INTRODUCING DOGS INTO KENNELS: PREDICTION OF SOCIAL TENDENCIES TO FACILITATE INTEGRATION

S M Sonderegger[1] and D C Turner[2†]

[1] Pet Ethology Group, Ethology Department, Institute of Zoology, University of Zurich-Irchel, Switzerland

[2] Institute for applied Ethology and Animal Psychology, IET/IEAP, CH-8816 Hirzel, Switzerland

[†] Contact for correspondence and requests for reprints

Abstract   *Animal Welfare 1996, 5: 391-404*

Ethological observations of the introduction of new charges into a large mixed-sex group in a dog shelter, and the later behaviour of the dogs in the run, were used to investigate a method of early assessment of the dogs' reactions to the new situation. Subjects were divided qualitatively into four categories according to their interactional behaviour during the first two days ('dog-oriented', 'human-oriented', 'dog & human friendly', 'asocial'). This classification was compared to an independent division resulting from statistical analysis of the dogs' entry-sequences, and was found to be consistent for 80 per cent of dogs. One week after entry, both female and male dogs received distinctively fewer social interactions by conspecifics and tended to direct more interaction-initiating behaviour towards the keeper, thus demonstrating an integration process; females became more physically active and initiated significantly more interactions with other dogs; for males, the contrary was found. Qualitative comparison between first visitors and regular guests suggest that experienced dogs integrate faster, showing fewer behavioural signs of distress and engaging more often in investigatory behaviour. Results indicate that the assessment of dogs from their behaviour during the entry-sequence is a valid method to predict later tendencies. Males and females should be handled differently during introduction. The stress of entry into an existing group can therefore be reduced, improving the animals' welfare.

Introduction

Most studies testing dog behaviour are related to puppy testing or to the occurrence or prevention of problem behaviours (eg Scott & Fuller 1965; Campbell 1975; van den Borg *et al* 1991). To our knowledge no published material is available on the integration of dogs into a social kennel situation.

A recent study has shown clearly that, because of its suitability to the nature of the dogs, group-housing in animal shelters is highly preferable to single-housing (Mertens 1994). Keeping dogs in groups offers them the opportunity to satisfy their natural need for physical

exercise and for social contacts with conspecifics (and people), provoking fewer behavioural disturbances in the animals. However, dog shelters with group runs have the problem of introducing new charges into the group of residents. Besides coping with an unfamiliar environment and separation from its owner, the newcomer is confronted with immediate inspections by the dogs already in the run. Therefore, such introductions can represent a situation of additional social stress for the entering dog. The way in which the animal copes with this sudden change of life circumstances might be reflected in its behaviour, and one would expect the animal to behave differently once it has become familiar with the shelter situation. To people involved in dog kennelling it seems to be just common knowledge that new dogs go through a process of integration during the first couple of days in the shelter. Yet, the phenomenon itself has never received scientific attention. The present study investigated whether it was possible to demonstrate, from behavioural changes during the first week of the dogs' stay, an integration process; and if the behaviour shown by the dogs immediately after the entry allowed one to predict the course their behaviour would take during that integration process. This prediction could be of major importance to the animals' welfare, as it would enable the keeper to take suitable measures for shortening the individual's integration process and for directing its social behaviour into forms more desirable to the shelter.

Methods

The basic plan was to categorize dogs according to the behaviour shown on their first and second day in the run, ie after their initial introduction, and then to retrospectively analyse their entry sequences to elucidate their typical behaviour patterns during introduction. Factors which could influence the behaviour of the dogs during the integration process including their sex and age and previous shelter experience were also assessed.

Subjects and housing conditions

The sample consisted of 68 single dogs (usually kept in their own homes without conspecifics) of any breed, sex, and age (see Table 1) which were brought for at least a one-week stay to a large dog shelter with a group run system.

Table 1 **Composition of the sample of dogs (n = 68).**

Sex	intact males	intact females	castrated males	spayed females
	31	26	3	8
Age	≤ 3 years	4-6 years	7-9 years	≥ 10 years
	17	21	18	12
Height to shoulder	small dogs (≤ 41cm)	medium sized dogs (42-62cm)		tall dogs (≥ 63cm)
	12	36		20
Breed	pure breeds (31 different breeds) 59		mongrels 9	

During the observational phase the shelter lodged about 100 residents. These were allowed to spend a total of five to six hours (0730-1130h, 1800-1930h) a day together under

human supervision in a large outdoor enclosure surrounded by a 2m high fence. An 800m² enclosure with gravel was used daily, and an additional 800m² of lawn was used occasionally. For the rest of the time, the dogs were housed in pairs of opposite sex or singly in pens measuring 2.3m², with a wooden floor and a visual barrier to the neighbouring pen, each containing bedding places and a water bowl.

