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# Assessment of Working Dog Suitability from Quantimetric Data

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## Abstract

We propose new approaches to assessing the suitability of potential working dogs for a given occupation. The main focus is placed on continuously-recording technology that does not rely on constant human observation. An example is provided in the form of a pilot study relying on activity and human-proximity data collected from dogs both prior to and during advanced training at Canine Companions for Independence. We conclude by noting other technologies that could also be used to achieve this purpose.

## Author Keywords

animal-computer interaction, quantimetrics, working dog

## ACM Classification Keywords

H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous.

## Introduction

The set of skills required for working dog success vary across occupations. These skills include perceptual, cognitive, and physical abilities, in addition to specific ways of working with humans, dictated by each occupation. Most working dogs are bred and sent to volunteer homes to be cared for from the age of 8 weeks to 18 months. These volunteers, commonly called 'puppy raisers', foster the puppies in their homes and provide

basic training such as housebreaking, leash walking, and simple commands. When the puppies reach approximately 18 months of age, they progress to advanced training. At that time, professional trainers evaluate the young dogs to determine suitability for a particular profession. While there are multiple factors that contribute to the high costs of training a working dog, one of the largest is the inability to determine which professions each dog is best suited for prior to advanced training. In addition to the financial cost, being trained for an occupation that does not match a dog's temperament can result in a great deal of stress for both dogs and trainers.

#### *Related Work*

The field of assessing dog temperament (or personality) has a well documented history. For example, multiple efforts have attempted to predict guide dog success based on lateralization (*handedness*) tests as well as puppy raiser surveys [3, 1]. Similarly, Slabbert et al. [2] conducted a 2 year longitudinal study to determine the factors influencing the success of police dogs. This study focused on behavior testing of dogs as young as 8 weeks and determined that the most reliable predictions of adult police dog success came from a combination of tests done when the dogs were between 8 weeks and 9 months of age.

Recent advances in computing and sensing technology have led to the possibility of quantifying aspects of these assessments in a systematic fashion. Unlike behavior tests and surveys that rely on the observation and expertise of the proctor, some options now exist for continuous monitoring. Traditionally, the only tools that could theoretically achieve this were continuously-recording video cameras. New electronic technologies have enabled the creation of wearable quantimetric sensors that are

small and sufficiently lightweight to be used as monitors for even young puppies, minimizing the obtrusiveness to acceptable levels. By analyzing the statistical properties of these data (whether it is inertial, visual or biometric), it is possible to classify distinct activity and rest patterns. Most importantly, it should be possible to determine the existence of trends that can characterize successful dogs across multiple litters.

#### **Methodology for Pilot Study**

We are conducting a pilot study with the aim of testing our hypothesis using inertial measurement sensors. For this study we partnered with Canine Companions for Independence (CCI), the oldest and largest provider of assistance dogs in the United States. CCI provides dogs in four categories: service dogs for people with physical disabilities; hearing dogs for people with hearing impairments; skilled companion dogs for children or adults who may not be able to live independently; and facility dogs who work with a therapist or teacher. The primary sensing technology we are deploying are commercially-available monitors provided by Whistle Labs Inc.



**Figure 1:** Canine Companions for Independence puppy wearing a Whistle Activity Monitor.

We are equipping a large group (100-120) of puppies, from multiple litters with a Whistle Activity Monitor. These devices are being placed on dog collars as they enter puppy raiser homes at an average of 8 weeks of age. The puppies will wear the devices continuously (when not charging for an hour per week) and will remain with them as they enter advanced training. Placement decisions will not be made based on this data.

### **Subject Demographics**

The sample population, consisting of up to 120 CCI dogs, will range in age from 8 weeks to 2.5 years old. Their breeds include Golden Retrievers, Labrador Retrievers, and crosses of these two breeds.

### **Materials**

One of the most promising features of the assessment methodology is the use of technologies that do not require constant human observation or specialized training to deploy. Contrary to previous techniques, data acquisition can occur as continuously as the practicalities of charging the devices allow. The devices we are using for data collection in our studies will be worn by the dogs at all times, with the only break occurring for charging of the devices (one hour per week).

Contrary to video recording, which would require cameras on each location, a single wearable device can accompany the dog at all times and places.

Our primary equipment, the Whistle Activity Monitor, contains a tri-axial accelerometer coupled with Bluetooth and Wi-Fi. Bluetooth allows the device to detect the presence of a smartphone belonging to the dog's caretakers. Proximity detection is achieved via a companion smartphone application. Devices can be worn

by the dogs even during synchronization. A battery life of 7-10 days allows for minimum disruptions due to charging. This device is small and light enough to be worn by even young 8-week-old puppies without discomfort. It is able to fit on any size dog collar and weighs 16 grams.



**Figure 2:** The Whistle Activity Monitor by Whistle Labs. Reprinted with permission from Whistle Labs Inc

### **Challenges**

As we designed this initial study, we identified several challenges with approaches such as this one. The most notable is the effect that the sensing technology can have on the behavior of the dog. For example, the smartphone application displays the minutes of activity which could influence the dog-walking habits of the puppy raiser. In addition, dogs could attempt to remove the activity monitor from themselves, despite its size being comparable to that of dog tags. Dogs who exhibit this behavior and remove the monitor may be disqualified from the study for safety reasons. Challenges of this nature have been described by Westerlaken et al. [4]. Nonetheless, we expect that the amount of dogs who engage in this behavior will not be sufficient to prevent us

from obtaining representative results.

Because volunteers raise the potential working dog puppies in their homes, their consent and continued participation is needed during the duration of the study. The puppy raisers will be responsible for keeping the devices charged and syncing them with the companion application.

While the requirements for continuous data collection are few, due to hourly over-the-air synchronization, the need to maintain a battery charge on the activity monitor and ensure Wi-Fi or Bluetooth access is ongoing. Maintaining these requirements for extended periods of time could be challenging for many volunteers.

### **Future Work**

We foresee that researchers could include emerging sensing modalities, such as the bio-metric sensors, for working dog assessments. We expect that these sensing technologies can open new avenues of exploration in suitability assessments. By more accurately predicting working dog success, we hope to improve the experience of dogs in both training and active duty, as well as the humans with which they interact.

### **Acknowledgements**

We would like to thank the volunteer puppy raisers at Canine Companions for Independence who will participate in this study. Additionally, we would like to thank our collaborators at Whistle Labs for their continued support.

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