Faculty of Agricultural and Nutritional Science

Christian-Albrechts-University Kiel
Institute of Animal Breeding and Husbandry

Significant dyads in agonistic interactions and their impact on centrality parameters in pigs

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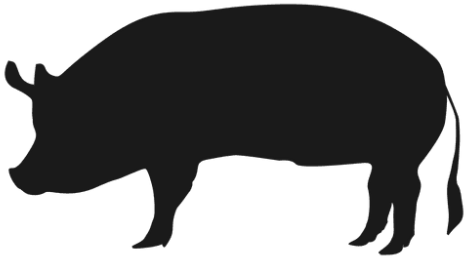
Session 40, Abstract number 31781, kbuettner@tierzucht.uni-kiel.de

Introduction

vs.



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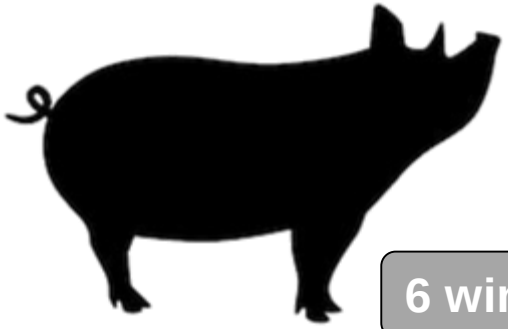
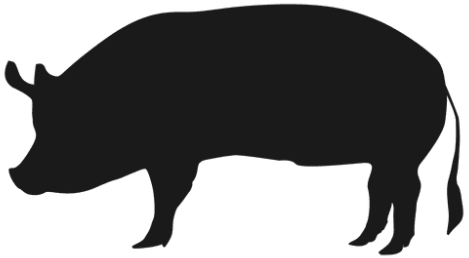


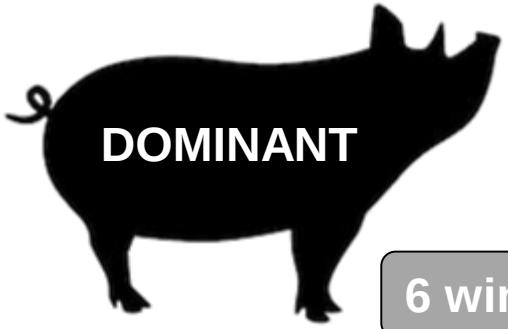
6 wins

vs.



5 wins

Introduction



6 wins

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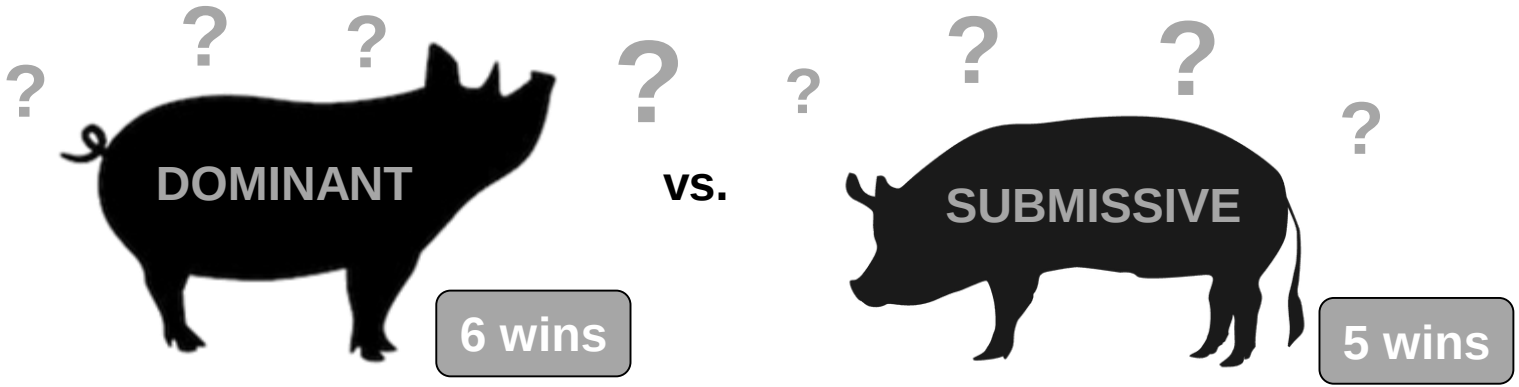
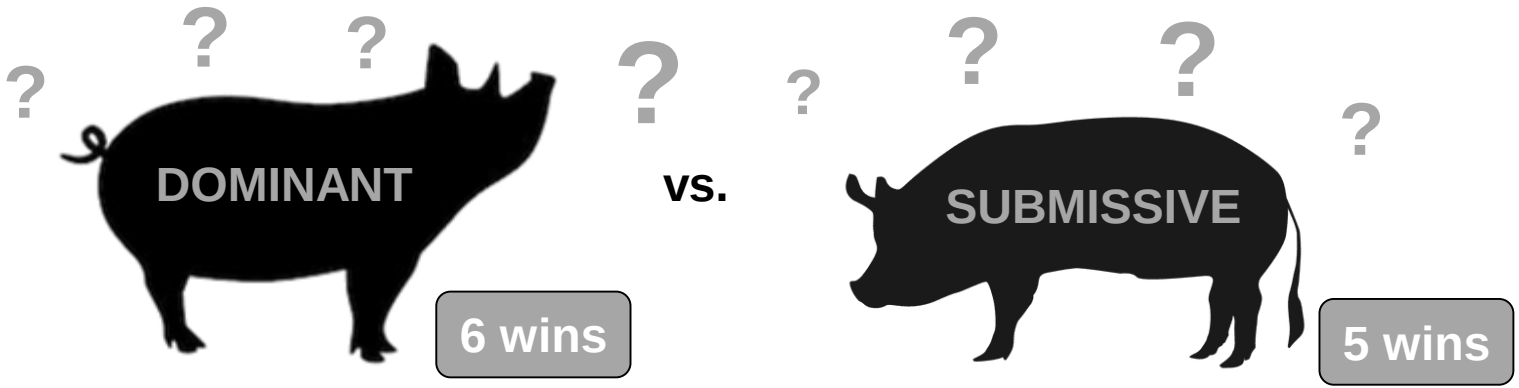