Data collection

All subjects were introduced into the shelter's run by a member of the shelter staff who kept them on leash for 5min and then released them. Focal animal sampling (Altmann 1974) was done *ad libitum* over the first 15min starting with the subject's entry (focal animal sample I = entry-sequence), then during another 15min on the first day but after the subjects had spent at least 1h in the run (focal animal sample II). Observations made during the focal animal samplings were spoken into a dictaphone and transcribed later on that day. Furthermore, on the first day (after the focal animal sampling II), the second, and the seventh day, 5min of instantaneous sampling (Altmann 1974) of each subject was conducted with 30sec intervals, during which the following items were recorded on a check sheet:

a) Distance of subject to the nearest dog
b) Distance of subject to the supervisor
c) Is the subject in movement or stationary (physical activity)?
d) Is the subject involved in a social interaction, and if so, is its partner conspecific or human (interactional behaviour)?
e) Is the subject initiator or receiver of the social interaction (interactional behaviour)?

Any behaviour directed towards a conspecific or human not more than 3m away was defined as a social interaction. The subject was considered as initiator in an interaction with the supervisor if the distance between them was 0m, or if it approached the supervisor to a distance ≤ 1m and stayed with that person for at least 5sec after being called in a friendly voice.

Observations were always carried out by the same person (the first author) from outside and 2m above the run, just above the entrance through which new dogs were introduced.

Categorization of subjects

Pilot observations had indicated that dogs could be categorized into four basic behavioural types according to their social behaviour shown during their first few days in the shelter. These categories were called 'dog-oriented', 'human-oriented', 'dog & human friendly', and 'asocial', and could be characterized as follows:

- 'dog-oriented' dogs engage immediately in interactions with conspecifics, yet ignore the human supervisor completely.
- 'human-oriented' dogs seek immediate contact with the supervisor and/or remain within a short distance of that person; they are very reluctant to interact with conspecifics.
- 'dog & human friendly' dogs direct social behaviour both towards other dogs and the supervisor.
- 'asocial' dogs spend the first part of their stay sitting in a distant corner of the run without interacting, just watching. They reject approaches by conspecifics, and show reserved or even timid behaviour towards the supervisor.

The subjects were categorized by the criteria shown in Table 2. For this, each individual dog was rated independently: from data in the focal animal sample II and from the instantaneous sample records of days one and two, the former being decisive in case of inconsistency.

Table 2   **Criteria for the categorization of subjects.**

Behavioural category	Focal animal sample II (on day 1)	Instantaneous samples (on days 1 & 2)
Dog-oriented	Initiates – no interactions with S – ≥ 4 interactions with C	Initiates – no interactions with S – ≥ 2 interactions with C Distances to S in 70% of the intervals > 10m or at random
Human-oriented	Initiates – ≥ 1 interactions with S – ≤ 3 interactions with C	Initiates – ≥ 1 interaction with S, and/or distance to S ≤ 5m in 70% of the intervals – ≤ 1 interaction with C, or – ≥ 2 interactions with C if within a distance to S ≤ 5m
Dog & human friendly	Initiates – ≥ 1 interaction with S – ≥ 4 interactions with C	Initiates – ≥ 1 interaction with S – ≥ 2 interactions with C
Asocial	Initiates – no interactions with S – ≤ 3 interactions with C	Initiates – no interactions with S – ≤ 1 interaction with C Distance to S in 70% of the intervals > 10m or at random

C = conspecifics; S = supervisor

Statistical classification of subjects

In order to determine the feasibility of predicting an individual's eventual integration based on its entry behaviour, canonical discriminant analyses (Manly 1986) were performed on observational data from the subjects' entry-sequences: the first analysis (DA 1) was on data from the initial 5min in the run when subjects were on leash, the second (DA 2) analysed data from minutes 6–10 when the dogs could move freely. The behavioural variables are listed below.

