The aim of this study sought to test whether hiding boxes decreased stress levels and weight loss in shelter cats. Hiding is natural behaviour for cats (de Oliveira, Sangalelli Torecari & Genaro, 2015; Vinke, Godijn & van der Leij, 2014) when wary. Previous research found that hiding boxes reduced stress quicker than without (de Oliveira et al., 2015; Ellis, Styhny, Spears & Cockram, 2017; Vinke et al., 2014). Adoption rates (AR) and length of stay (LOS) were also measured [see supplement]. Shelter cats can exhibit stress-induced behaviours that severely impact on individual as well as shelter population health (Rehnberg, Watson & Peters, 2015; Sonntag & Overall, 2014; Vinke et al., 2014; Wagner, Hurley & Slavisky, 2018). This study assessed the stress levels of new arrivals in a Dutch animal shelter, where a large number of strays are taken in annually (Vinke et al., 2014). Assessment was made using the Kessler and Turner (1997) Cat-Stress-Score (CSS) (van der Leij, Selman, Vernooy & Vinke, 2019) was bodyweight measurements.

**Method**

Randomised controlled trial design was used to reduce bias by assigning 23 stray cats into two balanced groups (Suresh, 2011), termed here as Group A (experimental group with hiding box) and Group B (control group without hiding box). Group A had 12 cats (6m, 6f): 1-7 years. Group B had 11 cats (5m, 6f): 1-10 years. Criteria was set as <1 to >10-year-old and of good general health. Gender was not a determinant, following findings from Kry and Casey (2007), where gender did not impact stress scores.

Habituation took place at initial intake (24-hours) and camera set up (2-min).

Data were collected Days 1, 2, 3, 5, 7, 9, 12 between 12:30 and 17:15 each day for 20-minutes via remote surveillance.

**Sampling:** Scan sampling was used to gather data, suitable for group observation and effective for state behaviours (Suresh, 2011). Other related studies have used this method for groups (de Oliveira, 2015). This method may have missed event-type behaviours in CSS scoring. Previous experiment by Vinke et al., (2014), acknowledged that stress indicator such as pupil size was marked as ‘missing value’ if unseen by camera. This potentially compromises the reliability of results. Sample points were at 5, 10, 15 and 20-minutes and averaged to represent each cat. This may not be enough data for representative average due to small sample size (Holmes, Moody, Dine & Trueman, 2017). Continuous would record frequency of behaviours to identify longevity of stress (Rehnberg et al., 2015). Focal-continuous sampling may have provided better dataset where all occurrences of event and state behaviours could be recorded (Martin & Bateson, 2007). In time sampling stress behaviours may be missed between sample points.

**Results**

Differences between A and B were measured using statistical analysis software (SPSS and R). SPSS tested using a two-sample t-test and chi-square test. R measured linear mixed regression models for fixed and random effects. Two sample t-tests were used to measure Length of Stay (LOS) for each cat. This test uses matched data to test the mean between before and after measurements, and was appropriate for the small sample size in this study (Holmes et al., 2017). Chi-square test was used for verifying number of adopted cats, whereby the prediction and outcome were measured. This test is better suited to larger sample sizes (Holmes et al., 2017). Levene’s test was used for equal variance assumptions on variables. To test normal distribution Shapiro-Wilk test was used, to detects if \( p \)-value was more than or equal to 5% (\( p=0.05 \)), where passing gives confidence that “no significant departure from normality” was detected. This was appropriate for this study, as the results were on an interval scale with parametric data (measuring differences between observation across time) (Holmes et al., 2017).

**Discussion**

Repeatability: Researchers followed the UK Cat Behaviour Working Group ethogram, however there was no discussion on the specific behaviours. A standardised ethogram has been proposed by other researchers to alleviate inter-observer consistency for studying cat behaviour (Stanton, Sullivan & Fazio, 2015). A feline behaviour training video was used by all observers.

**Stress Score:** Initial CSS means were similar. Day 1 mean for Group A was 2.7 and the mean for Group B was 3.1. Mean CSS decreased the longer in residence. Group A reached a “steady state” 7-days earlier than Group B. It should be noted that Group A may have a prevalence of ‘unseen’ behaviours from being in hiding boxes and this could have altered visibility, therefore altering perceivable behaviours for indicating CSS.

**Bodyweight:** All subjects lost weight. 7 cats lost 5-10% bwt. 15 cats lost 10-25% bwt (mirroring findings in Tanaka et al., where 57% of the group lost 5-25%). The margin between A and B decreased from 300g to 210g difference from Day 7. This may suggest that Group B lost more weight than Group A. Group A lost 6.3% bwt. Group B lost 7.7% initial bwt.

**Conclusion**

This study advances on other related research on an achievable environmental enrichment strategy for shelter cats. Future considerations towards perceived safety rather than stress causes should be considered in consideration of natural feline behavior to promote optimal welfare and therefore decreasing stress-related illnesses. For efficiency found for hiding box effects on weight loss, AR or LOS, indicating that although stress was reduced when provided with hiding boxes, the cats were self-soothing, rather than relaxing.

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*References*

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