NSIF Lauren Christian Graduate Student Award

Mary Kate Hollifield

October 25th, 2023
St. Louis, Missouri

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Determining the stability of accuracy of genomic estimated breeding values in future generations in commercial pig populations

Mary Kate Hollifield,[†,1] Daniela Lourenco,[†] Matias Bermann,[†] Jeremy T. Howard,[‡] and Ignacy Misztal[†]

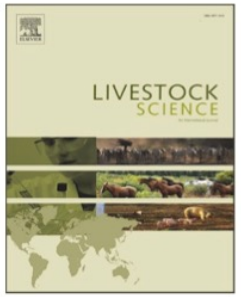
Impact of including the cause of missing records on genetic evaluations for growth in commercial pigs

Mary Kate Hollifield,[†,1] Daniela Lourenco,[†] Shogo Tsuruta,[†] Matias Bermann,[†] Jeremy T. Howard,[‡] and Ignacy Misztal[†]

JDS Communications®
2022; 3:343–347

Impact of blending the genomic relationship matrix with different levels of pedigree relationships or the identity matrix on genetic evaluations

Mary Kate Hollifield,* Matias Bermann, Daniela Lourenco, and Ignacy Misztal



Exploring the statistical nature of independent chromosome segments

Mary Kate Hollifield *, Matias Bermann, Daniela Lourenco, Ignacy Misztal

Current Research

- Estimation of heritability with genomic information by Method R (under review)
- Estimation of heritabilities and genetic correlations in large genomic models using predictivity
- Estimating genetic parameters of digital behavior traits and its relationship with production traits in purebred pigs *

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Estimating genetic parameters of digital behavior traits and its relationship with production traits in purebred pigs

Mary Kate Hollifield*, Ching-Yi Chen†, Eric Psota†, Justin Holl†, Daniela Lourenco*, Ignacy Misztal*

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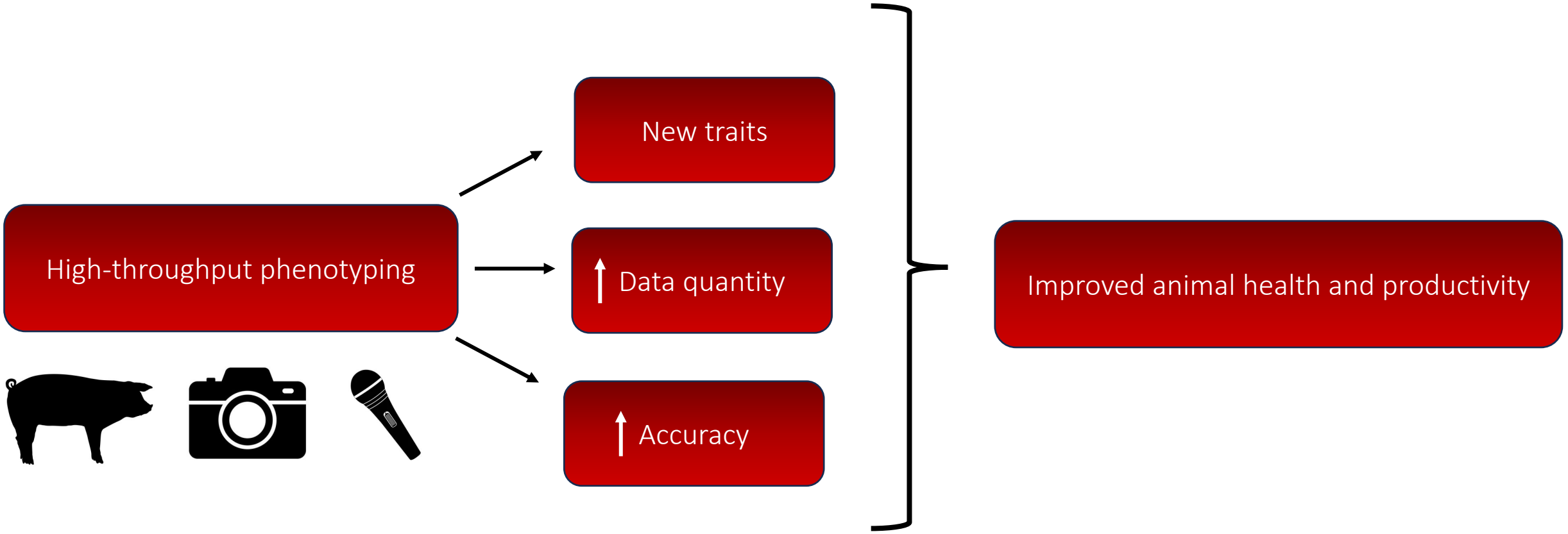
Introduction



Objectives

- Create data quality control SOP
- Identify behavior patterns
- Estimate genetic parameters
- Genetic correlation with production traits
- Determine if full recording period is needed

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Materials & Methods

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- Day-wise behavioral data extracted from video recordings
  - 12 pens, one camera per pen
- Two lines
- Females only
- 2008 pigs x 70 days = 140,560 data points
- Behavior traits:
  - Eating time, drinking time, distance
  - Laterally lying time, sternally lying time, sitting time, standing time

