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DEGLI STUDI
FIRENZE



Exploring the retention of learning in dairy cows exposed to Virtual Fencing after 90 days of non-use

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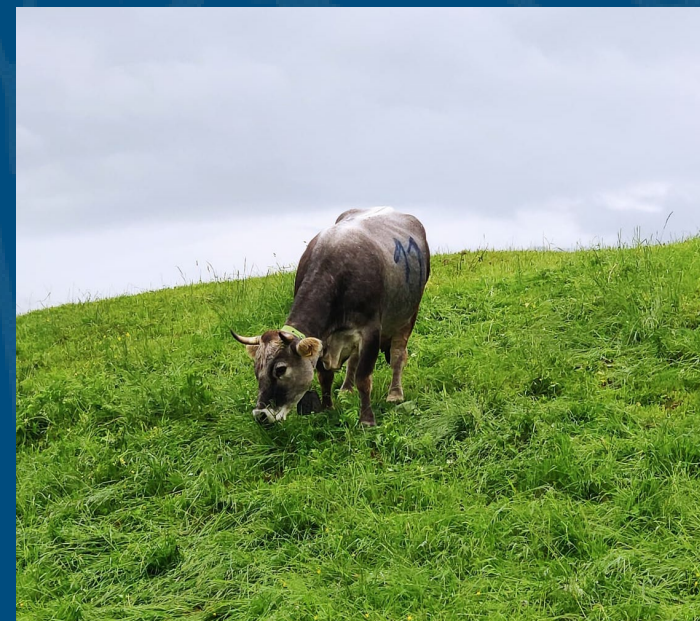
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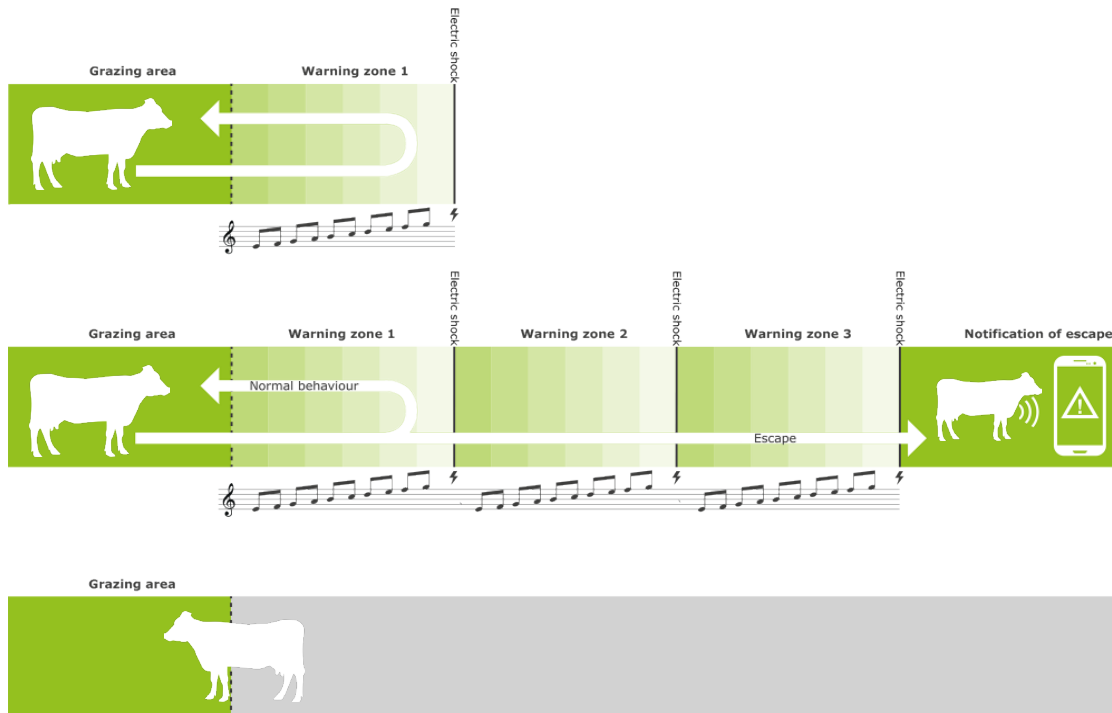
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Virtual Fencing technology for grazing management

