A pilot study to detect the effects of a green-lipped mussel (Perna canaliculus) nutraceutical on working farm dogs with musculoskeletal abnormalities using accelerometry

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Supplementary Table 1. Summary of dog parameters. Each dog may have more than one affected joint and may demonstrate more than one clinical sign.

Parameter	Number of dogs	% of dogs
Sex		
Male	19	70
Female	8	30
Breed		
Huntaway	17	63
Heading	10	37
Affected joint		
Hip	17	63
Carpus	12	44
Stifle	6	22
Elbow	3	11
Tarsus	5	19
Shoulder	2	7
Clinical signs		
Range of motion	13	48
Pain	12	44
Lameness	6	22
Crepitus	6	22
"Stiff"	4	15
Joint swelling/thickening	4	15
Radiographic joint abnormalities	2	7

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Supplementary Table 2. Epochs by exclusion criteria that were removed during filtering to clean the data set[a].

Exclusion criteria	Epoch count	% of epochs
Duplicate timestamps	989,748	3.2
Scratching > 6	157,243	0.5
Consecutive zero values	565,699	1.8
Data from the 2000's	277,606	0.9
No change in roll	207,634	0.7
No change in pitch	178,531	0.6
Outside of round timeframe	702,937	2.2
Total epochs removed	1,830,929	5.5

[a]Criteria are not exclusive, and epochs may have been excluded for more than one criteria.

Supplementary Table 3. Distribution of epochs that failed one or more of the exclusion criteria.

Number of exclusion criteria violated	Epoch count	% of epochs
1	1,012,938	3.05
2	441,257	1.33
3	330,191	1.00
4	39,342	0.12
5	7,201	0.02

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Supplementary Table 4. Unadjusted linear regressions between daytime 90th percentile delta-G_{10} and possible single explanatory variables for 3,500 days from 27 dogs.

Parameter	Beta	SE	P-value
Sex			
Female	REF		
Male	0.38	1.37	0.78
Breed			
Heading	REF		
Huntaway	-16.73	1.22	< 0.001
Season			
Autumn	REF		
Spring	5.06	1.53	< 0.001
Summer	0.76	1.52	< 0.001
Winter	-33.48	16.35	< 0.001
Order of treatment			
$GLME_{220}$: $GLME_{180}$: Placebo	REF		
$GLME_{220}$: Placebo: $GLME_{180}$	-10.74	1.96	< 0.001
$GLME_{180}$: $GLME_{220}$: Placebo	18	2	< 0.001
$GLME_{180}$: Placebo: $GLME_{220}$	11.06	1.74	< 0.001
Placebo: $GLME_{220}$: $GLME_{180}$	-14.41	1.98	< 0.001
Placebo: $GLME_{180}$: $GLME_{220}$	-27.34	1.85	< 0.001
Farm			
Farm A	REF		
Farm B	27.67	2.18	< 0.001
Farm C	11.24	2.65	< 0.001
Farm F	6.17	3.21	0.05
Farm G	43.77	2.21	< 0.001
Farm H	-9.62	2.42	< 0.001
Farm I	31.8	2.69	< 0.001
Farm J	-5.11	2.71	0.06
Farm K	-9.68	2.42	< 0.001
Farm L	-26.12	2.13	< 0.001
Farm N	29.83	2.23	< 0.001
Farm O	19.31	2.19	< 0.001
Farm P	-19.02	2.8	< 0.001
Farm Q	23.25	3.09	< 0.001
Farm R	23.65	3.39	< 0.001
Farm S	-6.31	4.78	0.19
Weight	-0.49	0.11	< 0.001
Age	-3.22	0.23	< 0.001

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Supplementary Table 5. Unadjusted linear regressions between daytime 75th percentile in delta-G_{10} and possible single explanatory variables for 3,500 days from 27 dogs.

Parameter	Beta	SE	P-value
Sex			
Female	REF		
Male	0.004	1.05	0.997
Breed			
Heading	REF		
Huntaway	-10.35	0.94	< 0.001
Season			
Autumn	REF		
Spring	4.93	1.17	< 0.001
Summer	1.16	1.16	< 0.001
Winter	-21.54	12.47	< 0.001
Order of treatment			
$GLME_{220}$: $GLME_{180}$: Placebo	REF		
$GLME_{220}$: Placebo: $GLME_{180}$	-3.29	1.54	0.03
$GLME_{180}$: $GLME_{220}$: Placebo	11.32	1.57	< 0.001
$GLME_{180}$: Placebo: $GLME_{220}$	9.21	1.36	< 0.001
Placebo: $GLME_{220}$: $GLME_{180}$	-7.54	1.55	< 0.001
Placebo: $GLME_{180}$: $GLME_{220}$	-17.69	1.45	< 0.001
Farm			
Farm A	REF		
Farm B	19.69	1.72	< 0.001
Farm C	12.63	2.09	< 0.001
Farm F	5.81	2.53	0.02
Farm G	31.26	1.74	< 0.001
Farm H	-7.92	1.91	< 0.001
Farm I	19.84	2.12	< 0.001
Farm J	-5.14	2.14	0.02
Farm K	-6	1.91	< 0.001
Farm L	-20.03	1.68	< 0.001
Farm N	18.31	1.76	< 0.001
Farm O	14.29	1.72	< 0.001
Farm P	-9.06	2.21	< 0.001
Farm Q	16.84	2.44	< 0.001
Farm R	20.49	2.67	< 0.001
Farm S	-7.84	3.77	0.04
Weight	-0.13	0.08	0.1
Age	-1.76	0.18	< 0.001

