Lifestyles of the modern dog (*Canis familiaris*): Relationships among activity, feeding, personality, and separation anxiety in beagles and huskies

BY

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ABSTRACT

Over the past few decades in most Westernized countries, the lifestyle of modern companion dogs has changed significantly to accommodate the lifestyles of their owners. For the purpose of this study, lifestyle encompasses dog activity levels, caloric and protein intake, feeding habits, daily routines, and their living environment. This study aimed to uncover correlations between components of a dog's lifestyle, their personality traits and owner-reported canine separation anxiety in two breed types: beagles and huskies. Voyce® collars were used during a four-day period to record and classify activity into four levels: rest, low, moderate, high. Owners answered a lifestyle questionnaire describing the history and habits of their dog and completed the Monash Canine Personality Questionnaire-Revised (MCPQ-R), which scores dogs for five personality dimensions (Extraversion, Motivation, Training Focus, Amicability, and Neuroticism). Owners also completed a food and activity log. Activity levels were similar between beagles and huskies. Collar-recorded activity differed as expected between daytime and nighttime periods. Owners reported spending more time on daily walks with huskies compared to beagles. Owner-reported daily time spent on walks corroborated the daytime activity recorded by the collars. Personality dimensions did not differ by breed types. Some personality dimensions and collar-recorded activity were found to correlate; however, following a Bonferroni correction, the correlations were no longer statistically significant. Huskies consumed a larger percentage of their daily caloric intake from protein source. The method of feeding (ad libitum vs. set times) did not influence either dog weight or caloric intake. Owners reported separation anxiety in 12 dogs (48%). Breed did not have an effect on owner-reported separation anxiety. Dogs with owner-reported separation anxiety spent significantly less time in high activity during the day.
The results suggest that individual variation in dogs' personality dimensions and owner-reported separation anxiety are driven by both environmental (lifestyle) and intrinsic (physiological)

factors. Future studies should aim at more closely exploring the relationship between owners and dogs to determine how it influences dog lifestyle, personality, and behaviour.

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INTRODUCTION

Once domesticated and often bred for specific purposes, such as hunting or tracking, dogs (*Canis familiaris*) in Westernized countries have been required to adapt to the lifestyles of their owners towards a way of life that required less work, easier food availability and more space constraints (Jimenez 2016; Chandler et al. 2017). A large proportion of dogs living as pets suffer the cost of this new lifestyle through high overweight and obesity prevalence (Lund et al. 2006; Bland et al. 2009). In 2010, it was estimated that 59% of pet dogs living in the UK were above their ideal body score (Courcier et al. 2010). Overweight and obesity were also conditions seen in 40% of juvenile dogs sampled at different location in the UK (German et al. 2018). One of the main factors predicting unnecessary weight gain in dogs are poor exercising habits of their owners (Courcier et al. 2010). In fact, Bland et al. (2009) found that obese dogs rarely exercised while normal weight dogs enjoyed physical activity on a daily basis. Interestingly, the study pointed to an association between having a backyard accessible for free-roaming and higher body weight. Bland et al. (2009) note that owners with large fenced backyard might assume that their dog would be able to reach high levels of physical activity on their own and were less likely to be active with their dog, via walks or other activities. How and what owners feed their dogs has also changed in more recent times, with commercial dog foods comprising the main component of dogs' diet (Laflamme et al. 2008) and evidence that owners often misinterpret food label recommendations for feeding, which results in overfeeding their dogs (Michel et al. 2009). Thus, compared to their ancestors, many dogs in modern society experience a lack of activity, an over-abundance of food, and the health consequences that can arise from this lifestyle (e.g. German et al. 2017b).

The typical activity or energy level of any given dog has been considered part of canine personality (e.g., the Extraversion dimension of the Monash Canine Personality Questionnaire-Revised, MCPQ-R, Ley et al. 2009a), and can vary depending on breed. For example, dogs

grouped as Working dogs and Terriers scored substantially higher on Extraversion (Ley et al. 2009a). This result is not unexpected, given the high levels of activity and the initial purpose's for which breeds within these groups were created (Ley et al. 2009a). In fact, a dog's personality is commonly thought to arise from their breed, especially if they are artificially selected to exhibit certain behaviors (Bradley 2011). For example, uniformity in the behavior of a specific breed has been especially acknowledged for sled-dogs, rigorously bred to harmoniously pull heavy weight as a team (Lord et al. 2014). Lord et al. (2014) note that the morphology and the pulling behavior have to be carefully selected for in order to avoid outliers by eliminating sled-dogs with suboptimal characteristics from the gene pool. However, uniformity in behavior does not hold true for most domesticated dogs as breeding pressure has often been placed on appearance to meet breed standards and not on temperament (Bradley 2011). Despite this, breed differences with regard to behaviour were found by Notari & Goodwin (2007), who assessed differences among 49 breeds of dogs by asking Italian veterinarians to rank randomly assigned breeds as the most to least likely to exhibit specific behavioral traits. Their findings showed clear perceived differences between breeds of dogs for aggression, maturity, and reactivity and were in accordance with findings of similar surveys in the US and the UK (Bradshaw & Goodwin 1998; Notari & Goodwin 2007).

In contrast, Svartberg (2006) studied behavioral differences among 31 breeds of dog based on their playfulness, sociability, curiosity, and aggressiveness and found no significant differences within different breed types. The author classified dogs under breed types, regrouping breeds or mix-breed dogs by the similarity of their role evolved through artificial selection (i.e. retrieving breeds, guarding breeds, etc). In fact, there was more distinctiveness within breed types than across all breeds (Svartberg 2006). These discrepancies with the conclusions of Notari & Goodwin (2007) could arise from the different evaluation methods. Bradshaw & Goodwin (1998) and Notari & Goodwin (2007) surveyed veterinarians to rank breeds on their perception of the breeds. While this population would have personal experience

handling different individuals of many breeds, they might still be biased by what their

expectations of the breed is supposed to be rather than what individual dogs within the breeds

are. In contrast, Svartberg (2006) used the data from a behavioral test done by the Swedish

Working Dog Association over a period of 5 years that tested a total of 13,097 dogs. Since

individual dogs were assessed through a series of behavioral tests with a representation of at

least 40 dogs per breed, the author was able to evaluate the data to determine if personality

traits were significantly different within each breed type, bred for similar purposes (Svartberg

2006). This experimental method showed greater behavioral variation within dogs of the same

breed type than among dogs of different breeds types. A review by Merhkam & Wynne (2014)

on systemic inter-breed variations in personality, cognition, and behaviour discussed the

amplitude of mixed results found across studies, some agreeing about certain personality traits

systematically found in certain breeds while other concluded that no systematic behavior could

be found in the studies they examined. Despite the divergent conclusions of such studies,

Merhkam & Wynne (2014) suggested that the available evidence favours larger personality trait

variations of individuals within breeds than between breeds, complementing the findings of

Svartberg (2006).

      Evaluation of the relationship between personality traits and lifestyle differences at the

levels of breed and the individual in dogs is still relatively unexamined. A study based on owner

reports would be useful, as owners have been proven to be reliable assessor of their pets'

behavior and ailment (Morris et al. 2008) as well as their welfare (Mariti et al. 2012). The owner-

based MCPQ-R tool for canine personality evaluation has been shown to reliably and validly

evaluate five personality dimensions: Extraversion, Motivation, Training Focus, Amicability, and

Neuroticism (Ley et al. 2009b). Although owner-based questionnaires are often accused of

being biased, a recent review from Wiener & Haskell (2016) found that owners are reliable

assessors of their dogs' behaviors. The authors discussed the intricate knowledge owners have

of their dog providing a clearer picture of the dog's temperament in both broad and precise contexts.

The importance of quantifying biological variation within the same breed or species is only now attracting interest from researchers (e.g., Careau et al. 2010; Versteegh et al. 2012). An emerging concept in ecology has suggested a link between the metabolic rate of animals and consistent individual differences in behavior, i.e., personality (Careau et al. 2008; Dammhahn et al. 2018). This literature explores the pace of life of endotherms and how their reactivity to stressful situations is reflected in their basal metabolic rate (Careau et al. 2008; Biro & Stamps, 2010). In a recent meta-analysis looking at relationships between behavioral traits and metabolic rate compared to hormone levels, metabolic rate correlated with behavior, where species with higher basal metabolic rates were more likely to show greater reactivity to stressors (Holtmann et al. 2017). Previously, Careau & Garland (2012) had discussed the variations found in behavioral traits associated with performance of individuals within the same species, raising the question of consequent metabolic rate differences within a taxonomic group. Following the pace of life model, individuals fall along a slow to fast continuum, where a slow metabolic rate correlates with low aggression, shyness, low activity, sociability, and careful exploration, while a fast metabolic rate correlates with aggression, boldness, rapid decision-making, high activity and poor sociability (Figure 1, Réale et al. 2010). This new field of research opens up the possibility of predicting the personality traits of an individual based on objective physiological measurements.
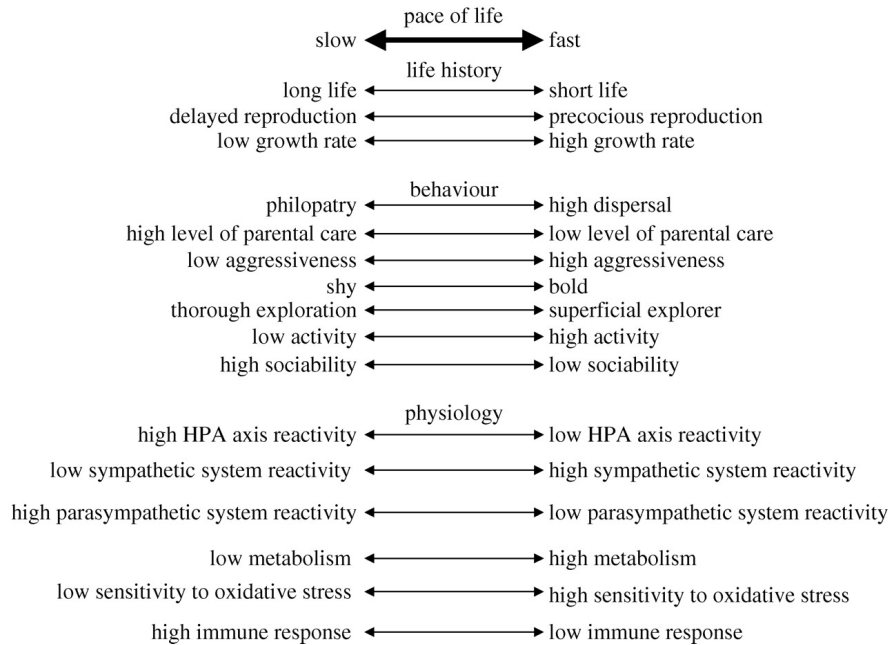
Figure 1. Pace of life axis where life history traits, behavioral traits, and physiological traits correlate based on their position on the axis. Image from Réale et al. (2010).

The MCPQ-R encompasses personality dimensions found in companion dogs (Training Focus, Amicability, Motivation) while also bridging the gap between domesticated and wild animals with personality dimensions found across a large range of species (Extraversion, Neuroticism) (Ley et al. 2008). Certain behaviors listed in the pace of life axis would likely correlate with the personality dimensions of the MCPQ-R. The activity axis is clearly described by the MCPQ-R Extraversion dimension (Ley et al. 2008, 2009a). The shyness-boldness axis could be encompassed by the Motivation dimension, which uses adjectives such as "assertive", "independent", and "tenacious" (Ley et al. 2009a). Furthermore, the sociability axis might reflect the Amicability of a dog, as this dimension is rated through adjectives such as "sociable", "friendly", and "easy going" (Ley et al. 2009a).

Estimation of the metabolic rate without the use of invasive procedures bases itself on the body mass of the subject and allometric equations for its species (Wilson et al. 2006). Most studies assessing physiological measures in organisms, including humans, assume the

existence of a normal body range across a species of similarly-aged individuals (Hawthorne et al. 2004). These allometric equations used to measure the metabolic rate of specific species fail to take into account large differences in surface area of individuals within the same species, or even within the same subspecies or breed (Divol & Priymenko 2017). Among mammalians, domestic dogs (*Canis familiaris*) stand out by their abnormally large range of body morphology compared to most other mammalian species (Galis et al. 2007; Greer et al. 2007). Different dog breeds have been artificially selected to weigh as little as 1.4 kg with a surface area estimated at $0.18m^2$, up to 80 kg with a surface area of $1.98m^2$ (Hill & Scott 2004). When the surface area per kilogram of body weight is compared between the toy breed and the giant breed, the respective surface/volume ratios of $0.09m^2/kg$ and $0.02m^2/kg$ are obtained. For the same unit of weight, toy breeds have to expend more energy to maintain a stable internal body temperature compared to giant breeds because of the difference in body surface area (Schmidt-Nielsen 1984; Greer et al. 2007). Although smaller dogs may be defined as fast-paced based on their size and metabolic rate, most of their life-history traits suggest a slower pace of life. They have smaller litters, slower growth rates, and live longer than larger breeds of dogs (Samaras et al. 2002; Jimenez et al. 2016).

Correlations between the weight of wild mammals and their metabolic rate have also proven to be weak within species (Speakman 2005), suggesting that other individual factors promote such variations. Attributing behavioral attributes to dogs based on their metabolic rate, and associated pace of life, although objective, will likely not represent the individual. Other objective measures might be better suited to predict dogs' personality across their wide range of body sizes.

Along with low activity, an important contribution to the obesity epidemic in companion dogs is the food being served to them (German 2016). Being fed table scraps is only detrimental to dogs if the table scraps are high in calories and sodium (Heuberger & Wakshlag 2011). These foods also tend to be unaccounted for in the regular amount of food dogs' are provided

with (White et al. 2016). Overweight and obese owners tend to have poorer diet and a poorer interest about nutrition and health in general, whether regarding themselves or their dog (Chandler et al. 2017). Owners of obese dogs were also found to buy lower end food brands and report that food price was an important criterion in their choice of brand (Kienzle et al. 1998; Suarez et al. 2012).

The large majority of owners choose to buy commercially available food to feed their companion dogs (Laflamme et al. 2008). Dry commercial dog food typically offers similar caloric intake per cup measured across brands (Roberts et al. 2018). The percentage of calorie dedicated to protein intake might however differ from 15% to 39%, with more expensive brands typically advertising greater protein content (Roberts et al. 2018). With an increased focus put on health and weight management in both humans and pets in the last decades (e.g. Chandler et al. 2017), the dog food industry has caught on and now offers products reflecting the fad diets of the human nutrition world (Schlesinger & Joffe 2011; Connolly et al. 2014). High protein diets have been particularly popular in human nutrition for a number of years (Westerterp-Plantenga et al. 2009). Higher intake of protein has been found to help decrease total caloric intake, likely due to its satiety effect (Yaissle et al. 2004; Weber et al. 2007). Increasing the daily proportion of calorie dedicated to protein intake was also the subject of different research on its effect on behavior. In humans, this macronutrient redistribution resulting in a larger intake of protein did not affect individual's mood over the short or long term (Karl et al. 2015). In dog nutrition, providing a large portion of the caloric intake to protein sources leads to higher tolerances to stress by lowering circulating cortisol faster after a period of stress (reviewed in Bosch et al. 2007).