The power of DA 1 and DA 2 were tested by cross validation (Manly 1986). For the cross validation procedure 10 per cent of the data (from 6 individuals selected randomly) were set aside and the discriminating rule in the canonical DA determined from the remaining 90 per cent (62 individuals). The power of the discriminating rule was then tested on the 10 per cent of the data that were set aside. This procedure was repeated 10 times.

Besides sex and age of subjects, behavioural data were considered as independent variables if they were shown by at least half of the animals of at least one of the above

mentioned categories. Independent behavioural variables included in DA 1 were: *allows olfactory control* (ie does not withdraw or snap when sniffed), *approaches conspecific, approaches supervisor, evades contact with conspecific, ignores conspecific, looks at supervisor, pulls-ahead, sits* (as a behavioural state), *sniffs conspecific, sniffs ground, tail-wags to conspecific, tail-wags to supervisor, tolerates mounting or head-on-the-back.*

The same procedure was used to select independent behavioural variables entering into DA 2. These were: *approaches conspecific, circles, evades contact with conspecific, is courted, is guarded, muzzle-contact, proximate to supervisor, pushes through conspecifics, receives assertive display, sits, socio-positive behaviour towards supervisor* (ie *approaches/looks at/tail-wags to supervisor), sniffs conspecific, sniffs ground, tail-wags to conspecific, urine-marks.*

Behavioural differences between first visitors and dogs with shelter experience
The influence of a dog's experience in this shelter on its behaviour shown during the entry-sequence would preferably have been tested within the same individual. Unfortunately, this was not possible, since none of the first five visitors of the sample were brought to the shelter for a second stay during the observational phase. For each of the first visitors, therefore, the best corresponding dog (closest match in breed/temperament, sex, age, and category) with shelter experience was selected from the sample for qualitative comparison of observational data, collected from minutes 11–15 of the entry-sequence.

First visitors were expected to show more behavioural signs of distress. Behavioural parameters assumed to indicate stress were: seeking proximity to the supervisor (s) (ie *approaches s, accompanies s, close to s, body contact with s*), and the rather passive strategy, wait and see! (ie *sits, watches, evades conspecific*).

Experienced dogs were expected to initiate more social contacts with conspecifics and to engage more intensely in investigatory behaviour. For social contacts with conspecifics (c) the following behaviours were considered: *approaches c, tail-wags to c, solicits play/play.* Exploration was quantified on the basis of the behaviours *sniffs conspecific,* and *sniffs ground.*

Results and Discussions
Confirmation of an integration process
Statistical comparison of physical activity and interactional behaviour on the basis of instantaneous sample records from day one to days two and seven demonstrated changes in behaviour indicative of an integration process for intact female and male dogs (Wilcoxon signed rank, one-tailed). Spayed females and castrated males were not tested as the number of animals was too small.

Female dogs (n = 22) showed no significant behavioural changes from day one to day two, with the exception of receiving fewer interactions from conspecifics. Yet one week after entry they showed tendencies towards more physical activity and active interactions with the supervisor, a significant rise in the amount of initiating and a further decrease in the frequency of receiving interactions by conspecifics (Table 3).

Male dogs (n = 28) tended to be less physically active on their second day, although interactional behaviour remained at the same level as on the day of entry. On the seventh day, the reduction in physical activity was significant, and tendencies to initiate and receive

fewer intraspecific interactions were found; interestingly, the number of males directing social behaviour towards the supervisor rose from only three animals on the second day up to twelve on the seventh day (Table 3).

Table 3 **Summary of results on behavioural changes in female and male dogs during the integration process (Wilcoxon, one-tailed).**

	Female dogs (n_1 = 22)		Male dogs (n_2 = 28)	
	1st vs 2nd day	1st vs 7th day	1st vs 2nd day	1st vs 7th day
Physical activity	n=19, Z=-0.93 P<0.2	n=19, Z=-1.52 P<0.07 ↑	n=24, Z=-1.6 P<0.06 ↑	n=22, Z=-2.34 P<0.01 ↓*
Initiated interactions with conspecifics	n=13, Z=-0.72 P<0.3	n=16, Z=-1.93 P<0.03 ↑*	n=24, Z=-0.4 P<0.4	n=22, Z=-1.52, P<0.07 ↓
Initiated interactions with supervisor	n=7, Z=-0.26 P<0.4	n=8, Z=-1.42 P<0.08 ↑	n=3, not tested	n=12, Z=-1.03 P<0.2 ↑
Received interactions by conspecifics	n=18, Z=-1.88 P<0.03 ↓*	n=17, Z=-2.07 P<0.03 ↓*	n=17, Z=-0.32 P<0.4	n=14, Z=-1.52 P<0.06 ↓

n = number of dogs considered in the test. ↑ = increase, ↓ = decrease in frequency, * = significant at $P < 0.05$

