

# Mentorship-Based Development and Canine Anxiety: Research Proposal

## Background and Rationale

*Mentorship in action: A calm adult dog can model balanced behavior for a younger dog, potentially reducing anxiety.*

Anxiety disorders in pet dogs – including separation anxiety, generalized anxiety, and reactivity – are widespread and pose significant welfare concerns. Recent large-scale survey research in Finland found that over 70% of pet dogs exhibit at least one form of fear- or anxiety-related behavior [companionanimalpsychology.com](https://companionanimalpsychology.com). Among these, separation-related distress is a common issue, affecting an estimated 14–20% of dogs [preventivevet.com](https://preventivevet.com) in the general pet population (some surveys report lower incidences around 6% [companionanimalpsychology.com](https://companionanimalpsychology.com), depending on criteria). Such anxiety problems can manifest as destructive behavior when left alone, excessive vocalization, phobias, or aggression, and they impact not only the dog's emotional well-being but also the dog-owner bond and the success of dogs staying in their homes. Given these stakes, there is a strong rationale to investigate innovative early-life strategies that might prevent or mitigate canine anxiety disorders.

**Structured mentorship-based upbringing** is a novel approach posited to improve dogs' emotional development and resilience. *Just Behaving* – a mentorship-focused philosophy of dog rearing – hypothesizes that puppies raised under the guidance of calm, experienced mentors (human or canine) develop into more emotionally stable, well-adjusted companions. The Just Behaving model emphasizes a family-like rearing environment where the breeder or owner assumes a mentor/parent role rather than a traditional trainer role. This approach is built on five core pillars: **Mentorship, Calmness, Indirect Correction, Structured Leadership, and Prevention** [justbehaving.com](https://justbehaving.com). By integrating these pillars, the aim is to raise a dog that is confident, well-mannered, and secure in its relationship with humans. Notably, Just Behaving's breeder program reports that “*from birth, puppies learn through mentorship rather than traditional obedience training*,” with calm adult dogs gently guiding puppies to appropriate behavior and emotional self-control [justbehaving.com](https://justbehaving.com). Families receive young dogs who “instinctively understand how to interact gently and respectfully, minimizing common behavioral issues from day one” [justbehaving.com](https://justbehaving.com). These anecdotal outcomes suggest that a mentored upbringing might reduce the incidence or severity of anxiety-driven behaviors (e.g. frantic jumping, excessive barking, or panic when alone) later in life.

Despite the growing interest in mentorship-based puppy raising, there is currently little to no empirical data quantifying its effects on anxiety outcomes. Traditional training

methods (e.g. reward-based obedience classes) are well studied, and positive reinforcement training has documented benefits for canine behavior. However, the mentorship model's claim – that early-life calm leadership and social modeling produce a more emotionally resilient dog – remains to be tested scientifically. A recent academic review comparing Just Behaving to mainstream training noted that integrated lifestyle mentorship with an emphasis on calmness is expected to lead to fewer arousal-based issues (such as hyperactivity or anxiety) in adulthood. The author pointed out that measuring the incidence of anxiety-related behaviors in dogs raised with mentorship vs. conventional methods would be a valuable study, filling a gap in current research.

In summary, the rationale for this study is clear: if a structured mentorship upbringing can indeed foster secure attachment and emotional stability in dogs, it could offer a powerful preventative strategy against common anxiety disorders. Demonstrating this would have practical implications for breeders, trainers, and pet owners, and would contribute scientific evidence for the philosophy that “a truly well-behaved dog is one that has learned to relax” – not just to obey. This study will investigate whether puppies raised under the Just Behaving mentorship model show lower prevalence or intensity of anxiety behaviors (separation distress, generalized anxiety, reactivity) compared to puppies raised with more conventional socialization and training. We will also examine underlying factors (attachment security and stress physiology) to understand *why* mentorship may have these effects.

### **Theoretical Framework: Attachment and Emotional Modeling**

The mentorship-based approach is grounded in principles of attachment theory and social learning, adapted from human psychology to the canine context. Attachment theory, originating from Bowlby and Ainsworth's work in humans, describes how a caregiver's style influences an offspring's sense of security and stress regulation. Similarly in dogs, early interactions with caregivers (human owners or adult dogs) can shape the dog's attachment style (secure vs. insecure) and anxiety levels. Just Behaving explicitly draws an analogy between raising a puppy and parenting a child. The owner (or breeder) is encouraged to be an authoritative “mentor-parent” – providing consistent guidance, warmth, and protection – as opposed to an overly permissive playmate or a harsh authoritarian. This parallels the authoritative parenting style in humans, which research shows tends to produce the most secure, well-adjusted children. In canine terms, a mentor-style owner is kind but sets clear boundaries, whereas a purely indulgent owner may coddle the dog with affection but offer little guidance, and a coercive owner relies on force without warmth.

There is emerging evidence that dogs *do* experience analogous attachment patterns with their owners. For example, one study (summarized in a DogTime report) found that dogs with “authoritative” owners were most likely to form secure attachments to their

humans and were more socially responsive and persistent in problem-solving tasks. In secure dog-owner attachments, the dog trusts that the owner will be available and helpful in times of uncertainty, which prevents extreme distress or clinginess. In contrast, dogs with permissive owners often develop insecure attachments – they may become overly dependent and anxious (clingy due to constant coddling without structure) or conversely, ignore the owner's cues (having learned the owner is irrelevant except for treats). Likewise, dogs with very authoritarian owners (all discipline, no warmth) can show elevated fear, stress or aggression. The mentorship model aims for the ideal middle ground: “leadership with love,” balancing affection and guidance. This balance is theorized to produce a dog who is confident and calm knowing their leader is in control, much as a securely attached child feels safe to explore the world knowing their parent has their back.

