Cognitive bias and group preference when housing fattening pigs in a small vs very large group

Uta König v. Borstel,

Henrike Schwanhold, Ali Kiani

Background – Group size

- Due to structural change and increasing farm sizes partly trend to very large group sizes > 100 animals (Hoy et al., 2006; Schwarting et al., 2005; Mauer, 2007)
- Wild pigs live in groups of up to 20 (max. 30) animals (Van Putten, 1978); linear hierarchy (Jenssen, 1997)
- Individual recognition > approx. 50 animals not evidenced (Knierim 2005; Stricklin and Gonyou, 1999)

Advantages and disadvantages of large groups – producer

	Large (≥60) vs small groups (≤20)	References
Investment needs	+	Tölle and Meyer, 2016
Work efficiency	+/(-)	Tölle and Meyer, 2016
Animal care	-	Tölle and Meyer, 2016
Daily gain	- (-) o	Kaminski and Marx, 1990; Arden, 2003; O'Connel et al. (2004); Spoolder et al. (1999); Wolter et al., 2000, Tölle, 2008
Feed conversion	- o	Hoofs, 1991; (WOLTER et al., 2000b).
Quality of product (growing apart, commercial class)	- o +	Arden, 2003; O'Connel et al. (2004); Spoolder et al. (1999); Wolter et al., (2000). Kircher et al. (2001)

Advantages and disadvantages of large groups – health & welfare

	Large (≥60) vs small groups (≤20)	References
Mortality	- o	Schmolke et al., 2002; Arden, 2003; Turner et al., 2003
Morbidity	- o	Arden, 2003; Schwarting, et al., 2005; Turner et al., 2003
Aggression, skin lesions	+	Sambraus and Iben, 2002; Kaminski and Marx (1990); Turner et al., 2001; Samarkone and Gonyou, 2004
Behavioural disorders	- o	Schmolke et al., 2002; Bryant and Ewebanks, 1972
dirtiness	+	Hoofs, 1991; Meyer-Hamme et al., 2015
Lying behaviour, possibility for retreat	- +	Meyer, 2005

Animals and housing system

- 96 Pigs (BHZP Victoria x Pi)
- housing in 1 group starting at 40 kg
- Of theses 14 focus animals

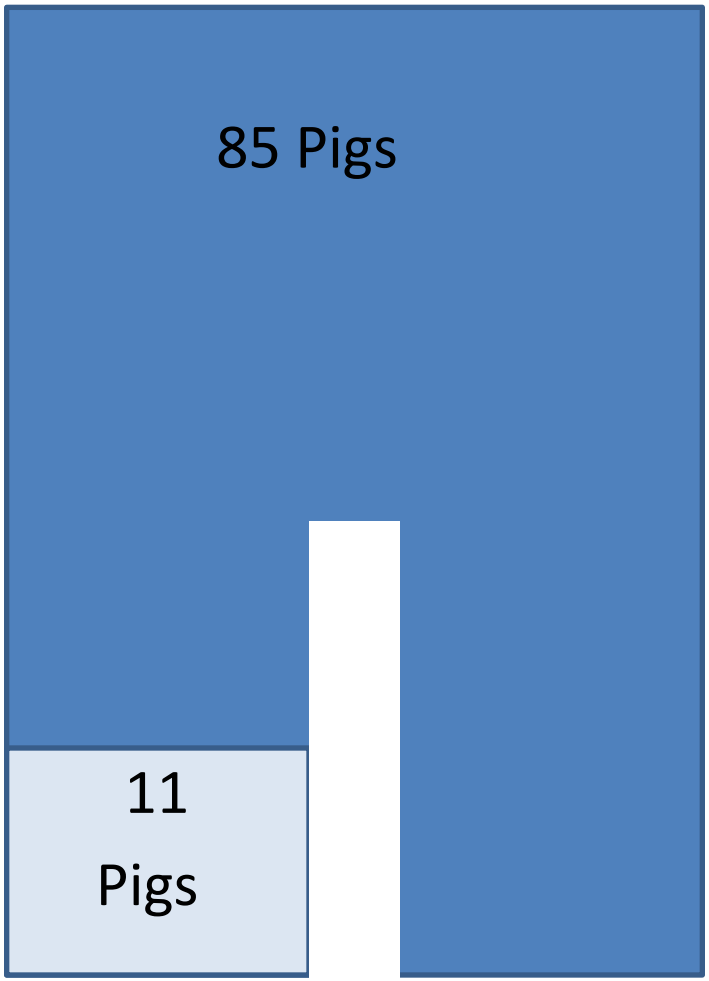
Large pen:

