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Applied Animal Behaviour Science 103 (2007) 105–117
APPLIED ANIMAL BEHAVIOUR SCIENCE
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# Measuring attention deficit and activity in dogs: A new application and validation of a human ADHD questionnaire

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Accepted 28 March 2006
Available online 30 May 2006

**Abstract**

Recently more evidence has been found that the dog could serve as a viable model for studying the evolutionary emergence and regulating mechanisms of human behaviour. This approach is of especial importance when someone wants to study the underlying mechanisms of such human behaviour disorders like attention deficit hyperactivity disorder (ADHD). Using questionnaires is a widely accepted methodology in this field of human behaviour research and recently many reported parallel observations also on dogs (e.g. questionnaire analysis of temperament traits). However, the handicap of this line of studies is, that the psychometric properties (validity) of the animal questionnaires were rarely examined, therefore, the reliability of this methodology remains uncertain.

In the present paper a 13-item questionnaire assessing attention skills, impulsivity and motor activity in pet dogs was developed on the basis of a validated one used for evaluating ADHD related problems in children. The primary purpose of this study was to measure reliability and validity of the questionnaire in order to introduce a new method for studying behaviour problems related to attention skills and the levels of activity/impusivity in pet dogs.

The owners of a pet dog population ($N = 220$) of many different breeds (69) were involved in the study and the sample was balanced for the dogs' age, gender and training/qualification. Internal and external validity of the questionnaire were analysed and results supported the relevance of the two subscales predetermined from the items of the questionnaire (inattention and activity–impulsivity). Comparisons of the inattention and activity–impulsivity scores of the different age-, gender- and training-groups showed significant effects of age and training on the attention skills in the dogs. Findings suggest that the application

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0168-1591/$ – see front matter 
doi:10.1016/j.applanim.2006.03.017

of human ADHD questionnaire (dog-ADHD rating scale) is a reliable and valid method of assessing attention skills and activity in dogs.


*Keywords:* Dog; Questionnaire; Validity; ADHD; Activity

## 1. Introduction

Attention deficit hyperactivity disorder (ADHD) has been described in human children's behaviour (e.g. Gittelman et al., 1985). This disorder is characterized by two features: problems in attention skills and abnormal motor behaviour. The phenotypic manifestation of this trait is often very divergent involving different degrees of attentional and/or motor deficits (Huang-Pollock and Nigg, 2003). These aspects of the disease can be studied either by tasks requiring persistent cognitive activity or by behavioural tests measuring fine movements and controllability of motor actions (e.g. Kashala et al., 2005). Recent surveys estimate the prevalence of ADHD among children within a relatively broad range of occurence suggesting that 1–12% of children are more or less affected (e.g. Faraone et al., 2003; Biederman and Faraone, 2005). Moreover, ADHD is often associated with other behaviour disorders such as abnormalities in social behaviour (Colledge and Blair, 2001), enhanced aggression (Saldana and Neuringer, 1998), disability for adapting oneself to the norms of the social group (e.g. Mannuzza et al., 2002; Mugnaini et al., in press; Willcut and Carlson, 2005) and problems associated with cognitive, language, motor, emotional and learning impairments (Pliszka, 1998; Barkley, 2003). Although some efficient treatment methods has been suggested, very little is known about causal mechanisms of ADHD. To date different underlying mechanisms are supposed, and many agree that the manifestation of this disorder is associated with anomalies in the dopaminergic and/or noradrenergic systems (e.g. Inoue and Lupski, 2003).

Today rats and mice provide the preferred animal model for experimental observations on ADHD-related behaviours (e.g. Boix et al., 1998). Although, these laboratory species offer some advantage of standard phenotype and testing experimental protocols, they are less suitable for modelling human social relationships, which is an important factor in the emergence of children's hyperactivity disorder.