- In Virtual Fencing (VF) system the physical boundaries are replaced by virtual ones
- The containment of animals is ensured by the delivery of 2 deterrent stimuli: an acoustic warning (AW), followed by an electrical pulse (EP) if the animal continues to move away from the virtual boundary



Virtual Fencing technology for grazing management

TRAINING

2 - 4 days to learn



✓ GRAZING

Collars used year-round
to manage animal at
pasture

SEASONAL GRAZING

Collars usage of 3-6 months
followed by a period of non-
use

Aim of the study

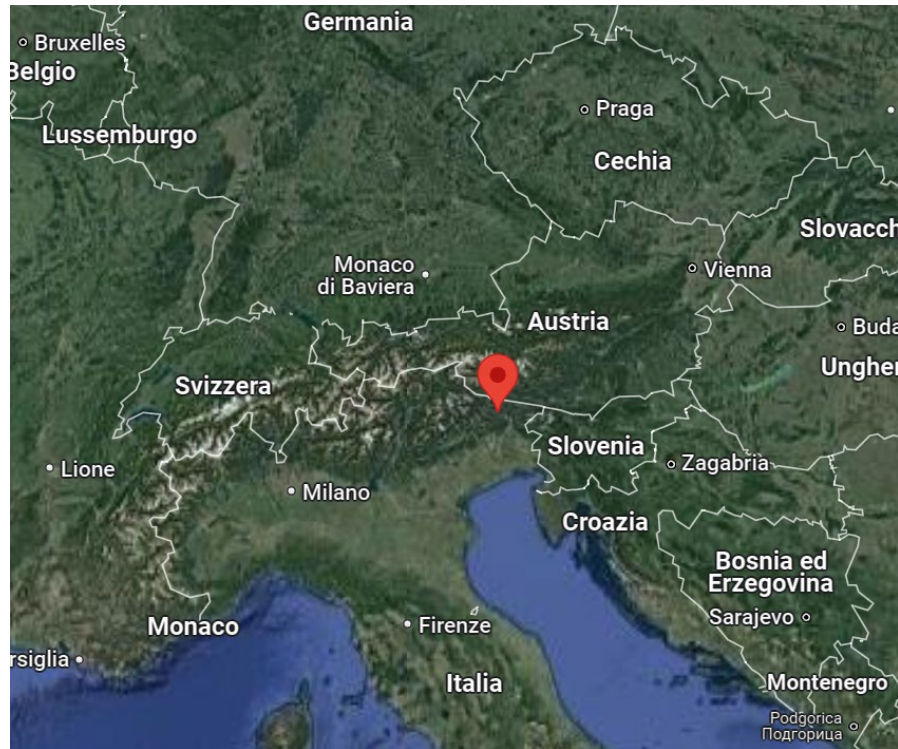
Can animals retain this
learning after a period of
non-use?



Material and methods

STUDY AREA

The study was conducted during the summer of 2023 in a lowland pasture located in the Carnia territory (Friuli Venezia Giulia Region) of 3 ha in total