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Initial Observations

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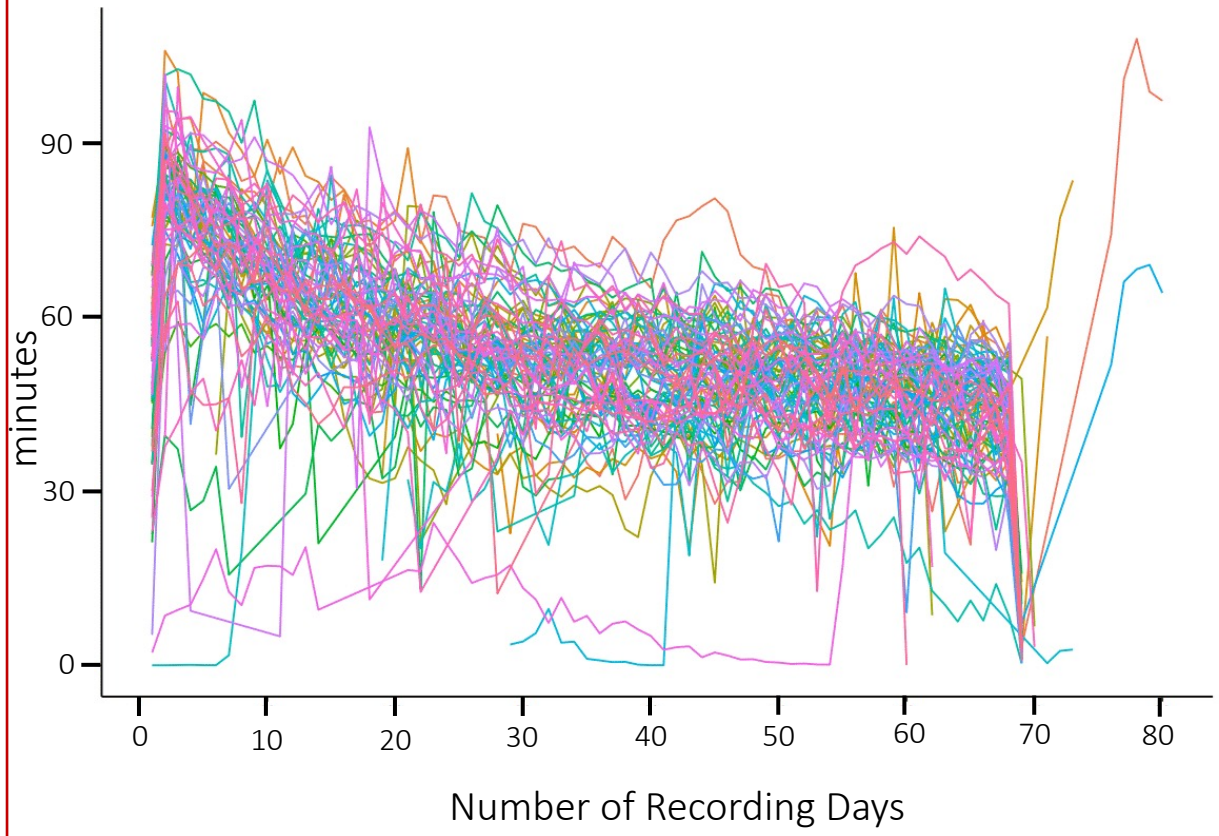
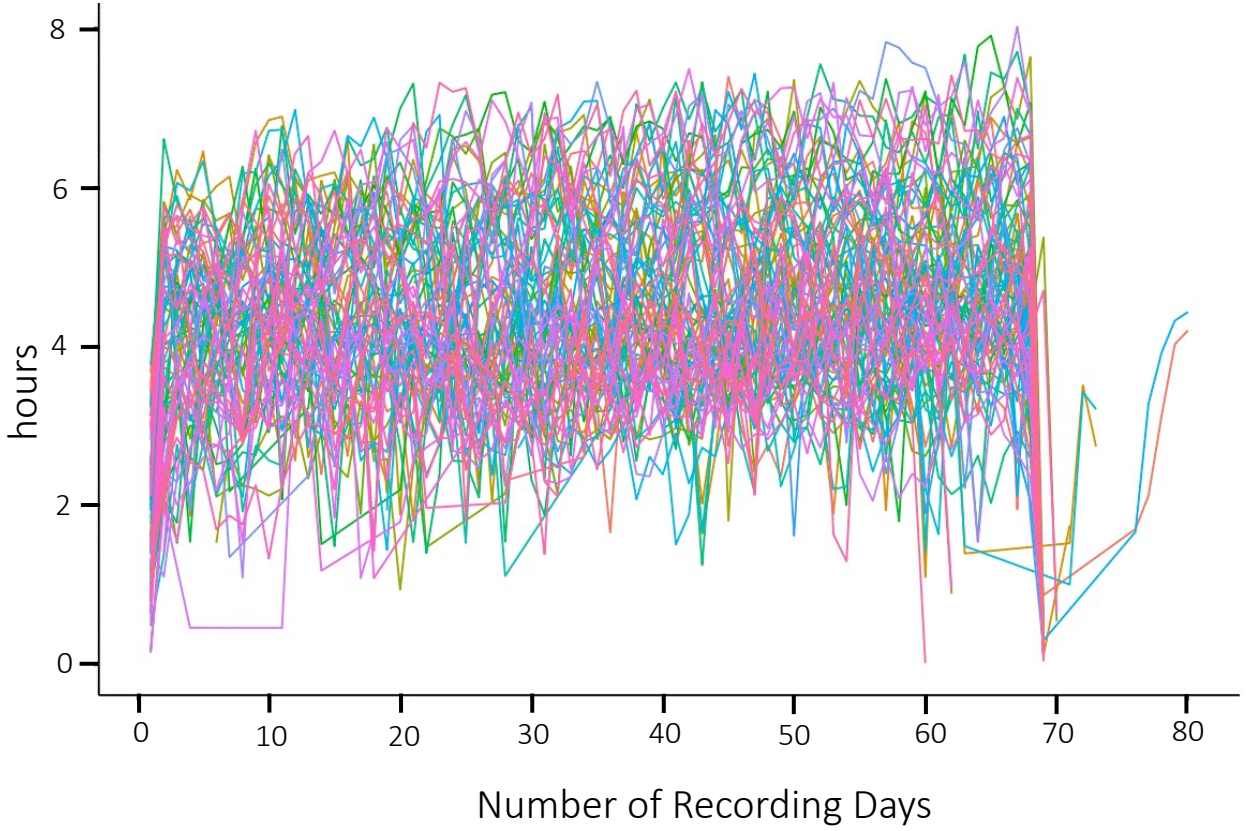
Average eating time per batch