Definition of dominance (Drews, 1993)

Consistent outcome of agonistic interactions to the advantage of one animal

Introduction



Definition of dominance (Drews, 1993)

Consistent outcome of agonistic interactions to the advantage of one animal

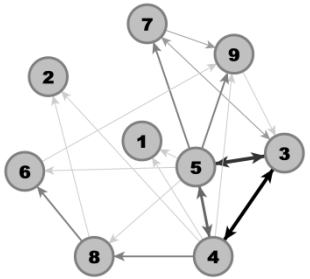
Testing for significance is needed → Real dominance relationship

Only animals which won significantly more fights should be considered dominant

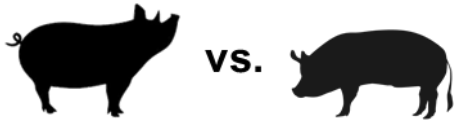
Aim of the present study

→ **Two calculation methods for the determination of significant dyads**

Pen individual limits



Dyad individual limits



→ **Evaluation of the impact of the exclusion of insignificant dyads on centrality parameters derived from social network analysis**

Materials & Methods

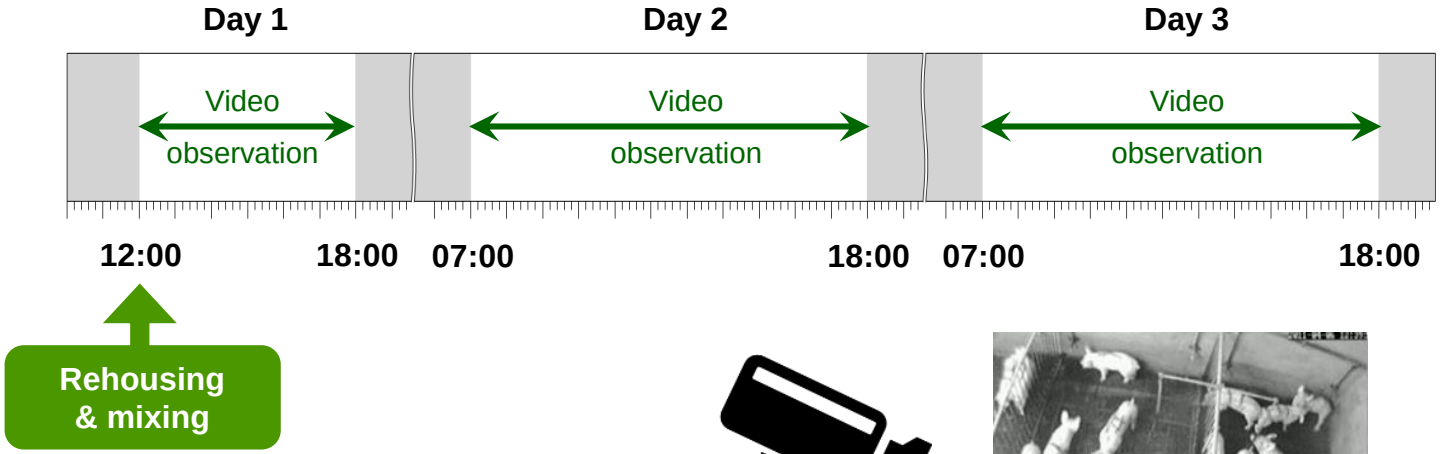
Animals & Housing

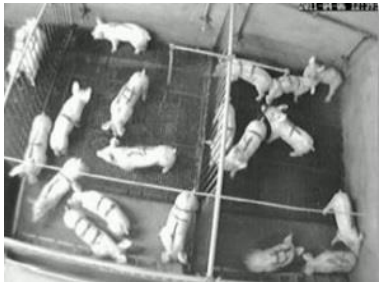
- **Trial unit:** Conventional breeding farm (closed system)
- **Animal number**
  - 93 pens in 10 batches with 829 weaned piglets
  - Ø 8.9 ± 0.6 animals/pen
- **Group composition**
  - Mixed gender groups, castrated males, docked tails
  - Sorted by nearly equal body weight
  - Mixing of unfamiliar pigs

