



ELSEVIER

Applied Animal Behaviour Science 40 (1994) 273–284

---

---

APPLIED ANIMAL  
BEHAVIOUR  
SCIENCE

---

---

## Predictive value of activity level and behavioral evaluation on future dominance in puppies

R. Beaudet<sup>a</sup>, A. Chalifoux<sup>b</sup>, A. Dallaire<sup>b,\*</sup>

<sup>a</sup>*Clinique de comportement canin, 292 ave. Rielle, Verdun, Québec, H4G 2S7, Canada*

<sup>b</sup>*Faculté de Médecine vétérinaire, C.P. 5000, St-Hyacinthe, Québec, J2S 7C6, Canada*

Received 2 July 1993; accepted 7 April 1994

---

### Abstract

In the course of a research project to define a test applicable to the selection of future companion dogs, verification of the predictive value of the behavioral puppy test proposed by Campbell was undertaken with respect to dominance in the unweaned puppy. Two questions were raised: (1) is the level of socialization at 7 weeks a reliable index of the future social tendencies? (2) Does the behavioral puppy test have a better predictive value when used with a complementary test? Thirty-nine puppies were tested at 7 weeks of age and were reevaluated at 16 weeks. An observation area with an entry box was built at the breeding kennel. Behavioral reactions and number of movements were videotaped. The behavioral evaluation test was administered as indicated by Campbell. Results show that when applied at 7 weeks of age without an additional criterion, the test has no predictive value regarding future social tendencies. In fact, the total value of the behavioral scores for social tendencies between the two age groups showed a trend toward regression from dominance to submission. However, with an additional and independent criterion, i.e. the number of movements during the test, the predictive value of the total of behavioral scores for social tendencies is higher. Significant correlations were obtained for both age groups between the number of movements and the score for each manipulation of the test and between movements and the total value of the behavioral score for social tendencies derived from the complete test.

*Keywords:* Dog; Dominance; Puppy test; Activity level; Status

---

\* Corresponding author.

## **1. Introduction**

Canine behavior problems related to aggression in dogs are widely recognized. Epidemiological data on dog bites support that assertion. Among the many types of aggression, dominance-related aggression seems to be the most common (Beaver, 1983; Blackshaw, 1991).

Effective breeding programs, early socialization of dogs, obedience training, reinforcement of friendly behavior and the owner's commitment towards the animal are important factors in the prevention of aggressive behaviors (Wright, 1991). Lack of physical contact with the environment or isolation at a very early age contributes to the high level of emotional distress later on in life (Fuller, 1963; Ross et al, 1959). An insufficient socialization, associated with a lack of training and inadequate interactions between animal and owner are generally thought to be the causes of numerous behavior problems.

The need to predict risks of future aggressive behavior, particularly those linked to dominance, resulted in the development of puppy temperament testing. The aim of such behavioral puppy tests is to evaluate the potential to socialize appropriately, not only with litter-mates, but also with people, the dog's future pack. It is already known that intra- and inter-specific socialization processes are largely concomitant (Fox, 1974).

In the past 20 years, many tests have been developed to evaluate various aptitudes in the very young puppy. Some of these tests were designed to facilitate the selection of puppies intended for a particular use, such as guide-dogs (Pfaffenberger, 1965; Pfaffenberger et al., 1976). Others were developed to improve specific breeds, such as the German Shepherd (Humphrey and Warner, 1934). On the other hand, the 'Puppy Aptitude Test' was designed to predict the training and companionship potential of a puppy (Bartlet, 1985). Generally, these tests are poorly accessible, difficult to apply, and not standardized, as they are often based on subjective values.

These tests are designed to evaluate the degree of dominance, submissiveness and independence in the puppy. The most widely known socialization test is the one elaborated by Campbell (1972). The ease and the rapidity of application of this test were the keys to its success. This test measures the puppy's degree of socialization using simple manipulations and an evaluation scale. Many breeders have adopted it to assist the future owner in the selection of an individual from a litter. Some researchers suggest about 8 weeks as the ideal age for puppy adoption (Scott and Fuller, 1965; Campbell, 1972). This test is then most often applied at the age of 7 weeks, that being one week after the social attraction towards others species has begun (Pfaffenberger et al., 1976). According to Campbell, the test was conceived to evaluate the degree of attraction towards people, the physical and social dominance of a puppy, and leadership tendencies, and, when well executed, permits a future owner to choose a puppy that best suits his or her temperament and the environment in which the animal will live.

