



# Early Neurological Stimulation (ENS): Implications for canine welfare and management

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## Introduction

In discussions of how to best support puppy development and welfare, factors such as the puppy's growth or time spent with its mother and littermates are often considered. Recently, the amount and type of environmental enrichment provided to puppies in the form of toys, walks or playtime outdoors, and interactions with humans and other animals have also become important considerations. Simple interactions early in a puppy's life may additionally increase its ability to learn and cope successfully with stress later on, thus leading to better welfare outcomes. Early Neurological Stimulation (ENS), which involves applying gentle stressors to a very young animal for

short periods of time, is thought to improve their stress responses later in life. The stressors—which often include removing animals from their litters for short periods, very briefly exposing them to cool temperatures, holding them in different positions, and gently touching parts of their bodies—are applied for a few seconds, once a day, for at least 10 days.

## Effects of ENS

The link between stress and activation of the endocrine system is well known. The release of glucocorticoids (a class of stress hormones) from the adrenal cortex following stress affects many processes in the body. These changes are the basis for the body's "fight or

flight” response. The effects of short-term, mild stress can be beneficial, creating “robustness” in the body and preparing it to deal more effectively with stressors later in life (Levine, 1960; and reviewed in Meaney, 2001; Pryce and Feldon, 2003). However, not all stress is equal. High-intensity or long-term stress is often detrimental, either because of overwhelming the body’s ability to respond, or leading to negative side effects from a sustained “fight-or-flight” process, which depletes energy and the ability to resist disease (Selye, 1956).

Studies of ENS began with rat pups, and currently, most of the published work in this area is rodent-focused. Rat pups handled early in life were much less fearful when exposed to an auditory stimulus (Schaefer, 1963), had lower corticosterone levels when restrained by a person (Plotsky and Meaney, 1993), and were less resistant to being captured after stress (Núñez et al., 1996). These findings have since generated interest in exploring the effects of ENS in other species, including dogs.

### Applications and effects of ENS on puppy development

As is the case for rodents, it is believed that ENS may provide stimulation to the developing puppy’s endocrine system and cause him/her to develop more ability to deal with stressful events later in life. This may lead to better learning and an improved ability to cope with adversity. Though some of this belief stems from the benefits of ENS shown in other species, it has also been advanced by unpublished work conducted as part of a US Military Working Dog (MWD) training program called “Bio Sensor,” later discussed by Battaglia (2009). Specific claims on the effects of “Bio Sensor” listed in Battaglia’s discussion include “improved” heart rate, “stronger” heartbeats and adrenal glands, and increased stress tolerance and disease resistance (Battaglia, 2009), although how these effects were measured was not specified. The “Bio Sensor” program exercises included the following:

1. Tactile Stimulation: the puppy is “tickled” between the foot pads on any one foot with a Q-Tip (3-5 seconds)
2. Head Erect: the puppy is held perpendicular to the ground with both hands, orienting its head above its tail (3-5 seconds)
3. Head Down: the puppy is held perpendicular to the ground with both hands, orienting its tail above its head (3-5 seconds)
4. Supine: the puppy rests with its back in the palms of both hands, with its nose oriented toward the ceiling (3-5 seconds)
5. Thermal Stimulation: a damp towel is placed in fridge for at least 5 minutes; place puppy on towel on all fours and do not restrain movement (3-5 seconds)



To date, only a few studies have been conducted on ENS in dogs using various handling exercises, and these have shown variable results. For example, a study by Fox and Stelzner (1966) applied an ENS treatment that included exposure to light and sound, movement, cold, swimming, grooming, and a check of the puppy’s reflexes. The entire ENS treatment took one hour per puppy and was done daily from day one to 5 weeks of age. After three weeks, 10 minutes of play with the researcher was added in. Puppies were weighed and their heart rates were measured weekly. They were then behaviorally tested at 5 weeks, and the body weights, heart rates, and reflexes of ENS puppies were compared with those who did not receive ENS treatment. Handled puppies explored more, were more social toward humans and more confident when engaged in a social situation with other dogs. They also were better at problem-solving. They had increased heart rates compared to puppies that did not receive ENS, but there were no differences in their weights or reflexes (Fox and Stelzner, 1966).

Another study looked at the effects of ENS on dogs being raised in homes and those kept in professional breeding kennels. The ENS consisted of a 5-minute gentle whole-body massage with the puppy lying both on its back and on its stomach (Gazzano et al., 2008). This was done daily for days 3-21 of life. The puppies were later behaviorally tested at 8 weeks of age. Handled and unhandled puppies from both the kennels and the homes were compared. In an isolation test, all handled puppies regardless of housing explored the environment more. There were no differences between any groups in their heart rates or reactions to different objects and an unfamiliar environment and person (Gazzano et al., 2008).

Other studies have found no significant effects of using ENS in dogs. For instance, Schoon and Berntsen (2011) observed that when puppies bred for mine-detection underwent “Bio Sensor” in addition to their normal socialization program, there were no differences in their performance on a test intended to measure search behavior, responses to novel people, environments, and objects. There were also no differences in any of their developmental benchmarks (Schoon and Berntsen, 2011). However, the high level of socialization the puppies were already receiving could have masked any effects of the ENS. ENS effects might be clearer when used with puppies raised in a less stimulating environment.

Overall, because of the variety of test processes used and the small number of studies that exist, it is currently impossible to say if some types of ENS are more effective than others. More research is needed to determine what sorts of ENS intervention might be most beneficial to dogs.

### Limitations of ENS

For those choosing to use ENS in hopes of improving puppy welfare, caution is needed to avoid inadvertently creating problems. For example, it can be easy to accidentally overstress puppies when providing ENS. As previously mentioned, little research has been done on ENS in dogs, which makes it unclear as to how much stimulation is needed to achieve any benefits. This is problematic because there is no threshold for under- or over-stimulation (Battaglia, 2009). Separating young animals from their mothers is commonly a part of ENS, but a review of many studies has found that separation for a prolonged period produces long-term negative effects on brain chemistry and stress responses in puppies (Anand and Scalzo, 2000). The duration of separation needed to achieve benefits rather than negative effects is unclear. Further, following Schaefer’s (1963) suggestion that a temperature change may be the only factor needed for effective ENS, a slight, brief temperature change might be useful to incorporate into puppy ENS programs. However, a prolonged or severe change in temperature may be harmful to the puppy’s health. Therefore, anyone including cold stress in their ENS protocols must be careful not to expose puppies to very cold temperatures, and puppies should not be exposed to cooler surfaces or ambient air temperatures for more than a few seconds at a time. Regardless of which ENS procedures are used, puppies must be continuously monitored for signs of distress, as these would indicate a need to stop the ENS treatment immediately.



Photo by Croney Lab, Purdue University.

### Conclusions

There is some evidence to suggest that ENS may help dogs cope better with stress later in life. Several of the suggested ENS stimulation techniques take little time to do, are low cost, and may provide crucial long-term behavioral benefits to dogs. The techniques are relatively easy for breeders to incorporate into their practices, and, if effective, could potentially improve the overall health and welfare of puppies, potentially improving owner satisfaction. Breeders should therefore be educated about the potential benefits of ENS and how to implement it without over-stressing puppies. More research is needed to determine the most effective methods of ENS, so that both dogs and breeders receive the greatest benefits from utilizing this intervention.

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