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Feeding horses in groups: Do feeding strategies affect horse welfare?

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1. Background

Feeding behaviour of horses

Natural conditions

~ **12 to 16 hours** foraging/day

- **Pauses** between two feeding bouts : **2 to 4 hours** maximum
→ **small and regular meals**, spread over 24h

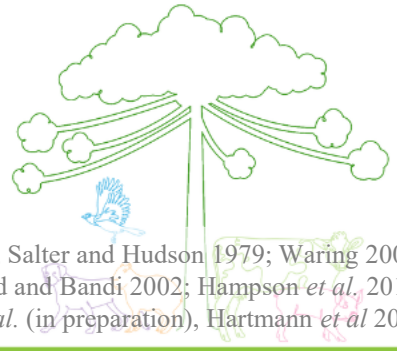
- Over **50'000 chews**

Captivity

~ **5 to 9 hours** foraging/day

- **Pauses** between two feeding bouts : **> 4 hours**
→1 to 3 meals of forage, **mostly during the day**

~ **20 000** to **38 000 chews** per day

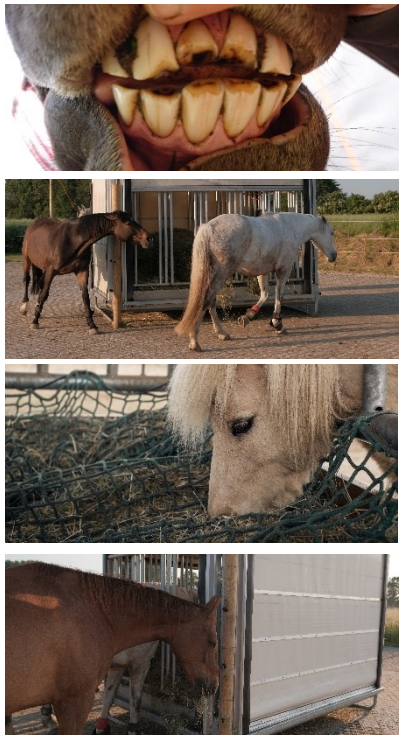


Boyd *et al.* 1988; Mayes and Duncan 1986; Salter and Hudson 1979; Waring 2003; Zeitler-Feicht 2008; Weinert 2019; Boyd and Bandi 2002; Hampson *et al.* 2010; Lesimple *et al*. 2016; Larsson and Müller 2018, Roig-Pons *et al.* (in preparation), Hartmann *et al* 2012

Feeding horses in captivity – problems & strategies

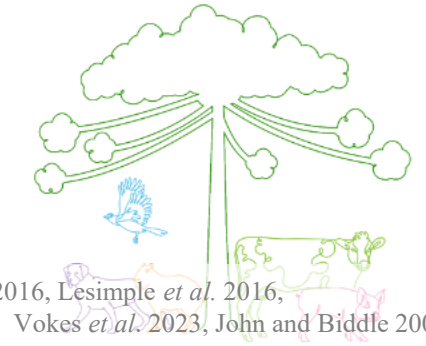
- **Boredom, frustration**, development of **stereotypic behaviours**
- Increased **aggressivness** in groups
- **Digestive problems** (reduced saliva production, risk of ulcers…)

+ *Ad libitum* hay→ **risk of overweight**
(metabolic predisposition, reduced nutritional needs)



Possible feeding strategies

- Use **slow-feeding dispensers** (hay nets)
- **Portion the daily feed in multiple, smaller meals**



Bachmann *et al*. 2003, Burla *et al*. 2016, Lesimple *et al*. 2016, Nicholson, 1999, Klugh *et al*. 2016, Vokes *et al*. 2023, John and Biddle 2009

Research question & hypotheses

« *What is the best feeding management for group-housed horses?*»

- **Slow-feeding** vs **mutiple portioning (portioned)**:
  ↑ **time spent feeding** (~ time-budget under natural conditions)
  ↓ **aggressivness**
  ↑ **risk of injuries / frustration** due to the net