- 8 small pens + aisle
- 0,75 m² / Pig
- Fully slatted floor
- Automatic wet feeders
- Nipple drinkers
- Material for enrichment

Animals and housing system

- 96 Pigs (BHZP Victoria x Pi)
- housing in 1 group starting at 40 kg
- Of theses 14 focus animals

- After 4 weeks separated in 2 groups:
  - 11 animals (7 focus animals)
  - 85 animals (7 focus animals)
- Equal animal-place- and animal-feeding-place-ratio



Assessment of emotional status: test for cognitive bias

- Is that glass half full or half empty?

Cognitive bias

- Depressive/anxious humans interpret neutral stimuli (e.g. glance) more negative than normal people (Gur et al., 1992)

Distortion of perception

- Depressive/anxious humans interpret neutral stimuli (e.g. glance) more negative than normal people (Gur et al., 1992)

- Successful application e.g. in rats, starlings, cattle, pigs (Matheson et al., 2008; Burman et al., 2009; Mendl et al., 2009, Douglas et al., 2012; Weary et al. 2015)

Distortion of perception

- Depressive/anxious humans interpret neutral stimuli (e.g. glance) more negative than normal people (Gur et al., 1992)

- Successful application e.g. in rats, starlings, cattle, pigs (Matheson et al., 2008; Burman et al., 2009; Mendl et al., 2009, Douglas et al., 2012; Weary et al. 2015)

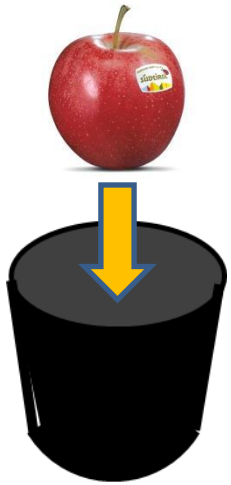
- To date most reliable proof of emotions in animals

Test for cognitive bias

How to ask the animal if the glass is half full or half empty?

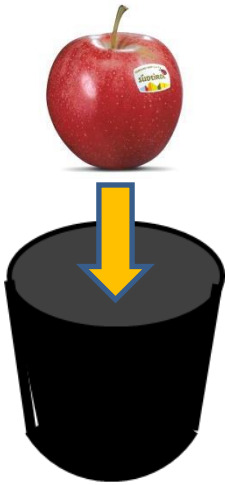
Test for cognitive bias

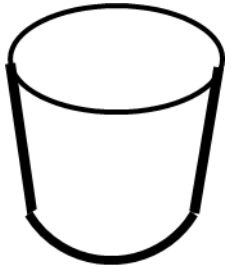
Asking the animal if the bucket is half full or half empty:



Training for cognitive bias

20 training sessions
12 trials each:





Semi-randomised sequence

6 x

6 x

Training for cognitive bias

Learning criterion:

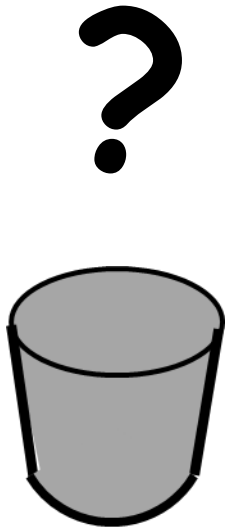
>80 % correct decisions within 30 sec

- Black bucket: approach and opening of lid
- White bucket:

  no approach

Test for cognitive bias

Presentation of an ambiguous stimulus:



Test for cognitive bias

- 6 test sessions (-1, 0, 2, 6, 9, 12 days before/after grouping)

- 12 trials per session and animal (randomised 4 x black, white, grey bucket, each)

Recorded parameters:

- passing the obstacle (yes/no)
- opening of the bucket (yes/no)
- duration until arrival at bucket (maximum: 30 sec)

Test for distortion of perception

- 6 test sessions (-1, 0, 2, 6, 9, 12 days before/after grouping)
- 12 trials per session and animal (randomised 4 x black, white, grey bucket, each)

Recorded parameters:

- passing the obstacle (yes/no)
- opening of the bucket (yes/no)
- duration until arrival at bucket (maximum: 30 sec)

Statistical analyses

Cognitive bias:

- Mixed model: y = μ + colour of bucket + group + *animal + e*
- Survival analysis: SAS proc lifetest/proc phreg

Preference test:

- Method for sequential tests (Bross, 1952)

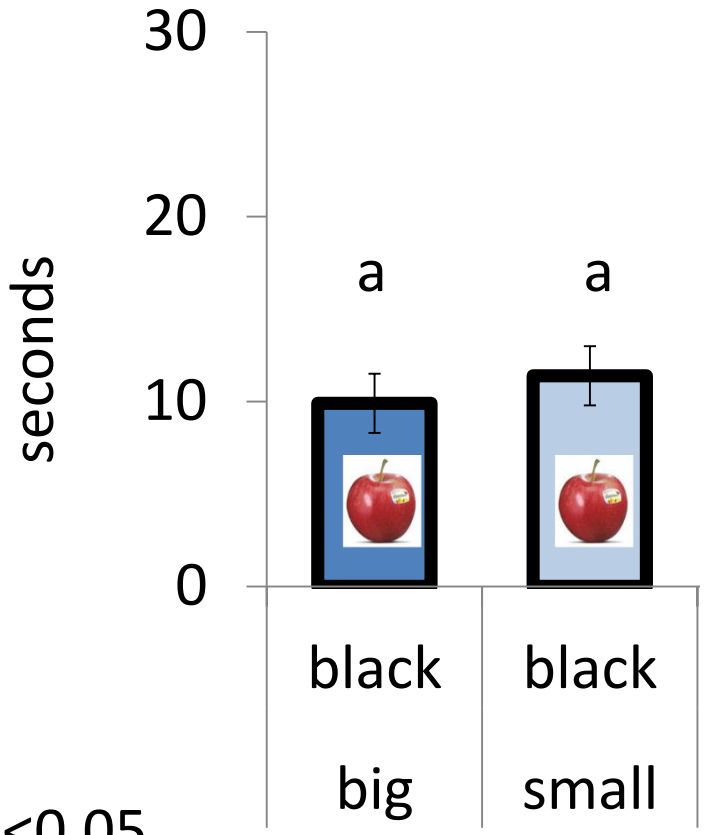
Performance, behaviour:

- Correlations; mixed model : y = μ + group + *animal+ e*
  (experimental unit = animal)

Results – test for cognitive bias

latency to open bucket:

Before separation into 2 groups (control)