Although this test has been widely used for many years, its predictive value was only recently evaluated. One study did not confirm the predictive value of the

social tendencies of a puppy based on a test applied only at 7 weeks of age (Young, 1988). Moreover, others questioned the value of this test when additional variables were not considered along with the test. One such parameter could be the general activity level of the animal. Activity level can be reflected by the number of movements of the animal in an observation area during a fixed period of time (Krushinskii, 1962; Murphree and Dykman, 1965). According to many workers, general activity level is a sign of emotional level (James, 1951; Ader, 1965; Gray et al., 1965; Fox, 1972). Such an approach would give the opportunity to establish a correlation between the results of the behavioral test and the results of a complementary independent test (Anastasi, 1968).

During a research project to define a test applicable to the selection of a future companion dog, two questions were raised: (1) is the level of socialization at seven weeks a reliable index of the future social tendencies? (2) Does the behavioral puppy test proposed by Campbell have a better predictive value when used with a complementary test?

## 2. Animals, materials and methods

Thirty-nine puppies were tested at 7 weeks of age and at 16 weeks. This last age group was retained because puppies within the juvenile period display most of the adult behaviors such as hierarchical competition and possessive aggression. The puppies came from a professional breeder; five breeds were represented. Twelve Beagles, 15 German shepherd dogs, three Miniature poodles, seven Shiba inu and two Shetland sheepdogs were used. Total numbers of males and females were respectively 15 and 24. All puppies were examined by a veterinarian before the first test. They had received the necessary vaccinations and were declared healthy enough to be sold.

The puppies were kept with their mother until approximately 5 weeks of age. They were then progressively weaned from the fifth to the seventh week. Most of the puppies were bought after the first evaluation and came back at 16 weeks for the second evaluation. We therefore had no direct control on the puppies's environment. We did not wish to influence this setting in any manner. The idea was to observe how the prediction of social tendencies given by first testing was reproducible after the development of the puppies in their given environment.

To avoid any diversions, all behavioral observations were performed out of the breeding kennel. An observation area of 1.83 m × 1.83 m × 1.83 m was built (Fig. 1). The lower half of the walls was made of plywood and the upper part was closed off with white cotton cloth. An entry box permitted the animal to reach the observation area at its own pace. The entry box size are indicated in Fig. 2. The puppies were placed in the entry box through a door at one end. A guillotine door at the other end, giving access to the observation area, is opened before the introduction and is closed with the help of a pulley system as soon as the puppy has passed into the observation area. This prevents its return into the entry box. At this time, the manipulator enters the observation area and starts procedures.

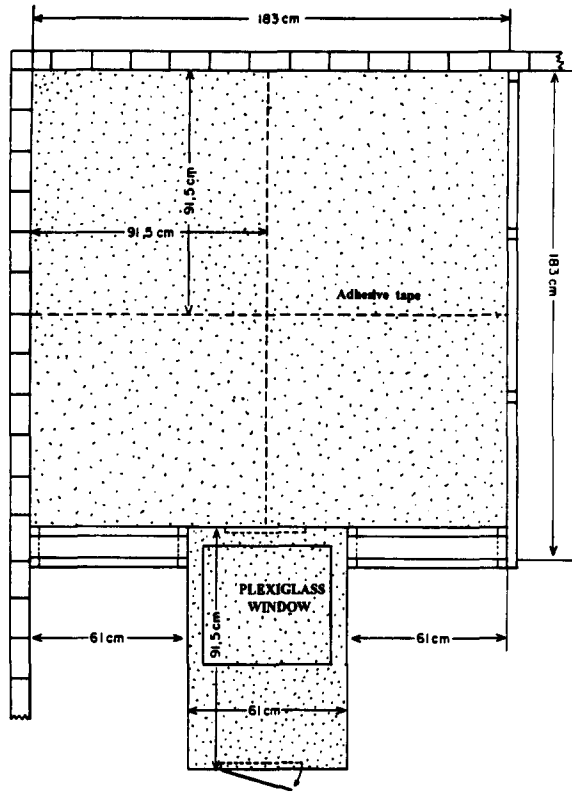


Fig. 1. The observation area.