Discussion

The lack of a behavioural change on the dogs' second day indicates that integration had not yet taken place. The significant decrease of passive interactions observed in females was due to the abated interest of the other dogs. Such a decrease was not found for male dogs. Even though incoming males got checked by their conspecifics too, they received overall far fewer social contacts than females did. This was true for the first day (Mann-Whitney U, one-tailed, females n_1 = 26, males n_2 = 31: Z = -3.296, $P < 0.0005$), the second (Z = -1.509, $P < 0.07$), and the seventh day (Z = -3.168, $P < 0.001$). As a consequence, male dogs had the opportunity to cope with the new environment earlier and were less disturbed by conspecifics. This explains the diminished physical activity in male dogs on their second day in the shelter.

The behavioural changes found on the seventh day are related to the dogs becoming more relaxed than at the beginning of their stay, indicating that an integration had taken place during this period (see General Discussion). Because of the above mentioned distinct social situation of the sexes in the group, the social stress males and females experience during introduction might differ . This would account for the opposite behavioural development during the integration process observed in male and female dogs.

Assessment of dogs

The original categorization of the 68 subjects led to the distribution shown in Table 4. Comparison of each subject's original categorization with the statistical prediction resulting from DA 1 (subjects on leash) yielded consistent groupings for 78 per cent of dogs (Table 5) (cross validation: 72%; this is regarded as a fairly high correspondence). The analogous comparison with DA 2 statistical prediction, (subjects unleashed) resulted in consistent

groupings for 82 per cent of dogs (Table 6) (cross validation: 62%; the lower value here is due to the greater variation in dog behaviour shown when they were unleashed.)

Table 4   **Results of the categorization of subjects.**

Category	Sex	Age (years)				Total
		≤ 3	4–6	7–9	≥ 10	
Dog-oriented	Intact females	1			1	2
	Spayed females	1		1		2
	Intact males	2	12	6	6	26
	Castrated males					0
	Total	4	12	7	7	**30**
Human-	Intact females	2	1	4	3	10
oriented	Spayed females	2	1			3
	Intact males	1		1		2
	Castrated males			1		1
	Total	5	2	6	3	**16**
Dog & human	Intact females	5	2	2	1	10
friendly	Spayed females			1		1
	Intact males	2	1			3
	Castrated males		1			1
	Total	7	4	3	1	**15**
Asocial	Intact females		3	1		4
	Spayed females			1	1	2
	Intact males					0
	Castrated males	1				1
	Total	1	3	2	1	**7***

*The relatively small number of animals in this category probably reflects a sampling bias, since only dogs which are perceived by their owners as being 'social' are brought to a shelter with a group keeping system.

Table 5   **Comparison of the categorization of subjects with the statistical prediction resulting from DA 1 (dogs on leash).**

Category	Statistical prediction (results of DA 1)			
	A	B	C	D
A (n = 30)	**26**		2	2
B (n = 16)		**12**	3	1
C (n = 15)	3	1	**9**	2
D (n = 7)			1	**6**
Total (n = 68):	29	13	15	11

Behavioural categories: A = dog-oriented, B = human-oriented, C = dog & human friendly, D = asocial. The numbers in bold represent the consistent groupings.

Table 6   **Comparison of the categorization of subjects with the statistical prediction resulting from DA 2 (dogs off leash).**

Category	Statistical prediction (results of DA 2)			
	A	B	C	D
A (n = 30)	26		1	3
B (n = 16)	1	14	1	
C (n = 15)	3	1	10	1
D (n = 7)			1	6
Total (n = 68):	30	15	13	10

Behavioural categories: A = dog-oriented, B = human-oriented, C = dog & human friendly, D = asocial. The numbers in bold represent the consistent groupings.