Materials & Methods

Video observation

- **Start:** Directly after rehousing and mixing in the flatdeck pens
- **Duration:** 3 days during the light phases

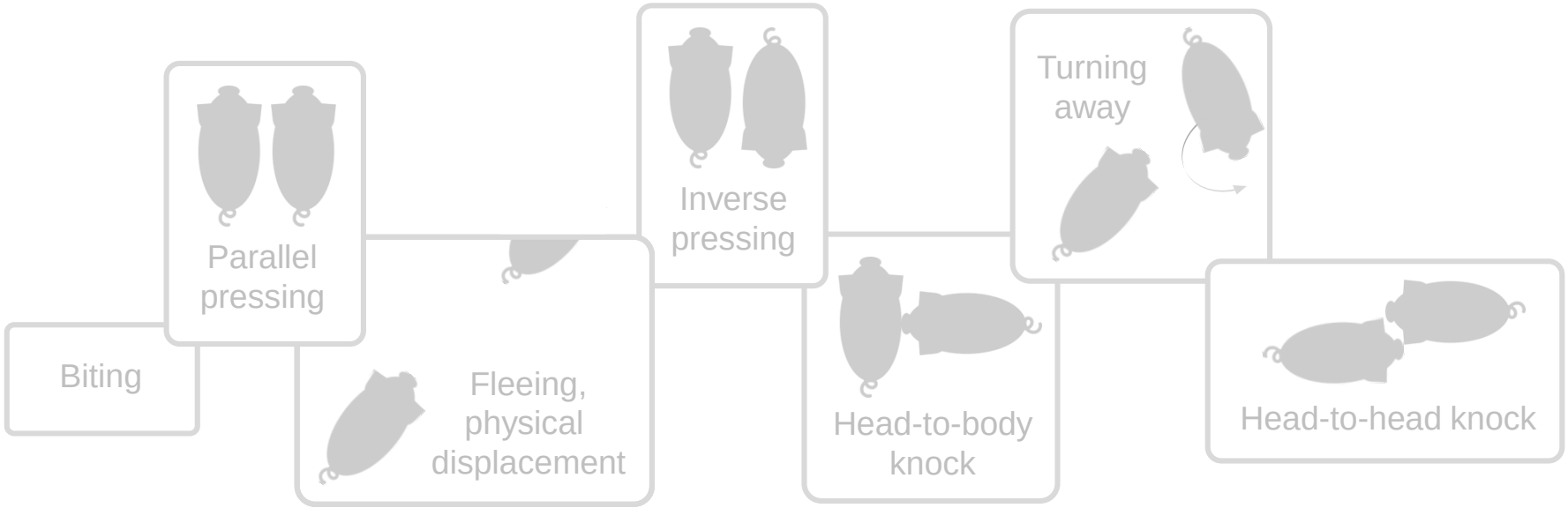




Materials & Methods

Agonistic interactions

- **Start:** Physical contact of one animal towards another (> 1s)
- **End:** Submissive behaviour of an involved animal