Another key theoretical component is emotional modeling and social learning. Puppies are highly social learners: they absorb not only commands but emotional cues from those around them. The Just Behaving philosophy capitalizes on this by using mature, well-tempered adult dogs and calm humans as role models for puppies. Research supports that even very young puppies possess social learning abilities – for instance, 8-week-old puppies can learn to solve simple puzzles by watching an adult dog demonstrate the task. This social learning extends to emotional responses. If a puppy repeatedly observes that adult dogs or the mentor-owner respond to novel stimuli in a relaxed, non-fearful manner, the puppy is likely to emulate that calm behavior. Over time, these modeled experiences may inoculate the puppy against developing excessive fear or reactivity. In essence, the mentor “teaches” the pup how to interpret and cope with the world's challenges.

There is evidence of emotional contagion and synchronization between dogs and their human caregivers. A notable study from Linköping University found that the long-term stress levels of dogs mirror those of their owners: dogs with highly stressed owners (measured via cortisol) also showed elevated cortisol, whereas dogs with relaxed owners had low cortisol levels [sciencedaily.com](https://www.sciencedaily.com). This bi-directional emotional mirroring suggests that a calm, confident mentor can physiologically transmit a sense of security to the dog. In the mentorship model, the human is trained to remain composed and gently authoritative in all puppy interactions – effectively modeling low-anxiety behavior. The puppy not only learns commands but learns an *emotional demeanor*: the capacity to settle, recover from surprises, and not overreact. Mainstream trainers are increasingly recognizing the importance of this emotional conditioning; for example, some positive trainers use “capture calmness” exercises to reward a dog for relaxing quietly, essentially reinforcing a calm emotional state. Just Behaving builds this into everyday life from the start, such that calmness is the normative state the puppy learns.

In theoretical summary, a mentorship-based upbringing is expected to foster a secure attachment bond between dog and owner (analogous to a securely attached child), and to instill robust emotional regulation through modeling. The dog views the mentor as a secure base – a source of guidance and safety – which can reduce the dog’s anxiety in novel or stressful situations. This framework leads to the central hypothesis of our study: *puppies raised with consistent mentor guidance and emotional modeling will exhibit lower anxiety-related behaviors and improved stress resilience compared to puppies raised without such structured mentorship*. We ground this hypothesis in attachment theory (predicting that secure attachment yields less anxiety) and social learning theory (predicting that modeled calm behavior yields calmer dogs). The Just Behaving philosophy’s anecdotal success – producing dogs that are “*not only obedient, but emotionally stable, calm yet joyful, and securely bonded to a loving mentor*”

– provides a compelling philosophical basis which this research will translate into testable scientific questions.

## **Proposed Study Design**

This study will be a comparative longitudinal cohort study examining the effects of a mentorship-based developmental program on later anxiety outcomes in dogs. We will follow at least two cohorts of puppies from early development into adulthood, differing in their upbringing model:

- **Mentorship-Raised Cohort (JB Model):** Puppies raised under the *Just Behaving* mentorship philosophy. These puppies (e.g. English Cream Golden Retrievers from the JB breeding program, or similar setups) spend their first 10–12 weeks in an enriched environment with adult dog mentors and human mentors providing structured socialization, calm guidance, and indirect corrections as per JB protocols [justbehaving.com](http://justbehaving.com). After adoption, their owners continue to apply mentorship principles (with guidance and resources from the JB program). This cohort represents the structured mentorship upbringing.
- **Conventional Upbringing Cohort (Control):** Puppies of similar age and breed (for example, Golden Retrievers from other reputable breeders or rescues) raised in a more traditional manner. This typically involves normal socialization and play in the litter, followed by adoption around 8–10 weeks to pet homes where training is informal or uses standard puppy classes and reward-based methods, without an intentional mentorship framework. No deliberate pairing with mentor dogs or specialized calmness training is implemented, aside from what average puppy owners ordinarily do (e.g. basic obedience, play at dog parks, etc.). This cohort serves as a comparison group reflecting the conventional mix of social exposure and training common in pet dogs.

**A longitudinal design** is crucial to capture how early-life mentorship influences developmental trajectory. We plan to track each dog over the course of at least 12–18 months, with key assessments at multiple time points. For example, data collection could occur at baseline (immediately post-adoption, ~3 months age), then at 6 months, 12 months, and 18 months. This timeline allows us to observe puppies through critical developmental stages: juvenile period, adolescence (when many behavior problems emerge), and young adulthood. A longer follow-up (e.g. extending to 24 months or 3 years) would be valuable to assess longer-term stability of effects, and we will include it if resources permit. The study is prospective: puppies will be enrolled before or at the time they go to their adoptive homes, and then monitored forward in time.