Recently it has been suggested that dogs could provide a useful model for some aspects of human behaviour because of the similarity of evolutionary processes that have shaped their behaviour (Miklósi et al., 2004). At present most dogs are living in human social settings and are involved in complex social interactions with humans. Recently, such functional behavioural analogies between man and dog have been argued for in the case of social-communicative skills (Miklósi et al., 2004) and personality models (Jones and Gosling, 2005). Moreover, Fox (1975) noted parallels in psychosomatic responses and abnormal behaviour in children and dogs, whilst more recently Overall (2000) described parallels between human and canine separation anxiety, or obsessive–compulsive disorder. More importantly, many of such disorders develop in different dog breeds without any purposeful artificial selection to the trait providing a natural model for the human case in contrast to rodents where inbred strains selected purposefully are used to observe such behaviours. It is likely that the similarity goes beyond the level of behaviour, and if there are genetic contributing factors in the case of humans, similar effects are to be expected also in the case of dogs.

Using simple behaviour tests, different levels of activity and learning ability have been observed in dogs (Bareggi et al., 1979a,b; Corson et al., 1980). In addition there was a high

individual variability in the reaction to amphetamnine and *p*-amphetamine treatment. These studies concluded that different brain mechanisms jointly control behavioural activity.

Recent work on dogs provided evidence that questionnaire analysis could be a fruitful approach to get relevant data about such temperament traits of dogs like activity and impulsivity (e.g. Serpell and Hsu, 2001; Jones and Gosling, 2005). The basic assumption of this methodology is that the owner who lives with the dog knows the behaviour of his/her dog well (similarly to parents living with their infants) and specific behaviour traits can be studied by well elaborated questionnaires. A further obvious advantage of this method is that this way we can obtain data about large representative groups of dogs (compared to the aforementioned laboratory observations). Many recent studies have also shown that similarly to parent's attitude in 'parental questionnaire' studies (ADHD RS Parent Version, DuPaul, 1998) dog owners are pleased to fill in questionnaires about the behaviour of their dogs (e.g. Podberscek and Serpell, 1996, 1997; O'Farrell, 1997; Topál et al., 1997; Pongrácz et al., 2001; Sallander et al., 2001; Fuchs et al., 2005).

The problematic point of this line of studies is that apart from few exceptions (Hsu and Serpell, 2003) the psychometric properties (validity) of these questionnaires were not studied so the scientific reliability of the data obtained this way are uncertain. Validity can be measured in four main ways: logical or face validity, content validity, construct validity and criterion validity (George et al., 2003). Moreover, in contrast to the apparent parallels between parent-infant and dog-owner relationships (see e.g. attachment Topál et al., 1998, 2005) which predicts that the relevant application of human 'parental questionnaires' to dogs may be a powerful way of behaviour evaluation, the potential possibilities of this approach have not been utilized.

The purpose of the present study was twofold: (I) We wanted to develop a questionnaire assessing attention skills, impulsivity and motor activity in pet dogs on the basis of a human parental questionnaire. (II) We aimed at measuring reliability and validity of the questionnaire by using standard psychological methods for assessing parental perceptions of the behaviour of their children.

## 2. Methods

### 2.1. Development of the questionnaire

Dog owners were asked to fill in a questionnaire which was designed to measure attention deficit and activity–impulsivity in their dogs (dog-ADHD rating scale owner version, see Appendix I). The questionnaire was developed on the basis of a validated human attention-deficit hyperactivity disorder (ADHD) questionnaire involving 18 items (ADHD RS Parent version, DuPaul, 1998). Before using this questionnaire the items were rewritten in order to adjust the statements to the case of the dog and five items were left out of the final version because these were too 'human specific' statements (e.g. 'is often forgetful in daily activities', 'often loses things needed for tasks and activities', 'often blurts out answers before questions have been finished'). In addition to the 13 items some other data (names of the owner and dog, date of birth, gender, breed and training qualification) were also recorded. Respondents were requested to describe how often their dogs behaved according to the specific situations formulated in items 1–13. The owners had to choose answers from the presented alternatives representing different frequencies of how often the statement is true for their dog on a four level scale (never-rarely-often-very often). Statements relating to attention deficit and activity were presented in a mixed order (see Appendix I).

