**Reward Prediction error draft experimental design.**

Raspberry Pi components

**Sequence:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Phase** | **Description:** | **Comment** | **Measurement** |
| Acquisition | Horse enters test chute |  |  |
| Start tone sounds | 1 sec dur | Latency between start tone and first touch sensor activation |
| Horse touches panel with nose activating touch sensor | Only the first touch is registered, further touches not registered until next trial |  |
| Correct response tone sounds | 0.5 sec dur |  |
| Wait period | 2-3 sec |  |
| Servo motor engages, dispenses feed via chute to receptacle | 50gms feed dispensed |  |
| Horse consumes | 10-20 sec |  |
| Time out | Fixed duration based on average consumption time | Total length of trial |
| Next trial-repeat sequence x 10 trials per session? |  |  |
| Final trial-end tone | 1 sec dur | Total length of session per horse |
| Session ends, horse removed from chute |  |  |
|  | | |
| **Extinction** | Horse enters test chute |  |  |
|  | Start tone sounds | 1 sec dur |  |
| Horse touches panel with nose activating touch sensor | All touches registered | Latency between start tone and first touch sensor activation  Number of touches |
| No tone |  |  |
| Wait period | 2-3 sec |  |
| No feed dispense | No feed dispense |  |
| Time out | Fixed duration based on average consumption time |  |
| Next trial-repeat sequence until horse no longer responds to start tone | Indeterminate time period | Total length of trial |
| Final trial-end tone | 1 sec dur | Total length of session |
| Session ends, horse removed from chute |  |  |
|  |  | | |
| **Reinstatement** | Horse enters test chute |  |  |
|  | Start tone sounds | 1 sec dur |  |
| Horse touches panel with nose activating touch sensor | Only the first touch is registered, further touches not registered | Latency between start tone and first touch sensor activation |
| Correct response tone sounds | 0.5 sec dur |  |
| Wait period | 2-3 sec |  |
| Servo motor engages, dispenses feed via chute to receptacle | 50gms feed dispensed |  |
| Horse consumes | 10-20 sec |  |
| Time out | Fixed duration based on average consumption time |  |
| Next trial-repeat sequence until reinstatement criteria is reached-x responses to start tone | Indeterminate time period. | Total length of trial |
| Final trial-end tone | 1 sec |  |
| Session ends, horse removed from chute |  | Total length of session per horse |

**Components to be automated:**

1. Tone generation
2. Touch sensor activation
3. Feed dispenser dispensing fixed weight of feed.
4. Fixed time periods between events

**Materials:**

1. Raspberry Pi + leads, power supply etc
2. Tone generator and amplifier
3. Touch sensor
4. Servo or solenoid motor for feed dispenser control
5. Power supply for servo motor
6. Arduino or Rpi hat for motor controller? Or relay?
7. Materials for feed dispenser-tube, door, receptacle
8. Backing panel and attachments
9. Python code

**Electronic sequence per TRIAL**

**Acquisition:**

Event 1: Start tone-(1 sec duration)

Event 2: Activation of touch sensor (nose press on panel)

Event 3: Correct response tone (different from start tone-0.5 sec duration

Event 5: Wait period-2-3 sec

Event 6: Activation of servo motor-dispense feed (50gm per trial)

Event 7: Time out (set period 10-15s for feed consumption)

Event 8: Reset for new trial

Event 9: Finish session tone after final trial in session

**Extinction**

Event 1: Start tone-(1 sec duration)

Event 2: Activation of touch sensor (nose press on panel)

Event 3: Time out (same period as acquisition phase but no feed dispensed)

Event 4: Reset for new trial

Event 5: Finish session tone after final trial in session

**Reinstatement**

Event 1: Start tone-(1 sec duration)

Event 2: Activation of touch sensor (nose press on panel)

Event 3: Correct response tone (different from start tone-0.5 sec duration

Event 5: Wait period-2-3 sec

Event 6: Activation of servo motor-dispense feed (50gm per trial)

Event 7: Time out (set period 10-15s for feed consumption)

Event 8: Reset for new trial

Event 9: Finish session tone after final trial in session

**Questions:**

1. Can one RPi control all of these events?
2. Recommendation for servo motor that will handle 5-8kg of weight
3. Recommendation for additional components for RPi re larger servo model-separate power supply-other?
4. Recommendation for tone generator and amplifier
5. Recommendation for touch sensor suitable to be attached to a piece of Perspex or thin metal sheeting
6. Sensitivity of the touch sensor
7. Code to control proposed sequence?