Considerations for Assessing Equine Well-Being and Stress

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Horses & Humans Research Foundation Conference
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Photo: Stock Image

Today's Goals

- Discuss measures of equine stress and well-being
- Explore affective states and why we should consider positive affective states

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Implementing What You Learn

1. Include welfare assessments
2. Array of measures to select from
3. Note if it's positive or negative
4. Use results in decision making

Traditional Measures of Stress

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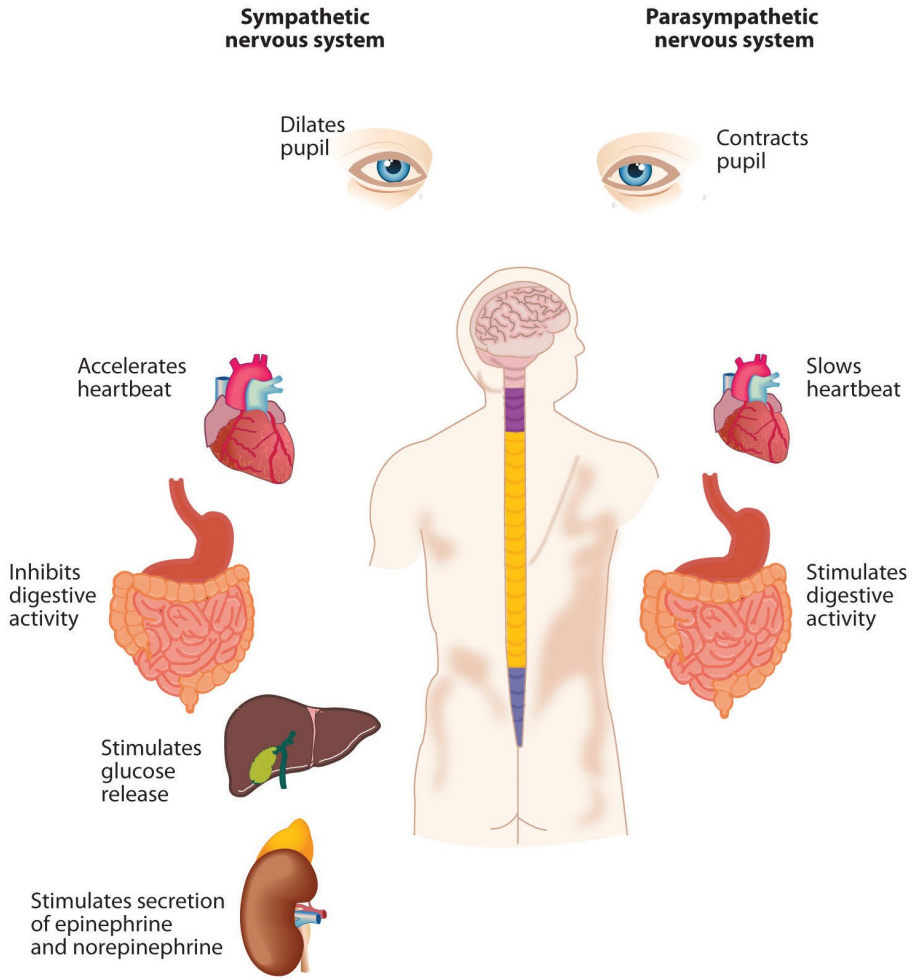
Autonomic Nervous System



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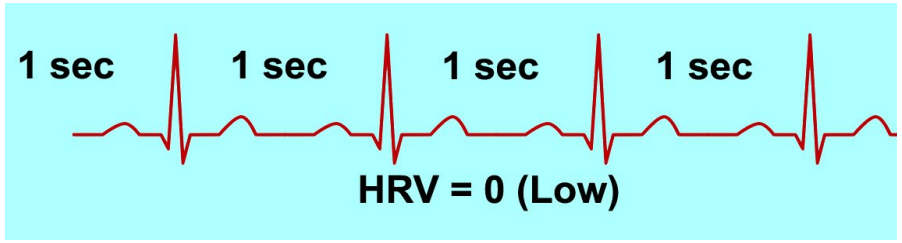
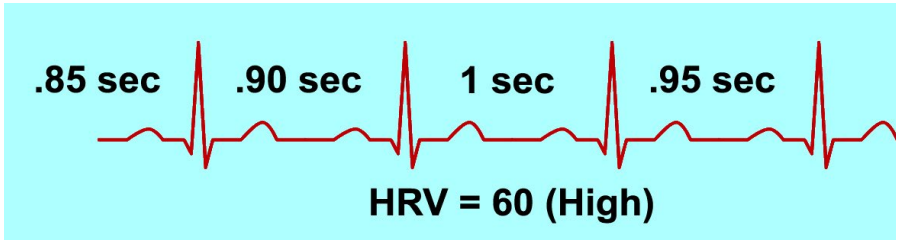
Heart Rate Variability (HRV)

- Variability in time between successive heart beats
- Parasympathetic & sympathetic balance
- Requires high quality HR recording

Heart Rate Variability (HRV)

Average Heart Rate = 60 bpm



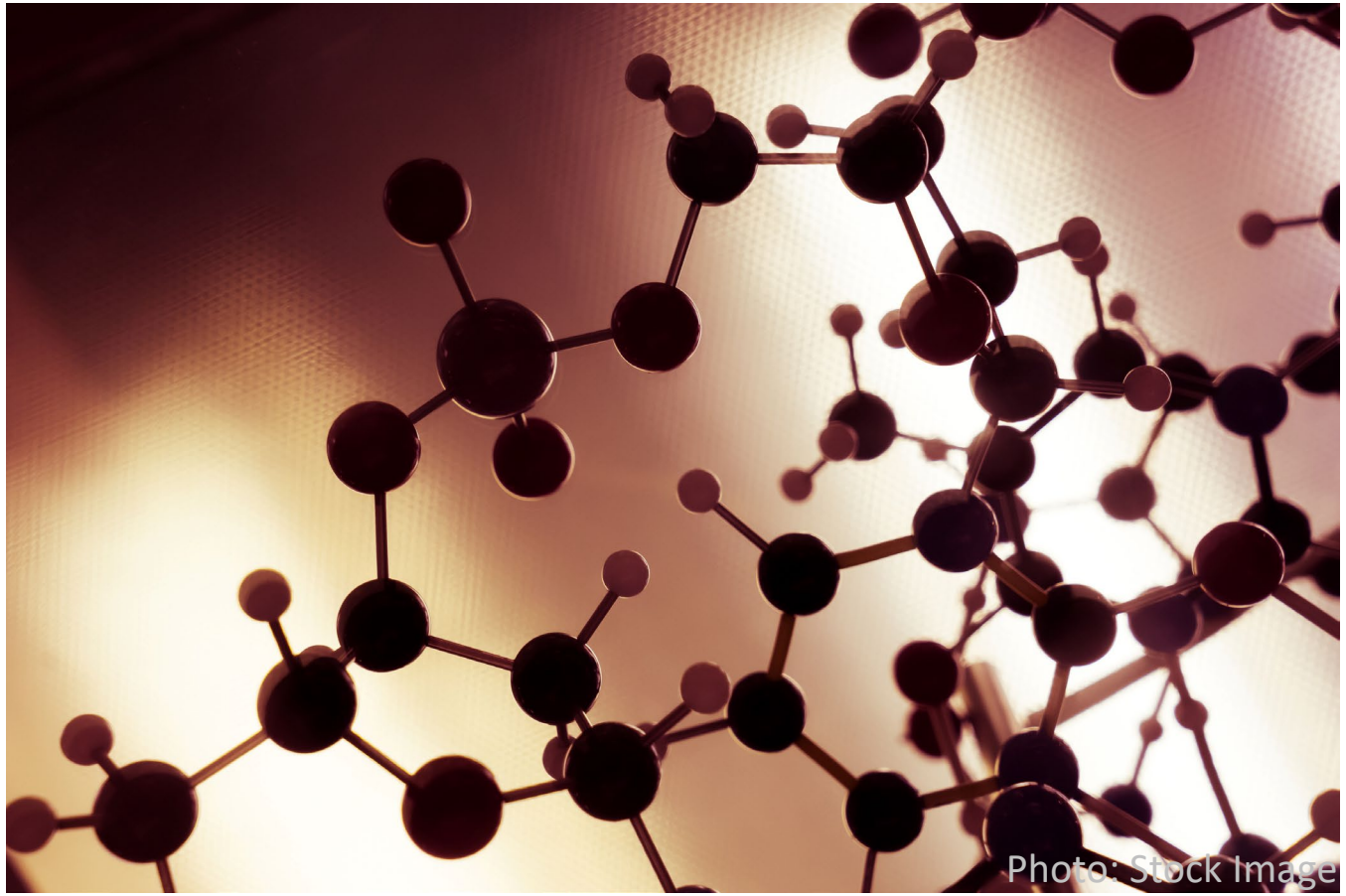


- High stress
- Less resiliency
- More sympathetic activation

- Low stress
- More resiliency
- More parasympathetic activation

Hormone Concentrations

- Cortisol
  - Most common
  - Blood, saliva, manure
- Epinephrine
  - Blood
- Norepinephrine
  - Blood



