**Supplementary Table 1. Comparison of validity and reliability and practicability respondent scores between two Delphi exercises, macaques, 56 welfare indices**.

Potential indicators reaching less than 70% agreement for practicability have been shaded grey. Areas of focus are denoted by symbols as follows:

* **Animal-focused**:behavioural#, physiological/physical##
* **Environment-focused**:micro^ (i.e. cage), macro^^ (i.e. ambient)
* **Staff-focused**:procedural and development+, husbandry++

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Current study**  **(n=67 respondents)** | | |  | **Truelove *et al*., 2020 (n=39 respondents)** | | | |
| **Potential indicator** | **Valid, Reliable (%)** | **Practical (%)** | **Rank based on Validity, Reliability (%)** |  | **Composite Score (avg. Validity, Reliability, Practicability) (%)** | **Rank based on Composite score** | **Valid, Reliable^ (%)** | **Practical^ (%)** |
| Self-harm behaviour# | 80.6 | 81.5 | 1 |  | 94.0 | 6 | 93.6 | 94.9 |
| Social enrichment^ | 77.6 | 86.5 | 2 |  | 84.6 | 28 | 85.9 | 82.1 |
| Cage dimensions^ | 76.1 | 84.3 | 3 |  | 84.6 | 29 | 85.9 | 82.1 |
| Body weight## | 73.1 | 81.6 | 4 |  | 94.9 | 5 | 92.7 | 97.1 |
| Health monitoring programme++ | 73.1 | 79.2 | 5 |  | 97.4 | 2 | 97.1 | 100.0 |
| Appetite# | 70.1 | 74.5 | 6 |  | 84.6 | 31 | 82.4 | 88.2 |
| Staff training++ | 70.1 | 80.9 | 7 |  | 84.6 | 30 | 79.5 | 94.9 |
| Positive reinforcement training++ | 70.1 | 76.6 | 8 |  | 84.6 | 32 | 82.4 | 82.4 |
| NHP induced injuries## | 68.7 | 84.4 | 9 |  | 92.3 | 10 | 89.7 | 97.1 |
| Behavioural management programme++ | 68.7 | 73.9 | 10 |  | 86.3 | 24 | 83.3 | 92.3 |
| Vertical space^ | 67.2 | 91.1 | 11 |  | 93.2 | 8 | 94.1 | 94.1 |
| Cage furniture^ | 64.2 | 93.0 | 12 |  | 88.9 | 14 | 92.3 | 82.1 |
| Blood in faeces / urine## | 64.2 | 79.1 | 13 |  | 86.3 | 25 | 88.3 | 79.4 |
| Huddled posture# | 64.2 | 88.4 | 14 |  | 96.6 | 4 | 95.6 | 94.1 |
| Physical enrichment^ | 64.2 | 93.0 | 15 |  | 84.6 | 33 | 82.4 | 88.2 |
| Stereotypy# | 64.2 | 72.1 | 16 |  | 88.9 | 15 | 88.5 | 89.7 |
| Social density^ | 62.7 | 76.2 | 17 |  | 96.6 | 3 | 97.1 | 94.1 |
| Food enrichment^ | 61.2 | 92.7 | 18 |  | 80.3 | 48 | 79.5 | 79.4 |
| See other NHPs^ | 61.2 | 97.6 | 19 |  | 88.9 | 16 | 84.7 | 97.4 |
| Mortality## | 59.7 | 79.5 | 20 |  | 84.6 | 34 | 85.3 | 79.4 |
| Animal caregiver observations++ | 59.7 | 87.5 | 21 |  | 82.1 | 42 | 80.9 | 88.2 |
| Weaning age+ | 59.7 | 72.5 | 22 |  | 78.6 | 53 | 78.2 | 82.1 |
| Environmental complexity^ | 58.2 | 74.4 | 23 |  | 80.3 | 49 | 80.8 | 79.5 |