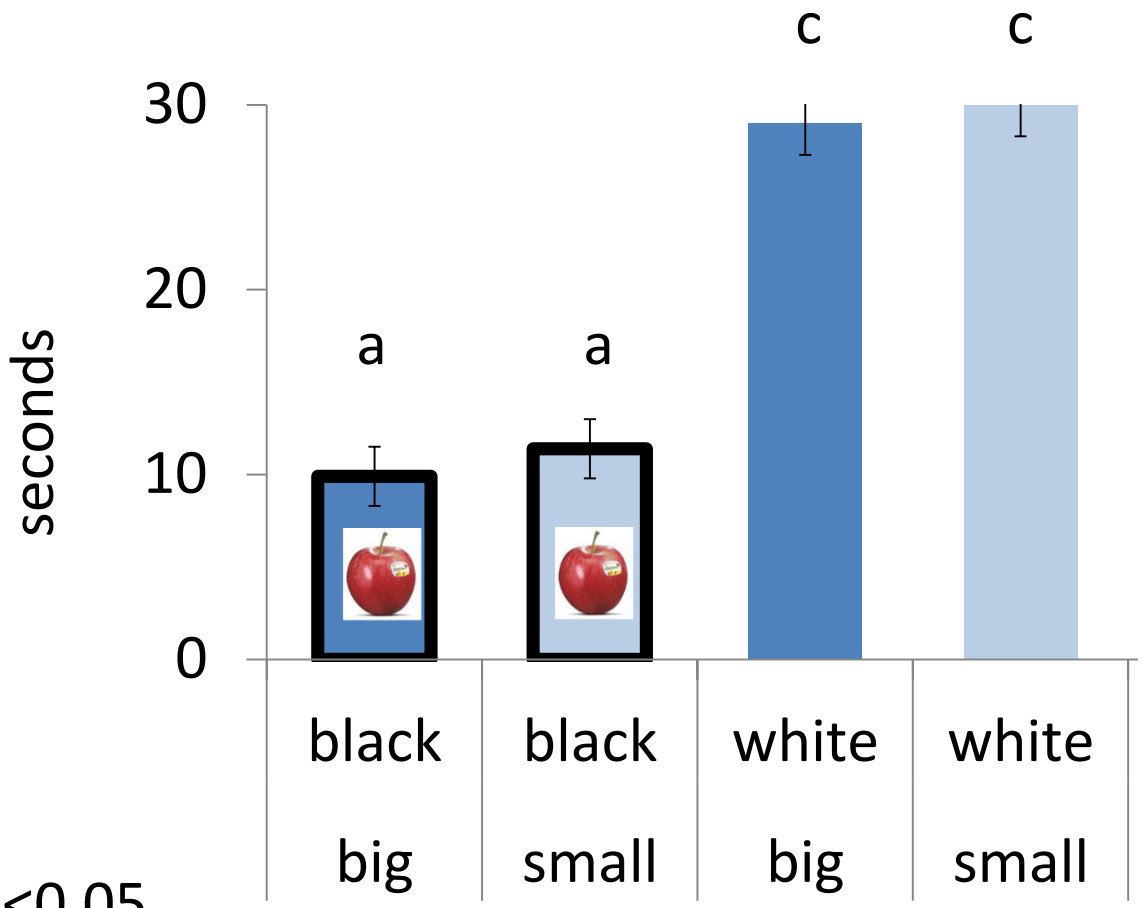


a,b: P<0.05

Results – test for cognitive bias

latency to open bucket:

Before separation into 2 groups (control)

