Influences of exercise enrichment on feedlot cattle behaviour and the human-animal relationship

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Background

- ↑ Human population = ↑ demand for high quality protein
- BUT ↑ societal concern for livestock welfare
- Society largely self educated (social media) = now largely unaware of general farming practices
- Need for transparency and proof of ‘quality of life’
- Demand for livestock to lead a ‘natural’ life
- Cattle feedlots = ‘barren’ environment, with cattle spending 40 - >300days

Pasture:

- 24 hr period:
  = mostly grazing, ruminating, resting
  = short time on walking[1]

Feedlot:

~ 25% deviation from natural behaviour [2]

- Increased aggressive behaviours (buller syndrome)[3]

https://sustainabletable.org.au/all-things-ethical-eating/beef/

Enrichment

- **OIE** = "Increasing the complexity in a captive animal's environment to foster the expression of non-injurious species-typical behaviours…" [5]
- Legally required:
  - Non-human primates[6]
  - Pigs in the EU[7]
  - Social housing for gregarious species[8]
- Types of enrichment: cognitive, physical, social, sensory and nutrition
- Feedlot cattle = impact weight gain, incidence of morbidity and abnormal behaviours[5]






Cattle Enrichment

- Automated/fixed brushes[9-12]
  = ↑ social behaviour
  = ↓ boredom behaviour
  = ↓ visceral diseases
  = no changes in weight gains
- Balls, manila ropes [11,13,14]
  = ↑ calf social behaviour
  = habituation
- Scents and sounds [8,16]
  = minimal use
  = habituation
- Mirrors and food puzzles [8,13,16]
  = habituation
  = not commercially applicable
- Exercise [8,15]
  = ↑social behaviours
  = ↓aggressive behaviours
  = ↓lameness
  = leaner meat

Human-animal relationship

- Human-animal relationship (HAR) [8,15,17,18]:

  = influenced by previous handling

  = Low Stress Stock Handling (LSSH)

  = less stress during handling and slaughter

  (↓cortisol and ↓glycogen depletion)

  = improved welfare

  = ↓aggression = less animal and human injuries

https://www.gobobpipe.com/low-stress-landing.htm

https://www.beefmagazine.com/beef-quality/low-stress-cattle-handling-not-low-pressure-cattle-handling

Study Aim

To determine if exercise influences feedlot cattle behaviour, productivity and the human-animal relationship

Feedlot

- Approx. 260km North-east Perth
- 286 *Bos taurus* cattle at day 40 of a 120 feeding program
- Study = 40 days February – April 2019 (day 40-80 of feeding program)

- Split across 3 pens:
  - Out-of-pen exercise (n = 94)
  - In-pen exercise (n = 97)
  - Control (n = 95)

Method

Day 0 & 40:

- Crush temperament score (approx. 30% pen)
- Crush exit speed (approx. 30% pen)
- Body weight (all)

Day 1, 20 & 39:

- Novel person test (730-9am)
  = 3 cameras per pen
  = activity budget before and after
  = during test: % pen no reaction, looked, approached, retreated at walk, retreated at run (reactivity index)
- Avoidance test (10-11am)

