Genetic analysis of temperament traits assessed by riders and judges at Icelandic horse field tests

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Breeding goal for Icelandic horses

Beautiful five-gaited horses that should be suited both for leisure and professional riders at all ages

- Conformation and riding ability traits assessed at field tests
  • Performance on a straight track
- Subjective scoring on an objectively defined linear scale 5-10; 0.5
**Spirit**

- Part of the selection criteria since 1950
- Composite trait

<table>
<thead>
<tr>
<th>Spirit</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiery, indefatigable</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Eager, enthusiastic</td>
<td>5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Willing</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

- Included in the breeding evaluation
- Estimated heritability is 0.37
- Considerable genetic gain
Spirit

• Controversial trait

“The horse should be fiery, cheerful and brave, but extremely easy to handle. All the time, the horse tries to please the rider.”
https://www.youtube.com/watch?v=J4omG8eygls

• Does the current assessment method for spirit support breeding of well-tempered riding horses suited for the general rider?

• Trial project involving additional assessments pertaining to temperamental suppleness of breeding horses
### Additional temperamental suppleness of breeding horses

<table>
<thead>
<tr>
<th>Trait</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Head carriage</strong></td>
<td>Unstable head carriage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Stable head carriage</td>
</tr>
<tr>
<td><strong>Rein contact</strong></td>
<td>Stiff/heavy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Light/supple</td>
</tr>
<tr>
<td><strong>Top line</strong></td>
<td>Stiff</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Supple</td>
</tr>
<tr>
<td><strong>Cooperation</strong></td>
<td>Uncooperative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cooperative Lightness</td>
</tr>
<tr>
<td></td>
<td>Aggressiveness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Out of control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Nerve strength</strong></td>
<td>Tenseness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Composed Determination</td>
</tr>
<tr>
<td></td>
<td>Nervousness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Courage</td>
</tr>
<tr>
<td></td>
<td>Fearfulness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Overall suppleness 1-7**
Aim of the study

Is the assessment of spirit a proper/good indicator of well-tempered riding horses?

• Evaluate consistency between temperament assessments made by breeding judges and riders at breeding field tests
• Estimate genetic parameters for temperament traits
Data

• Breeding field tests
  - Riders and judges assessed the same horses
  - Spirit and the new suppleness traits
  - 440 horses – 67.0%
Data from breeding field tests

Score for Spirit

- All assessed horses
- Sample - scored by judges
- Sample - scored by riders
### Principal component analysis

- Temperament traits assessed at breeding field tests

<table>
<thead>
<tr>
<th>Physical constitution component</th>
<th>State of mind component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head carriage</td>
<td>Spirit</td>
</tr>
<tr>
<td>Rein contact</td>
<td>Cooperation</td>
</tr>
<tr>
<td>Top line</td>
<td>Nerve strength</td>
</tr>
<tr>
<td>Overall suppleness</td>
<td>Overall suppleness</td>
</tr>
</tbody>
</table>
Genetic analyses

• Genetic parameters estimated for:
  - Temperament traits assessed by breeding judges for all horses presented at breeding field tests in Iceland in 2014 and 2015
  - Temperament traits assessed by both breeding judges and riders

• Models included
  - age and sex of the horse
  - field test

\[ Y_{ijk} = \mu + \text{age}_i \text{_sex} + \text{field test}_j + \text{individual}_k + \text{pe}_k + e_{ijk} \]
Genetic analyses

- Estimated heritabilities:
  - Temperament traits at breeding field tests

<table>
<thead>
<tr>
<th></th>
<th>All horses (judges)</th>
<th>Sample Riders</th>
<th>Sample Judges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spirit</td>
<td>0.14</td>
<td>0.08 – 0.15</td>
<td>0.15 – 0.20</td>
</tr>
<tr>
<td>Cooperation</td>
<td>0.07 – 0.11</td>
<td>0.23 – 0.49</td>
<td>0.00 – 0.05</td>
</tr>
<tr>
<td>Nerve strength</td>
<td>0.15 – 0.16</td>
<td>0.34 – 0.40</td>
<td>0.04 – 0.12</td>
</tr>
<tr>
<td>Overall suppleness</td>
<td>0.19</td>
<td>0.36 – 0.46</td>
<td>0.00 – 0.07</td>
</tr>
<tr>
<td>Head carriage</td>
<td>0.00 – 0.04</td>
<td>0.02 – 0.35</td>
<td>0.01 – 0.52</td>
</tr>
<tr>
<td>Rein contact</td>
<td>0.19</td>
<td>0.19 – 0.24</td>
<td>0.21 – 0.23</td>
</tr>
<tr>
<td>Top line</td>
<td>0.03 – 0.06</td>
<td>0.04 – 0.31</td>
<td>0.00 – 0.76</td>
</tr>
</tbody>
</table>
Genetic analyses

• Estimated phenotypic correlations:
  – Between assessments made by riders and judges
    • 0.22 – 0.61
  – Between temperament traits at breeding field tests
    • 0.35 – 0.87
Genetic analyses

• Estimated genetic correlations:
  - Between assessments made by riders and judges
    • 0.45 – 1.00
  - Between temperament traits at breeding field tests
    • 0.26 – 1.00
Conclusion

• Considerable genetic variance of the new suppleness traits
  - Provide additional information supporting the assessment of spirit
  - Trait definitions need to be improved
  - Development of the assessment
    • So judges are better able to assess the aspects of traits
Thank you for your attention!

Questions?