Personality tests for horses

Dr. Krisztina Nagy, PhD
Personality- temperament

- propensity of the animal to behave in certain ways in certain situations
- personal characteristic
- individual differences – consistent over time and across situations

- e.g.: an introverted person may learn to talk to people at a party but will not speak about his/her intimate feelings
How to measure personality?

Questionnaire surveys, Behaviour tests
All measurements are estimations

• Estimations have errors
• Measurement errors needs to be reduced

• Precision: standard deviation of the estimator
• Bias: average difference between the estimator and the true value
Measurement errors
(random error + systematic error)

- **Random error**
  - a. Unbiased and precise = accurate
  - b. Unbiased but not precise = not accurate

- **Systematic error**
  - c. Biased but precise = not accurate
  - d. Biased and not precise = not accurate
Is it repeatable what we measure?

- repeatability, *reliability*:
  - Of the observer: inter-rater reliability ($r \geq 0.7$)
  - Of the test (consistency over time): test-retest reliability
Bias
Are we measuring what we wanted to?

- **Validity** (the strength of our conclusions)
  - Internal validity
    - compare the obtained data to measurements of a previously published method
    - conduct similar tests which have similar results
  - External validity
    - ability to generalize the results
    - increase the number (*sample unit*)
    - other studies report similar results
Reliability and validity

- If reliable but not valid: no use
- If not even reliable: absolutely no use
# Questionnaire surveys

Momozawa et al. (2005)

<table>
<thead>
<tr>
<th>Items</th>
<th>Description (This horse tends to ...)</th>
<th>1</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nervousness</td>
<td>become nervous about insects, noises, etc.</td>
<td>Calm</td>
<td>Nervous</td>
</tr>
<tr>
<td>Concentration</td>
<td>be trainable and undisturbed by the environment</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>Self-reliance</td>
<td>be at ease if left alone away from the herd</td>
<td>Restless</td>
<td>At ease</td>
</tr>
<tr>
<td>Trainability</td>
<td>be trained easily and promptly</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>Excitability</td>
<td>get excited easily</td>
<td>Not excitable</td>
<td>Excitable</td>
</tr>
<tr>
<td>Friendliness toward people</td>
<td>be never aggressive or fearful</td>
<td>Unfriendly</td>
<td>Friendly</td>
</tr>
<tr>
<td>Curiosity</td>
<td>be interested in novel objects and approach them</td>
<td>Rarely</td>
<td>Frequently</td>
</tr>
<tr>
<td>Memory</td>
<td>memorize what it learned or was trained</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>Panic</td>
<td>get excited to an abnormal extent</td>
<td>Never</td>
<td>Frequently</td>
</tr>
<tr>
<td>Cooperation</td>
<td>be cooperative with a caretaker when handled</td>
<td>Never</td>
<td>Always</td>
</tr>
<tr>
<td>Inconsistent emotionality</td>
<td>be unpredictable from day to day</td>
<td>Consistent</td>
<td>Inconsistent</td>
</tr>
<tr>
<td>Stubbornness</td>
<td>be obstinate once it resists a command</td>
<td>Obedient</td>
<td>Stubborn</td>
</tr>
<tr>
<td>Docility</td>
<td>be docile in general</td>
<td>Active</td>
<td>Docile</td>
</tr>
<tr>
<td>Vigilance</td>
<td>be vigilant about surroundings</td>
<td>Never</td>
<td>Always</td>
</tr>
<tr>
<td>Perseverance</td>
<td>be patient with various stimuli</td>
<td>Impatient</td>
<td>Patient</td>
</tr>
<tr>
<td>Friendliness toward horses</td>
<td>interact with other horses in a friendly manner</td>
<td>Unfriendly</td>
<td>Friendly</td>
</tr>
<tr>
<td>Competitiveness</td>
<td>be dominant in antagonistic encounters with other horses</td>
<td>Subordinate</td>
<td>Dominant</td>
</tr>
<tr>
<td>Skittishness</td>
<td>get surprised easily</td>
<td>Not skittish</td>
<td>Skittish</td>
</tr>
<tr>
<td>Timidity</td>
<td>be timid in a novel environment</td>
<td>Audacious</td>
<td>Timid</td>
</tr>
<tr>
<td>Gate entrance</td>
<td>go easily through the starting gate</td>
<td>Rarely</td>
<td>Always</td>
</tr>
</tbody>
</table>
Questionnaire surveys
Momozawa et al. (2005)

- 20 items, 69 horses, 3 caretakers (reliability)
- similar results replicated in another group of race horses (n=70) (validity)
- correlation between anxiety level and the balloon reactivity test (validity)
Temperament traits
Momozawa et al. (2005)

• Anxiety

• Affability
  – ‘Friendliness toward people’, ‘Cooperation’, ‘Docility’ and ‘Friendliness toward horses’

• Trainability
  – ‘Concentration’, ‘Trainability’, ‘Memory’ and ‘Perseverance’
Other studies 1.  
Morris et al. (2005)