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Supplementary Table 6. Unadjusted linear regressions between daytime median delta-G_{10} and possible single explanatory variables for 3,500 days from 27 dogs.

Parameter	Beta	SE	P-value
Sex			
Female	REF		
Male	0.08	0.67	0.9
Breed			
Heading	REF		
Huntaway	-4.04	0.61	< 0.001
Season			
Autumn	REF		
Spring	3.27	0.75	< 0.001
Summer	1.55	0.74	< 0.001
Winter	-11.91	8	< 0.001
Order of treatment			
$GLME_{220}$: $GLME_{180}$: Placebo	REF		
$GLME_{220}$: Placebo: $GLME_{180}$	0.84	1.02	0.41
$GLME_{180}$: $GLME_{220}$: Placebo	4.47	1.04	< 0.001
$GLME_{180}$: Placebo: $GLME_{220}$	4.79	0.9	< 0.001
Placebo: $GLME_{220}$: $GLME_{180}$	-1.8	1.03	0.08
Placebo: $GLME_{180}$: $GLME_{220}$	-8.41	0.96	< 0.001
Farm			
Farm A	REF		
Farm B	12.11	1.15	< 0.001
Farm C	11.63	1.4	< 0.001
Farm F	6.49	1.7	< 0.001
Farm G	16.52	1.17	< 0.001
Farm H	-3.03	1.28	0.02
Farm I	6.4	1.42	< 0.001
Farm J	-3.81	1.43	0.01
Farm K	-2.59	1.28	0.04
Farm L	-11.18	1.13	< 0.001
Farm N	10.12	1.18	< 0.001
Farm O	8.67	1.16	< 0.001
Farm P	-0.57	1.48	0.7
Farm Q	11.53	1.63	< 0.001
Farm R	17.62	1.79	< 0.001
Farm S	-4.12	2.53	0.1
Weight	0.09	0.05	0.08
Age	-0.63	0.12	< 0.001

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Supplementary Table 7. Unadjusted linear regression between daytime interquartile range in delta-G_{10} and possible single explanatory variables for 3,500 days from 27 dogs.

Parameter	Beta	SE	P-value
Sex			
Female	REF		
Male	-0.45	0.85	0.6
Breed			
Heading	REF		
Huntaway	-9.36	0.76	< 0.001
Season			
Autumn	REF		
Spring	3.34	0.94	< 0.001
Summer	0.37	0.94	< 0.001
Winter	-18.17	10.04	< 0.001
Order of treatment			
$GLME_{220}$: $GLME_{180}$: Placebo	REF		
$GLME_{220}$: Placebo: $GLME_{180}$	-4.1	1.23	< 0.001
$GLME_{180}$: $GLME_{220}$: Placebo	9.57	1.25	< 0.001
$GLME_{180}$: Placebo: $GLME_{220}$	7.79	1.09	< 0.001
Placebo: $GLME_{220}$: $GLME_{180}$	-7.43	1.24	< 0.001
Placebo: $GLME_{180}$: $GLME_{220}$	-15.06	1.16	< 0.001
Farm			
Farm A	REF		
Farm B	13.83	1.39	< 0.001
Farm C	5.08	1.69	< 0.001
Farm F	2.35	2.05	0.25
Farm G	24.84	1.41	< 0.001
Farm H	-8.16	1.54	< 0.001
Farm I	18.13	1.71	< 0.001
Farm J	-3.78	1.73	0.03
Farm K	-5	1.56	< 0.001
Farm L	-16.34	1.36	< 0.001
Farm N	12.84	1.42	< 0.001
Farm O	10.4	1.39	< 0.001
Farm P	-11.26	1.78	< 0.001
Farm Q	11.08	1.99	< 0.001
Farm R	10.36	2.17	< 0.001
Farm S	-6.91	3.04	0.02
Weight	-0.22	0.07	< 0.001
Age	-1.6	0.14	< 0.001

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Supplementary Table 8. Unadjusted linear regressions between night-time median delta-G_{10} and possible single explanatory variables for 3,780 nights from 27 dogs.

