Repeatability and Reliability of an approach test to determine calves’ responsiveness to humans: “a brief report”

B. J. Lensink, C. G. van Reenen, B. Engel, T. B. Rodenburg, I. Veissier

Applied Animal Behaviour Science
Accepted June 5, 2003

Presented by: Teresa Wingate
Overview of Experiment:

♦ A test to measure animal responsiveness was conducted in 2 steps:
  – Step 1 (approach phase): with drawl or not from the calves to the unknown person
  – Step 2 (touch phase): Calves reaction to outstretching arm and touching on the head on a 1-4 scale

THEY COMPARED THE RESULTS TO ARENA TESTS AND SAW SIMILARITIES
Purpose of the Experiment:

♦ Under commercial conditions, arena tests are rarely possible because no special arena is available or it’s not possible to enter the animals pen, and the tests are time consuming.

♦ The approach test is used because it’s easy, fast, and comparable to arena test through the experimental findings.
The approach test is a reliable way to determine animals responsiveness to humans.
Hypothesis:

- The approach test is a good assessment instrument that can be used to look at responsiveness of animals to humans
Theoretical Construct:

♦ Responsiveness to humans

♦ **Operational Definition:** with drawl from humans on the approach and touch phase
Quasi-Experimental or Experimental??

♦ Neither…..
  – The experiment was performed to develop an assessment instrument
Subjects:

- Male Holstein calves
  - Study 1: 150 calves housed in groups
  - Study 2: 22 calves housed in individual pens
Independent variable I:

- Approach phase

**Scale of Measurement:**
- Quantitative (with drawl or no with drawl)
- Nominal Scale

**Levels of Independent Variable I:**
- ZERO
Independent variable II:

- Touch phase

**Scale of Measurement:**
- Qualitative (1-4 scale)
- Ratio scale

**Levels of Independent Variable II:**
- ZERO
Independent variable III:

♦ Arena test
  – comparing independent variables I and II with independent variable III

♦ **Scale of Measurement:**
  – Quantitative (with drawl of no with drawl)

♦ **Levels of Independent variable:**
  – ZERO
Dependent variable:

- Responsiveness of calves when in an arena and/or in an individual pen

- **Scale of Measurement:**
  - Ratio scale
Data Analysis: Study 1

♦ **Approach phase**: calculated probability of observing same response for calves over repetitions

♦ **Touch phase**: conditional probability calculated, denoting the probability for initial reaction scores to reappear during second test
<table>
<thead>
<tr>
<th>Observation</th>
<th>Observation 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1  2  3  4</td>
</tr>
<tr>
<td>1</td>
<td>0.57 0.34 0.20 0.07</td>
</tr>
<tr>
<td>2</td>
<td>0.17 <strong>0.19</strong> 0.16 0.08</td>
</tr>
<tr>
<td>3</td>
<td>0.19 0.30 <strong>0.34</strong> 0.26</td>
</tr>
<tr>
<td>4</td>
<td>0.07 0.17 0.30 <strong>0.59</strong></td>
</tr>
</tbody>
</table>
Data Analysis: Study 2

- **Arena test**: Analysis of co-variance (ANOVA’s) performed with latency, frequency, time of interaction with unknown person and stockperson in the arena as dependent variants.
Table 2
Comparison between calves’ responses to humans test in their crate and in an arena using ANOVA for study 2

<table>
<thead>
<tr>
<th>Covariate/factor</th>
<th>Latency</th>
<th>Frequency</th>
<th>Time Interacting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>P</td>
<td>F</td>
</tr>
<tr>
<td>Approach phase</td>
<td>9.94</td>
<td>&lt;.01</td>
<td>5.53</td>
</tr>
<tr>
<td>Touch phase</td>
<td>13.02</td>
<td>&lt;.01</td>
<td>7.72</td>
</tr>
</tbody>
</table>
Results:

- **Main Effect**: Found a relationship between arena and individual pens in the animals responsiveness to unknown person.

- From the approach test, they categorized the scores and did a F-test and related it to the arena scores.
Results Cont…

- **Approach phase**: The average probability for an equal score on 2 observations was .84 (S.E. = .03) with a 95% lower confidence bound of .79

- **Touch phase**: Responses on observation 1 and 2 were significantly correlated, $r = .62$, $p < .001$
Results Cont…

<table>
<thead>
<tr>
<th>Observation</th>
<th>Observation 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0.57</td>
</tr>
<tr>
<td>2</td>
<td>0.17</td>
</tr>
<tr>
<td>3</td>
<td>0.19</td>
</tr>
<tr>
<td>4</td>
<td>0.07</td>
</tr>
</tbody>
</table>
Results Cont…

- **Approach VS. Arena test: Responsiveness in approach test were shown to be similarly consistent with the arena test**

<table>
<thead>
<tr>
<th>Covariate/factor</th>
<th>Latency</th>
<th>Frequency</th>
<th>Time Interacting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>P</td>
<td>F</td>
</tr>
<tr>
<td>Approach phase</td>
<td>9.94</td>
<td>&lt;.01</td>
<td>5.53</td>
</tr>
<tr>
<td>Touch phase</td>
<td>13.02</td>
<td>&lt;.01</td>
<td>7.72</td>
</tr>
</tbody>
</table>
Discussion:

♦ Advantage of approach test: quick, easy, and able to do on large quantities of animals (commercial conditions)

♦ *Approach test* showed consistency among repetitions

♦ *Arena test* showed that the calves that withdrew from the unknown person in the approach test interacted less with the unknown person in the arena and vice versa
Did the Operational definitions correspond well to the Theoretical Constructs??

- NO, there were many confounding variables along with no strong relationship among arena and individual pens using the approach and touch tests
- Possible confounding variables:
  - Didn’t do study on female calves
  - Can’t generalize to all animals… only male Holstein calves
  - The arena test was in a square room which could have increased animal stress
If the results were significant, did they have a big effect??

- NO!!
  - From Table 1, $r = .62$ but it should be closer to .80 to be significantly correlated
  - From Table 2, they should have calculated a $r$ value. They show a relationship but not a strong relationship
Discussion Cont…

- **What are the Potential Confounds??**
  - Like I said before:
    - They only looked at male Holstein calves, not female or any other types of calves.
    - The arena test was in a square area which could cause an increase in animals stress due to the corners whereas a circular room isn’t as stressful because there are no corners.
Discussion Cont…

- Do you agree with the authors??
  - NO!! They misused reliability and repeatability
  
  - They said the approach test can be considered repeatable…. SHOULD HAVE USED RELIABLE and they said it was reliable when they MEANT TO SAY VALID

  - I do however think that if the study was repeated and done correctly, it could be useful information to find
Discussion Cont…

How would you have done the study different??

- Use female calves and of different groups
- Calculate $r$ value for Table 2
- Use arena test in circular room to decrease animals stress
- Find more secure way to measure touch test so more consistent results can be shown among entire scale (not just extremes)
Discussion Cont…

♦ What to do next??

♦ Repeat the study considering the multiple confounding variables, include needed information in data analysis (r value), and use correct terms (validity and reliability) in proper context
THE END!