



UNIVERSITÀ DI PARMA



Using sensor technology to quantify gait quality

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System we are using



Equisense Motion S

Measurements we are considering



- Symmetry at trot in a straight line (/10)
- Impulsion per gait (cm)
- Cadence per gait (strides/minute)
- Stride regularity (/10)
- Heart rate
- Speed



Symmetry



Impulsion



Stride Frequency



Stride Regularity



Gait Speed



Heart Rate per Gait



Recovery Time



Energy Expenditure

Steps for one horse measurement



1 preparation



Attach the sensor to the girth

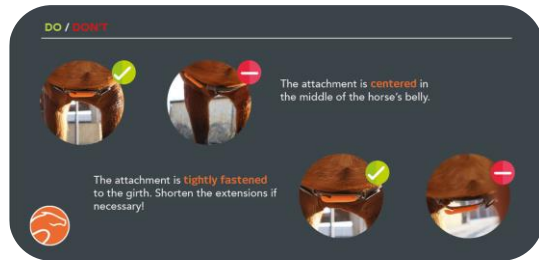


Put electrode under saddle

Steps for one horse measurement



Some tips...

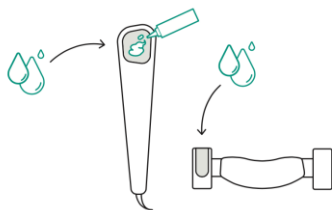


Steps for one horse measurement

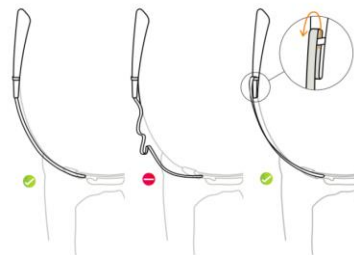
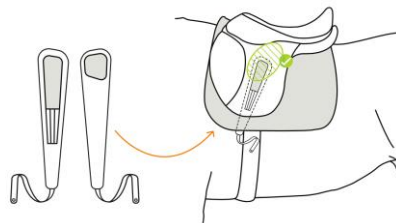


Some tips...

Correct position of the high electrode



Right amount of gel can be sometimes challenging!



Steps for one horse measurement



2 start a session



Gelsa
X

0 Sessions
0 Hours of Training
1 Rider

Pictures
Share
Settings

Name
Gelsa

Breed
Horse

Birth Year
2018

Height (cm)
138

Weight (kg)
480

Steps for one horse measurement



3 Post processing

Equisense Web
Logout

Table view
Motion5
657769940
11201422

My sessions

Compare
Filter 7

| <input type="checkbox"/> | Label | Type | Date | Duration | Rider | Horse | Firmware | App | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|--------------------------|-------|----------|---------------------|----------|-----------------|-------------|----------|---------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | | activity | 24/3/2023, 19:22:05 | | michela ablondi | Gelsa | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | | activity | 24/3/2023, 08:45:50 | | michela ablondi | Gelsa | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | | activity | 24/3/2023, 08:42:08 | | michela ablondi | Gelsa | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | | motion | 20/3/2023, 09:53:03 | 1m3s | michela ablondi | Electrode 2 | 1.4.12 | Android-36.03 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | | motion | 20/3/2023, 09:42:23 | 1m10s | michela ablondi | Electrode | 1.4.12 | Android-36.03 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | | motion | 20/3/2023, 09:37:23 | 1m6s | michela ablondi | Attachment | 1.4.12 | Android-36.03 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | | motion | 20/3/2023, 09:33:14 | 1m39s | michela ablondi | Sensor | 1.4.12 | Android-36.03 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | | motion | 18/3/2023, 16:36:03 | 11m0s | michela ablondi | Escorpio | 1.4.12 | Android-36.03 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | | motion | 18/3/2023, 15:56:59 | 13m13s | michela ablondi | Nico | 1.4.12 | Android-36.03 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | | motion | 18/3/2023, 15:22:33 | 7m27s | michela ablondi | Beatz | 1.4.12 | Android-36.03 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

What matters



- Quality of the presentation – environment condition
- Keep calm, it takes time!
- Post-processing can be extremely easy or very difficult!