- Human NEO Personality Inventory
- 60 items, 10 horses, 9 judges
- Big Five dimensions in horses
  – Neuroticism (r=0.623) – similar to Anxiety
  – Extraversion (r=0.445)
  – Openness to experience (r=0.262)
  – Agreeableness (r=0.492) – similar to Affability
  – Conscientiousness (r=0.364)

(Costa & McRae, 1992)
Difficulties

Morris et al. (2005)

• Openness to experience
  – is excited by the beauty of his/her surroundings
  – thinks about ideas and abstract thoughts
  – likes poetry

• Conscientiousness
  – keeps a neat and clean stable
  – is rather disorganised
Other studies 2.
McGrogan et al. (2008)

– Dimensions of horse personality based on owner and trainer supplied personality traits

• 36 items, 100 horses, 2-3 rater/horse

• Temperament traits (named as in Big5):
  – Agreeableness – similar to Affability
  – Extraversion – some aspects of Trainability but also ‘Dominance’ and ‘Neuroticism’
  – Neuroticism – similar to Anxiety
### Principal component analysis (PCA)

<table>
<thead>
<tr>
<th>Adjective</th>
<th>Agreeableness</th>
<th>Extraversion</th>
<th>Neuroticism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kind</td>
<td>0.90</td>
<td>0.01</td>
<td>-0.08</td>
</tr>
<tr>
<td>Sweet</td>
<td>0.87</td>
<td>0.12</td>
<td>-0.15</td>
</tr>
<tr>
<td>Aggressive to horses</td>
<td>-0.81</td>
<td>0.15</td>
<td>0.21</td>
</tr>
<tr>
<td>Social to horses</td>
<td>0.80</td>
<td>0.04</td>
<td>0.08</td>
</tr>
<tr>
<td>Sour</td>
<td>-0.79</td>
<td>-0.01</td>
<td>0.28</td>
</tr>
<tr>
<td>Aggressive to humans</td>
<td>-0.78</td>
<td>-0.12</td>
<td>0.08</td>
</tr>
<tr>
<td>Happy</td>
<td>0.72</td>
<td>0.46</td>
<td>-0.03</td>
</tr>
<tr>
<td>Social to humans</td>
<td>0.74</td>
<td>0.23</td>
<td>0.19</td>
</tr>
<tr>
<td>Generous</td>
<td>0.71</td>
<td>-0.12</td>
<td>-0.24</td>
</tr>
<tr>
<td>Mannerly</td>
<td>0.69</td>
<td>0.09</td>
<td>-0.38</td>
</tr>
<tr>
<td>Bossy</td>
<td>-0.67</td>
<td>0.09</td>
<td>0.35</td>
</tr>
<tr>
<td>Sensitive</td>
<td>0.66</td>
<td>0.12</td>
<td>0.37</td>
</tr>
<tr>
<td>Cooperative</td>
<td>0.64</td>
<td>0.49</td>
<td>-0.23</td>
</tr>
<tr>
<td>Loner</td>
<td>-0.64</td>
<td>-0.16</td>
<td>0.13</td>
</tr>
<tr>
<td>Obedient</td>
<td>0.57</td>
<td>0.51</td>
<td>-0.27</td>
</tr>
<tr>
<td>Stubborn</td>
<td>-0.54</td>
<td>-0.40</td>
<td>0.34</td>
</tr>
<tr>
<td>Forgiving</td>
<td>0.52</td>
<td>0.32</td>
<td>-0.47</td>
</tr>
<tr>
<td>Shy</td>
<td>-0.43</td>
<td>-0.36</td>
<td>0.02</td>
</tr>
<tr>
<td>Cautious</td>
<td>0.41</td>
<td>-0.36</td>
<td>0.08</td>
</tr>
<tr>
<td>Bold</td>
<td>-0.13</td>
<td>0.77</td>
<td>-0.09</td>
</tr>
<tr>
<td>Competitive</td>
<td>-0.09</td>
<td>0.77</td>
<td>0.01</td>
</tr>
<tr>
<td>Smart</td>
<td>0.23</td>
<td>0.75</td>
<td>-0.08</td>
</tr>
<tr>
<td>Proud</td>
<td>0.26</td>
<td>0.74</td>
<td>0.03</td>
</tr>
<tr>
<td>Intelligent</td>
<td>0.34</td>
<td>0.70</td>
<td>-0.25</td>
</tr>
<tr>
<td>Timid</td>
<td>0.11</td>
<td>-0.69</td>
<td>0.27</td>
</tr>
<tr>
<td>Curious</td>
<td>0.30</td>
<td>0.67</td>
<td>0.25</td>
</tr>
<tr>
<td>Follower</td>
<td>0.41</td>
<td>-0.61</td>
<td>-0.09</td>
</tr>
<tr>
<td>Leader</td>
<td>-0.53</td>
<td>0.61</td>
<td>0.07</td>
</tr>
<tr>
<td>Lazy</td>
<td>-0.22</td>
<td>0.53</td>
<td>-0.09</td>
</tr>
<tr>
<td>Nervous</td>
<td>-0.29</td>
<td>-0.37</td>
<td>0.68</td>
</tr>
<tr>
<td>Noisy</td>
<td>-0.00</td>
<td>0.19</td>
<td>0.58</td>
</tr>
<tr>
<td>Quiet</td>
<td>0.53</td>
<td>-0.14</td>
<td>-0.58</td>
</tr>
<tr>
<td>Steady</td>
<td>0.42</td>
<td>0.47</td>
<td>-0.53</td>
</tr>
<tr>
<td>Stoic</td>
<td>0.01</td>
<td>0.06</td>
<td>-0.44</td>
</tr>
</tbody>
</table>

**Factor loading score:**
Helps to decide which adjective belongs to which factor (temperament trait)

**Eigenvalue:**
Helps to decide how many factors to build

% of variance:
The 3 factors explain the 59% of the total variance
Other studies 3.