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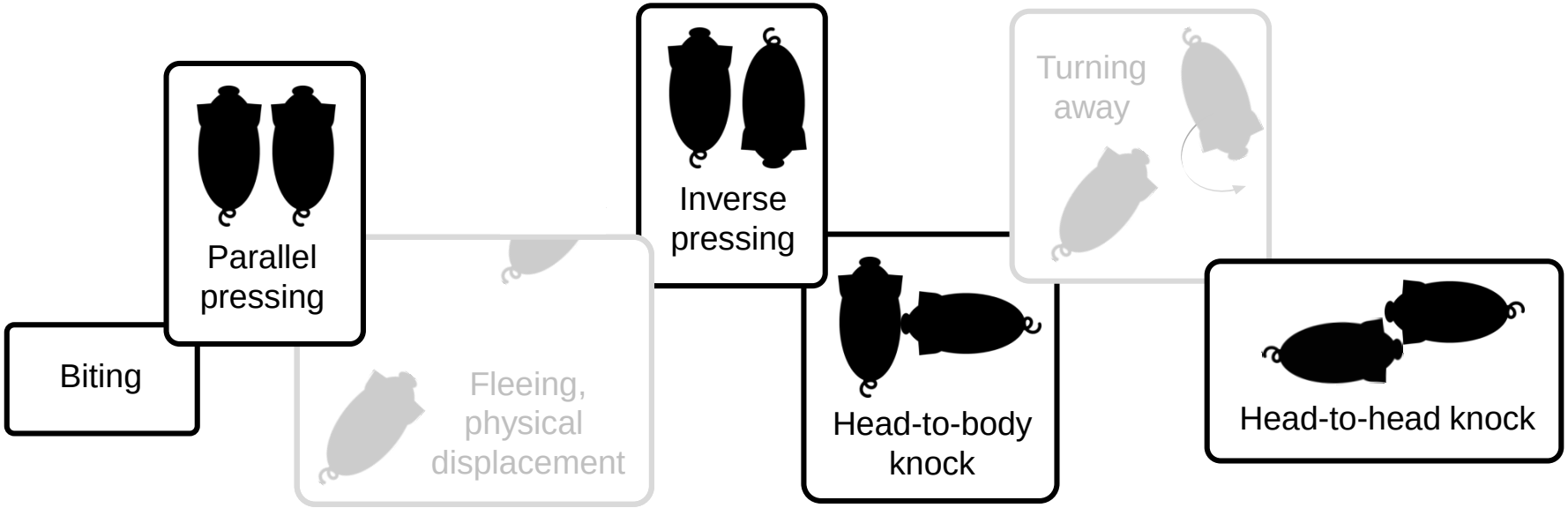

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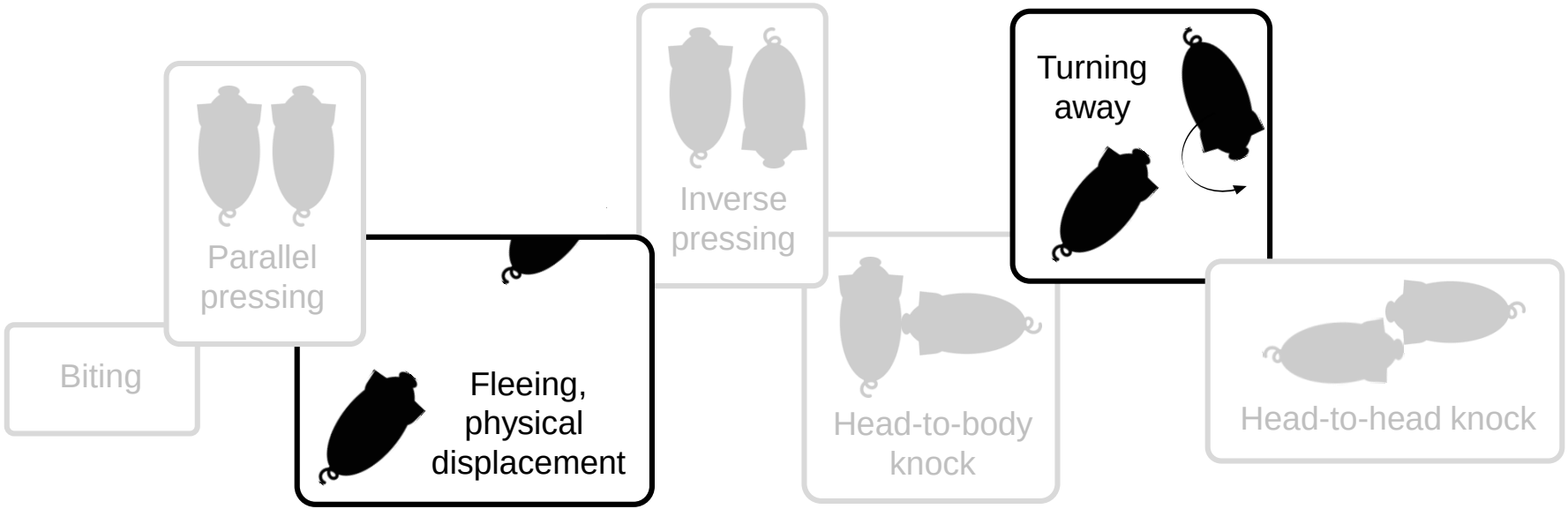
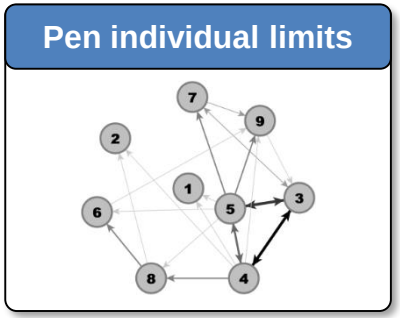


Materials & Methods

Calculation methods for significant dyads

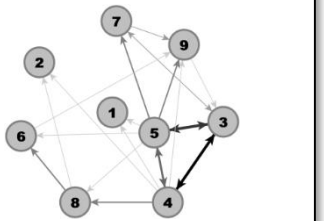


- **One-sided sign test:** Differences of won fights of **all dyadic interactions within the pen**
- **Significant dyad:**
  Difference > Upper 95% confidence interval

