

Effects of castration on problem behaviors in male dogs with reference to age and duration of behavior

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Objective—To determine whether 9 problem behaviors in adult male dogs were affected by castration and to examine the influence of age and duration of problem behavior on behavioral effects of castration.

Design—Cohort study.

Animals—57 male dogs > 2 years old at the time of castration that had ≥ 1 of the targeted problem behaviors.

Procedure—Data were collected by telephone contact with owners to identify dogs that had ≥ 1 problem behavior before castration and to estimate the improvement (ie, decrease) in the objectionable behaviors after castration. Problem behaviors of interest included urine marking in the house, mounting, roaming, fear of inanimate stimuli, aggression toward human family members, aggression toward unfamiliar people, aggression toward other dogs in the household, aggression toward unfamiliar dogs, and aggression toward human territorial intruders.

Results—Effects of castration on fear of inanimate stimuli or aggression toward unfamiliar people were not significant. For urine marking, mounting, and roaming, castration resulted in an improvement of $\geq 50\%$ in $\geq 60\%$ of dogs and an improvement of $\geq 90\%$ in 25 to 40% of dogs. For remaining behaviors, castration resulted in an improvement of $\geq 50\%$ in < 35% of dogs. Significant correlations were not found between the percentage of improvement and age of the dog or duration of the problem behavior at the time of castration.

Clinical Implications—Castration was most effective in altering objectionable urine marking, mounting, and roaming. With various types of aggressive behavior, including aggression toward human family members, castration may be effective in decreasing aggression in some dogs, but fewer than a third can be expected to have marked improvement. Age of the dog or duration of the problem behavior does not have value in predicting whether castration will have a beneficial effect. (*J Am Vet Med Assoc* 1997;211:180–182)

Castration is the most common and one of the most ancient ways of controlling behavior of domestic animals.¹ Although male and female dogs are increasingly castrated or spayed before puberty in the interest of pet population control, gonadally intact adult male dogs are sometimes castrated in an attempt to alter objectionable behavior. Issues that are particularly important in consideration of castration as a means to

decrease objectionable behavior in male dogs include probability that a specific behavioral pattern will be affected by castration, degree to which the behavior will be altered (ie, whether the behavior will be eliminated or just reduced in frequency), influence of age at the time of castration on probability of the behavior being altered, and the role of experience (ie, duration of the problem behavior) in the retention of a behavioral pattern after castration.

Results of a previous clinical survey² used to determine the effects of castration on the behavior of 42 dogs indicated that urine marking in the house, mounting of dogs, people, or inanimate objects, and fighting with other male dogs were markedly reduced in 50 to 60% of dogs after castration. Roaming was reduced in 90% of dogs. In the same study, 8 dogs with territorial aggression and 4 with fear-related aggression had no change in their behaviors. Castration of younger males was not more likely to result in elimination of problem behaviors than castration of older dogs.

The purposes of the study reported here were to determine the probability that, and degree to which, 9 problem behaviors in adult male dogs are affected by castration and to examine the influence of age and duration of the problem behaviors on the behavioral effects of castration. Data were collected by use of a survey to determine which behavioral patterns are most likely to be altered and to what extent. Particular attention was paid to statistical extrapolation of results from the study population to dogs in general.

Materials and Methods

Selection of dogs—Dogs included in this study were adult males that had been admitted to the University of California-Davis Veterinary Medical Teaching Hospital for castration between January 1989 and January 1995. Dogs considered for inclusion in this study were those that were 2 to 7 years old at the time of castration. Telephone screening was used to identify dogs that had been under the care of the owner for > 6 months prior to castration. The caller inquired about any specific problem behaviors prior to castration and the motivation for castration. Only dogs that had ≥ 1 of the following problem behaviors prior to castration were included in our study: urine marking (leg lifting) in the house, mounting of objects, people, or other animals, roaming, fear of inanimate stimuli such as loud sounds, aggression toward a human family member, aggression toward unfamiliar people away from the home, aggression toward other dogs in the household, aggression toward unfamiliar dogs, and aggression toward human territorial intruders. Fifty-seven dogs met the criteria for inclusion in our survey, with most dogs having > 1 problem behavior.

