

Table S1. C-BARQ behavioural scores from 72 pet dogs used to calculate median split for pair-wise matching of dogs in higher vs lower anxiety or aggression groups. The cohort displayed was selected from questionnaire respondents based on location, age (2-7 years), consistent diet and living arrangements for 3+ months.

Anxiety Score (C-BARQ)					
	Composite	Stranger Directed	Dog Directed	Nonsocial Fear	Separation Related
<i>N</i>	72	72	72	72	72
Mean $\pm$ S.E.	0.955 $\pm$ 0.07	0.82 $\pm$ 0.121	1.155 $\pm$ 0.119	1.05 $\pm$ 0.107	0.82 $\pm$ 0.101
Median	0.782	0.5	1	0.83	0.5
Range	0.0425 – 2.625	0 – 3.25	0 – 3.25	0 – 3.17	0 – 3.25
Aggression Score (C-BARQ)					
	Composite	Stranger Directed	Dog Directed	Owner Directed	Familiar Dog
<i>N</i>	72	72	70	72	55
Mean $\pm$ S.E.	0.565 $\pm$ 0.05	0.618 $\pm$ 0.08	1.061 $\pm$ 0.117	0.158 $\pm$ 0.03	0.406 $\pm$ 0.08
Median	0.455	0.4	0.875	0	0
Range	0 – 1.8825	0 – 2.9	0 – 4	0 – 1.38	0 – 1.75

Table S2. Owner-reported behaviours displayed by dogs who participated in both the Diet & Lifestyle questionnaire and C-BARQ (n=235). Individual chi-squared values are displayed for each behaviour across the four behavioural groups, with n reflecting the number of dogs within each behavioural group that displayed the relevant behaviour. The original cohort (n=235) were split by the median of their composite anxiety (mean of stranger-directed fear, dog-directed fear, nonsocial fear, and separation) and composite aggression (mean of stranger-directed aggression, dog-directed aggression, and owner-directed aggression) scores. The median values were 0.835 for anxiety, and 0.397 for aggression (n=235).

	Total (n=235)		Low Anx Low Agg (n=83)		Low Anx High Agg (n=34)		High Anx Low Agg (n=33)		High Anx High Agg (n=85)		χ^2	p
	n	%	n	%	n	%	n	%	n	%		
<i>Towards People</i>												
Lunging	24	10.21	4	4.81	2	5.88	2	6.06	16	18.82	16.40	0.0009
Barking	85	36.17	14	16.86	11	32.35	6	18.18	54	63.52	45.79	<0.0001
Staring	59	25.11	14	16.86	4	11.76	9	27.27	32	37.64	13.41	0.0038
Pulling Towards	96	40.85	38	45.78	11	32.35	11	33.33	36	42.35	2.70	0.439
Wagging Tail	152	64.68	68	81.92	22	64.70	21	63.63	41	48.23	20.88	0.0001
Excited	122	51.91	51	61.44	21	61.76	18	54.54	32	37.64	11.37	0.0099
Interested/Calm	72	30.64	32	38.55	12	35.29	10	30.30	18	21.17	6.37	0.09
Move Away	44	18.72	3	3.61	3	8.82	13	39.39	25	29.41	30.28	<0.0001
Ignore	49	20.85	18	21.68	10	29.41	5	15.15	16	18.82	2.41	0.49
<i>Towards Dogs</i>												
	n	%	n	%	n	%	n	%	n	%	χ^2	p
Lunging	64	27.23	7	8.43	12	35.29	3	9.09	42	49.41	42.49	<0.0001
Barking	114	48.51	19	22.89	22	64.71	8	24.24	65	76.47	61.84	<0.0001
Staring	91	38.72	25	30.12	13	38.23	8	24.24	45	52.94	12.75	0.005
Pulling Towards	150	63.83	49	59.03	24	70.58	18	54.54	59	69.41	3.87	0.275

