HABITUATION EFFECTS TO FREQUENT ROAD TRANSPORT IN SPORT HORSES

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Can animals habituate to frequent travelling?

A case study on sport horses
Relevance of the topic

- Multiple evidence that transport can be stressful for horses
  - Elevated heart rates, respiratory rates, cortisol levels, ...
  - Studies tested mainly transport naïve horses
    (e.g. Godoi et al., 2014; Schmidt et al., 2010b)

- Limited evidence on horses that travel regularly and are accustomed to transportation
  - Diseases associated with frequent transportation
  - Small sample sizes (e.g. Schmidt et al., 2010a; Tateo et al., 2012)
  - Transport over extremely long distances (e.g. Jones, 2003; Schmidt et al., 2010a)
To investigate whether frequent transport acts as a major stressor for travel experienced sport horses or if the stress becomes minimal due to habituation effects.
Methods

- Data collection at six dressage and seven show jumping events at two equestrian centres in the UK
- 120 sport horses, 5-24 years and of 41 different breeds
- Behavioural assessment
  - student and professional in animal behaviour (ICC = 0.93)
  - using 1-10 scale adapted from previously published scale of behavioural indicators of stress for use with domestic horses (Young et al., 2012)
  - owners were questioned about current veterinary problems and special transport related experiences of the horse in the past
Methods

- Data collection at six dressage and seven show jumping events at two equestrian centres in the UK
- 120 sport horses, 5-24 years and of 41 different breeds
- Behavioural assessment
  - student and professional in animal behaviour (ICC = 0.93)
  - using 1-10 scale adapted from previously published *scale of behavioural indicators of stress for use with domestic horses* (Young et al., 2012)
- Physiological assessment
  - salivary cortisol concentrations (→ only unloading)
  - assessed in 29 horses
- Total stress score
  - cortisol values used to validate or modify behavioural assessment
  - average of unloading and loading score
- Statistics: Mann-Whitney U-test and Spearman’s rank test
Results

- Transport experience was positively correlated with the total stress scores of the horses ($r_s = 0.273, p = 0.003$)
Influence of transport experience

Figure 3.3. Mean total stress scores (± standard error) of horses transported with different frequencies. N=120 horses.
Results

- Transport experience was positively correlated with the total stress scores of the horses ($r_s=0.273$, $p=0.003$)

- Horses travelling with a companion had significantly lower stress levels than horses that travelled without a companion ($p=0.0063$)
Influence of a companion

Presence of a companion had no significant effect on stress levels of very frequent travellers (every ≤10 days, p=0.066).

**Fig. 2**) Comparison of the mean total stress score (± standard error) of horses that were transported with a companion (n=46) and without a companion (n=74). ***, W=2287.0, p=0.0063 (adjusted for ties), d=0.4.**
Results

- Transport experience was positively correlated with the total stress scores of the horses ($r_s=0.273$, $p=0.003$)

- Horses travelling with a companion had significantly lower stress levels than horses that travelled by themselves ($p=0.0063$)
  
  - but no significant effect for very frequent travellers ($p=0.066$)

- Transport experience was positively correlated with the stress score for loading ($r_s=0.301$, $p=0.004$)
Results

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- Horses travelling with a companion had significantly lower stress levels than horses that travelled by themselves ($p = 0.0063$)
  - but no significant effect for very frequent travellers ($p = 0.066$)

- Transport experience was positively correlated with the stress score for loading ($r_s = 0.301$, $p = 0.004$)

- Transport duration had no significant impact on the total stress scores of the horses ($r_s = -0.139$, $p = 0.129$)
Influence of transport duration

Fig. 3) Mean total stress scores (± standard error) of horses transported for different journey durations (in minutes, n=119 horses).
Main limitations of the study

- No control for individual horses
  - No replications
  - No knowledge of baseline cortisol values

- Cortisol concentrations assessed in only 29 horses
  - possibility of passively coping individuals

- Influence of temperament
Conclusion

- Stress levels of horses travelling with high frequency were indicative of no or solely a low stress response to transportation.

- A high level of transport experience can significantly reduce transport stress in sport horses:
  - especially during the loading procedure
  - positive influence of a companion for infrequent travellers
THANK YOU!

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### Table 4

A scale of behavioural indicators of stress in domestic stabled horses, as revealed by principal component analysis (PCA) and behavioural assessment completed by a professional panel.