Behavior

- Duration, frequency, or composite score
- Direct observation or video recordings
- Rely on interpretation

Novel Measures of Stress

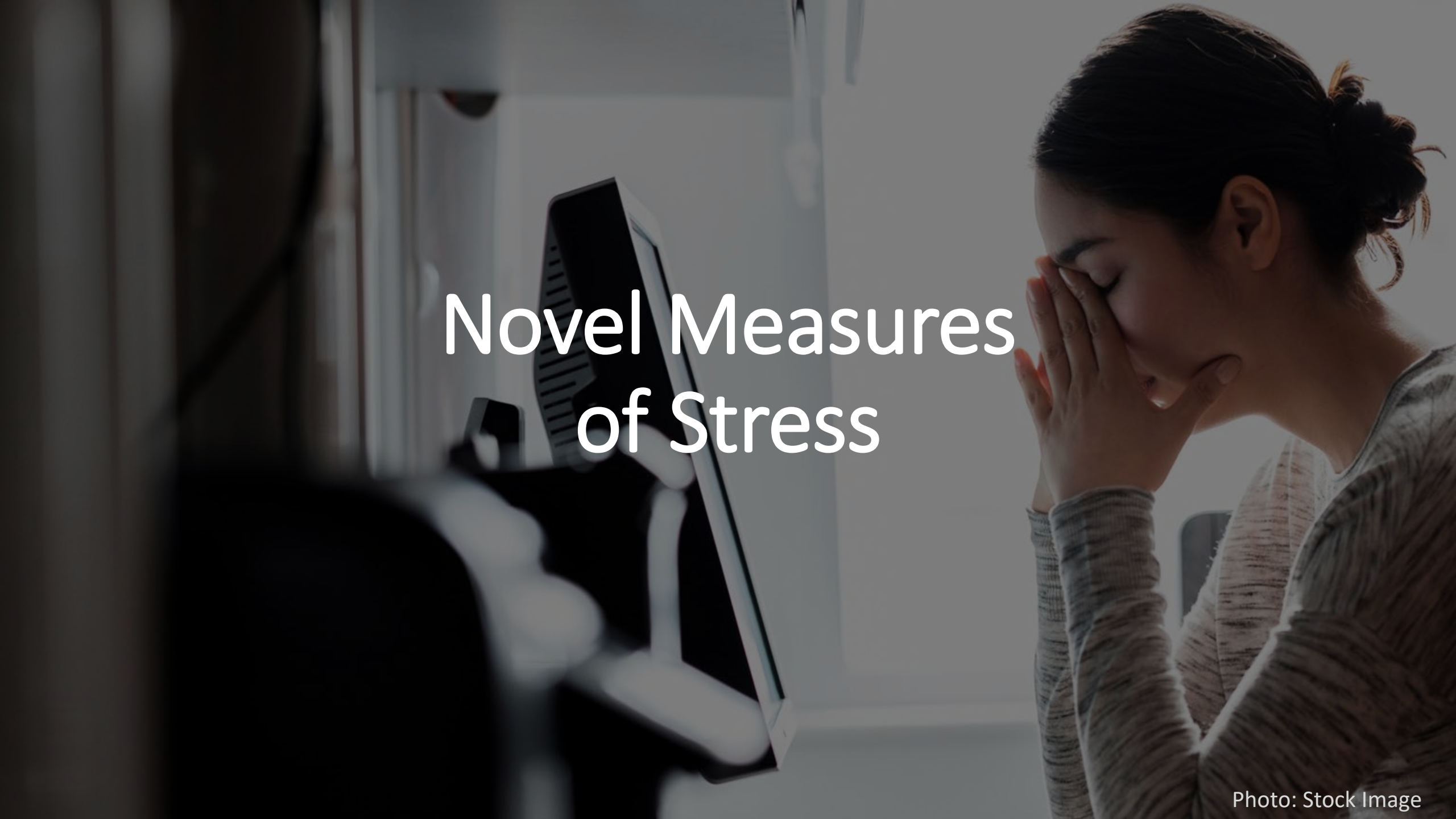


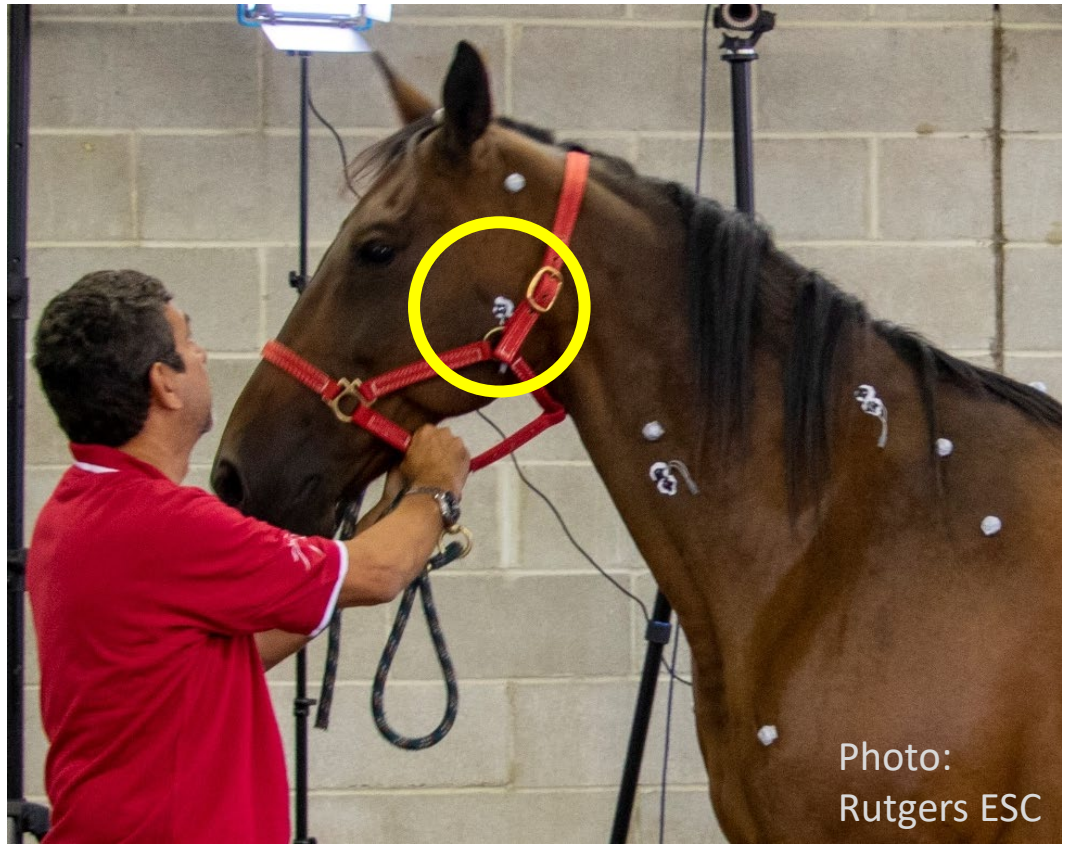
Photo: Stock Image

Validation Study

- Eight mature Standardbred horses
  - Four mares, four geldings
- Four treatments of 3 min each with 10 min washout periods
  - Control
  - Social Isolation
  - Novel Object
  - Sham Clipping

Surface Electromyography (sEMG)

- **Muscles of interest:**
  - ***Masseter***



Surface Electromyography (sEMG)