Six items (1, 2, 3, 7, 10, 12) were designed to refer to inattention in the dog (Subscale I) and seven (4, 5, 6, 8, 9, 11, 13) were designed to measure the level of motor activity and impulsivity (Subscale II).

Filling in the questionnaire took 3–10 min and it was done in the presence of the first author (J.V.) who provided help if it was asked for.

### 2.2. Subjects

Dogs and their owners were recruited on voluntary basis from among the participants of our family dog research database. Questionnaire data were recorded between February 2003 and May 2005 in Hungary at various dog obedience schools, dog-shows and agility competitions for dogs.

Our sample consisted of 220 animals (195 purebred subjects of 69 different breeds and 25 mixed breed dogs), and was balanced for gender (106 males and 114 females). In this analysis not more than 10 individuals represent a breed (for more details see Appendix II). In terms of their age dogs were assigned to the following three groups of similar size: juveniles (subjects of 10–24 months, $N = 63$, mean age $\pm$ S.D. = 17.1 $\pm$ 3.8 months); adults (25–54 months old, $N = 78$, mean age $\pm$ S.D. = 37.8 $\pm$ 8.3 months); older ones (55–160 months old, $N = 79$, mean age $\pm$ S.D. = 89.5 $\pm$ 23.4 months). Because attention skills and activity–impulsivity of the dog can be influenced by training, dogs were also categorized in terms of their past training experience. Dogs were either fully trained (participated in a special training course and took an examination, $N = 48$) or received basic training only (participated some introductory training at training school but did not get qualification, $N = 95$), or untrained (did not get any training or was trained by the owner at home, $N = 77$) (for more details see Appendix III). So we divided dogs into three training categories: animals were untrained, beginners or advanced.

The number of owners filling in the questionnaire ($N = 168$) was less than the number of dogs because in some cases one person had more than one dog (at most three individuals). The age of the owners ranged from 14 to 60 years and their sex ratio was biased toward females (39 men/128 women).

### 2.3. Data analysis

On the basis of the owners' answers we calculated mean scores of the two predetermined subscales (inattention, activity–impulsivity) for each individual. 'Inattention' is composed of six items (item 1, 2, 3, 7, 10 and 12) whilst 'activity–impulsivity' is of seven (item 4, 5, 6, 8, 9, 11 and 13—see Appendix I).

For the statistical analysis we used the SPSS statistical program (version 10.0). First the internal consistency of the questionnaire was estimated by the calculation of Cronbach's alpha (Cronbach and Meehl, 1995). In order to test the independence of the two subscales ('inattention' and 'activity–impulsivity') Pearson's correlation coefficients were also established between them.

Then the structure of the questionnaire items was analysed by multivariate methods (factor analysis with varimax rotation) and the factorial structure (factor loadings of questionnaire items) was compared to the two predetermined subscales. Individual factor scores were also calculated for each dog and correlation analysis was used to assess the association between individual factor scores and the scores of 'inattention' and 'activity–impulsivity'.

In order to analyse external consistency (the effect of age, gender and past training experiences on the 'inattention' and 'activity–impulsivity' scores) we performed known group comparisons by Mann–Whitney *U*-tests and Kruskal–Wallis tests with Dunn's post hoc test if $P < 0.05$ using the groupings above (age: juveniles/adults/older dogs; gender: females/males; training: untrained/beginner/advanced).

## 3. Results

### 3.1. Internal consistency

The internal consistency of both predetermined subscales was found to be high as Cronbach's alpha values exceeded 0.7 (0.784 for inattention and 0.734 for activity–impulsivity, Table 1) which can be considered as the threshold for statistical significance (see e.g. Muszbek et al., 2006).