DA 1 assigned most importance to the following variables (in decreasing order): *intact male, looks at supervisor, sits, sniffs conspecific, pulls-ahead, sniffs ground,* and *tail-wags to supervisor*. Highest weighted variables in DA 2 were (in decreasing order): *intact male, proximate to supervisor, socio-positive behaviour towards supervisor, is guarded, sniffs conspecific, urine-marks, receives assertive display,* and *is courted*.

Discussion

For both discriminant analyses all the multivariate tests were highly significant ($P < 0.0001$), whereas tests of residuals only partly resulted in significant values. Unfortunately, this could not be remedied by the elimination of variables with F values at higher P levels (weaker tendencies) without a major loss of information. Since this study was aimed at outlining a picture of dog behaviour patterns to help the supervisor to rate new dogs, analyses were carried out considering all variables.

The classifications of subjects predicted by DA 1 and DA 2 coincided well with the independent original categorization. The number of dogs with inconsistent groupings lies within biological acceptance for individual variability. Approximately half of the 'wrong' classifications were a consequence of the way the statistical test worked. For example, the importance attributed by both DA 1 and DA 2 to the variable *intact male*, to which several behavioural variables were correlated, caused males from other categories to be rated as dog-oriented; females included in this male-dominated category became distributed into the obviously more female-like categories: human-oriented, dog & human friendly, and asocial (see distribution of the sexes). For further investigations, we therefore would suggest using a larger sample and performing the canonical discriminant analysis on the sample split by sex. The rest of the inconsistent groupings were attributable to the actual behaviour of those dogs during the entry-sequence.

Inconsistent classifications mostly involved animals from the category dog & human friendly. This makes sense, since these animals, depending on the situation, can show behaviour typical for dog-oriented and human-oriented animals, respectively. However, the dogs of the category dog & human friendly are the least problematic to the shelter. Therefore, the assessment of dogs from their behaviour shown during the entry-sequence

appears to be a valid and practical method. Category-specific behaviour patterns during the entry-sequence and suggestions for handling problematic individuals will be presented in the final discussion.

Distribution of sexes in the behavioural categories

A Chi-square test for two independent samples (intact & spayed females: $n_1 = 34$; intact males: $n_2 = 31$) proved the sex-dependent distribution of subjects relative to the categories[4], dog-oriented, human-oriented and dog & human friendly, to be highly significant ($X^2 = 28.7$, $P < 0.0001$). The largest category, dog-oriented, included almost all intact males of the sample and very few females. In contrast, the categories human-oriented and dog & human friendly were composed mainly of intact and spayed females, and the category asocial contained no intact males at all (see Figures 1a and 1b).
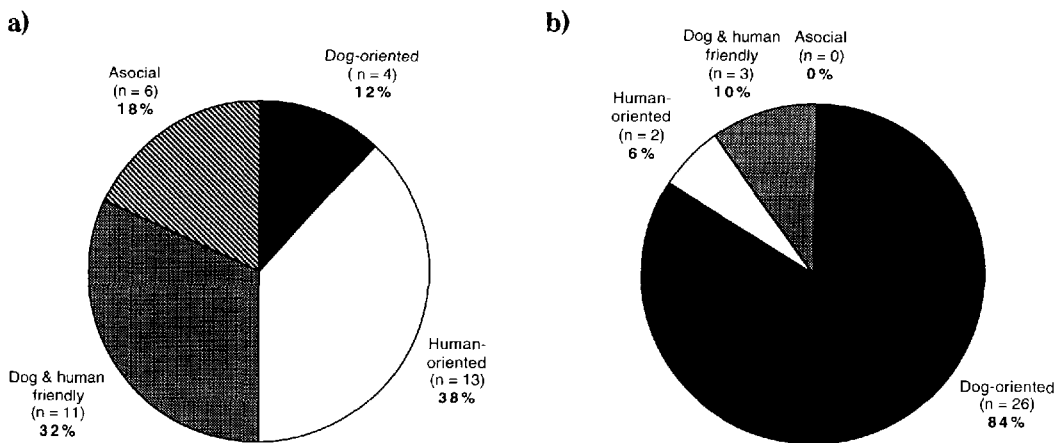

Figure 1 Distribution of the subjects (%) amongst the behavioural categories a) for intact and spayed females (n = 34); b) for intact males (n = 31).