- **Muscles of interest:**
  - ***Masseter***
  - ***Brachiocephalas***

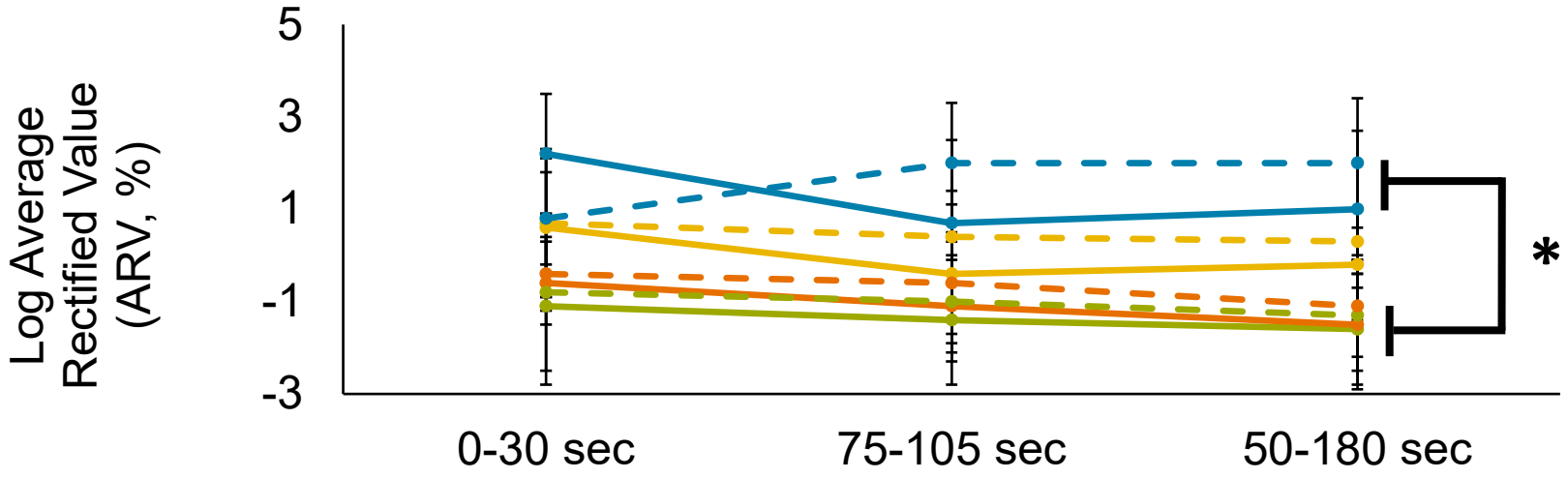
Surface Electromyography (sEMG)

- **Muscles of interest:**
  - ***Masseter***
  - ***Brachiocephalas***
  - ***Cervical trapezius***

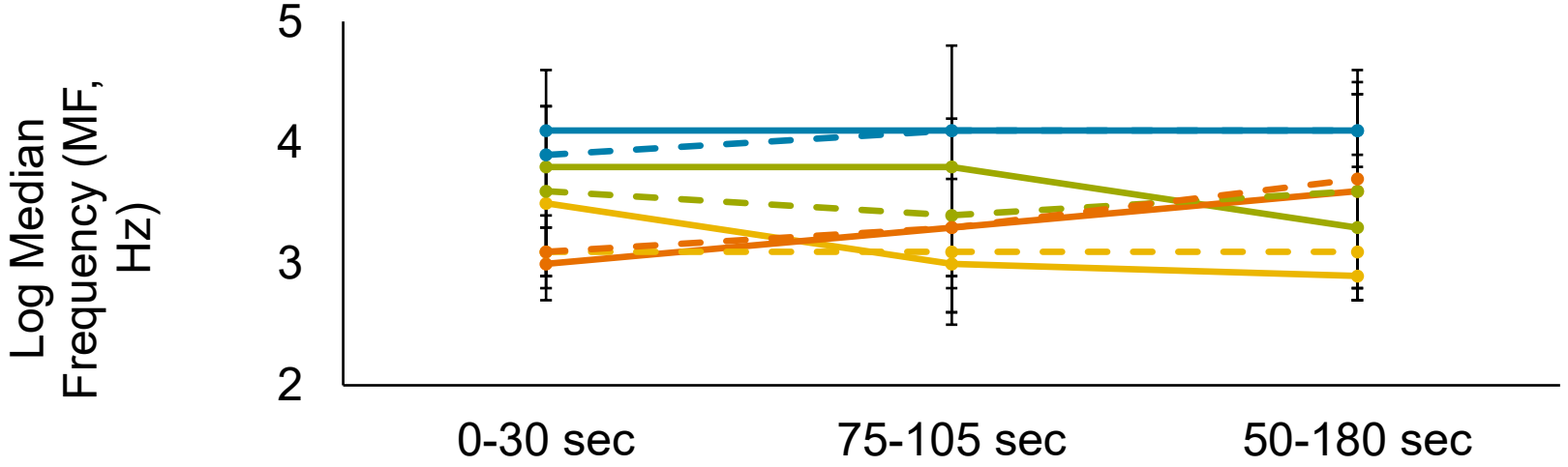
Surface Electromyography (sEMG)

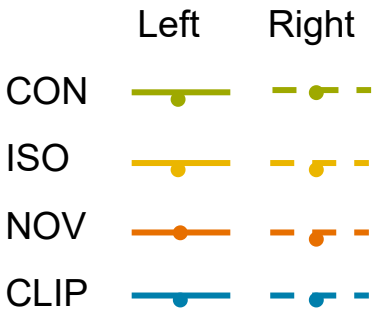
- **Muscles of interest:**
  - ***Masseter***
  - ***Brachiocephalas***
  - ***Cervical trapezius***
  - ***Longissimus dorsi***

Masseter



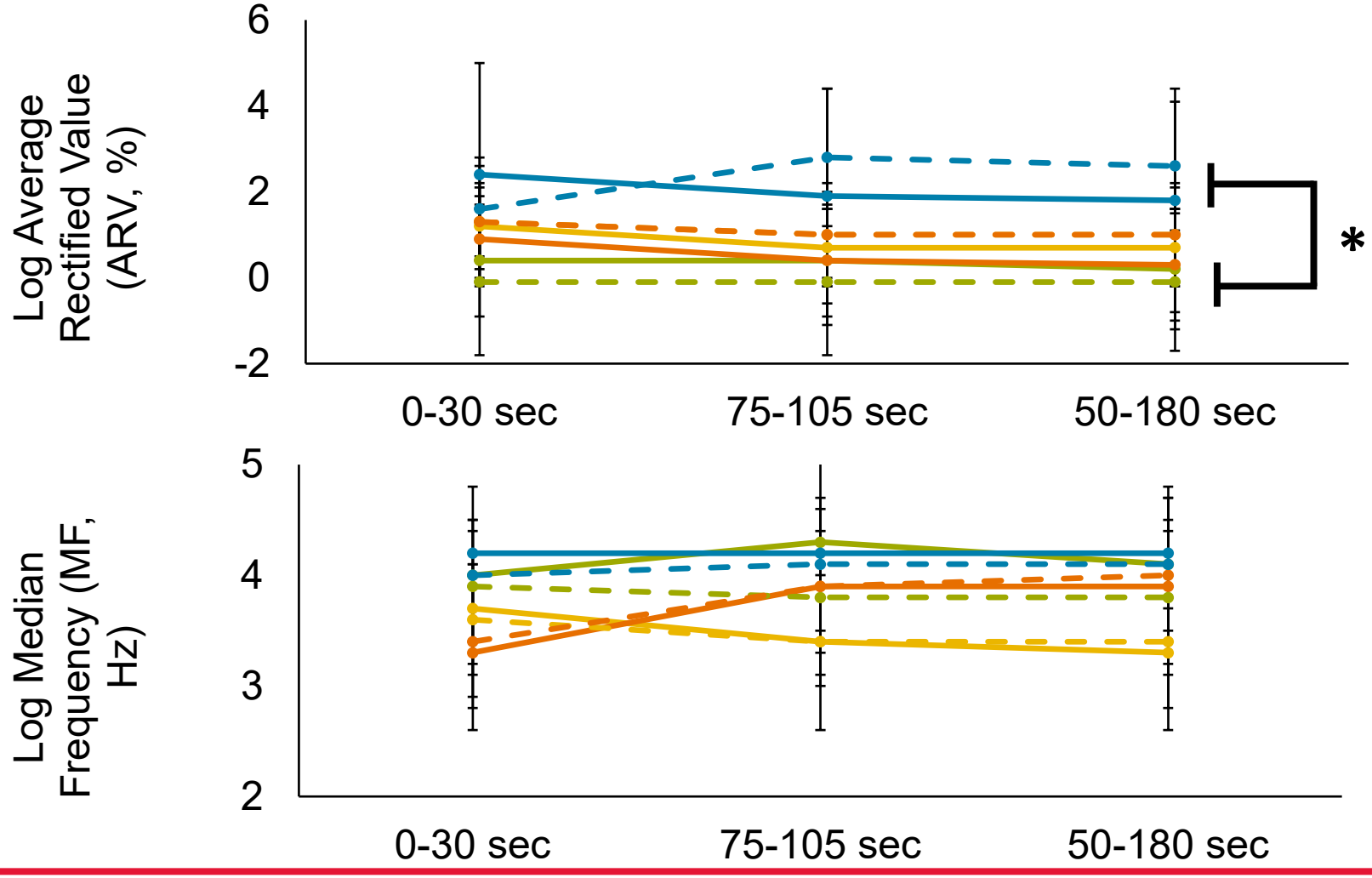
Main Effects (*P-value*):
Treatment (<0.0001)
Time (0.0073)
Side (0.0727)
Treatment*Time (0.4624)
Time*Side (0.0205)
Treatment*Side (0.9715)