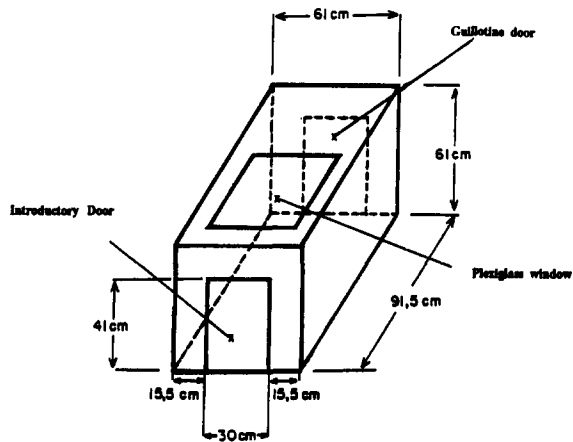


Fig. 2. The entry box.

Table 1  
 Letter substitution for the total obtained for each stimulus of the behavioral puppy test, and the total value for social tendencies and the number of movements at 7 and 16 weeks

	First evaluation - 7 weeks					Second evaluation - 16 weeks				
	Behavioral score for social tendencies					Behavioral score for social tendencies				
Movements	Stimuli					Stimuli				
	Total					Total				
	1	2	3	4	5	1	2	3	4	5

Males										
D <sup>1</sup>	S	S	S	S	S	S	S	S	S	S
74	22	S	S	S	N	D	N	N	N	N
98	17	S	S	S	N	N	N	N	N	N
109	13	S	S	S	N	N	N	N	N	N
54	9	S	S	S	N	N	N	N	N	N
59	9	S	S	S	N	N	N	N	N	N
51	9	S	S	S	N	N	N	N	N	N
16	5	S	S	S	N	N	N	N	N	N
35	17	S	S	S	N	N	N	N	N	N
53	13	S	S	S	N	N	N	N	N	N
80	13	S	S	S	N	N	N	N	N	N
48	13	S	S	S	N	N	N	N	N	N
62	25	S	S	S	N	N	N	N	N	N
123	17	S	S	S	N	N	N	N	N	N
94	30	D	N	N	N	N	N	N	N	N
21	5	S	S	S	N	N	N	N	N	N
Females										
D <sup>1</sup>	S	S	S	S	S	S	S	S	S	S
74	22	S	S	S	N	D	N	N	N	N
98	17	S	S	S	N	N	N	N	N	N
109	13	S	S	S	N	N	N	N	N	N
54	9	S	S	S	N	N	N	N	N	N
59	9	S	S	S	N	N	N	N	N	N
51	9	S	S	S	N	N	N	N	N	N
16	5	S	S	S	N	N	N	N	N	N
35	17	S	S	S	N	N	N	N	N	N
53	13	S	S	S	N	N	N	N	N	N
80	13	S	S	S	N	N	N	N	N	N
48	13	S	S	S	N	N	N	N	N	N
62	25	S	S	S	N	N	N	N	N	N
123	17	S	S	S	N	N	N	N	N	N
94	30	D	N	N	N	N	N	N	N	N
21	5	S	S	S	N	N	N	N	N	N
58	25	S	S	S	N	N	N	N	N	N
20	5	S	S	S	N	N	N	N	N	N
1	5	S	S	S	N	N	N	N	N	N
65	13	S	S	S	N	N	N	N	N	N
15	5	S	S	S	N	N	N	N	N	N
56	13	S	S	S	N	N	N	N	N	N
41	17	S	S	S	N	N	N	N	N	N
49	13	S	S	S	N	N	N	N	N	N
46	9	S	S	S	N	N	N	N	N	N
0	5	S	S	S	N	N	N	N	N	N
103	21	S	S	S	N	N	N	N	N	N
25	13	S	S	S	N	N	N	N	N	N
62	9	S	S	S	N	N	N	N	N	N
20	9	S	S	S	N	N	N	N	N	N
133	30	D	N	D	N	N	N	N	N	N
110	41	D	N	D	N	D	N	D	N	D
48	9	S	S	S	N	N	N	N	N	N
84	17	S	S	S	N	N	N	N	N	N
77	23	S	S	S	N	D	D	D	D	D
60	18	S	S	S	N	D	D	D	D	D
54	5	S	S	S	N	S	S	S	S	S
27	13	S	S	S	N	N	N	N	N	N
49	22	S	S	S	N	N	N	N	N	N
10	5	S	S	S	N	S	S	S	S	S

<sup>1</sup> A numerical value of 10, 5 and 1 was given respectively to each letter D, N and S. The total score was obtained by adding these values.  
 Stimuli: 1, social attraction; 2, following; 3, restraint; 4, elevation dominance; 5, social dominance.