Discussion

Twenty-six out of the 31 males of the sample fell into the category dog-oriented. This is seen as a consequence of the marked sexual drive in male dogs (eg Fox 1978; Immelmann 1983; Zimen 1989), which obviously persists into old age. Being stimulated by the odour of bitches in heat kept in an adjacent run, and by the presence of females in the group, sexuality fundamentally influenced males' social behaviour: a male not only has to know which females are potentially available to him, but also has to be able to estimate the strength of his male rivals. Therefore, a male is highly motivated to investigate and interact with its conspecifics. In a group of about 100 dogs, this is a rather time-consuming undertaking and explains why male dogs pay little attention to the supervisor during that period. Accordingly, males rarely fell into the categories human-oriented or dog & human friendly, and never were rated as asocials. As they usually do not initiate interactions with the supervisor, many

---

[4] The category asocial was too small to be considered for the test.

males must only experience that person during the first two days as being restrictive: they are rebuked when disturbing a female too much, or when assertive displays towards other males become more serious.

Amazingly, only four female dogs were assigned to the category dog-oriented. Particularly striking was the behaviour of one intact female which urine- and faeces-marked in a very male-like manner during the first 5min after entry into the run; males treated her as if she was on heat. The other females, one intact and two spayed animals, expressed little social engagement and showed low physical activity; just the fact that they occasionally sniffed conspecifics as they passed by prevented them from being rated as asocials.

The categories human-oriented and dog & human friendly both required of their members active interactions with the supervisor. Obviously, female dogs were more ready to do so, which at least in part has to be interpreted as an effect of the special situation in the run: since the social interest of male dogs clearly concentrates on the females, these can become distressed at times. Most female dogs learn very quickly that males do not dare to court them when close to the supervisor, the most dominant animal in the run. Thus, whenever a female wants to relax she can withdraw to the supervisor; from here, it is only a small step to interacting with him. Therefore, human-oriented females spent most of the time in the run close to the supervisor, whereas dog & human friendly ones withdrew only temporarily. Actually, the behavioural variables *is courted* and *is guarded* also were of major importance in DA 2 for splitting female dogs into the categories: human-oriented females received relatively little courting but much guarding behaviour; for females of the category dog & human friendly, the values of the two variables were about equal; whereas asocial females received far more courting than guarding behaviour because of their usual immobility at a large distance from the supervisor.

The category asocial contained exclusively females with very low physical activity, either caused by age, corpulence, or learned strategy. The latter is thought to apply to three intact females: all of them reacted very distressed when being introduced into the run, snapping desperately and seeking to escape from the surrounding dogs. The supervisors punished such behaviour by a twitch at the leash. Left off leash, these bitches ran away to a distant corner of the run and sat down to block their anogenital region, at the same time signalling their readiness to defend themselves. At this point, the curious pursuers soon lost interest in them. Therefore, these three individuals missed the experience of the supervisor's protection, but learned that they would be largely ignored by conspecifics if they kept quiet.

Distribution of age relative to the behavioural categories

Considering the whole sample, a category-specific age distribution could not be demonstrated (Kruskal-Wallis, n = 68: H = 4.67, $P < 0.2$).

Discussion

A dog's interactional behaviour is influenced by various factors (eg Scott & Fuller 1965; Immelmann 1983; Zimen 1989) of which the most important for this study are:
- social confidence (results from the degree of socialization during the sensitive
    phase, ie from the 3rd to the 14th week after birth, and from social experiences
    made later in life);
- sex and hormonal status;

- social tendency (individual social inclination) and momentary motivational state; and
- age.

All of these factors interact with each other in multiple ways. It is understandable, therefore, why the distinct interactional behaviour of the dog-oriented, the human-oriented, the dog & human friendly, and the asocial subjects could not be related to just differences in age. Sexes could not be tested separately because sample sizes were too small to allow this.

