Comparison of Polar® RS800CX heart rate monitor and electrocardiogram for measuring inter-beat intervals in healthy dogs

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Heart rate variability (HRV) parameters indicate the relationship between autonomic activation and the level of stress or pain. By analyzing series of inter-beat intervals (IBIs), time- and frequency-based HRV parameters can be estimated. The aim with the present study was to assess the criterion validity, relative reliability and level of agreement of Polar® RS800CX heart rate monitor measuring IBIs, compared to electrocardiogram (ECG) in dogs.

METHODS

Five minutes of simultaneously recorded IBIs from Polar® RS800CX and ECG in 11 adult healthy dogs maintaining standing position were analyzed. Polar® data was statistically compared to ECG data to assess for systematic differences between the methods. Three different methods for handling missing IBI data were used. Relative reliabilities and levels of agreement were calculated by a three-level nested model and intraclass coefficients, and the Bland and Altman analysis for repeated measurements per individual.

RESULTS

Correlations between ECG and Polar® varied between 0.73 and 0.84 depending on how missing values were handled. Polar® was over- and underestimating IBI data compared to ECG. Excluding three subjects with more than 5% erroneous IBIs resulted in intraclass coefficients between 0.97 and 0.99. Bland and Altman analysis (n=8) showed mean difference was 1.8 ms and 98.5% of the IBI values were plotted inside limits of agreement.

CONCLUSION

This study showed that Polar® systematically biased registered IBI series and that it was fundamental to detect measurement errors. For Polar® RS800CX heart rate monitor to be used interchangeably to ECG, only small amounts of artefacts could be accepted.

Constructing a canine ocular pain score

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Several ophthalmic conditions are recognised as being painful. Corneal ulceration, uveitis and glaucoma are often considered to cause pain yet even here there are considerable intra-species differences. Corneal ulceration is often exceptionally painful in humans and yet many dogs with corneal ulcers seem surprisingly pain free. But how can we be sure? What signs should we look for to indicate ocular pain? Here we aim to construct an ocular pain score to provide a easy to use assessment of ocular pain.

50 dogs with ophthalmic conditions likely to be painful were assessed for a set of criteria likely to indicate ocular pain

including behavioural changes (decreased appetite and increased lethargy), those potentially linked to acute pain (vocalisation and panting) and specific ocular signs (blepharospasm, aversion to ocular examination and tearing). These were scored as absent (0), mild (1) or severe (2).

The mean and standard deviation of the signs evaluated are shown in Table 1. Neither vocalisation nor panting characterised ocular pain. Increased lethargy appeared to be more a sign of ophthalmic discomfort than was decreased appetite. Blepharospasm and aversion to examination of the eye were important signs while photophobia appeared more severe in uveitis than in corneal ulceration and glaucoma.

Quantification of ocular pain may prove to be particularly useful in defining when dogs with ocular disease are in need of analgesia and in measuring responses to pain relief. More work is needed to evaluate this scoring system and apply it to a larger number of dogs. In particular at present each sign has been given an equal weighting but further research may show that some signs need to be given greater weighting than others.

Condition	Lethargy	Vocalisation	Blepharospasm	Aversion	Photophobia	Tearing
Corneal ulcer	0.0±0.0	1.0±0.75	1.25±0.89	1.13±0.64	0.63±0.51	0.88±0.83
Uveitis	1.29±0.95	0.14±0.38	0.86±0.69	0.71±0.49	1.0±0.58	0.43±0.53
Glaucoma	1.25±0.96	0.0±0.0	1.0±0.82	0.75±0.96	0.50±0.58	0.25±0.50

Table 1: Mean ± standard deviation of factors evaluated as signs of pain in ocular disease.