

Exploring Sniffing Durations: A Comparative Analysis of Detection Dogs and Scoring Types



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Introduction

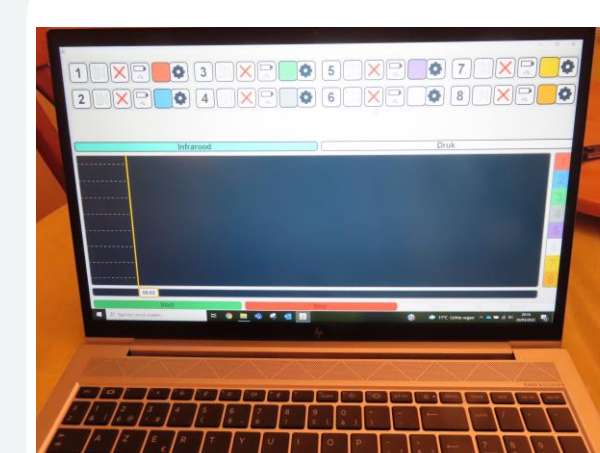
Scent Detection Dogs may sniff a bit longer or shorter when looking for a target odour. Can this tell us something about their accuracy?

What does previous research say (Concha et al., 2014)?

- Sniffing duration- calculated from video frames - is shorter in case of true negative scores.
- Dogs sniff only once in the case of true negative scores.

We tested this with the SnuffelSensor, measuring the exact sniffing duration in milliseconds via infrared sensors.

SnuffelSensor



M&M

Three ecological detection dogs imprinted on insects and scats, generated 359 sniffing bouts in 51 runs with one target odor and seven distractors. To analyze differences in duration among types of scores, a mixed linear model was used with the natural log of duration to comply with normality, taking dog and type of score as fixed effects and day as random effect.

Types of scores: CN= correct negative; CP=correct positive; FN=false negative; FP=false positive

Results

1. Individual differences?

Dogs show significant difference in duration ($p < 0.0001$).

Rafale & Wietse: $p < 0.0001$

Smoke & Wietse: $p < 0.0001$

Smoke & Rafale: NS ($p = 0.1911$)

Duration is significantly shorter in Wietse

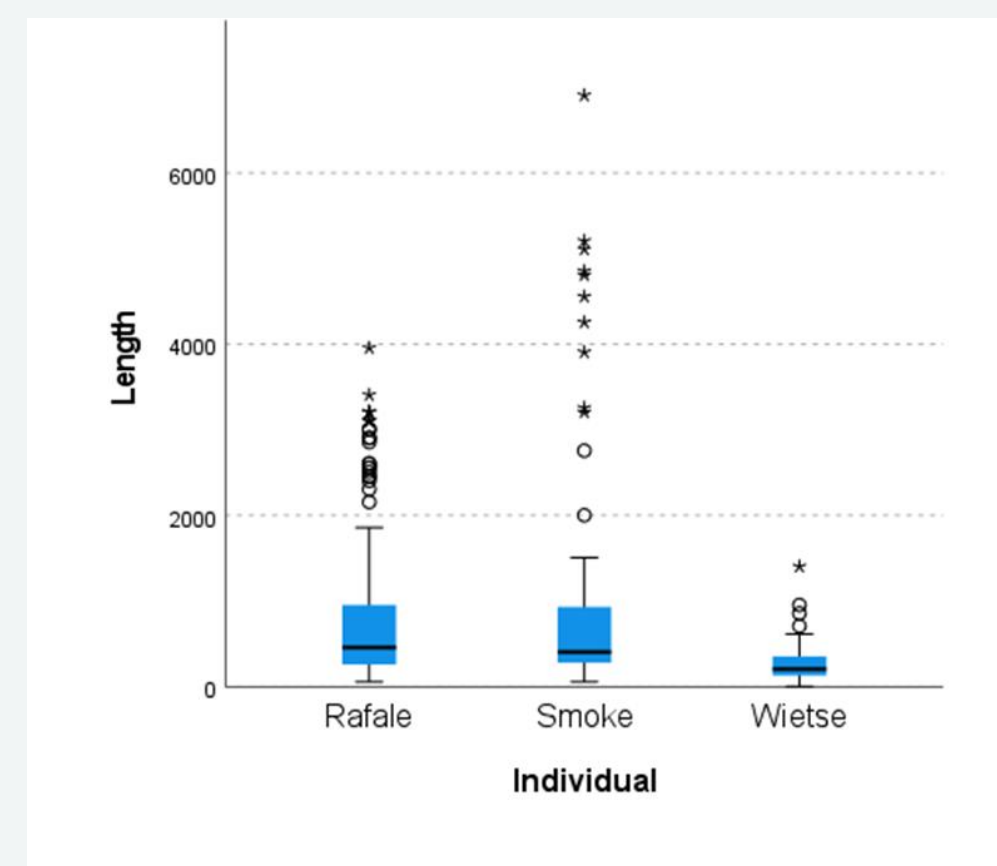
(Tukey correction for pairwise comparisons)

Duration in milliseconds:

Rafale: $\bar{x} = 803,47$; $SD = 832,69$; range=55-3955

Smoke: $\bar{x} = 1021,14$; $SD = 1442,92$; range=56-6905

Wietse: $\bar{x} = 272,52$; $SD = 234,17$; range=1-1403



2. Difference among types of score in sniffing duration?

Duration in milliseconds:

CN: $\bar{x} = 415,85$; $SD = 316,32$; range=1-2756, n=227

CP: $\bar{x} = 1294,52$; $SD = 1358,23$; range=52-6905, n=108

FN: $\bar{x} = 600,50$; $SD = 527,52$; range=104-1606, n=10

FP: $\bar{x} = 2194,86$; $SD = 1549,56$; range=106-4806, n=14

Types of scores show significant difference in duration ($p < 0.0001$).