In order to investigate whether the two subscales are independent from each other we correlated the scores for 'inattention' and 'activity–impulsivity'. Pearson's correlation coefficient was quite low ($r = 0.27$) suggesting only weak association between 'inattention'

Table 1
Mean scores and S.D.s for the items of the two subscales ('inattention', 'activity–impulsivity') and Cronbach's alpha calculations

| | Mean | S.D. | Corrected item total | Alpha if item deleted |
|---|---|---|---|---|
| Inattention subscale (alpha = 0.784) | | | | |
| Item 1 | 0.71 | 0.73 | 0.58 | 0.74 |
| Item 2 | 0.82 | 0.84 | 0.64 | 0.72 |
| Item 3 | 0.50 | 0.69 | 0.58 | 0.74 |
| Item 7 | 0.50 | 0.70 | 0.41 | 0.78 |
| Item 10 | 0.66 | 0.77 | 0.48 | 0.76 |
| Item 12 | 0.96 | 0.79 | 0.50 | 0.76 |
| Activity–impulsivity subscale (alpha = 0.734) | | | | |
| Item 4 | 1.20 | 0.96 | 0.35 | 0.72 |
| Item 5 | 0.81 | 0.98 | 0.40 | 0.71 |
| Item 6 | 1.39 | 1.10 | 0.58 | 0.67 |
| Item 8 | 0.71 | 0.81 | 0.55 | 0.68 |
| Item 9 | 1.40 | 1.00 | 0.45 | 0.70 |
| Item 11 | 0.93 | 0.84 | 0.37 | 0.72 |
| Item 13 | 0.98 | 0.98 | 0.45 | 0.70 |

and 'activity–impulsivity'. None the less the $P$ value for this correlation coefficient was very significant ($P < 0.001$). Importantly, however, the sample size was relatively large ($N = 220$) and the level of significance attached to a correlation depends not only on the strength of the association or effect size' but on the sample size as well. Accordingly in our case only $r > 0.7$ could have been regarded as reliably high (Martin and Bateson, 1986).

### 3.2. Factorial structure

Factor analysis was used to explore the factorial structure of the questionnaire scores. Scree plot shows (Fig. 1) that there are two main factors (factor 1 and factor 2, see Table 2) accounting for 46.0% of the total variance (characterized by eigenvalues >2). The first factor explains 28.4%, and the second 17.6% of the total variance.

For the first factor (factor 1) all but two items which were aimed to measure 'inattention' in dogs were represented by high loadings (>0.65). At the same time this factor is characterized by low loadings for all items measuring 'activity–impulsivity' (<0.38) (Table 2). In contrast, the second factor is characterized by relatively high scores for items measuring 'activity–impulsivity' (>0.51) except for item 4, which did not reach this threshold, having no high loadings on either of the two factors. All 'inattention' items were represented on factor 2 by low loadings (<0.37).

This shows that the factor structure obtained from this analysis is equivalent with our predetermined scale-structure (significant overlapping between the components of factor 1 and the predetermined items of 'inattention' scale and there is a similar association between factor 2 and 'activity–impulsivity' scale). It seems, therefore, that factor 1 is related to attention skills (subscale 'inattention') while factor 2 can be referred to as activity (subscale 'activity–impulsivity').

In accordance with these, extremely high correlations were found between the predetermined subscales and the corresponding factors ('inattention' scores–factor 1 scores: $r = 0.97$, $P < 0.0001$; 'activity–impulsivity' scores–factor 2 scores: $r = 0.97$, $P < 0.0001$).

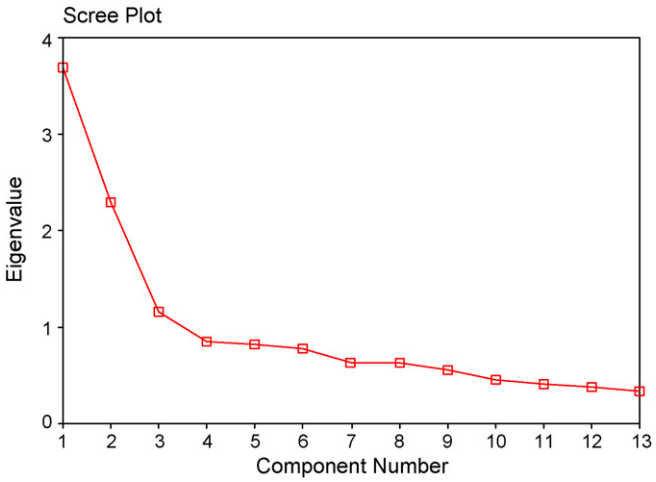


Fig. 1. Scree plot of the factorial structure of the questionnaire.