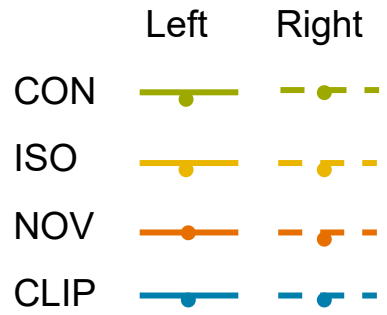


Main Effects (*P-value*):
Treatment (<0.0001)
Time (0.8167)
Side (0.5842)
Treatment*Time (0.0065)
Time*Side (0.2582)
Treatment*Side (0.9250)

Brachiocephalas

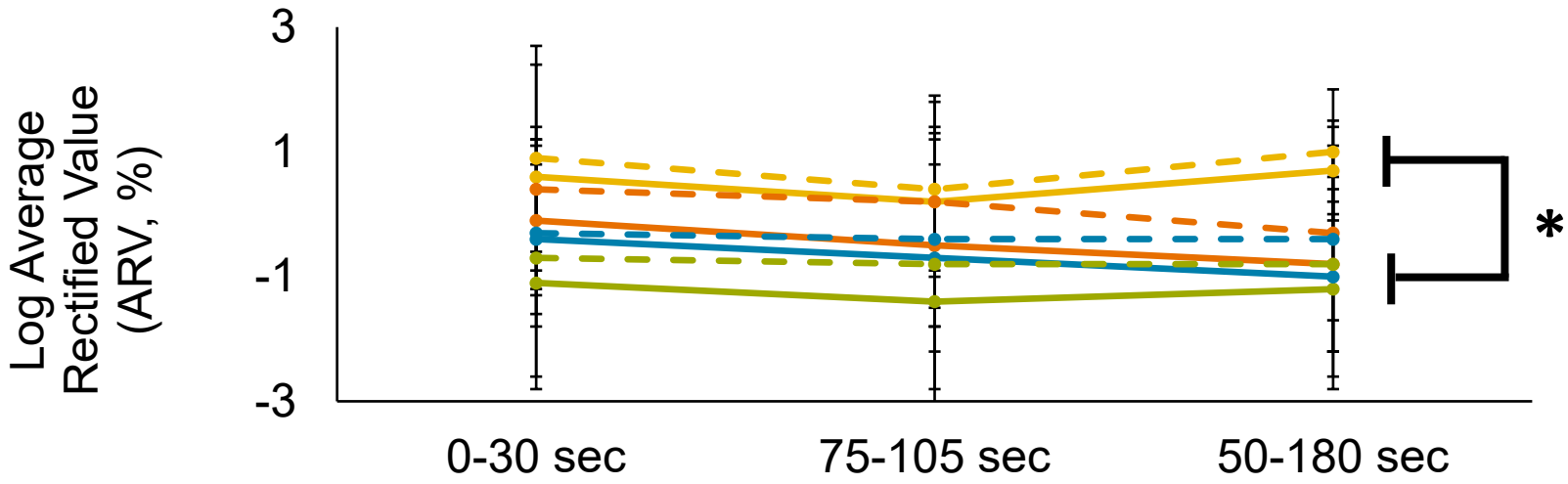


Main Effects (*P-value*):
Treatment (0.0007)
Time (0.1314)
Side (0.5943)
Treatment*Time (0.1864)
Time*Side (0.0065)
Treatment*Side (0.7084)

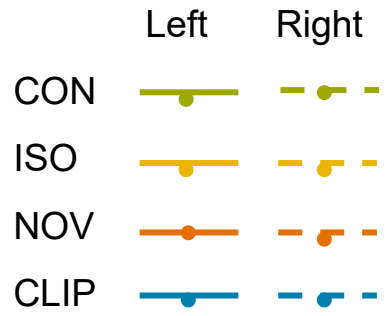


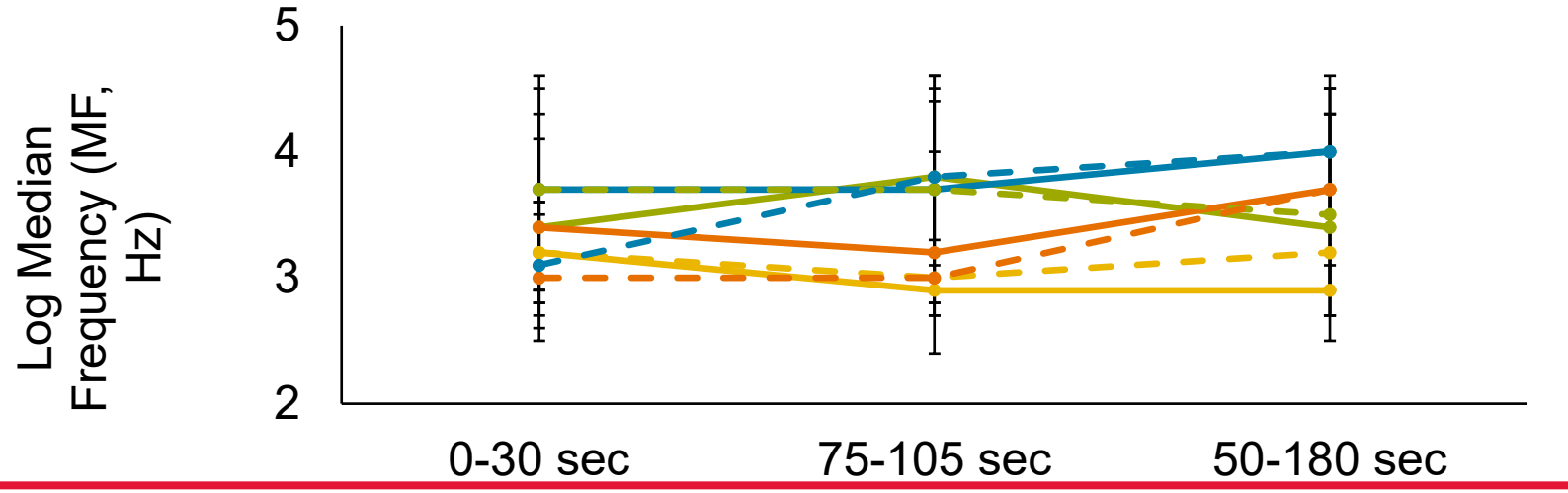
Main Effects (*P-value*):
Treatment (0.0011)
Time (0.5082)
Side (0.3391)
Treatment*Time (0.0010)
Time*Side (0.6660)
Treatment*Side (0.5584)

Cervical trapezius



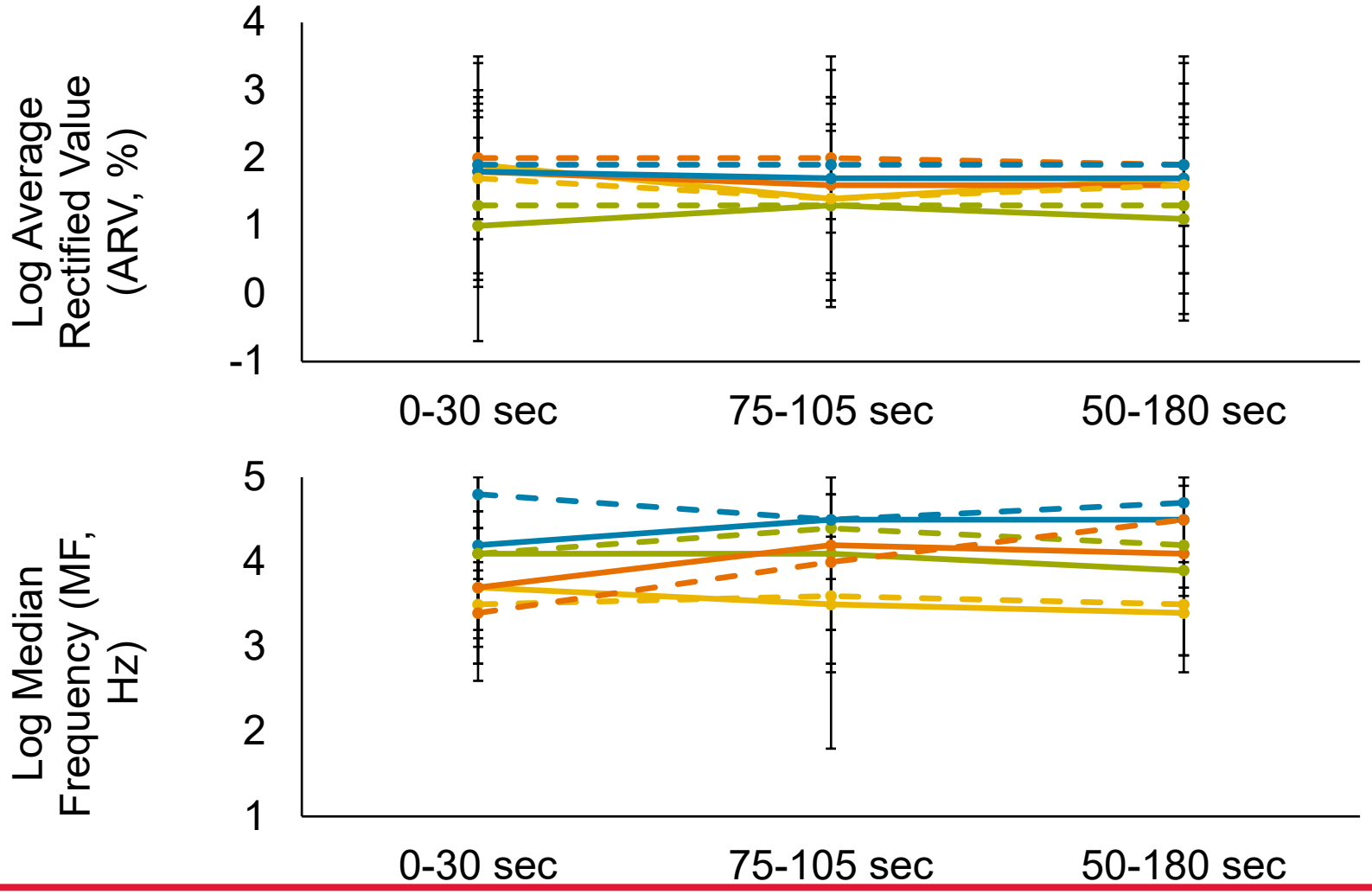
Main Effects (*P-value*):
Treatment (<0.0001)
Time (0.1351)
Side (0.0771)
Treatment*Time (0.1245)
Time*Side (0.8625)
Treatment*Side (0.9522)