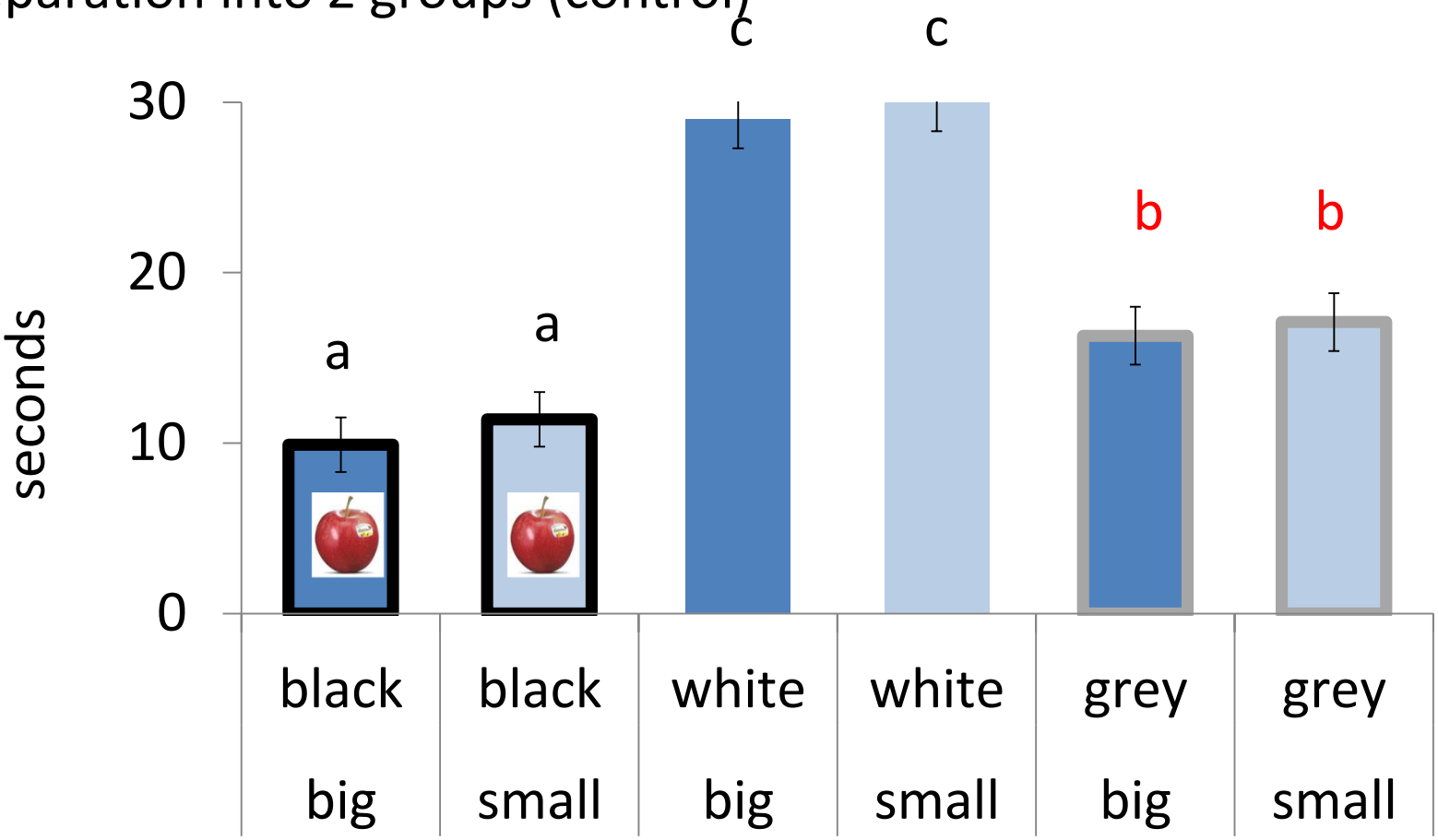


a,b: P<0.05

Results – test for cognitive bias

latency to open bucket:

