Test-retest reliability of the Welfare Quality® animal welfare assessment protocol for sows and piglets

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Welfare Quality® (WQ)

Welfare Quality
Science and society improving animal welfare

Assessment protocol for pigs

Assessment protocol for cattle

Assessment protocol for poultry
### WQ: Principles, criteria & indicators

#### Principles

- **Good feeding**
  - Absence of prolonged hunger
  - Absence of prolonged thirst

- **Good housing**
  - Comfort around resting
  - Thermal comfort
  - Ease of movement

- **Good health**
  - Absence of injuries
  - Absence of diseases
  - Absence of pain induced by management procedures

- **Appropriate behaviour**
  - Expression of social behaviour
  - Expression of other behaviours
  - Fear of humans
  - Positive emotional state

#### Criteria

- Qualitative Behaviour Assessment
- Behavioural observations
- Human-animal relationship
- Individual indicators
- Management-based indicators
- Resource-based indicators
1. Qualitative Behaviour Assessment (QBA) (4-6 observation points, farm level)
   - Visual analogue scale, 20 terms, e.g. active, relaxed, fearful
   
   | absent | dominant |
   | 0 mm   | 125 mm   |

2. Behavioural observations: Instantaneous scan sampling (1-4 pens)
   - Positive social behaviour
   - Use of enrichment material
   - Other
   - Negative social behaviour
   - Investigation of the pen
   - Resting

3. Behavioural observations: Stereotypies (40 sows)

4. Human-animal relationship (20 sows)

5. Individual indicators (90 sows, 10 litters)
**Experimental setup**

- **Test-retest reliability**
  - 13 farrowing farms
  - Same observer
  - 5 farm visits (V1-5) per farm

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**V1:** Day 0  
**V2:** Day 3  
**V3:** Week 7  
**V4:** Month 5  
**V5:** Month 10
Test-retest reliability

- **RS**
  - Spearman’s rank correlation coefficient
  - Martin and Bateson (2007):
    - $\geq 0.40$: Acceptable correlation
    - $\geq 0.70$: Good correlation

- **ICC**
  - Intraclass correlation coefficient
    - $\geq 0.40$: Acceptable reliability
    - $\geq 0.70$: Good reliability

- **SDC**
  - Smallest detectable change
  - de Vet et al. (2006):
    - $\leq 0.10$: Acceptable agreement

- **LoA**
  - Limits of agreement
  - de Vet et al. (2006):
    - $\leq -0.10$ to $0.10$: Acceptable agreement
Further evaluation: Principal component analysis (PCA)
- Used to emphasise variation
- Reduction of number of original variables (descriptive terms) into fewer dimensionality (principal components)

Comparison of principal components 1 und 2 (PC; PC1 and PC2) between farm visits
- Two-dimensional interpretative word chart
- Spearman’s rank correlation coefficient (RS)
Qualitative Behaviour Assessment

Mean values [%] of the farm visits (V1-5), corresponding statistical parameters

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Active</td>
<td>0.18</td>
<td>0.36</td>
<td>0.58</td>
<td>(\in (-0.48;0.27)-(-0.91;0.53))</td>
</tr>
<tr>
<td>Relaxed</td>
<td>0.35</td>
<td>0.32</td>
<td>0.53</td>
<td>(\in (-0.22;0.48)-(-0.50;0.61))</td>
</tr>
<tr>
<td>Fearful</td>
<td>0.20</td>
<td>0.15</td>
<td>0.19</td>
<td>(\in (-0.22;0.16)-(-0.45;0.31))</td>
</tr>
</tbody>
</table>
Qualitative Behaviour Assessment

Word charts of the factor loadings concerning the Qualitative Behaviour Assessment

<table>
<thead>
<tr>
<th>RS</th>
<th>V1-V2 (day 3)</th>
<th>V1-V3 (week 7)</th>
<th>V1-V4 (month 5)</th>
<th>V1-V5 (month 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC1</td>
<td>-0.83</td>
<td>0.93</td>
<td>0.93</td>
<td>-0.90</td>
</tr>
<tr>
<td>PC2</td>
<td>-0.80</td>
<td>0.87</td>
<td>-0.12</td>
<td>0.83</td>
</tr>
</tbody>
</table>
Instantaneous scan sampling