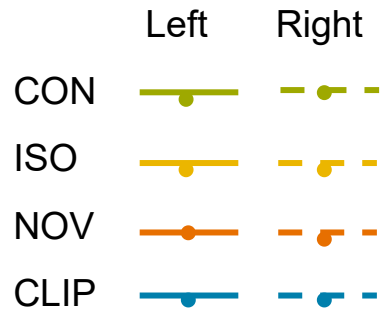


Main Effects (*P-value*):
Treatment (0.0038)
Time (0.0007)
Side (0.8558)
Treatment*Time (<0.0001)
Time*Side (0.1803)
Treatment*Side (0.6169)

Longissimus dorsi



Main Effects (*P-value*):
- Treatment (0.1271)
- Time (0.4254)
- Side (0.5630)
- Treatment*Time (0.0778)
- Time*Side (0.6933)
- Treatment*Side (0.9091)



Main Effects (*P-value*):
- **Treatment (0.0001)**
- Time (0.1865)
- Side (0.3812)
- **Treatment*Time (0.0385)**
- Time*Side (0.3989)
- Treatment*Side (0.7435)

Conclusions

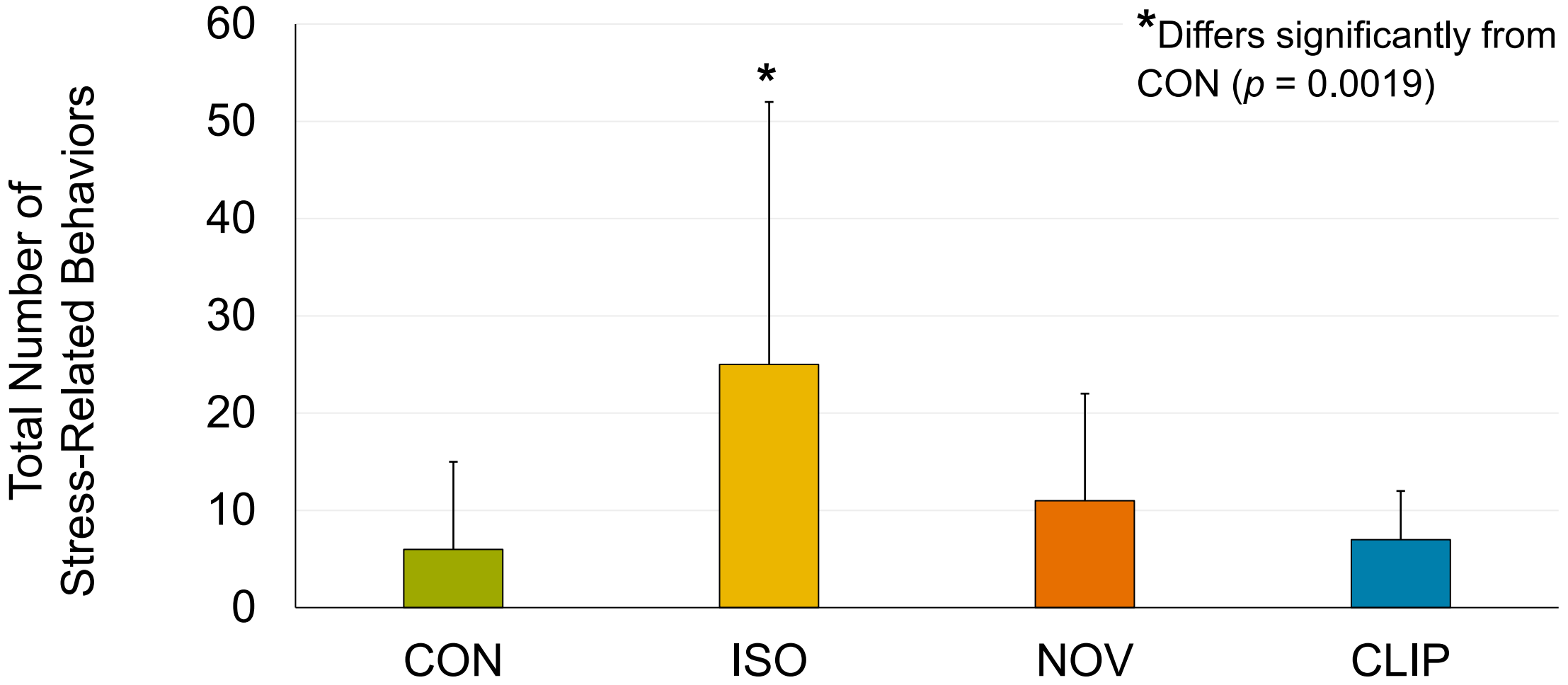
- **Muscular tension could be used to assess stress**
- **Best to assess in the jaw or neck area**

Photo: Stock Image

Validation Study

- Eight mature Standardbred horses
  - Four mares, four geldings
- Four treatments of 3 min each with 10 min washout periods
  - Control
  - Social Isolation
  - Novel Object
  - Sham Clipping