**Sample size and composition:** We aim for a sample that provides sufficient statistical power to detect differences in anxiety outcomes between cohorts. A target of  $N \approx 30$  puppies per cohort (total  $N \sim 60$ ) is a reasonable starting point for a pilot study, balancing power with feasibility. Power analysis (based on expected medium effect sizes in anxiety scores) suggests that ~25–30 dogs per group would allow detection of differences with power  $>0.8$ . To strengthen findings, we will try to recruit a larger sample (e.g. 40–50 per group) if possible, potentially by collaborating with multiple breeders or training organizations that practice mentorship-style rearing. All puppies will be of similar breed/background (e.g. limiting to retrievers) to control for breed-related temperament differences. They will be block-randomized or matched on factors like sex and initial temperament (using breeder reports) to ensure cohorts are comparable. Importantly, owners (or adopters) will be recruited as partners in the research and educated on the study protocol, since much data will be collected in home environments.

**Study conditions and blinding:** This is by necessity a quasi-experimental design – we cannot randomly assign puppies to different rearing methods without ethical and practical issues. Instead, we leverage naturally occurring groups (JB-raised vs. others), acknowledging there may be some self-selection and background differences. We will document potential confounds (for example, differences in early socialization intensity, genetic lines, or owner characteristics) and, where possible, include them as covariates in analysis. Outcome assessors (e.g. those coding behavior from video or analyzing stress hormones) can be blinded to group to reduce bias. For instance, saliva and hair samples for cortisol analysis will be labeled with codes, and behavioral videos can be stripped of obvious identifiers before evaluation, so that researchers scoring the data do not know if a given dog is from the mentorship group or control group.

**Environment of study:** Most data will be gathered in the dogs' natural environments (their homes) to assess real-life behavior and reduce the stress of lab visits. Additionally, periodic evaluations in a neutral setting (such as a veterinary behavioral clinic or training center) will be scheduled at the same age milestones for all dogs. These clinic visits will allow controlled behavioral tests (e.g. a brief separation test or novel object test under

identical conditions for each dog) and collection of physiological samples (such as cortisol). For a subset of dogs, we may also incorporate a shelter-like environment test or involve foster home observations to see how mentorship upbringing might generalize to higher-stress contexts (this addresses whether the benefits hold outside of the familiar home setting). By combining home observations with standardized clinic assessments, the study will capture a holistic picture of the dog's anxiety and coping mechanisms.

In summary, the proposed design is a two-cohort longitudinal comparison, where the primary independent variable is the presence or absence of a structured mentorship-based early upbringing. The design is intentionally comparative rather than seeking an absolute improvement over time – we are interested in whether the mentorship cohort shows *better outcomes (less anxiety)* relative to the control cohort. The longitudinal aspect will also let us observe when differences emerge (e.g., perhaps mentorship dogs navigate adolescence with fewer fear responses). Through this design, we aim to isolate the effect of the JB mentorship model on anxiety-related development.

### **Methodology: Participants, Procedure, and Measures**

**Participants (Dogs and Owners):** The study will enroll puppies around the age of weaning/adoption (8–12 weeks old) along with their adopting owners. Inclusion criteria for the mentorship group are that puppies have been raised in a program adhering to the Just Behaving principles (or a closely similar mentorship-based regimen) from birth until adoption. Inclusion for the control group requires that puppies have not had a structured mentorship program – they may come from typical breeders or shelters with standard socialization practices. All owner participants will be adults who agree to partake in a research study for at least one year, including periodic evaluations and record-keeping. We will ensure both cohorts have similar distributions of sex, breed, and initial social exposure (for example, if the mentorship group are all breeder-raised Goldens, the control group should also be largely breeder-raised Goldens, as opposed to all shelter rescues, to avoid major early-life differences beyond the mentorship factor). If any control group puppies happen to live with well-balanced adult dogs in their new home, we will document that as a potential informal “mentor” influence – such cases might be analyzed separately or controlled for, since the presence of an older dog could partially mimic the mentorship effect.

**Owner Instructions and Blinding:** Owners in the mentorship group will be following the Just Behaving philosophy as part of their normal puppy-raising (many will have gotten the puppy from the JB breeder, who provides training on the method). Control owners will raise their puppy as they normally would; we will not dictate their training approach but will record what they do (e.g. attendance in puppy class, methods used) via questionnaires. To minimize bias, we will inform all owners that the study is about

“early development and behavior” without emphasizing the specific hypothesis about mentorship (to avoid owners subconsciously altering their behavior). Owners will know which group they are in by the nature of how they got their puppy, but outcome measurements will rely on objective tests and blinded coding rather than owner self-assessment alone.

**Interventions/Exposures:** This is not an interventional trial where we assign a treatment; rather, the “intervention” is naturally integrated into the puppy’s life via their upbringing style. The mentorship cohort’s “treatment” is the structured mentorship program (including exposure to mentor dogs, reinforcement of calm behaviors, and guided prevention of bad habits per JB protocols). The control cohort receives the “usual care” of standard socialization/training practices. We will, however, standardize certain exposure challenges for all puppies to evaluate their responses. For example, at set ages each owner will conduct a short home-alone test (e.g. leave the puppy alone in a safe room for 3 minutes while video-recording) and a novel stimulus test (introduce a new object or person) following a script we provide. These controlled challenges, done by all participants, ensure that each dog faces similar conditions for assessment of anxiety or calmness. Aside from these scheduled tests, we do not alter how the mentorship vs. control puppies are raised – we observe and measure the natural outcomes of their different rearing philosophies.