In other studies examining food intake and temperament, overweight dogs were shown to adopt the same attitudes as their overweight owners (Pogany et al. 2018). Pogany et al. (2018) reported that overweight satiated dogs were pessimistic when faced with an ambiguous low-value reward. In contrast, even post-meal, they were over-excited when presented with a

high value reward compared to the normal weight group (Pogany et al. 2018). Certain studies were interested in the association between personality and protein intake in companion dogs. German et al. (2017b) found that higher protein intake correlated with higher levels of aggression and fearfulness. These results suggest that body morphology, calorie intake, and protein intake are linked to metabolic rates and as such, could be predictive of personality dimensions.

Another hallmark of modern dog lifestyle is long periods of times spent alone during daily separation from owners, should the owners work outside the home. In some proportion of dogs, this lifestyle is problematic, as they experience separation anxiety, defined as an extended period of stress when the dog is left alone or when the primary owner is not with the dog (reviewed in Sherman & Mills 2008). The main diagnosis criteria of separation anxiety are repetitive behavior (pacing), destructive behaviors, vocalization, and restlessness (Horwitz 2000; Horwitz & Mills 2009). Active deeds such as vocalization and destructive behaviors are described to be the main reason for concerns in owners (McCrave 1991) and the main risk of injury to the dogs (Horwitz 2000). Events that could induce separation anxiety are well understood: being left alone for extended periods of time, insufficient physical activity, moving to a new environment, and losing a pack member, to name a few (Sherman & Mills 2008).

Dogs suffering from separation anxiety or demonstrating stress-induced behaviors are some the most common reasons of failed adoption (Miller et al. 1996; Diesel et al. 2010). Being able to predict the personality and the incidence of separation anxiety ahead of an adoption by relying on objective measures could help curb this issue and improve the welfare of dog companions better suited for their new home (Dreschel 2010). Physical activity and Neuroticism might be two components of a dog's lifestyle that can be used to predict the risk of developing separation anxiety. As well, objective measurements of activity while an owner is absent could be helpful in the diagnosis of the condition.

Welfare

Careau et al. (2008) argue that the extent of intra-breed personality variations is not only common in domesticated dogs but across the subphylum Vertebrata. The authors discuss the reluctance to take into account individual differences in wildlife behavior until recently, since personality was often study as an evolutionary trait affecting the population or the species as a whole rather than a factor that may differ within the same population or species (Careau et al. 2008). As dog breeds become more fluid based on owners looking for appearance uniqueness in their companion, or because purebred dogs are often thought to be inbred and prone to illnesses (Bradley 2011), there is a desire to find an objective predictor of personality traits in dogs. McGreevy & Bennett (2010) discussed the mismatch between owners' expectations of a stereotypical personality associated with a breed and the true individual personality of a dog up for adoption. They argue that many cases of neglect and abandonment arise because of personality conflict between the owners and their pets (McGreevy & Bennett 2010). Other studies have found that owners' emotional state is adopted by the dog over time and either leads to strong bonding if owners are not aggressive and not anxious (Hoffman et al. 2013) or leads to increasing frustration if the owners' personality prevent them from resolving conflicts (Dodman et al. 2018).

Tesfom & Birch (2013) demonstrated that owners' highest concern when acquiring a dog was the temperament of the animal. Breed preference did not seem to play a large role in dog adoption until it becomes evident that owners have different breed expectations related to behavior (Tesfom & Birch 2013).

The purpose of this study is to explore possible associations between personality dimensions, separation anxiety and objectives measurements of modern dogs' lifestyle which comprises physical activity, energy and protein intake, methods of feeding, and home environment. To do this, relatively new technology will be used to assess dog activity levels in the form of an activity monitoring collar (Voyce Health Monitor™). The MCPQ-R assessment

tool will be used to evaluate dog personality, and owner-based questionnaires will evaluate the dog's lifestyle, including feeding practices and activity, as well as assess behaviour and separation anxiety. This study will focus on two breed types: huskies and beagles, in order to limit the impact of breed effects on the physiological, behavioural, and lifestyle measures.

HYPOTHESES & RESEARCH QUESTIONS

Three hypotheses with subsequent research questions will be evaluated in this study:

1. Owner-reported personality dimensions and activity will correlate differently in huskies and beagles breed types.

Is there a difference in daily activity between types?

Is there a difference in MCPQ-R personality dimension scores between types?

Do personality dimensions correlate with levels of physical activity within breed types?

2. Caloric intake correlates with canine personality traits independently of breed type.

Is there a difference of caloric intake between breed types?

Is caloric intake associated with body morphology?

Are caloric intake, protein intake and personality dimensions associated?

Does the feeding method influence food intake?

3. Owner-reported separation anxiety influences food intake and physical activity.

Is there a difference in separation anxiety between breed types?

Does separation anxiety correlate with daytime moderate or high levels of activity?

Does separation anxiety correlate with personality dimensions?

Do dogs with separation anxiety refrain from eating when owners are absent?

METHODS

Written informed consent was given by all dog owners and the procedures used in this research were approved by both Memorial University of Newfoundland's Interdisciplinary Committee on Ethics in Human Research (ICEHR Ref No.20181601-SC) and the Institutional Animal Care Committee (Animal Use Protocol # 17-01-CW).

Subjects

Husky and beagle type companion dogs were recruited in the St. John's, NL area between February and July 2018 (Table 1). These breeds were chosen for their commonness in the region, and for their breed histories as working dogs, selected for different task (i.e., sled-pulling vs. hunting by scent) (Lord et al. 2016). The study was restricted to these breeds to limit possible influences of breed differences on dog behavioural and physiological traits (e.g., Mehrkam & Wynne, 2014). Mixed-breed beagles and huskies were accepted, provided that the owners viewed the predominant breed of their dog as husky or beagle. In fact, while these breeds are common in NL, few individuals considered beagle or husky are registered purebreds, and they might represent local breeding populations that are generally not closed to outbreeding with other dog breeds. Subjects were between the ages of 1.5 to 9 years, healthy, and not taking medication altering metabolism (i.e. corticosteroids, hormones), as consistent with previous studies (Morrison et al. 2014; Belda et al. 2018). The dogs were required to have lived with their owners for a minimum of six months. A sample of 13 huskies (n = 8 males) and 12 beagles (n = 5 males) meeting the aforementioned criteria participated in the study. All dogs, with the exception of one male husky, were spayed or neutered (Table 1).

Recruitment

Advertisements through social media and local radio were used to recruit participants. Interested owners were sent a comprehensive study description and the inclusion criteria (Appendix A). Interested owners with a qualified dog were sent a consent form before the initial visit to be signed during that visit.

Study protocol

The study took place at the subjects' home in the presence of owners to promote behaviors and physiological responses in a habituated environment (similar to Yashari et al. 2015). Two or three visits of approximately 20-40 minutes each were required to complete the study. The first visit was always scheduled on a Wednesday and was used to deploy the activity collar that would be worn 24h/day to record activity during two consecutive week days and one weekend (i.e., Wednesday evening to Sunday). Owners were asked to leave the collar on the dog continuously during this period unless there was a risk the collar might be submerged in water. The owners were also given a lifestyle questionnaire and a personality questionnaire to complete (described below). During the four test days, the owners were asked to maintain the regular feeding and activity habits of their dog, and to complete a food and activity log (Appendix B). The second visit was typically scheduled on the following Monday, when the collar and log books were retrieved. Data from the collars were graphed and sent to owners within two weeks of study completion, as a gesture of appreciation for their participation and as an educational outreach component of the study.

Table 1. Demographics of the dogs recruited to participate in this study

Descriptors	Husky	Beagle	Combined
Sample size (n)	13	12	25
Male (n)	8	5	13
Female (n)	5	7	12
Intact (n)	1	0	1
Neutered/spayed (n)	12	12	24
Single dog home (n)	12	5	17
Multi-dogs home (n)	1	7	8
Fed ad libitum	5	2	7
Mean Age (mos ± SD)	45.31± 14.67	72.82 ± 31.25	57.92 ± 26.29
Owner-reported separation anxiety (n)	5	7	12

Behavioural testing for a related study (O'Reilly 2018) also occurred during home visits and included a cognitive bias test and a laterality test. Both behavioural tests were conducted at the first visit for dogs tested between February-June 2018, but due to scheduling restrictions, they were carried out at the second visit for dogs tested in July 2018.

Activity Collars

Six Voyce Health Monitor™ nylon collars equipped with an accelerometer and ultra-band radar technology (Figure 2) were provided for this study by Voyce®, Chantilly, VA, USA, (http://www.voyce.com). Dog collars were chosen as the least stress-inducing method to obtain

physiological data non-invasively. The collars are equipped with a plastic box that contains the technical components, software and battery. The device boxes measured 10.0 x 4.5 x 2 cm and weighed 50 g. Collars were sized medium (40.5-50.5 cm, 110 g), large (48-64 cm, 112 g), and extra large (63-81 cm, 115 g). The Voyce® collars were worn in place of the subject's regular collar. Owners were asked to periodically ensure that the box was ventrally positioned on the dog's neck as per Voyce® protocol and as in previous studies with similar devices (Hansen et al. 2007; Belda et al. 2018).

Figure 2. Voyce Health Monitor™ size medium with emphasis on the plastic box that contains the accelerometer component.

The accelerometry component of the collars measured physical activity and sedentary behavior. The tri-axial accelerometer recorded the dog's motion in coronal, sagittal, and transverse planes (Figure 3). Accelerometer data were translated into milli-g deviation of magnitude to ascertain activity, without differentiation of the direction of movement; i.e., up-down movement and forward motion were not differentiated for the purpose of defining activity. The summation of motion in three axes was preferred over the differential acceleration per axis

as the focus of this study was on recording different levels of physical activity regardless of the direction of the activity. Before deploying the devices, they were all pre-tested on at least one dog to ensure that no acceleration was recorded when the collars were turned off, when the collars were turned on but were not being worn and were stationary, when they were worn by a dog at rest, and when they were worn by a dog during a period of high activity. Based on this pre-testing, accelerometer data were considered to be sufficiently reliable for deployment. The acceleration of the dog was set to be recorded every second, though there were some irregularities in the data output which suggested that collars sometimes stopped recording for sporadic periods, from a few seconds to a few minutes. These periods of missed readings could not be explained by the company and have also been reported for a similar device, the PetPace collar™ (Belda et al. 2018).
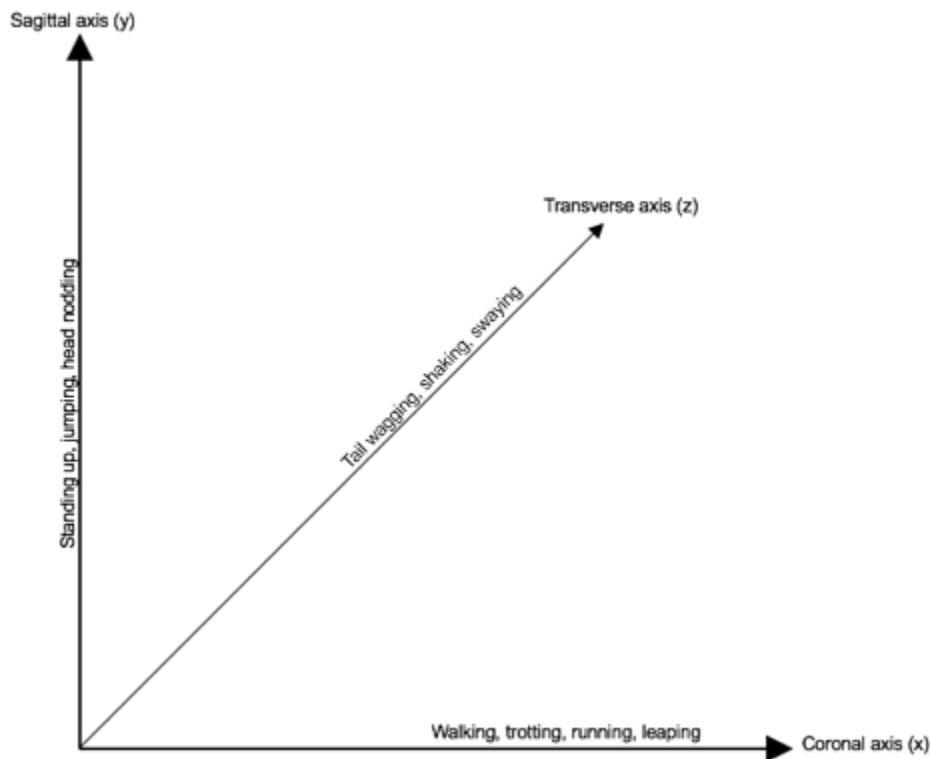
Figure 3. Tri-axis of acceleration recorded by the accelerometer in the Voyce® collars and

      example of types of activity recorded by each axis (Jeremey Junnila, Director of

      Clients Services, Voyce® , pers. comm.).

The collars were activated at the first visit and immediately started recording the dog's motion and were left on until the following Monday (five days) or until owners noticed that the collar had stopped flashing (indicating a dead battery). The aim was to record four full days of activity including two week days and a full weekend. In most cases, the battery ran out early on Sunday, giving three full days of recording. Three subjects were excluded from the activity evaluation component of the study due to poor recording from their collars (i.e., < 48 hours recorded).

All collars were well-tolerated, likely as they were used in place of the dogs' usual collars. Although the collars were also manufactured to record resting heart rates and resting respiratory rates using the ultra-band radar technology (Landis-Hanna et al. 2016), the data collected were not used in the current study, due to irregularities in the timing of these measurements (e.g., data were recorded for times when the collar was not being worn) that have not yet been rectified.

Lifestyle Questionnaire

Owners were asked to complete a lifestyle questionnaire modified from Tiira & Lohi (2014). One version was given to owners of a singleton dog (Appendix C), while a second version was given to owners with multiple dogs (Appendix D). As well as providing basic information about their dog's age, sex, and spay/neuter status, the 32 item-long questionnaire asked owners about the adoption of the dog, any formal training they may have received, the household, their usual activity levels, their socialization, their separation anxiety history, their perceived happiness, and their health. Owners could answer that their dog had separation anxiety as per their impression of the dog, without a diagnosed condition. All owners returned the questionnaires completely answered (n=25).

Personality Questionnaire

The dogs' personality traits were assessed by the owners using the Monash Canine Personality Questionnaire-Revised (MCPQ-R; Ley et al. 2008, 2009a, Appendix E). This 26-item questionnaire asks the owners how a one word descriptor (e.g., active, timid) might represent their dog on a scale of not representative (1) to very representative (6). Each adjective clustered into one of five personality dimensions: Excitability, Motivation, Training Focus, Amicability, and Neuroticism. The summations of owner-given scores for each adjective within a dimension, divided by the maximum score possible for that dimension were used to determine each dog's dimension score (percentage). The lowest score possible to get for each dimension is 16.67% and the highest is 100%. Owners have been shown to be reliable assessors of their dog's behavior when compared to third-person objective testing in previous studies (e.g., review in Rayment et al. 2015). The MCPQ-R has been validated and found to be a reliable measure of domestic dogs' personality (between co-owners: Ley et al. 2009b; between owners and walkers: Posluns et al. 2017). All owners completed the MCPQ-R (n=25).

