Using appropriate reinforcement to trigger attention:
The example of horse training.

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64th Annual meeting of the european federation of animal science
August 26th - 30th 2013, Nantes, France
Attentional state: a definition

«It is the taking possession by the mind, in clear and vivid form, of one out of what seems several simultaneously possible objects or trains of thought. Focalization, concentration, of consciousness are of its essence." (James, 1890).

How does attention look like?

Behavioural and postural adjustments (gazes, body orientation...)

Sokolov (1960); Cohen (1972); Xitco (2004)
Usual Beliefs

Some horses are less attentive than others!

**Intrinsic & extrinsic factors?**

Breed, Sire, Age  

**Housing conditions, Human’s actions**

A supposed impact of attentional state of the working horse on its performance

Lack of scientific knowledge
**Hypothesis: Attention and learning performances are interrelated?**

Do human’s actions have an impact?

*Previous works showed that humans’ actions influence learning performances*

**Positive primary reinforcement**
- (e.g. food reward)
- versus
- Negative reinforcement or nothing

**Impact of the type of the reward**
- tactile action
- food reward

Promotes learning
Implements human-horse relationships (short and long term)
*(Sankey et al, 2010 a,b,c)*

Are these differences mediated by attention?
2 studies, 1 method:

Training:
Remain motionless in response to a vocal order
Increasing duration of immobility required
5 min/days, 5 consecutive days
(Sankey et al, 2010)

Attentional measurements:

<table>
<thead>
<tr>
<th>Gaze orientation</th>
<th>Towards the trainer / environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck orientation</td>
<td>Towards the trainer / environment</td>
</tr>
<tr>
<td>Behaviours</td>
<td>Towards the trainer (e.g. sniffing) « agitated behaviours » (e.g. moving forward &amp; backward)</td>
</tr>
</tbody>
</table>
**Study 1**

**Does the use of primary positive reinforcement promote attention?**

N=15 males
1 year old
Angloarabian breed

FR (N=8): Food Reward
C (N=7): Control horses

On the first day, no difference between groups

By the end of the training, Food Rewarded horses present more postures and behaviours orientated towards the trainer than Control horses

**YES! The use of primary positive reinforcement promotes attention towards the trainer!**
Study 2
What is the impact of the type of reward?

Attention towards the trainer in D1

<table>
<thead>
<tr>
<th>Time (%)</th>
<th>Gazes</th>
<th>Neck orientation</th>
<th>Behaviours</th>
</tr>
</thead>
<tbody>
<tr>
<td>FR</td>
<td></td>
<td></td>
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<tr>
<td>GR</td>
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</tbody>
</table>

N = 15 (6 females ; 9 males)
1 year old
Konik Polski
FR (N=8): Food Reward
GR (N=7): Grooming Reward

Attention towards the trainer in D5

<table>
<thead>
<tr>
<th>Time (%)</th>
<th>Gazes</th>
<th>Neck orientation</th>
<th>Behaviours</th>
</tr>
</thead>
<tbody>
<tr>
<td>FR</td>
<td>*</td>
<td>*</td>
<td>**</td>
</tr>
<tr>
<td>GR</td>
<td></td>
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</tbody>
</table>

MW: *p < 0.05
**p < 0.01

Agitated behaviours depending on the day of training

D1
D5

P=0.07 *

Grooming rewarded horses showed lower attention

Rochais et al, under review
Study 2
What is the impact of the type of reinforcement?

Temporal changes in time spent gazing the trainer

Individual variation

Coefficient of Variation

<table>
<thead>
<tr>
<th>CV (%)</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>D4</th>
<th>D5</th>
</tr>
</thead>
<tbody>
<tr>
<td>FR</td>
<td>48 %</td>
<td>24 %</td>
<td>7 %</td>
<td>19 %</td>
<td>7 %</td>
</tr>
<tr>
<td>GR</td>
<td>92 %</td>
<td>52 %</td>
<td>54 %</td>
<td>55 %</td>
<td>94 %</td>
</tr>
</tbody>
</table>

Wilcoxon test: *p < 0.05

Rochais et al, under review
Study 2

Could differences in attention explain differences in learning performances?

An interrelation between learning and attention: at the individual level

An optimal « window » of attention for better performances?

Too little ... ...or too much attention is related to lower performances?

Rochais et al, under review
General Discussion
Triggering attention and learning performances?

What these studies tell us?

- Impact of human’s actions on attentional processes
- The use of positive reinforcement promotes human-directed attention
- An optimal window of attention that promotes learning
- The type of reward has to be validated by the horse itself

Take home message

Positive reinforcement promotes **attention, learning and hence safety**
Appropriate rewards have to be used!
Conclusion

Further research is needed

Attentive Humans — Attentive Horses

Sankey et al, 2011
Fureix et al, in prep

Breed, Age
Training context
Housing conditions
Thank you for your attention!

Acknowledgements

Station expérimentale des Haras Nationaux, Laurence Wimel & staff of Chamberet, France

The Polish Academy of Sciences, Institute of Genetics and Animal Breeding, Popielno, Poland

Colleagues

CNRS, « Région Bretagne » and IFCE for financial support