Average lateral lying time per batch



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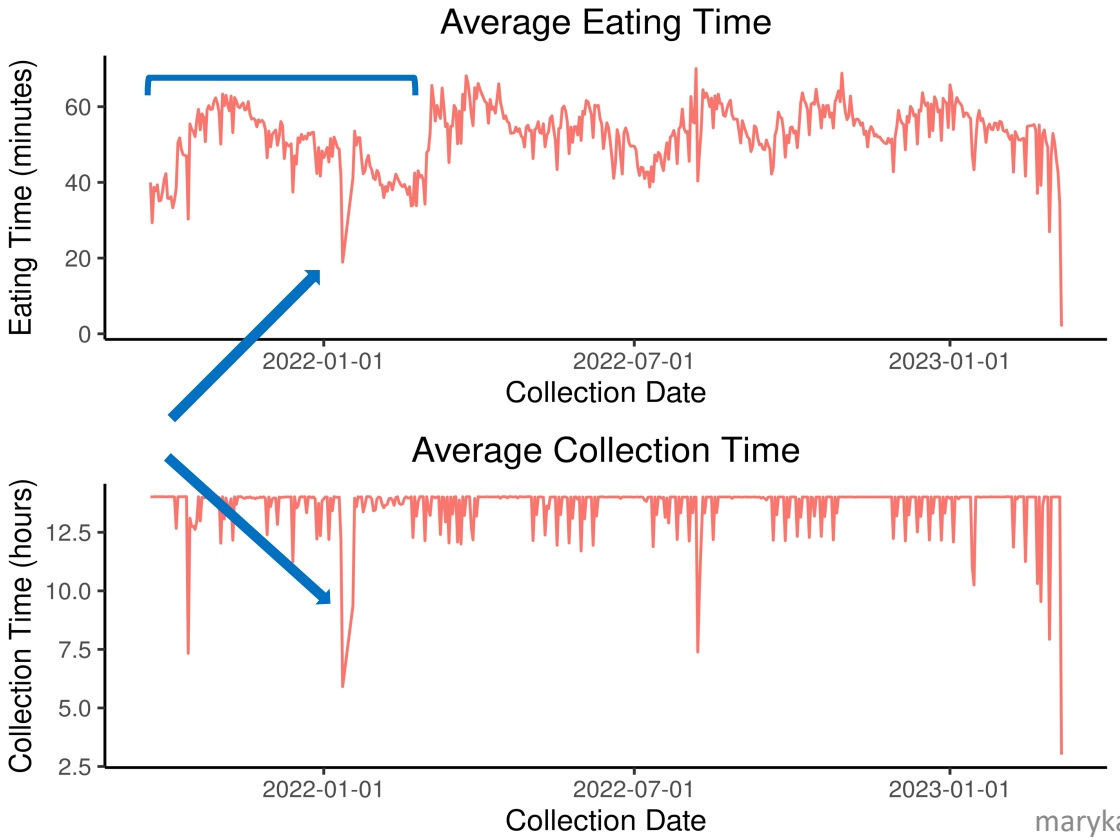
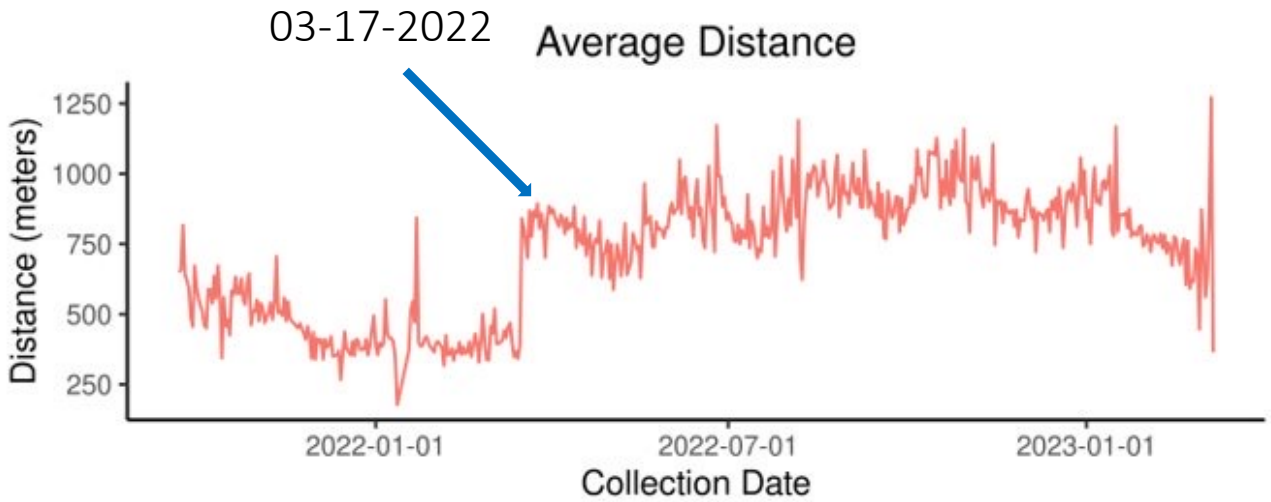
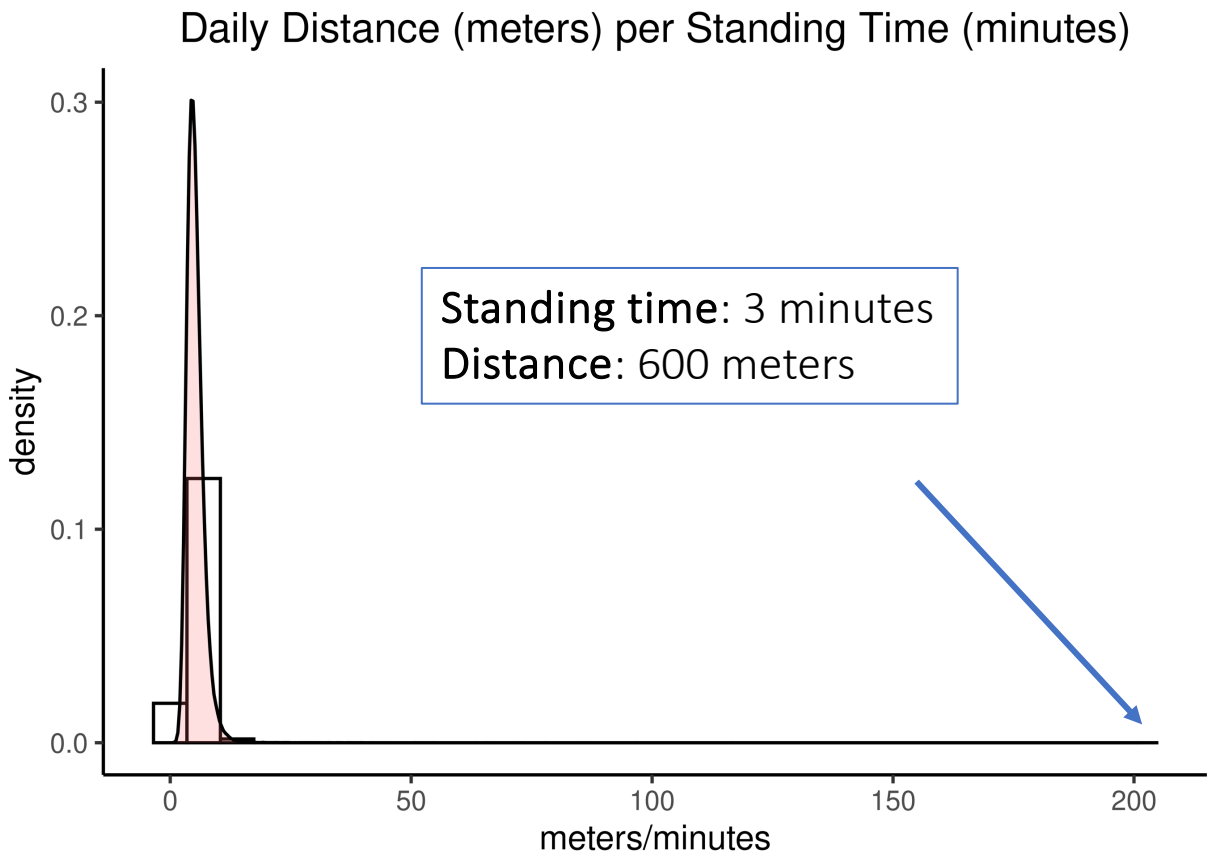
Recording Time