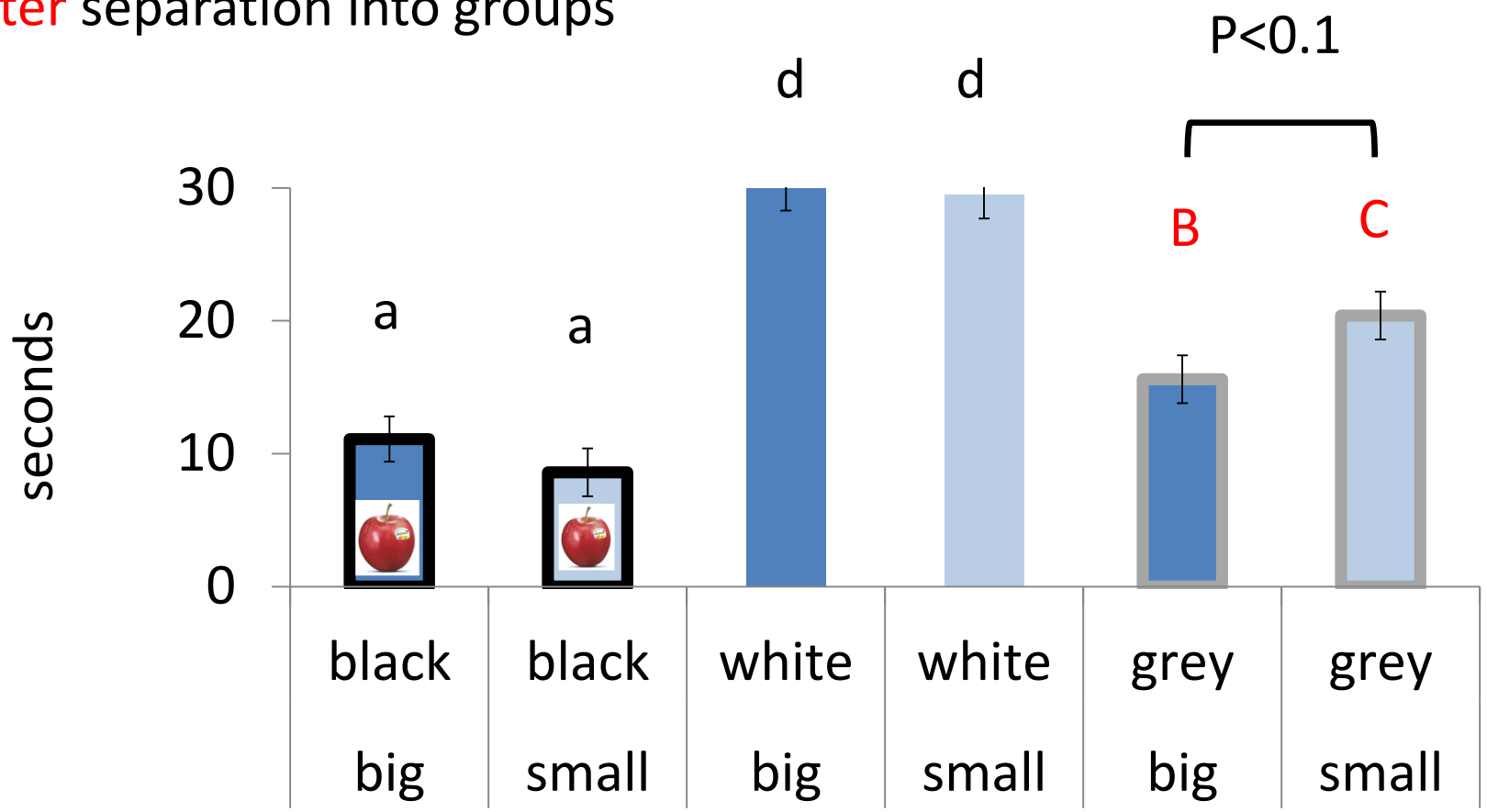
Before separation into 2 groups (control)



Results – cognitive bias

latency to open bucket:

2 days after separation into groups

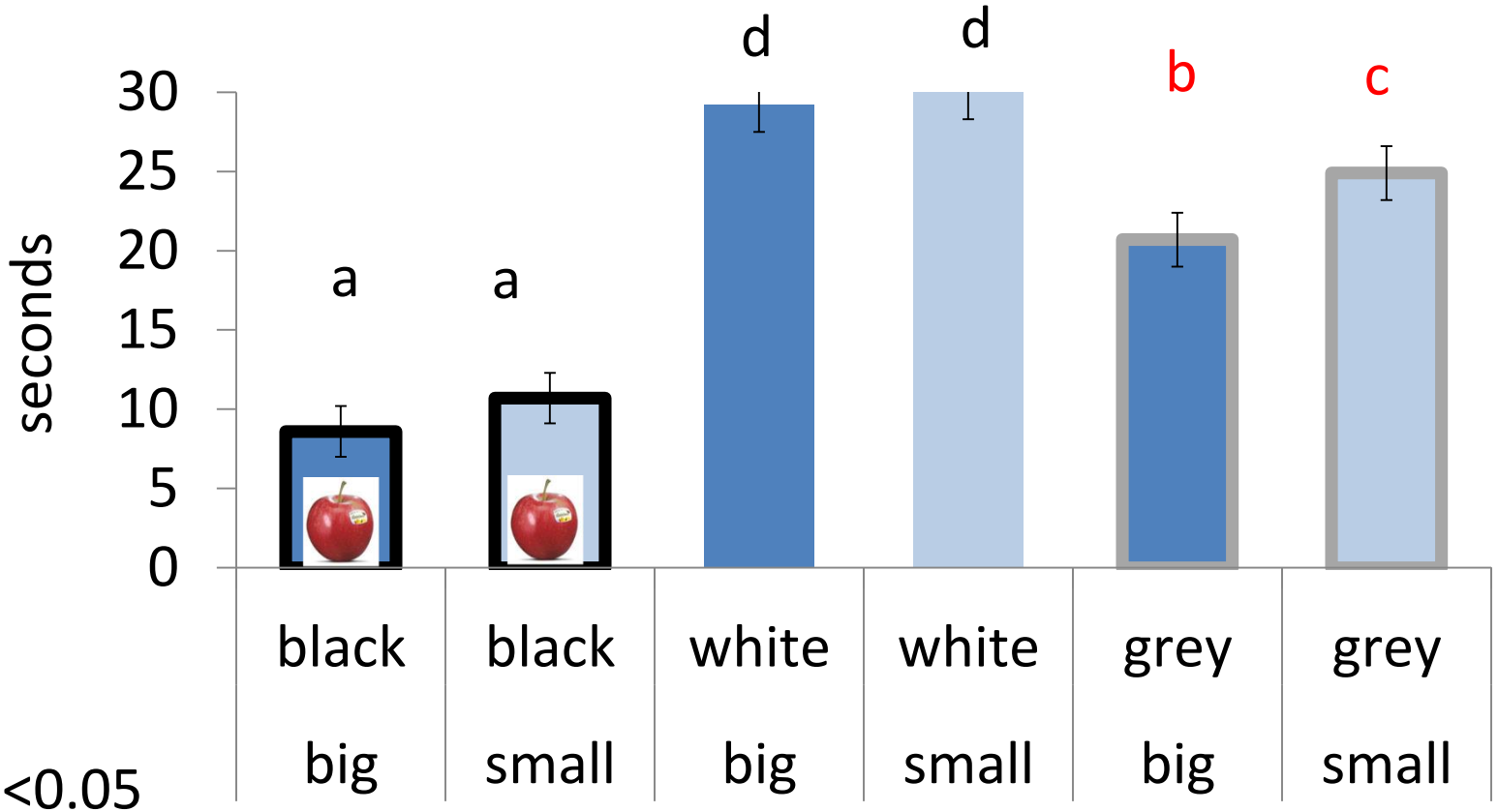


a,b: P<0.05

Results – test for cognitive bias

latency to bucket:

6, **9**, 12 days after partition in groups



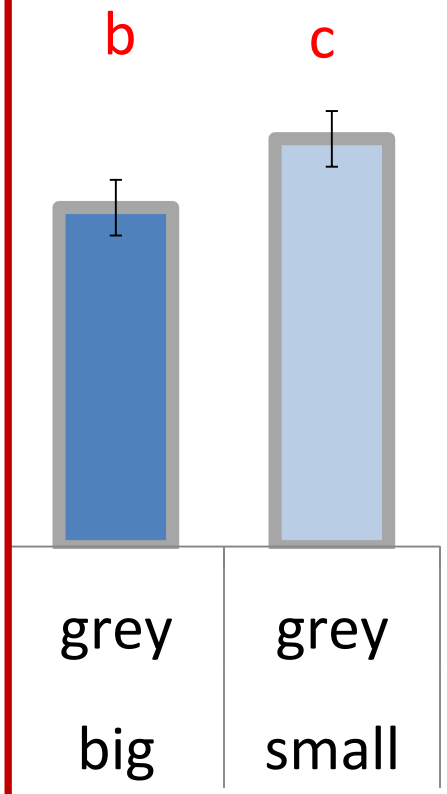
a,b: P<0.05

Results – test for cognitive bias

latency to open bucket

Pigs from small groups are more “pessimistic”

-> Comparable results in pigs kept in baren vs enriched environment (Douglas et al., 2012)



Small vs large group

- Performance and behaviour: no clear advantage
  (= literature)

  -> Results not generally applicable (1 group each)

- Preference: back to test arena

- Emotional status: better animal welfare in large groups!