Parameter	Beta	SE	P-value
Sex			
Female	REF		
Male	-0.01	0.01	0.69
Breed			
Heading	REF		
Huntaway	-0.02	0.01	< 0.001
Season			
Autumn	REF		
Spring	-0.05	0.02	< 0.001
Summer	-0.03	0.02	< 0.001
Winter	-0.07	0.17	< 0.001
Order of treatment			
$GLME_{220}$: $GLME_{180}$: Placebo	REF		
$GLME_{220}$: Placebo: $GLME_{180}$	0.06	0.02	0.01
$GLME_{180}$: $GLME_{220}$: Placebo	0.02	0.02	0.45
$GLME_{180}$: Placebo: $GLME_{220}$	0.03	0.02	0.12
Placebo: $GLME_{220}$: $GLME_{180}$	0.09	0.02	< 0.001
Placebo: $GLME_{180}$: $GLME_{220}$	0.12	0.02	< 0.001
Farm			
Farm A	REF		
Farm B	-0.03	0.03	0.38
Farm C	-0.02	0.03	0.6
Farm F	-0.05	0.04	0.21
Farm G	-0.01	0.03	0.73
Farm H	0.04	0.03	0.27
Farm I	0.02	0.04	0.62
Farm J	-0.07	0.04	0.06
Farm K	0.03	0.03	0.31
Farm L	0.08	0.03	< 0.001
Farm N	-0.05	0.03	0.1
Farm O	0.02	0.03	0.44
Farm P	0.02	0.04	0.63
Farm Q	0.12	0.04	< 0.001
Farm R	0.11	0.04	0.02
Farm S	-0.05	0.05	0.35
Weight	-0.003	0.001	0.03
Age	-0.003	0.003	< 0.001

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Supplementary Table 9. Unadjusted linear regressions between night-time IQR delta-G_{10} and possible single explanatory variables for 3,780 nights from 27 dogs.

Parameter	Beta	SE	P-value
Sex			
Female	REF		
Male	-0.15	0.05	< 0.001
Breed			
Heading	REF		
Huntaway	-0.05	0.04	< 0.001
Season			
Autumn	REF		
Spring	-0.12	0.05	< 0.001
Summer	0.02	0.05	< 0.001
Winter	-0.045	0.53	< 0.001
Order of treatment			
$GLME_{220}$: $GLME_{180}$: Placebo	REF		
$GLME_{220}$: Placebo: $GLME_{180}$	0.03	0.07	0.69
$GLME_{180}$: $GLME_{220}$: Placebo	0.13	0.08	0.09
$GLME_{180}$: Placebo: $GLME_{220}$	0.04	0.07	0.53
Placebo: $GLME_{220}$: $GLME_{180}$	0.07	0.07	0.35
Placebo: $GLME_{180}$: $GLME_{220}$	0.22	0.07	< 0.001
Farm			
Farm A	REF		
Farm B	-0.07	0.09	0.45
Farm C	-0.028	0.11	0.79
Farm F	-0.01	0.14	0.93
Farm G	0.08	0.09	0.4
Farm H	0.13	0.1	0.22
Farm I	0.45	0.11	< 0.001
Farm J	-0.11	0.11	0.33
Farm K	0.03	0.1	0.75
Farm L	0.13	0.09	0.13
Farm N	-0.07	0.09	0.44
Farm O	0.05	0.09	0.58
Farm P	0.12	0.12	0.32
Farm Q	0.48	0.12	< 0.001
Farm R	0.14	0.14	0.32
Farm S	0.05	0.16	0.74
Weight	-0.011	0.004	< 0.001
Age	-0.004	0.008	< 0.001