Table 2

Correlation and determination coefficients between the total value for social tendencies at 7 and 16 weeks, between number of movements at 7 and 16 weeks, and between the number of movements and the total value for social tendencies for the two age groups

		1	2	3	4
Group of 39 puppies	<i>R</i>	0.29012	-0.03904	0.46878*	0.69722**
	<i>R</i> <sup>2</sup>	0.08417	0.00152	0.21976	0.48611
Males	<i>R</i>	0.24520	0.24151	0.33269	0.53228
	<i>R</i> <sup>2</sup>	0.06012	0.05833	0.11068	0.28332
Females	<i>R</i>	0.31279	0.12373	0.52045*	0.78787**
	<i>R</i> <sup>2</sup>	0.09733	0.01521	0.27087	0.62075

\*  $P < 0.05$ .

\*\*  $P < 0.001$ .

1, Correlation between the total for social tendencies at 7 and 16 weeks.

2, Correlation between the number of movements at 7 and 16 weeks.

3, Correlation between the number of movements and the total value for social tendencies at 7 weeks.

4, Correlation between the number of movements and the total value for social tendencies at 16 weeks.

Table 3

Correlation and determination coefficients between the behavioral tendencies observed for each stimulus of the behavioral puppy test and the number of movements at 7 and 16 weeks

		Stimuli				
		1	2	3	4	5
<i>7 weeks</i>						
Group of 39 puppies	<i>R</i>	0.41220*	0.35569*	0.35292*	0.43673*	0.39057*
	<i>R</i> <sup>2</sup>	0.16991	0.15657	0.12456	0.19073	0.15254
Males	<i>R</i>	0.41470	0.26549	0.25670	0.23137	0.18070
	<i>R</i> <sup>2</sup>	0.17197	0.07048	0.07113	0.05353	0.03265
Females	<i>R</i>	0.46566*	0.47235*	0.37802	0.49855*	0.44914*
	<i>R</i> <sup>2</sup>	0.21684	0.22311	0.14290	0.24855	0.20173
<i>16 weeks</i>						
Group of 39 puppies	<i>R</i>	0.52638**	0.59478**	0.68324*	0.43367*	0.49542*
	<i>R</i> <sup>2</sup>	0.27707	0.35376	0.40735	0.18807	0.24544
Males	<i>R</i>	0.49710	0.47264	0.42521	-0.02403	0.33644
	<i>R</i> <sup>2</sup>	0.24711	0.22339	0.18080	0.00058	0.11319
Females	<i>R</i>	0.54197*	0.63590**	0.74771*	0.66375**	0.61137
	<i>R</i> <sup>2</sup>	0.29373	0.40437	0.55908	0.44056	0.37377

\*  $P < 0.05$ .

\*\*  $P < 0.001$ .

Stimuli: 1, social attraction; 2, following; 3, restraint; 4, elevation dominance; 5, social dominance.

The same person tested the 39 puppies at 7 and 16 weeks of age. The floor of this observation area was subdivided into four identical squares of 0.915 m × 0.915 m (Fig. 1). The number of lines crossed was used as a measure of activity. The

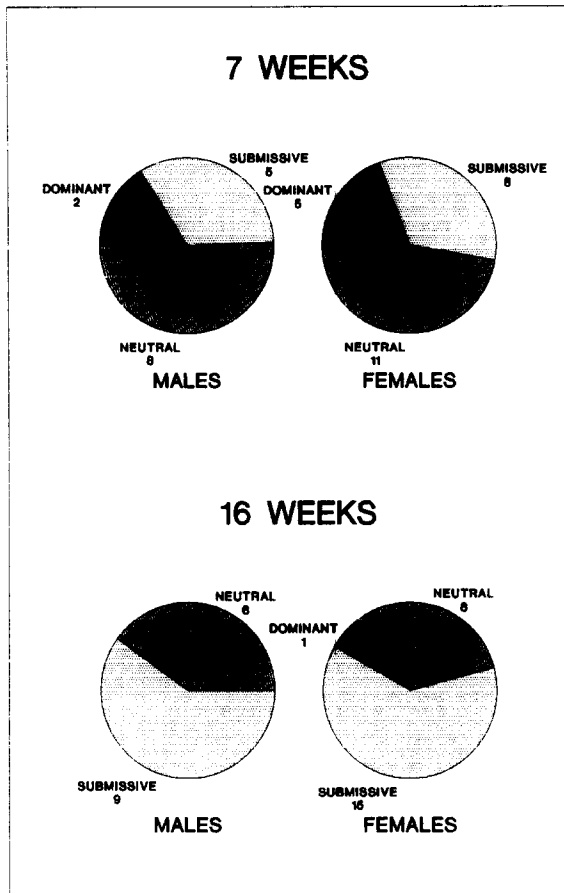


Fig. 3. Social tendencies shift in relation to age and sex.