Method

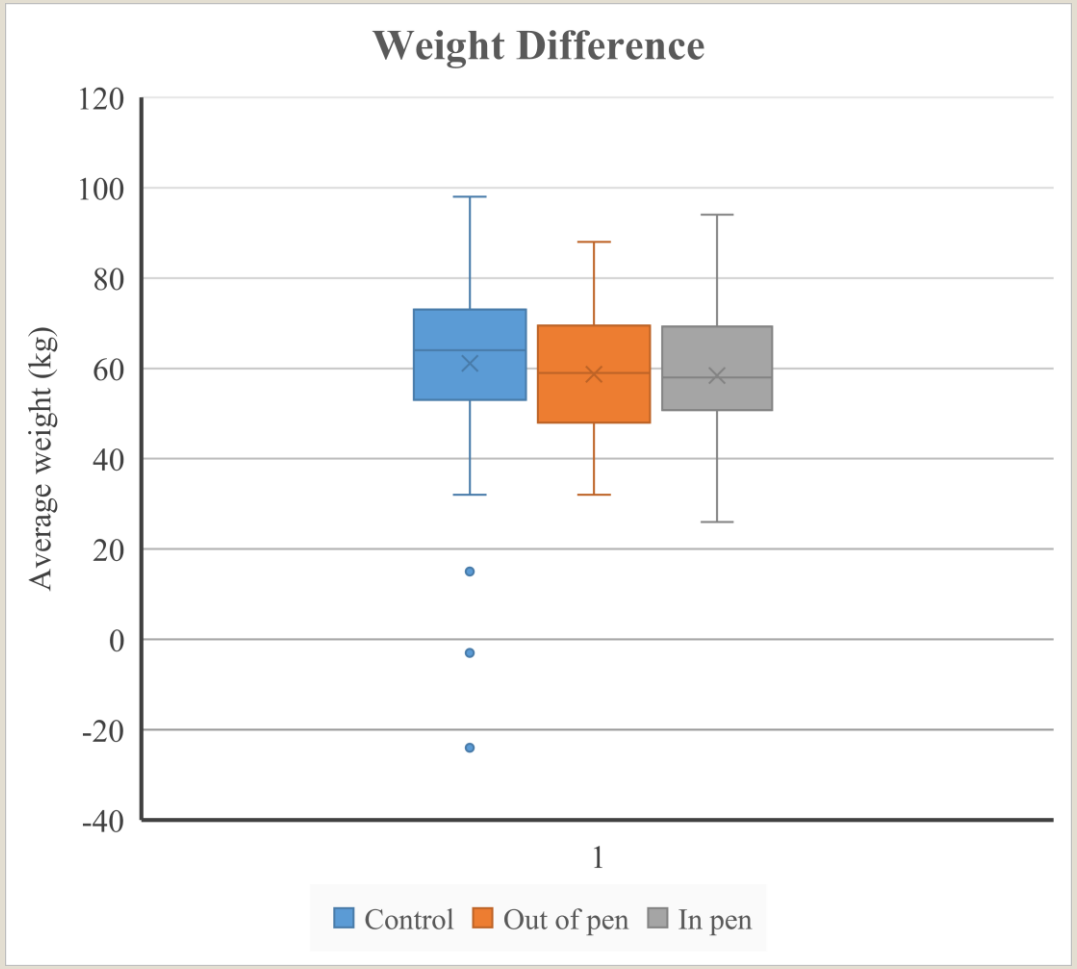
- Exercise regime: LSSH by Feedlot staff
  In-pen = moved in circular motion around pen perimeter
  Out-of-pen = gate into laneway opened and cattle moved out of pen

- Day 2-19 = 20-30min, 2-3 x per week
- Day 21-38 = 10-20min, 2-3 x per week

- Statistical analysis via SPSS
  - Repeated Measures ANOVA = body weight
  - Friedman's test and Kruskal Wallis = crush score, exit speed, avoidance test, novel person test
- Statistical analysis vis Statistica
  - Repeated Measures ANOVA with Tukey's post hoc testing

Productivity

- Mean weight gains = not significant between pens
- Control group = largest distribution, 2 animals lost weight
- OP = smallest distribution
- Therefore, exercise = NO NEG. impact on production



Temperament

- **Crush score:**

  (non-reactive – highly reactive)

  - Sig. decreased day 0 – 40 ($p < 0.01$)