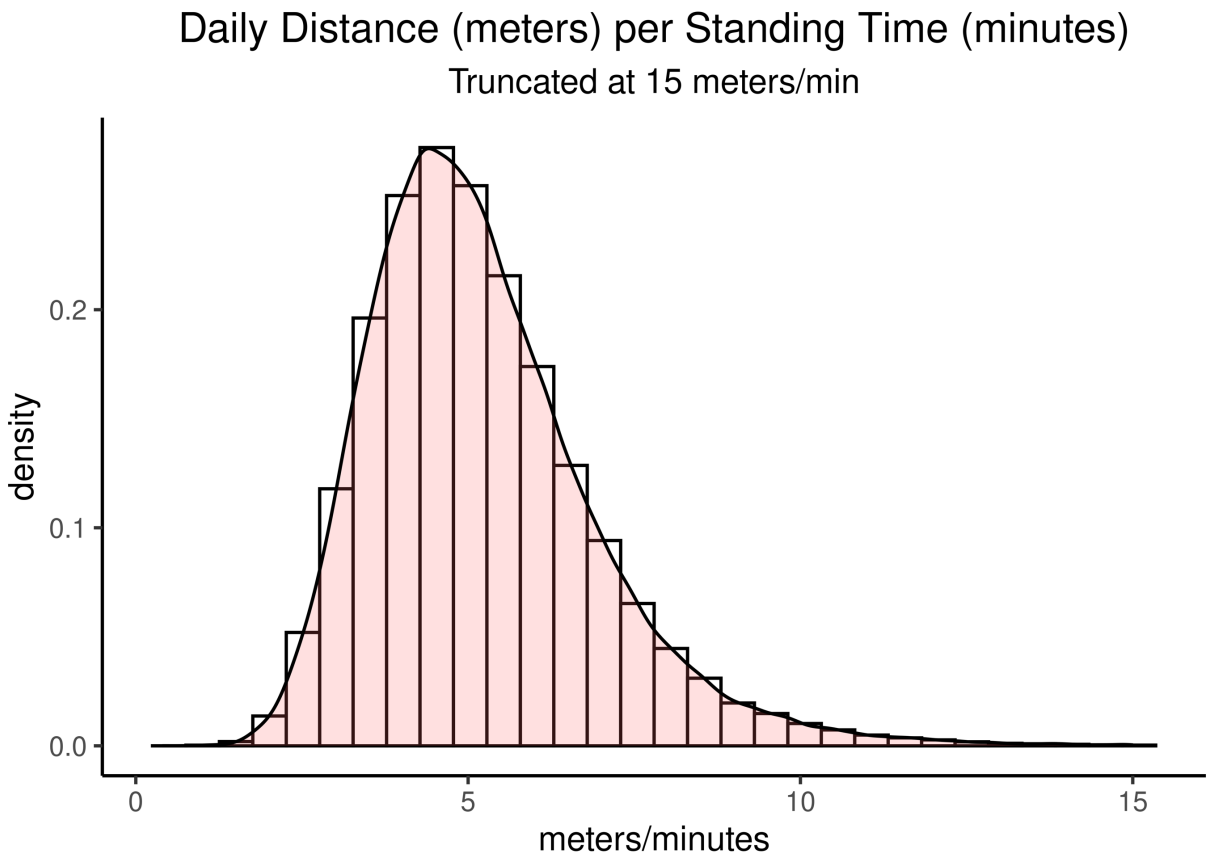
- Less consistent observations prior to April 2022
- Disruptions with <8 hours of recording time per day