<table>
<thead>
<tr>
<th>Stress level</th>
<th>Behaviour score</th>
<th>Behavioural indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>No stress</td>
<td>1</td>
<td>Standing at the front of the stable, looking around or head below wither height, eating. Ears pricked, back or slowly scanning, tail still or gently swishing. Some repetitive oral behaviour. <em>Horse described as:</em> Horse calm, unconcerned, relaxed, quiet, listening, accepting. <em>Behaviour exhibited for previous BS plus:</em> Walking. <em>Horse also described as:</em> Horse alert and watching.</td>
</tr>
<tr>
<td>Low stress</td>
<td>2</td>
<td>Occasional weaving behaviour, box walking and repetitive head movements. Ears occasionally flattened. Defecation. <em>Horse described as:</em> Listening, interested, alert. <em>Behaviour exhibited for previous BS plus:</em> Pacing. Approaching potential stressors e.g. noise from outside the stable. Repeated tail swishing. <em>Horse also described as:</em> Curious, unsettled, barging.</td>
</tr>
<tr>
<td>Medium stress</td>
<td>3</td>
<td>Scratching against stable walls or fittings, pawing at ground with front legs. Nostrils flared. Repeatedly looking around. Tail raised. <em>Horse described as:</em> Restless, showing tension in the body, fidgeting when still. <em>Behaviour exhibited for previous BS plus:</em> Approaching and retreating away from potential stressors, Stopping eating to focus on potential stressor. <em>Horse also described as:</em> Jumpy, easily startled.</td>
</tr>
<tr>
<td>High stress</td>
<td>5</td>
<td>Keeping away from potential stressors and remaining still to focus on them. <em>Horse described as:</em> <em>Behaviour exhibited for previous BS.</em> <em>Horse also described as:</em></td>
</tr>
<tr>
<td>9-10</td>
<td></td>
<td>Behaviour as exhibited for previous BS. <em>Horse described as:</em> Agitated, fidgety, anxious, active, aggressive, uncomfortable (McDonnell et al., 1999; Strand et al., 2002).</td>
</tr>
<tr>
<td>Stress level</td>
<td>Behaviour score</td>
<td>Behavioural indicators</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>No stress</td>
<td>1</td>
<td>Strides of an average length coming off the trailer then standing, looking around or head below wither height, ears pointing forward/pricked or slowly scanning, tail still or gently swishing. Some repetitive oral behaviour. Neck relaxed, loose/floppy lower lip, lip line curled down at corners, round nostrils. maybe eating when off trailer, will not jump or be startled at sudden noise or movement. <em>Horse described as:</em> Horse relaxed, calm, unconcerned, quiet, listening, accepting.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td><em>Behaviour exhibited for previous BS plus:</em> Strides of an average length coming off the trailer then walking (with average strides when off trailer), neck slightly elevated. <em>Horse also described as:</em> Horse alert and watching, mildly excited.</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td><em>Behaviour exhibited for previous BS plus:</em> Repeated tail swishing. Pacing. Approaching potential stressors e.g. noises. Responds to sudden noises or movement by slight movement, but calms quickly. <em>Horse also described as:</em> Curious, unsettled, barging.</td>
</tr>
<tr>
<td>Medium stress</td>
<td>5</td>
<td><em>Behaviour exhibited for previous stress level plus:</em> Scratching against trailer walls or fittings. Pawing at ground with front legs. Nostrils flared. Repeatedly looking around. Tail raised. <em>Horse described as:</em> Restless, showing tension in the body. Fidgeting when still. Moderately excited.</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td><em>Behaviour exhibited for previous BS plus:</em> Strides shortened when coming off the trailer. Approaching and retreating away from potential stressors. (Stopping eating to focus on potential stressor.) <em>Horse also described as:</em> Jumpy, easily startled. Moderately excited.</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td><em>Behaviour exhibited for previous BS plus:</em> Keeping away from potential stressors and remaining still to focus on them. Ears pointing backwards, horse shies away from potential stressors. <em>Horse described as for previous BS:</em> Jumpy, easily startled. Horse is excited.</td>
</tr>
<tr>
<td>High stress</td>
<td>8</td>
<td><em>Behaviour exhibited for previous stress level plus:</em> Strides considerably shortened when coming off the trailer. Repeated performance of stereotypic behaviour e.g. weaving, repetitive head movements. Stamping of hind feet. Snorting. Sudden/violent movements. Lip line straight and tight, nostrils tight/long/thin. Head up, neck stretched. <em>Horse described as:</em> Very unsettled and alert.</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td><em>Behaviour as exhibited for previous BS.</em> Repeated performance of stereotypic behaviour e.g. weaving, repetitive head movements. Stamping of hind feet. Snorting. Ears laid backwards, horse shows muscle tension/is shivering and/or sweating, horse ‘rushes down the ramp,’ tries to escape/flee from potential stressors or goes backwards once unloaded. <em>Horse also described as:</em> Anxious, agitated, fidgety, active, aggressive, uncomfortable.</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td><em>Behaviour as exhibited for previous BS.</em> Horses flees from potential stressors in trot or canter once unloaded (minimum five strides). <em>Horse also described as:</em> Very anxious, agitated, fidgety, aggressive, uncomfortable.</td>
</tr>
</tbody>
</table>