Equisense Survey

| HORSE | ID | OWNER | SEX | AGE |
|---|----|-------|-----|-----|
| Type of farming | | | | |
| <input type="checkbox"/> 1: stable <input type="checkbox"/> 2: stable with daily movement (paddock) <input type="checkbox"/> 3: pasture | | | | |
| Feed (in trial period) | | | | |
| <input type="checkbox"/> 1: hay <input type="checkbox"/> 2: hay and concentrated feed (quantity and type) | | | | |
| Training | | | | |
| <input type="checkbox"/> 1: absent (no training in the last month) <input type="checkbox"/> 2: rare (1-2 hours per week) <input type="checkbox"/> 3: frequent (3-5 hours per week) <input type="checkbox"/> 4: intense (>5 hours per week) | | | | |
| Discipline | | | | |
| <input type="checkbox"/> 1: basic training (walk, trot, canter) <input type="checkbox"/> 2: working equitation <input type="checkbox"/> 3: english <input type="checkbox"/> 4: western | | | | |
| Races | | | | |
| <input type="checkbox"/> 1: yes <input type="checkbox"/> 2: no | | | | |
| Level (for affirmative reply) | | | | |
| <input type="checkbox"/> 1: low level <input type="checkbox"/> 2: medium level (regional competitions) | | | | |
| <input type="checkbox"/> 3: high level (national competitions) | | | | |
| Pathologies | | | | |
| <input type="checkbox"/> 1: no <input type="checkbox"/> 2: respiratory pathologies <input type="checkbox"/> 3: osteo-muscular pathologies <input type="checkbox"/> 4: colic <input type="checkbox"/> 5: other | | | | |
| Shoeing | | | | |
| <input type="checkbox"/> 1: no <input type="checkbox"/> 2: only forelimbs <input type="checkbox"/> 3: all <input type="checkbox"/> 4: corrective | | | | |
| Time elapsed since the last shoeing | | | | |
| <input type="checkbox"/> 1: less than a week <input type="checkbox"/> 2: 2-4 weeks <input type="checkbox"/> 3: over 4 weeks | | | | |
| Rider's skill | | | | |
| <input type="checkbox"/> 1: beginner (1 hour per week/ A1 license) <input type="checkbox"/> 2: medium (2-4 hours per week/ A2 license) <input type="checkbox"/> 3: expert (races/ A3 license / instructor) <input type="checkbox"/> 4: missed (several riders) | | | | |
| Rider (for the trial) | | | | |
| Arena size | | | | |
| <input type="checkbox"/> 1: 20x40 <input type="checkbox"/> 2: smaller <input type="checkbox"/> 3: bigger | | | | |
| Ground | | | | |
| <input type="checkbox"/> 1: sand <input type="checkbox"/> 2: grass <input type="checkbox"/> 3: other | | | | |

How we work



- Visit breeders with at least 4 horses
- Tested several breeds (Bardigiano, Tolfetano, Murgese and SWB)
- Roughly 200 observations collected so far
- 20 x 40-meter arena
- Ridden horse using a developed protocol
- 10 minutes per horse on average
- 5 minutes for the set up
- 1 person to ride the horse and 1 person for setting the system via phone app

| Movements | | |
|-----------|--------------|--|
| 1 | A X C | Enter in trot Halt – immobility – salute Proceed in trot Track to the right |
| 2 | Da M a M | Proceed in trot |
| 3 | MXK | Diagonal (trot) |
| 4 | Da K a K | Proceed in trot |
| 5 | Tra A e F | Transition at left canter |
| 6 | | Two laps on track at left canter |
| 7 | M | Transition at trot |
| 8 | MCH | Trot |
| 9 | HXF | Diagonal (trot) |
| 10 | Tra A e K | Transition at right canter |
| 11 | | Two laps on track at right canter |
| 12 | H | Transition at trot |
| 13 | HCM | Trot |
| 14 | MXK | Diagonal (trot) |
| 15 | A | walk |
| 16 | | Two laps on track at walk |
| 17 | A X | Down the center line Halt – immobility - salute |

Pro and Cons



- Very easy system to be implemented in practice
- Company available to help when issues arrive
- Derived phenotypes quite easy to be understood by breeders
- Moderate correlation with official evaluations
- Phone GPS sometimes doesn't work properly –speed not always available
- Heart rate – gel amount and position of electrodes can be challenging
- No information on legs related phenotypes