Wagging Tail	134	57.02	51	61.44	16	47.05	23	69.69	44	51.76	5.16	0.160
Excited	114	48.51	47	56.62	17	50.0	19	57.57	31	36.47	8.23	0.041
Interested/Calm	57	24.25	28	33.73	7	20.58	11	33.33	11	12.94	11.71	0.008
Move Away	24	10.21	2	2.41	2	5.88	6	18.18	14	16.47	12.12	0.006
Ignore	44	18.72	16	19.28	8	23.52	7	21.21	13	15.29	1.324	0.723

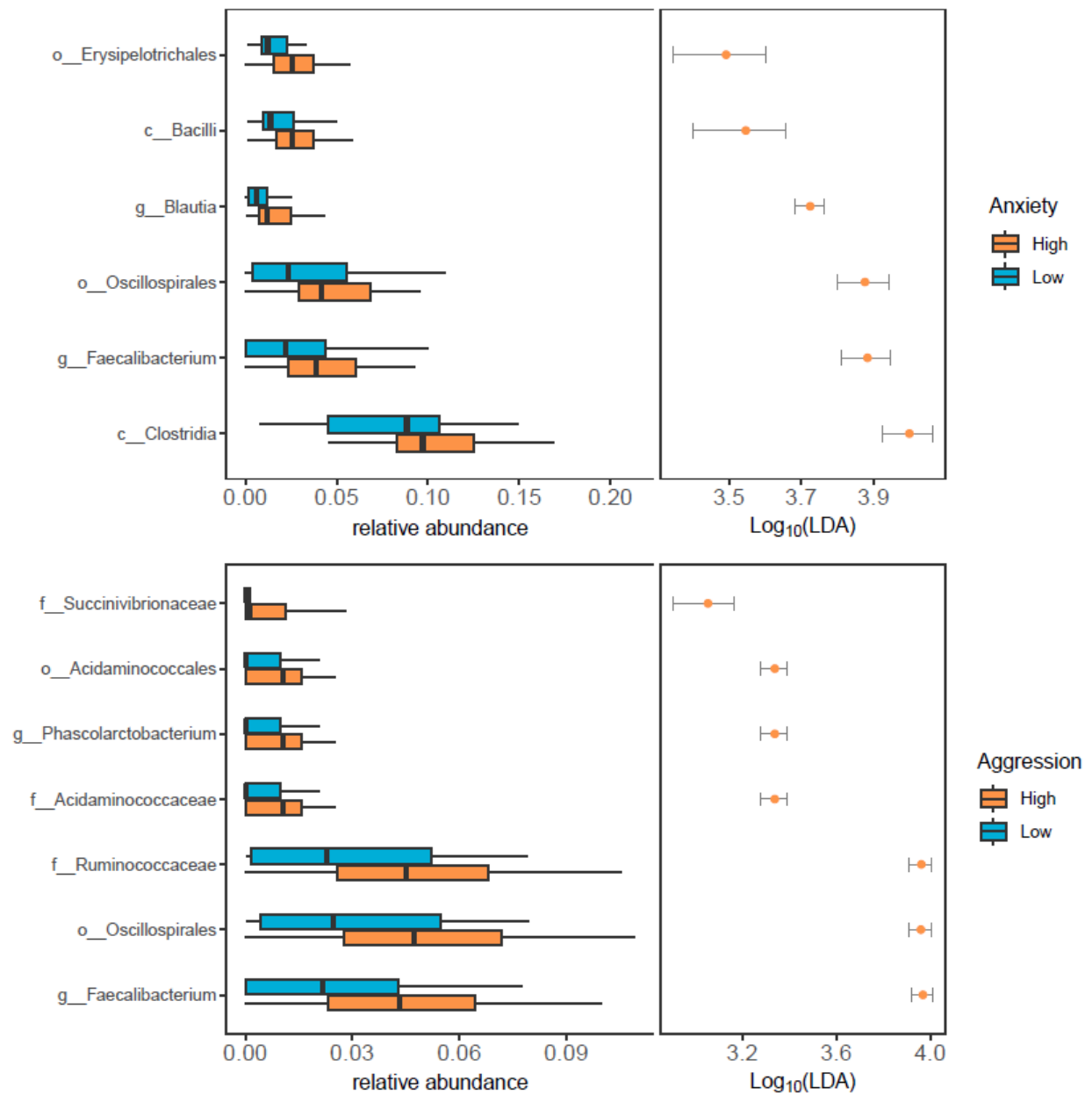
Table S3. Sequence quality (number of reads) through DADA2 pipeline

