Ethics | Policy & Law

&

Animal Welfare



Animal welfare is an academic discipline



Understanding animals & their capacity for experiences (**sentience**)

How to apply knowledge gained by science. What should I do and why?

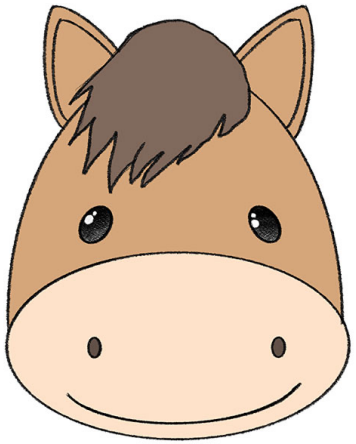
(**human-animal relationship**)

Tell us the **general consensus** view about our relationship with animals

Animal welfare is a property of sentient animals

- Animal welfare state = overall mental experiences of animal
- Not resources or management applied to animal
- What matters to animal = how they subjectively experiences their situation

Animal Welfare



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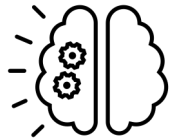
Breathing – extrapolating from the human experience

- During normal breathing at rest, usually unaware of sensations relating to ventilation
- When respiration is **stimulated, challenged, obstructed or attended to**, sensations associated with breathing rise to consciousness
  - This includes breathlessness



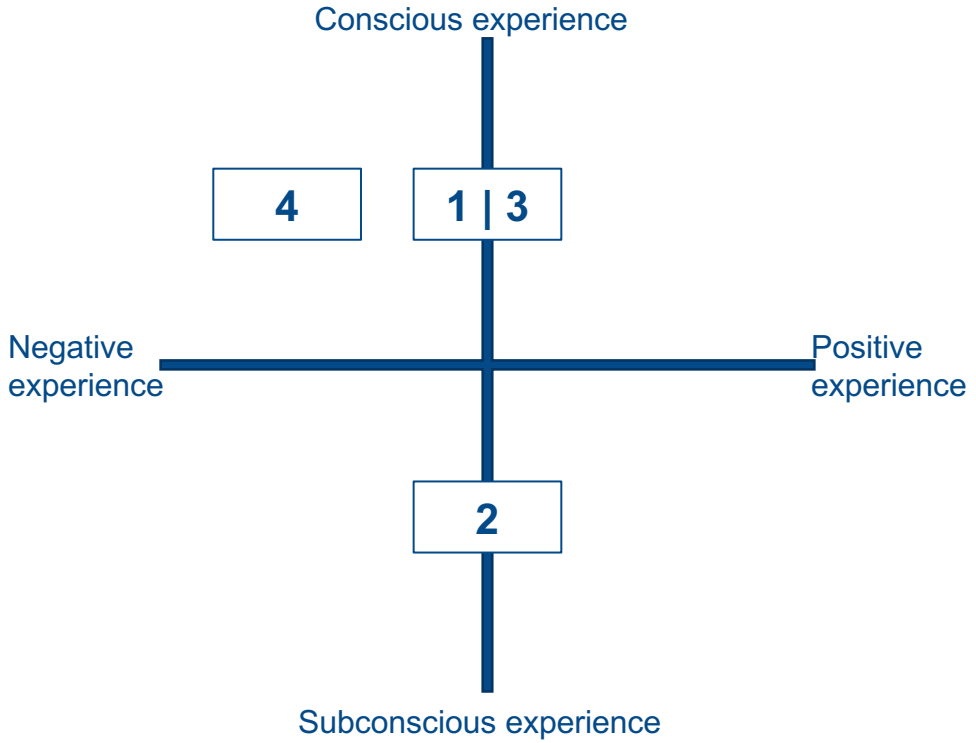
➢ Breathlessness = **unpleasant** respiratory sensations

(negative mental experiences)

Breathing – extrapolating from the human experience

- **Control of breathing** is both automatic AND voluntary

- Healthy horses breathing pattern:
  1. Initial phase of exercise (voluntary command)
  2. Activation of chemoreceptors & muscle receptors (automatic drive)
  3. Exercise intensity approaches aerobic threshold (↑ automatic drive) → sense of breathing effort/work i.e., **non-aversive** respiratory effort
  4. Mismatch between total central command (voluntary & automatic) & respiratory responses → **unpleasant** experiences of breathlessness



Breathlessness in horses during exercise

Certain internal states and/or external circumstances might predispose horses to **3 forms of breathlessness:**