- **Portioned**

TD ↓ **frustration during meals** (smaller breaks between feeding bouts),
↑ **welfare** (less agonistic interactions and injuries)

SF no frustration due to the net

2. Material and methods

Treatments

TRADITIONAL (TD)

- **3 feeding slots**/day
- **2 hours**/time slot
- **during the day only** (7am, 1pm and 9pm)

- Total hay availability = **6 h**
- **Pauses > 6 h** between meals

PORTIONED (PO)

- **6 feeding slots**/day
- **1 hour**/time slot
- **spread over 24 hours** (3am, 7am, 11am, 3pm, 7pm, 11pm)

- Total hay availability = **6 h**
- **Pauses = 3h** between each meal

SLOW-FEEDING (SF)

- **ad libitum** hay
- **hay net** (40mm)

- **no regulation** of time spent feeding
- net covering the hay

Loose hay

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Experimental design

- **18 mares** in **4 groups** (4 or 5 mares)
- **Stable groups** (> 6 months)
- Loose housing (**paddock-trails**)
- **Time-controlled hay racks** (8 feeding spots)
- **Cross-over design** (with Rep «0»)
- **3** weeks of **habituation**
  2 weeks of **data collection**

Rep 0	Rep 1	Rep 2	Rep 3
SF	PO	TD	SF
PO	TD	PO	SF
TD	SF	TD	PO
SF	PO	SF	TD

Data collection - Observations

- **15 hours of continous observation** (per group per treatment)
  → **affiliative behaviours**
  (movement, proximity, approach for social interactions and actions)

  → **agonistic behaviours**
  (passive displacements, push, threatening behaviours and agressive behaviours)

- **Every 15 min, scan sampling**
  → **localisation** (feeding area, trail or lying & drinker area)

  → **activity** of each individual (feeding, searching for food, standing vigilant, walking, resting while standing or lying, social interactions)

Data collection - Injuries

<u>At the beginning of each data collection</u>

D0 : **Baseline**

⬇

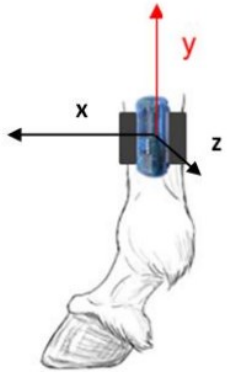
D+2 : **New injuries** (localisation, size et severity)

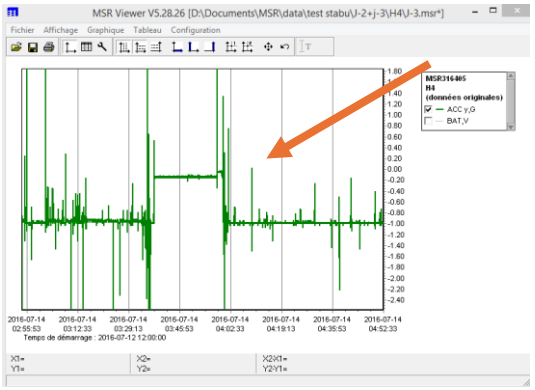
⬇

D+4 : **New injuries** (localisation, size et severity)

Data collection – Lying behaviour

- **Accelerometers** (MSR 145)
- **5 to 14 days of recording** per mare and per treatment
- Analyses using R-statistics : **automatic detection of lying bouts** (occurrence, duration)





Statistical analyses

- Use of **linear mixed-models**
  - (lmer or glmer “Poisson”)
  - transformation if needed (1+log(Y))

- **Random effects** : Observer, Repeat(:Day), Group(:Horse)
- **Fixed effect**: Treatment