Behavioural differences between first visitors and experienced dogs

As can be seen in Figure 2, first visitors indeed showed more behavioural signs of distress, initiated fewer social contacts with conspecifics, and engaged less in investigatory behaviour than their experienced counterparts.
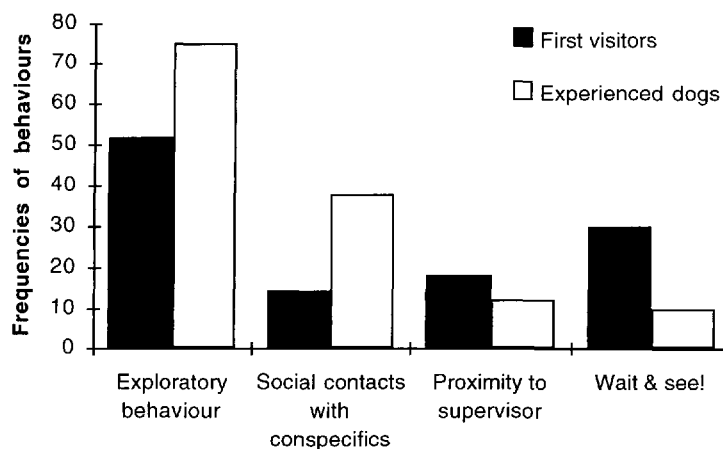

Figure 2   **Total number of behaviours shown by first visitors (n = 5) and by dogs with shelter experience (n = 5) during minutes 11–15 after entry.**

Behavioural parameters: *sniffs conspecific, sniffs ground* (exploratory behaviour); *approaches conspecific, tail-wags to conspecific, solicits play/play* (social contacts with conspecifics); *approaches supervisor, accompanies supervisor, close to supervisor, body contact with supervisor* (proximity to supervisor); *sits, watches, evades conspecific* (wait and see!).

Discussion

Obviously, the experiences made in earlier visits to the shelter quickened the recovery from the 'shock of entry': 11–15min after entry into the shelter's run, past guests of the shelter, compared to first visitors, found themselves notably in an advanced stage of integration. Also in the following stages of the integration process these dogs will not have to cope with as much newness, even though some things will be unfamiliar; this too speaks for the hypothesis that experienced dogs integrate faster.

General Discussion

The main aim of this study was to investigate a method of early assessment of dogs while being introduced into the group. This was accomplished with the aid of canonical

discriminant analyses. As individuals differ considerably in the frequency of showing a particular behaviour, we focussed on distinct behaviour patterns typical for members of the categories. Therefore, more behavioural variables were considered for the analyses than would have been allowed from the statistical point of view.

Tables 7 and 8 summarize such category-typical behaviour patterns for the most important behavioural variables of DA 1 and DA 2. The pattern emerges from the combination of the individual variables typical for the members of each category. However, further investigation will be necessary to expand and shape these preliminary findings.

Table 7   **Category-typical behaviour patterns for the most important behavioural variables of DA 1 (dogs on leash).**

	looks at supervision			sits			sniffs conspecifics			pulls-ahead			sniffs ground			tailwags to supervisor		
	h	m	l	h	m	l	h	m	l	h	m	l	h	m	l	h	m	l
A		●		●			●●				●		●					●
B	●				●+		●				●●			●		●		
C		●			●			●+			●		●+				●	
D		●	●					●			●				●			●

Behavioural categories: A = dog-oriented, B = human-oriented, C = dog & human friendly, D = asocial. Relative frequencies of behaviours: h = high, l = low, m = moderate. ●● = Members of this category show that behaviour with a much higher frequency than members of the other categories do. ● + = Members of this category tend to show that behaviour more often than members of the category noted at the same frequency level (ie human-oriented dogs sit more often than dog & human friendly ones do).

Table 8   **Category-typical behaviour patterns for the most important behavioural variables of DA 2 (dogs off leash).**

	proximate to supervisor			socio-positive behaviour towards supervisor			is courted			is guarded			sniffs conspecific			urine marks, and receives assertive display		
	h	m	l	h	m	l	h	m	l	h	m	l	h	m	l	h	m	l
A		●			●			●		●			●●			●●		
B	●			●				●		●				●			●	
C		●			●		●				●+			●+			●	
D		●				●	●				●				●			●

Behavioural categories: A = dog-oriented, B = human-oriented, C = dog & human friendly, D = asocial. Relative frequencies of behaviours: h = high, l = low, m = moderate. ●● = Members of this category show that behaviour with a much higher frequency than members of the other categories do. ● + = Members of this category tend to show that behaviour more often than members of the category noted at the same frequency level (ie 'human-oriented' dogs sit more often than 'dog & human' friendly ones do).

Regarding the interests of the shelter staff, dogs expressing rather inconvenient behaviour are those from the categories asocial and dog-oriented, as these tend to ignore, or even evade, the supervisor. The following suggestions for the handling of such individuals during introduction have been derived from results of this study and should be tested in practice.