	input	filtered	denoisedF	denoisedR	merged	nonchim
Sample1	91680	58959	58518	58476	56700	41849
Sample10	101679	65325	64983	64838	63208	39221
Sample11	109479	70993	70525	69996	67737	43041
Sample12	103804	62069	61376	61131	57506	37529
Sample13	127183	82115	81020	80645	76219	51366
Sample14	102527	62778	62179	62121	60070	42915
Sample15	118395	75400	74444	74402	70866	43994
Sample16	88338	57516	56851	56688	53544	35764
Sample17	100166	62633	62388	62255	61032	40246
Sample18	68249	43298	43006	42583	40919	31059
Sample19	81879	51263	50986	50850	48839	32473
Sample2	77487	49679	49164	49036	46760	34589
Sample20	133346	83360	82726	82658	79540	56121
Sample21	87496	57685	57200	57165	55139	38436
Sample22	143556	89860	88729	88757	83430	49888
Sample23	98498	62450	61997	62015	59214	28162
Sample24	75542	48108	47617	47324	45075	31541
Sample25	80664	52271	51614	51494	48690	32046
Sample26	92974	61056	60423	60405	57602	38776
Sample27	85762	56523	56268	56165	55297	31875
Sample28	90459	56124	55361	55137	51832	33092
Sample29	101713	65482	64904	64930	61217	39266
Sample3	111738	73425	72880	72700	70367	47186
Sample30	76248	46079	45813	45708	44454	32357
Sample31	59746	38072	37821	37740	36770	27590
Sample32	38855	24916	24713	24555	23793	17037
Sample33	79521	52174	51800	51656	49872	35075
Sample34	65658	41701	41213	41164	39664	28225
Sample35	69883	46212	46060	45954	44806	32779
Sample36	92074	55182	54413	54358	51083	34128
Sample37	77995	49542	48955	48801	46295	30637
Sample38	89120	55900	55215	54975	52669	31185
Sample39	87416	54440	53982	53975	52420	30489
Sample4	71428	44610	44203	43912	41890	29779
Sample40	14772	8095	7988	7978	7743	5621
Sample41	80585	51042	50525	50370	47688	34919
Sample42	58685	38810	38576	38517	37901	26316
Sample43	76585	49123	48268	48023	44191	29251
Sample44	97094	59709	59290	59101	57274	37343
Sample45	115931	74594	73724	73413	69157	47160

Table S4. Relative abundance across taxonomic levels for the entire cohort (All Dogs, n=48), higher and lower anxiety and aggression groups. Values are displayed as percentages $\pm$ standard error, with p-values before adjustment for false discovery (Mann-Whitney U). After correction for false discovery, all p values were > 0.05 .