**Behavioral Tracking and Journaling:** A rich longitudinal data set will be collected using both automated tools and owner-reported logs:

- **Puppy Development Journal (Daily/Weekly Logs):** Owners in both groups will be asked to maintain a development journal, documenting notable events in the puppy’s life. This can include social encounters, training activities, any incidents of fearful or anxious behavior, and milestones (e.g. “first night alone in crate without crying”). *Just Behaving* has developed a Puppy Development Journal template for its clients, which we will use (or adapt) for consistency [justbehaving.com](http://justbehaving.com). This journal ensures key aspects of the puppy’s routine and environment are recorded. For control owners, it serves the same purpose of capturing their puppy’s experiences (even if not following JB philosophy). Having this qualitative and quantitative log will help contextualize each dog’s behavior (for example, noting if a spike in anxiety coincided with a change in routine).
- **Longitudinal Behavior Tracker (Monthly Surveys):** We will employ a structured monthly survey or checklist for owners to quantify behavior frequencies. This *Longitudinal Behavior Tracker* (another tool from Just Behaving resources) will list specific behaviors of interest (e.g. “how often did your dog exhibit signs of panic when left alone this month?” or “rate your dog’s overall calmness on a 1–5 scale this month”). It will also ask about any training or

socialization activities undertaken. Owners submit this electronically each month. These repeated measures provide a timeline of behavior change. We will use validated behavior assessment instruments where possible – for instance, questions from the C-BARQ (Canine Behavioral Assessment & Research Questionnaire) can be integrated into our monthly tracker to later compare with population norms. Additionally, specific metrics for anxiety (like a separation anxiety rating scale, if the dog was left alone regularly, or a thunderstorm fear rating if applicable) will be included. The data from these trackers will allow statistical modeling of behavior trajectories over time between the two groups.

- **Mentorship Planning Worksheet:** For the mentorship cohort, we will collect detailed information on *how* the mentorship is implemented for each puppy. The Mentorship Planning Worksheet is a tool that outlines the mentor interactions a puppy gets (e.g. “Puppy spends 2 hours daily with Adult Dog X who corrects its play-biting,” or “Family practices supervised calm sit-stay during dinner each evening with puppy”). We will ask the JB breeder and the new owners to fill this out, specifying the types of mentor-guided activities or interventions used throughout the study. This will let us quantify mentorship exposure (for example, total hours per week of mentor dog play, or number of guided calming sessions). The control group owners, in contrast, will have an analogous section in their logs for any ad hoc mentorship-like experiences (e.g. if they have another pet at home or if they attended a puppy social class with an instructor dog present). By documenting this, we can ensure the independent variable (mentorship exposure) is characterized for each dog and check for overlap between groups (if a control dog inadvertently gets a lot of mentoring from an older housemate, we can analyze them separately).

**Behavioral Assessments (In-Person or Video-Based):** At each major time point (3mo, 6mo, 12mo, 18mo), we will conduct standardized behavioral tests to objectively measure anxiety and attachment-related behaviors:

- **Separation/Reunion Test:** Using a protocol similar to the Ainsworth *Strange Situation Test* adapted for dogs, we will observe each dog’s behavior during a brief separation from and reunion with the owner. For instance, at the 12-month mark, the owner brings the dog to our test location (or performs at home with video): the owner leaves the room for 2 minutes, and we record the dog’s behavior alone (whining, pacing, stress signals) and then the dog’s greeting behavior when the owner returns. This test is a classic measure of attachment security – securely attached dogs may show mild stress during absence but recover quickly upon return, whereas insecurely attached dogs might either panic intensely or show indifferent/avoidant behavior. We will score these sessions using an observational coding system (e.g. counting stress vocalizations, time



spent near door, etc., and qualitative rating of reunion). Trained observers (such as DACVB residents or behavior research students) will conduct coding from video, blinded to the dog's group. This provides data on separation anxiety levels and attachment behavior.

- **Novel Stimulus Test:** We expose the dog to a mildly novel or startling stimulus in a controlled way to gauge generalized anxiety or resilience. For example, an umbrella suddenly opened, or a noisy object placed in the environment. The dog's immediate reaction (startle, avoidance, curiosity) and recovery time (how quickly it stops showing fear and engages normally) will be recorded. A shorter recovery and exploratory response would indicate better emotional resilience. Such tests will be done following ethical guidelines to avoid trauma – stimuli will be moderate (akin to everyday surprises). We will use a standardized scoring (e.g. a scale for startle intensity and a stopwatch for recovery latency). This addresses generalized anxiety or fearfulness in novel situations.
- **Social Reactivity Assessment:** To measure reactivity, especially relevant for leash reactivity or aggression, we will include a controlled encounter with a stranger and with another dog (if safety allows). For instance, at the 6-month and 12-month visits, we can have a neutral stranger approach the dog or have a calm “stooge” dog visible at a distance, and record the subject dog's behavior (does it remain calm, show friendly interest, or react fearfully or aggressively?). We will code behaviors like barking, lunging, or avoidance. Another measure is a simple handling test – a familiar or unfamiliar person gently examines the dog (as a vet would) to see if the dog shows anxiety with handling. These tests tap into social anxiety and reactivity levels.
- **Owner Surveys and Interviews:** In addition to objective tests, at each time point we will have owners fill out detailed questionnaires about their dog's behavior in daily life. This includes standardized instruments such as the C-BARQ or the Monash Dog Owner Relationship Scale (to assess the dog-owner bond quality). We may also interview owners (qualitatively or via structured questions) about any incidents of concern (e.g. “Has your dog destroyed objects when alone? Describe circumstances.” or “How does your dog behave when you prepare to leave the house?”). Owner reports will supplement observed data, noting that owners have the most exposure to the dog's behavior across contexts.