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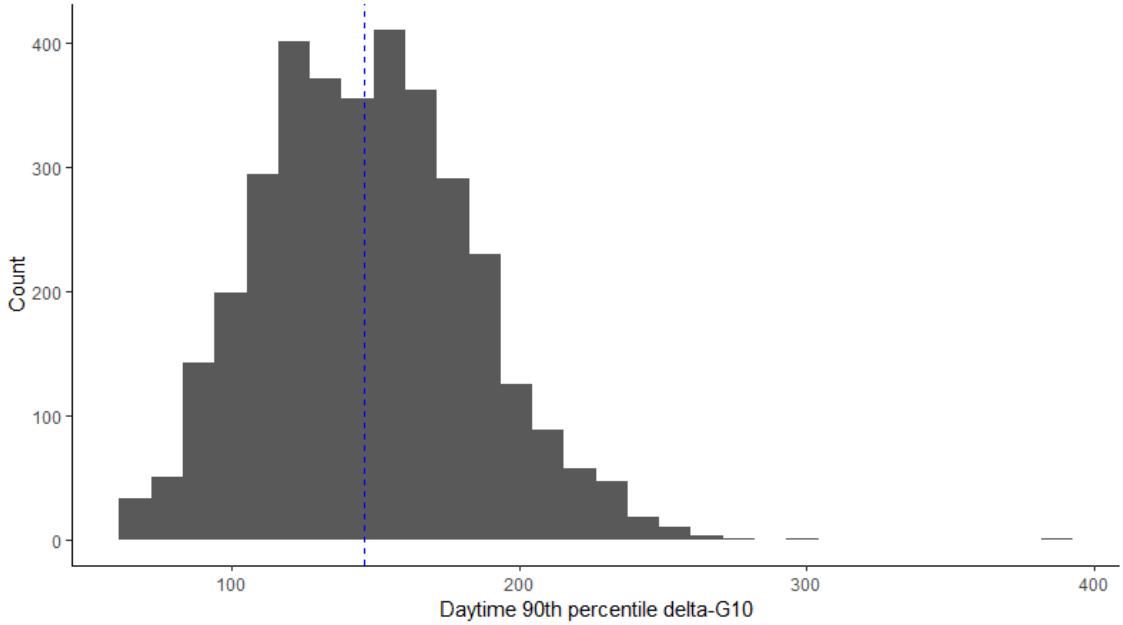
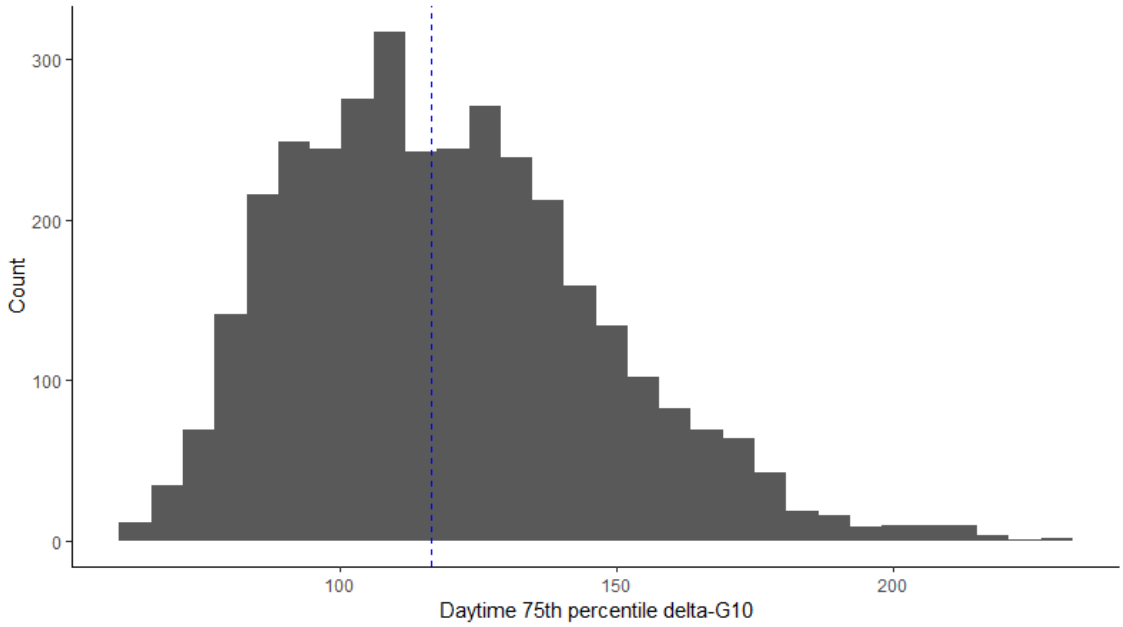
Supplementary Figure 1. Daytime 90th percentile delta-G_{10} for epochs greater than walking, with median marked in a blue dashed line (min = 61.5, max = 382.3, mean = 147.3, median = 146.2, lower quartile = 120.6, upper quartile = 171.4).



Supplementary Figure 2. Daytime 75th percentile delta-G_{10} for epochs greater than walking, with median marked in a blue dashed line (min = 61.4, max = 227.8, mean = 119.4, median = 116.6, lower quartile = 98.2, upper quartile = 136.7).



