Sociability in grazing dairy cows is related to individual social network properties and behavioural synchrony

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*Kees van Reenen, Joop van der Werf, Bas Engel, Inma Estevez, Ane Rodriguez-Aurrekoetxea, Lysanne Snijders*
Introduction

Sociability

- The motivation of individuals to be close to conspecifics
- Animals show individual differences – underlying trait
- ‘Gold standard’: Social Runway Test

Latency to make contact with conspecifics
Introduction

- In dairy cows kept indoors, sociability – measured in a social runway test – is related to the behaviour at group level\(^1\)
  
  - High latencies
  - High latencies
  
  \(\rightarrow\) behaviour less synchronised
  \(\rightarrow\) less close to other cows

Key parameter:
Distance to nearest neighbour

\(^1\)Gibbons et al., 2010. Appl Anim Behav Sci 122, 84-91.
Research questions

• Is the response to a social runway test performed **outdoors** consistent?

• Is the response to a social runway test performed **outdoors** associated with behavioural synchrony?

• Is the response to a social runway test performed outdoors associated with **distance to nearest neighbour on pasture**?

and other **social network properties** of the individual?
Materials and methods

Experiment

• Grazing experiment
• Comparison of three grazing systems
• 20 cows per system – 60 cows in total
Materials and methods

Social runway test

- Performed twice in each cow, 8 weeks in-between tests
- Performed on cow path (concrete) from pasture to barn
- Latencies to reach 5m or 2m from group mates
- Max duration 300 sec

Test animal in startbox

18 m RUNWAY

Group of 9 herdmates

5m  2m
Materials and methods

*Social runway test*
Materials and methods

Location data

• XY coordinates recorded during 105 visual scans in each group over a 14-day period (*Chickitizer software*)
Materials and methods

Location data

• Transformation of location data into proximity data

Proportion of scans that cows make ‘contact’ ≤ 2m

Association matrix

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Materials and methods

Social network properties

• Social network analysis with UCINET and SOCPROG software

• Calculation of individual network properties = connectivity metrics

  ➢ Strength = index of sum of associations of an individual with all other individuals (~ distance to nearest neighbour)

  ➢ Eigenvector centrality (EC) = measure of how well an individual is connected to other well-connected individuals
Materials and methods

Sensor data

• 24 hours/day, 7 days/week

Standing/lying

‘IceQube’
Materials and methods

*Synchonony of standing/lying from sensor data*

Time on pasture divided in scans: 15 min inter-scan interval

For each scan determine:
• Is herd synchronous, i.e. ≥ 60% are doing the same
• Is individual cow synchronous with the herd
• Individual measure of synchrony

\[
\frac{\#\text{scans synchronous with herd}}{\#\text{scans herd is synchronous}} \times 100\%
\]
Results

Response to social runway test

Large variation in response between individuals

Average latency to reach 2m (sec)
Results

Repeatability of response to social runway test

Repeatability = $\frac{\sigma^2_{\text{cow}}}{\sigma^2_{\text{cow}} + \sigma^2_{\text{error}}}$

- Latency to 5m: 0.48 ($P < 0.01$)
- Latency to 2m: 0.30 ($P < 0.01$)

Average latencies used in analysis of covariance
Results

**Consistency of behavioural synchrony**

Average synchrony per month (May – October)

- All correlations between averages per month are significant ($R_{\text{spearman}} 0.30 - 0.74$, $N=60$), $P < 0.05$)

- Average level of synchrony averaged over 6-month grazing season was used in analysis of covariance
Results

*Relationship between social runway test and individual social network properties & behavioural synchrony*

**Analysis of covariance**

- Latencies to 2 and 5 m negatively associated with Strength, Eigenvector centrality, and behavioural synchrony

- Regression coefficient ($\beta$): similar for grazing systems
Conclusions

• Individual differences in response to social runway test and behavioural synchrony are consistent over time.

• Short latencies in the social runway test corresponded to close proximity, high connectedness to herd mates, and high behavioural synchrony.

• Sociability is a stable personality trait in grazing dairy cows that influences behavioural dynamics at group level.
Thank you for your attention!