**Physiological Stress Measures:** To complement behavioral data, we will collect physiological markers of stress and arousal, focusing on cortisol as a primary indicator:

- **Cortisol Levels:** We will use salivary cortisol sampling during specific tests (e.g. separation test) to measure acute stress responses, and hair cortisol sampling to measure chronic stress levels over time. Saliva will be collected from each dog at

baseline (resting, with owner present), then after a mild stress challenge (such as after the separation test or after a brief exercise) at each assessment age. The difference will indicate how strongly the dog's HPA axis reacts and recovers. We expect that dogs in the mentorship cohort, if truly less anxious, might show lower cortisol elevations in response to stress and/or a faster return to baseline. Hair samples will be taken perhaps at 6 months and 18 months – hair cortisol reflects integrated cortisol secretion over the preceding weeks to months. Prior research has shown that hair cortisol synchronizes with long-term stress; for example, dogs with more relaxed owners had lower hair cortisol [sciencedaily.com](https://www.sciencedaily.com). We will analyze hair cortisol as an objective gauge of each dog's chronic stress load in their living environment.

- **Other Biomarkers:** If resources allow, we could measure additional parameters: heart rate and heart rate variability (HRV) during tests (HRV is an indicator of stress resilience; higher HRV at rest usually means better emotional regulation), and possibly immunological markers of stress (like IgA levels) or neuroendocrine markers (like oxytocin levels in a friendly interaction test, since oxytocin relates to attachment/bonding). These are exploratory and can be added to enrich the physiological profile.

All samples will be collected non-invasively or minimally invasively. Saliva can be obtained by chew rope or swab, and hair by small clippings. We will coordinate with veterinary professionals for any blood draws if absolutely needed, but the current plan is to avoid blood sampling to keep the study as stress-free as possible for the dogs (we don't want the measurement itself to confound the anxiety we're measuring).

**Data Analysis Plan:** We will use mixed-effects statistical models to analyze longitudinal data, with fixed effects for group (mentorship vs control) and time, and random effects for each dog (to account for repeated measures). Outcome variables will include behavioral scores (e.g. separation distress score, fearfulness score), physiological measures (cortisol levels), and attachment security ratings. We will test the interaction of group×time to see if trajectories differ – e.g., does the mentorship group show a significantly lower increase in anxiety behaviors during adolescence than controls? We will also compare groups at the final time point for overall differences in anxiety-related outcomes. Qualitative owner reports will be coded for common themes (perhaps mentorship owners reporting easier calming, etc., which we can quote in a descriptive portion). The analysis will control for any baseline differences observed at 3 months (if, say, mentorship pups already appear slightly different at adoption, we'll adjust for that). The expected result, based on our hypothesis, is that the mentorship cohort will have lower anxiety scores, quicker stress recovery, and more dogs classified as securely attached to owners, compared to the control group. We will also examine correlations within the mentorship group to see if greater exposure to mentor guidance (per the

Mentorship Worksheet data) correlates with better outcomes, as a dose-response indicator.

## Metrics and Outcome Measures

The key outcome variables and how we will measure them are summarized below. These metrics derive from both the Just Behaving philosophical goals (e.g. secure attachment, calm behavior) and standard clinical behavior science practices (e.g. cortisol, standardized anxiety scales):

- **Separation Anxiety Indicators:** We will quantify each dog's response to being left alone. Behavioral metrics include the duration and frequency of distress behaviors (whining, barking, scratching at door, destructive chewing) observed during the separation test or reported by owners during routine absences. We will use a scoring system (e.g., 0 = relaxed, 1 = mild whining, 2 = moderate pacing/vocalizing, 3 = severe panic indications like attempts to escape or self-injury) to rate each dog. Additionally, the latency to calm down after reunion with the owner is measured (how quickly does the dog stop excitement or agitation upon the owner's return?). We expect mentorship-raised dogs to exhibit *lower separation distress scores* and faster recovery when the owner returns, indicative of secure attachment (the dog is confident the owner will come back).
- **Generalized Anxiety & Fearfulness:** This encompasses the dog's tendency to react fearfully to everyday stimuli or novel events. Metrics here include the novel stimulus test score (e.g., rating startle intensity 0–3 and measuring recovery time in seconds). We will also compile an "anxiety index" from owner questionnaires covering reactions to common triggers (thunderstorms, vet visits, strangers, etc.). For example, owners might rate their dog's fear on a Likert scale in various situations; these can be aggregated. A validated instrument like the *Dog Anxiety Scale* or a subset of C-BARQ items (such as those for noise phobia, stranger-directed fear, etc.) will be used to ensure standardization. The outcome of interest is whether the mentorship group has significantly *lower fear/anxiety scores* or a smaller proportion of dogs developing severe phobias. As an illustrative metric, if at 18 months 30% of control dogs meet criteria for "high fearfulness" (based on a threshold on the survey), we might expect a considerably smaller percentage in the mentored dogs, reflecting a protective effect of early mentorship.
- **Reactivity and Aggression:** Though not the primary focus (mentorship is more aimed at anxiety than aggression), reactivity often overlaps with anxiety (e.g. fear-based reactivity). We will measure leash reactivity and any signs of aggression. One metric is the number of reactive incidents owners report (e.g. lunging or barking at other dogs on walks). Another is the dog's behavior during

the staged stranger/dog encounter: we may give a composite reactivity score (considering posture, growling, etc.). We anticipate that dogs raised with strong social mentorship (especially by stable adult dogs) will have learned appropriate social signals and be less prone to reactive outbursts. For instance, a mentored dog might communicate appeasement or look to their owner for guidance rather than exploding in bark at a stranger; this can be captured by coding gaze toward owner or ability to obey a calm-down cue during the test. Secure attachment can indirectly reduce reactivity because the dog trusts the owner's leadership when assessing threats.