  - Not sig. between pens

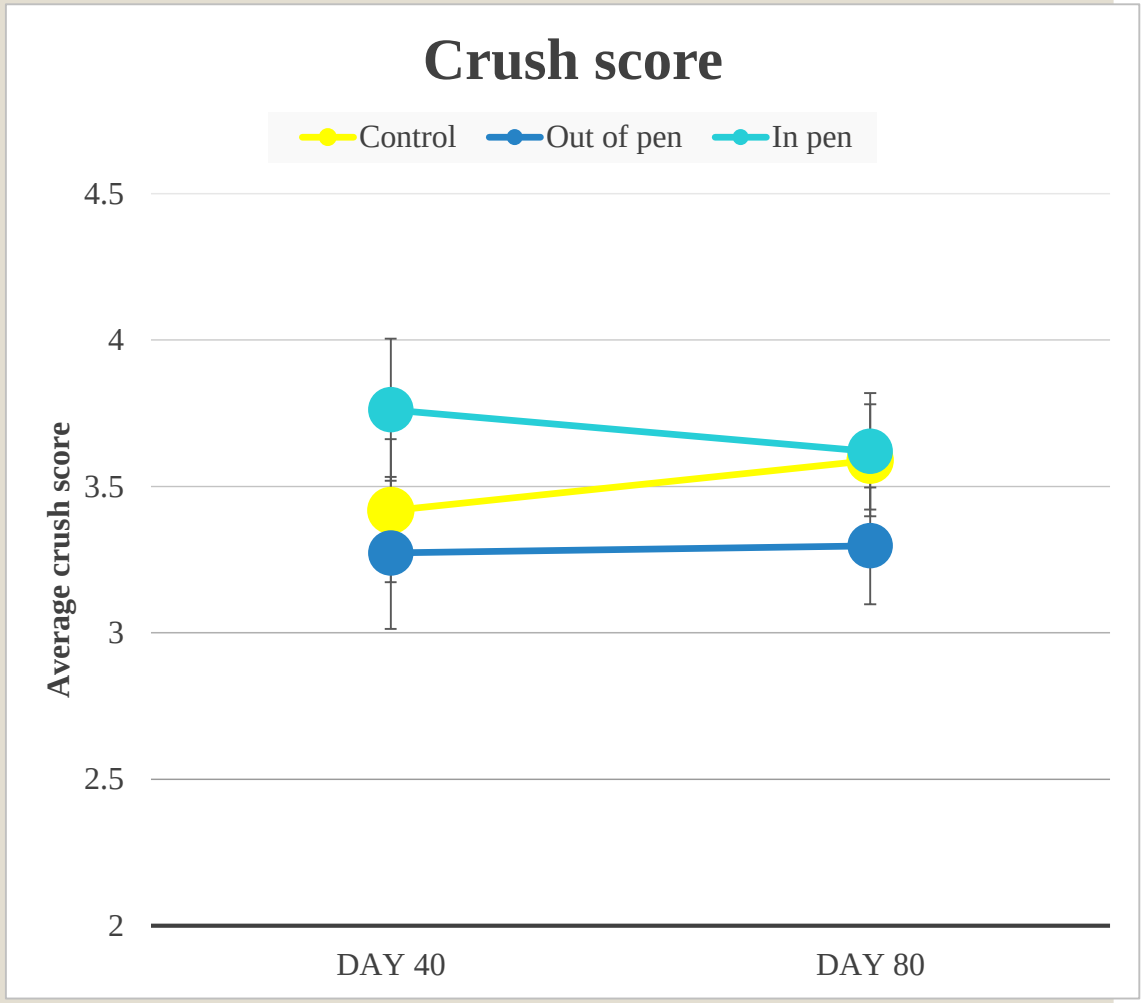
- **Exit speed:**

  - Not sig. across days or pens

- **Not surprising:**

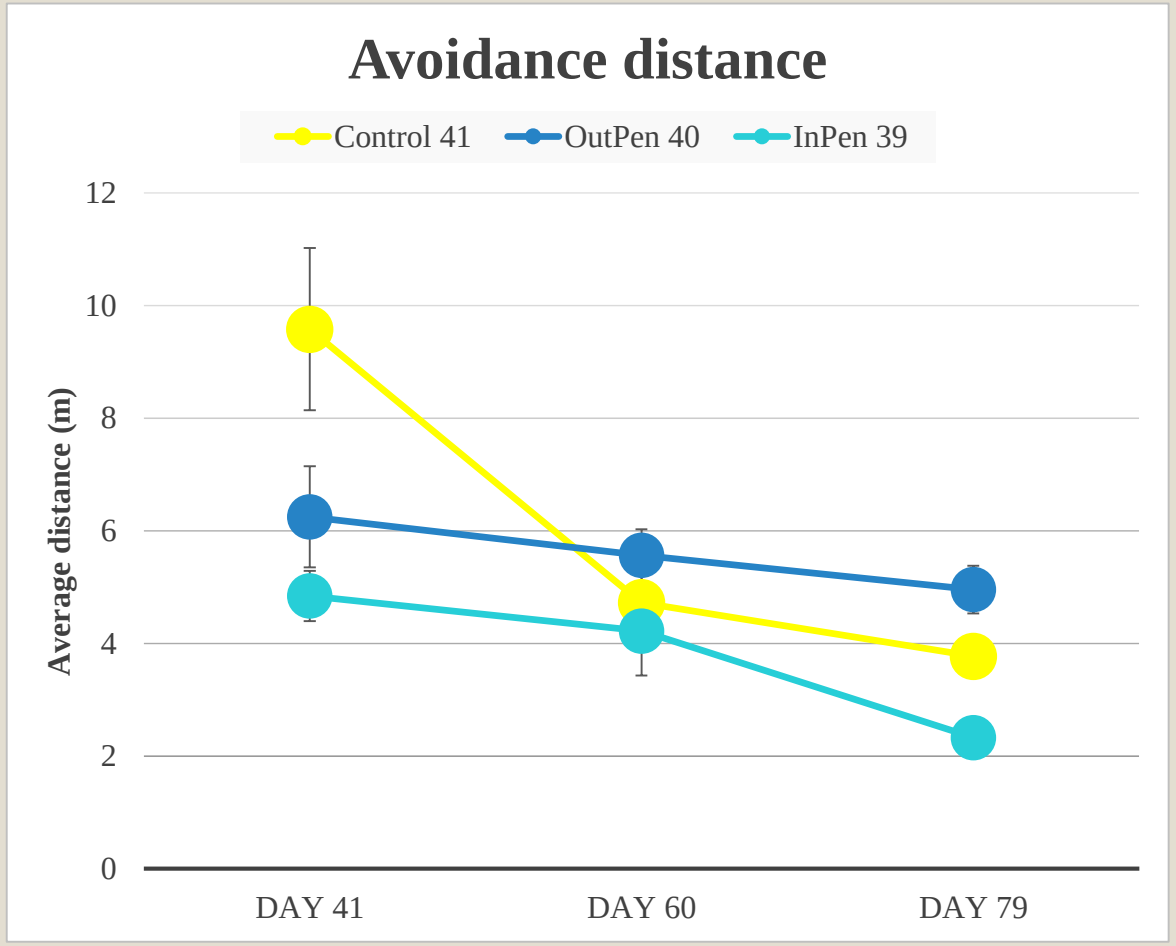
  - Study started on day 40

  - *Bos taurus* cattle



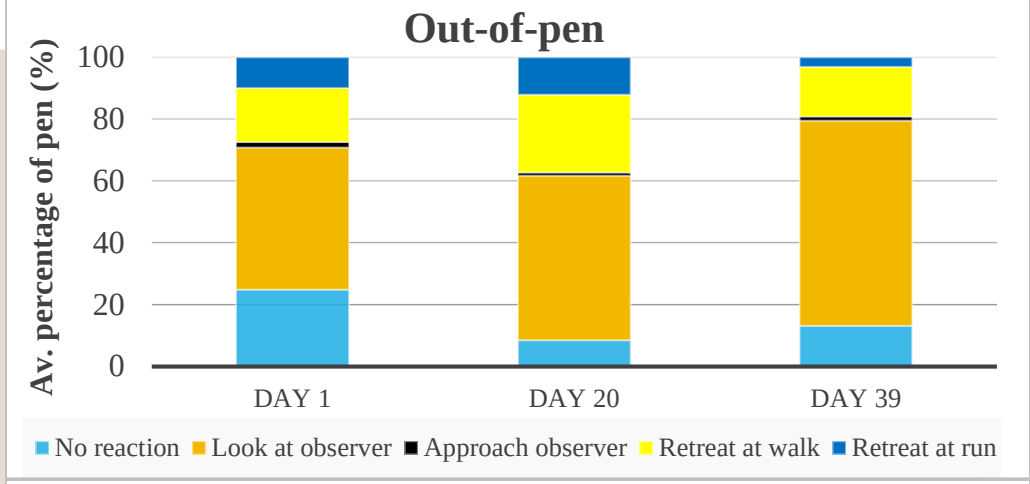
Temperament

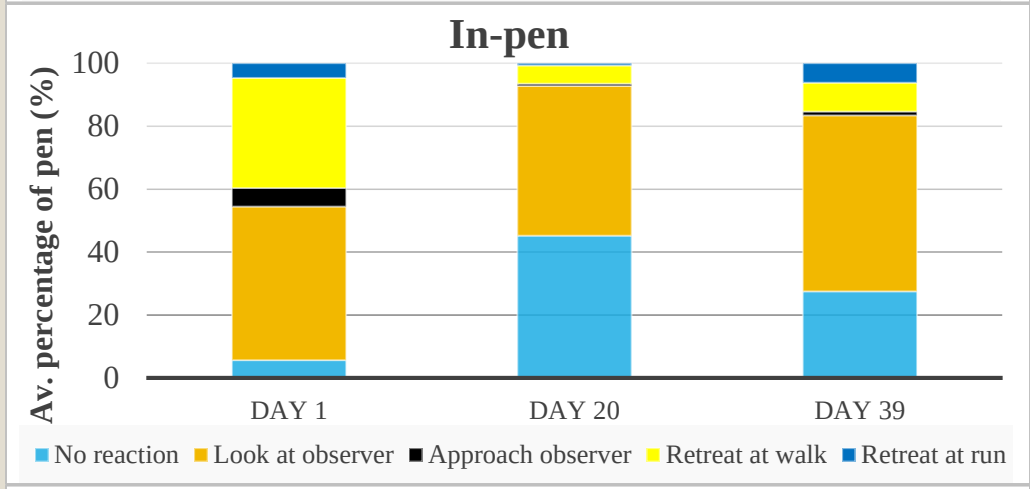
- **Avoidance distance:**