- **Post-hoc comparison** : Tukey test

3. Results

Time-budget and space utilisation

	Feeding	Searching for food	Standing (vigilant)	Walking	Resting (standing)	Resting (lying)	Social interactions	Other
SF	66.6	1.6	9.9	3.8	14.0	1.3	1.5	1.3
PO	27.1	7.6	19.5	3.5	40.7	0.6	0.0	1.0
TD	28.3	7.4	18.4	3.7	39.4	0.4	0.6	1.8

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- **SF**: ↑ time spent **feeding** and **lying**

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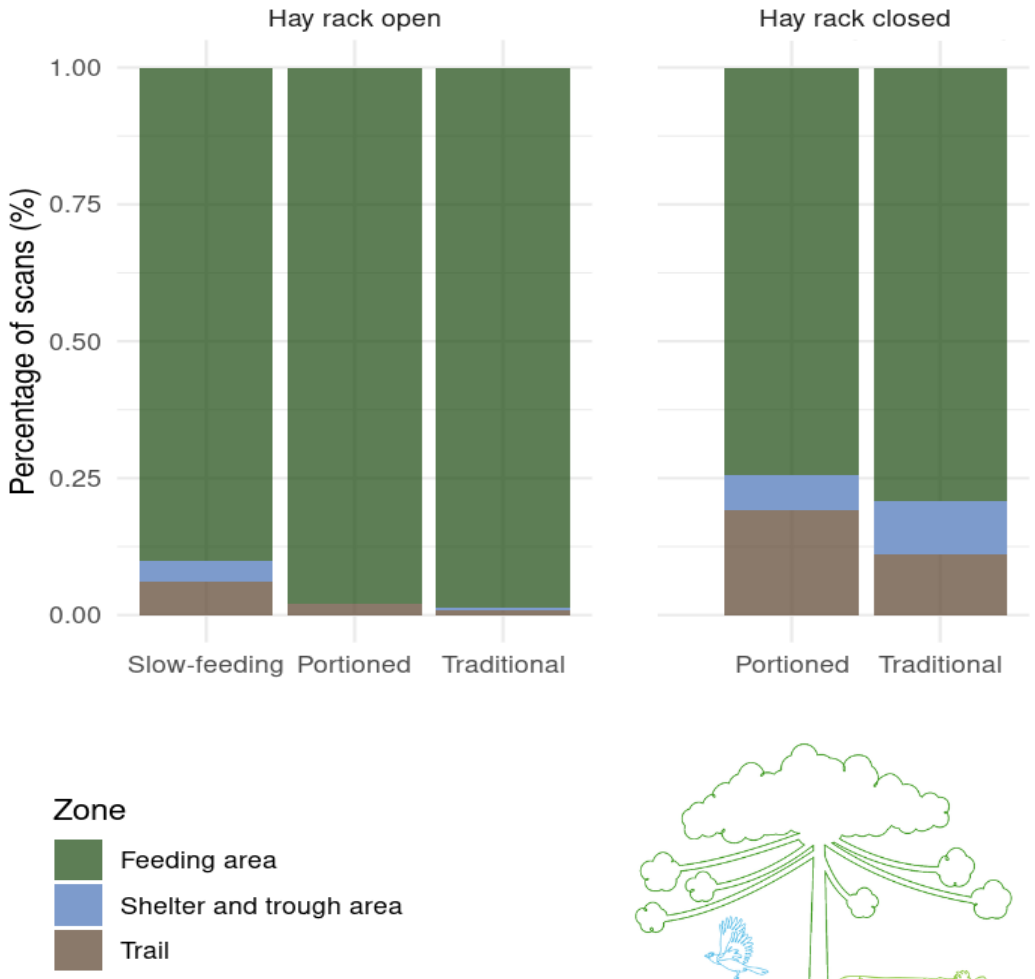
- **SF**: ↑ time spent **feeding**

- **TD** **&** **PO** : **very similar**
  ↑ time spent **standing** (vigilant or resting)
  ↑ time spent **searching for food**