Lloyd et al. (2008)

- Cross-species comparison (Stevenson-Hinde et al., 1980)
  - cats, gorillas, spotted hyenas, cheetahs, etc.
- 30 items, 61 horses, 3 rater/horse
- Temperament traits:
  - ‘dominance’ – similar to Affability
  - ‘anxiousness’ – similar to Anxiety
  - ‘excitability’
  - ‘protection’
  - ‘sociability’
  - ‘inquisitiveness’
Loadings of behaviourally defined adjectives (BDAs) onto six components extracted using principal component analysis with varimax rotation

<table>
<thead>
<tr>
<th>BDAs</th>
<th>Component 1 (dominance)</th>
<th>Component 2 (anxiousness)</th>
<th>Component 3 (excitability)</th>
<th>Component 4 (protection)</th>
<th>Component 5 (sociability)</th>
<th>Component 6 (inquisitiveness)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliable</td>
<td>-0.785</td>
<td>-0.181</td>
<td>-0.262</td>
<td>0.139</td>
<td>0.066</td>
<td>-0.228</td>
</tr>
<tr>
<td>Subordinate</td>
<td>-0.772</td>
<td>0.180</td>
<td>0.134</td>
<td>0.070</td>
<td>0.062</td>
<td>-0.032</td>
</tr>
<tr>
<td>Equable</td>
<td>-0.656</td>
<td>-0.522</td>
<td>-0.255</td>
<td>0.050</td>
<td>0.089</td>
<td>0.201</td>
</tr>
<tr>
<td>Eccentric</td>
<td>0.419</td>
<td>0.370</td>
<td>0.291</td>
<td>0.251</td>
<td>0.121</td>
<td>0.414</td>
</tr>
<tr>
<td>Effective</td>
<td>0.612</td>
<td>-0.096</td>
<td>0.203</td>
<td>0.009</td>
<td>0.298</td>
<td>0.079</td>
</tr>
<tr>
<td>Stubbom</td>
<td>0.729</td>
<td>0.230</td>
<td>0.170</td>
<td>-0.179</td>
<td>0.010</td>
<td>0.450</td>
</tr>
<tr>
<td>Aggressive</td>
<td>0.794</td>
<td>0.077</td>
<td>0.124</td>
<td>0.314</td>
<td>-0.086</td>
<td>-0.024</td>
</tr>
<tr>
<td>Irritable</td>
<td>0.837</td>
<td>0.292</td>
<td>0.270</td>
<td>-0.069</td>
<td>-0.015</td>
<td>0.004</td>
</tr>
<tr>
<td>Suspicious</td>
<td>0.064</td>
<td>0.750</td>
<td>0.086</td>
<td>-0.265</td>
<td>-0.243</td>
<td>0.013</td>
</tr>
<tr>
<td>Insecure</td>
<td>0.077</td>
<td>0.805</td>
<td>0.081</td>
<td>0.084</td>
<td>0.000</td>
<td>0.044</td>
</tr>
<tr>
<td>Tense</td>
<td>0.352</td>
<td>0.822</td>
<td>0.206</td>
<td>-0.054</td>
<td>0.110</td>
<td>-0.092</td>
</tr>
<tr>
<td>Apprehensive</td>
<td>0.015</td>
<td>0.907</td>
<td>0.220</td>
<td>-0.048</td>
<td>0.104</td>
<td>-0.022</td>
</tr>
<tr>
<td>Fearful</td>
<td>-0.008</td>
<td>0.915</td>
<td>0.067</td>
<td>-0.028</td>
<td>0.085</td>
<td>0.122</td>
</tr>
<tr>
<td>Active</td>
<td>0.180</td>
<td>0.236</td>
<td>0.777</td>
<td>0.032</td>
<td>0.411</td>
<td>0.207</td>
</tr>
<tr>
<td>Slow</td>
<td>-0.306</td>
<td>-0.228</td>
<td>-0.768</td>
<td>0.123</td>
<td>-0.274</td>
<td>-0.042</td>
</tr>
<tr>
<td>Excitable</td>
<td>0.180</td>
<td>0.549</td>
<td>0.709</td>
<td>-0.038</td>
<td>0.036</td>
<td>0.247</td>
</tr>
<tr>
<td>Intelligent</td>
<td>-0.031</td>
<td>0.106</td>
<td>0.731</td>
<td>0.367</td>
<td>-0.064</td>
<td>0.279</td>
</tr>
<tr>
<td>Understanding</td>
<td>-0.627</td>
<td>-0.038</td>
<td>-0.007</td>
<td><strong>0.679</strong></td>
<td>0.006</td>
<td>-0.166</td>
</tr>
<tr>
<td>Motherly</td>
<td>-0.372</td>
<td>-0.006</td>
<td>0.006</td>
<td><strong>0.832</strong></td>
<td>0.078</td>
<td>0.039</td>
</tr>
<tr>
<td>Protective</td>
<td>-0.050</td>
<td>-0.132</td>
<td>-0.033</td>
<td><strong>0.842</strong></td>
<td>0.343</td>
<td>-0.072</td>
</tr>
<tr>
<td>Sociable</td>
<td>-0.174</td>
<td>0.265</td>
<td>0.036</td>
<td>0.277</td>
<td><strong>0.760</strong></td>
<td>0.329</td>
</tr>
<tr>
<td>Playful</td>
<td>0.008</td>
<td>0.086</td>
<td>0.403</td>
<td>-0.049</td>
<td><strong>0.785</strong></td>
<td>0.105</td>
</tr>
<tr>
<td>Popular</td>
<td>-0.086</td>
<td>-0.117</td>
<td>0.067</td>
<td>0.428</td>
<td><strong>0.803</strong></td>
<td>-0.083</td>
</tr>
<tr>
<td>Curious</td>
<td>0.002</td>
<td>-0.194</td>
<td>0.268</td>
<td>-0.060</td>
<td>0.332</td>
<td><strong>0.697</strong></td>
</tr>
<tr>
<td>Opportunistic</td>
<td>0.195</td>
<td>0.064</td>
<td>0.214</td>
<td>-0.066</td>
<td>0.028</td>
<td><strong>0.807</strong></td>
</tr>
</tbody>
</table>