Food and Activity Log

Owners were asked to fill a food log to measure the energy and protein intake of their dogs while wearing the collar (see Appendix B). Four full days of food intake were recorded. Owners were given a standardized measuring cup (500 ml capacity) to measure the quantity of food given to their dog. They were asked to record any food given, whether store-bought or homemade, treats, table scraps, and to record any quantity of food left-over (i.e., not eaten). The method of feeding- once per day, twice per day, or ad libitum- was also recorded. Owners were asked to be as specific as possible when recording the type of food and treats provided, including the brand, type of food (dry/wet/raw), the flavor (e.g., beef, chicken, etc.), and any specification on the package (adults, weight control, grain-free, allergy, oral care, skin/coat, etc.). For homemade food or table scraps, owners were asked to list all the ingredients and their

quantity on the food log. Upon retrieving the food log, the caloric and protein content of all food listed was estimated by finding the nutrition label of each food online (i.e., manufacturer websites) or on a bag of this same food at a local pet food store. For homemade food without labels (e.g. steak, stew, etc.), the Canadian Nutrient File (Health Canada 2018) was used to estimate nutritional values. The daily caloric (kcal) and protein (g) intake of each subject was averaged across the four-day log and divided by the dog's body weight to obtain a measure of intake/kg across dogs with a large range of body size. Based on the total energy intake, the percentage of calories from protein sources was extracted.

$$\frac{Daily\ protein\ intake\ (g)\ \times 4\ kcal/g}{Daily\ caloric\ intake\ (kcal)} \times 100$$

One subject was removed from the food intake results, as the food log was not filled by the owner (remaining n=24).

The activity log (Appendix B) was used as a corroboration measure for the collar accelerometers. Owners were asked to give a general overview of the dog's day, how much time the dog spent alone vs. with their owners, and the exact timing of high energy activities (e.g., playing ball, dog park visits, etc.). These times were cross-referenced with the collar data to ensure that the acceleration reflected these peaks of activity. In all cases, the collars accurately depicted faster motion during the same times described in the activity logs. Body weight was measured in kilograms using a digital veterinary scale (Cardinal Detecto Model VET330, Webb City, MO). Height was measured in meters using a wicket made from a meter stick inserted into a mobile balsa wood plate that laid perpendicular to the stick, resting on the back of the dog. Height was taken with the dog standing on four legs from the base of one of the front paw to the tip of the shoulder blade. Body measurements were transformed into weight per unit of height (kg/m) to make the variable more comparable across a range of body shapes (Table 1). The body dimensions were missing for one subject. The same six devices were used for all subjects.

Raw Data

Once the collars were retrieved from the subjects, they were connected and synced wirelessly to Voyce's network where the data are stored in a cloud-based server. A representative from Voyce® compiled the results recorded by the collars for the time they were worn by the subjects and sent the acceleration data for the specified period. Due to the sporadic periods without any recorded motion, the acceleration data were treated as individual counts. As per Voyce® protocol, the acceleration data were categorized into four levels of physical activity:

1) 0-4 milli-g deviation of magnitude = rest (e.g. very slight motion, head nod, or slight body shift while sleeping).

2) 5-63 milli-g deviation = low activity (e.g. stationary awake with normal respiration and occasional panting and tail wags).

3) 64-400 milli-g deviation = moderate activity (e.g. light play, walking).

4) >400 milli-g deviation = high activity (e.g. rough play, running, jumping).

Activity over a 24 h period was further divided into daytime and nighttime activity. Daytime was defined as the period between 6 am and 11 pm consistent with previous studies (Morrison et al. 2014; Yashari et al. 2015). Using the ratio of acceleration counts for each activity level versus the total number of counts recorded in each period, the percentage of time spent in each activity category was calculated for the daytime and nighttime periods.

Statistical analysis

Descriptive and comparative statistical analysis were executed using jamovi.org (jamovi project 2018). The subjects were initially divided by breed type (husky or beagle) and independent samples two-tailed t-tests were used to examine differences between the two groups for owner-reported personality dimensions, activity recorded by the collars, body dimensions, separation anxiety and food intake. Mann-Whitney U tests were computed alternatively to t-tests whenever the t-distribution was non-normal (i.e. Shapiro-Wilk $p < 0.05$).

Mann-Whitney U is a non-parametric test impervious to non-normal distributions that is typically more conservative (Beatty 2018). Independent samples one-tailed t-tests were also used to compare dogs fed either ad libitum or at set time for body dimensions and food intake measurement. Pearson's correlations were used to assess relationships amongst the following factors: activity, personality dimensions, food intake, and body dimensions. Pearson's correlations were deemed strong when $-0.7 \geq r \geq 0.7$, moderate when $-0.5 \geq r \geq 0.5$, weak when $-0.3 \geq r \geq 0.3$ and null when $-0.1 \geq r \geq 0.1$. Repeated measures ANOVA were used to investigate the effect of breed, time of day (day or night), and the interaction of both on the time spent in each activity levels.

The percentages of daytime spent in moderate and in high activity were summed to encompass all activities that would qualified as physically active by the owners (ranging from light walk to sprint). In the lifestyle questionnaire, owner-reported time spent on walks daily was tested against the time spent in moderate and high activity combined during the daytime since walks are expected to prompt both levels of activity. Owners were asked to choose the category of minutes (<30, 30-60, 60-120, 120-180 or >180min) that best represented how much time their dog spends on daily walks (Appendix C & D, Q17).

ANOVAs were used to detect if breed types were significantly different in terms of activity levels and time of the day, and separation anxiety and feeding methods in order to investigate their effect on a continuous variable. When variables with multiple levels were being tested with ANOVA, a post-hoc Tukey test was computed to examine which levels differed. As it was infrequent and not normally distributed, the percentage of time spent in high activity was square-root transformed to normalize the distribution. As recommended by Armstrong (2014), in the event that a significant result is suspected to be skewed or that it had arose purely from data exploration, a Bonferroni correction was used to obtain the most conservative alpha value possible in order to accept or reject the result. With a restricted sample size, it was preferable to be conservative and accept a type II error rather than report false positives.

The association between separation anxiety and owner-reported physical activity was determined using a Chi-Square tests for independence to detect any dependence between the fixed categorical variables. To discriminate against dependencies that would obscure the correlations tested, Chi-Square tests were used for breed type and single/multi-dog households, for breed type and method of feeding, and for breed type and owner-reported daily walk. For all comparisons, $p < 0.05$ was considered statistically significant.

RESULTS

I. Activity

I.a. Activity

There were no significant differences found between the beagle and husky types of this sample in percentage of time spent in any activity level recorded by the collars, whether during the daytime or nighttime (Figure 4a, b; all p values > 0.05). In this sample, both dog types engaged in similar intensity of activity per 24hrs.

Dogs allocated significantly less time to high intensity activity in a 24hrs period, whereas the distribution of their time budget between rest, low, and moderate levels of activity did not differ (Table 2).
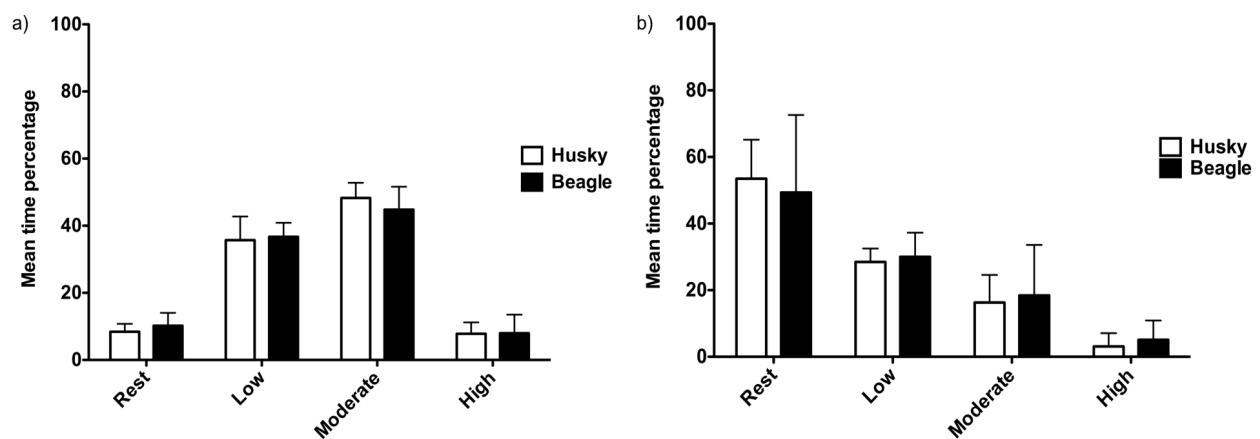
Figure 4. Mean (±SD) percentage of daytime (a) and nighttime (b) spent in each level of physical activity as recorded by the collar for beagle and husky breed types.

Table 2. Post hoc exploration of differences in daily time allocated to each levels of activity.

Activity Levels Compared	Mean Difference	SD	df	t	ptukey
Rest vs Low	-0.02195	0.0221	60	-0.993	0.754
Rest vs Moderate	-0.01545	0.0221	60	-0.699	0.897
Rest vs High	0.24479	0.0221	60	11.072	<0 .001
Low vs Moderate	0.0065	0.0221	60	0.294	0.991
Low vs High	0.26674	0.0221	60	12.065	<0 .001
Moderate vs High	0.26024	0.0221	60	11.771	<0 .001

Dogs spent more time at rest during the nighttime than during the daytime and more time being moderately active during the day than at night (Figure 5, Appendix F). Interestingly, dogs' low activity during the daytime and the nighttime were not different (Figure 5). Likewise, dogs spent a similar time in high activity during the day and at night, although, overall, they only spent a small percentage of their day at high activity (Figure 5, Appendix F).
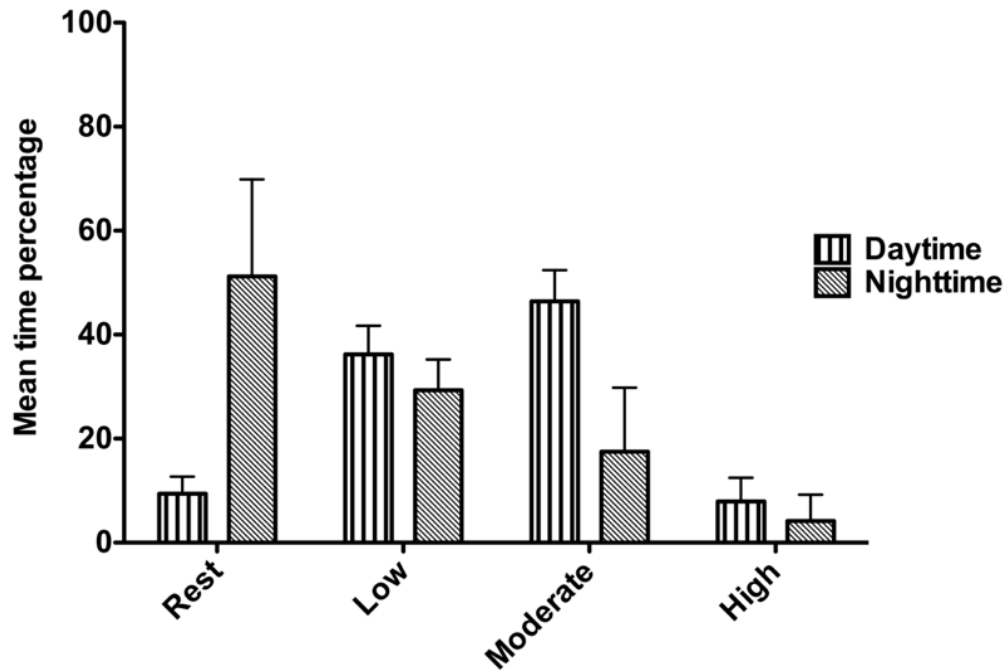
Figure 5. Mean (±SD) percentage of daytime and nighttime spent in each level of physical activity as recorded by the collar for the combined breed types.

Husky owners reported their dog spent more time on walks every day than beagle owners (Mann-Whitney U = 35.00, df = 23, p = 0.012, Figure 6).

Owner-reported time spent on daily walk & breed
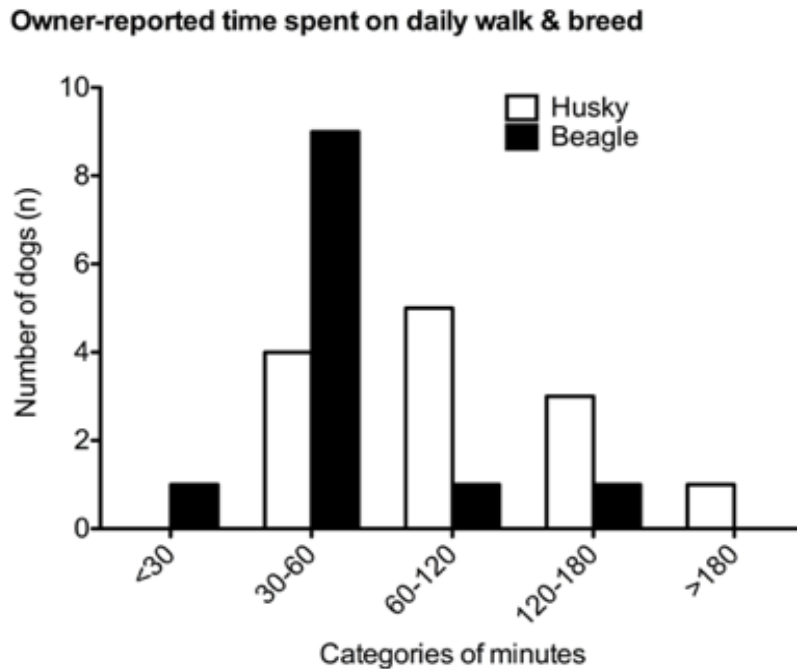
Figure 6. Frequency of husky and beagle breed types and the time they spend on walks daily, as per owners' report.

Dogs whose owners reported as spending more time on walks every day were found to spend more time being moderately and highly active during the daytime when these two levels of activity were summed together (r = 0.43, p = 0.046).

Whether dogs lived in a single or a multi-dog home did not make a significant difference in terms of their daily activity. They did not spend more time in moderate or high activity during the daytime if there was more than one dog in the household, nor did they spend less time on walks daily (all p > 0.05). A confounding effect was, however, found between single and multi-dogs home and breed type since only one husky lived in a multi-dog home compared to seven beagles (N = 25, X^2 = 7.35, df = 1, p = 0.007).