Thank you very much!

Henrike Schwanhold

Ali Kiani

Erwin Tönges

Knut Salzmann

eip-agri
AGRICULTURE & INNOVATION

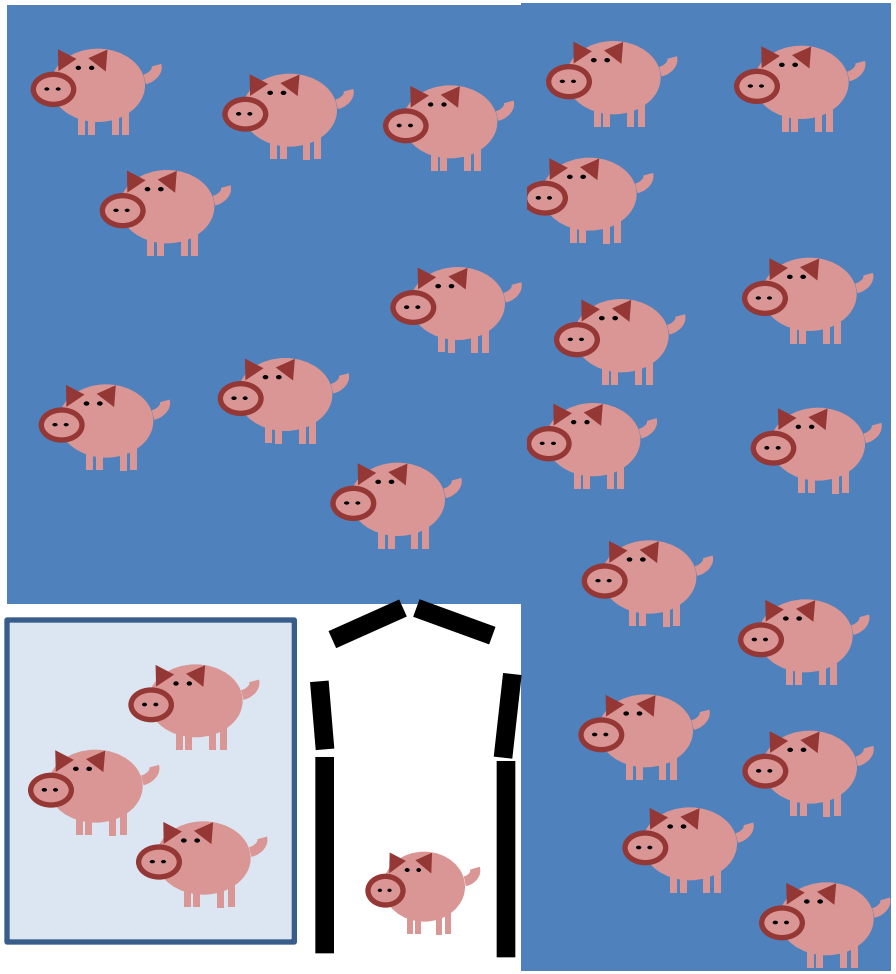
funded by European Commission

Financially supported by EU within the framework of EIP-Agri Programme

Preference test

Testing of each pig:

- 5 x before grouping (inherent side preference?)
- Until significance (Bross, 1952) or max. 17 times



Results – performance & behaviour

Small vs large groups

- Skin lesions before/after partition in groups: $P>0.1$
- Sozial interactions 24 h after grouping:
  (0.4 ± 0.4 vs 1.0 ± 0.2 interactions/h; $P<0.05$)

- Daily gain: until now $P>0.1$
- Feed conversion: until now $P>0.1$

- Correlations between daily gain and behavioural tests: $P>0.1$