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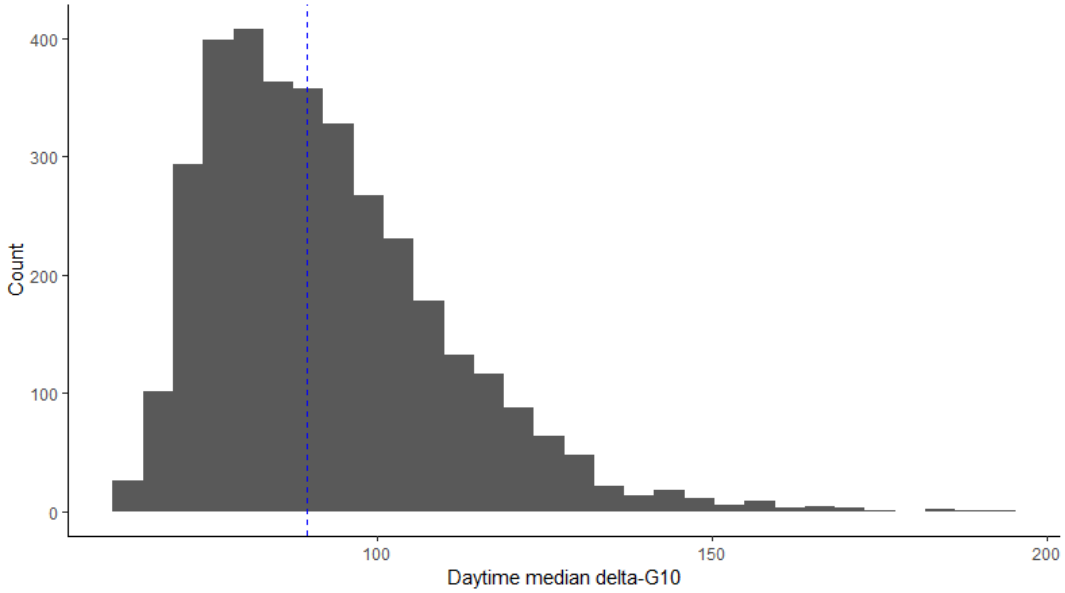
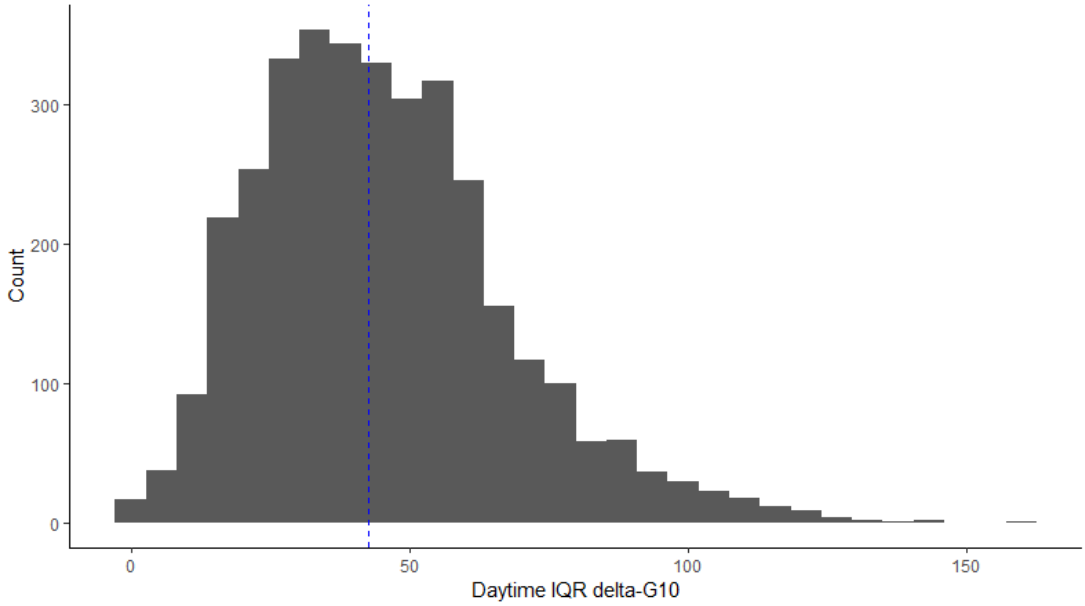
Supplementary Figure 3. Daytime median delta-G_{10} for epochs greater than walking, with median marked in a blue dashed line (min = 61.13, max = 191.31, mean = 92.67, median = 89.51, lower quartile = 79.07, upper quartile = 102.42).



Supplementary Figure 4. Daytime IQR in delta-G_{10} for epochs greater than walking, with median marked in a blue dashed line (min = 0.02, max = 159.89, mean = 45.39, median = 42.58, lower quartile = 29.10, upper quartile = 58.07).