- **Secure Attachment Behaviors:** While attachment style is somewhat abstract to measure, we will attempt to classify dogs as having *secure vs. insecure attachment* to their owner using a combination of the separation/reunion test and owner relationship questionnaires. Metrics include proximity seeking (does the dog prefer to stay near the owner but explore when reassured?), contact maintenance (does the dog settle happily with the owner after reunion, rather than remaining anxious or avoidant?), and stress response to caregiver absence (as described above). We might adapt criteria used in published canine attachment studies (e.g., how a dog alternates between exploring the environment and checking back with owner in a novel room). A securely attached dog is expected to handle the absence with moderate distress and be quickly comforted upon return, whereas an insecure-attached dog might either not care (avoidant) or be inconsolable (anxious-ambivalent). The outcome measure could be a categorical assignment of each dog's attachment style at 1 year. We predict a higher proportion of securely-attached dogs in the mentorship group, aligning with the idea that authoritative-style mentorship yields secure bonds. In contrast, some control dogs may show more signs of insecure attachment (e.g. overly clingy behavior even when owner is present, or conversely, ignoring the owner), which might correlate with their higher anxiety.
- **Physiological Stress Markers:** The primary metric here is cortisol (both acute and chronic). For acute stress: the difference between pre-test and post-test salivary cortisol levels ( $\Delta$ Cortisol) will indicate the stress reactivity. We expect, for example, the mean  $\Delta$ Cortisol in the separation test to be lower in the mentored cohort. We will also evaluate cortisol recovery – perhaps by taking a third sample 20 minutes post-reunion to see if cortisol levels subside faster in one group. For chronic stress: the hair cortisol concentration (HCC) measured at ~6 months and ~18 months. Lower HCC would suggest a lower chronic stress load. We will compare group means for HCC; a meaningful outcome would be if the mentorship group has significantly lower HCC at 18 months, supporting the notion that they experienced less sustained stress. Additionally, if we collect HRV

data, an outcome could be average resting HRV – higher values in mentorship dogs would support better calm/rest state dominance. These physiological measures provide an objective biological correlate to observed behavior, strengthening any findings of reduced anxiety.

- **Other Developmental Outcomes:** While the focus is anxiety, we will also track some general behavior outcomes to see if mentorship has broader effects (these can be secondary outcomes). This includes things like trainability (does mentorship also make dogs more attentive and easier to train? – measured via owner report or perhaps a simple task given at 1 year), or problem behaviors (any reports of destructive behavior, excessive barking, etc., which could be related to anxiety or lack thereof). We will note if the mentored dogs have fewer behavior problems reported overall, aligning with JB's claim of more balanced dogs [justbehaving.com](http://justbehaving.com).

To ensure scientific rigor, all metrics chosen have precedent in canine behavioral research or in veterinary behavioral evaluations. We will use established behavioral scoring systems where available (for instance, uses of a standardized separation anxiety scale from the clinical literature, or a coding scheme used in published attachment studies). We will also incorporate reliability checks – e.g., two independent coders will score a subset of behavioral videos to compute inter-rater reliability. Outcome measures will be clearly defined prior to the study (as per a pre-registered analysis plan) to avoid bias or fishing for positive results. The integration of physiological data with behavioral data is especially powerful: if both converge (for example, mentorship dogs both behave calmer *and* have lower cortisol), it gives strong evidence of a true difference. On the other hand, if behavior differences are found without physiological differences, or vice versa, that will also be scientifically interesting (it may indicate that mentorship changes outward behavior but internal stress is still similar, or that it biologically buffers stress even if behavior differences are subtle).

### **Practical Considerations for Data Collection**

Conducting a longitudinal study in real-life settings presents logistical challenges, so careful planning and use of available tools is essential. We will leverage *Just Behaving's* existing infrastructure and resources for tracking puppy development, and adapt them for research purposes:

- **Home Environment Data Collection:** Most behavioral observations will occur in the dogs' home environments, requiring owner cooperation. To facilitate this, we will provide owners with user-friendly tools like a mobile app or online portal where they can fill the Puppy Development Journal entries and monthly Behavior Tracker surveys. Reminders will be automated, and we will keep the interface simple (e.g. checkboxes for common behaviors, sliders for ratings) to encourage

consistent data entry. Owners will also be provided with video recording instructions and equipment if needed (for example, a tripod and a secure camera if they need it) to record the specified home-alone tests and other scenarios. We recognize that owner-recorded data can be variable in quality, so we will do a training session with owners on how to record useful footage (proper camera placement, etc.). The research team will remain in regular contact with owners (using email, scheduled calls, or even a dedicated support group) to maintain engagement and address any questions about data collection. This hands-on approach not only improves data quality but mirrors the JB philosophy of providing ongoing mentorship – in this case, mentoring owners to be good data collectors and attentive observers of their dogs.