### 3.3. External validity—known group comparisons

In order to test the external validity of our questionnaire, we planned known group comparisons analysing the effect of age, sex and training on the dogs' attention skills and the levels of activity–impulsivity. Although attention deficit in dogs as a function of age or sex has not been studied earlier, there are some recent studies describing the effect of age and sex on dogs' motor activity. Accordingly, using questionnaires researchers (Bain et al., 2001; Neilson et al., 2001) found significant decline of motor activity in older dogs, and this was also supported by behavioural observations (Head et al., 1997; Siwak et al., 2002). In contrast age-dependent activity could not be detected in a shelter dog population (Wells et al., 2002). Similarly, sex did not seem to affect activity (Neilson et al., 2001—questionnaire study).

Past learning experience can influence the dogs' questionnaire scores because extensive formal training may enhance the self-control resulting in lower 'activity–impulsivity' scores and/

Table 2
Factor loadings of questionnaire items

| Aimed to measure | Item no. | Factor 1 | Factor 2 |
|---|---|---|---|
| Inattention | Item 2 | **0.7954** | −0.0433 |
| Inattention | Item 3 | **0.7646** | −0.1196 |
| Inattention | Item 1 | **0.7288** | 0.1340 |
| Inattention | Item 10 | **0.6638** | 0.0392 |
| Inattention | Item 12 | **0.5839** | 0.3663 |
| Inattention | Item 7 | **0.5120** | 0.2183 |
| Activity–impulsivity | Item 6 | −0.1190 | **0.7942** |
| Activity–impulsivity | Item 9 | −0.1573 | **0.7145** |
| Activity–impulsivity | Item 8 | 0.3083 | 0.6822 |
| Activity–impulsivity | Item 13 | 0.0955 | 0.5812 |
| Activity–impulsivity | Item 11 | 0.2070 | **0.5169** |
| Activity–impulsivity | Item 5 | 0.0907 | **0.5149** |
| Activity–impulsivity | Item 4 | 0.3774 | 0.3917 |

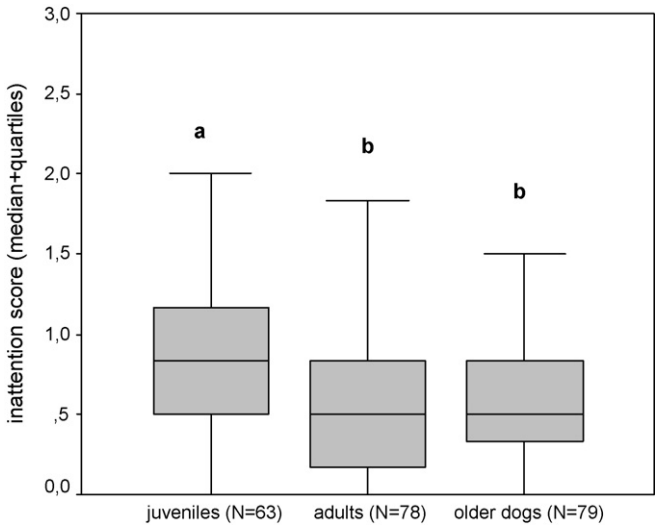


Fig. 2. The effect of the dogs' age on the 'inattention' scores. Different letters indicate significant differences ($P < 0.05$ level).

or improves the dogs' attention skills (lower 'inattention' scores). In line with the above we found that the dogs' 'activity–impulsivity' scores were not influenced by the level of training ($\chi^2 = 1.340$, $P = 0.512$) as well as by the gender ($U = 5200.5$, $P = 0.073$) and age ($\chi^2 = 5.791$, $P = 0.055$). The effect of age and gender, however, approached significance and there is a tendency that juveniles and males obtain higher 'activity–impulsivity' scores.