Eigenvalue  
Cumulative % variance

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4.96</td>
<td>19.83</td>
<td>38.82</td>
<td>50.81</td>
<td>61.18</td>
<td>71.34</td>
<td>79.26</td>
</tr>
</tbody>
</table>

Figures in bold represent the highest loading for each adjective across all components.
Additionally: 2h (8*15 min) **behavioural observation** while the horse was at pasture.

<table>
<thead>
<tr>
<th>Personality component</th>
<th>Contributing BDAs and behaviours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component 1 (dominance)</td>
<td></td>
</tr>
<tr>
<td>BDA</td>
<td>Reliable</td>
</tr>
<tr>
<td>Behaviour</td>
<td>Herding</td>
</tr>
<tr>
<td>$r_s$</td>
<td>0.33</td>
</tr>
<tr>
<td>$P$</td>
<td>0.03</td>
</tr>
<tr>
<td>Component 2 (anxiousness)</td>
<td></td>
</tr>
<tr>
<td>BDA</td>
<td>Suspicious</td>
</tr>
<tr>
<td>Behaviour</td>
<td>Passage</td>
</tr>
<tr>
<td>$r_s$</td>
<td>0.33</td>
</tr>
<tr>
<td>$P$</td>
<td>0.03</td>
</tr>
<tr>
<td>Component 3 (excitability)</td>
<td></td>
</tr>
<tr>
<td>BDA</td>
<td>Active</td>
</tr>
<tr>
<td>Behaviour</td>
<td>Stand</td>
</tr>
<tr>
<td>$r_s$</td>
<td>−0.43</td>
</tr>
<tr>
<td>$P$</td>
<td>0.00</td>
</tr>
<tr>
<td>Component 4 (protection)</td>
<td></td>
</tr>
<tr>
<td>BDA</td>
<td>Understanding</td>
</tr>
<tr>
<td>Behaviour</td>
<td>Passage</td>
</tr>
<tr>
<td>$r_s$</td>
<td>−0.36</td>
</tr>
<tr>
<td>$P$</td>
<td>0.02</td>
</tr>
<tr>
<td>Component 5 (sociability)</td>
<td></td>
</tr>
<tr>
<td>BDA</td>
<td>Sociable</td>
</tr>
<tr>
<td>Behaviour</td>
<td>Canter</td>
</tr>
<tr>
<td>$r_s$</td>
<td>0.38</td>
</tr>
<tr>
<td>$P$</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Table 5: Correlations between personality component scores for 44 horses, against behaviour data collected for the same group of horses.
Most common behaviour tests

- Open field test (arena test)
- Handling test (bridge test)
- Novel object test (umbrella test)
- Stranger test (unfamiliar person)
- Human-animal relationship
- Learning tests
Variations

- number of tests
- type of the test
- what to measure
- on what type of horse
- etc.
Practical use of the personality tests

• temperament can strongly determine the animal’s usability

• most important horse’s temperament:
  – quietness, reliability, safety (Pony Club members, Buckley et al., 2004)

• attempts:
  – The association between performance in show-jumping and personality traits earlier in life (Visser et al., 2003)
„Interieurprüfung“
Interieur test - difficulties

• Conclusions (Pirsich, 2009, MSc thesis)
  – can be part of the ‘Leistungsprüfung‘
  – influencing factors: exam station, training phase, genetics (?)
  – rating methods needs to become more objective
  – interieur test should be standardized
What to measure?