Materials & Methods

Calculation methods for significant dyads

Pen individual limits



- **One-sided sign test:** Differences of won fights of **all dyadic interactions within the pen**
- **Significant dyad:**
  Difference > Upper 95% confidence interval

Dyad individual limits

- **One-sided sign test:** Number of won and lost fights of **each individual dyadic interaction**
- **Significant dyad:** At least 5 agonistic interactions with unidirectional outcome (5:0; 6:0; 7:0; 7:1; …)

Materials & Methods

Resulting data sets

ALL → Including all dyadic interactions

PEN

→ Including only significant dyads according to **pen individual limits**

→ **15.2 % significant dyads**

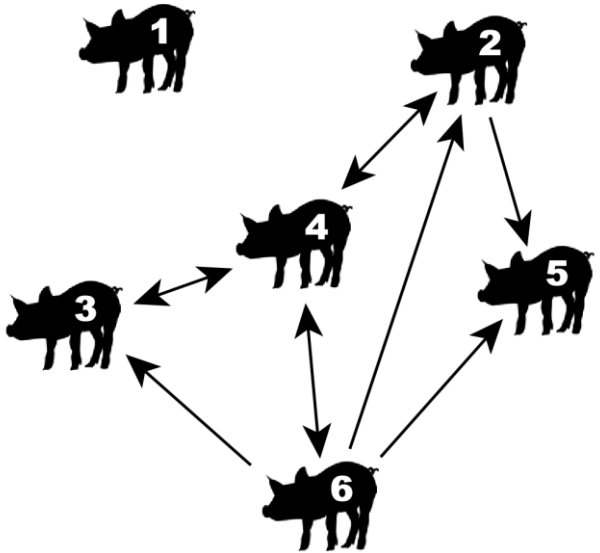
DYAD

→ Including only significant dyads according to **dyad individual limits**

→ **13.3 % significant dyads**

Materials & Methods

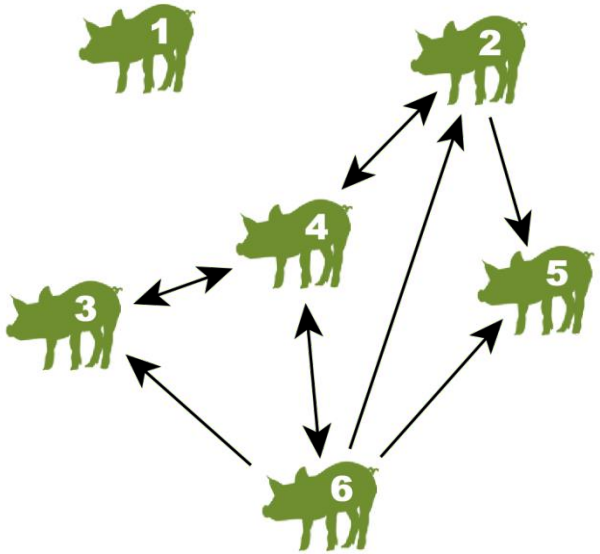
Social network analysis



- **Nodes:** Animals
- **Edges:** Agonistic interaction (Pointing from initiator to receiver of an agonistic interaction)

Materials & Methods

Social network analysis



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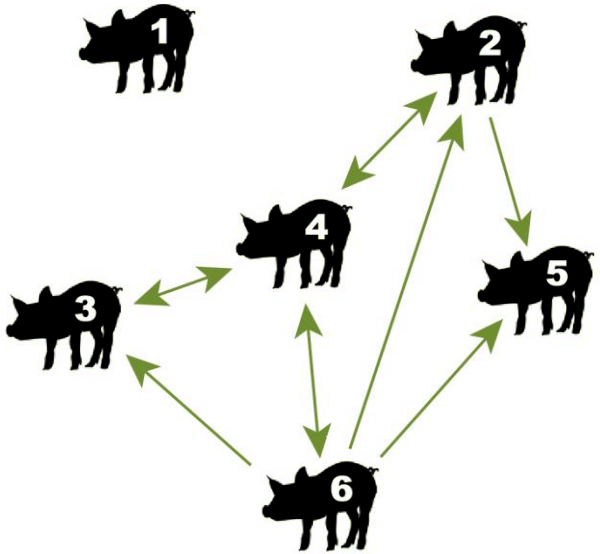

