

Virtual fencing for goats

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A photograph of a dense forest with a stream and a path. The text "THE WORLD'S FIRST VIRTUAL FENCE" is overlaid in the center. "THE WORLD'S FIRST" is in white, and "VIRTUAL FENCE" is in green.

THE WORLD'S FIRST VIRTUAL FENCE

Animal welfare benefits:

- Access to new and varied pastures
- Less parasite pressure
- No conflict with wild animals
- Better control of each individual
- Fence out dangerous places
- Outdoor during winter
- Better possibilities during extreme weather



Background:

- 1000 goats on commercial farms, Norway, 2017
- Animal welfare documentation
- Stress or discomfort?
- Can all individuals learn it?
- Controllable and predictable?
- Individual and group level



Study 2017

- Field study
 - 10 different Norwegian farms
 - Total of 92 goats
 - Boer and Kashmir breed
1. Experienced goats on their regular pasture
 2. Experienced goats moved to new pastures, or given new extended
 3. Goats learning the system for the first time



Experienced goats on their regular pasture:

- 10 groups
- N=92, data from 77 collars
- Data collected for 7 days

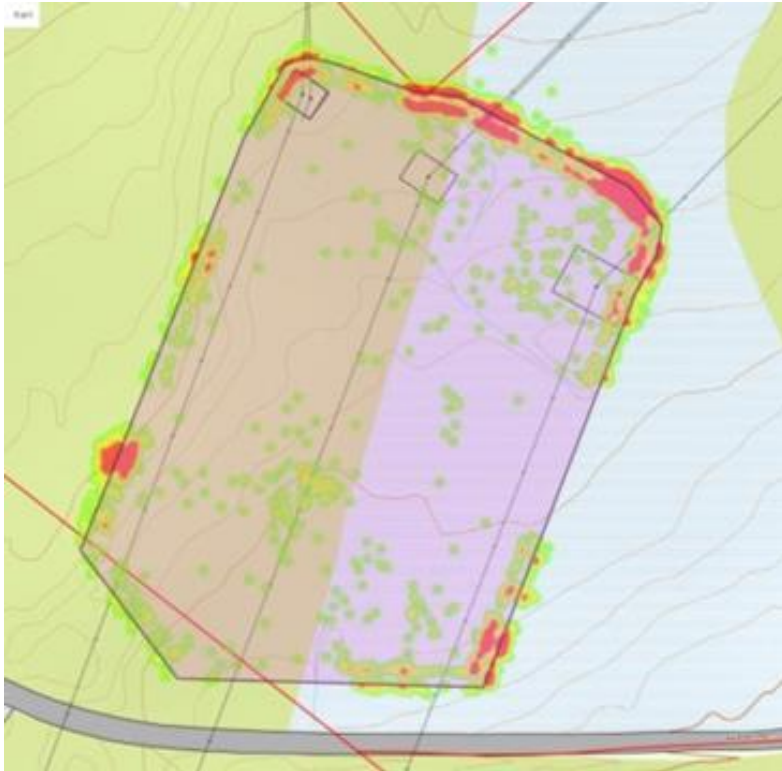
- Mean of 10.6 (0.3-148.4) warning sounds per animal per day
- Mean of 0.4 (0-4.1) electric shocks per animal per day



| | E 1 | E 2 | E 3 | E 4 | E 5 | E 6 | E 7 | E 8 | E 9 | E 10 |
|---|-------|-------|------|------|------|-------|------|-------|------|------|
| <i>n</i> | 5 | 11 | 4 | 8 | 6 | 7 | 7 | 13 | 5 | 11 |
| Mean no. of sounds pr. animal pr. day | 19,14 | 39,86 | 2,79 | 3,30 | 1,43 | 15,78 | 2,43 | 17,09 | 0,83 | 3,49 |
| Mean no. of shocks pr. animal pr. day | 0,52 | 0,92 | 0,11 | 0,13 | 0,07 | 0,63 | 0,24 | 0,98 | 0,09 | 0,40 |
| Mean no. of escapes pr. animal pr day | 0 | 0 | 0 | 0 | 0 | 0 | 0,04 | 0,05 | 0 | 0 |
| Max no. of sound pr. animal for the 7 day period | 285 | 1039 | 36 | 49 | 21 | 219 | 45 | 391 | 10 | 61 |
| Min no. of sound pr. animal for the 7 day period | 73 | 10 | 9 | 4 | 4 | 47 | 3 | 29 | 4 | 8 |
| Max no. of shocks pr. animal for the 7 day period | 5 | 29 | 2 | 2 | 1 | 11 | 6 | 13 | 1 | 6 |
| Min no. of shocks for the 7 day period | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |

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Individual variation:



Individual with 1039 warning sounds



Individual with 10 warning sounds

Experienced goats being moved to new pastures, or given a new, extended area:

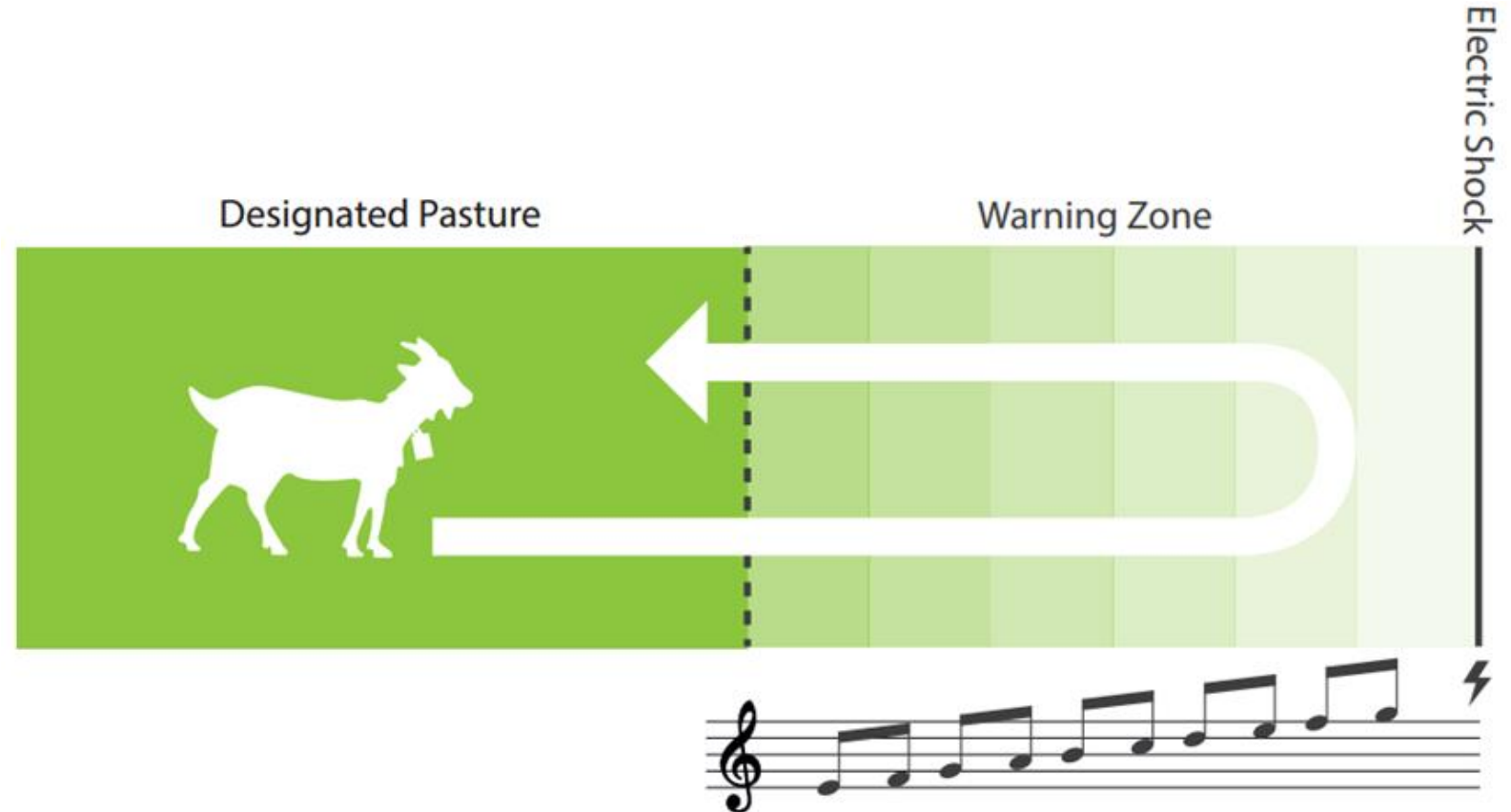
- 4 groups
- N=45, data from 37 collars
- Data collected for 5 days