Time-budget and space utilisation

- **Horses mainly stayed close to the hay racks** (86.1% of all scans)
- For TD and PO: closing of hay rack → moved to trail and shelter but still high proportion of scans in feeding area (76.6%)
- Horses rarely observed in the shelter area, even during non-feeding slots



Social interactions

Hay racks closed (PO and TD) : no significant difference

Hay racks open

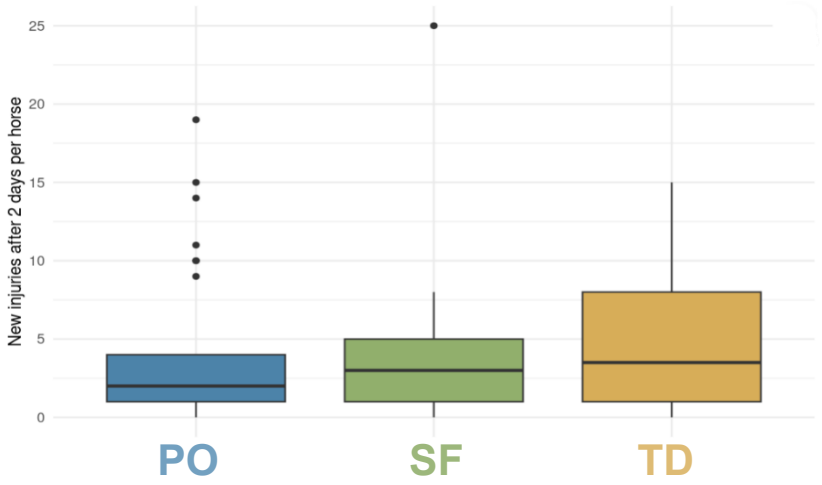
- Affiliative interactions : **no effect** of Treatment
- Agonistic interactions: **significant increase in PO compared to SF**

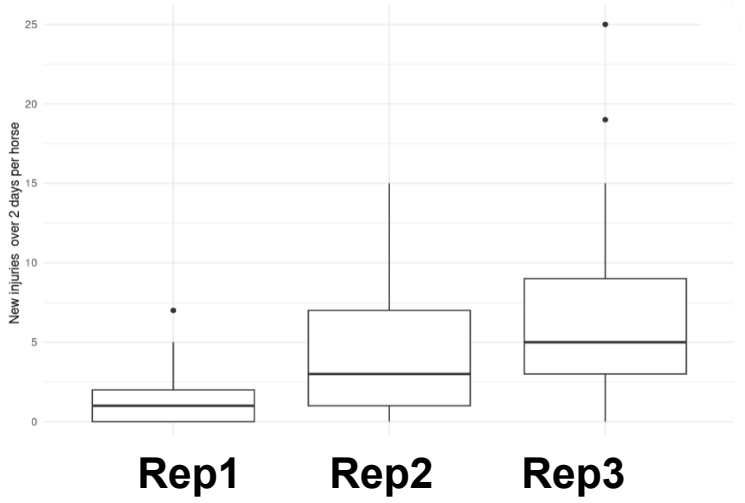
Treatment
Portioned
Slow-feeding
Traditional