| Prolapse## | 56.7 | 78.9 | 24 |  | 91.5 | 12 | 92.7 | 91.2 |
| Frequency of surgeries during lifetime+ | 55.2 | 70.3 | 25 |  | 85.5 | 27 | 86.8 | 79.4 |
| Humane euthanasia programme++ | 53.7 | 86.1 | 26 |  | 98.3 | 1 | 97.1 | 100.0 |
| Frequency of sedations during lifetime+ | 53.7 | 72.2 | 27 |  | 73.5 | 55 | 83.9 | 73.5 |
| Frequency of medical procedures during lifetime+ | 53.7 | 72.2 | 28 |  | 81.2 | 45 | 89.7 | 84.6 |
| Visual barriers between cages^ | 50.7 | 91.2 | 29 |  | 88.0 | 21 | 88.3 | 88.2 |
| Frequency of moves during lifetime+ | 49.3 | 66.7 | 30 |  | 79.5 | 50 | 87.2 | 87.2 |
| Visual barriers within cages^ | 47.8 | 90.6 | 31 |  | 79.5 | 51 | 86.8 | 61.8 |
| Discharges## | 47.8 | 90.3 | 32 |  | 84.6 | 35 | 85.3 | 82.4 |
| Environmental-induced injuries## | 46.3 | 61.3 | 33 |  | 83.8 | 37 | 84.6 | 82.1 |
| Rearing history+ | 46.3 | 71.0 | 34 |  | 86.3 | 26 | 92.7 | 76.5 |
| Provision of variety of food^ | 44.8 | 83.3 | 35 |  | 88.9 | 17 | 83.9 | 97.1 |
| Room temperature^ ^ | 41.8 | 71.4 | 36 |  | 92.3 | 11 | 94.2 | 88.2 |
| Field of view^ | 41.8 | 55.6 | 37 |  | 81.2 | 46 | 83.9 | 76.5 |
| Dyspnoea# | 38.8 | 73.1 | 38 |  | 88.9 | 18 | 83.8 | 94.1 |
| Sensory enrichment^ | 38.8 | 73.1 | 39 |  | 91.5 | 13 | 91.2 | 94.1 |
| Fear of other NHPs# | 37.3 | 56.0 | 40 |  | 83.8 | 38 | 92.3 | 89.7 |
| Disease surveillance++ | 35.8 | 87.5 | 41 |  | 83.8 | 39 | 79.4 | 85.3 |
| Destructible enrichment^ | 35.8 | 91.7 | 42 |  | 84.6 | 36 | 83.9 | 88.2 |
| Frequency of chair restraint+ | 34.3 | 52.2 | 43 |  | 88.0 | 22 | 88.2 | 91.2 |
| Light intensity^ ^ | 32.8 | 95.5 | 44 |  | 92.3 | 9 | 89.7 | 97.1 |
| Hear other NHPs^ ^ | 32.8 | 86.4 | 45 |  | 82.9 | 40 | 82.4 | 91.2 |
| Cage position^ | 32.8 | 57.1 | 46 |  | 82.1 | 43 | 85.3 | 76.5 |
| Room cleaning frequency++ | 32.8 | 68.2 | 47 |  | 79.5 | 52 | 83.8 | 73.5 |
| Manipulanda^ | 31.3 | 71.4 | 48 |  | 88.0 | 23 | 86.8 | 97.1 |
| Humidity^ ^ | 29.9 | 78.9 | 49 |  | 88.9 | 19 | 85.3 | 97.1 |
| Room ventilation^^ | 26.9 | 77.8 | 50 |  | 94.0 | 7 | 94.1 | 94.1 |
| Daily number of meals++ | 26.9 | 77.8 | 51 |  | 81.2 | 47 | 78.0 | 97.1 |
| Intentional exposure to novelty++ | 26.9 | 50.0 | 52 |  | 71.8 | 56 | 80.9 | 76.5 |
| See humans^ | 25.4 | 88.2 | 53 |  | 88.9 | 20 | 86.8 | 91.2 |
| Daily timing of meals++ | 22.4 | 80.0 | 54 |  | 76.1 | 54 | 80.9 | 79.4 |
| Frequency of inoculations during lifetime+ | 17.9 | 75.0 | 55 |  | 82.1 | 44 | 80.9 | 88.2 |
| Provision of browse^ | 17.9 | 83.3 | 56 |  | 82.9 | 41 | 82.4 | 88.2 |

^Individual scores extracted from reported composite score, for comparison.