		All Dogs	Anxiety Group			Aggression Group		
			Lower	Higher	p	Lower	Higher	p
Phylum	Bacteroidota	53.6 ± 2.3	51.5 ± 4.1	55.9 ± 2.1	0.483	51.8 ± 3.5	55.2 ± 3.25	0.307
	Firmicutes	23.9 ± 1.7	24.5 ± 2.9	23.3 ± 1.6	0.539	25.2 ± 3.1	22.8 ± 1.61	0.870
	Fusobacteriota	18.5 ± 1.8	20.0 ± 2.9	17 ± 2.2	0.550	18.9 ± 2.4	18.2 ± 2.9	0.628
Class	Bacteroidia	53.6 ± 2.3	51.5 ± 4.1	55.9 ± 2.1	0.483	51.8 ± 3.5	55.2 ± 3.2	0.307
	Fusobacteria	18.5 ± 1.8	20 ± 2.9	17 ± 2.2	0.550	18.9 ± 2.4	18.2 ± 2.9	0.628
	Negativicutes	11.8 ± 1.6	13.6 ± 2.9	9.9 ± 1.2	0.733	14.0 ± 3.0	9.8 ± 1.4	0.244
	Clostridia	9.3 ± 0.6	8.4 ± 0.9	10.4 ± 0.7	0.081	8.3 ± 0.9	10.3 ± 0.8	0.129
	Gammaproteobacteria	3.7 ± 0.3	3.8 ± 0.5	3.5 ± 0.3	0.918	3.8 ± 0.6	3.6 ± 0.3	0.741
	Bacilli	2.7 ± 0.4	2.4 ± 0.7	2.9 ± 0.4	0.043	2.7 ± 0.7	2.6 ± 0.4	0.392
Order	Bacteroidales	53.6 ± 2.3	51.5 ± 4.1	55.9 ± 2.1	0.483	51.8 ± 3.5	55.2 ± 3.2	0.307
	Fusobacteriales	18.5 ± 1.8	20.0 ± 2.9	17.0 ± 2.2	0.550	18.9 ± 2.4	18.2 ± 2.9	0.628
	Veillonellales-	11 ± 1.6	12.9 ± 3	8.9 ± 1.3	0.628	13.5 ± 3.0	8.7 ± 1.5	0.19
	Selenomonadales							
	Lachnospirales	4.4 ± 0.5	4.1 ± 0.8	4.6 ± 0.6	0.110	4.4 ± 0.7	4.3 ± 0.6	0.584
	Oscillospirales	3.9 ± 0.4	3.2 ± 0.6	4.7 ± 0.5	0.081	3.0 ± 0.5	4.8 ± 0.5	0.05
	Burkholderiales	3.1 ± 0.3	3.2 ± 0.5	3.0 ± 0.3	0.934	3.3 ± 0.5	2.9 ± 0.3	0.687
	Erysipelotrichales	2.4 ± 0.3	2.2 ± 0.6	2.7 ± 0.3	0.039	2.5 ± 0.7	2.4 ± 0.3	0.297
Family	Bacteroidaceae	29.9 ± 2.5	28.7 ± 3.7	31.3 ± 3.4	0.563	29.3 ± 3.6	30.5 ± 3.6	0.877
	Prevotellaceae	23.5 ± 3.1	22.7 ± 4.7	24.4 ± 4.3	0.621	22.5 ± 4.9	24.5 ± 4.1	0.521
	Fusobacteriaceae	18.5 ± 1.8	20.0 ± 2.9	17.0 ± 2.2	0.550	18.9 ± 2.4	18.2 ± 2.9	0.628
	Selonomondaceae	11 ± 1.6	12.9 ± 3.0	8.9 ± 1.3	0.650	13.5 ± 3.0	8.6 ± 1.5	0.176
	Lachnospiraceae	4.4 ± 0.5	4.1 ± 0.8	4.6 ± 0.6	0.110	4.4 ± 0.7	4.9 ± 0.6	0.584
	Ruminococcaceae	3.6 ± 0.4	3.0 ± 0.6	4.3 ± 0.5	0.137	2.7 ± 0.5	4.5 ± 0.5	0.055
	Sutterellaceae	3.1 ± 0.3	3.2 ± 0.5	2.9 ± 0.3	0.934	3.3 ± 0.5	2.9 ± 0.3	0.703

Figure S1. Linear discriminant analysis ($\text{Log}_{10}(\text{LDA})$) for higher and lower anxiety or aggression groups (n=48) identifying the differences in relative abundance for the most relevant operational taxonomic units (OTUs).



Lifestyle & Routine

How many dogs live in your home?

- 1
- 2
- 3
- 4+

What would you consider to be your dog's main source of exercise:

Walking (ie neighbourhood walks)

Running

Hiking

Fetch/Frisbee

Garden/Yard

Doggie Daycare

None/Not Applicable

On average, how frequently does your dog exercise away from your property (eg. Walks, hiking etc) each week?