Trait Definitions





Data Cleaning SOP

- Remove:
  - All data before 03-17-2022
  - Start and end day records
  - Records from the day the animal was culled
  - Records from days with less than 8 hours of recording time
  - Distance/standing time records < 15 meters/minute
- Standardize all records to 14 hours

	Before Cleaning	After Cleaning	After Cleaning + Off-test
# Individuals	2008	1327	1079
# Records	119812	77423	71873

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Phenotypic Correlations

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	Eat	Drink	Lat. Lying	Stern. Lying	Sitting	Standing	Distance	ADG	BF	LD	ADFI_EBV
Eat		0.15	-0.31	-0.01	-0.04	0.59	0.26	0.06	0.05	0.05	0.08
Drink			0.03	-0.19	0.05	0.20	0.16	-0.02	0.05	-0.09	-0.03
Lat. Lying				-0.82	-0.20	-0.52	-0.23	-0.07	-0.00	-0.14	-0.09
Stern. Lying					0.09	-0.03	-0.14	0.13	0.01	0.19	0.17
Sitting						-0.14	-0.06	0.11	-0.02	0.09	0.10
Standing							0.63	-0.10	0.00	-0.06	-0.13
Distance								-0.18	-0.01	-0.14	-0.23
ADG									0.29	0.52	0.37
BF										0.10	-0.9
LD											0.25
ADFI_EBV											

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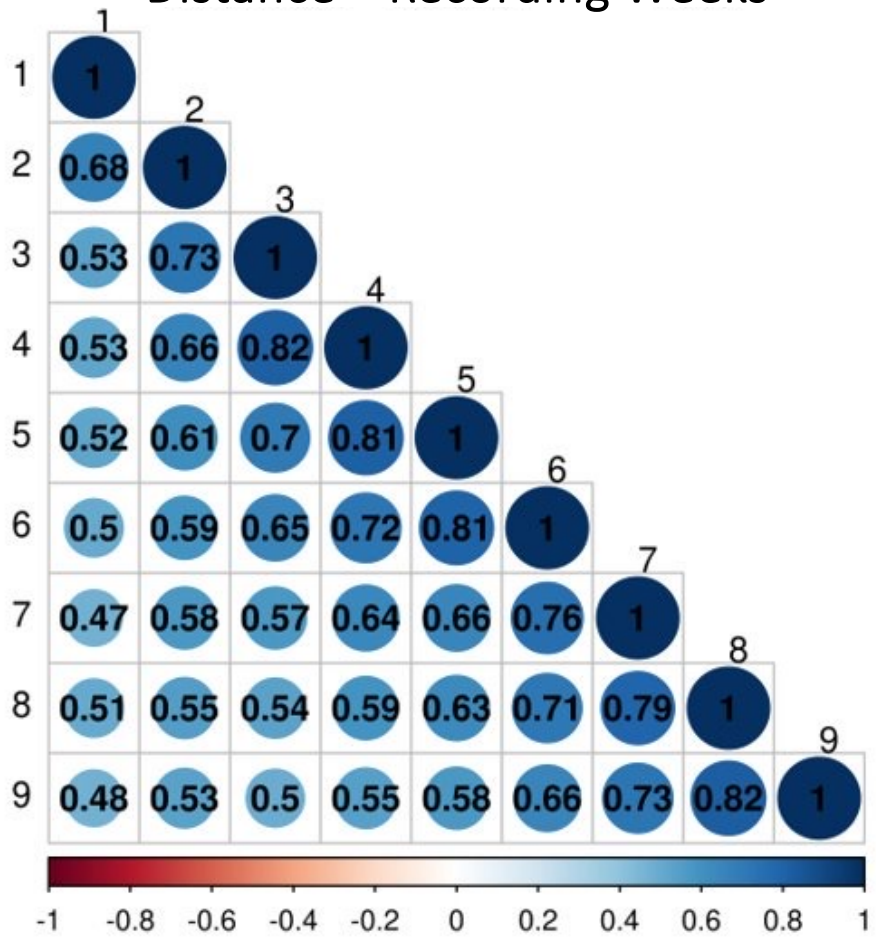
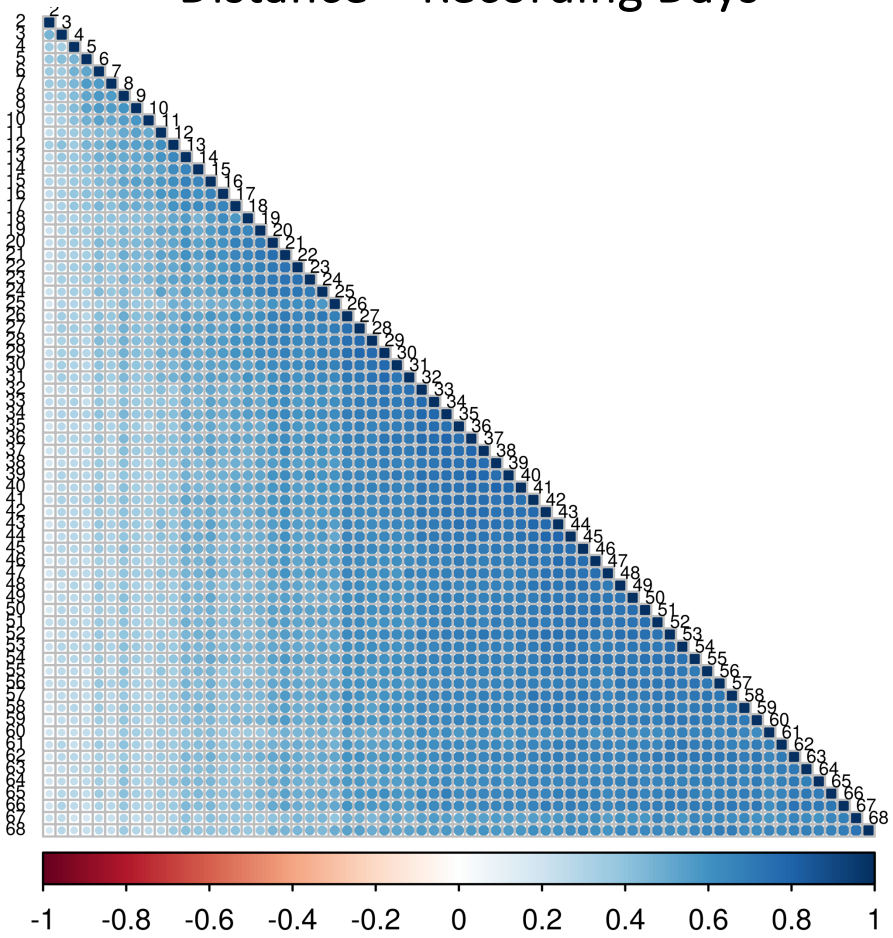
Distance – Recording Weeks