ANIMALS

Mixed dairy herd consisting of lactating cows

- 14 Grigia Alpina
- 3 Pezzata Rossa
- 4 Jersey



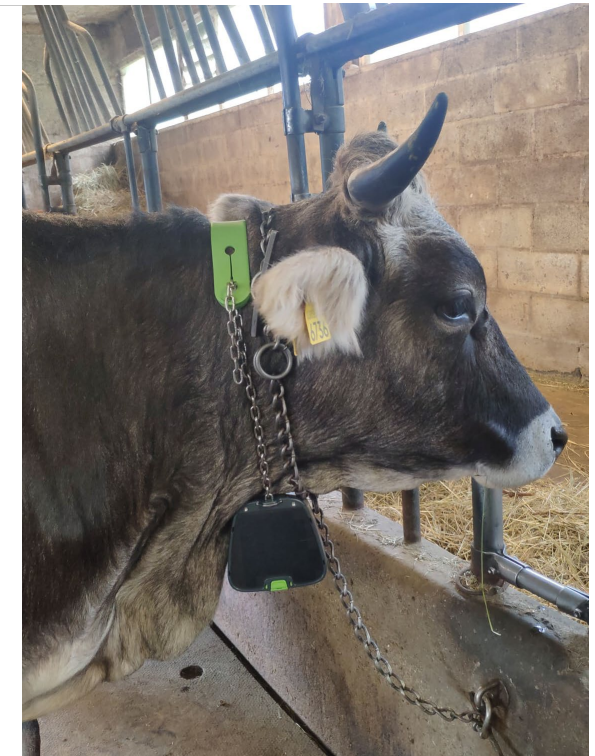
Material and methods

EXPERIMENTAL DESIGN AND COLLARS

Learning period (L)
11 days

Re-learning period (RL)
11 days

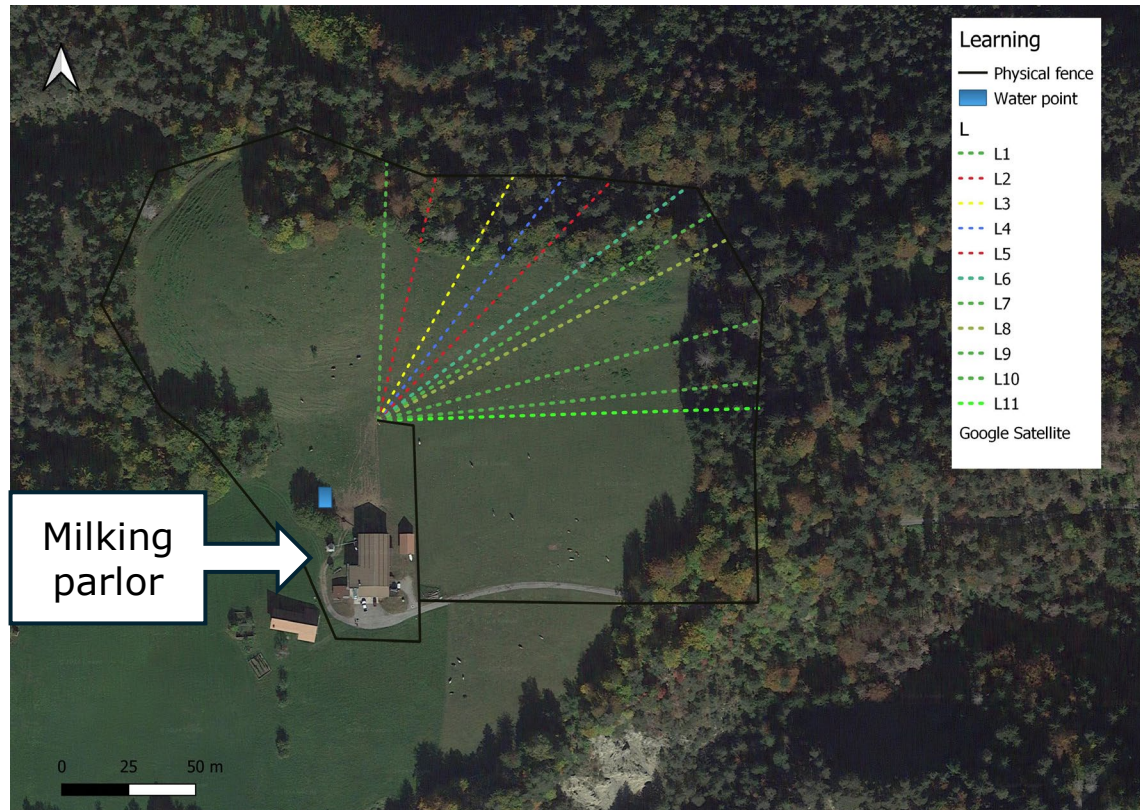
Non-use period
90 days



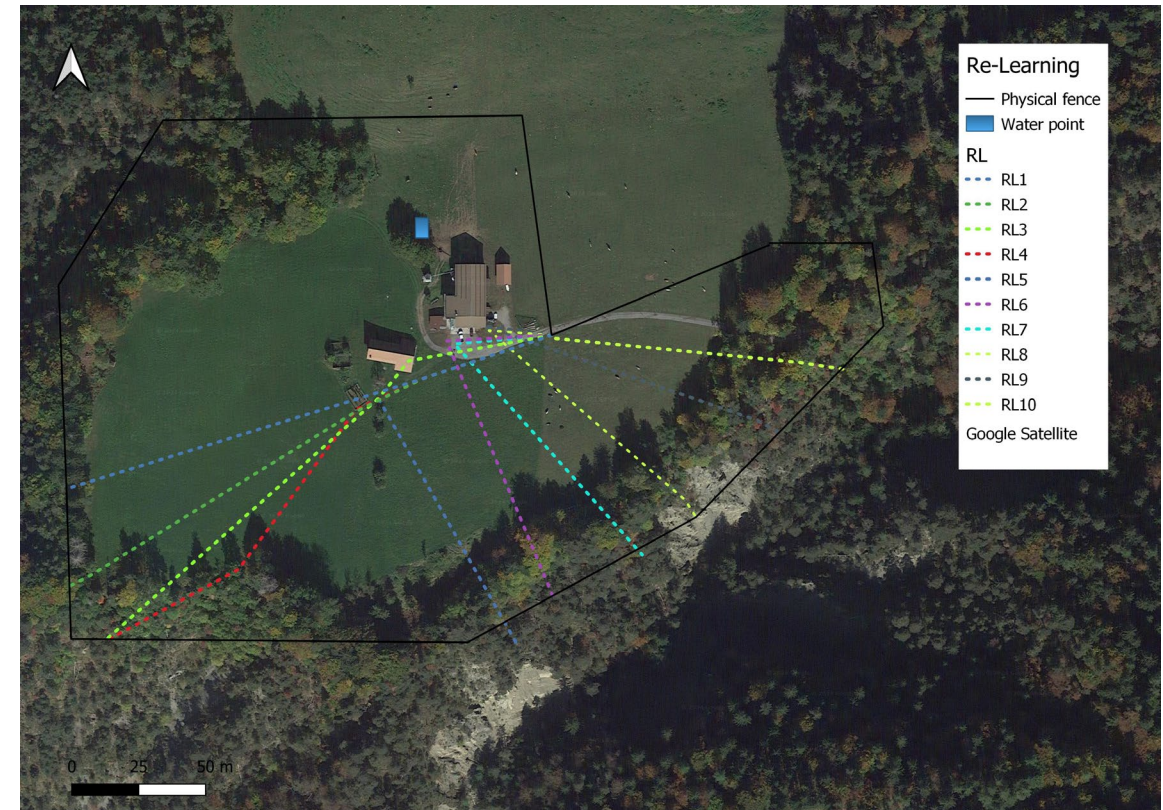
Material and methods

EXPERIMENTAL DESIGN AND COLLARS

LEARNING



RE-LEARNING



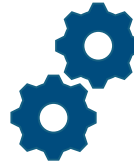
Material and methods

DATA PROCESSING AND STATISTICAL ANALYSIS

Data were elaborated using generalized mixed models (R software, version 4.2.2)

Dependent variables

- Total number of acoustic warnings (AW)
- Total number of electrical pulses (EP)
- EP / AW



Fixed effects

- Learning phase (Learning, Re-learning)
- Days within Learning phase
- Their one-way interaction

Random effects

- Animal

- Mean differences between L and RL periods were assessed through post-hoc test with Sidak adjustment using “emmeans” package (Searle et al., 1980)
- P-value threshold of <0.05

