HEART RATE VARIABILITY AND HEART MURMURS IN MATURE CATS DURING CLINICAL EXAMINATION

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 The aim of this study was to determine best practice for auscultation of the feline heart during clinical examination. Data were collected from enrolment examinations at the University of Liverpool’s Feline Healthy Ageing Clinic. Enrolled cats were aged between 7 and 10 years. The heart rate (HR) and the presence of a heart murmur was recorded on three occasions during the enrolment examination. Shortly after the start of the appointment (HR1), during the clinical examination (HR2) and at the end of an orthopaedic assessment (HR3).

 Results from all three-time points were available from 169 cats following the removal of 6 cats diagnosed with hyperthyroidism. The overall prevalence of cats with heart murmurs detected on at least one of the three occasions was 30% (50/169).

 The proportion of cats with murmurs was 64% (32/50) at HR1, 54% (27/50) at HR2 and 60% at HR3. 26% (13/50) of the cats had murmurs present on 3/3 occasions, 26% (13/50) had murmurs present on 2/3 occasions and 48% (24/50) of the cats only had a murmur present on 1/3 occasions.

HR was normally distributed, and there were no differences in HR between the cats with and without a heart murmur at each time point (2- sample T test, HR1p=0.65, HR2 p= 0.24, HR3 p=0.53). Heart rate was not associated with the grade of murmur (repeated measures ANOVA, p=0.53).

 In cats with a heart murmur, on repeat measures ANOVA there was a significant difference in heart rates across differences time points (p=0.02), following post-hoc testing HR3 was significantly lower than HR1 (p=0.03). In ‘Healthy Cats’ there was also significant difference in heart rate across the different time points (p = 0.0001) following post-hoc testing, HR2 and HR3 were significantly lower than HR1 (p=0.00005, p=0.012).

Co-efficient of variation (CoV) and variation around the mean (Var) was calculated for each cat, these were not normally distributed. CoV (p=0.02\*) and Var (p=0.02\*) were significantly less in cats with a heart murmur (Wilcoxon rank sum test).

There was marked variability in feline HR and the detection of heart murmurs at different points during the appointment. Auscultation of the feline heart should be performed on a number of occasions during an appointment to maximise the chance of identifying hear murmurs during a clinical examination. Variation in heart rate is considered a sign of healthy heart but, given that echocardiography was not performed, the significance of the group differences identified requires further study.

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| **‘Healthy cats’** | **Mean** | **Min** | **Max** | **SD** | **Median CoV** | **Median Var** |
| HR1 | 187 | 126 | 246 | 23.6 |  |  |
| HR2 | 176 | 104 | 192 | 27.4 | 7.4 (IQR 3.6-8.9) | 165 (IQR 84-483) |
| HR3 | 179.8 | 130 | 198 | 25.1 |  |  |
|  |  |  |  |  |  |  |
| **‘Cats with a murmur’** | **Mean** | **Min** | **Max** | **SD** | **Median CoV** | **Median Var** |
| HR1 | 188.6 | 150 | 246 | 19.1 |  |  |
| HR2 | 181.8 | 130 | 240 | 23.4 | 6.5 (IQR 5-12.6) | 138 (IQR 48-259) |
| HR3 | 181.9 | 140 | 192 | 18.3 |  |  |