Distance – Recording Days



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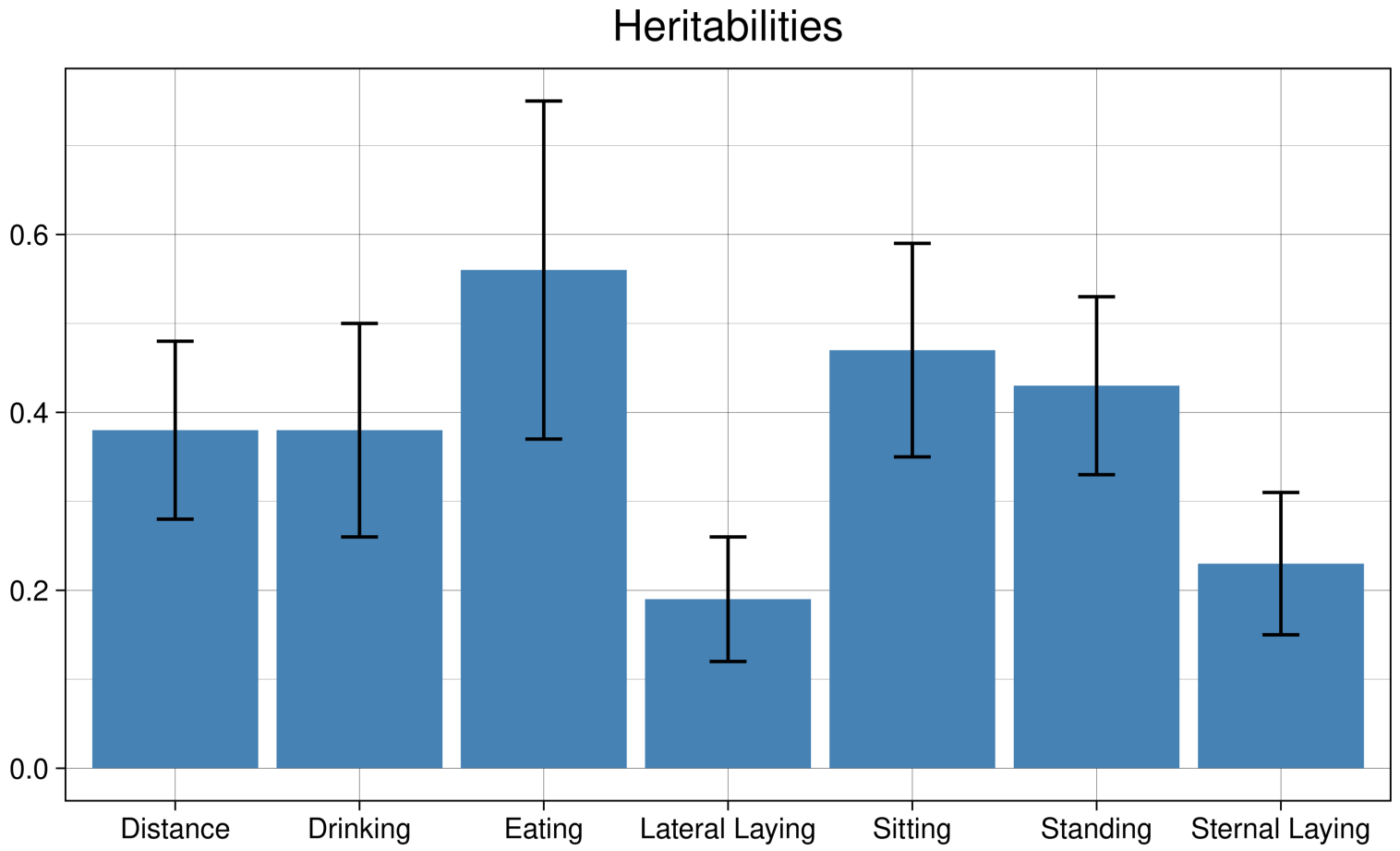
Model