Results

ANIMALS' POSITION DURING LEARNING PHASE



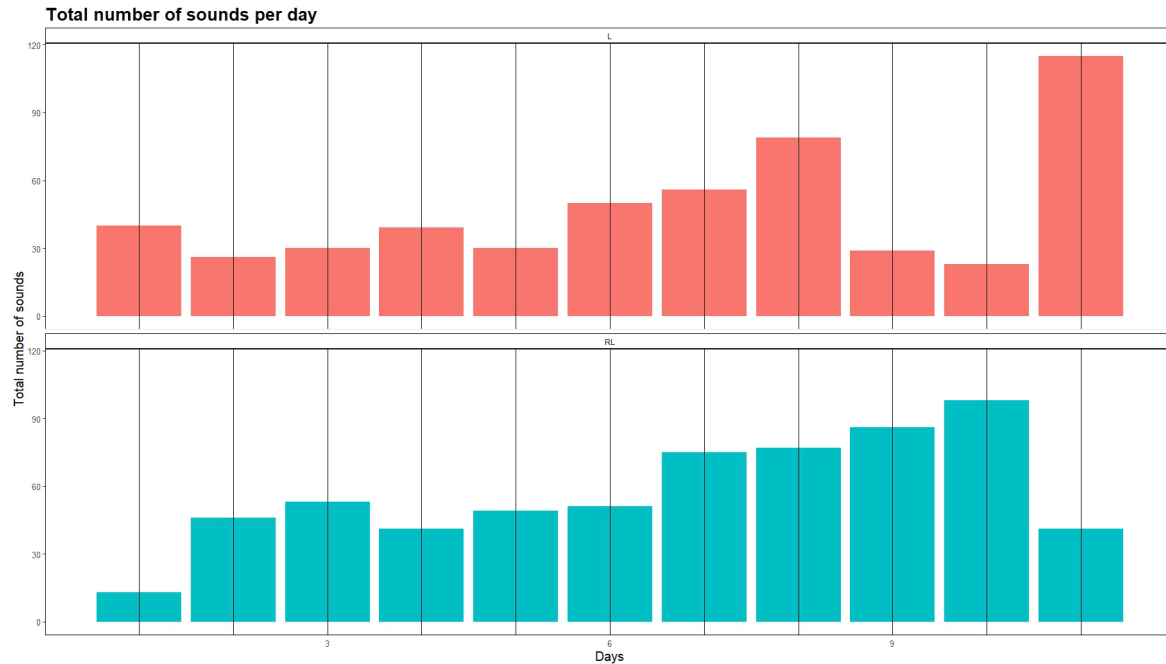
Results

ANIMALS' POSITION DURING RE-LEARNING PHASE



Results

MEAN ACOUSTIC WARNINGS AND ELECTRICAL PULSES PER DAY



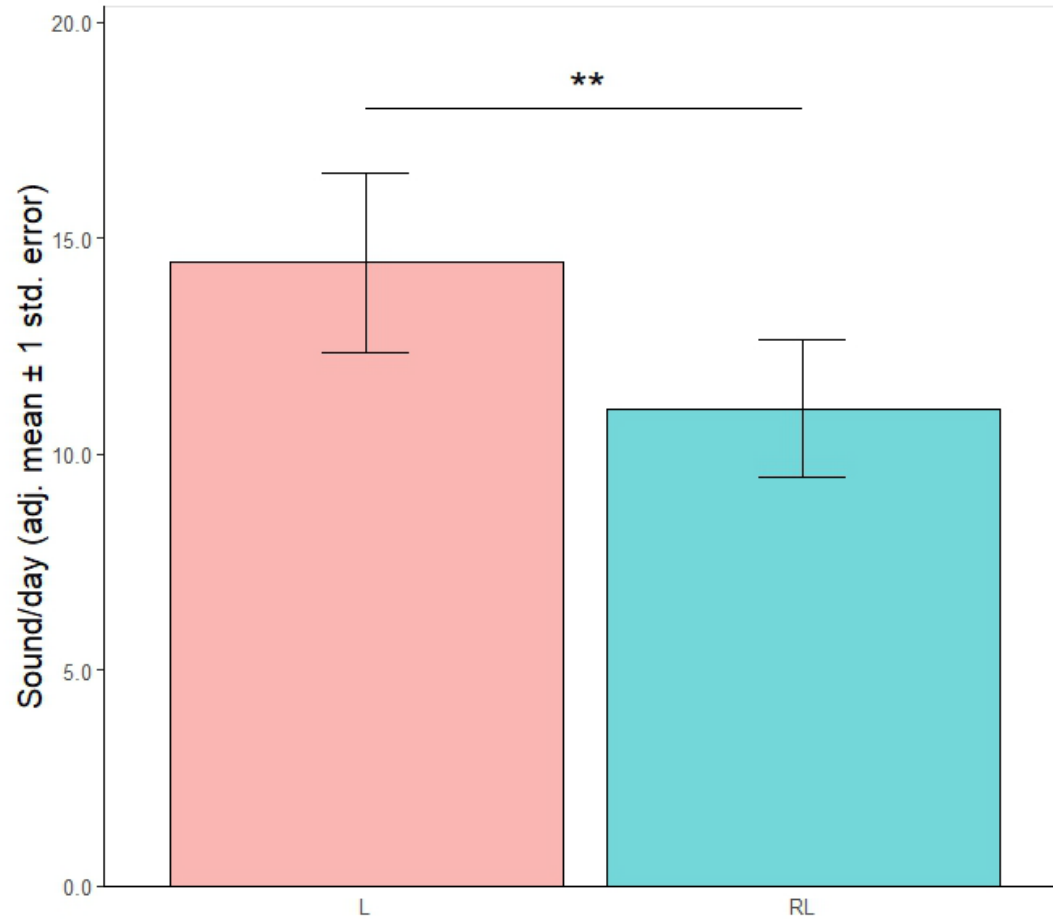
The average number of electrical pulses per day showed a decreasing trend in L, while stayed constant in RL