  (larger distance = more reactive)
  - Sig. decreased day 0 – 40 for control ($p < 0.001$) and IP ($p < 0.001$)
  - Pens sig. differed every day ($p < 0.01$)
  - Control greatest change, but started at highest distance
  - Consider pen placement (control = end pen row)
  - IP = lowest av. distance day 40 = influence of exercise treatment?

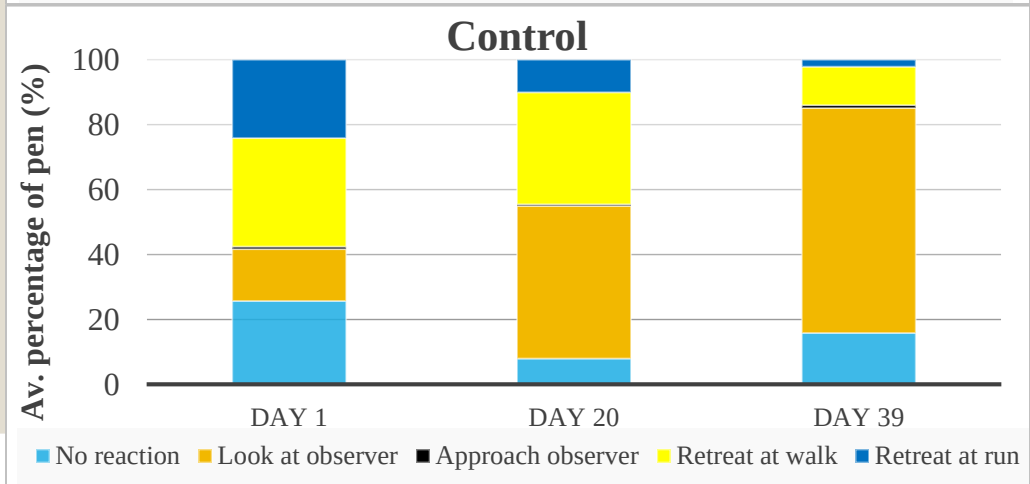


Behaviour: Novel person test

- Control = ↑ ‘look-at-person’ (p <0.01)
  ↓ ‘retreat-at-walk’ &
  ‘retreat-at-run’ (p < 0.05)
- OP = ↑ ‘look-at-person’ (p < 0.01)
  ↓ ‘retreat-at-run’ & ‘no-reaction’
  (p < 0.05)
- IP = ↑ ‘no-reaction’ & ‘retreat-at-walk’
  (p < 0.01)
- No sig. change in ‘approach’
- Less reactive day 40