Regarding the 'inattention' scores, gender had no effect ($U = 5618.5$, $P = 0.366$), but age and training seems to affect this factor ($\chi^2 = 10.167$, $P = 0.006$ and $\chi^2 = 31.489$, $P < 0.0001$, respectively). Dunn's post hoc test showed, that juvenile dogs were characterized by higher 'inattention' scores than the individuals in the two other age categories ($P < 0.05$, Fig. 2).

Since temperament traits can be different in terms of size (there is a general notion that small dogs are more active/impulsive than big ones) further comparisons were made between small- ($N = 31$, <40 cm in height) and large-sized dogs ($N = 30$, >63 cm in height). Significant differences were not found in their 'inattention' scores ($t = 0.184$, $P = 0.855$) however it seemed to be a trend that small dogs had higher 'activity–impulsivity' scores than large-sized dogs ($t = 1.795$, $P = 0.078$).

Moreover, those dogs, which were subjected to any kind of systematic training (beginners and advanced dogs) were characterized by lower 'inattention' scores, than the untrained dogs ($P < 0.05$, Fig. 3). Importantly, this result was not confounded by effect of age (more untrained subjects among juveniles) because a comparison between different age × training categories (see Appendix III) failed to show significant differences (chi-square test, $\chi^2 = 7.219$, d.f. = 4, $P = 0.1248$).

## 4. Discussion

In line with the increasing behavioural observations and theoretical arguments (see Miklósi et al., 2004; Hare and Tomasello, 2005 for reviews) we have here introduced a novel methodological approach for studying functional analogues in the behaviour of dogs and

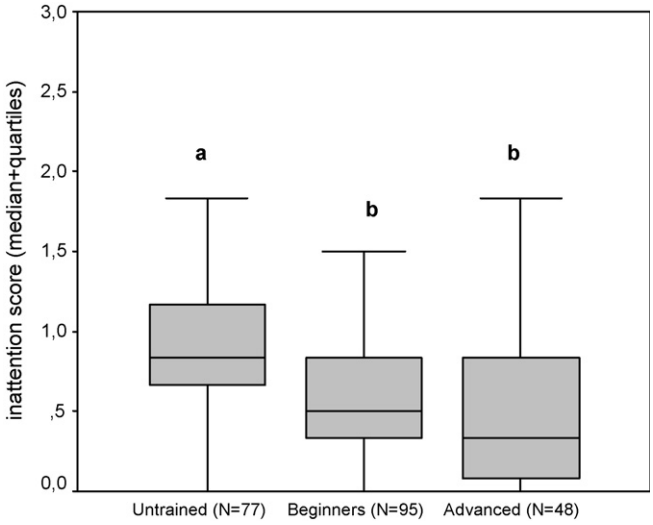


Fig. 3. The effect of past training experience on the 'inattention' scores. Different letters indicate significant differences ($P < 0.05$ level).

human infants: an application of a questionnaire developed for measuring attention deficit hyperactivity in children (DuPaul, 1998). Similarly to the case of the children, this questionnaire was developed as a tool for describing typical responses of pet dogs to common stimuli in their natural environment. Owners have a possibility to observe their dogs' behaviour in many different situations, and therefore their ratings concerning the activity and attention skills are based on extensive experience over a longer period. Attention skills and motor activity, the two main components of attention deficit hyperactivity were evaluated in dogs by their owners and the main purpose of this study was to determine validity of this method.

In the present study we investigated construct validity using both internal and external validation. Construct validity is used for evaluating the degree to which a test measures a hypothetical construct. Using this approach here we investigated whether the structure of the questionnaire items predetermined by the composers of the original (human) questionnaire fits our results and whether our results are consistent with the known findings from the literature.