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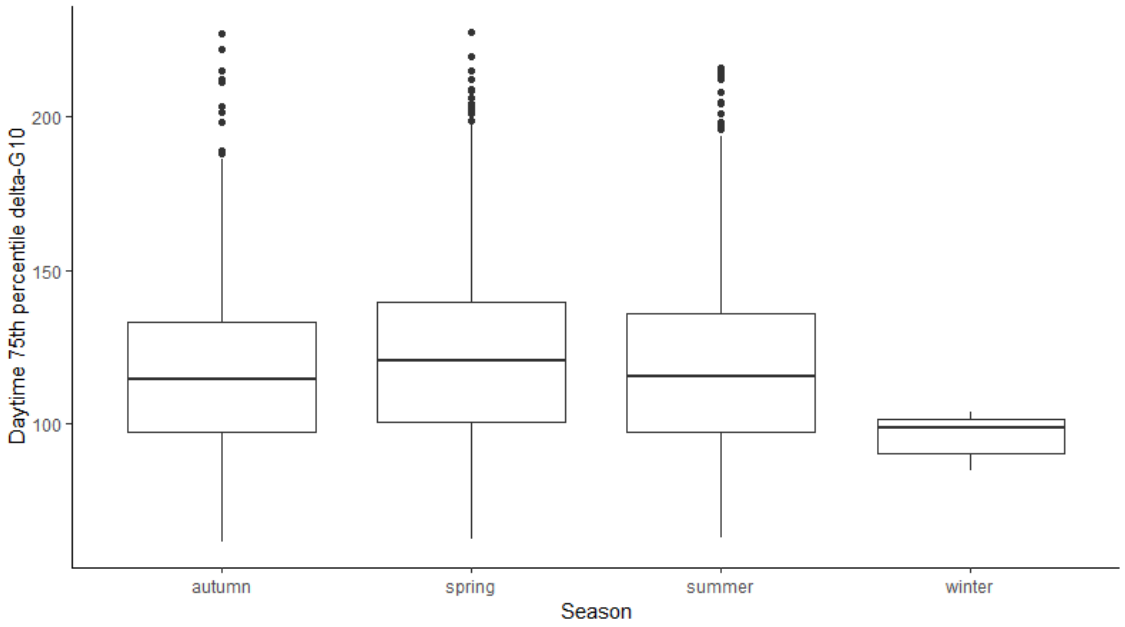
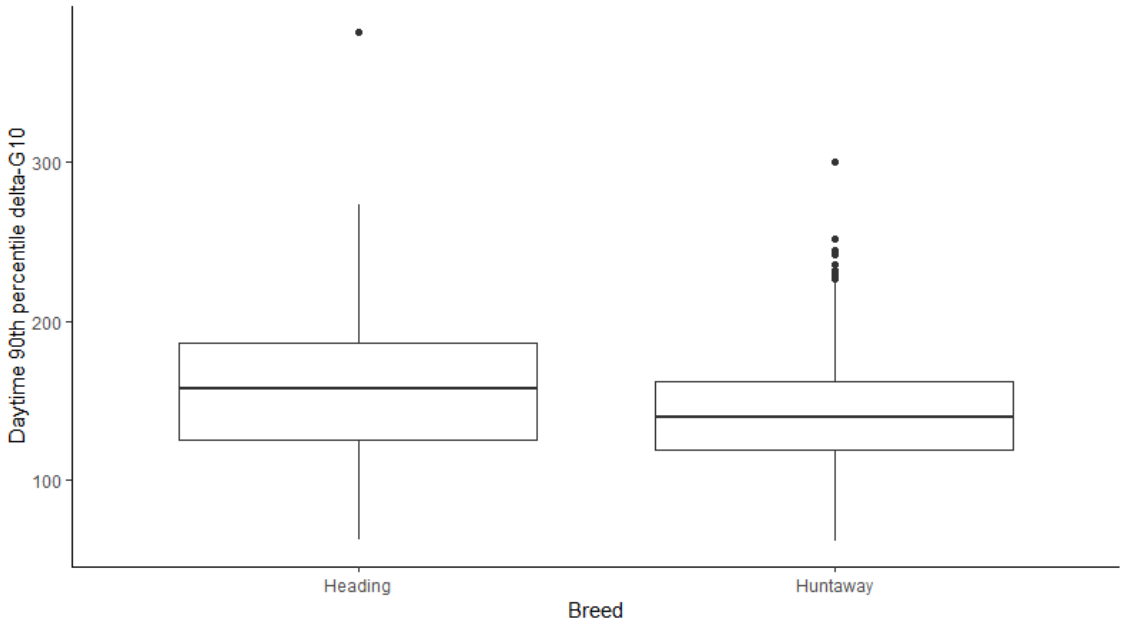
Supplementary Figure 5. Daytime 75th percentile delta-G_{10} by season. Based on 3,500 days from 27 dogs (p-value < 0.001).