• Frequency of a behaviour
  – defecation, snorting, etc.

• Latency
  – time needed to touch the object, etc.

• Reaction vigour
  – behaviour reaction on a scale
  – heart rate
  – etc.
The association between performance in show-jumping and personality traits earlier in life

(Visser et al., 2003)

Variables used in the analysis of personality tests and performance test of horses between 9 and 37 months of age ($n = 38-41$)

| NO | Snorting | Snorting during exposure to novel object
| NO | Exploring NO | Exploring novel object, within one body length of novel object
| NO | Exploring other | Exploring other things in the arena
| NO | Focus NO | Focus (ears and eyes) on novel object
| NO | Head low | Head below the imaginary horizontal belly-line
| NO | Latency circle | Latency time to enter the circle around the novel object
| NO | Latency touch NO | Latency time to touch the novel object for the first time
| NO | Trot/canter | Trotting and cantering during exposure novel object
| NO | Tail high | Carrying the tail above the imaginary horizontal back line
| NO | ‘Flightiness’ | First PCA component created from nine behavioural variables
| NO | ‘Sensitivity’ | Second PCA component created from nine behavioural variables
| NO | Non-motor HR | Heart rate corrected for locomotion
| NO | RMSSD novel | Heart rate variability during exposure novel object
| HA | Pawing in front | Latency time to first pawing handler in front of box
| HA | Pawing within | Latency time to first pawing handler within box
| HA | Attempts crossing | Number of attempts per session
| HA | Reluctance crossing | Reluctance behaviour while approaching the bridge
| HA | Restless alone | Restlessness behaviour in box alone
| HA | Restless in front | Restlessness behaviour in box handler in front
| HA | Restless within | Restlessness behaviour in box handler within
| HA | Stand still bridge | Standing still in front of the bridge
| HA | Walking alone | Walking in box alone
| HA | ‘Patience’ | First PCA component created from nine behavioural variables
| HA | ‘Willingness to perform’ | Second PCA component created from nine behavioural variables
| HA | RMSSD bridge | Heart rate variability during approach/crossing bridge
| AV | Correct responses | Percentage of correct responses during a session
| AV | Duration air puffs | Mean duration of the air puffs given per trial
| RE | Perform operant | Latency time to perform the operant
| RE | Collect reward | Latency time to collect reward
| BR | Lunging HR | Mean heart rate (in bpm) during the test
| BR | Lunging RMSSD | Heart rate variability (in ms) during the test
| BR | Lunging bit | Percentage of time horse accepts the bit
| BR | Mounting HR | Mean heart rate (in bpm) during the test
| BR | Mounting RMSSD | Heart rate variability (in ms) during the test
| BR | Mounting bit | Percentage of time horse accepts the bit
| TR | Entering | Latency time to enter the trailer
| NHB | Free jumping | Average percentage of correct jumps for free jumping during training days
| NHB | Jumping rider | Average percentage of correct jumps with rider during training days
| NHB | Refusal novel course | Number of refusals during first time novel course
| NHB | Rearing novel course | Number of times rearing during first time novel course
| NHB | Shying novel course | Number of times shying away from something during first time novel course
| NHB | Total duration | Time needed to complete the novel course
| NHB | Heart rate novel course | Mean heart rate (in bpm) relative to baseline recordings
| NHB | RMSSD novel course | Heart rate variability (in ms) during the test relative to baseline recordings

Fearfulness in horses: A temperament trait stable across time and situations (Lansade et al., 2008)

<table>
<thead>
<tr>
<th>Novel object test</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Licking/nibbling (f)</td>
<td></td>
</tr>
<tr>
<td>Contact (d)</td>
<td></td>
</tr>
<tr>
<td>Glances (f)</td>
<td></td>
</tr>
<tr>
<td>Licking/nibbling (l)</td>
<td></td>
</tr>
<tr>
<td>Sniffing (l)</td>
<td></td>
</tr>
<tr>
<td>Sniffing (f)</td>
<td></td>
</tr>
<tr>
<td>Blowing (f)</td>
<td></td>
</tr>
<tr>
<td>Sectors entered (n)</td>
<td></td>
</tr>
<tr>
<td>Glances (l)</td>
<td></td>
</tr>
<tr>
<td>Vigilant position (f)</td>
<td></td>
</tr>
</tbody>
</table>

| Novel area test                        |                          |
| Time to put one foot                   |                          |
| Time to eat                            |                          |
| Glances (f)                            |                          |
| Sniffing the floor (f)                 |                          |
| Vigilant position (f)                  |                          |
| Licking/nibbling (f)                   |                          |
| Sniffing (l)                           |                          |
| Sniffing (f)                           |                          |
| Time near the area                     |                          |
| Licking/nibbling (l)                   |                          |

| Surprise test, horse free              |                          |
| Flight distance                        |                          |
| Time to eat                            |                          |
| Glances (f)                            |                          |
| Sniffing the floor (f)                 |                          |