(Adapted from Young et al. 2012; Munsters et al. 2012)
Figure 3.1. Outline of the travel frequencies of the studied horses (n=120).
Figure 3.7. Outline of the transport durations of the studied horses (n=119).
Influence of travel experience
(Results of beh. & physiol. sampled horses, n=29)

Figure 3.12. Mean total stress scores (± standard error, blue bars) and mean salivary cortisol concentrations (± standard error, measured in ng/ml, red bars) of horses transported with different frequencies. Excluding outliers. N=29 horses.
Correlation of travel frequency with the total stress score

Figure 3.2. Correlation of the total stress score of the horses with the frequency of transport. 
**$r_s=0.273$, $p=0.003$. N=120 horses. 
Regression equation: total stress score = 1.581 + 0.04739*(travel frequency)
Correlation of travel frequency with the loading stress score

Figure 3.5. Correlation of the loading stress score with the travel experience. **, $r_s = 0.301$, $p=0.004$. N=91 horses.
Regression equation: Loading stress score = 1.453 + 0.05968*(travel frequency in days)
<table>
<thead>
<tr>
<th>Stress Level</th>
<th>Beh. Score</th>
<th>Salivary CORTISOL (ng/ml)</th>
<th>Reference</th>
</tr>
</thead>
</table>
| No Stress   | 1          | <0.35-0.65                | Range baseline values in diurnal rhythm: 0.35-0.65ng/ml (Bohák et al., 2013)  
Basal values before transport: 0.38±0.05ng/ml (Schmidt et al., 2010a)  
Baseline values in the morning: 0.6 ng/ml (Erber et al., 2013)  
Basal cortisol-IR one day before transport:0.4ng/ml (Schmidt et al., 2010c) |
|             | 2          | ~0.8 (max. 1.0)           | Concentrations before loading: 0.69 ±0.26 ng/ml (Shanahan, 2003)  
Baseline before transport:1.0 ng/ml (Schmidt et al., 2010b) |
| Low Stress  | 3          | 1.0-1.7                   | Values before competition: 1.0 ± 0.2ng/ml (Becker-Birck et al., 2013)  
Values 30min before loading: 1.07±0.21ng/ml (Schmidt et al., 2010a)  
Concentration after loading: 1.23 ± 0.26ng/ml (Shanahan, 2003) |
|             | 4          | ~2.0                      | Horses abruptly moved to individual boxes from a mixed group: 1.8 ± 0.2 ng/ml (Erber et al., 2013) |
| Medium Stress| 5         | 2.2-3.5                   | Range mid-transport of an excessive journey: 2.37-3.10ng/ml (Schmidt et al., 2010a)  
End of an excessive transport: 2.83±0.36ng/ml (Schmidt et al., 2010a)  
Values after competition: 2.2±0.4 ng/ml (Becker-Birck et al., 2013) |
|             | 6          | 4.0+                      | Range highest cortisol during transport in transport naïve horses: 4.1-6.5ng/ml (Schmidt et al., 2010b) |
|             | 7          | ~5.0- 6.5                 | Greatest cortisol for completely transport naïve horses: 5.9 ±0.6 ng/ml (Schmidt et al., 2010c) |
| High Stress | 8          | ≥6.5                      | |