Never

Less than once per week

Once per week

2-4 times per week

Daily

On average, how much time does your dog spend exercising away from your property (eg. Walks, hiking etc) each week?

Less than one hour per week

1-2 hours per week

2-4 hours per week

4-6 hours per week

6+ hours per week

How frequently does your dog encounter people outside your family?

Never

Less than once per week

Once per week

2-4 times per week

Daily

How frequently does your dog encounter dogs outside your family?

Never

Less than once per week

Once per week

2-4 times per week

Daily

Diet

Does your dog have scheduled meal times, or are they free-fed?

Scheduled meals

Free-fed

If your dog has scheduled meal times, how many times per day does your dog eat?

One

Two

Three

Four or more

How long has your dog been fed on this schedule?

Less than a month

1-3 months

3 – 6 months

6+ months

What type of food forms the majority of your dog's diet? (select all that apply)

Kibble

Canned/Wet food

Raw

Home-cooked

What brand of food do you feed your dog? (eg. Purina, Acana, Orijen, Royal Canin)

What formula of food do you feed your dog? (eg. Kirkland Salmon & Sweet Potato, Acana Wild Coast, Go! Sensitivity Salmon Formula) Please provide as much information as possible so we can search the ingredients and nutritional information – you can also email a photo of the food packaging to sdp575@mun.ca

How long has your dog been eating this food?

Less than a month

1-3 months

3 – 6 months

6+ months

Do you supplement your dog's diet regularly (ie. more than once per week) with any of the following foods (select all that apply):

Green vegetables (broccoli, spinach, kale, peas, beans)

Salad vegetables (tomato, peppers, cucumber)

Fruits (blueberries, banana, strawberries, apple)

Poultry

Red meats

Fish

Deli meats (hot dogs, ham, bologna)

Starchy vegetables (potato, sweet potato)

Yogurt

Peanut butter

From the following graphic, how would you rate your dog's body condition?

1

3

5

7

9



Medical

Does your dog currently eat a veterinary-prescribed diet?

Yes

No

If yes, please specify the brand, formula and reason for the particular diet (eg. Purina ProPlan Neurocare kibble, for epilepsy):

Has your dog ever taken a dewormer, such as Sentinel or Strongid?

Yes

No

On average, how frequently does your dog take a dewormer?

Every month

Every 3 months

Every 6 months

Every year

Never

When did your dog last receive their dewormer?

Has your dog ever taken flea medication, such as Advantage Multi?

Yes

No

On average, how frequently does your dog take flea medication?

Every month

Every 3 months

Every 6 months

Every year

Never

When did your dog last receive their flea medication?

Has your dog been vaccinated against parvovirus, distemper and parainfluenza? (hint – this is the vaccination your puppy gets at 8, 12 and 16 weeks, then as a booster in adulthood)

Yes

No

On average, how frequently has your dog been vaccinated since their puppy boosters?

Every year

Every 2 years

Every 3 years

Less than every 3 years

Never

When did your dog last receive their vaccinations for parvovirus, distemper and parainfluenza?

Does your dog currently taking any medication? If so, please specify:

Does your dog receive any of the following supplements:

Omega 3/6 oils

CBD products

Fortiflora/Probiotics

Other: _____

On average, how many times does your dog defecate each day?

One

Two

Three

More than three

On average, which of these movements most accurately represent your dog's bowel movements?

1

2

3

4

5

6

7

8

Type 1		Separate, hard pellets or lumps (may require straining).
Type 2		Lumpy and sausage-shaped.
Type 3		Like a sausage with cracks on the surface.
Type 4		Long, smooth, soft, and snake-like.
Type 5		Soft, distinct blobs (may be covered in mucous and pass easily).
Type 6		Fluffy, ragged, and mushy.
Type 7		Watery; entirely liquified.
Type 8		Mucous-like, bubbly, foul-smelling, and may spray out.