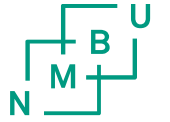


| | F 1 | F 2 | F 3 | F 4 |
|--|----------|-----------|-----------|----------|
| <i>n</i> | 6 | 11 | 15 | 5 |
| Mean no. of sound pr. animal pr. day | 5,48 | 3,25 | 7,93 | 2,36 |
| Mean no. of shocks pr. animal pr. day | 0,26 | 0,33 | 1,15 | 0,24 |
| Mean no. of escapes pr. animal pr. day | 0 | 0 | 0,37 | 0 |
| Max no. of sound pr. animal during the 5 day period | 61 | 27 | 165 | 22 |
| Min no. of sound pr. animal during the 5 day period | 30 | 5 | 21 | 0 |
| Max no. of shocks pr. animal for the 5 day period | 4 | 3 | 17 | 3 |
| Min no. of shocks pr. animal for the 5 day period | 0 | 0 | 3 | 0 |

Goats learning the system for the first time:

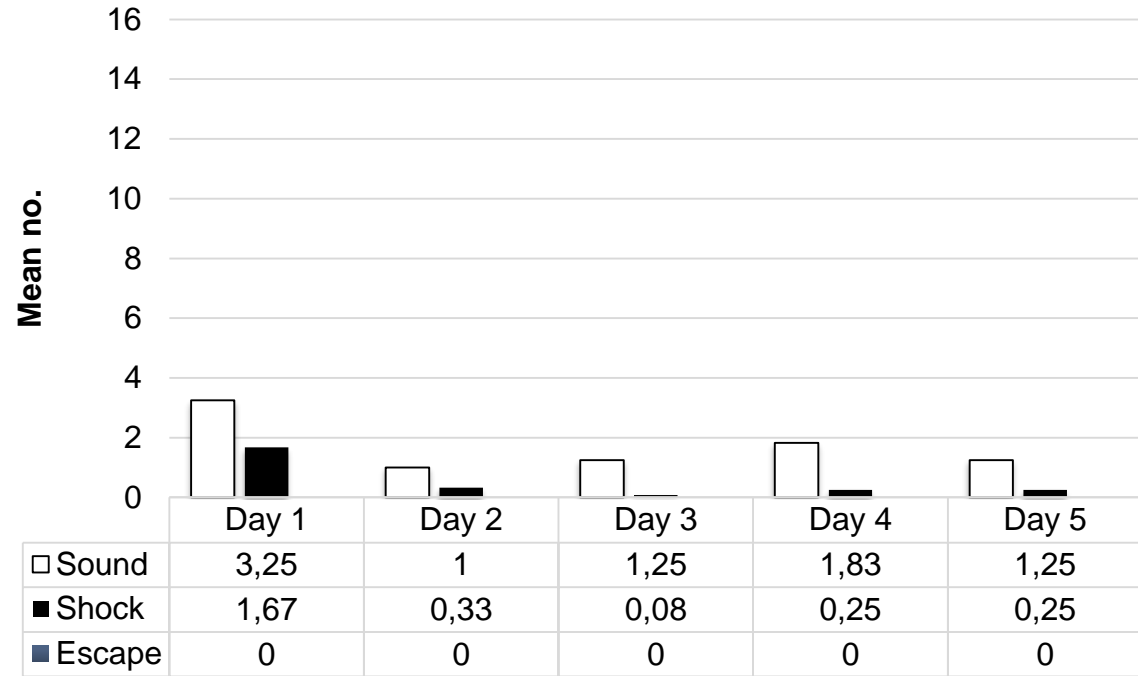
- 6 groups
- N=47
- Data collected for 5 days
- Operant conditioning, with positive punishment