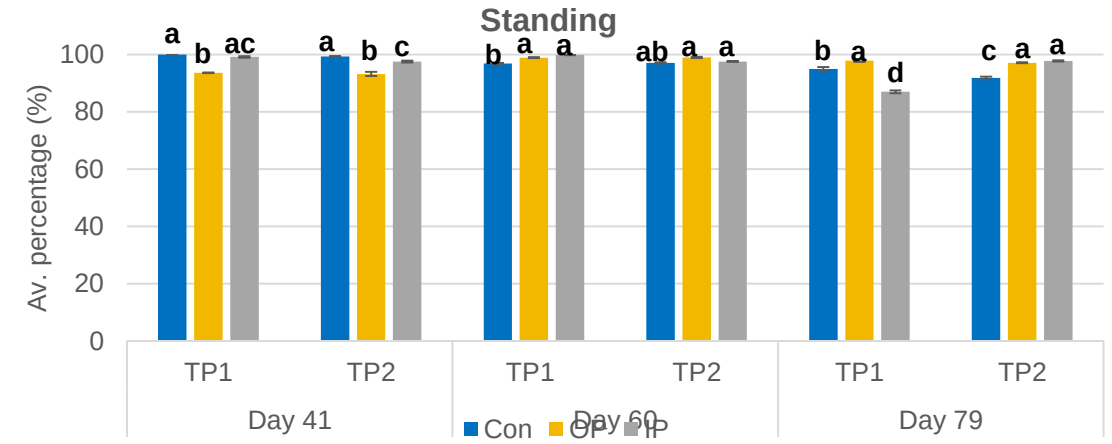


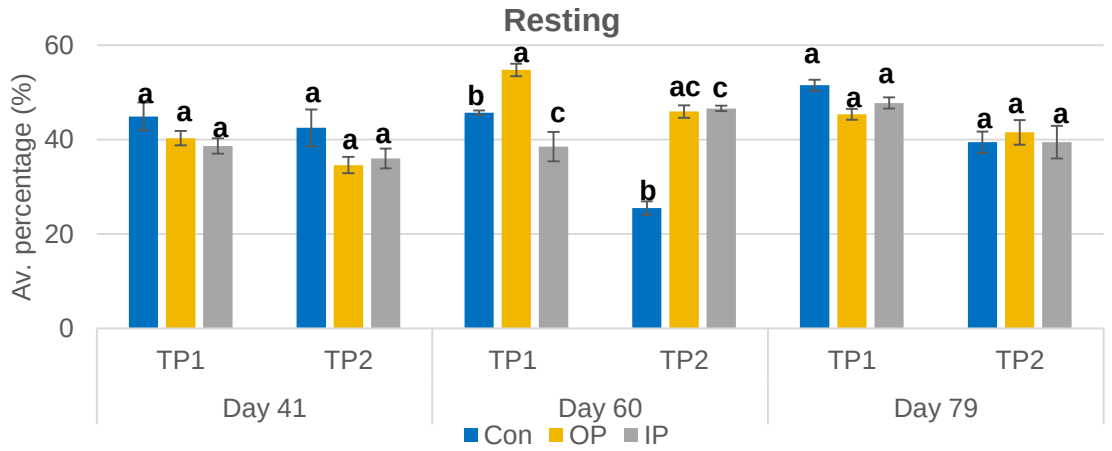


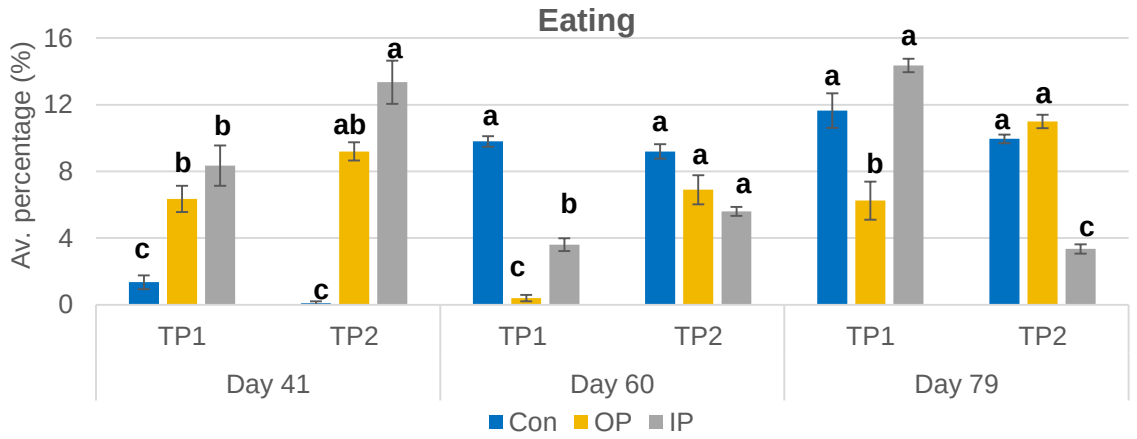


Behaviour: Activity budget

- All behav. sig. interaction pen*day*timepoint (except mounting and exploration)
- Standing:
  - standing more after novel person test
- Resting:
  - exercise pens = smaller decrease after novel person test
- Eating:
  -exercise pens often eating more after novel person test