Quantitative Behavior



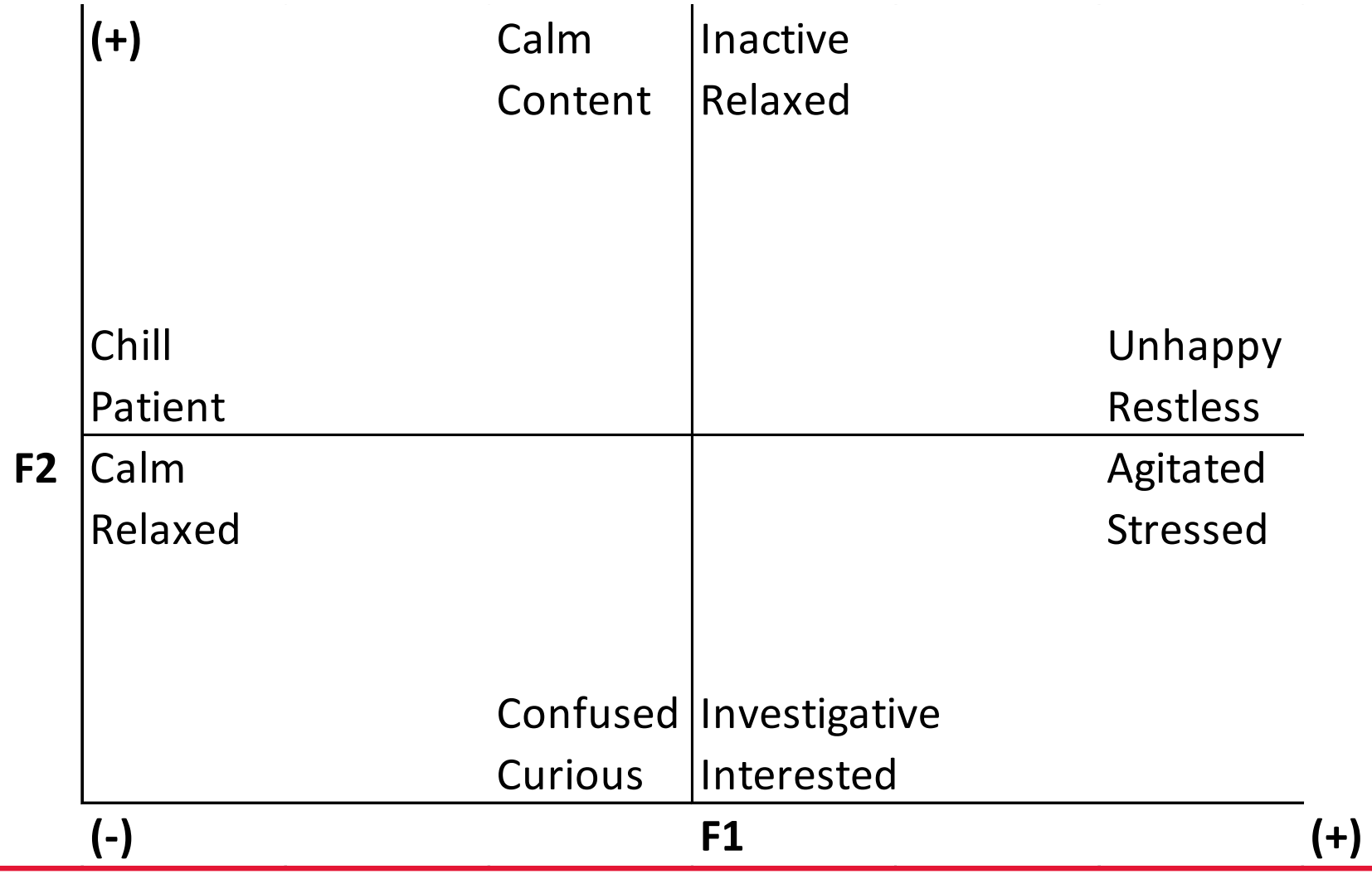
Free Choice Profiling

- Generate list of descriptive terms
  - Examples:
    - Angry
    - Agitated
    - Relaxed
    - Calm

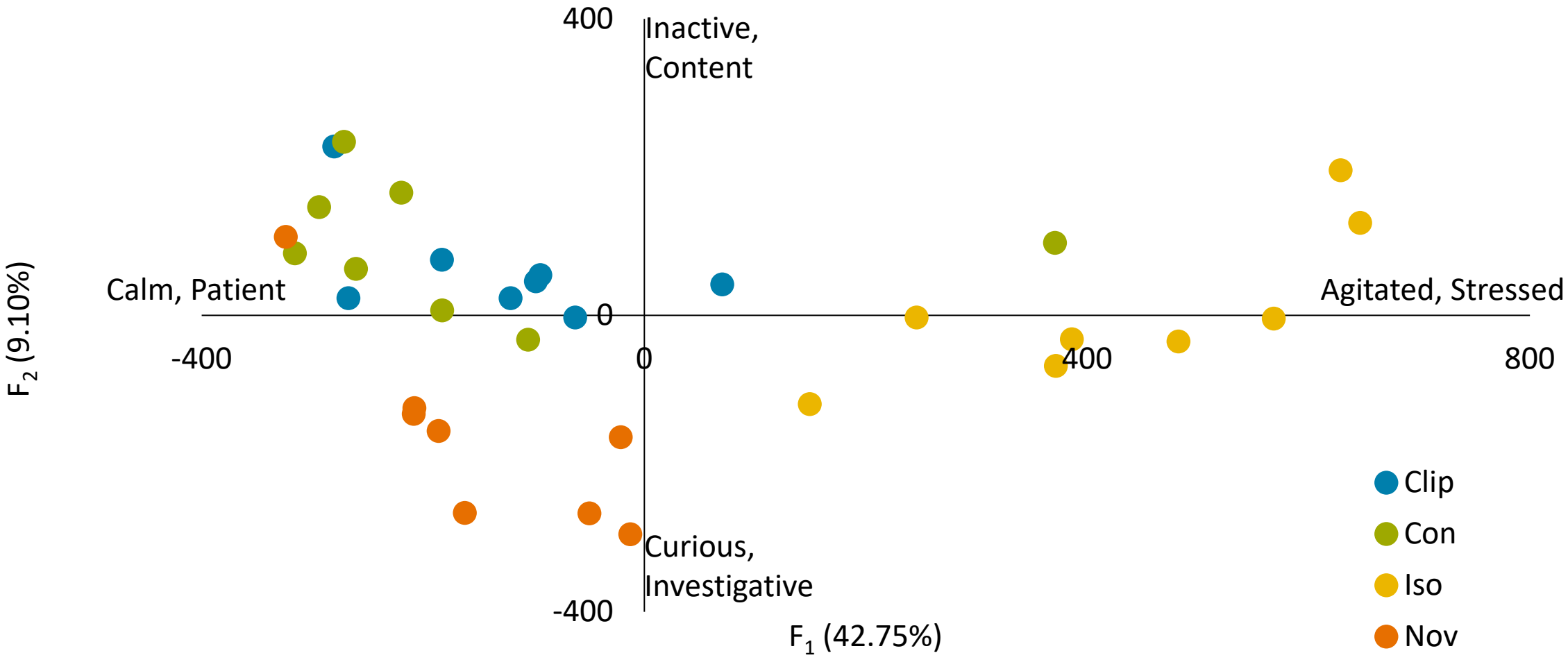
Qualitative Behavior Assessment

- Rate each horse's expression of each term
- Generalized Procrustes Analysis

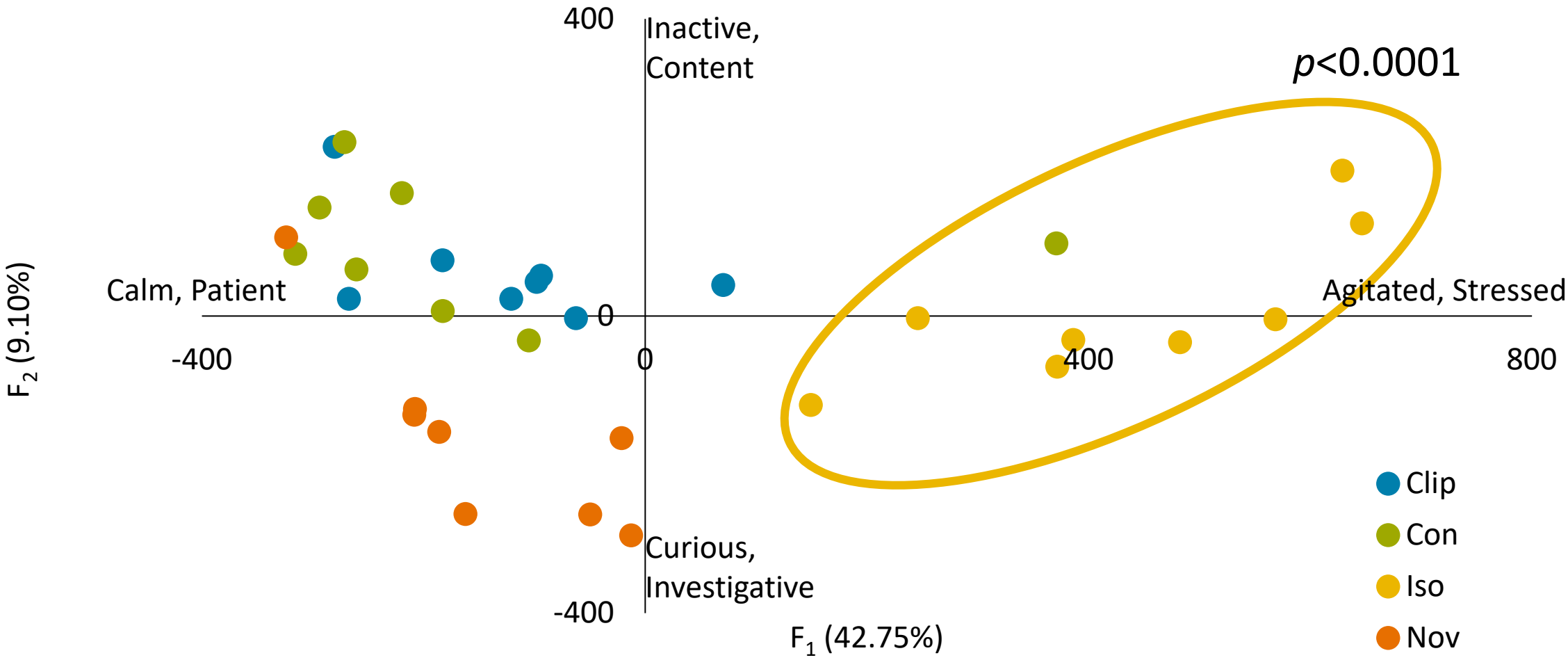
Consensus Profile



QBA


400
Inactive,
Content
Calm, Patient
Agitated, Stressed
0
-400
0
400
800
-400
Curious,
Investigative
F2 (9.10%)
F1 (42.75%)
Clip
Con
Iso
Nov