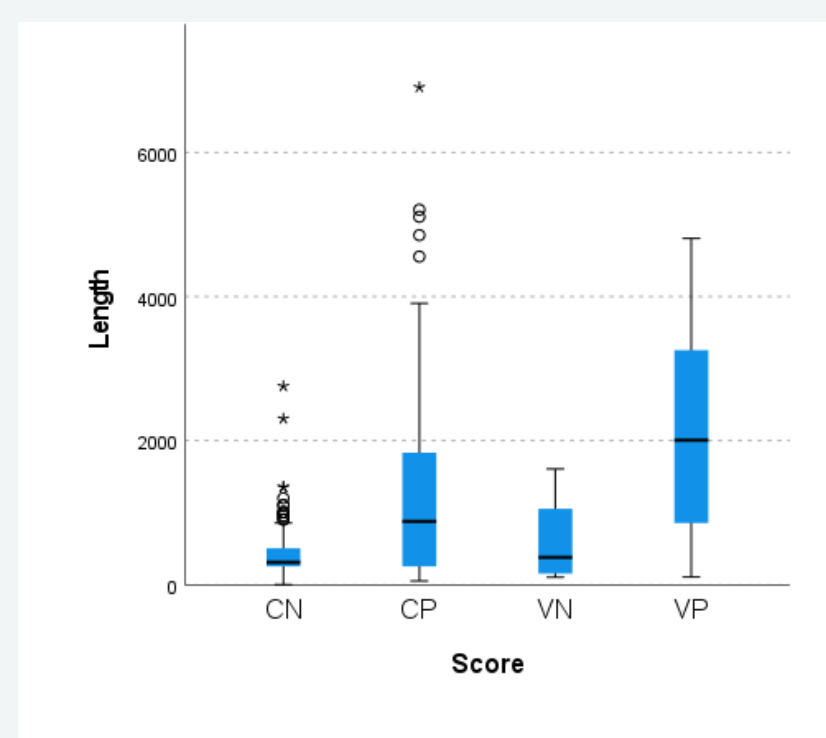
CN - CP: $p < 0.0001$ → CN is shorter

CN - FP: $p < 0.0001$ → CN is shorter

CP - FN: NS ($p = 0.9382$).

CN - FN: trend ($p < 0.08$)

(Tukey correction for pairwise comparisons)



3. Checking more than once and if so, when?

This occurred 45 times on 359 scores.

Repeated nose in pot

CN	CP	FN	FP	total
13	29	0	3	45
28.89%	64.44%	0%	6.67%	100%

Distribution of scores

CN	CP	FN	FP	total
227	108	10	14	359
63.23%	30.08%	2.79%	3.90%	100%

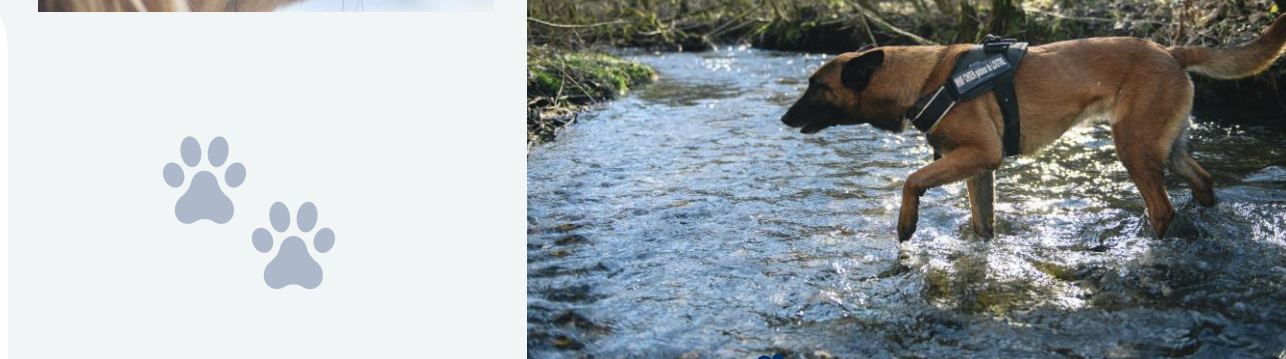
Wietse: I am the snifferificator with sniff-tastic timing! I sniff wolf scat fast as f**



The dogs repeatedly entered the nose in the sniffing pot mostly at correct positives (the targets) but they did so also with correct negatives. This differs from Concha et al. (2014).



Rafale: I am that pawesome snifferific bitch trained on glowworm larvae



Smokey: I sniff otter spraints and stag beetle larvae with sniffelicious snifficiency.

There were significant differences in sniffing duration among dogs ($p < 0.001$).

There are significant differences in sniffing duration among type of scores. Correct negative scores were shorter than correct positive and false positive scores ($p < 0.0001$).

There was a trend for correct negative scores being shorter than false negatives ($p < 0.08$).

The results are nearly the same as in the study by Concha et al. (2014).

Conclusions

Sniffing duration in detection dogs is short and differs according to types of scores, with correct negative being the shortest. Repeated sniffing occurs more often but not exclusively with correct positive scores. Duration and frequency of sniffing gives extra clues about the performance of the dog.

Acknowledgments

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Reference: Concha A, Mills DS, Feugier A, Zulch H, Guest C, Harris R, Pike TW. 2014. Using sniffing behavior to differentiate true negative from false negative responses in trained scent-detection dogs. *Chem Senses*. 39(9):749-54. doi: 10.1093/chemse/bju045.

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