Supplementary Figure 6. Daytime 90th percentile delta-G_{10} by breed. Based on 3,500 days from 27 dogs (p-value < 0.001).



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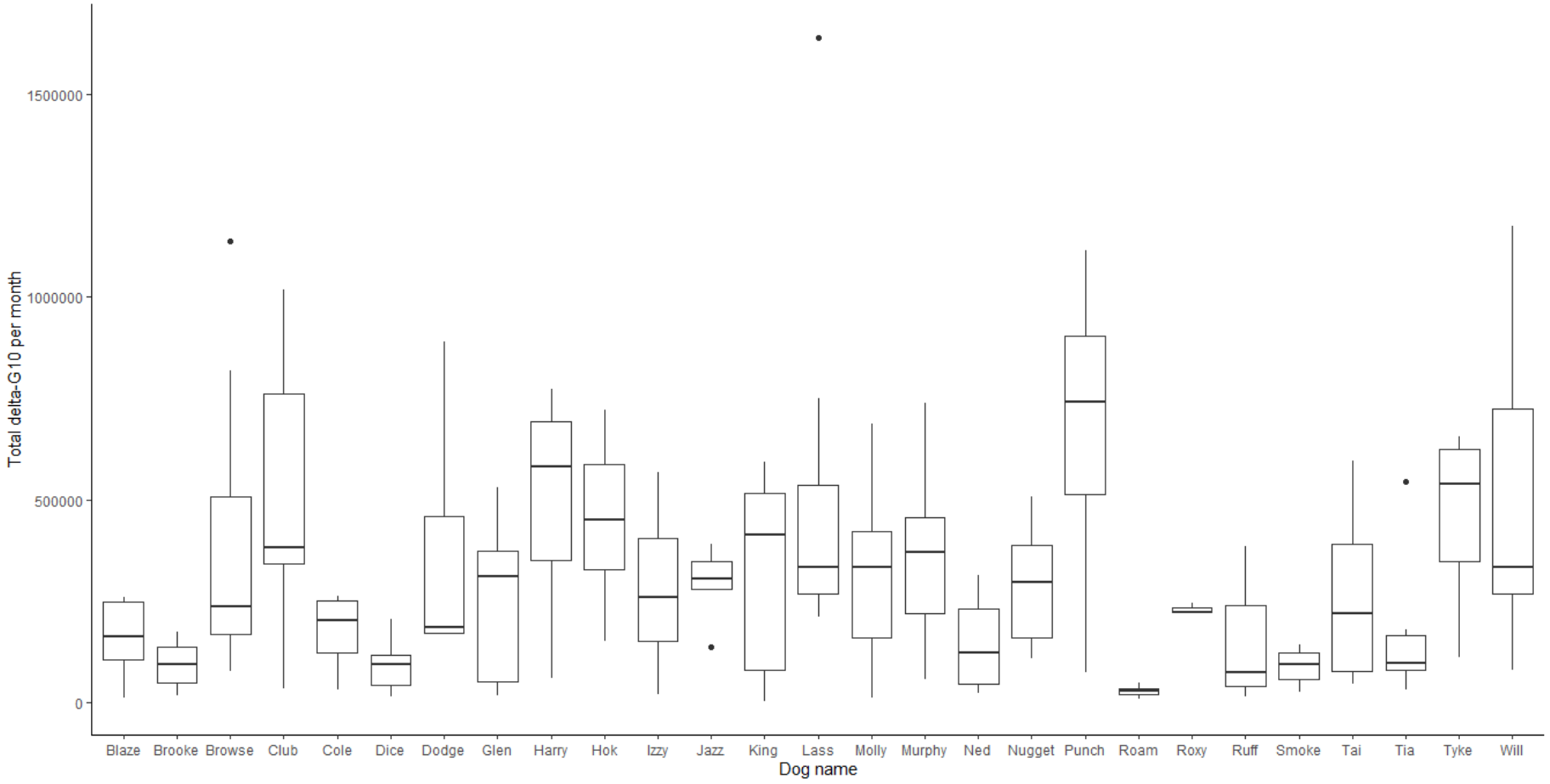
Supplementary Figure 7. Boxplots of the monthly delta-G_{10} for each of the 27 dogs over the course of the study. This includes the months on treatment with green lipped mussel extract and placebo.