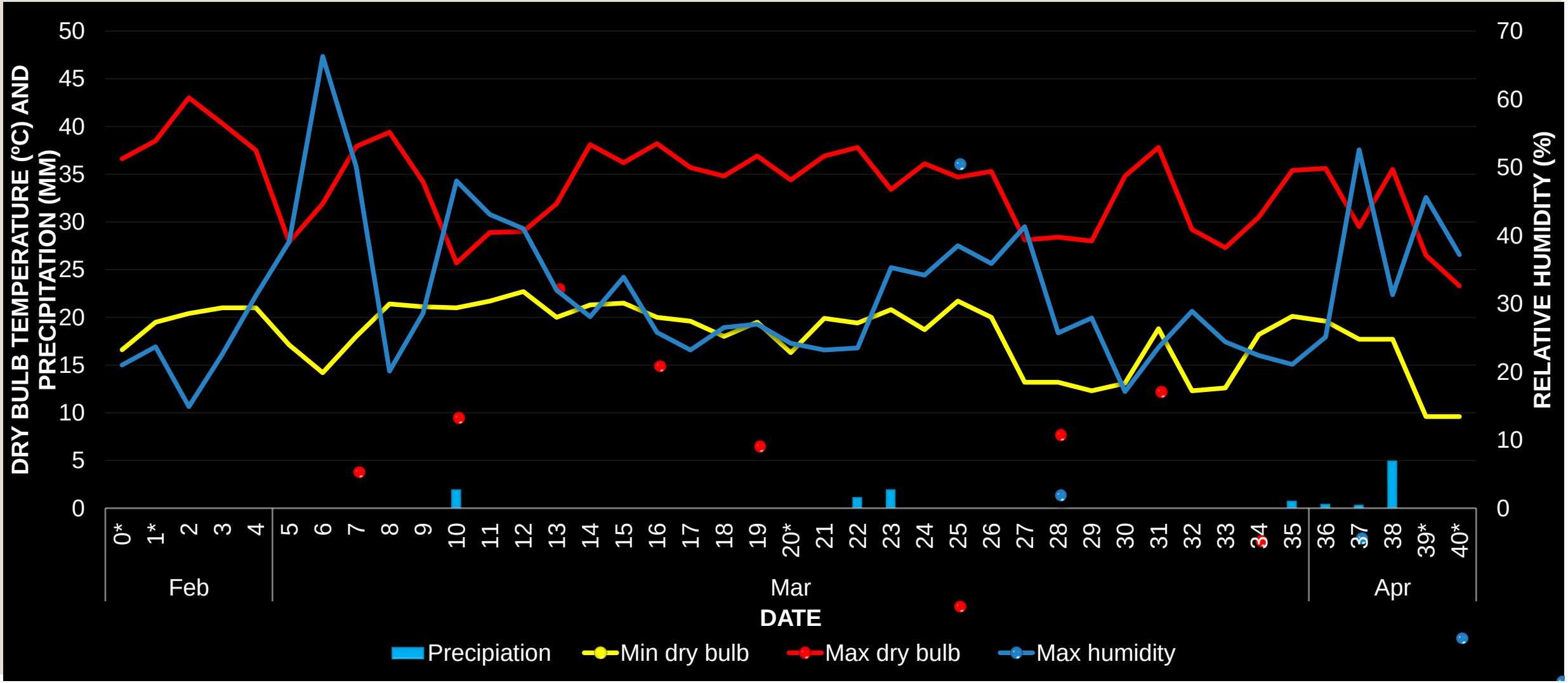






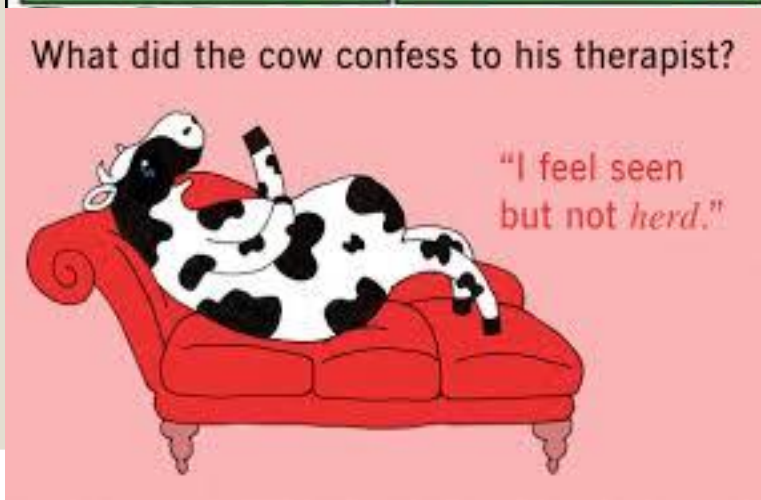
Climate

High temperatures throughout study could have influenced behaviour and weight gains