I.b. Personality

There were no significant differences between the MCPQ-R personality dimension scores of husky and beagle types (all p values > 0.05, Figure 7, Appendix G). In this sample, breed types did not influence how the owners scored their dogs on the MCPQ-R.
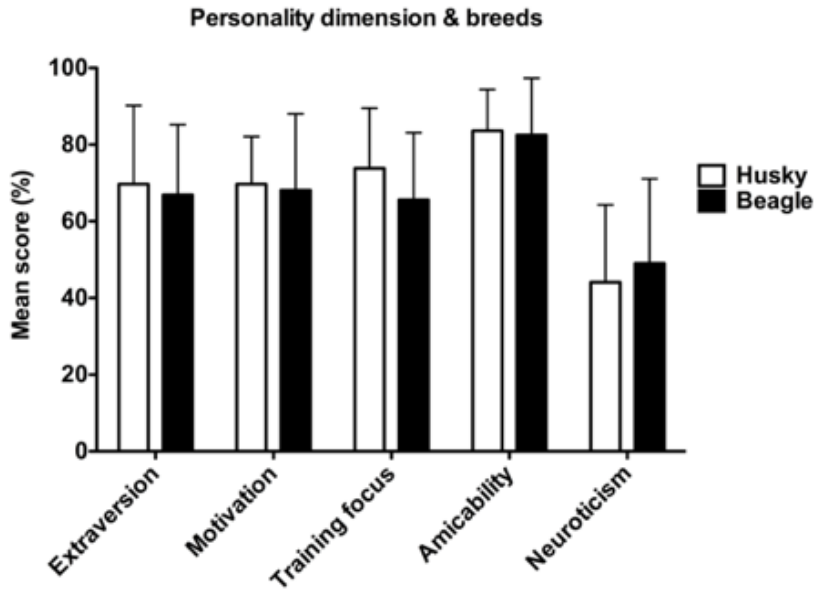
Figure 7. Mean (±SD) scores (%) obtained for husky and beagle types for MCPQ-R personality
    dimensions.

I.c. Relationships Between Activity and Personality

Dogs whose owners scored them high on Extraversion spent less time at rest and engaged in more low level activity during nighttime (respectively, $r = -0.365$, $p = 0.047$; $r = 0.391$, $p = 0.036$). Interestingly, these dogs did not compensate with more rest during daytime ($r = -0.252$, $p = 0.129$). Dogs who were described as high on the Motivation dimension also engaged in more high intensity daytime activity ($r = 0.459$, $p = 0.032$). Dogs who obtained a higher score on Amicability spent more time being moderately active at night ($r = 0.457$, $p = 0.033$) and less time at rest ($r = -0.437$, $p = 0.042$). Dogs who were scored higher on the Neuroticism dimension by their owners spent less time being highly active during the night ($r = -$

0.529, p = 0.011). Dogs who were described as high for Training Focus were reported by owners to spend more time on daily walks (r = 0.447, p= 0.037). Dogs who spent more time being taken on daily walks also spent more time in the moderate and high activity levels during the day (r = 0.460, p = 0.031). However, following Bonferroni correction to conservatively evaluate possible relationships between the five personality dimensions and the 10 descriptors of physical activity, these correlations between personality dimensions and physical activity were no longer statistically significant.

II. Body measurements

II.a. Breed type differences

Huskies were significantly heavier per meter of height than were beagles (Table 3). Despite this, both breed types had similar daily caloric intake per kilogram of body weight (Table 3). Therefore, huskies had a higher energy intake per kilogram of weight than beagles. Huskies were also found to have more caloric intake from protein sources even though there were no significant differences in protein intake per kilogram of weight between the two breed types (Table 3).

Table 3. Morphometric measurements and food intake comparisons between husky and beagle

breed types.

	Husky	Beagle	Analysis of independent samples		
Continuous Variables	Mean ± SD	Mean ± SD	t-test	df	p
Weight (kg)	33.43 ± 7.97	16.37 ± 3.12	-5.70	22	<0.001
Height (m)	0.59 ± 0.06	0.39 ± 0.05	-8.23	22	<0.001
Weight per Height (kg/m)	56.22 ± 11.36	42.10 ± 7.65	-3.01	22	0.006
Daily Caloric Intake per Unit of Weight (kcal/kg)	34.36 ± 14.47	44.73 ± 14.02	1.82	22	0.083
Daily Protein Intake per Unit of Weight (g/kg)	2.82 ± 1.26	2.86 ± 1.16	-0.45	22	0.657
Daily Percentage of Caloric Intake from Protein Intake (%)	33.59 ± 10.33	25.34 ± 5.21	28[1]	22	0.011[1]

[1]Mann-Whitney U used due to non-normal distribution (Shapiro-Wilk test).

II.b. Food intake, body morphometrics, and personality

In this sample, dogs with a higher caloric intake per kilogram of body weight were found to be the less heavy per meter of height (r = -0.538, p = 0.012). Dogs who ate more calories per kilogram of weight also ate more protein for the same unit of weight (r = 0.827, p < 0.001). Dogs whose owners scored them high on Training Focus tended to be heavier per meter of height (r = 0.454, p = 0.03). None of the remaining four personality dimensions were found to correlate with morphometric measurements (0.3 ≥ rs ≥ -0.3, ps >0.5). Protein intake contributing to a larger proportion of a dog's total daily caloric intake did not correlate with any specific personality dimensions in this sample. Dogs' caloric and protein intake per kilogram of body weight were also not correlated with Extraversion or any other personality dimensions.

II.c. Methods of feeding

Contrary to prevailing wisdom, dogs who were fed ad libitum versus at set times were not heavier per meter of height, nor did they eat more calories per kilogram of weight (Table 4). However, dogs fed ad libitum had a higher protein intake per unit weight than dogs fed at set times (respectively 3.94 ± 1.94g versus 2.62 ± 0.98g), although for similar daily caloric intake, dogs fed ad libitum did not eat a significantly larger proportion of protein (Table 4).

No associations between feeding methods and breed types were found (X^2 = 1.47, p = 0.225), that is, both beagles and huskies were as likely to be fed by either method.

Table 4. Morphometric measurements and energy food comparison between dogs fed ad libitum and at set times.

Continuous variables	t-test	df	p
Weight per unit of height (kg/m)	0.41	22	0.689
Caloric intake per unit of weight (kcal/kg)	-0.79	22	0.437
Protein intake per unit of weight (g/kg)	-2.24	22	0.035
Percentage of daily caloric intake from protein sources (%)	42[1]	22	0.288[1]

[1]Mann-Whitney U used due to non-normal distribution (Shapiro-Wilk test).

Dogs living in multi-dog homes had similar intakes of calories and protein per kilogram of weight compared to single-dog home (Table 5). Despite this, those in single-dog homes ate more of their daily caloric intake from protein sources than those in multi-dog homes (respectively, 34.94 ± 14.51% versus 23.66 ± 2.89%). However, a confounding effect was

found between single/multi-dog homes and breed type since only one husky lived in a multi-dog home compared to seven beagles (N = 25, X^2 = 7.35, df = 1, p = 0.007).

Table 5. Food intake comparison between dogs living in single versus multi-dog homes.

Continuous variables	t-test	df	p
Caloric intake per unit of weight (kcal/kg)	0.463	22	0.648
Protein intake per unit of weight (g/kg)	-1.32	22	0.2
Percentage of daily caloric intake from protein sources (%)	16.0[1]	22	0.004[1]

[1]Mann-Whitney U used due to non-normal distribution (Shapiro-Wilk test).

III. Separation anxiety

Owner reported their dog as suffering from separation anxiety in 38.46% of huskies (n = 5), 58.33% of beagles (n = 7), and 48% of the total sample (n = 12 dogs). Separation anxiety was as likely to occur in beagles as in huskies. The presence of separation anxiety influenced the activity of dogs differently during the daytime versus the nighttime ($F_{(1,40)}$ = 11.34, p = 0.002). Dogs whose owners reported them as suffering from separation anxiety spent less time in high activity during the daytime (t = 2.49, df = 20, p = 0.022, Figure 8a). Subjects with owner-reported separation anxiety did not have a higher score for Neuroticism, nor did they differ in the other four personality dimensions scores (Figure 8b, p > 0.05).

Dogs with owner-reported separation anxiety did not have a significantly different caloric intake nor different morphometric measurements compared to dogs without separation anxiety (Table 6). Dogs with separation anxiety who were fed ad libitum had similar caloric intake compared to dogs fed at set times (p > 0.05).
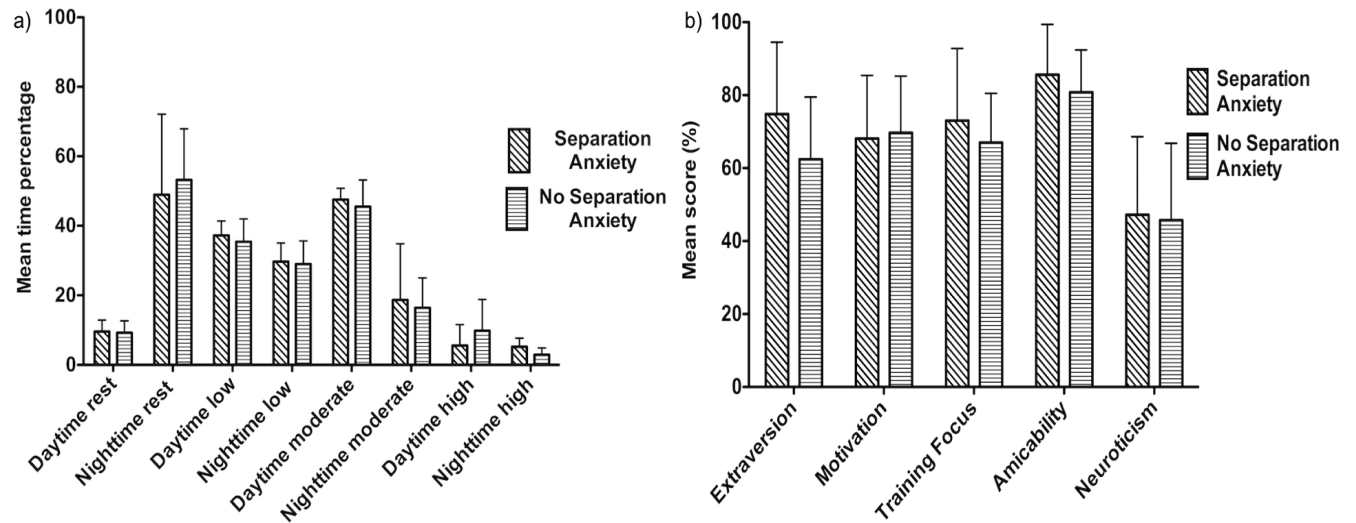
Figure 8. Comparisons between dogs with and without history of separation anxiety as per a) the mean percentage of time spent in each level of activity during the day or the night and b) the mean MCPQ-R personality dimensions scores (±SD).

Table 6. Morphometric measurements and energy intake comparisons based on dogs' history of separation anxiety as reported by the owners.

	t-test	df	p
Weight per height unit (kg/m)	1.982	22	0.060
Daily caloric intake per weight unit (kcal/kg)	-0.475	22	0.640
Percentage of daily caloric intake from protein source (%)	50[1]	22	0.219[1]
Daily protein intake per weight unit (g/kg)	-0.283	22	0.780

[1]Mann-Whitney U used due to non-normal distribution (Shapiro-Wilk test).

DISCUSSION

Using owner-reports of personality dimensions, separation anxiety, activity, and feeding habits, coupled with Voyce® collars activity output, certain personality dimensions indeed

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correlated with specific levels of activity, whereas morphological measurements and separation anxiety were unrelated to dogs' personality in this sample.

Activity

In contradiction to Morrison et al. (2014), who had found different intensity outputs of daily physical activity between two dog breeds, the activity levels of husky and beagle breed types did not differ. While more huskies in this sample were walked for longer periods on daily walks, their activity output, as recorded by the collars, did not differ from the beagles' activity. In this sample, both breed types were equally active, suggesting that beagles might spend more time being active outside of designated walk setting than did huskies. It is a widespread impression that larger dogs require more physical activity than smaller dogs, mainly because smaller dogs are perceived to compensate for shorter stride length by increasing their speed and, subsequently, their energy output (Westgarth et al. 2014; Lim & Rhodes 2016; Pickup et al. 2017). In line with this opinion, The Kennel Club in the UK will only recommend small breeds to owners who wish to exercise their dogs no longer than 30 minutes daily (The Kennel Club, 2018). A study interested in owners' demographic and dog walking habits found that owners of breeds perceived to require more activity spent more time walking their dog on a weekly basis (Degeling et al. 2012). Pickup et al. (2017) demonstrated that owners of small dogs spend less time on daily walks than owners of larger breeds. Analogous to our results, the percentage of dogs walking for more than 60 minutes daily was elevated in Alaskan malamutes and Siberian huskies compared to beagles (from Pickup et al. 2017, respectively: 38%, 29%, and 21%). As there seems to be an agreement that smaller dogs require less walking time than larger dogs, the results obtained from the collars suggest that beagles engaged in other types of moderate activity outside the standard walk. Their smaller size might offer easier opportunities to reach moderate and high levels of activity inside their home, whereas huskies might require larger

space to accommodate their larger stride. Alternatively, the collars might not have been able to capture the typical routines of the dogs in this sample over the four days they were worn.

As expected, the proportion of time spent in high activity during a 24hrs period was lower compared to time spent in other activity levels while, surprisingly, dogs spent as much time being moderately active as at rest or at low activity. The circadian rhythm of dogs has been described as long periods of uninterrupted rest during dark hours, separated by sporadic periods of activity (Tobler & Sigg 1986). Daytime hours are occupied by extended period of steady activity (presumably low and moderate) as well as short bursts of high activity and limited periods of rest (Tobler & Sigg 1986). Piccione et al. (2014) indicate that the current circadian rhythm of companion dogs is under the complete control of their owners, especially during the daytime if the dog is indoors while the owner is away. Dogs given the opportunity to exercise at their discretion during daylight hours might increase their proportion of time spent in high activity at the expense of moderate activity. As evidenced by Nishino et al. (1997), dogs without narcolepsy will allocate most of their rest time to dark hours while still having sporadic naps through the daylight hours. These findings concur with our results that show dogs spend greater lengths of time at rest during the night than during the day. Rest interrupted by multiple periods of casual activity throughout dark hours has repeatedly characterized the activity pattern of companion dogs (Tobler & Sigg 1986; Nishino et al. 1997; Zanghi et al. 2013; Piccione et al. 2014).

Dogs whose owners reported spending more time on walks every day had a greater portion of their day dedicated to moderate and high activity as recorded by the collars. As well as corroborating the data recorded by the collars, this finding also corroborates the importance of walks to increase daily physical activity. Just as seen in human health in the last decades, overweight and obesity are afflicting the companion dog population and leading to serious impairments to their quality of life (Bland et al. 2009; Warren et al. 2011). Lack of physical activity is an important factor of unnecessary weight gain in mammals (Hayes et al. 2005) and

has been linked to increased incidence of obesity across dog breeds (Warren et al. 2011; German et al. 2017a). Overweight and obesity lead to health deterioration in dogs, notably by increasing their risk of hypertension (Bodey & Michell, 1996), insulin resistance (German 2009), and osteoarthritis (Marshall et al. 2010) to name just a few. Dog walking is often referred to as the gold standard to keep owners, pets, or both active (Courcier et al. 2010; Bartges et al. 2017; Chandler et al. 2017).