When a new charge is suspected to be asocial, it is probably advantageous to keep this individual on a leash until all the residents have satisfied their curiosity and dispersed again. This might also help the animal experience the supervisor as a reliable protector; as it learns to relax near that person, stress of entry might be reduced, improving the animal's welfare (see discussion of the distribution of sexes).

Taking into account that intact males turned out to be almost exclusively dog-oriented during introduction, it seems wise to permit them first to investigate their conspecifics and the new environment. Yet, as male dogs at the beginning of their integration process rarely interact with the supervisor, it is up to that person to call the newcomer in a friendly voice and have it sit close by for a few minutes. Starting with this procedure about 1h after the newcomer's entry, and repeating it several times during the dog's first and second day, would guarantee that the male does not only experience the supervisor as being restrictive (see discussion of the distribution of sexes).

It has been clearly shown that dogs do undergo an integration process during their first week of stay in a shelter with a group keeping system, and that the sexes develop distinct tendencies. However, no comments can be made on how long the integration process lasts on average[5], nor whether it lasts longer for females than for males, nor whether dogs integrate faster into a shelter with group keeping than into one with a single housing system. If the latter speculation could be corroborated by further investigations, from the point of view of the animals' welfare this would be an important reason to support the establishment of group keeping systems in dog shelters.

When generalizing these findings to other shelter situations, it should be kept in mind that observations for this study were made in a boarding kennel for pets which kept dogs in an unusually large group. Field observations on wolves living within habitats of optimal prey supply found the largest packs were of 20-30 individuals (Mech 1970). Normally, packs consist of less than 8 animals because of aggression that arises between pack members. The inherited ability of dogs to organize themselves in packs presumably is overtaxed when kept within a group of 50-100 conspecifics. Yet, in shelters keeping their residents in groups of 10-30 dogs, these animals might show stronger tendencies to establish a social hierarchy. Then one would expect more intraspecific aggression to establish the hierarchy, and the highest ranking dogs might compete with the supervisor for the alpha position.

Animal welfare implications
This study represents a first attempt to assess the relationship between dog behaviour upon entry into a social kennel situation and the integration process. It has been shown that it is possible to predict the course of a dog's integration process by observing its entry behaviour.

---

[5] The first author gained the impression that no further behavioural changes took place after the dog's third or fourth day in the shelter.

Kennel supervisors are provided with behavioural patterns which should facilitate their work and help to improve their charges' welfare.

Stress of entry was found to be of shorter duration in individuals which have already gone through an introduction into a large group of dogs earlier in life. It is probable, therefore, that dog owners can augment their pet's welfare during the beginning of its stay in the shelter by always taking it to the same institution.

Although female dogs seem to become a little more distressed when being introduced to the group than males, they soon recover, learning strategies to cope with the situation in the group run. It is thought to be important for shelters with group keeping systems to have about as many (or even more) females in the run as males. This would diminish the rivalry between the males and relieve the social pressure directed towards the females.

Acknowledgements

References

Altmann J 1974 Observational study of behavior: sampling methods. *Behaviour 49 (3-4):* 227-267

Campbell W E 1975 *Behavior Problems in Dogs.* American Veterinary Publications Inc: Santa Barbara, USA

Fox M W 1978 *The Dog: Its Domestication and Behavior.* Garland STPM Press: New York, USA

Immelmann K 1983 *Einführung in die Verhaltensforschung.* Verlag Paul Parey: Berlin/Hamburg, Germany

Manly B 1986 *Multivariate Statistical Methods: A Primer.* Chapman & Hall: London, UK

Mech L D 1970 *The Wolf: The Ecology and Behavior of an Endangered Species.* Natural History Press: New York, USA

Mertens P 1994 *Die Haltung von Hunden in Tierheimen: Verhaltens- und tierschutz-relevante Aspekte der Einzel- und Gruppenhaltung.* Shaker: Aachen, Germany

Scott J and Fuller J 1965 *Dog Behavior – The Genetic Basis.* The University of Chicago Press: Chicago, USA

van den Borg J, Netto W J and Planta D J 1991 Behavioural testing of dogs in animal shelters to predict problem behaviour. *Applied Animal Behaviour Science 32:* 237-251

Zimen E 1989 *Der Hund: Abstammung – Verhalten – Mensch und Hund.* C. Bertelsmann Verlag GmbH: München, Germany