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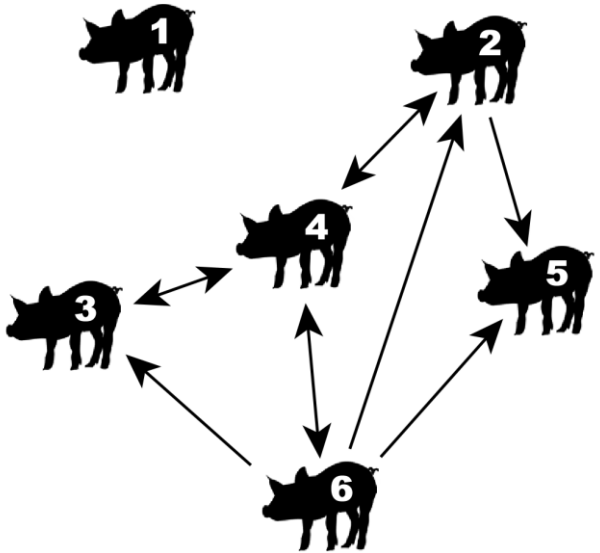

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- **Centralities:** Description of the individuals' position in the network

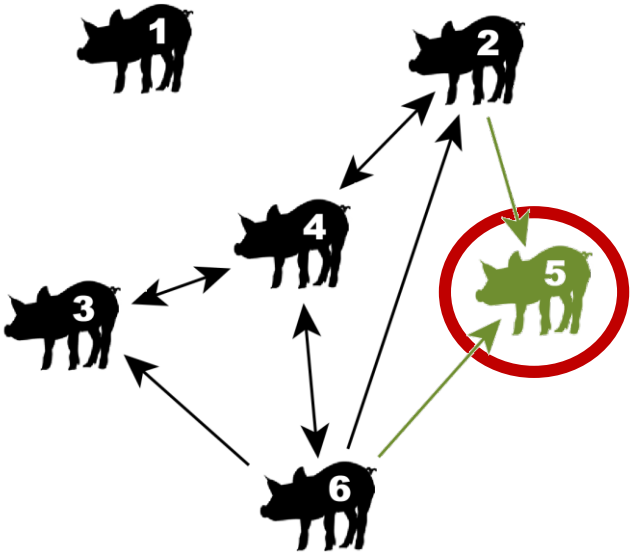
  → In-degree & Out-degree

  → Betweenness

  → Ingoing closeness & Outgoing closeness

Materials & Methods

Social network analysis



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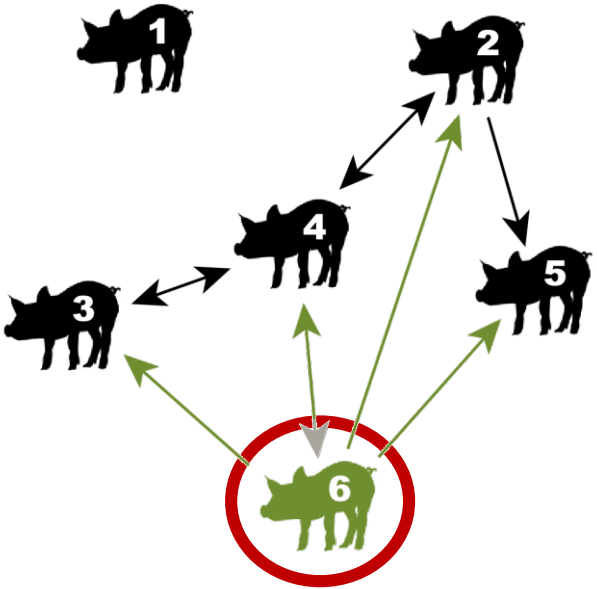

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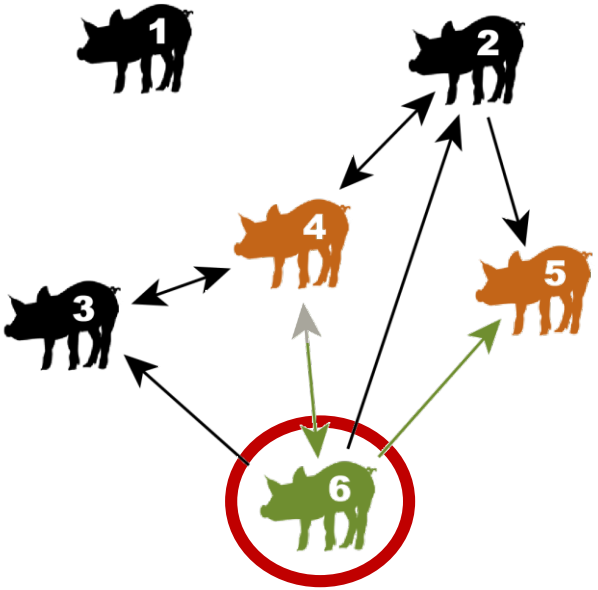