Mean values [%] of the farm visits (V1-5), corresponding statistical parameters

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Positive social behaviour (P)</td>
<td>0.37</td>
<td>0.28</td>
<td>0.05</td>
<td>∈(-0.03;0.06)-(-0.08;0.08)</td>
</tr>
<tr>
<td>Negative social behaviour (N)</td>
<td>0.34</td>
<td>0.15</td>
<td>0.03</td>
<td>∈(-0.03;0.02)-(-0.04;0.03)</td>
</tr>
<tr>
<td>Use of enrichment material (E)</td>
<td>0.78</td>
<td>0.63</td>
<td>0.38</td>
<td>∈(-0.26;0.25)-(-0.41;0.52)</td>
</tr>
<tr>
<td>Investigation of the pen (I)</td>
<td>0.37</td>
<td>0.28</td>
<td>0.05</td>
<td>∈(-0.03;0.06)-(-0.08;0.08)</td>
</tr>
<tr>
<td>Other (O)</td>
<td>0.64</td>
<td>0.59</td>
<td>0.38</td>
<td>∈(-0.28;0.25)-(-0.53;0.40)</td>
</tr>
</tbody>
</table>
Stereotypies

Example: Sham chewing, corresponding statistical parameters

\[
\begin{align*}
\text{RS [median]}: & \quad 0.84 \\
\text{ICC [median]}: & \quad 0.88 \\
\text{SDC [median]}: & \quad 0.17 \\
\text{LoA [range]}: & \quad \epsilon(-0.17;0.13)\text{-}(-0.24;0.21)
\end{align*}
\]
Human-animal relationship

Mean values [%] of the farm visits (V1-5), corresponding statistical parameters

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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Touching</td>
<td>0.48</td>
<td>0.52</td>
<td>0.47</td>
<td>$\in (-0.38;0.21)\text{--}(-0.67;0.25)$</td>
</tr>
<tr>
<td>Kneeling</td>
<td>0.51</td>
<td>0.32</td>
<td>0.33</td>
<td>$\in (-0.15;0.19)\text{--}(-0.39;0.44)$</td>
</tr>
<tr>
<td>Standing</td>
<td>0.56</td>
<td>0.69</td>
<td>0.44</td>
<td>$\in (-0.28;0.42)\text{--}(-0.39;0.73)$</td>
</tr>
</tbody>
</table>
Individual indicators

- Body condition score
- Skin condition
- Rectal prolapse
- Uterine prolapse
- Metritis
- Vulva lesions
- Scouring
- Constipation
- Lameness
- Bursitis
- Mastitis
- Rupture/hernia
- Manure on the body
- Wounds on the body
- Shoulder sores
- Local infections
- Sneezing
- Coughing
- Panting
- Pumping
- Huddling
Individual indicators

- Manure on the body
- Neurological disorder
- Sneezing
- Coughing
- Panting
- Pumping
- Rectal prolapse
- Scouring
- Splay legs
- Lameness
- Huddling
## Conclusion

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Reliability</th>
<th>Agreement</th>
<th>Test-retest reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Qualitative Behaviour Assessment</td>
<td>Direct: ☒</td>
<td>Direct: ☒</td>
<td>In question</td>
</tr>
<tr>
<td></td>
<td>PCA: ☑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Behavioural observations: Instantaneous scan sampling</td>
<td>☑ ☒ ☒ ✓</td>
<td>☒ ☒ ☑ ☐</td>
<td>☑</td>
</tr>
<tr>
<td>3. Behavioural observations: Stereotypies</td>
<td>☑</td>
<td>☒ ☒ ☐</td>
<td>☑</td>
</tr>
<tr>
<td>4. Human-animal relationship</td>
<td>☑</td>
<td>☒ ☒ ☐</td>
<td>☑</td>
</tr>
<tr>
<td>5. Individual indicators</td>
<td>☑</td>
<td>☑ ☑ ☑</td>
<td>☑</td>
</tr>
</tbody>
</table>

### Indicator Definitions

- **Reliability**
  - Direct: Present
  - PCA: Principal Component Analysis

- **Agreement**
  - Acceptable
  - In question

- **Test-retest reliability**
  - Acceptable
Thank you for your attention!

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