- *y = line + CG + litter + animal + residual*
- CG: Off-TestDay_Year
- airemlf90



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Genetic Correlations

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	Eat	Drink	Lat. Lying	Stern. Lying	Sitting	Standing	Distance	ADG	BF	LD
Eat		0.38	-0.40	-0.41	-	0.69	0.45	-	0.18	-
Drink			-0.33	-0.43	0.26	0.62	0.44	0.32	0.18	-
Lat. Lying				-0.84	-0.23	-0.72	-0.68	0.50	0.19	0.24
Stern. Lying					-0.25	-0.62	-0.58	0.26	-	-
Sitting						-0.48	-	0.26	-	0.19
Standing							0.93	-0.56	-0.17	-0.37
Distance								-0.57	-0.27	-0.48
ADG									0.56	0.84
BF										0.21
LD										

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- Two trait model: **ADG, Standing Time Period**
- *y = line + CG + litter + animal + residual*

Standing Time Period	Genetic Corr	Phenotypic Corr
All	-0.56 ± 0.11	-0.16
Days 1-13	-0.41 ± 0.10	-0.08
Days 14-26	-0.40 ± 0.10	-0.06
Days 27-40	-0.43 ± 0.09	-0.07
Days 41-54	-0.51 ± 0.08	-0.19
Days 55-68	-0.55 ± 0.10	-0.28

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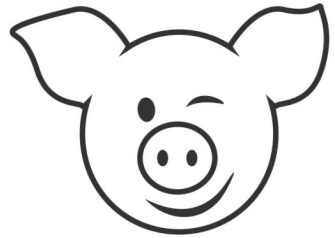
- Two trait model: **BF, Behavior trait time interval**
- *y = line + CG + litter + animal + residual*

Genetic Correlations

Time Period	Eating Time	Drinking Time	Lateral Laying	Sternal Laying	Sitting	Standing	Distance
All	0.18 ± 0.07	0.21 ± 0.11	0.19 ± 0.09	-0.04 ± 0.09	-0.01 ± 0.08	-0.17 ±0.07	-0.26 ± 0.09
Days 1-13	0.22 ± 0.07	0.29 ± 0.12	0.26 ± 0.10	-0.22 ± 0.13	0.11 ± 0.12	-0.10 ± 0.07	-0.23 ± 0.14
Days 14-26	0.23 ± 0.08	0.37 ± 0.19	0.21 ± 0.16	-0.18 ± 0.16	-0.03 ± 0.09	-0.05 ± 0.07	-0.11 ± 0.10
Days 27-40	0.19 ± 0.08	0.21 ± 0.13	0.20 ± 0.11	-0.08 ± 0.10	-0.01 ± 0.07	-0.14 ± 0.08	-0.21 ± 0.14
Days 41-54	0.11 ± 0.08	0.14 ± 0.10	0.14 ± 0.09	0.05 ± 0.09	-0.02 ± 0.08	-0.22 ± 0.09	-0.34 ± 0.13
Days 55-68	0.05 ± 0.08	0.02 ± 0.16	0.13 ± 0.09	0.14 ± 0.10	-0.04 ± 0.09	-0.28 ± 0.08	-0.37 ± 0.10

Conclusions

- Digital Phenotyping -> Alternative method to capture novel phenotypes in high volume
- Quality control is needed prior to any analysis or interpretation of data
- Behavior traits have low to moderate correlations with production traits
- Digital phenotyping provides opportunity for enhancing genetic gain



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Thank you!