behavioral reactions and the number of movements were videotaped for future reference.

The behavioral puppy test was administered as indicated by Campbell (1972). The test includes the following:

(1) Social attraction. As soon as the puppy is in the observation area, it is transported and placed on the ground in a corner by the manipulator; he then moves to the opposite corner. In a crouch position, the manipulator lightly claps his hands to get the puppy's interest. This gesture is done until the puppy responds or for a maximum of 30 s.

(2) Following. Slightly leaning, the manipulator places himself beside the puppy and taps his leg with his hand to coax the puppy to follow him around the observation area. One complete circle around the observation area is sufficient.

(3) Restraint dominance. The manipulator brings the puppy to one corner of

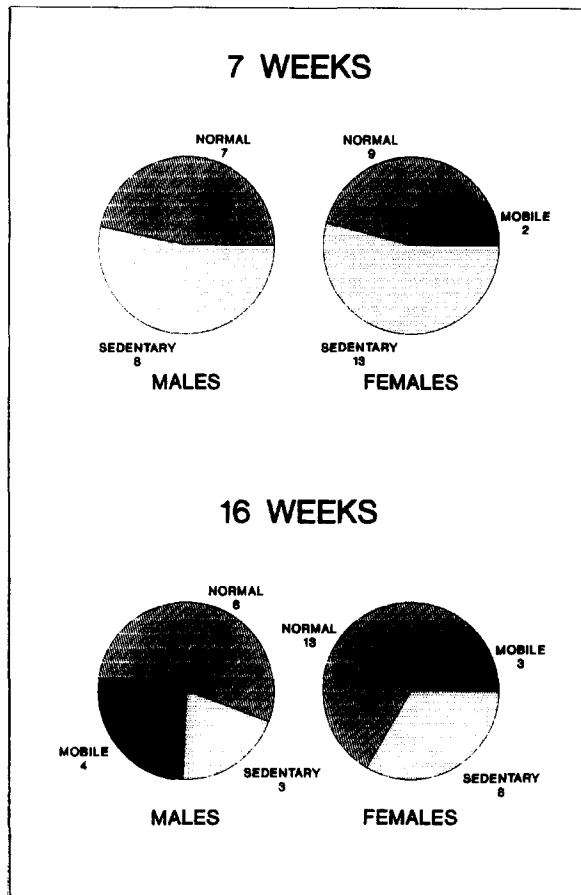


Fig. 4. General activity shift in relation to age and sex.

the observation area. The puppy is then turned over on its back and held in this position for 30 s.

(4) Elevation dominance. When restraint dominance is completed the puppy will return onto its belly or to a standing position. The manipulator then slides one hand beneath the thorax of the dog and lifts it about 15 cm off the ground for 30 s.

(5) Social dominance. After putting the puppy on the ground, it is stroked gently from the top of head to the tail in a continuous manner for 30 s.

The behavioral reactions are entered on an evaluation form. Weighted scores were given to the behavioral reactions to allow statistical analysis. The variables associated with dominance ranked highest and those related to submission were lowest. By adding the variables, totals were obtained for each stimulus. These totals were replaced by letters—(D) for dominance, (N) for neutrality and (S) for submission. A  $\chi^2$  test was used for this substitution. The responses and the

reactions of the puppies were assigned to one of these three categories, instead of the five categories used by Campbell (1972). A numerical score of 10, 5 and 1 was respectively given to each category to obtain the total value for the social tendencies.

During the entire test, including the periods of time when the animal was un-manipulated, the number of movements in the observation area were counted. Each time the puppy passed over the adhesive tape, a count was made. The total count reflects the general activity level of the puppy. Behavioral reactions and the total number of movements were noted during the test and were reviewed on videotapes. Regression analysis between results at the two ages was performed after the behavioral tendencies for each manipulation of the test were identified, after obtaining the total value for the social tendencies and the total number of movements.