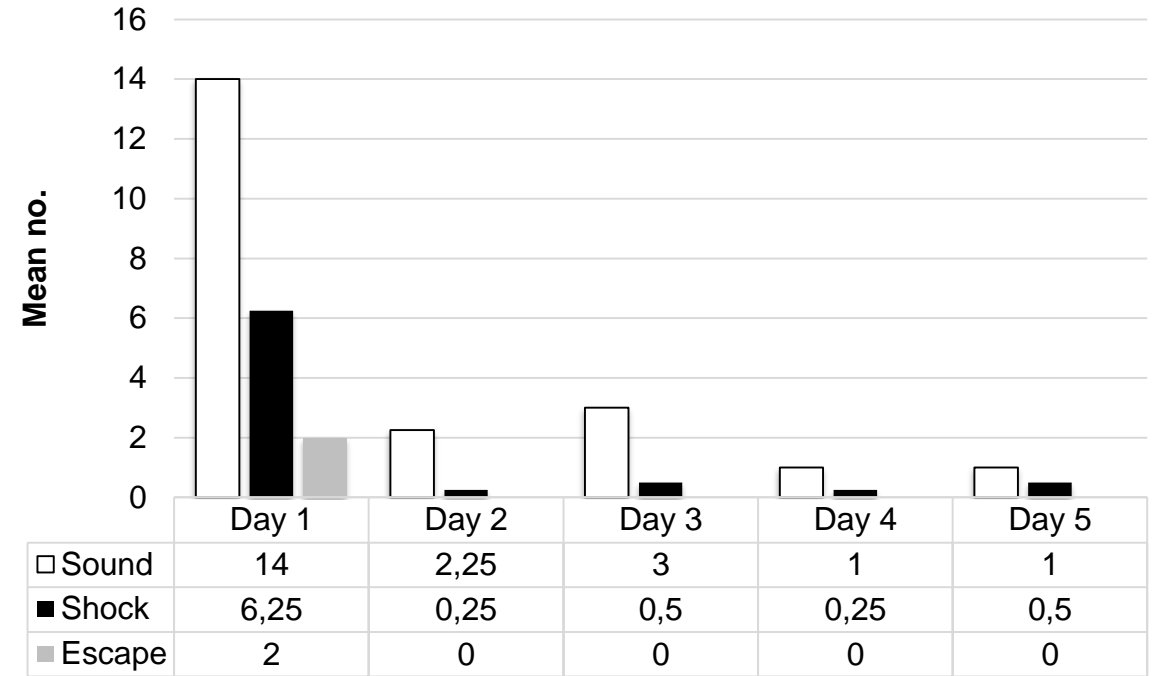
| | 11 | 12 | 13 | 14 | 15 | 16 |
|--|------|------|------|------|------|------|
| <i>n</i> | 5 | 12 | 10 | 4 | 3 | 13 |
| Mean no. of warning sounds pr. animal pr. day | 0,96 | 1,72 | 8,14 | 4,25 | 13,2 | 7,31 |
| Mean no. of shocks pr. animal pr. day | 0,2 | 0,42 | 2,26 | 1,55 | 5,47 | 1,46 |
| Mean no. of escapes pr. animal pr. day | 0 | 0 | 0,34 | 0,40 | 0,47 | 0,06 |
| Max no. of sound pr. animal during the 5 day period | 7 | 16 | 112 | 29 | 83 | 50 |
| Min no. of sound pr. animal during the 5 day period | 3 | 3 | 20 | 16 | 35 | 23 |
| Max no. of shocks pr. animal during the 5 day period | 3 | 5 | 27 | 9 | 38 | 15 |
| Min no. of shocks pr. animal during the 5 day period | 0 | 0 | 3 | 6 | 11 | 4 |