1. Unpleasant respiratory effort
2. Air hunger
3. Chest tightness

1. Unpleasant respiratory effort

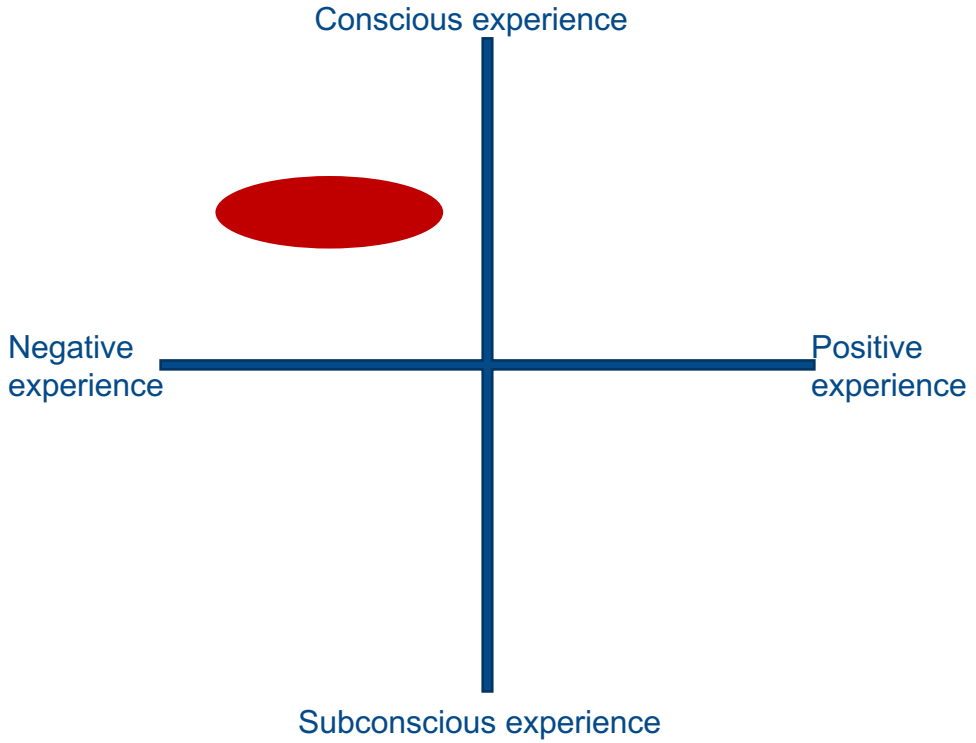
- **Respiratory effort = 'Work', 'effort', or 'heaviness' of breathing**
  - When voluntary motor command to respiratory muscles needs to be *increased* to meet ventilation requirements

- **Normal exercise:** when ↑ depth & frequency of breathing is required & ventilation *matches* command → **not** unpleasant respiratory effort

1. Unpleasant respiratory effort

- **Pathological states:** when ↑ depth & frequency of breathing is required & motor command needed is *greater than normal* → **unpleasant** respiratory effort
  - Mismatch between motor command & response

- From:
  - Impeded airflow (muscles must generate more airway pressure)
  - Pressure-generating capacity diminished



2. Air hunger

- Air hunger = sensation experienced at the end of a long breath hold
  - Often described as “increased urge to breathe”, “shortness of breath”, “smothering”, or “suffocation”

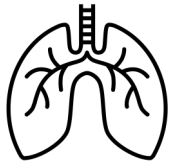
- **Always unpleasant**, mod. air hunger more unpleasant than max. respiratory effort

- From: mismatch between automatic motor command & degree of lung inflation
  - Automatic drive to breathe is increased by any condition that raises $PaCO_2$ and/or which reduces PaO_2 → **Chemical drive to breathe**

3. Chest tightness

- Associated with inflammatory processes e.g., asthma or allergic bronchitis
  - Bronchoconstriction

- Irritant receptors in airways & lungs → sensation of chest tightness



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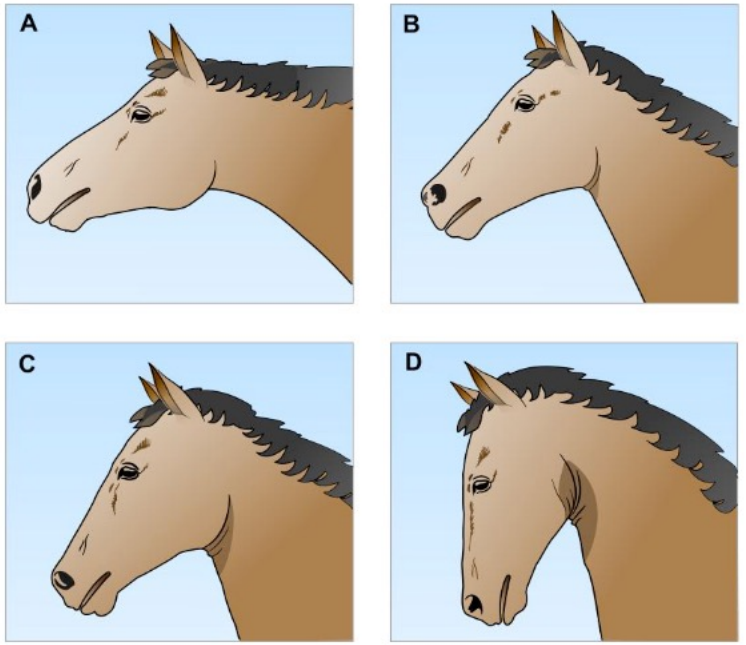
Impact of rein use on breathlessness