Personality

Personality dimensions scores were not affected by breed type in this study. Given the history of these breeds on the island of Newfoundland, some differences might have been expected (i.e. beagles: Clarke 2013). It is however possible that the personality dimensions investigated here were under similar artificial pressure for dogs bred to assist humans. Hence, huskies and beagles may have scored similarly on dimensions such as training focus, motivation, and neuroticism because those traits were specifically selected for or against (BeaglePro 2018; Lee 2015). That being said, a meta-analysis investigating consistency in reports of dog personality concluded that working dogs did not have more homogenous personality traits compared to non-working dogs (Fratkin et al. 2013). Fratkin et al. (2013) discussed that dog breeders do not select for behavior consistency across a breed or a type, an issue also raised by McGreevy & Bennett (2010). Stereotyping breeds with certain behavioural traits might therefore be outdated and erroneous. Surprisingly, many kennel associations continue to describe all of their registered breeds by stereotypical temperament and use these temperaments to match prospective owners with certain breeds (e.g. American Kennel Club 2018; The Kennel Club 2018) Thus, investigating other methods to objectively predict the personality outline of individual dogs is crucial, especially in adoption settings where owners' satisfaction with their pet depends on their expectation of temperament being met (Curb et al. 2013).

Previous studies have also suggested that dogs' behavioral traits were shaped by their owners own behaviors. Even in the case of highly trained working dogs of the same or similar breeds, owners behavior was still the better predictor of dogs comportment when faced with a task (Hoummady et al. 2016). Owners who scored high on Conscientiousness tended to have better performing dogs, whereas owners who scored high on "excitement seeking" had dogs who struggled to improve their performance (Hoummady et al. 2016). Another large study looking at dog behavior problems found that emotionally unstable owners correlated positively with dogs with problematic behaviors (Dodman et al. 2018). Thus, dogs' personality might be more environmentally-derived than breed-based. This conclusion is driven by research which have suggested that there are greater variations in dogs' behavior intra-breed than there are inter-breeds (Mehrkam & Wynne 2014).

Personality & activity

While the application of the Bonferroni correction resulted in no statistically significant correlation between personality dimensions and activity levels, certain trends can be seen in the original relationships. Dogs described as extraverted by their owners were more alert and less restful during the night. On the MCPQ-R, Extraversion refers to the keywords "active", "excitable", "energetic", "hyperactive", and "restless", which all refers to a continuously busy dog (Ley et al. 2009a). Since most owners tend to spend more time with their dog during the evening and at night, it is possible that dogs who happen to be less settled at night will be classified as extraverted. Higher Motivation correlated with more time spent in high activity during the day. Motivation being partly determined by adjectives such as "persevering" and "tenacious" (Ley et al. 2009a), dogs who scored high in this personality dimension might be unwilling to reduce their activity level prematurely. They might also cross the threshold moderate-high activity more often as a high score in Motivation describes them as more competitive and more aggressive (Ley et al. 2008). The positive correlation between Amicability

and moderate activity at night was a surprising result to obtain as this personality dimension is rated through non-active adjectives such as "relaxed" and "non-aggressive". Owners that perceived their dog as highly amicable might have a better relationship with their pet (King et al. 2009) and, therefore, engage their pet in more activity. If they have scored their pet as not being aggressive, they might be willing to engage in higher intensity play such as tug-of-war. Dogs' activity might, therefore, depend on their owners' willingness to engage in such activities with them. The flipside of this relation is that dogs who were scored high in Neuroticism spent less time being highly active at night. Their intrinsic fearfulness and nervousness might stop them from engaging in high energy activities during nighttime. Their owners might also prefer to engage in calm or soothing activities at night with a dog that they consider to be anxious (Kotrschal et al. 2009; Schöberl et al. 2017). Training Focus was positively correlated to the time spent on walks every day. This is an expected relationship as dogs who scored higher in this dimension are described as "attentive", "obedient", and "reliable". Owners might thoroughly enjoy walking a dog that is well-trained or willing to be trained (Shore et al. 2006; King et al, 2009; Hoffman et al. 2013). Dogs might also have become more trainable because owners were willing to spend more time on walks training them. Exercise through daily walks has been shown in previous studies to decrease the incidence of behavioural problem. Dogs partaking in longer or more frequent walks were more docile and less destructive at home (Kobelt et al. 2003; Cutt et al. 2008), had lower incidence of neurotic behaviors (Tami et al. 2008), and were more inclined to follow commands (Kobelt et al. 2003; Tami et al. 2008).

Dogs who spend more time on walks and socializing during the day time have longer and less agitated periods of sleep afterwards (Kis et al. 2014). Kis et al. (2014) tested if dogs living in a shelter with poorer sleep at night compensated with longer periods of rest during the day. While they did not find any correlation between rest or activity during the day and rest at night, they did report that dogs who spent more time resting were less anxious and displayed less neurotic traits. Interestingly, in this sample, no correlation were found between personality

dimensions and increased rest time. Participants were already quite homogenous and most dogs likely had plenty of opportunities to rest during the day when the owners were absent or at night when the owners were asleep.

Body measurements & feeding habits

Huskies ingesting similar caloric intake per kilogram of weight as beagles did even though they were demonstrated to be significantly bigger was a surprising finding. Many studies have been particularly interested in dogs' energetic gain versus body size and have routinely found a clear negative correlation between dogs' metabolic rate and body weight (Speakman et al. 2003; Middleton et al. 2017). Consequently, it would have been expected to see beagles exceed the daily energy consumption of huskies. Several reasons might explain this unexpected result, the main one being the knowledge that beagles are obesity-prone (Usui et al. 2016; Pogány et al. 2018). In addition, Usui et al. (2016) have also found that in neutered pets, small sized dogs are more likely to be classified as overweight than larger dogs when using the body score assessment to determine body condition. Thus, owners might already be sensitized to small breeds and beagles' propensity to gain weight and, subsequently, are actively restricting their dog's energy intake. As well, weight gain is potentially easier to assess by owners on smaller breeds and on short-haired breeds. Yam et al. (2017) demonstrated that owners tend to overestimate the weight of small dogs while underestimating the weight of larger dogs. Husky owners might therefore provide more food to a dog whose body score they underestimate due to its size and the thickness of its fur coat.

Given their history as sled-dogs and working dogs in the Arctic, huskies were expected to ingest a relatively low energy intake compared to other breeds because of their high metabolic efficiency (Gerth et al. 2010; Miller et al. 2017). Indeed, Gerth et al. (2010) found that in the peak of working working season, at frigid temperatures, Inuit sled dogs running and pulling for 8-9hrs a day would maintain a weight of 33.02 ± 3.0 kg on an average intake of

988.05 ± 223.23kcal per day (~30kcal/kg daily). While the huskies surveyed in this study had near-identical weights to those working dogs, they were feed an extra 100-150kcal per day while spending only short portions of their day in high activity level. This tendency to consume larger energy intake than required for basic weight maintenance is in accordance with the findings of Hewson-Hughes et al. (2012) who reported systematic overconsumption in all dogs from the five breeds they tested. The conclusion that pet dogs overfeed is easy to accept when it is currently estimated that 40 to 60% of western companion dogs are overweight or obese (German et al. 2017b; 2018).

Huskies were also found to ingest a larger proportion of their energy intake as protein. While not analyzed for this study, it was anecdotally noted that husky owners provided their dog with more complex diets made of store-bought and homemade food, as well as choosing more expensive food brands (Appendix H). Studies interested in the development of commercial pet products discussed that clusters of owners who view their pet as an extension of themselves (Tesfom & Birch 2013; Boya et al. 2015) paid more attention to nutrition trends and were willing to spend more money on their dog's nutrition (Boya et al. 2015). It is also possible that owners' choice of breed as pet companion relates to their own lifestyle, including their own food choices (Suarez et al. 2012). Active people are more vigilant of their food choices (Booth et al. 2001) and, as pet owners, might be inclined to get a breed described as active, such as huskies, and extend their food beliefs onto their dog (Suarez et al. 2012; Boya et al. 2015). This could explain why huskies had a higher proportion of their caloric intake as protein. Middleton et al. (2017) also noted that small dogs were able to break down and absorb proteins more efficiently than larger breeds. Protein requirement might therefore differ between dog size, although, this is not believe to be the reason behind the lower protein intake of beagles in this sample.

Dogs who ate the most caloric intake per unit of weight were the least heavy ones per meter of height. This is an interesting finding that appears counterintuitive. In lights of our previous result stating that physical activity did not correlate with weight, two reasons might

explain this trend: 1) Owners of lean dogs are more inclined to feed them larger portions of food, whether as meals or as treats or 2) owners of overweight dogs might try to curb their dog's food intake. The second explanation is the most compelling because the protein intake remained in proportion with the total caloric intake, suggesting that the variability is in the main food source of these dogs. While it is possible that leaner dogs received larger meals, it is more likely that owners will purposefully decrease the food intake of overweight dogs, rather than increase the food intake of lean and healthy dogs.

The only personality dimension that correlated with dogs' morphology, caloric, or protein intake was Training Focus, which was positively correlated to caloric intake per body weight. As stated and cautioned by Dinallo et al. (2017), owners who spend extensive periods of time training their dog often use treats, which can easily lead to overconsumption. Treat-training has been shown to improve considerably the obedience of dogs and their willingness to partake in training (Hoummady et al. 2016). This might only reinforce overconsumption and lead to more treat-based praise when a dog is well-behaved in general (Linder & Muller 2014).

Although our results did not demonstrate this association, German et al. (2017b) reported that overweight dogs displayed more aggressive and neurotic behaviors. Compared to healthy weight dogs, they were more fearful, more likely to be aggressive towards other dogs and strangers, and had poorer recall off-leash (German et al. 2017b). The authors raised the possibility that the weight gain is a result of aggression and fearfulness rather than the cause. Dogs might be more prone to weight gain if owners are reluctant to exercise them or if they get improperly rewarded with food to keep them quiet (German et al. 2017b; White et al. 2016).

Diets rich in proteins are often promoted as healthier and as beneficial to the mood in human mainstream media (Karl et al. 2015). Many dog owners have followed suite and believe their dog is better behaved better when they are fed larger quantities of protein (Whigham et al. 2015). The results from this study add to the growing evidence that protein intake in well-fed pet dogs does not influence their behavior (DeNapoli et al. 2000; Bosch et al. 2007). The restricted

evidence that protein intake affects dogs' behavior is non-compelling due to poor methodology or small sample sizes and tend to correlate increased protein intake to increased aggression (Mugford 1987, Dodman et al. 1996).

Dogs permitted to autoregulate their macronutrient consumption tend to ingest a third of their energy intake as proteins (Hewson-Hughes et al. 2013). Beagles were found to consistently gravitate towards a 30% makeup of their caloric intake from protein sources (Romsos & Ferguson, 1983; Tôrres et al. 2003). Hewson-Hughes et al. (2013) report that the macronutrients composition of companion dogs' diet stayed consistent across five breeds of dogs representing all body ranges possible within the domesticated dog population. Roberts et al. (2018) also provided ab libitum feeding to dogs in order to record their preferred break down of energy by macronutrients. They found that dogs had an initial protein intake of 35% of their total caloric intake and this intake slowly increased to 45% over a period of 10 days (Roberts et al. 2018). This increase in protein consumption coincided with a decrease in overall caloric intake due to a displacement of fat ingestion towards a higher protein intake. While dogs ate 3.63 times more energy than their requirements on day one, they ended the trial consuming 1.62 times the recommended energy intake (Roberts et al. 2018). These results were not seen in the study of Hewson-Hughes (2012) since the dogs could not regulate their macronutrients intake as finely (i.e. they could only choose one of three diets). While protein intake does not seem to influence dogs' temperament, it might influence self-regulation of food intake, as seen in human studies (Weber et al. 2007). As discussed by Roberts et al. (2018), it would be interesting to investigate caloric regulation in dogs fed macronutrients ad libitum over a period of time that would permit acclimatisation.

This might explain why dogs fed ad libitum in our study were not shown as weighting more or feeding more than dogs fed at set times. Given the overwhelming evidence that self-feeding can lead to overconsumption (Bradshaw 2006; NRC 2006; Hewson-Hughes et al. 2012; Roberts et al. 2018), it might be safe to assume that, regardless of the feeding methods, dogs

were fed more than required, as is seen across the western world (Bosch et al. 2007). That being said, the husky group's caloric intake reflected the daily requirements stated by the Merck Veterinary Manual (Sanderson 2018) of 32kcal/kg while the beagles group did exceed the recommended 34kcal/kg by 29%.

Feeding method

The relationship between the number of pet dogs living in the home and their food intake was interesting in terms of the quality of food each might receive. While both types of household had dogs of similar body weight and energy intake, dogs living in single-dog homes ate a higher proportion of caloric intake from protein sources daily. This is a slight indication that single-dog owners might feed their dogs differently, potentially with more expensive brands.

Single versus multi-dog households

Robertson (2003) had found that single dogs tended to be overweight and obese compared to dogs living in multi-dog homes. Dogs living with other dogs are thought to spend more time being active during the day, therefore kept a leaner figure than dogs living without other dogs (Robertson 2003). In our study, dogs living in multi-dog homes did not spend more time in moderate or high activity during the day. In fact, none of their activity levels differ from dogs living in single dog home. While, in our sample, dogs living in single versus multi-dog homes did not differ in terms of personality dimensions, Kubinyi et al. (2009) found that the lower the number of dogs in a household, the bolder the dogs were. Dogs living by themselves were the boldest while households of three or more dogs were the least bold (Kubinyi et al. 2009). Boldness was not a trait explored for this study but could be interpreted as one of the facets of Motivation, which was not found to correlate with the subjects living in either single or multi-dog homes. Another study using the MCPQ-R to describe dogs' personality dimensions did not find associations between the five dimensions and dogs living in single or multi-dog

households (Ottenheimer Carrier et al. 2013). Our sample might lack representation of multi-dog homes as they were initially disqualified from participating. The admissibility criteria were loosened for multi-dog homes halfway through the data collection period in order to qualify more beagles in the study.

Separation anxiety

Our results demonstrated that there were no breed effects on the incidence of separation anxiety, as corroborated by the results of Bradshaw et al. (2006) and Sherman & Mills (2008).