Conclusion

- Exercise in feedlot cattle appeared beneficial for cattle behaviour, welfare and production
- Out-of-pen benefit:
  - Activity budget, novel person test, crush behaviour
  = More impact on overall welfare of cattle
- In-pen exercise benefit
  - Avoidance test, novel person test, crush behaviour
  = More impact on human-animal relationship
- Replicates needed:
  - colder climate
  - across whole feeding regime
  - *Bos indicus*



References

1. Kilgour, 2012, In pursuit of “normal”: A review of the behaviour of cattle at pasture. Applied Animal Behaviour Science, 138:1-11
2. Fell & Clarke, 1993, Behaviour of lot-fed cattle. In: Farrel DJ (Ed) Recent Advances in Animal Nutrition in Australia. University of New England. Armidale, Australia.
   pp 107-116.
3. Montelli NLLL, Macitelli F, da Silva Braga J, Paranhos da Costa MJR, 2019, Economic impacts of space allowance per animal on beef cattle feedlot. Semina: Ciências Agrárias, 40:3665-3677
4. Global Animal Partnership. Accessed June 2020 https://globalanimalpartnership.org/standards/producer-resources#beef
5. World Organisation of Animal Health, 2012, Chapter 7.8 Use of animals in research and education. Terrestrial Animal Health Code. Accessed June 2020 https://www.aaalac.org/pub/?id=E90176F0-0E95-10C3-EC76-6942831232E8
6. Wilson SC, Mitlöhner FM, Morrow-Tesch J, Dailey JW, McGlone JJ, 2002, An assessment of several potential enrichment devices for feedlot cattle. Applied Animal Behaviour Science, 76(4):259-265
7. van de Weerd H, Ison S, 2019, Providing effective environmental enrichment to pigs: how far have we come? Animals, 9:254
8. Mandel R, Whay HR, Klement E, Nicol CJ, 2016, Invited review: Environmental enrichment of dairy cows and calves in indoor housing. Journal of Dairy Science, 99(3):1695-1715
9. Ninomiya S, 2019, Grooming device effects on behaviour and welfare of Japanese black fattening cattle. Animals, 9(4):7
10. de Vries TJ, Vankova <. Veira D, von Keyserlingk MAG, 2007, Usage of mechanical brushes by lactating dairy cows. Journal of Dairy Science, 90:2241-2245.

11. Bulens A, van Beirendonck S, van Theilen J, Driessen B, 2014. The effect of environmental enrichment on the behaviour of beef calves. Proceedings of the 6th International Conference on the Assessment of Animal Welfare at Farm and Group Level; Clermont-Ferrand, France, WAFL, p 235.
12. Uren JE, 2018, Environmental enrichment of calves using stationary and mechanical brushes. Ohio State University, Ohio
13. Mandel R, Wenkler ML, van Reenen K, Keil NM, Hillmann E, 2019, Can access to an automated grooming brush and/or a mirror reduce stress of dairy cows kept in social isolation? Applied Animal Behaviour Science, 211:1-8
14. Stanford K, Silasi R, McAllister T, Schwartzkopf-Genswein K, 2008, Behavior of feedlot cattle affects voluntary oral and physical interactions with manila ropes. Journal of Animal Science, 87(1):296-303.
15. Gerlach B, 2014, The effects of exercise on beef cattle health, performance and carcass quality, and the effects of extended aging, blade tenderization, and degree of doneness on beef aroma volatile formation. PhD [Thesis] Kansas State University, Kansas.
16. Wells DL, 2009, Sensory stimulation as environmental enrichment for captive animals: A review. Applied Animal Behaviour Science, 118(1):1-11.
17. Probst JK, Hillman E, Leiber F, Kreuzer M, Spengler Neff A, 2013, Influence of gentle touching applied few weeks before slaughter on avoidance distance and slaughter stress in finishing cattle. Applied Animal Behaviour Science, 144(1):14-21
18. Probst JK, Spengler Neff A, Leiber F, Kreuzer M, Hillman E, 2012, Gentle touching early life reduces avoidance distance and slaughter stress in beef cattle. Applied Animal Behaviour Science, 139(1):42-9