Results

TOTAL COUNT OF ACOUSTIC WARNINGS AND ELECTRICAL PULSES

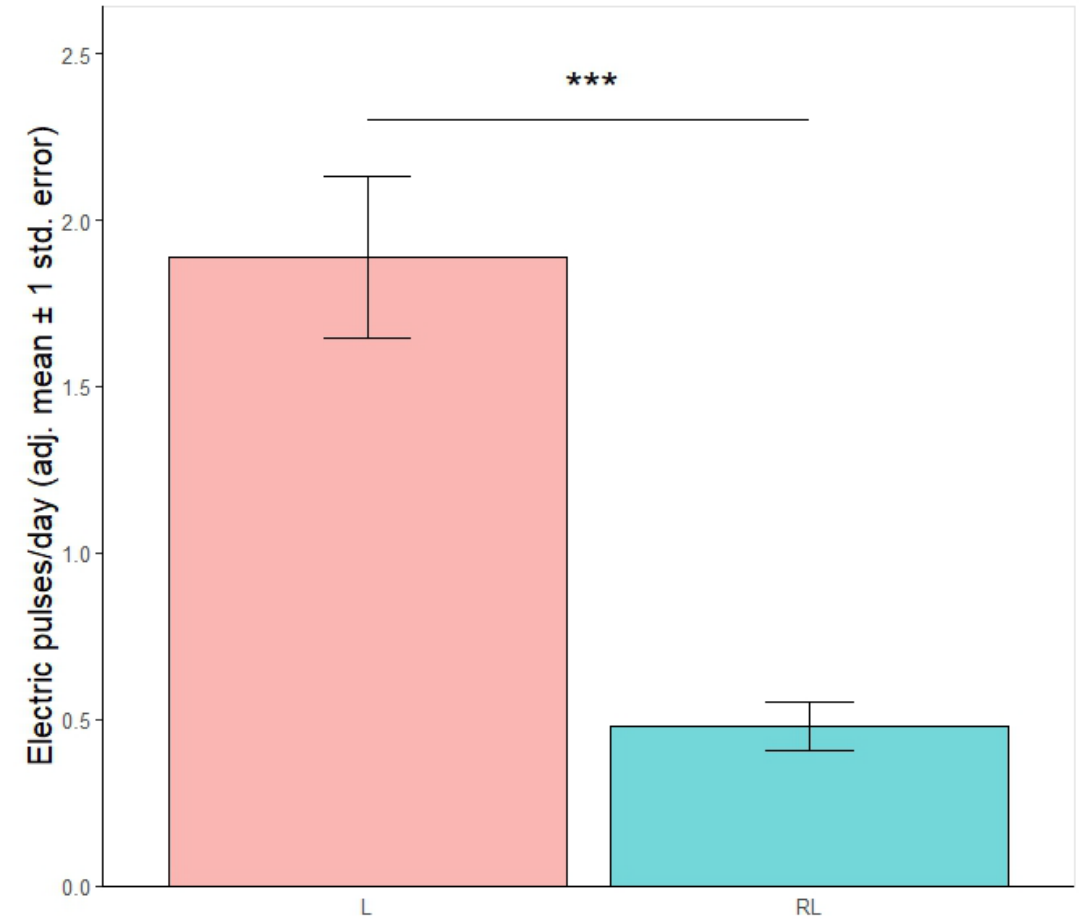
Sounds per day

L RL



Electric pulses per day

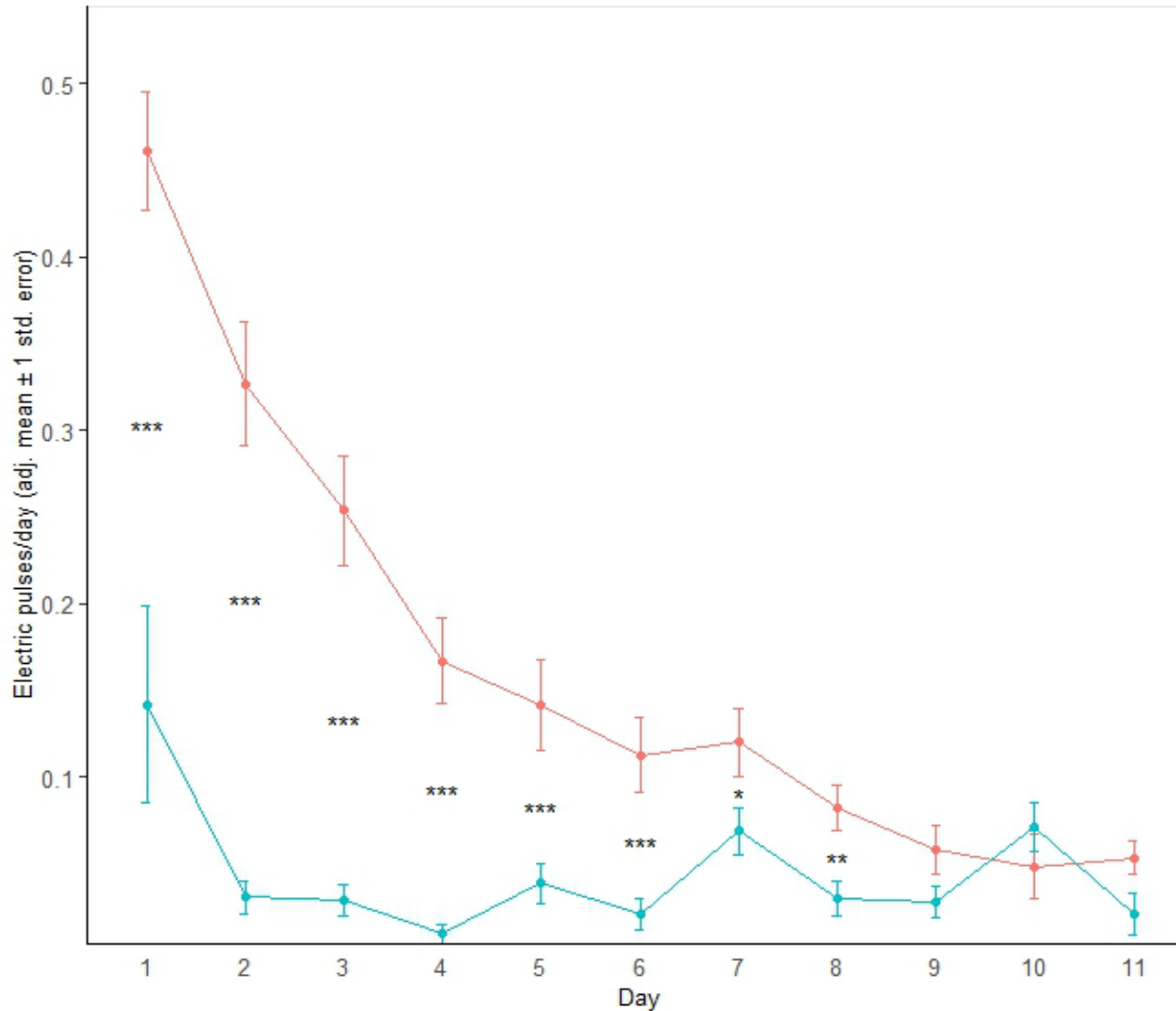
L RL



Results

EP/AW RATIO PER DAY IN LEARNING AND RE-LEARNING

—●— L —●— RL



Probability of receiving an electrical pulse during L and RL periods was expressed by calculating the ratio between total count of AW and of EP

Significant differences between L and RL within each day of trial were observed for the first 8 days

Discussion and conclusions

Conclusions

- VF succeeded in managing animals at grazing. EP received even in L were comparable to those reported in literature
- Statistics of RL period were comparable to those of the last days of L period
- Animals were able to retain the learning after 90 days of non-use, thus they do not need to be retrained after a period without collars

Limitations of the study and future perspectives

- Focus on longer non-use period to better simulate the length of non-grazing season in Alps
- Includes welfare- and production- related parameters to better investigate the impact of VF on animal welfare and milk production

Thanks for your attention!



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