While the dogs with owner-reported separation anxiety tested in our study engaged in lower levels of high physical activity during the daytime, Lund et al. (1999) witnessed increased levels of agitation and of highly active behaviors, such as jumping, when dogs were left on their own. Dogs diagnosed with separation anxiety by a veterinarian were demonstrated to be more active, even in the confined space of a kennel, during burst of anxiety (Grigg et al. 2017). This is further confirmed by Konok et al. (2011) who found that only dogs without separation anxiety would decrease their level of activity after their owner's departure in a laboratory setting. In other interesting findings, the relationship between anxious behaviors and separation anxiety was only demonstrated in a group properly diagnosed by a veterinarian, whereas the group without a valid diagnosis displayed passive behaviors similar to the control (no separation anxiety) group (Scaglia et al. 2013). Seeing the overwhelming evidence that genuine separation anxiety is mostly reflected through higher activity behaviors, our results suggest that the owners in this study were unable to correctly identify separation anxiety. Owners who had described their dog as such might have misinterpreted certain behaviors and owners who described their dog as not suffering from separation anxiety might have failed to notice it in their dog (Kotrschal et al. 2009; Mariti et al. 2012). The question might also not have been asked properly or should have been more precise to differentiate true diagnoses from owner-perceived conditions.

Misattribution of separation anxiety would also explain why it was not found to correlate with Neuroticism. Fearfulness and nervousness are the core adjectives describing Neuroticism (Ley et al. 2009b) while fear, nervousness, and anxiety are also the core themes of separation anxiety (review in: Ogata 2016). Therefore, dogs suffering from separation anxiety should have been associated with Neuroticism if the diagnoses had been certain.

Congruently, dogs described as suffering from separation anxiety by their owners did not have different caloric intake nor weight per meter of height. Early studies had described pet dogs with separation anxiety as neglecting their food and water intake during the period of stress (Hothersall & Tuber 1979). Voith & Borchelt (1985) described anorexia as a common symptom of chronic stress and separation anxiety. More recently, Åkerberg et al. (2012) found that beagles who were more reactive to stressors decreased their food intake or showed less interest in food than in a relaxed situation. Anorexia continues to be a symptom examined by medical professionals before diagnosing separation anxiety (Voith & Borchelt 1985; Horwitz 2000; Horwitz & Mills 2009). Despite this, it is not clear what the relationships are between food intake, body weight, and separation anxiety. Owners are often encouraged to hand out treats before their departure to transform their absence into a positive experience (Schipper et al. 2008; Herron et al. 2014). Dogs are also commonly fed only in the presence of their owners. It is therefore unconvincing that separation anxiety would prevent adequate caloric intake enough to cause weight loss, considering that they might eat most of their food intake when their owner is present.

As reported by their owners, dogs living by themselves might tend to be more fearful than dogs living with other dogs in the home (Tiira & Lohi 2015). Dreschel & Granger (2005) found that the stress hormone levels of dogs living in multi-dog homes were less reactive to stressors and normalized faster than in dogs living in single dog homes. The presence of a conspecific in the home might therefore work as a soothing mechanism and be an effective method to counter separation anxiety.

Limitations

Just as Yashari et al. (2015) documented when testing the Whistle accelerometer, Voyce® also used proprietary software with unknown algorithms. This hindered our abilities to verify the accuracy of the collar by measuring the acceleration of dogs in real time during the test phase. The battery draining in less than four days in most cases also prevented having a complete view of activity during the weekend compared to week days. Future studies might be interested to see how different weekdays and weekends are for dogs in terms of activity and separation anxiety. To better evaluate the different time a dog is recorded as being active, the addition of a microphone beside the accelerometer may discriminate between true rest versus anxious immobility and normal low activity versus pacing if it is able to record whining, panting, and barking, as suggested by Gerencser et al. (2013). It has also been suggested by multiple studies that adjusting the accelerometer algorithm based on the size and gait of the individual dog may prove important when comparing activity levels across a range of body sizes (see Gerencser et al. 2013).

Participation to this study required for owners to contact the researchers themselves and agree to an extended period of time where the dog would be tested for physical activity and cognitive bias. Because of the effort demanded from the owners to participate, the resulting sample might only represent a subpopulation of dogs with a good quality of life. As well, every owner in this sample reported walking their dog daily. This is not reflective of larger scale populations as described by a review of dog walking habits that found that 41% of owners did not walk their dogs frequently (Christian et al. 2013).

To avoid confusion and make the results more definitive, questions about separation anxiety should discriminate between owners' perception of separation anxiety and what it entails, and veterinarian-diagnosed separation anxiety.

While this research might be expanded to a greater number of breed types in the future, comparing only two breed types in this study allowed for the investigation of correlations without the confounding effect of a heterogeneous sample. Since this study was exploratory in nature, no causal associations can be determined. Given the small sample size and the high number of factors examined, namely activity levels and personality dimensions, the results should be treated as preliminary and used to develop more pointed studies in the future.

CONCLUSION

In this study we explored the associations between different components of a dog's lifestyle, and owner-reported personality dimensions and separation anxiety. While the entire lifestyle of dogs plays a role in their general well-being, the best predictor of companion dogs' personality and risk of separation anxiety is likely the relationship with their owners. Dogs who spend more time being active with their owners have a lower incidence of behavioral problems (Bennett & Rohlf 2007). Brubaker & Udell (2018) found that, while performing a task, the extent of training dogs had received during their lifetime was not a reliable measure of success; instead, the best prediction of task success was the quality of the relationship between the dog and the owner. Echoing the results from Hoummady et al. (2016), dogs showed more perseverance and were more successful at completing a novel task when owners were present and encouraging, regardless of their previous training (Brubaker & Udell 2018). Dogs were also found to mirror the demeanor and the stress levels of their owners, as the study from Schöberl et al. (2017) showed.

At first glance, the one lifestyle component that did not seem to be affected by the dogs' owners in this study was their body morphology and their caloric intake. Companion dogs, irrespective of their breed type or environment, seem to regulate their macronutrient consumption to reflect strict percentages over their total caloric intake (Hewson-Hughes et al. 2012; Roberts et al. 2018). The dogs in this sample followed the same pattern, regardless of

their personality, activity levels, and separation anxiety propensity. The dogs in this sample were also majorly fed store-bought dog food that provide similar caloric intake per cup (Roberts et al. 2018). These results suggest that the pace of life hypothesis was not corroborated during this study.

While owners often believe that they can address behavioural issues or improve the wellbeing of their dog through food intake, their effort might be better spent cultivating a strong relationship with their dogs. Working on their own emotional state would mitigate the mirroring effect of their own discomfort onto their dog (Hoffman et al. 2013; Csoltova et al. 2017) and will likely benefit the dog much more than tampering with the food. Spending quality time with the dog, ensuring adequate levels of physical activity, providing positive reinforcement for positive behaviors, and giving the dog exposure to different kind of situations could lead to a happier, healthier, and more secure pet (Kienzle et al. 1998; Dreschel, 2010; Csoltova et al. 2017; Dodman et al. 2018).

Breed type was not found to have an effect on the activity, personality, caloric intake, and separation anxiety of dogs. Findings in multiple studies points toward greater personality intra-breed variabilities than inter-breeds, suggesting that dogs should be seen as individuals with unique traits and not as part of a breed with stereotypical behaviors to be expected. Prospective owners considering different characteristics in dogs were very concerned about the behavior of their future dog and not concerned at all about its physical attribute (King et al. 2009). Alarmingly, most breeders apply artificial selection on the physical appearance of the animal and neglect to select for behavioral traits (Bradley 2011). With kennel associations still advertising breeds by personality traits to future owners even through the overwhelming evidence that dogs have their individual personality distinct from their breed, this question becomes a welfare issue. One of the leading cause of abandonment is due to owners' expectations of their dog's behavior not being met (McGreevy & Bennett 2010). It is therefore

imperative to find a reliable and objective method to describe a dog's personality as well as to hold the owners accountable for their own behavior that might be reflected by their dog. Dogs' lifestyle being completely dependent of their owners' will for food, activity, and exposure to different situations (Burkholder & Baur 1998), it is not surprising that dogs' personality might get remodelled to resemble their owners'.

Future research should focus on the relationship between dog and owner, what creates a strong bond between the two, and what factors in the relationship might remodel the dog's personality.

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APPENDIX A

Recruitment script including the inclusion criteria.

My name is Jessika Lamarre, and I am a student in the Biology Department at Memorial University of Newfoundland. In conjunction with fellow student Arynne O'Reilly, I am conducting a research project called *The Modern Dog: Canine Metabolism, Behavioural, and Cognitive Indicators of Wellness I & II* for my Honours degree under the supervision of Drs. Carolyn Walsh and William Montevecchi. The purpose of the study is to investigate potential relationships between lifestyle (activity and food intake), physiology (resting heart rate & respiratory rate), personality, and how pessimistic or optimistic your dog acts in a behavioural task.

To qualify as a participant for this research, you need to meet all of the following criteria:
- You own a Husky or a Beagle between 2 - 9 years of age.
- You have lived with your dog for a minimum of 6 months.
- The dog has not been diagnosed with any endocrine or metabolic disorder (e.g., diabetes, hypothyroidism) and is not taking any medication that could influence metabolism (e.g., steroids, such as Prednisone).

Should you have any questions regarding the above criteria, please contact us.
This research will consist of two to three visits to your home. These visits will be conducted by two students and will each take between 1-2 hours of your time (for a total of ~ 4 hours). During the first visit, a short test will be used to determine whether your dog prefers to use his/her right or left paw to hold a food-filled Kong© (or shows no preference). You will be asked to answer a questionnaire about the lifestyle and history of your dog, answer a personality questionnaire, and fill out an online behavioural questionnaire (CBARQ) between the two visits. Afterwards, you will be asked to put on your dog a Voyce© collar that will be worn for 4 consecutive days (96 hours). The collar will record your dog's resting heart and respiratory rates, and activity levels (similar to a human activity tracker, such as a "Fitbit"). While your dog is wearing the collar, you will be asked to record his/her daily food intake, daily activities, and his/her social interactions (both human and non-human).

The second visit will be conducted four days later, at which time the collar and food/activity log will be retrieved. During this visit, a test of Cognitive Bias will be carried out for approximately half of the dogs ("Cognitive Bias" detailed procedure attached). For the remaining dogs, this test will be scheduled to occur 1-3 weeks after the second visit. The students will set up a simple cognitive bias experiment where the dog will learn the positions of a rewarded and non-rewarded food bowl. How optimistic or pessimistic your dog is will be tested by how he/she responds to a bowl placed in a novel position.

If you are interested in participating in this study, please contact me with the contact information below to set up a time for a first visit.
If you have any questions about my project or myself, please contact me by email or by phone or contact my supervisor, Dr. Carolyn Walsh.

Thank you in advance for considering participating in this study,

Jessika Lamarre

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research, such as your rights as a participant, you may contact the Chairperson of the ICEHR at icehr.chair@mun.ca or by telephone at 709-864-2861.

APPENDIX B

Food and activity log for set times feeding method.

Set Times Food Diary and Activity Log — Day 1

Day 1
Date: _____   Dog ID number: _____

Times Fed	Type of food given (Brand + dry/wet, scraps, treats, homemade)	Amount of food eaten (teaspoon, tablespoon, oz, cup, ml)	Activity: approximate time during which it took place	Type of activity (walk, run, play (e.g. retrieving), rough play (e.g. tug-of-war), interaction with other people/animals)
e.g. 5 pm	PC Salmon & Potato Premium Adult Dry	1.5 cup Ate all of it	e.g. 7 to 9 pm	Leisure walk to dog park (~1h) Dog park; playing with other dogs (~1h)

Hours spent in presence of owner or other known person: _____   Hours spent by him/herself: _____

Set Times Food Diary and Activity Log — Day 2

Day 2
Date: _____   Dog ID number: _____

Times Fed	Type of food given (Brand + dry/wet, scraps, treats, homemade)	Amount of food eaten (teaspoon, tablespoon, oz, cup, ml)	Activity: approximate time during which it took place	Type of activity (walk, run, play (e.g. retrieving), rough play (e.g. tug-of-war), interaction with other people/animals)
e.g. 8 am	Greenies original regular size dental treat	1	e.g. 12 to 1pm	Throwing balls and playing tug-of-war outside in deep snow

Hours spent in presence of owner or other known person: _____   Hours spent by him/herself: _____

Set Times Food Diary and Activity Log — Day 3

Day 3
Date: _____   Dog ID number: _____

Times Fed	Type of food given (Brand + dry/wet, scraps, treats, homemade)	Amount of food eaten (teaspoon, tablespoon, oz, cup, ml)	Activity: approximate time during which it took place	Type of activity (walk, run, play (e.g. retrieving), rough play (e.g. tug-of-war), interaction with other people/animals)
e.g. 7 pm	Table scraps: beef rice with gravy	2 thumbs size 1 hand palm	e.g. 6 to 10 pm	Family came to visit: dog initially excited, back and forth interacting and sleeping

Hours spent in presence of owner or other known person: _____   Hours spent by him/herself: _____

Set Time Food Diary and Activity Log — Day 4

Day 4
Date: _____   Dog ID number: _____

Times Fed	Type of food given (Brand + dry/wet, scraps, treats, homemade)	Amount of food eaten (teaspoon, tablespoon, oz, cup, ml)	Activity: approximate time during which it took place	Type of activity (walk, run, play (e.g. retrieving), rough play (e.g. tug-of-war), interaction with other people/animals)
e.g. 3 pm	Purebites Freeze Dried Treats Beef Liver	2 handfuls	e.g. 2h30 to 3h30 pm	Training to learn new commands with food reward

Hours spent in presence of owner or other known person: _____   Hours spent by him/herself: _____

APPENDIX B
Food and activity log for ad libitum feeding method.