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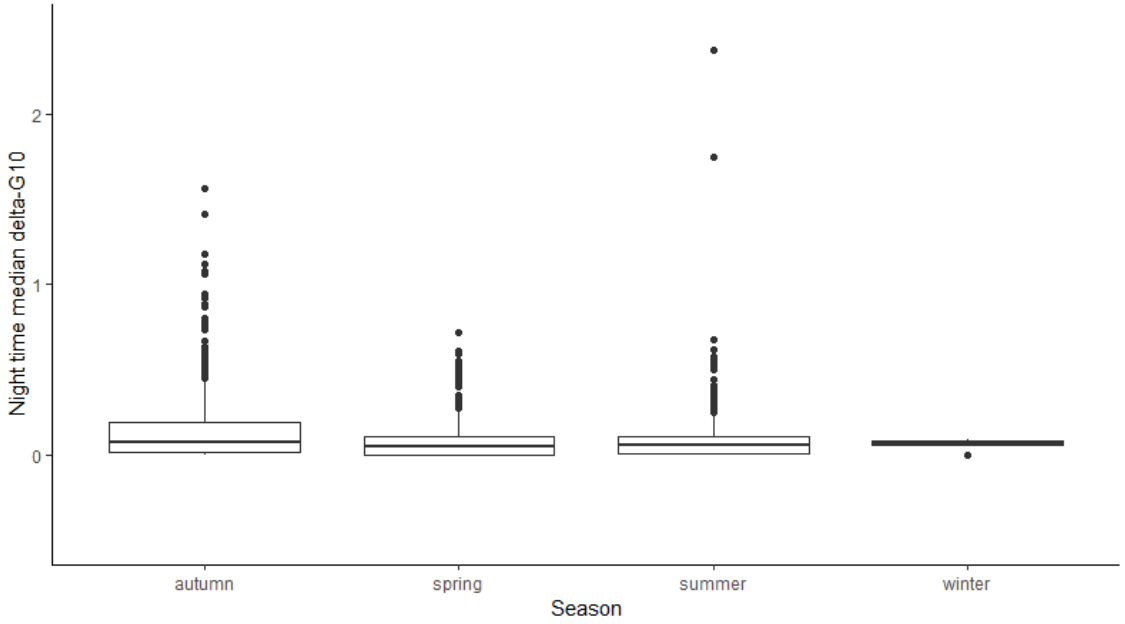
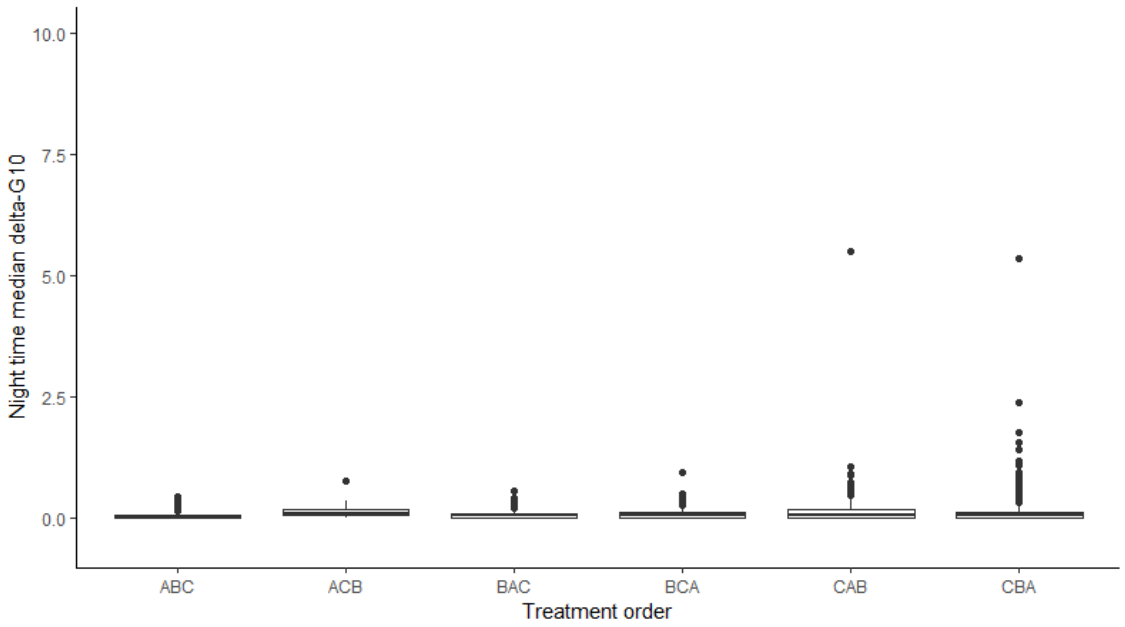
Supplementary Figure 8. Night-time median delta-G_{10} by season. Based on 3,780 nights from 27 dogs. There have been four outliers removed for this graph (p-value = 0.042).



Supplementary Figure 9. Night-time median delta-G_{10} by treatment order. Based on 3,780 nights from 27 dogs. There has been one outlier removed from this graph (p-value < 0.001).



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