--- lines marked with plaster powder

- umbrella
- bucket full of food

- Vigilant position (f)
- Blowing (f)

| Surprise test, horse tethered          |                          |
| Maximum HR                            |                          |
| Maximum HR–average HR                 |                          |
| Maximum HR–minimum HR                 |                          |
| Maximum HR × 100/minimum HR           |                          |
| Maximum HR × 100/average HR           |                          |
Training methods for horses: habituation to a frightening stimulus (Christiensen et al., 2006)

<table>
<thead>
<tr>
<th>Reaction</th>
<th>Ethogram of behavioural reactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 = None*</td>
<td>Does not react to the test stimulus and chewing is not interrupted</td>
</tr>
<tr>
<td>2 = Head up*</td>
<td>Raises the head from the feed container and chewing is interrupted, but is not alert and does not move away from the feed container</td>
</tr>
<tr>
<td>3 = Alert</td>
<td>Stands vigilant with elevated neck, with or without tail elevation, head and ears orientated towards test stimulus, chewing is interrupted, and horse may take up to 2 steps from the feed container</td>
</tr>
<tr>
<td>4 = Away</td>
<td>Moves 3 or more steps backwards or sideways from the feed container in response to the test stimulus, typically followed by alertness</td>
</tr>
<tr>
<td>5 = Flight</td>
<td>Turns/jumps away from the feed container in a sudden movement, typically followed by trotting/galloping, alertness and possibly snorting</td>
</tr>
</tbody>
</table>

Fear reactions in trained and untrained horses from dressage and show-jumping breeding lines (Borstel et al., 2010)

- Flight: The horse jumps to the side and gallops for more than four strides away.
- Sidesteps: The horse jumps to the side and trots or gallops away for more than two but no more than four strides (Not as energetic as “flight”).
- Alert: The horse quivers and may take up to two steps to the side.
- Head up: The horse throws its head up, stops eating but does not move away.
- None: The horse may or may not direct its attention (turn ear and/or eye) to the stimulus but does not stop eating/chewing or lift the head in response to the stimulus.
How to measure changes in behaviour?

• Fearfulness: does it improve by training?
  – Define the training method
  – How to measure?
  – What to measure?
  – When to measure?
  – How to select the individuals?
  – etc
Police horses- special training

Horses showing less excitability or more than the average (Lloyd et al., 2008)

Horses that were showing less excitability on the behaviour level, had greater reaction in heart rate variability
Study 5.
Differences in personality traits between crib-biting and control horses

- Momozawa et al. (2005) questionnaire survey
- 19 questions: ‘Anxiety’, ‘Affability’ and ‘Trainability’

<table>
<thead>
<tr>
<th>Questionnaire items</th>
<th>Description (This horse tends to . . .)</th>
<th>1</th>
<th>↔</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nervousness</td>
<td>become nervous about insects, noises, etc.</td>
<td>Calm</td>
<td></td>
<td>Nervous</td>
</tr>
<tr>
<td>Concentration</td>
<td>be trainable and undisturbed by the environment</td>
<td>Poor</td>
<td></td>
<td>Excellent</td>
</tr>
<tr>
<td>Self-reliance</td>
<td>be at ease if left alone away from the herd</td>
<td>Restless</td>
<td></td>
<td>At ease</td>
</tr>
<tr>
<td>Trainability</td>
<td>be trained easily and promptly</td>
<td>Poor</td>
<td></td>
<td>Excellent</td>
</tr>
<tr>
<td>Excitability</td>
<td>get excited easily</td>
<td>Not excitable</td>
<td></td>
<td>Excitable</td>
</tr>
<tr>
<td>Friendliness</td>
<td>be never aggressive or fearful</td>
<td>Unfriendly</td>
<td></td>
<td>Friendly</td>
</tr>
<tr>
<td>toward people</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Consequences of crib-biting

- Basal ganglia (n. caudatus, n. accumbens, putamen) dysfunction may diminish learning abilities
  - crib-biters were less successful, required longer time to perform an instrumental task (Hausberger et al., 2007)
  - learned association persisted longer during extinction (Hemmings et al., 2007)
- Crib-biters are more stress sensitive
  (Bachmann et al., 2003, Minero et al., 1999)

- Is it more difficult to work with a crib-biter?
Questionnaire survey

• 50 control, 50 crib-biting horse
  (did not differ regarding: age, sex, breed, usage, housing & management)

• Factor analysis: using our data, we found similar structure as Momozawa et al. (2005)

• General linear model:
  Dependent variable: Temperamentum trait
  Independent variables: group, age, sex, breed, usage
Questionnaire survey

• 50 control, 50 crib-biting horse
  (did not differ regarding: age, sex, breed, usage, housing & management)

• Factor analysis: using our data, we found similar structure as Momozawa et al. (2005)

• General linear model:
  Dependent variable: Temperamentum trait
  Independent variables: group, age, sex, breed, usage
Crib-biters were given less points to questions measuring Anxiety ($p=0.032$)
Affability

No significant differences among groups \((p=0.543)\)
Between crib-biters and control horses: no significant differences ($p=0.823$)

BUT: horses used for competition are more trainable than horses used for pleasure purposes ($p=0.068$)

Competition horses were trained on a higher level ($\chi^2$-test, $p<0.001$), and contained more sporthorse breed ($\chi^2$-test, $p=0.005$) than pleasure horses.
Champion crib-biting horses
Memory and learning

Dr. Krisztina Nagy, PhD
Clever Hans: a horse that counts?