Ad libitum Food Diary and Activity Log

Day 1
Date:

Dog ID number :

Times of refilling bowl; Times food given	Type of food given (Brand + dry/wet, scraps, treats, homemade)	Amount of food eaten (teaspoon, tablespoon, oz, cup, ml)	Activity: approximate time during which it took place	Type of activity (walk, run, play (e.g. retrieving), rough play (e.g. tug-of-war), interaction with other people/animals)
e.g. 7 am 6 pm	PC Salmon & Potato Premium Adult Dry	1.5 cup filled bowl 0.5 cup left; 1 cup added	e.g. 7 to 9 pm	Leisure walk to dog park (~1h) Dog park; playing with other dogs (~1h)

Hours spent in presence of owner or other known person:	Hours spent by him/herself:

Ad Libitum Food Diary and Activity Log

Day 2
Date:

Dog ID number :

Times of refilling bowl; Times food given	Type of food given (Brand + dry/wet, scraps, treats, homemade)	Amount of food eaten (teaspoon, tablespoon, oz, cup, ml)	Activity: approximate time during which it took place	Type of activity (walk, run, play (e.g. retrieving), rough play (e.g. tug-of-war), interaction with other people/animals)
e.g. 8 am	Greenies original regular size dental treat	1	e.g. 12 to 1pm	Throwing balls and playing tug-of-war outside in deep snow

Hours spent in presence of owner or other known person:	Hours spent by him/herself:

Ad Libitum Food Diary and Activity Log

Day 3
Date:

Dog ID number :

Times of refilling bowl; Times food given	Type of food given (Brand + dry/wet, scraps, treats, homemade)	Amount of food eaten (teaspoon, tablespoon, oz, cup, ml)	Activity: approximate time during which it took place	Type of activity (walk, run, play (e.g. retrieving), rough play (e.g. tug-of-war), interaction with other people/animals)
e.g. 7 pm	Table scraps: beef rice with gravy	2 thumbs size 1 hand palm	e.g. 6 to 10 pm	Family came to visit: dog initially excited, back and forth interacting and sleeping

Hours spent in presence of owner or other known person:	Hours spent by him/herself:

Ad Libitum Food Diary and Activity Log

Day 4
Date:

Dog ID number :

Times of refilling bowl; Times food given	Type of food given (Brand + dry/wet, scraps, treats, homemade)	Amount of food eaten (teaspoon, tablespoon, oz, cup, ml)	Activity: approximate time during which it took place	Type of activity (walk, run, play (e.g. retrieving), rough play (e.g. tug-of-war), interaction with other people/animals)
e.g. 3 pm	Purebites Freeze Dried Treats Beef Liver	2 handfuls	e.g. 2h30 to 3h30 pm	Training to learn new commands with food reward

Hours spent in presence of owner or other known person:	Hours spent by him/herself:

APPENDIX C

Lifestyle & Health Questionnaire, Single-dog home. (Modified from Tiira & Lohi, 2014)

Name of the owner:
Address:
Phone number:
Email address:
Breed:
Dog's name (call name):
Dog's birthdate (approximate, if unknown):
sex: ☐ male   ☐ female
Is the dog spayed/neutered: ☐ yes   ☐ no
If you answered yes, at what age was your dog spayed/neutered:
Dog's current age at first visit (in years):
Today's Date (Visit #1):

Dog Weight (lbs) (to be measured at visit)	Dog Height (inches)

 This questionnaire includes questions which deal with your dog's lifestyle and health, including past and current experiences with socialization and training.

Please answer all the questions; if you are unsure of the meaning of any question, please ask one of the researchers. All information submitted is strictly confidential. Neither you nor your dogs will be identified at any time. Once the questionnaire is completed, this top page containing your contact information will be removed, and stored separately from the rest of the questionnaire, in which your dog will be identified only by an assigned subject number.

This questionnaire has been modified from behavioural questionnaires developed at Helsinki University and The Folkhälsan Institute of Genetics (Finland), and based on the K9BEHAVIOURAL GENETICS QUESTIONNAIRES (Univ. of California, San Francisco & University of Pennsylvania, Philadelphia).

Background information

We are interested in your dog's lifestyle from puppyhood, and some of the following questions are designed to evaluate your dog's earlier experiences. If you do not know the answers (perhaps because your dog lived elsewhere when younger), please indicate that you "Cannot answer" and supply the reason. If you are uncertain of the meaning of any question, please ask one of the researchers.

1. At what age did the dog enter your household? _____

2. Dog was acquired from   ☐ home breeder (non-registered)

☐ registered breeder (registered showline breeding)

☐ registered (registered working line breeding)

☐ large (commercial) kennel

☐ shelter or rescue group

☐ pet store

☐ other, please specify: _____

3. What age did the puppy get separated from the mother? It is often (but not always) the same as the age when puppy enters a new home.

☐ under 4 weeks

☐ at the age of 4 weeks

☐ at the age of 5 weeks

☐ at the age of 6 weeks

☐ at the age of 7 weeks

☐ at the age of 8 weeks

☐ at the age of 9 weeks

☐ at the age of 10-12 weeks

☐ over 12 weeks or older

☐ is still living in the same household with its mother

☐ cannot answer (Reason: _____)

4. The following questions will require you to think back to your dog's experiences from about 7 weeks to about 3 months of age. It may not be possible to answer these question if your dog did not live with you as a puppy. If this is the case, please indicate this as the reason for the "Cannot answer" box. There may be other reasons why you may not be able to answer some of these questions. Please don't worry if this is the case, and simply provide a short reason in the blank spaces provided.

The socialization period: has the dog experienced the following events during the period between 7 weeks-3 months? How often?

Events   How often?

Met strange adult dogs

☐ very often (several times per day)

☐ often (twice a week-once a day)

☐ sometimes (twice a month-twice a week)

☐ seldom (1-2 times at puppyhood - twice a month)

☐ rarely (less than 1-2 times during puppyhood)

☐ never

☐ **cannot answer** (Reason: _____)

Met strange women

☐ very often (several times per day)

☐ often (twice a week-once a day)

☐ sometimes (twice a month-twice a week)

☐ seldom (1-2 times at puppyhood - twice a month)

☐ rarely (less than 1-2 times during puppyhood)

☐ never

☐ **cannot answer** (Reason: _____)

Met strange men

☐ very often (several times per day)

☐ often (twice a week-once a day)

☐ sometimes (twice a month-twice a week)

☐ seldom (1-2 times at puppyhood - twice a month)

☐ rarely (less than 1-2 times during puppyhood)

☐ never

☐ **cannot answer** (Reason: _____)

Met strange children

☐ very often (several times per day)

☐ often (twice a week-once a day)

☐ sometimes (twice a month-twice a week)

☐ seldom (1-2 times at puppyhood - twice a month)

☐ rarely (less than 1-2 times during puppyhood)

☐ never

☐ **cannot answer** (Reason: _____)

Visited city (or other place with traffic & many people)

☐ very often (several times per day)

☐ often (twice a week-once a day)

☐ sometimes (twice a month-twice a week)

☐ seldom (1-2 times at puppyhood - twice a month)

☐ rarely (less than 1-2 times during puppyhood)

☐ never

☐ **cannot answer** (Reason: _____)

Travelled by car

☐ very often (several times per day)

☐ often (twice a week-once a day)

☐ sometimes (twice a month-twice a week)

☐ seldom (1-2 times at puppyhood - twice a month)

☐ rarely (less than 1-2 times during puppyhood)

☐ never

☐ **cannot answer** (Reason: _____)

Travelled by bus

☐ very often (several times per day)

☐ often (twice a week-once a day)

☐ sometimes (twice a month-twice a week)

☐ seldom (1-2 times at puppyhood - twice a month)

☐ rarely (less than 1-2 times during puppyhood)

☐ never

☐ **cannot answer** (Reason: _____)

Travelled by plane

YES ☐ / NO ☐
If yes, age at travel by plane (if known): _____
☐ **cannot answer** (Reason: _____)

SINGLE DOG HOMES

5. How many dogs have ever lived with your current dog? _____ If more than "0",

can you state the length of time dogs lived together, and age of your current dog when the

other dog(s) no longer lived with him/her?

_____

_____

6. Has your dog ever lived with other pets in the household (e.g., cats, birds)?

YES ☐ /   NO ☐
IF Yes, please indicate the type of other pet(s) and whether the pet no longer lives in the household
(PAST), or still currently lives with your dog (CURRENT) (e.g., cat 1 (PAST), cat 2 (CURRENT), cockatiel
(PAST)):

_____

_____

_____

7. Is the dog participating in this study your first dog? Second? 10th? _____

8. Has your dog completed any training classes? **YES ☐ /   NO ☐**
IF Yes, please indicate the name of the class and training facility, followed by the approximate age of the
dog in brackets, e.g., Puppy Start Right, Dynamic Canines (10 weeks); Foundations, Newfoundland
Athletic Dog Association (8 months).

_____

CURRENT LIFESTYLE

For the following questions, **please consider <u>the last 6 months</u>**, and answer the questions with this timeframe in mind.

9. Your household includes _____ adults and _____ children.

10. Has there been <u>any changes in either the pet or human composition of your household </u>**within the last 6 months** (e.g., child moved away to college, older dog passed away, etc.)?

YES ☐ /   NO ☐
If Yes, please explain:

_____

_____

_____

12. Dog lives   ☐ indoors   ☐ outside/ in the kennel

☐ partly inside/partly in the kennel/outside

☐ other _____

13. Have you engaged any physical and/or training activities with your dog (e.g., walks, swimming, Schutzhund training classes, etc.) in the last 6 months? Please specify:

_____

_____

_____

_____

14. Activities with the dog – how much do you spend time in activities mentioned above? (daily walking excluded)

☐ nearly daily

☐ 2-4 times / week

☐ 1-2 times / week

☐ 1-2 times / month

☐ 1-2 times / half a year

☐ once a year

☐ zero

15. How many times does your dog get exercise (e.g., walks, runs, playing ball in yard, etc.) in a day?

☐ three times or more

☐ twice a day

☐ once a day

☐ dog is outside all the time

☐ something else, please specify _____

16. During the daily walks, is your dog

    ☐ on the leash during the whole walk

    ☐ dog is leashed part of the walk, and partly dog is allowed to run free

    ☐ dog is mostly allowed to run free during the walks

17. How many hours/minutes does your dog get the above exercise in a typical day?

☐ three hours or more

☐ 2-3 hours

☐ 1-2 hours

☐ 30 min-1 hour

☐ less than 30 min

18. How much does your dog spend **alone** in the house/kennel during the **average working day** (e.g., Thursday)?

☐ 0 hours

☐ 0-1 hours

☐ 1-3 hours

☐ 3-6 hours

☐ 6-8 hours

☐ 8-9 hours

☐ 9-10 hours

☐ 10 hours or more

19. How much does your dog spend **alone** in the house/kennel during the **average weekend** day (e.g., Saturday)?

☐ 0 hours

☐ 0-1 hours

☐ 1-3 hours

☐ 3-6 hours

☐ 6-8 hours

☐ 8-9 hours

☐ 9-10 hours

☐ 10 hours or more

20. In the last 6 months, estimate approximately how often does your dog has ridden in the car with you or another family member (to go anywhere)?

☐ almost daily

☐ 1-2 times per week

☐ 1-2 times per month

☐ 1-3 times in the past 6 months

☐ never

21. Do you do currently do any formal or informal training with your dog (e.g., agility training, on-line training courses, informal "tricks" training, etc.)?
YES ☐ **/**   **NO** ☐
IF Yes, what type(s) of training and how often do you train (daily, weekly, monthly)?

_____

_____

_____

22. Does your dog attend a doggie daycare/kennel facility? **YES** ☐ **/**   **NO** ☐
If YES, how often (e.g., days per week):

23. Apart from any attendance at a day care facility, has your dog gone to a dog park or had a dog "playdate" <u>in the last 6 months?</u> **YES** ☐ **/   NO** ☐

If yes, please describe type of activity and how often it occurred:

_____

_____

_____

_____

_____

Separation anxiety

24. Does your dog exhibit separation anxiety when left alone?

YES ☐ **/   NO** ☐

If you answered yes, please explain how the dog behaves:

_____

_____

25. Has the dog **<u>ever</u>** been treated with medication or other remedies for noise sensitiveness, anxiety, or phobias? **YES** ☐ **/   NO** ☐

IF YES, please check all possible treatments below that you have used only **<u>in the last 6 months</u>**:

☐ Acerpromazine

☐ Benzodiazepine (e.g., Valiumilla or Xanaxilla)

☐ Bach's Rescue Remedy

☐ Other 'natural' or 'holistic' remedies

☐ Behavioural desensitization tapes, CDs, or videos

☐ Other? (e.g., BAT): _____

Dog Health

26. Has your dog **<u>ever</u>** been diagnosed with a chronic illness, such as diabetes or hypothyroidism? **YES**

☐ **/   NO** ☐

If Yes, please provide details: _____

27. Please list any current concerns you might have about your dog's health and/or behaviour (whether you have sought out professional advice or not)- e.g., food allergies, behavioural problems:

_____

_____

28. Apart from an annual check-up (routine vaccinations, etc.), have you brought your dog to a veterinarian in the past 6 months? **YES** ☐ **/   NO** ☐

29. Within the past 6 months, have you consulted with any health care practitioner, trainer, diet consultant, etc. who is NOT a veterinarian? **YES** ☐ **/   NO** ☐

If Yes, please provide type of consultation and reason for it:

_____

_____

_____

30. On a scale of 1-5 for the weight/body condition of your dog, what score would you give your dog?

1	2	3	4	5
very thin	underweight	ideal	overweight	obese

31. On a scale of 1-5 for <u>how happy your dog seems</u> to you, what score would you give your dog?

1	2	3	4	5
never	rarely	sometimes	often	always

32. Does a particular reason come to mind for the score you gave your dog in the previous question (how happy he/she seems to you)? If so, please indicate it here:

_____

_____

_____

APPENDIX D

Lifestyle & Health Questionnaire, Multi-dog home. (Modified from Tiira & Lohi, 2014)

Name of the owner:	
Address:	
Phone number:	
Email address:	
Breed:	
Dog's name (call name):	
Dog's birthdate (approximate, if unknown):	
sex: ☐ male ☐ female	
Is the dog spayed/neutered: ☐ yes ☐ no	
If you answered yes, at what age was your dog spayed/neutered:	
Dog's current age at first visit (in years):	
Today's Date (Visit #1):	
Dog Weight (lbs) (to be measured at visit)	Dog Height (inches)

This questionnaire includes questions which deal with your dog's lifestyle and health, including past and current experiences with socialization and training.

Please answer all the questions; if you are unsure of the meaning of any question, please ask one of the researchers. All information submitted is strictly confidential. Neither you nor your dogs will be identified at any time. Once the questionnaire is completed, this top page containing your contact information will be removed, and stored separately from the rest of the questionnaire, in which your dog will be identified only by an assigned subject number.

This questionnaire has been modified from behavioural questionnaires developed at Helsinki University and The Folkhälsan Institute of Genetics (Finland), and based on the K9BEHAVIOURAL GENETICS QUESTIONNAIRES (Univ. of California, San Francisco & University of Pennsylvania, Philadelphia).

Background information

We are interested in your dog's lifestyle from puppyhood, and some of the following questions are designed to evaluate your dog's earlier experiences. If you do not know the answers (perhaps because your dog lived elsewhere when younger), please indicate that you "Cannot answer" and supply the reason. If you are uncertain of the meaning of any question, please ask one of the researchers.

1. At what age did the dog enter your household? _____

2. Dog was acquired from   ☐ home breeder (non-registered)

☐ registered breeder (registered showline breeding)

☐ registered (registered working line breeding)

☐ large (commercial) kennel

☐ shelter or rescue group

☐ pet store

☐ other, please specify: _____

3. What age did the puppy get separated from the mother? It is often (but not always) the same as the age when puppy enters a new home.

☐ under 4 weeks

☐ at the age of 4 weeks

☐ at the age of 5 weeks

☐ at the age of 6 weeks

☐ at the age of 7 weeks

☐ at the age of 8 weeks

☐ at the age of 9 weeks

☐ at the age of 10-12 weeks

☐ over 12 weeks or older

☐ is still living in the same household with its mother

☐ cannot answer (Reason: _____)

4. The following questions will require you to think back to your dog's experiences from about 7 weeks to about 3 months of age. It may not be possible to answer these question if your dog did not live with you as a puppy. If this is the case, please indicate this as the reason for the "Cannot answer" box. There

may be other reasons why you may not be able to answer some of these questions. Please don't worry if this is the case, and simply provide a short reason in the blank spaces provided.