As the questionnaire items (questions) were selected with a definite purpose, we analysed internal validity to determine whether the actual observations are truly representative of what we are observing. The internal consistency of the two subscales ('inattention' and 'activity–impulsivity') was estimated by the calculation of Cronbach's alpha (Cronbach and Meehl, 1995). This analysis showed a high internal consistency for both subscales suggesting that each item is a relevant and an important part of its subscale. Furthermore, we performed a factor analysis, whose results confirmed the predetermined subscale structure. That is, the factors extracted by means of factor analysis appeared to measure what they purport to measure (all items of the 'inattention' scale were represented on the first factor, and all but one items of the 'activity–impulsivity' scale were constituting the second factor). Correlation analysis also confirmed that the two subscales defined as 'inattention' and 'activity–impulsivity', can be regarded as unrelated dimensions of pet dogs' behaviour.

Another aspect of the reliability of a questionnaire is the external validity that refers to the generalizability of the method and conclusions on the basis of revealing known (or assumed) effects. Comparisons of the 'activity–impulsivity' subscale scores between the three distinct age categories (juveniles, adults and older dogs) showed only marginally significant effects (a trend for the juveniles to be more active). We should also note that because there were only 11 elderly dogs (older than 10 years) in the 79 'older dogs' age group in our sample, a strong effect on the age-dependent decline could not be expected. This result is in line with the behaviour observations suggesting that elder dogs show less activity than youngers (e.g. Head et al., 1997; Bain et al., 2001; Neilson et al., 2001). However, others have failed to show any effect of age on dogs' behaviour activity. Wells et al. (2002) for instance, found that the activity level of shelter dogs was not correlated with the age but with the time spent at the shelter.

Measuring the levels of activity (and attention skills) of dogs by behavioural observations is problematic because these traits are strongly influenced by several uncontrolled (and often unrecognized) factors in an experimental situation. Some suggest, for example, that subjects' motor activity may vary as a function of the novelty of the environment, timing of testing and housing/living conditions (e.g. Tobler and Sigg, 1986; Neilson et al., 2001).

In accordance with the popular (but scientifically not proven) notion that small dogs are generally more active/impulsive than big ones, we found that small- and large-sized dogs showed marginally significant differences in their activity/impulsivity scores. Neither the gender, nor the levels of training had an effect on the 'activity–impulsivity' of dogs. This is consistent with earlier findings (Neilson et al., 2001). In contrast, 'inattention' score was affected by both age and training, but not by the gender of the dogs. Although to our knowledge there are no publications concerning the effects of age and training qualification on attention skills in dogs, these results are in accordance with the general notion that dogs can be trained for being attentive and training and individual experience (as a function of age) may improve attention skills. Moreover, higher 'inattention' scores of the dogs in the juvenile group may reflect transitional effect of maturation.

A further possibility of how innate individual differences can be 'overshadowed' in this questionnaire study is, that those owners who take an active part in dog training courses with their dogs are willing to overestimate their dogs' attention skills calling forth an uncontrolled bias in rating the questionnaire items.

In summary, findings suggest that the application of human ADHD questionnaire is a reliable and valid method of assessing attention skills and activity in dogs. To our knowledge this is the first study on dogs using the adaptation of a questionnaire developed for studying children's behaviour (through the estimation of their parents).

In light of the fact, that polymorphism in the dopamine D4 receptor gene is associated with impulsivity and activity in humans (Benjamin et al., 1996) and such a polymorphism is present in dogs (Ito et al., 2004) we believe that this questionnaire will be helpful not only in screening of pet dogs for activity and attention related behavioural problems but may prove valuable in studying correlative relationship between DRD4 gene polymorphism and activity–impulsivity in dogs.

## Acknowledgements

This work has been supported by OTKA (T 029705), by the Hungarian Academy of Sciences (F 031/2000) and by a grant from the European Union (NEST 012787). We give special thanks to Anna Szekely for her essential contribution in data analysis.