### **3. Results**

Table 1 summarizes the results obtained for each puppy for evaluation at 7 and 16 weeks of age. The total value for the social tendencies observed is expressed as a numerical value obtained by adding the values associated with each letter (D, N or S). The general activity level is represented by the number of movements during the course of the test (approximately 15 min). In this table, it is important to note that for nearly 50% of the puppies, the social tendencies shifted between evaluation from dominant to neutral or from neutral to submissive and that they increased only in 12% of the puppies.

Table 2 gives the correlation and the determination coefficients between the total value for the social tendencies at 7 and 16 weeks, between the total number of movements at 7 and 16 weeks and between the total number of movements and the total value for the social tendencies for the two age groups. The correlation between the total number of movements and the total value for the social tendencies at 7 and 16 weeks showed significant results only in females.

Table 3 gives the correlation values and the determination coefficients between the total obtained from the observations for each stimulus of the behavioral puppy test proposed by Campbell and the total number of movements at 7 and 16 weeks.

From the total values for the social tendencies, limits for dominance (D), neutrality (N) and submission (S) categories were calculated. They were respectively between 32 and 50, 17 and 31, and five and 16. This allowed an evaluation of the shift in social tendencies in the 39 puppies from the first to the second test. Fig. 3 provides a summary of this shift in relation to age and sex.

The general activity level, evaluated by the total number of movements counted in the observation area during the whole test, also varied with age. A range of limits for three categories, mobile, normal and sedentary, were established according to a frequency distribution analysis. Modification of the general activity level as reflected by the total number of movements in relation to age and sex is shown in Fig. 4.

#### 4. Discussion

No significant correlations between the total value for social tendencies observed at 7 and 16 weeks were obtained (Table 2). The shift in the social tendencies shows a trend towards regression from dominance to neutrality and submission. For the 39 puppies evaluated in the study at two different ages, 15 maintained the same social tendencies (38%), whereas 19 shifted from a dominant status to neutrality or from neutrality to submission (49%). Only five puppies increased the value for their social tendencies (13%). These observations also reveal that shift of social status is slightly greater in females than in males, although correlations are not significant (Table 2 and Fig. 3).

The modification of the general activity level, reflected by the number of movements counted, is not significantly different between 7 and 16 weeks. Fifteen puppies maintained the same activity level (39%); six puppies exhibited a reduced activity level (15%), and activity was increased in 18 (46%). These modifications appeared more prominent in males than in females. Males have a tendency to be more active than females at 16 weeks (Fig. 4).

As a group, correlations between behavioral observations and activity level were significant at both ages, the coefficient of correlation being higher at 16 weeks. This significant correlation is attributed to females. The values obtained for males do not reach the threshold of statistical significance (Table 2).

The same comment can be made for correlations between the number of movements and the behavioral observations for each test stimulus. Significant results were obtained at both ages. Statistical significance is also higher at 16 weeks of age and is related to females. Values obtained for males are not significant ( $P > 0.05$ ).

On the basis of these results, the behavioral puppy test proposed by Campbell does not reliably predict the social status of a puppy at an older age when applied at 7 weeks. With a different test, Scott and Beilfelt (1976) have obtained a very low correlation between age and social tendencies. Goddard and Beilharz (1986) have found a higher predictive value by using different tests each week and starting the first evaluation at the age of 12 weeks.

Our data show that when associated with a criterion of validity or a complementary independent test, the correlation between the total value for the social tendencies obtained with the behavioral puppy test and this criterion is then significant. Significance is nonetheless obtained only in females, and is particularly high at 16 weeks of age. A similar relationship between social tendencies and general activity level in puppies has also been discussed by Fox (1972). In further studies it would be useful to increase the number of males to support these results, because it has already been observed that females are more active than males (Humphrey and Warner, 1934).

The behavioral puppy test proposed by Campbell was designed to be a tool for predicting behavior and tendencies toward social dominance. Over the years, the test has been used as a tool to predict the social rank of puppies, probably because most breeders thought that the hierarchical rank acquired during the primary

socialization period is definitive. Nothing leads us to believe that the social rank is definitive from a young age. Trumler (1988) stated that at the time a puppy leaves the litter and is put in new surroundings, it must find its place in the new 'pack' of its human family.