Rein use that maintains jowl angles less than resting angle of 90º (Figure 3B) → increased upper airway resistance

Imagine running across town to catch a bus while breathing through a bent straw

1. **Unpleasant respiratory effort**
   - More effort/work to breathe

2. **Air hunger**
   - Increased urge to breathe from exercise-induced hypoxaemia, hypercapnia, and/or acidaemia



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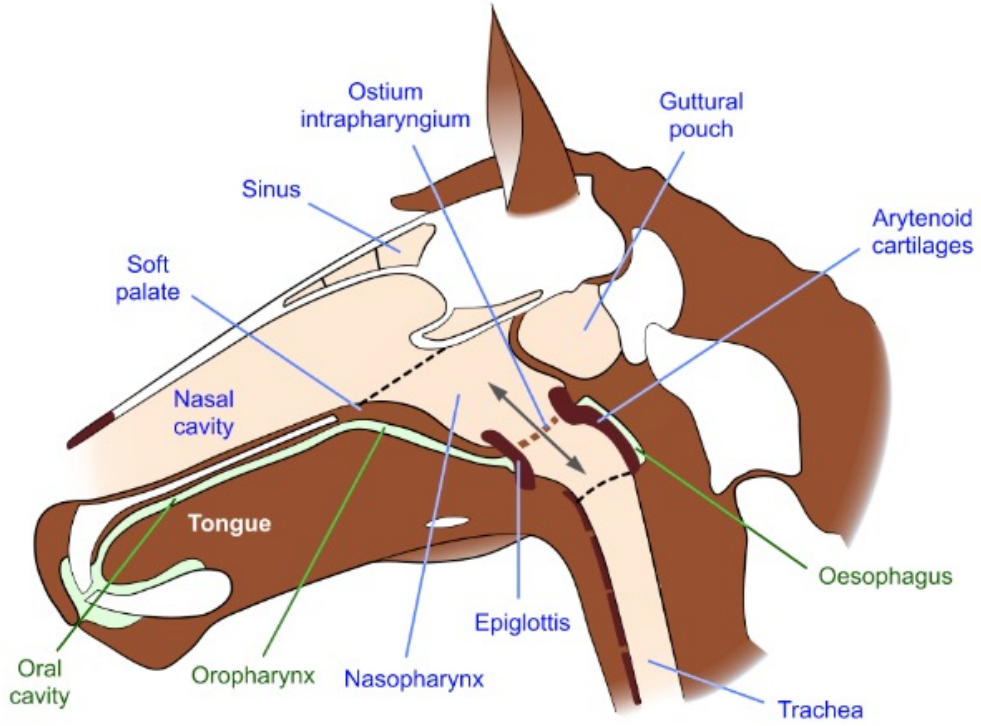
Impact of bit use on breathlessness

- Equine soft palate tightly apposed to base of larynx → **obligate nasal breathing**
  - Larynx (“button”) fits tightly into soft palate (“buttonhole”)
- Airtight lip-seal & full engagement of button/buttonhole maintain negative pressure in oropharynx
- Negative pressure holds soft palate against root of the tongue & prevents it from being sucked into airway during inspiration