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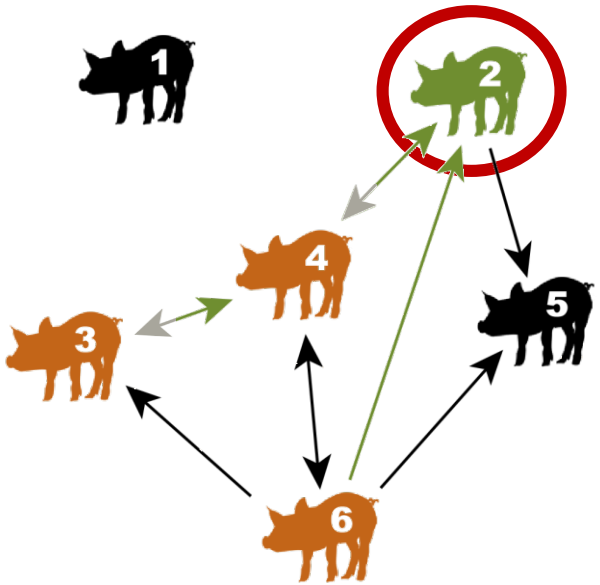

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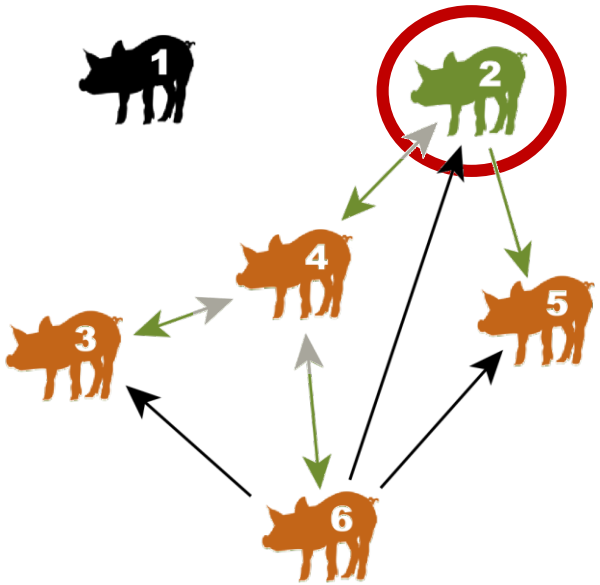

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Results

Basic information
for the resulting data sets

	ALL
Number of pens	93
Number of animals	829
Number of agonistic interactions	7,620
Ø Number of agonistic interactions/pen	81.9 ± 63.6

Results

Basic information
for the resulting data sets

	ALL	PEN
Number of pens	93	92
Number of animals	829	820
Number of agonistic interactions	7,620	3,351
Ø Number of agonistic interactions/pen	81.9 ± 63.6	36.4 ± 37.0

Results

Basic information
for the resulting data sets

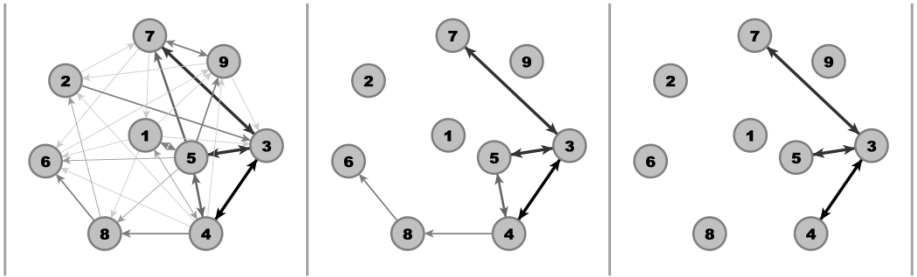
	ALL	PEN	DYAD
Number of pens	93	92	61
Number of animals	829	820	548
Number of agonistic interactions	7,620	3,351	2,495
Ø Number of agonistic interactions/pen	81.9 ± 63.6	36.4 ± 37.0	40.9 ± 44.5