The socialization period: has the dog experienced the following events during the period between 7 weeks-3 months? How often?

Events   How often?

Met strange adult dogs

☐ very often (several times per day)

☐ often (twice a week-once a day)

☐ sometimes (twice a month-twice a week)

☐ seldom (1-2 times at puppyhood - twice a month)

☐ rarely (less than 1-2 times during puppyhood)

☐ never

☐ **cannot answer** (Reason: _____)

Met strange women

☐ very often (several times per day)

☐ often (twice a week-once a day)

☐ sometimes (twice a month-twice a week)

☐ seldom (1-2 times at puppyhood - twice a month)

☐ rarely (less than 1-2 times during puppyhood)

☐ never

☐ **cannot answer** (Reason: _____)

Met strange men

☐ very often (several times per day)

☐ often (twice a week-once a day)

☐ sometimes (twice a month-twice a week)

☐ seldom (1-2 times at puppyhood - twice a month)

☐ rarely (less than 1-2 times during puppyhood)

☐ never

☐ **cannot answer** (Reason: _____)

Met strange children

☐ very often (several times per day)

☐ often (twice a week-once a day)

☐ sometimes (twice a month-twice a week)

☐ seldom (1-2 times at puppyhood - twice a month)

☐ rarely (less than 1-2 times during puppyhood)

☐ never

☐ **cannot answer** (Reason: _____)

Visited city (or other place with traffic & many people)

☐ very often (several times per day)

☐ often (twice a week-once a day)

☐ sometimes (twice a month-twice a week)

☐ seldom (1-2 times at puppyhood - twice a month)

☐ rarely (less than 1-2 times during puppyhood)

☐ never

☐ **cannot answer** (Reason: _____)

Travelled by car

☐ very often (several times per day)

☐ often (twice a week-once a day)

☐ sometimes (twice a month-twice a week)

☐ seldom (1-2 times at puppyhood - twice a month)

☐ rarely (less than 1-2 times during puppyhood)

☐ never

☐ **cannot answer** (Reason: _____)

Travelled by bus

☐ very often (several times per day)

☐ often (twice a week-once a day)

☐ sometimes (twice a month-twice a week)

☐ seldom (1-2 times at puppyhood - twice a month)

☐ rarely (less than 1-2 times during puppyhood)

☐ never

☐ **cannot answer** (Reason: _____)

 Travelled by plane

YES ☐ /   NO ☐
If yes, age at travel by plane (if known): _____
☐ **cannot answer** (Reason: _____)

MULTIPLE DOG HOMES

5. The following questions pertain to your dog's social experience with other dogs. Please answer the following questions taking into consideration any and all social interactions with other canines your dog has previously had. There may be some questions that do not apply to your dog's specific experience. If this is the case please check the "Cannot answer" box. There may be other reasons why you may not be able to answer some of these questions. Please don't worry if this is the case, and simply provide a short reason in the blank spaces provided.
If there are multiple dogs in the home are they all owned by the same person or by other people in the household?
One owner ☐ /   Multiple owners ☐
How many dogs did your dog live with between the ages of 7 weeks to 3 months of age?
☐ none

☐ one

☐ two

☐ three or more

☐ **cannot answer** (Reason: _____)

How many dogs has your dog lived with between the ages of 3 months and current day?

☐ none

☐ one

☐ two

☐ three or more

☐ **cannot answer** (Reason: _____)

Have there been changes to the total number of dogs in the home?

☐ no, the number of dogs has stayed the same

☐ yes, the number has increased

☐ yes, the number has decreased

☐ **cannot answer** (Reason: _____)

Please indicate below the NAME, AGE, SEX and LENGTH OF TIME your dog has lived with each of your other dogs:

(1)_____

(2)_____

(3)_____

(4)_____

(5)_____

☐ **cannot answer** (Reason: _____)

Please describe the interaction between your dog and the other dogs in the home

☐ does not interact with the other dogs

☐ hardly interacts with the other dogs

☐ sometimes interacts with the other dogs

☐ often interacts with the other dogs

☐ always interacts with the other dogs

☐ **cannot answer** (Reason: _____)

If your dog does interact with the other dogs in the home please indicate which sentence best describes their interaction most of the time.

☐ just a simple acknowledgement other the others dogs presence (ie. Sniffing each other)

☐ will play together but only when the owner is involved

☐ will play together on their own sometimes

☐ will play together as a regular routine

☐ **cannot answer** (Reason: _____)

Please rate how your dog behaves when separated from the other dogs in the home.

1	2	3	4	5
Happier when alone	indifferent	notices but is fine very distressed		slightly distressed

Please check all boxes that apply:

☐ Dogs are walked together

☐ Dogs sleep together

☐ Dogs are trained together

☐ Dogs attend the same doggie daycare/boarding kennel

☐ Dogs are left alone together while you are at work/running errands

☐ Dogs still play together when given the option to play with non-household dogs

☐ Dogs readily share valuable items (Kong with treats/Bone/Toy)

☐ **cannot answer** (Reason: _____)

6. Has your dog ever lived with other pets in the household (e.g., cats, birds)?
YES ☐ /   NO ☐
IF Yes, please indicate the type of other pet(s) and whether the pet no longer lives in the household (PAST), or still currently lives with your dog (CURRENT) (e.g., cat 1 (PAST), cat 2 (CURRENT), cockatiel (PAST)):

_____

_____

_____

7. Is the dog participating in this study your first dog? Second? 10th? _____
8. Has your dog completed any training classes? **YES ☐ /   NO ☐**
IF Yes, please indicate the name of the class and training facility, followed by the approximate age of the dog in brackets, e.g., Puppy Start Right, Dynamic Canines (10 weeks); Foundations, Newfoundland Athletic Dog Association (8 months).

_____

_____

_____

CURRENT LIFESTYLE

For the following questions, **please consider the last 6 months**, and answer the questions with this timeframe in mind.

9. Your household includes _____ adults and _____ children.

10. Has there been any changes in either the pet or human composition of your household **within the last 6 months** (e.g., child moved away to college, older dog passed away, etc.)?

 YES ☐ /   NO ☐

If Yes, please explain:

_____

_____

_____

12. Dog lives   ☐ indoors   ☐ outside/ in the kennel

                      ☐ partly inside/partly in the kennel/outside

                      ☐ other _____

13. Have you engaged any physical and/or training activities with your dog (e.g., walks, swimming, Schutzhund training classes, etc.) in the last 6 months? Please specify:

_____

_____

_____

_____

14. Activities with the dog – how much do you spend time in activities mentioned above? (daily walking excluded)

☐ nearly daily

☐ 2-4 times / week

☐ 1-2 times / week

☐ 1-2 times / month

☐ 1-2 times / half a year

☐ once a year

☐ zero

15. How many times does your dog get exercise (e.g., walks, runs, playing ball in yard, etc.) in a typical day?

☐ three times or more

☐ twice a day

☐ once a day

☐ dog is outside all the time

☐ something else, please specify _____

16. During the daily walks, is your dog

    ☐ on the leash during the whole walk

    ☐ dog is leashed part of the walk, and partly dog is allowed to run free

    ☐ dog is mostly allowed to run free during the walks

17. How many hours/minutes does your dog get the above exercise in a typical day?

☐ three hours or more

☐ 2-3 hours

☐ 1-2 hours

☐ 30 min-1 hour

☐ less than 30 min

18. How much does your dog spend **alone** in the house/kennel during the **average working day** (e.g., Thursday)?

☐ 0 hours

☐ 0-1 hours

☐ 1-3 hours

☐ 3-6 hours

☐ 6-8 hours

☐ 8-9 hours

☐ 9-10 hours

☐ 10 hours or more

19. How much does your dog spend **alone** in the house/kennel during the **average weekend** day (e.g., Saturday)?

☐ 0 hours

☐ 0-1 hours

☐ 1-3 hours

☐ 3-6 hours

☐ 6-8 hours

☐ 8-9 hours

☐ 9-10 hours

☐ 10 hours or more

20. In the last 6 months, estimate approximately how often does your dog has ridden in the car with you or another family member (to go anywhere)?

☐ almost daily

☐ 1-2 times per week

☐ 1-2 times per month

☐ 1-3 times in the past 6 months

☐ never

21. Do you do currently do any formal or informal training with your dog (e.g., agility training, on-line training courses, informal "tricks" training, etc.)?
YES ☐ /   NO ☐
IF Yes, what type(s) of training and how often do you train (daily, weekly, monthly)?
_____

_____

22. Does your dog attend a doggie daycare/kennel facility? **YES ☐ /   NO ☐**
If YES, how often (e.g., days per week):

23. Apart from any attendance at a day care facility, has your dog gone to a dog park or had a dog "playdate" in the last 6 months? **YES ☐ /   NO ☐**
If yes, please describe type of activity and how often it occurred:

_____

_____

Separation anxiety
24. Does your dog exhibit separation anxiety when left alone?
YES ☐ /   NO ☐
If you answered yes, please explain how the dog behaves:

_____

_____

 25. Has the dog **ever** been treated with medication or other remedies for noise sensitiveness, anxiety, or phobias? **YES ☐ / NO ☐**

IF YES, please check all possible treatments below that you have used only **in the last 6 months**:

☐ Acerpromazine

☐ Benzodiazepine (e.g., Valiumilla or Xanaxilla)

☐ Bach's Rescue Remedy

☐ Other 'natural' or 'holistic' remedies

☐ Behavioural desensitization tapes, CDs, or videos

☐ Other? (e.g., BAT): _____

Dog Health

26. Has your dog **ever** been diagnosed with a chronic illness, such as diabetes or hypothyroidism? **YES ☐ / NO ☐**

If Yes, please provide details: _____

27. Please list any current concerns you might have about your dog's health and/or behaviour (whether you have sought out professional advice or not)- e.g., food allergies, behavioural problems:

_____

_____

_____

28. Apart from an annual check-up (routine vaccinations, etc.), have you brought your dog to a veterinarian in the past 6 months? **YES ☐ / NO ☐**

29. Within the past 6 months, have you consulted with any health care practitioner, trainer, diet consultant, etc. who is NOT a veterinarian? **YES ☐ / NO ☐**

If Yes, please provide type of consultation and reason for it:

_____

_____

_____

30. On a scale of 1-5 for the weight/body condition of your dog, what score would you give your dog?

1	2	3	4	5
very thin	underweight	ideal	overweight	obese

31. On a scale of 1-5 for how happy your dog seems to you, what score would you give your dog?

1	2	3	4	5
never	rarely	sometimes	often	always

32. Does a particular reason come to mind for the score you gave your dog in the previous question (how happy he/she seems to you)? If so, please indicate it here:

_____

_____

_____

APPENDIX E

The Monash Canine Personality Questionnaire-Revised (Ley et al. 2009b)

Dog Name: _____   Dog Number: _____

Please rate your dog's personality using the Monash Canine Personality Questionnaire

Please rate how well each word describes your dog's personality by marking the appropriate box.
1 = really does not describe my dog, 6 = really describes my dog

	Really does not describe my dog					Really describes my dog
friendly	1	2	3	4	5	6
persevering	1	2	3	4	5	6
nervous	1	2	3	4	5	6
energetic	1	2	3	4	5	6
attentive	1	2	3	4	5	6
easy going	1	2	3	4	5	6
independent	1	2	3	4	5	6
trainable	1	2	3	4	5	6
non-aggressive	1	2	3	4	5	6
hyperactive	1	2	3	4	5	6
submissive	1	2	3	4	5	6
determined	1	2	3	4	5	6
relaxed	1	2	3	4	5	6
tenacious	1	2	3	4	5	6
timid	1	2	3	4	5	6
biddable*	1	2	3	4	5	6
active	1	2	3	4	5	6
intelligent	1	2	3	4	5	6
sociable	1	2	3	4	5	6
restless	1	2	3	4	5	6
fearful	1	2	3	4	5	6
obedient	1	2	3	4	5	6
lively	1	2	3	4	5	6
reliable	1	2	3	4	5	6
assertive	1	2	3	4	5	6
excitable	1	2	3	4	5	6

*biddable: your dog's willingness to follow directions/obey commands

APPENDIX F

Table 7. Descriptives of the post hoc comparisons of time allocated per levels of physical activity

recorded during the daytime or the nighttime.

Estimated Marginal Means Activity Levels * Day-Night			95% Confidence Interval	
Activity Levels	Day-Night	Mean	Lower	Upper
Rest	Day	0.0931	0.0534	0.1328
	Night	0.5158	0.4761	0.5555
Low	Day	0.3612	0.3215	0.4009
	Night	0.2916	0.2519	0.3313
Moderate	Day	0.4667	0.4269	0.5064
	Night	0.1731	0.1334	0.2128
High	Day	0.0788	0.0391	0.1185
	Night	0.0405	7.52E-04	0.0802

APPENDIX G

Table 8. Descriptive statistics of the personality dimensions of this sample of beagles and huskies.

		Extraversion	Motivation	Training Focus	Amicability	Neuroticism
Husky	N	13	13	13	13	13
	Mean (%)	69.70	69.70	73.80	83.60	44.10
	SD (%)	20.50	12.40	15.70	10.80	20.20
	Range (%)	33.33-100.00	50.00-83.33	38.89-94.44	63.33-96.67	16.67-87.50
Beagle	N	12	12	12	12	12
	Mean (%)	66.90	68.10	65.60	82.50	49.00
	SD (%)	18.30	19.90	17.50	14.80	22.10
	Range (%)	36.11-94.44	36.67-93.33	36.67-86.11	56.67-100.00	25.00-100.00
Combined sample	N	25	25	25	25	25
	Mean (%)	68.33	68.93	69.86	83.07	46.44
	SD (%)	19.08	16.06	16.75	12.65	20.82
	Range (%)	33.33-100.00	36.67-93.33	36.67-94.44	56.67-100.00	16.67-100.00
Comparison Husky-Beagle	t-test	-0.36	-0.26	-1.25		0.572
	Mann-Whitney U[1]				75.50	
	df	23	23	23	23	23
	p-value	0.726	0.799	0.225	0.913[1]	0.573

[1]Mann-Whitney U used due to non-normal distribution (Shapiro-Wilk test)

APPENDIX H

Table 9. Types of food providing the main macronutrients intake of huskies and beagles in this

sample, as reported by the owners. The sample size accounts for dogs receiving similar

proportion of nutrient intake from different brands and types of food. The mean daily

caloric and protein intake of huskies were 1122.48 ± 497.95kcal/d and 95.30 ± 46.25g/d.

The mean daily caloric and protein intakes of beagles were 708.14 ± 165.61kcal/d and

2.86 ± 1.16g/d.

Main source of calorie intake	Husky (n)	Beagle (n)	Combined (n)
Acana	4	3	7
Blue Wilderness	0	1	1
Caesar wet food	0	1	1
Homemade	4	0	4
Kirkland	4	1	5
Nutrience	1	0	1
Original Orijen	0	2	2
President Choice Nutrition First	2	3	5
Purina Beneful	0	2	2
Raw Carnivora	1	0	1
Terra Ultra	1	0	1