QBA


400
Inactive,
Content
p<0.0001
Calm, Patient
Agitated, Stressed
0
-400
0
400
800
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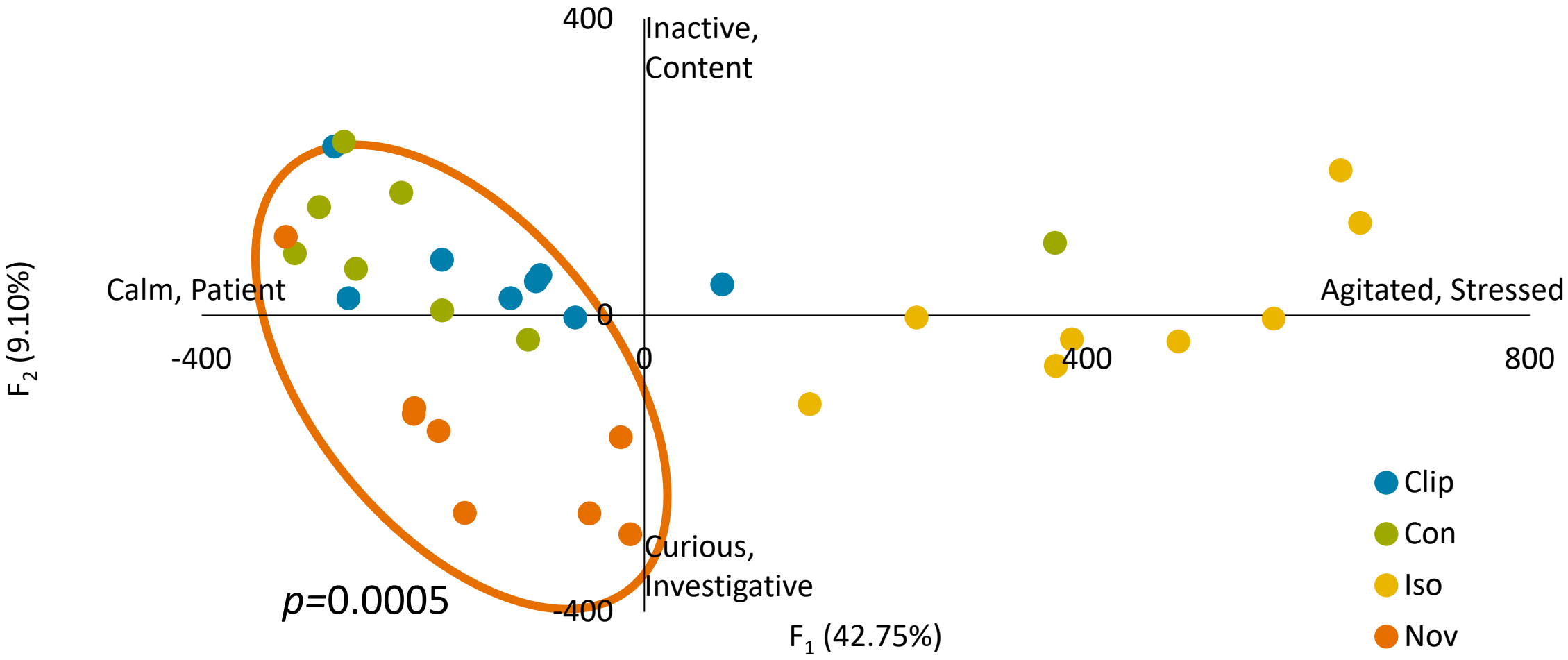

400
Inactive,
Content
Calm, Patient
Agitated, Stressed
0
-400
0
400
800
F_2 (9.10%)
F_1 (42.75%)
Curious,
Investigative
-400
p=0.0005
Clip
Con
Iso
Nov

Conclusions

- **Further validation of QBA**
- **May be more sensitive than other measures of behavior**

Photo: Stock Image

In the Field

- Eight mature horses
  - Four EAA, four Control
- Ongoing data collection

Photo:
Rutgers ESC

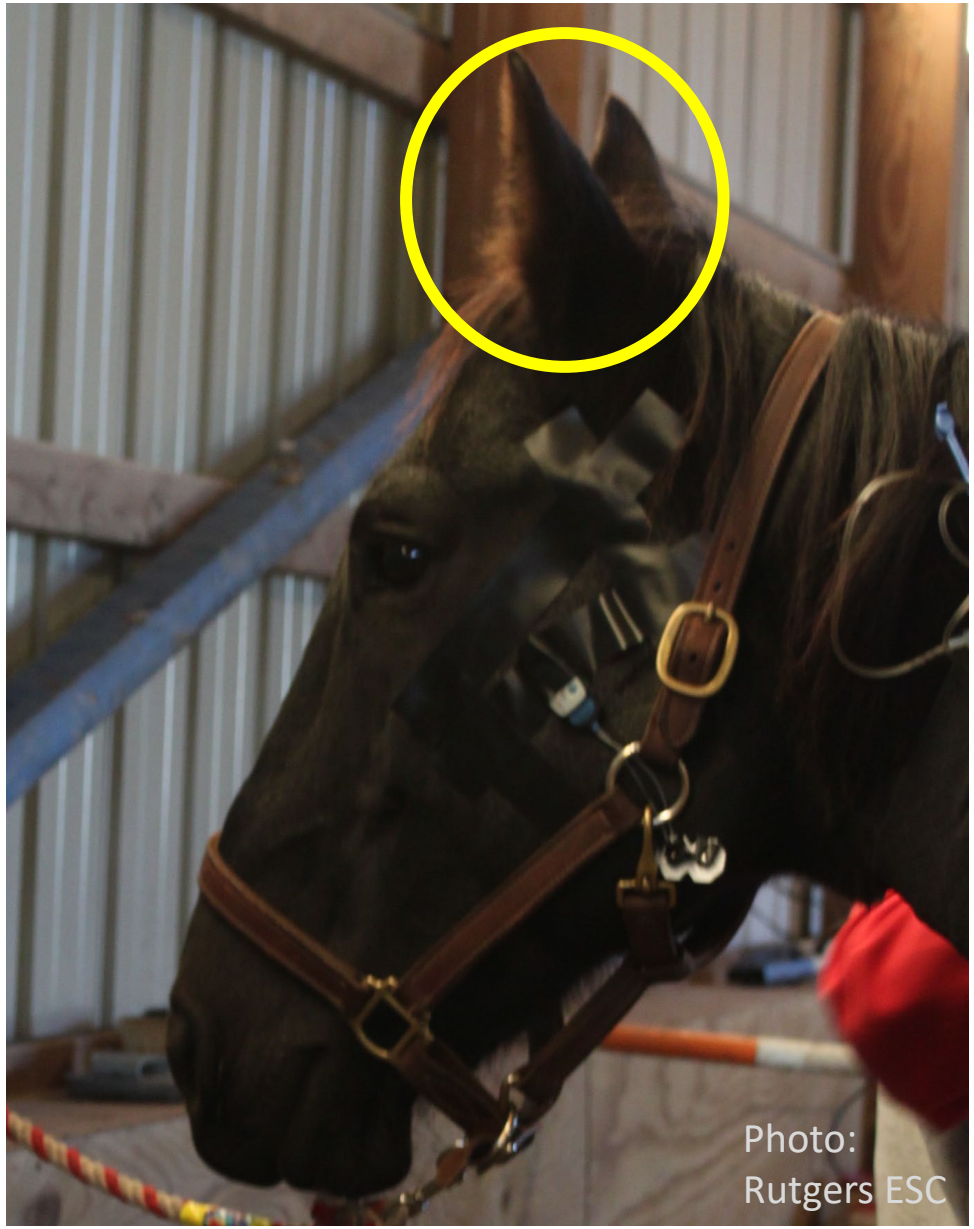
Horse Grimace Scale

- **Six facial action units**
  - **Scored 0-2**

Dalla Costa et., 2014

Horse Grimace Scale

- **Six facial action units**
  - **Ears**



Dalla Costa et., 2014

Horse Grimace Scale

- **Six facial action units**
  - **Ears**
  - **Area over the eye**

Dalla Costa et., 2014

Horse Grimace Scale

- **Six facial action units**
  - **Ears**
  - **Area over the eye**
  - **Area around the eye**

Dalla Costa et., 2014

Horse Grimace Scale

- **Six facial action units**
  - **Ears**
  - **Area over the eye**
  - **Area around the eye**
  - **Jaw**