- **Use of Just Behaving Tools:** The **Puppy Development Journal** will be provided as a structured template (either paper or digital). It might include sections like “Exposure & Socialization this week”, “Notable Behaviors/Milestones”, and “Challenges or Anxieties Observed”. We will encourage even the control group owners to use it diligently, as it essentially serves as a diary of the puppy’s life. Since these journals are originally designed by Just Behaving for family use, they use plain language and are easy to fill – a benefit for compliance. The Longitudinal Behavior Tracker likely exists as a spreadsheet or form; we will integrate it with our database so that each month’s data is logged per dog and can be easily compared. These tools not only gather quantitative data but also reflect the *emotional and developmental narrative* of each puppy, which is valuable for interpreting results.
- **Data Collection in Shelters or Clinical Settings:** While our main cohorts are home-raised puppies, we may extend some aspects of data collection to other environments to broaden applicability. For example, a shelter pilot: We could identify a shelter or rescue group willing to implement a mentorship-like program (pairing anxious puppies or dogs with calmer canine companions in the facility). Using a simplified version of our measures (e.g. recording cortisol and behavior of shelter dogs with and without a mentor dog in their kennel), we can explore if the mentorship effect is observable in a shelter context. This is a separate arm and would be exploratory, but we mention it to acknowledge that the principles could help in high-stress environments like shelters. If pursued, shelter staff would use a modified Behavior Tracker to note each dog’s anxiety-related behaviors (like barking, stereotypies) before and after introducing a mentor animal. They could also collect saliva cortisol in a non-invasive way (perhaps via chew toys).
- **Clinical Trial Environment:** During the planned clinic assessment visits, we will operate as if in a clinical trial setting – i.e., following a set protocol for each dog’s

evaluation. We will schedule these visits such that multiple dogs can be seen in one day (for efficiency, perhaps a weekend “behavior clinic” every few months for the study dogs). The environment will be a quiet room set up similarly for each dog (same furniture, same test objects) to standardize conditions. We’ll have veterinary behaviorists or researchers on-site to manage the tests safely. All necessary materials (e.g. novel test objects, saliva collection swabs, video cameras) will be prepared in advance. Owners will be briefed on what to expect (for instance, that they will be asked to step out of the room at a cue). Safety is a priority: for any dog showing extreme distress or aggression, tests will be adjusted or stopped to avoid psychological harm – the goal is to measure typical behavior, not to push dogs beyond their limits.

- **Ethical and Emotional Considerations:** The study is designed to be humane and minimally invasive. We are mindful of the emotional well-being of both dogs and owners throughout. For example, if an owner is uncomfortable performing a particular home test (say, leaving the puppy alone if they’ve never done so), we will work with them to either gently introduce it or skip that data point rather than cause undue distress. The mentorship philosophy emphasizes building trust and security; we will not ask owners (especially mentorship group owners who might be philosophically averse to certain training exercises) to violate their principles. All procedures will be reviewed by an animal ethics committee. We anticipate that most tests (short separations, mild novel stimuli) are within normal experiences of pet dogs and thus ethically sound. In fact, participating in the study might benefit owners by making them more observant and attuned to their dog’s behavior changes. We will provide feedback and resources to owners as appropriate – for example, if a control dog is showing severe anxiety, we will ethically provide the owner with advice or referrals for help (not leaving them to struggle just for the sake of data).
- **Data Management:** We will maintain a secure database for all collected data. Each dog will have a unique ID. Journals and qualitative data will be digitized (either entered directly by owners online or transcribed from paper). Video files will be stored and later coded; we might use behavioral analysis software for efficiency. Cortisol and other biological samples will be processed in a lab (e.g. using immunoassays for cortisol) and results merged into the dataset. Given the long duration, we need strategies to prevent attrition – we will keep owners motivated by sharing periodic newsletters about overall study progress, fun comparisons, or even small incentives (like dog toys after each completed survey set, or free behavior consults if they need). Collaboration with DACVB residents could involve them in this data gathering and owner communication process, which also serves as part of their training in conducting clinical research.

Incorporating these practical measures, we aim to gather high-quality, ecologically valid data that reflects each dog's true behavioral development. By using the *Just Behaving* tools (Puppy Journal, Behavior Tracker, etc.), we ensure that data collection aligns with the program's philosophy and leverages materials owners may already find intuitive. This alignment between the study's methods and the Just Behaving model's practices helps to keep the research grounded in real-world application – essentially bridging the gap between an academic study and a practical training journal. If successful, this approach could become a template for future studies involving private dog owners and breeders as citizen scientists in longitudinal research.