Results

Basic information
for the resulting data sets

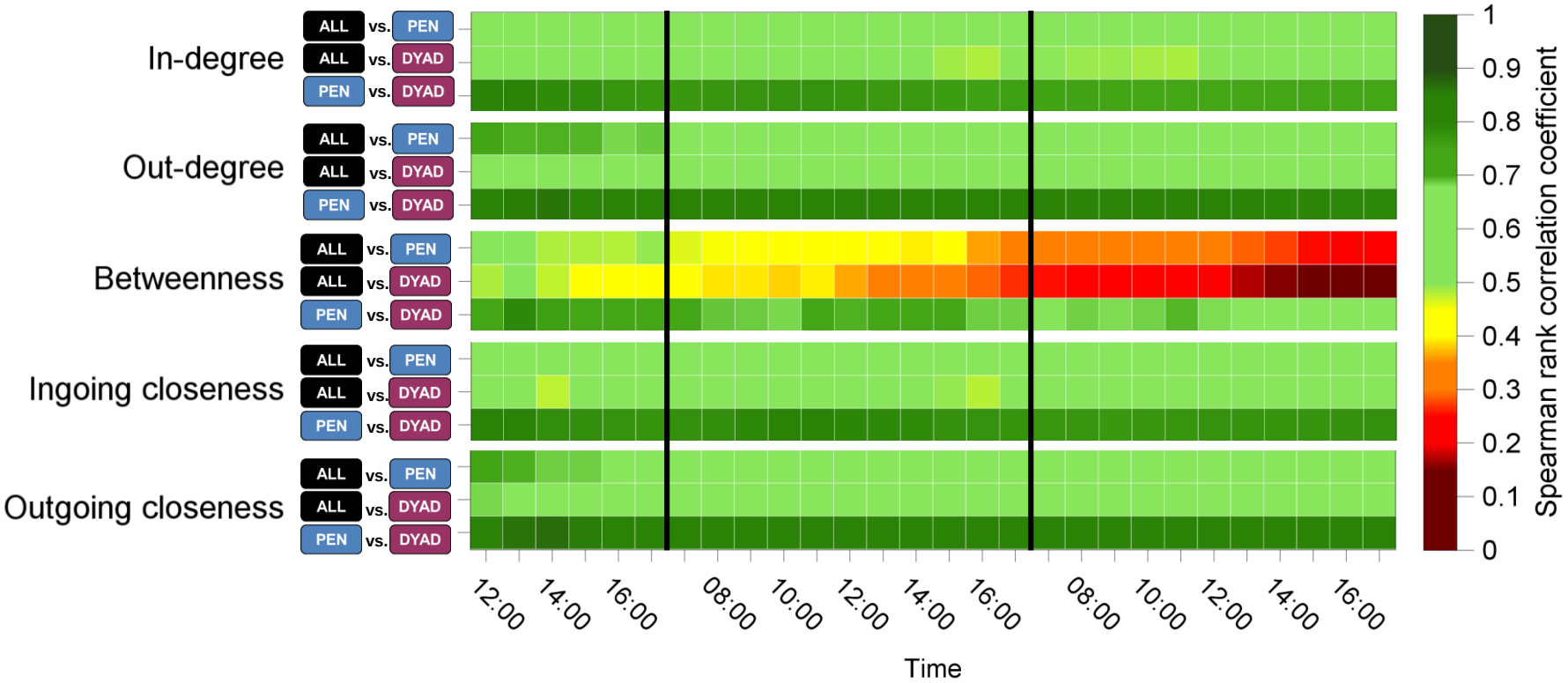
	ALL	PEN	DYAD
Number of pens	93	92	61
Number of animals	829	820	548
Number of agonistic interactions	7,620	3,351	2,495
Ø Number of agonistic interactions/pen	81.9 ± 63.6	36.4 ± 37.0	40.9 ± 44.5

Example network
at the end of video observation



Results

Comparison of the centrality parameters between the data sets



Results

Daily comparison of the centrality parameters

Discussion & Conclusion

Comparison of the centrality parameters between the data sets

- **High correlation coefficient between the data sets**

  PEN vs. DYAD

  → Similar ranking for both calculation methods of significant dyads

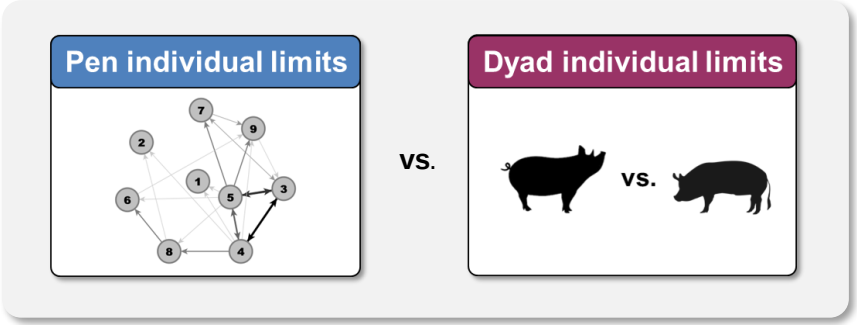
- **Only moderate correlation coefficients between the data sets**

  ALL vs. PEN & ALL vs. DYAD

  → Exclusion of insignificant dyads has an immense impact on the centrality parameters

Discussion & Conclusion

General comparison of the two calculation methods



- **Dyad individual limits are too strict**
  - → No information for groups with a low number of agonistic interactions
  - → Pen individual limits should be preferred as all dyadic interactions in the group are considered

Discussion & Conclusion

Daily comparison of the centrality parameters

Day 1 to day 2 **vs.** Day 1 to day 3 **vs.** Day 2 to day 3

- **Day 2 vs. day 3: Highly positive correlation coefficients**
  - → Stable centrality parameters achieved two days after mixing
  - → Two days of video observation sufficient in order to get reliable results
  - → Reduction of time-consuming and labour intensive video analysis

Thank you for your attention!

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Social network analysis in pigs: impacts of significant dyads on general network and centrality parameters

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3 mixing events
- Weaned piglets
- Fattening pigs
- Gilts

In general, one animal is considered dominant over another animal if it has won more fights than its opponent. Whether this difference in won and lost fights is significant is neglected in most studies. Thus, the present study evaluates the