• Complex learning or simple **associative** learning?

• Hans had learned that he would be rewarded if his foot movements stopped when he detected subtle behavioral changes in human observers.

• Osten leaned forward as Hans approached the correct number and adopted a more upright posture when it had been reached.
Denver, the swinging mule
Cognitive science research (cognition, intelligence)

Cross-modal individual recognition in domestic horses
(Proops & McComb, 2009)
Cross-modal individual recognition in domestic horses (Proops & McComb, 2009)

• Individual recognition in humans is cross-modal: allowing the matching of current sensory cues to identity with stored information about that specific individual from other modalities

• When horses were shown one associate and then the call of a different associate was played, they responded more quickly and looked significantly longer in the direction of the call than when the call matched the herd member just seen, an indication that the incongruent combination violated their expectations
Attributing attention: the use of human-given cues by domestic horses (Equus caballus)  
(Proops & McComb, 2010)

• Dogs are particularly good at determining the focus of human attention  
(close evolutionary relationship between humans and dogs? But what about other domesticated sp.?)

• Task to the horse: discriminate between an attentive and inattentive person in determining whom to approach for food
Do horses understand human-given cues?

- domestic horses are highly sensitive to human attentional cues, including gaze (horses chose the attentive person)
Sensitivity of horses to human pointing gestural cues (Maros et al, 2008)
DOGS’, DINGOES’ and HORSES’ comprehension of different human pointing gestural cues

![Graph showing comprehension rates for dogs, dingoes, and horses across different gestural cues. The graph includes bars for Distal Momentary, Distal Dynamic, Proximal Momentary, and Proximal Dynamic+G, with bars indicating correct choices (mean ± SE). The bars are labeled with asterisks to indicate significance levels. The x-axis represents the gestural cues, and the y-axis represents the percentage of correct choices. The chance level is indicated by a dotted line at 50%.](image-url)
• Selection pressures during domestication are thought to lead to an enhanced ability to use human-given cues. In case of dogs, several studies show that close evolutionary relationship between humans and dogs has led to marked changes in their communicative, social, cooperative and attachment behaviours towards humans (Miklósi et al., 2004). Dogs have a remarkable skill to use human-given cues in object-choice task, often outperforming chimpanzees and hand-reared wolves (Virányi et al., 2008).

• Studies on the ability of horses to read human cues have shown that they are also highly sensitive to human attentional cues, including gaze (Maros et al., 2008; Proops and McComb 2010). However, the performance of horses in an object choice task appeared to be inferior to that of domestic dogs.

• Socialization and training improve the ability of horses to read human cues (Krueger et al, 2010)
Discrimination learning and generalisation
(remember even 6 years later!)
Maze test

- Many horses begin maze trials with a clear preference for one side or the other
- Horses show left-eye preference in relation to people
- Emotional laterality should be taken into account in training methods
Social learning
associative or observation learning
Types of learning

- **Imprinting**
  - Sensitive period at early postnatal life

- **Non-associative learning:**
  - animal is exposed to a single stimulus to which it can become habituated or sensitized

- **Associative learning**
  - relationship is established between at least two stimuli
  - classical conditioning and operant conditioning
Imprint training
Imprint training is not effective

• Williams et al., (2003) Effects of imprint training procedure at birth on the reactions of foals at age six months
  – Newborn foal (0-48 hours) treated 0, 1 or 4 times
  – Test: 6 months

• Lansade et al. (2005) Effects of neonatal handling on subsequent manageability, reactivity and learning ability of foals
  – Newborn foal (0-14 days) treated 1/day or not
  – Test: 2 days, 3, 6, 12 months
Human-mare relationships and behaviour of foals toward humans (Henry et al, 2005)

• Newborn foal (0-5 days), mother (not the foal) is petted 15 min/day or not
• Test: 1 month (trying to touch the foal)
• Treated goup: foals are more friendly than control group
• BUT: foals of treated nervous mares: not friendly
Non-associative learning

Habituation

- repeated presentations of a stimulus by itself cause a decrease in the response
Non-associative learning
Systematic desensitization

- systematic desensitization: weakening an unwelcome fear response to a given stimulus or set of stimuli to the point of extinction
- behave passively rather than fearfully
Non-associative learning
Flooding

• the over-exposure to the causative stimuli until the response disappears
• horse not responding ≠ no longer fearful
• flooding leads to apathy
• horse may emerge with extreme fear responses in slightly different circumstances
• traditional horse ‘breaking’
Non-associative learning

Sensitization

• Sensitization is the opposite of habituation
• there is an increase in a response after repeated presentations of the stimulus by itself
• Sensitization can override habituation
Associative learning
relationship is established between at least two stimuli
• **Timing**: 1-2s!!
• **Fear**: learning ability ↓