## **Collaboration Opportunities**

This project offers numerous opportunities for collaboration among veterinary behavior experts, researchers, and practitioners in the dog training and breeding communities. By design, it sits at the intersection of academic research and real-world dog upbringing practices. We envision the following collaborative efforts to maximize the study's success and impact:

- **Partnership with Just Behaving Program:** First and foremost, working closely with the *Just Behaving* team (the founders/breeders who developed the mentorship philosophy) is crucial. They can provide access to their puppy litters and clients for the mentorship cohort, share their expertise in implementing the model, and contribute their own historical data for context. For example, the JB team likely has records or recollections of past puppies' outcomes; while anecdotal, these can inform hypothesis refinement and give credibility when recruiting owners ("these breeders have consistently seen calmer adult dogs – help us scientifically document it!"). In return, the research will provide JB with evidence-based validation (or constructive feedback) for their methods. This symbiotic relationship ensures the study remains true to the philosophy's core values while subjecting it to scientific scrutiny. The JB mentors could also co-author any publications or present results at conferences, demonstrating a model of practitioner-researcher collaboration.
- **DACVB Residents and Veterinary Behaviorists:** Diplomates and residents of the American College of Veterinary Behavior (DACVB) are ideal collaborators for this study. Residents often need to conduct research as part of their training, and this project could serve as a rich, clinically relevant study for a resident thesis or multi-resident project. They can assist in designing the behavioral tests (ensuring they align with clinical behavior diagnostics), perform in-person assessments, and lend their clinical eye in interpreting subtle behaviors (for instance, differentiating stress signals). Veterinary behaviorists can also help with the welfare monitoring of the dogs – ensuring that if any dog shows concerning



anxiety levels, the owner is counseled. By involving DACVB professionals, we also make the language and outcome of the research more accessible to the veterinary community. It grounds the study in clinical reality, increasing the likelihood that findings will influence veterinary behavior recommendations. Collaboration might involve multiple institutions – for instance, veterinary behavior services at a university could host the assessment sessions and handle cortisol lab analysis.

- **Academic Researchers in Animal Behavior:** Beyond veterinary behaviorists, we can involve researchers from academia (e.g. universities with anthrozoology or animal behavior programs). Experts in canine cognition and behavior (for example, those who study attachment in dogs, or social learning) might join as co-investigators. They can contribute by refining the experimental design, ensuring rigorous methodology and helping with statistical analysis. Additionally, if any lab has ongoing related studies (such as the effect of early socialization on behavior), we could share data or harmonize measures to compare results. A comparative psychologist might, for instance, be interested in the problem-solving persistence measure noted in the DogTime summary – they could add a cognitive test to our protocol to see if mentorship dogs indeed show greater persistence or problem-solving ability (a tangential but interesting outcome). Such academic input broadens the scope and adds multidisciplinary strength to the project.
- **Collaboration with Dog Training and Welfare Organizations:** Organizations focused on dog training (e.g. APDT – Association of Professional Dog Trainers) or animal welfare (e.g. ASPCA, or smaller rescue groups) may want to collaborate to apply findings. For example, a large dog training school might help recruit puppies for the control group (through their puppy classes) and in exchange get insights into whether incorporating mentorship elements improves their outcomes. Animal shelters or rescue networks might collaborate on spin-off trials, as mentioned, to implement mentorship for shelter dogs. By bringing in these stakeholders, we ensure the research is disseminated to those who can use it on the ground. Funding opportunities might also arise: a humane society could co-sponsor the project if they see potential to reduce surrender of dogs due to behavior issues (an anxious dog is a common reason for surrender). We can highlight how establishing a mentorship framework might prevent severe anxieties that often lead to relinquishment.
- **Data Scientists and Technology Partners:** Given the volume of longitudinal data (including video), collaborating with data science experts or tech companies could enhance analysis. For instance, a tech partner could help develop the mobile app for owner data entry or even explore automated video analysis

(machine learning to detect barking or pacing in videos). If any companies are developing smart canine wearable devices (for monitoring activity or physiological data like heart rate), we might integrate those – e.g. an accelerometer collar to objectively log restlessness when alone. Partnering with such a company on a subset of dogs would provide additional data and also advance their product validation. These kinds of collaborations can offer in-kind support (devices, software) which augment our measurement toolkit.

- **Publication and Education Collaboration:** When it comes to publishing results, co-authorship will reflect the collaborative nature: breeders, veterinarians, and scientists can all be represented. Beyond academic journals, we will work on translational outputs: for example, creating a white paper or guide for breeders and trainers summarizing the findings in practical terms. The Just Behaving team could host a seminar or workshop where the research team presents results to other breeders or the dog-owning community. This spreads knowledge and possibly encourages more people to adopt mentorship-style practices if results are positive. Conversely, if some aspects of mentorship are found less effective, collaborators can discuss refining those methods.

In essence, this research serves as a bridge between the philosophical, emotion-driven approach of mentorship-based training and the evidence-driven approach of scientific research. Collaboration is the planks of that bridge. By engaging practitioners (who supply the mentoring expertise and dogs), clinicians (who ensure behavioral and welfare validity), and scientists (who ensure methodological rigor), we create a comprehensive team equipped to handle the project's challenges and to interpret the outcomes from multiple perspectives. This synergy will enhance the credibility and applicability of the study. It also provides a platform for DACVB residents and young researchers to get hands-on experience in groundbreaking work that could reshape how we raise and train dogs to prevent anxiety.

Ultimately, the collaboration fosters a community of learning – much like mentorship itself. As the mentor dogs guide the puppies, the experienced professionals will guide new researchers, and the research findings will guide the next generation of dog owners and breeders. We anticipate that the outcome of this study will not only answer our research questions but also spark ongoing partnerships to further explore mentorship-based development, making it a model for future human–animal bond studies. By working together across disciplines, we move closer to the shared goal of every collaborator: happier, more secure dogs and more satisfied owners, grounded in both emotional wisdom and scientific evidence.