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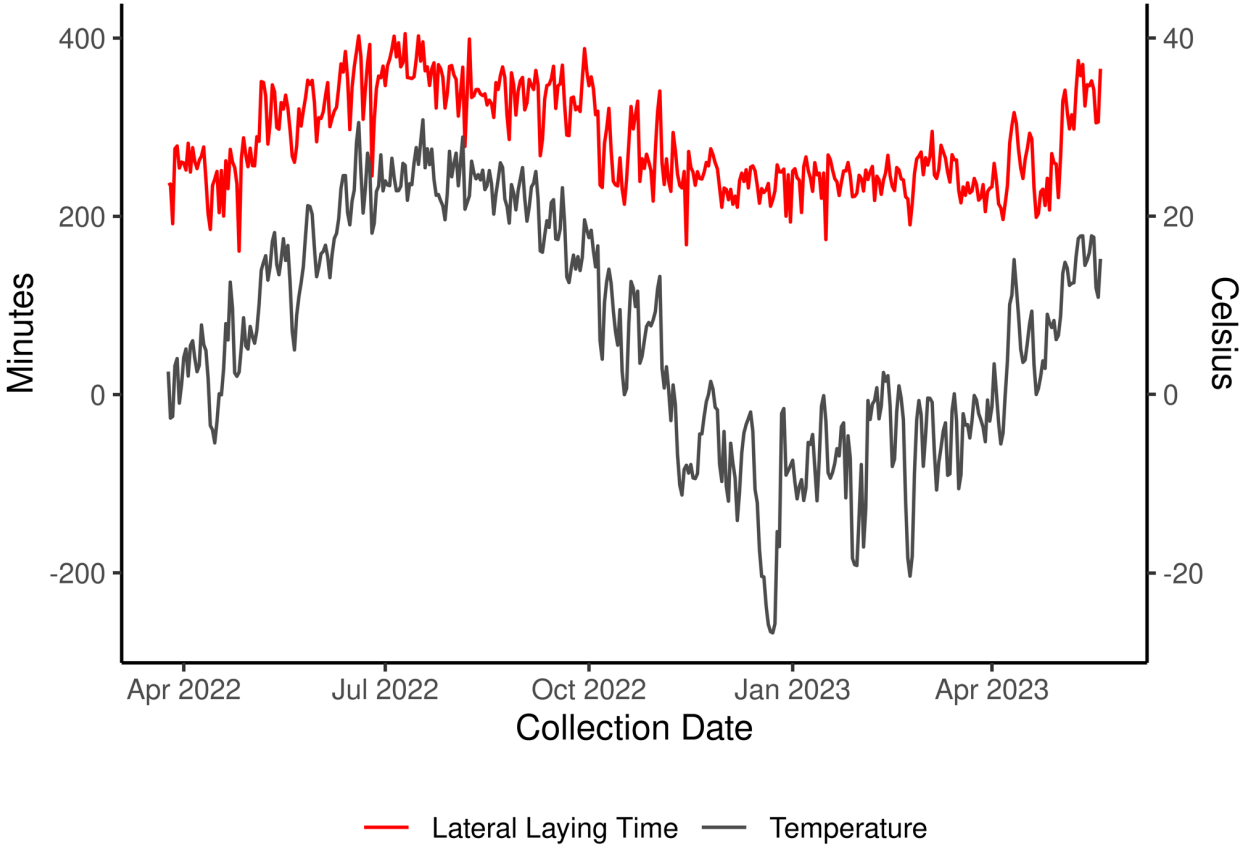
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Apr 2022
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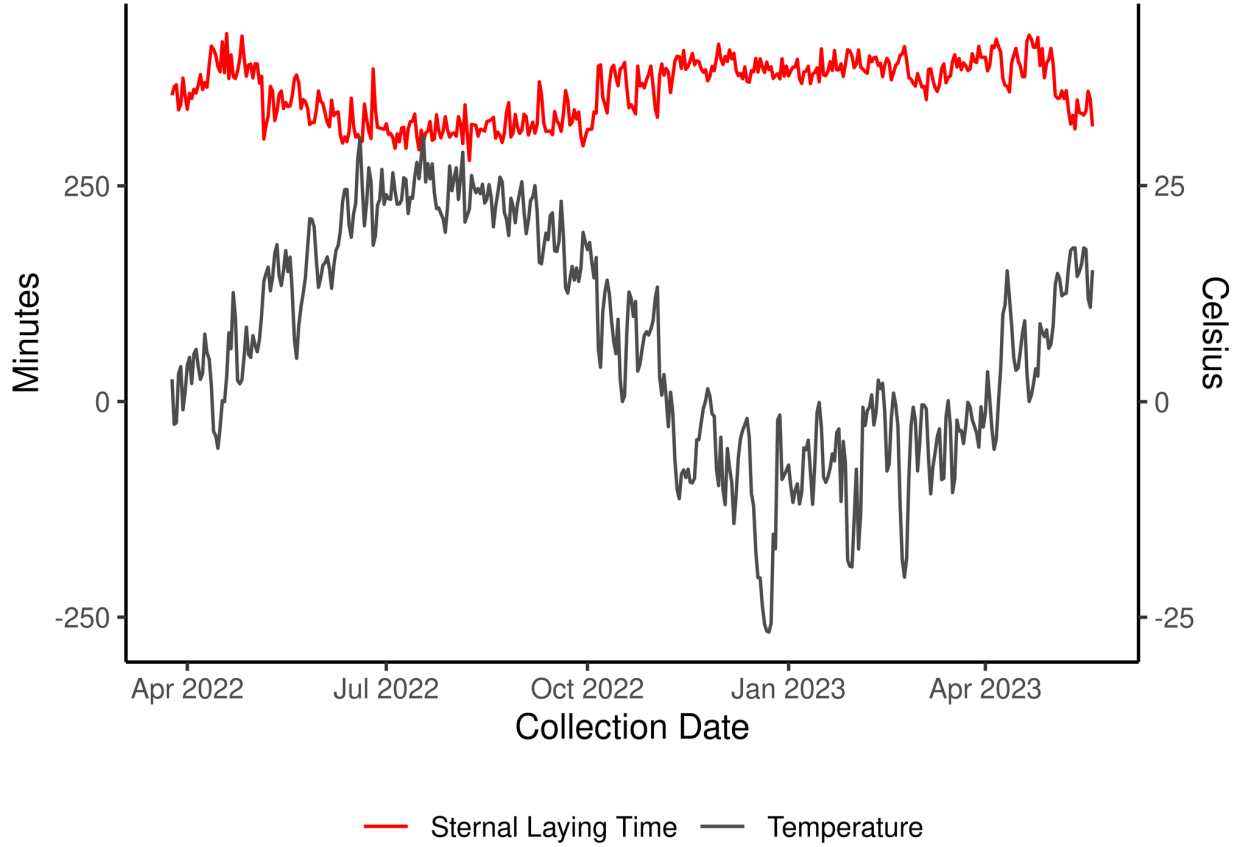
Apr 2023
Collection Date
Lateral Laying Time
Temperature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Jan 2023
Apr 2023
Collection Date
Sternal Laying Time
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Trait Statistics

	Min	Mean	Max	SD
Eating	0.0	56.5	166.0	19.5
Drinking	0.0	7.3	84.6	4.5
Lateral Lay	6.1	287.4	714.1	90.7
Sternal Lay	79.8	359.1	716.8	73.6
Sitting	0.1	22.9	204.25	17.9
Standing	2.8	170.5	611.3	52.0
Distance	30.0	872.4	3589.5	356.5