I 2

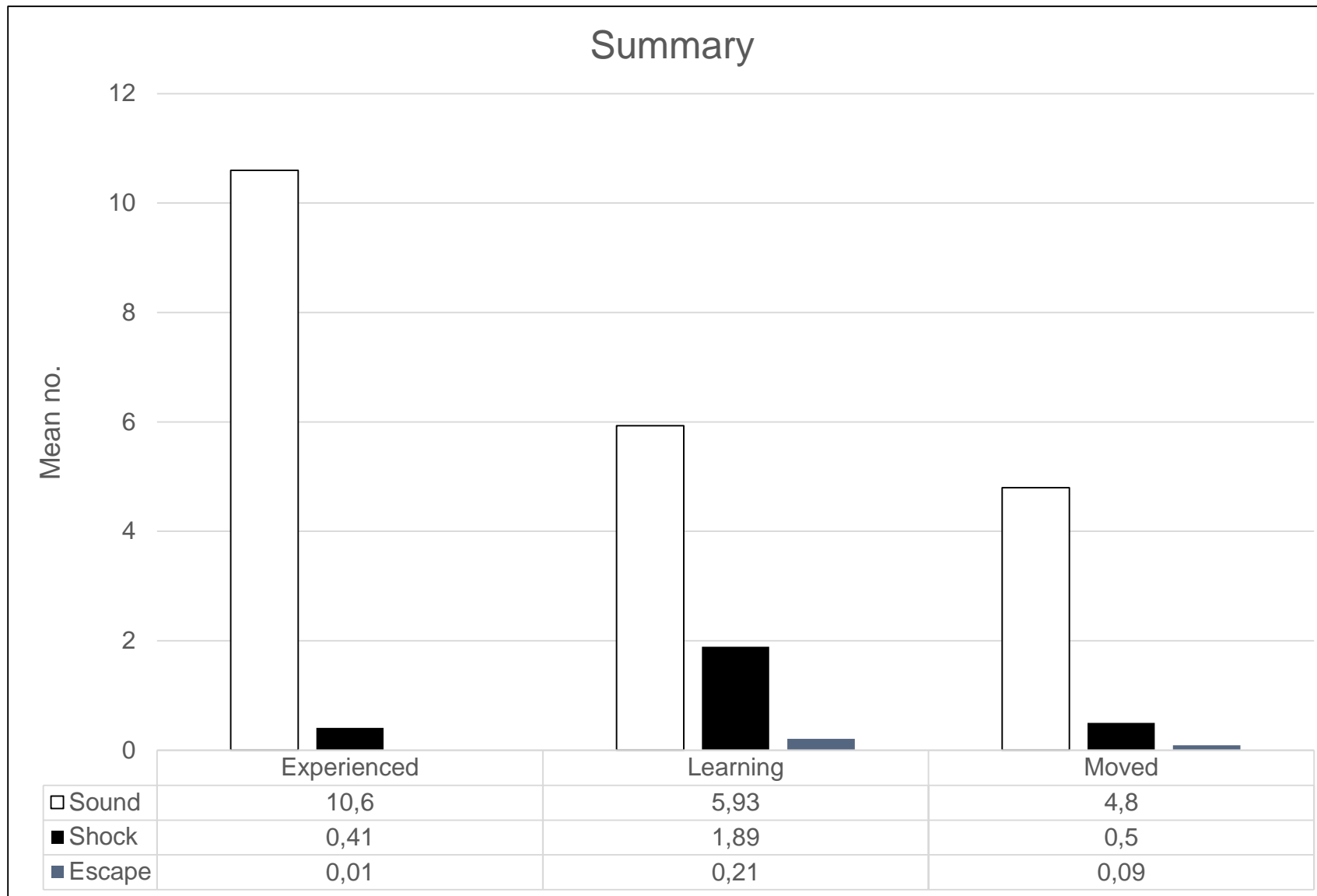


Group I 2: 12 goats

I 4



Group I 4: 4 goats



“We concluded that goats, within few days, started to associate the warning sound with the electric shock and hence learned the system, which in turn resulted in the animals getting relatively few electric shocks.”



Eftang & Bøe, 2017





Questions?