Injuries

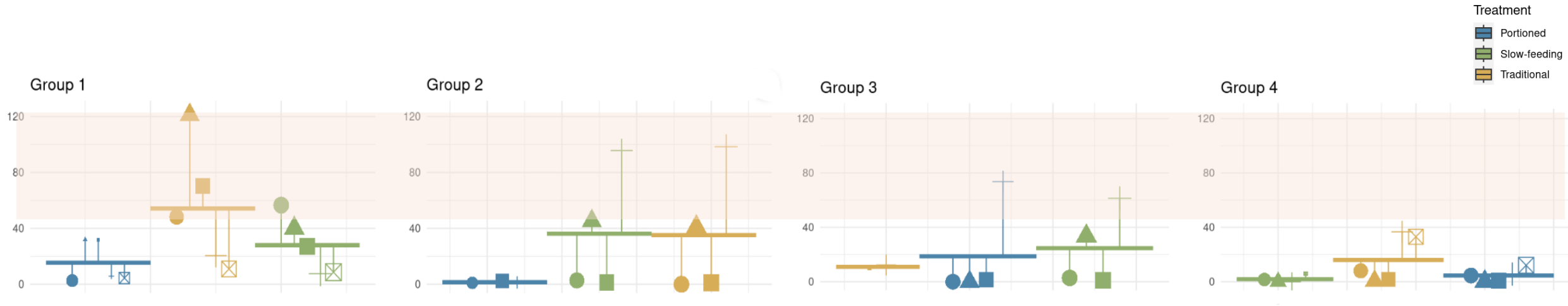
- **No significant difference** between treatments

- **Notable variance in random components** (Repeat:Day)
  → when included as fixed effect, best model included only Repeat
  → **Less injuries in Rep1** compared to Rep2 and Rep3, **with gradual increase**





Lying behaviour



- **Overall low time** spent lying down
- **Significant reduction of time spent lying in PO** (10min on average) compared to SF (23) and TD (32)

4. Discussion

Discussion

- **Slow-feeding (SF)**: **time-budget** similar to **natural conditions**
  No wood-chewing/coprophagy (≠ Traditional; TD & Portioned; PO)
  Very **few behaviours indicating frustration**, no accidents
  Agonistic level higher than in literature: *Frustration? Utilisation of space?*

Boyd *et al.* 1988; Mayes and Duncan 1986; Ellis et al., 2015; Greppi et al., 2024
Sundman et al., 2022; Flauger et al., 2013

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- **Traditional**: **no difference in agonistic behaviours compared to Slow-feeding**
  - *Duration of the meal and overall conditions? Or frustration with net?*
  - Only short-term investigation → could lead to digestive problems on long-term

Ellis, 2010; Durham 2010; Lüthersson et al.., 2018

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- **Few differences between** Traditional and Portioned (time-budget, injuries)
  - *Feeding slot of 1 hour = too short*?
  - *Short-term?* (**wood-chewing only in** TD**)**


Nicol, 1999

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- **Few differences between Traditional** and **Portioned** (time-budget, injuries)
  - *Feeding slot of 1 hour = too short?*
  - *Short-term?* (**wood-chewing only in TD**)

- **Lying behaviour**
  - *Extensive stabilisation*? → **pseudo-narcolepy**
  - **Impaired lying behaviour in PO :** Temporal distribution of feeding slots over the night?

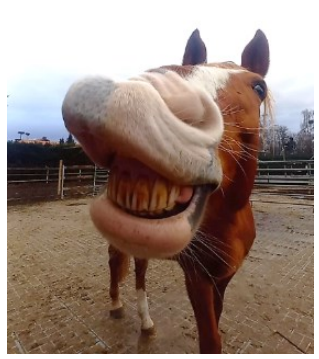
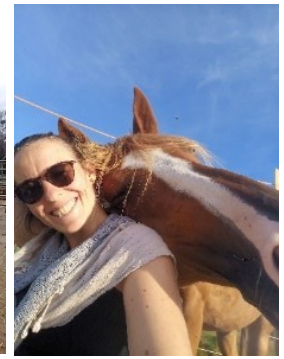
Seabra et al., 2023; Greening et al., 2022

Take-home message

- **Slow-feeding**: suitable option to enhance foraging while limiting hay ingestion
- **(mutiple) Portioning**: not effective in reducing aggression compared to traditional feeding in our study → further studies are needed to find optimal feeding strategies
- Further studies required to assess the potential effect of paddock-trails/extensive stabilisation on equine lying behaviour
- Observations / injuries / lying behaviour → differences in result
- High variability between groups and individuals: **need further replication**

Thank you for your attention!



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