## 5. Conclusions

Our results show that the behavioral puppy test, when applied at 7 weeks of age without an additional criterion, does not predict future social status of puppies. An independent criterion, such as a measure of general activity level, must be introduced along with the test for it to have predictive value. Furthermore, the test should be performed in older puppies beyond the end of the socialization period, at 16 weeks.

## Acknowledgments

This project was supported by a grant from the Canadian Veterinary Research Trust Fund (88-14; 89-02). We are very grateful to Louise Chartrand for her technical assistance, and to Claudette Souci, professional breeder, for allowing us to use her dogs.

## References

- Ader, R., 1965. Effects of early experience and differential housing on behaviour and susceptibility to gastric erosions in rat. *J. Comp. Physiol. Psychol.*, 60: 233–238.
- Anastasi, A., 1968. *Psychological Testing*. Macmillan, New York, 665 pp.
- Bartlet, M., 1985. Puppy aptitude testing. *Am. Kennel Gazette*, 31–34 and 64.
- Beaver, B.V., 1983. Clinical classification of canine aggression. *Appl. Anim. Ethol.*, 10: 35–43.
- Blackshaw, J.K., 1991. An overview of types of aggressive behaviour in dogs and methods of treatment. *Appl. Anim. Behav. Sci.*, 30: 351–361.
- Campbell, W.E., 1972. A behavior test for puppy selection. *Mod. Vet. Pract.*, 12: 29–33.
- Fox, M.W., 1972. *Understanding your Dog*. Coward, McCann and Geohegan, New York, 212 pp.
- Fox, M.W., 1974. *Concepts in Ethology: Animal & Human Behavior*. University of Minnesota Press, Minneapolis, 139 pp.
- Fuller, J.L., 1963. Early experience as a determinant of dog personality. *Southwest. Vet.*, 35: 73–80.
- Goddard, M.E. and Beilharz, R.G., 1986. Early prediction of adult behaviour in potential guide dogs. *Appl. Anim. Behav. Sci.*, 15: 247–260.
- Gray, J.A., Levine, S. and Broadhurst, P.L., 1965. Gonadal hormone injections in infancy and adult emotional behaviour. *Anim. Behav.*, 13: 33–45.
- Humphrey, E. and Warner, L., 1934. *Working dogs*. National Press, Palo Alto, CA, 261 pp.
- James, W.T., 1951. Social organization among dogs of different temperaments, terriers and beagles, reared together. *J. Comp. Physiol. Psychol.*, 44: 71–77.
- Krushinskii, L.V., 1962. *Animal Behavior: Its Normal and Abnormal Development*. Consultants Bureau, New York, 261 pp.
- Murphree, O.D. and Dykman, R.A., 1965. Litter patterns in the offspring of nervous and stable dogs: behavioural tests. *J. Nerv. Ment. Dis.*, 141(3): 321–332.

- Pfaffenberger, C., 1965. *The New Knowledge of Dog Behavior*. Howell Book House, New York, 206 pp.
- Pfaffenberger, C.J., Scott, J.P., Fuller, J.L., Ginsburg, B.E. and Biefelt, S.W. (Editors), 1976. *Guide Dogs for the Blind: Their Selection, Development and Training*. Elsevier, New York, 225 pp.
- Ross, S., Scott, J.P., Cherner, M. and Denengerg, V.H., 1959. Effects of restraint and isolation on yelping in puppies. *Anim. Behav.*, 8: 1–5.
- Scott, J.P. and Beifelt, S.W., 1976. Analysis of the puppy testing program. In: Pfaffenberger, C.L., Scott, J.P., Fuller, J.L., Ginsburg, B.E. and Bielfelt, S.W. (Editors), *Guide Dog for the Blind: Their Selection, Development and Training*. Elsevier, New York, 225 pp.
- Scott, J.P. and Fuller, J.L., 1965. *Genetics and Social Behaviour of the Dog*. University of Chicago Press, Chicago, 468 pp.
- Trumler, E., 1988. *Le chien pris au sérieux*. Jean-Jacques Puvert, Paris, 316 pp.
- Wright, J.C., 1991. Canine aggression toward people. *Vet. Clin. N. Am.*, 21 (2): 299–327.
- Young, M.S. 1988. Puppy selection and evaluation. In: *Dogs: Companions or nuisances?* Public Seminar, Werribee Veterinary Clinical Center, Princes Highway, 22: 8–15.