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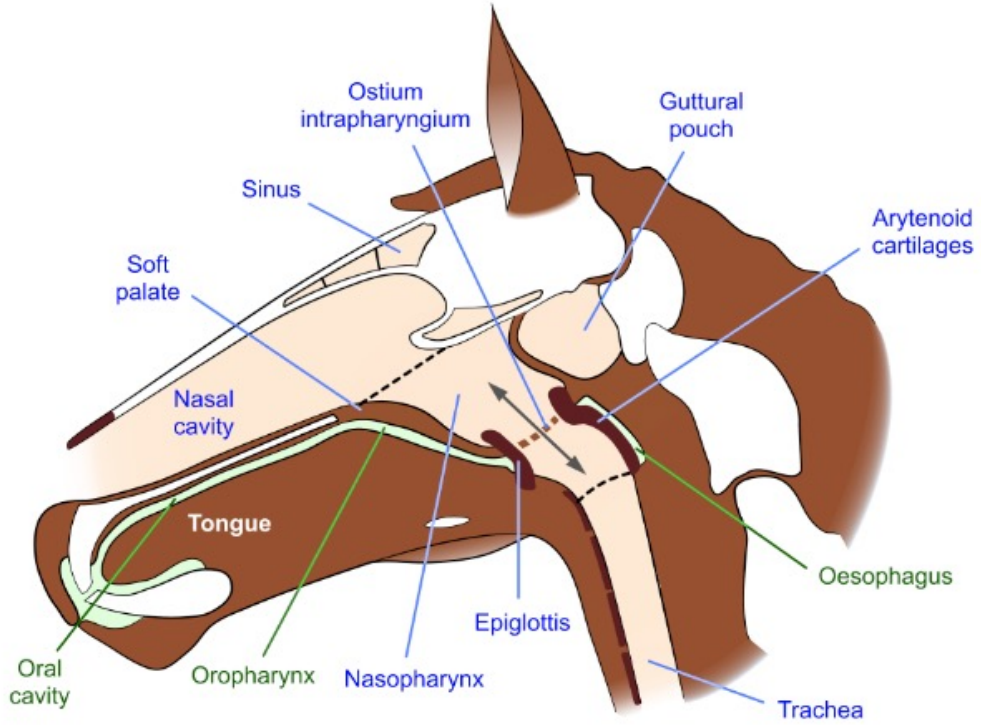
Impact of bit use on breathlessness

- Bit breaks airtight lip-seal & could dissipate the negative pressure in oral compartment
- Soft palate displacement into nasopharynx during inspiration, esp. during exercise
  - Decreased cross-sectional area→ increased airflow resistance + negative inspiratory pressure



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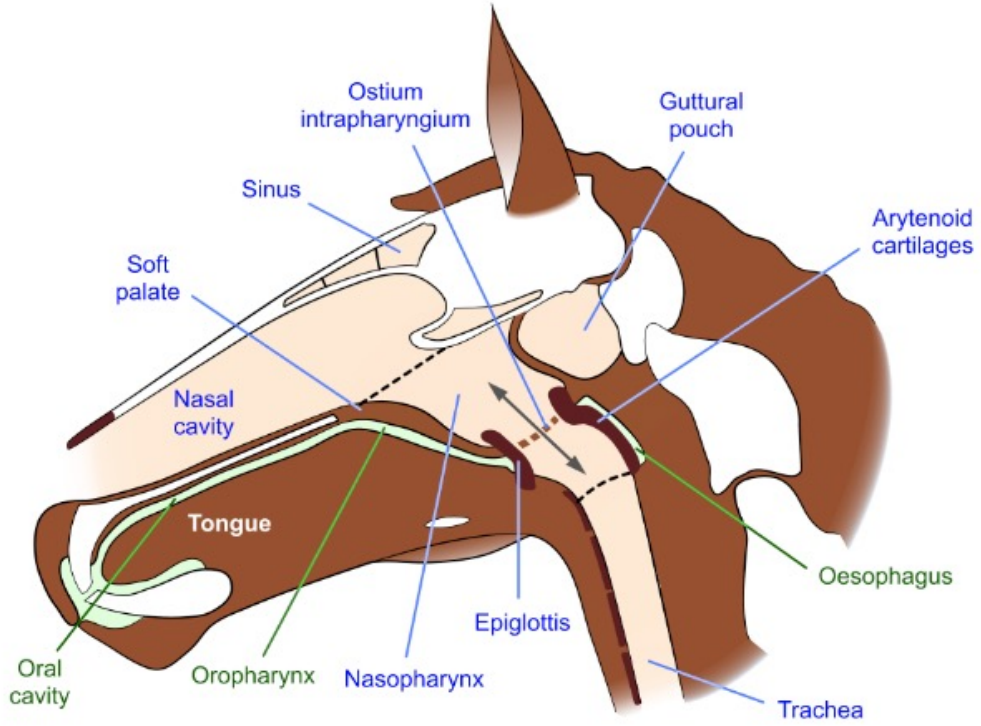

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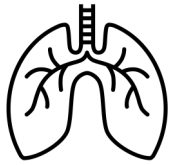

Mouth pain in horses

- Bit applied to tissues extremely sensitive to mechanical stimulation, mouth pain evidence:
  - Behavioural evidence that horses find bits aversive
  - Skeletal evidence of long-term bit-inflicted mouth injuries that would induce pain

- Desire to exert control over horses overcomes concerns about harm that can be done by using bits with sufficient pressure to cause significant pain-inducing soft tissue injury
  - Bit use is increasingly regarded as inhumane, abusive, and, if tested in some jurisdictions, would likely be illegal

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Coming soon…

Littlewood, K.E., Beausoleil, N.J., Mellor, D.J. (2023). **Assessing equine welfare**: Operationalizing the Five Domains Model for veterinary practitioners. In Koch, W. (Ed). Equine Behaviour and Welfare.

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