Dalla Costa et., 2014

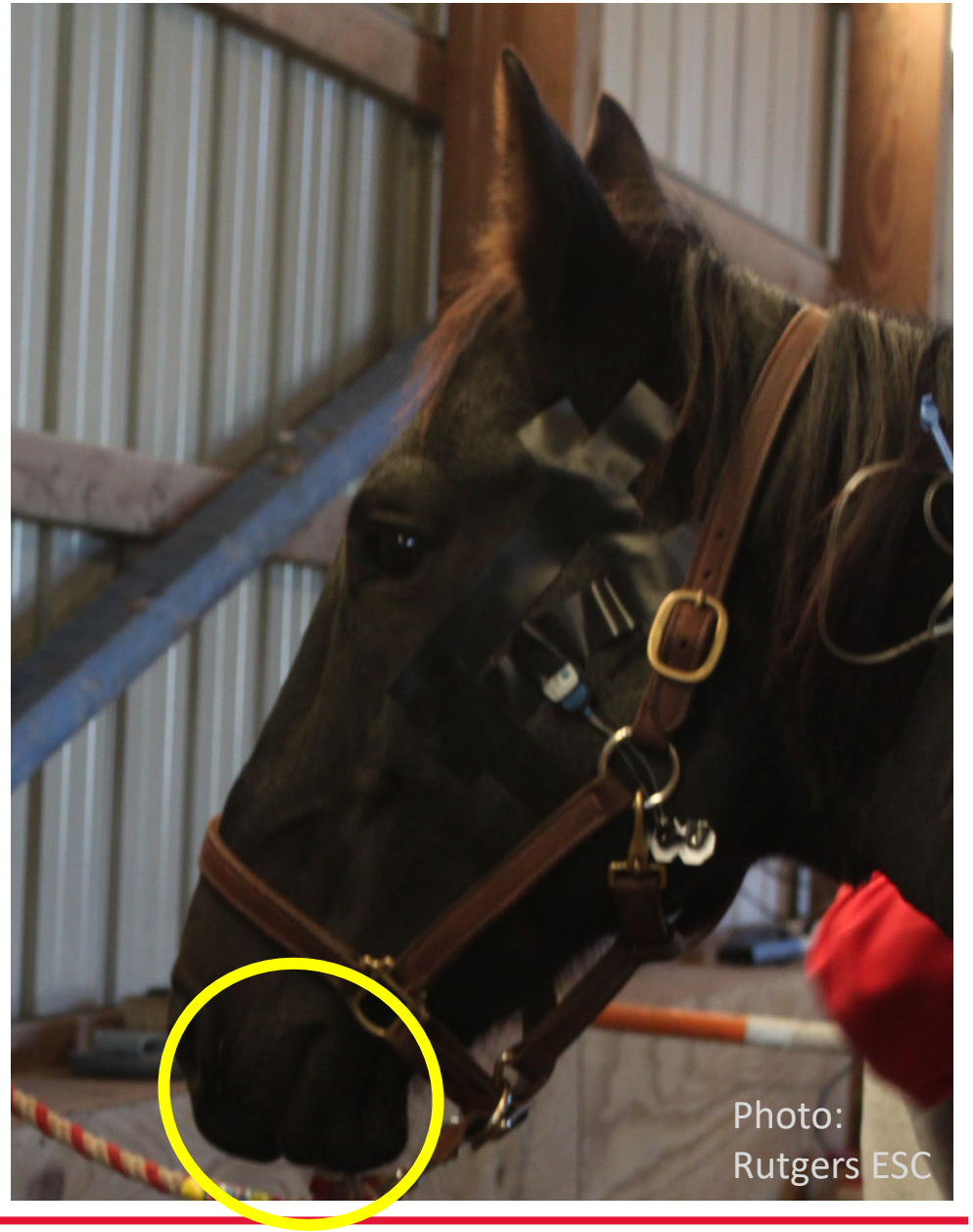
Horse Grimace Scale

- **Six facial action units**
  - **Ears**
  - **Area over the eye**
  - **Area around the eye**
  - **Jaw**
  - **Profile & muzzle**

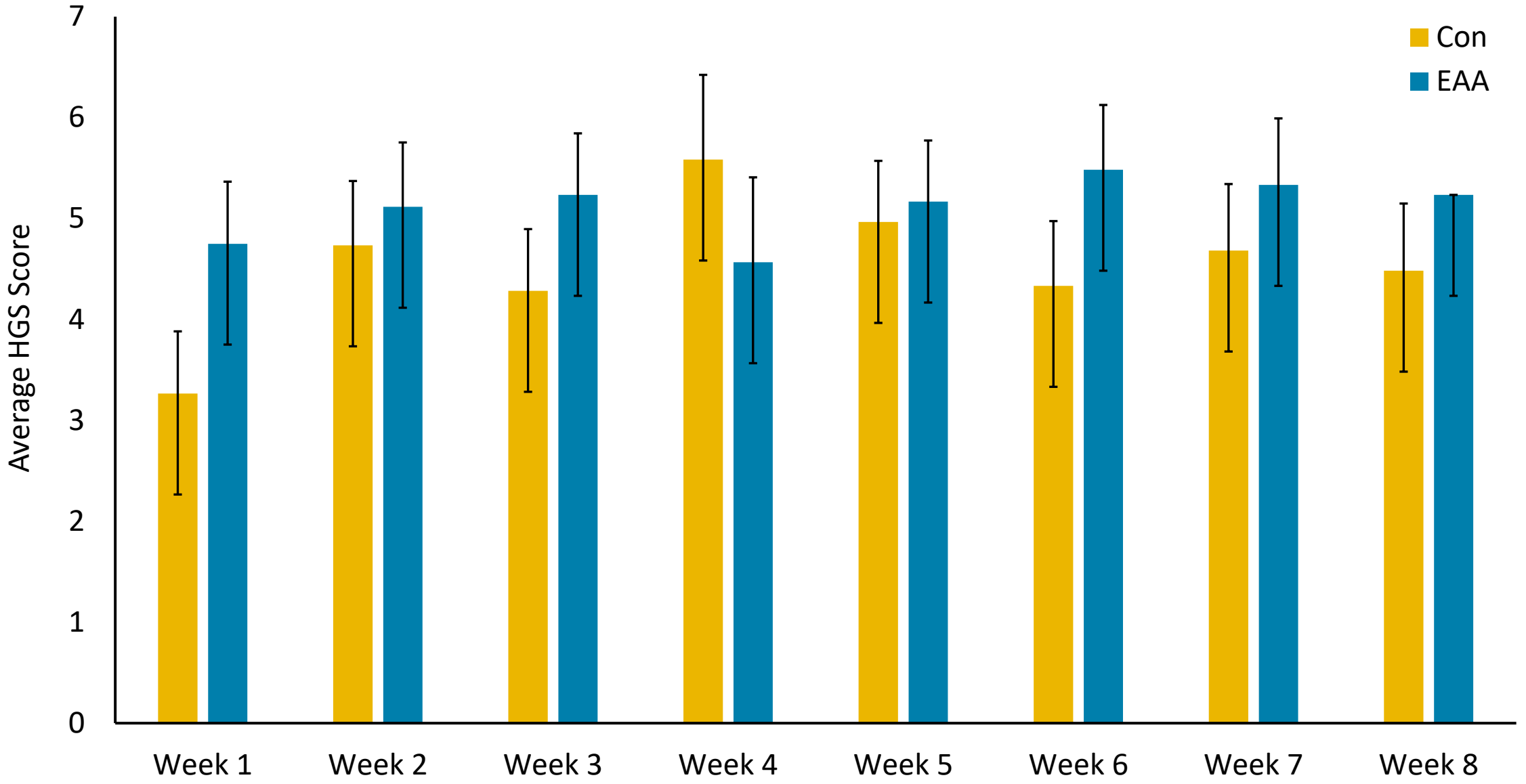
Dalla Costa et., 2014

Horse Grimace Scale

- **Six facial action units**
  - **Ears**
  - **Area over the eye**
  - **Area around the eye**
  - **Jaw**
  - **Profile & muzzle**
  - **Chin & lips**



Dalla Costa et., 2014


Average HGS Score
7
6
5
4
3
2
1
0
Con
EAA
Week 1
Week 2
Week 3
Week 4
Week 5
Week 6
Week 7
Week 8

Weaknesses

- Focus on detection of stress
  - Negative affective state
- Affective state = mood state (Hall & Heleski, 2017)
- Combination of valence (negative, positive) & arousal (low, high) (Animal Behavior & Cognition Lab, 2022)

The Challenge

- **Identify ways to measure positive affective state**

Implementing What You Learn

1. Include welfare assessments
2. Array of measures to select from
3. Note if it's positive or negative
4. Use results in decision making

Thank You!

- The Rutgers Equine Science Center
- The Rutgers Animal Care Staff
- Our Research Horses
- Special Strides
- Equine Exercise Physiology Lab
- Undergraduate Assistants
  - Kamila Cieslik
  - Sarah Florentine

Questions?

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