## Appendix I

Dog-ADHD RS Owner version questionnaire for attention deficit and activity-impulsivity

Please sign how often the statement is true for your dog!
(If you find it necessary you may add short notes to the items)

Name of owner:
Name and gender of dog: Breed of dog:
Date of birth of the dog (year, month): Date:

| Items: | Never | Sometimes | Often | Very often |
|---|---|---|---|---|
| 1. Your dog has a difficult time learning, because it is careless or other things can easily attract it's attention. | 0 | 1 | 2 | 3 |
| 2. . It's easy to attract it's attention, but it loses its interest soon. | 0 | 1 | 2 | 3 |
| 3. It's difficult for it to concentrate on a task or play. | 0 | 1 | 2 | 3 |
| 4. It leaves from it's place when it should stay. | 0 | 1 | 2 | 3 |
| 5. It can not be quiet, it can not be easily calmed. | 0 | 1 | 2 | 3 |
| 6. It fidgets all the time. | 0 | 1 | 2 | 3 |
| 7. It seems that it doesn't listen even if it knows that someone is speaking to it. | 0 | 1 | 2 | 3 |
| 8. It is excessive, difficult to control, if it lunges it is hard to hold back. | 0 | 1 | 2 | 3 |
| 9. It would always play and run. | 0 | 1 | 2 | 3 |
| 10. It solves simple tasks easily, but it often has difficulties with complicate tasks, even if it knows them and has practiced them often. | 0 | 1 | 2 | 3 |
| 11. It is likely to react hastily and that's why it is failing tasks. | 0 | 1 | 2 | 3 |
| 12. It's attention can be easily distracted. | 0 | 1 | 2 | 3 |
| 13. It can not wait as in it has no self-control. | 0 | 1 | 2 | 3 |

**Training qualification the dog has had:**
*(Please indicate whether the dog passed an exam or just participated in training)*

obedience Schutzhund agility hunting
trained at home no training something else, like:.....

## Appendix II

### *B.1. Distribution of the breeds in the total sample*

Twenty five mixed breed dogs, 10 Collies, 10 Golden Retrievers, 10 Groenendaels, 10 Tervuerens, 10 German Shepherds, 8 Border Collies, 7 Siberian Huskies, 6 German Boxers, 6

Hungarian Vizslas, 5 Great Danes, 5 Mudis, 5 English Pointers, 5 Samoyeds, 4 American Staffordshire Bullterriers, 4 Labrador Retrievers, 4 Malinois, 4 Moscow Watchdogs, 4 Shetland Sheepdogs, 3 English Cocker Spaniels, 3 Dogo Argentinos, 3 Australian Kelpies, 3 Central Asia Shepherd Dogs, 3 German Pointer Dogs, 3 Parson Russel Terriers, 3 Pumis, 3 Standard Poodles, 3 West Highland White Terriers, 2 English Bulldogs, 2 Basset Hounds, 2 Saint Bernards, 2 Bernese Mountain Dogs, 2 Dalmatians, 2 Dobermanns, 2 Kavkazskaya Ovcharkas, 2 Rottweilers, 2 Miniature Schnauzers, 2 Small Spitzs, 2 Welsh Terriers, 2 Standard Poodles, 1 Airedale Terrier, 1 American Bulldog, 1 Appenzeller Sennenhund, 1 Berger de Beauce, 1 Bichon Frise, 1 Old English Sheepdog, 1 Bullmastiff, 1 Cane Corso, 1 Cardigan Welsh Corgi, 1 Chow Chow, 1 Fox Terrier, 1 Hovawart, 1 Irish Red Setter, 1 Jack Russel Terrier, 1 Deutscher Jagdterrier, 1 American White Shepherd Dog, 1 Lhasa Apso, 1 Maltese, 1 Miniature Pinscher, 1 Puli, 1 Rhodesian Ridgeback, 1 Standard Schnauzer, 1 Giant Schnauzer, 1 Miniature Spitz, 1 Dachshund, 1 Whippet, 1 Yorkshire Terrier.

## Appendix III

Number of subjects in the different age × training categories (chi-square test, $\chi^2 = 7.219$, d.f. = 4, $P = 0.1248$).

| | Juveniles | Adults | Older dogs | Total |
|---|---|---|---|---|
| Untrained | 27 | 27 | 23 | 77 |
| Beginners | 28 | 35 | 32 | 95 |
| Advanced | 8 | 16 | 24 | 48 |
| Total | 63 | 78 | 79 | 220 |

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