---

**Table 4.1  Punishment versus reinforcement – effect of the treatment**

<table>
<thead>
<tr>
<th></th>
<th>Response becomes more likely in future</th>
<th>Response becomes less likely in future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive reinforcement</td>
<td>Positive reinforcement – titbit reinforces begging</td>
<td>Positive punishment – applying tension on the rein increases discomfort in the mouth</td>
</tr>
<tr>
<td>Punishment</td>
<td>Negative reinforcement – easing tension on the rein reduces discomfort in the mouth</td>
<td>Negative punishment – complete removal of food extinguishes begging</td>
</tr>
<tr>
<td>Attractive stimuli</td>
<td>Positive reinforcement</td>
<td>Positive punishment</td>
</tr>
<tr>
<td>Response unlikely</td>
<td>Punishment</td>
<td>Negative reinforcement</td>
</tr>
<tr>
<td>Negative punishment</td>
<td>Punishment</td>
<td>Positive reinforcement</td>
</tr>
</tbody>
</table>

---

**Operant conditioning**

- **Response probable**
- **Positive reinforcement**
- **Aversive stimuli**
- **Attractive stimuli**
- **Response unlikely**
- **Negative reinforcement**
- **Negative punishment**
Monty Roberts
The horse whisperer

Equus: body language of horses
Join up ®

http://www.montyroberts.com/university/
http://www.youtube.com/watch?v=9Dx91mH2voo
Round-pen work relies on an appreciation of the horse’s flight zone:

- Ears
- Coming closer
- Licking & Chewing
- Head-lowering
Chewing and snapping?

- OR: chewing to produce saliva (stress → dry mouth)
Shy boy
(join up with a wild mustang)
Pat Parelli: Natural Horse-man-ship

- teaches expertise in interaction with horses based on the way horses relate and communicate in their natural world – “natural horsemanship”
- based on respect for and love of horses – and understanding horse nature and psychology

7 games
- imitate the way horses play with each other
- Game #1 (Friendly Game): prove to your horse that you are friendly
- Game #2-7: prove to your horse that you are alpha in the herd

http://www.parellinaturalhorsetraining.com/
http://www.youtube.com/watch?v=k_JEN1mOJHk&feature=related
4 Phases

- Phase 1. you suggest
- Phase 2. you ask
- Phase 3. you tell
- Phase 4. you PROMISE that your horse will do what you ask - this is as strong as it needs to be.

*Game #2 The Porcupine Game*

- The steady pressure starts soft and slowly increases until the horse responds. When the horse moves away, the steady pressure is instantly released.
- This pressure is applied in four phases: press the hair, then the skin, then the muscle, then the bone.
Parelli Positive Attributes

Extrovert
- charismatic
- ambitious

Left-Brain
- tolerant
- extrovert positive
- more dots in more quadrants, the more "all-round" the horse is

Right-Brain
- sensitive
- introvert positive
- more dots in the bottom two quadrants denotes reliable qualities

Introvert
- content
- "sweet"

Left-Brain
- exuberant
- fast learner
- energetic
- athletic
- endurance
- perceptive
- obedient
- submissive

Right-Brain
- playful
- smart
- calm
- reliable
- consistent
- forgiving
- bonding

Color Key:
- mild
- moderate
- extreme

Name: ____________________________ Date: ________________

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www.parelli.com
Bitles bridle

http://www.youtube.com/watch?v=eHaEzGz0HeE
http://www.youtube.com/watch?v=IXR_SW_soll
Handling
(fearful responses to vet)
Ready to have his nails done
Associative learning
Classical and operant conditioning

- Clicker: secondary reinforcer, timing is very important!
- Negative versus positive reinforcement: an evaluation of training strategies for rehabilitated horses (McBride, 2008)
  - Positive reinforcement: horses were more motivated to participate in the training sessions and exhibited more exploratory or ‘trial and error’ type behaviours in novel situations/environments
Shaping with clicker training

http://www.clickertraining.com/
http://www.youtube.com/watch?v=IG7DJjlxHYg
What would you do with a biting horse?

- Punishment
- Neglecting
- Counter-conditioning (clicker training)
Operant counter-conditioning

- sadly underexploited strategy in the management of horse behavior
- habituating horses to aversive stimuli + expose them to pleasant coincidental consequences

Simply offering food in the presence of a fear-eliciting stimulus: NOT WORKING
• **Operant counter-conditioning** is similar to cognitive behaviour therapy.
Transport
Reducing stress during transport

- Monitor health status: horses may lose weight or develop an infection while travelling long distances (6hr or more)
- Gradually reduce the amount of exercise (7-5 days) and sweet/hard feeds before travelling long distance
- Train your horse to be accustomed to transport
- Careful planning (time of the day, route, stops)
- Have feeds and water that your horse is familiar with
- ...
- Transporting healthy horses for more than 24 h during hot weather and without water will cause severe dehydration
- Transport for more than 28 h even with periodic access to water will likely be harmful due to increasing fatigue
Air transport
Thank you very much for your attention!