Data collection—A follow-up call was performed by a veterinary behaviorist, during which owners were asked additional questions regarding problem behaviors that dogs

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Supported in part by the Friskies PetCare Residency Program in Clinical Animal Behavior at the University of California-Davis.

had prior to castration, duration of each problem behavior, and whether there was any change in behaviors after castration and, if so, the estimated percentage change (to the nearest 10%). Objective data, such as number of fresh urine stains, growling or biting incidents, and absences from the home (roaming), were sought in each interview to facilitate accurate recollection of any changes.

Statistical analyses—The percentage change for each objectionable behavioral pattern in individual dogs was categorized as improvement of < 50% (0 to 49% decrease in behavior), improvement of ≥ 50% (50 to 100% decrease; referred to as the 50% level), or improvement of ≥ 90% (90 to 100% decrease; referred to as the 90% level). By definition, improvement at the 50% level included those dogs at the 90% level. Because most dogs had > 1 problem behavior, the total number of data points for all 9 problem behaviors exceeded the number of dogs in the study; therefore, each problem was treated as independent of other problems. Exact binomial, nonparametric confidence intervals³ were used in lieu of the more common parametric (symmetric) confidence intervals or the mean ± SEM, because with small sample sizes, the proportion of dogs with improvement would not have an approximate normal distribution. Confidence intervals set at 95% were determined for the 50 and 90% levels of improvement. Confidence intervals represented the interval above and below the sample value within which extrapolation to the population at large could be made with 95% confidence. For example, if 60% of dogs in the study with objectionable urine marking had a decrease in the behavior after castration, the 95% confidence interval could be used to determine the range of probability values to apply to male dogs in general.

The second type of statistical analysis dealt with correlations between age of the dog at the time of castration and estimated percentage of improvement and duration of the problem and estimated percentage of improvement. These correlations were done with 2 nonparametric tests (two-tailed tests), using the Spearman's rank correlation and Kendall's *t*-test. Correlation analyses were only applied to behaviors in which ≥ 30% of the dogs had improvement at the 50% level. A value of *P* < 0.05 was considered significant.

Results

Percentages and 95% confidence intervals for improvement in behavioral patterns after castration at the 50 and 90% levels were depicted according to behaviors not involving aggression (Fig 1) and behaviors involving aggression (Fig 2). For 2 behavioral patterns, fear of inanimate stimuli and aggression toward unfamiliar people, 95% confidence intervals indicated that castration results in an extremely low (< 1%) probability of improvement. Although castration had a significant effect on the other 7 behavioral patterns at the 50 and 90% levels, for some of these behavior problems, a change was noticed in < 20% of dogs. The 3 behavioral patterns for which there was the greatest improvement were urine marking, mounting, and roaming. For these 3 behavioral patterns, ≥ 60% of owners reported improvement at the 50% level; improvement at the 90% level ranged from 25 to 40% of dogs castrated.

Correlations between age of the dog or duration of problem behavior at the time of castration and estimated percentage of improvement were tested for the following behaviors: urine marking, mounting, roam-

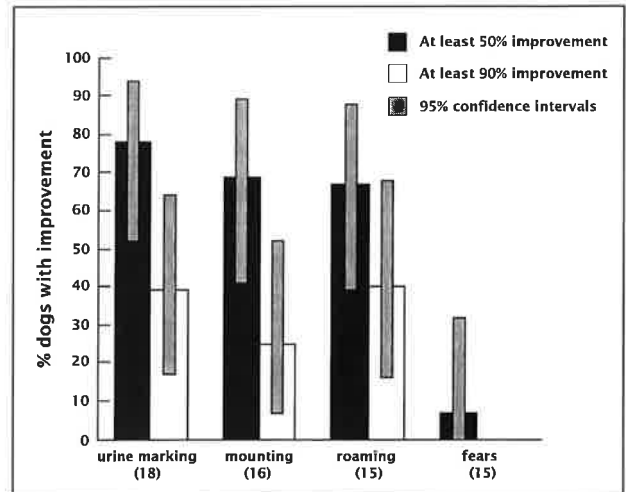


Figure 1—Percentage of male dogs with a decrease (improvement) in problem behaviors not involving aggression after castration. Results are depicted with 95% confidence intervals at the 50 and 90% levels of improvement (percentage of dogs at the 50% level includes those at the 90% level). Numbers in parentheses indicate the number of dogs in the study with each of the respective problem behaviors.

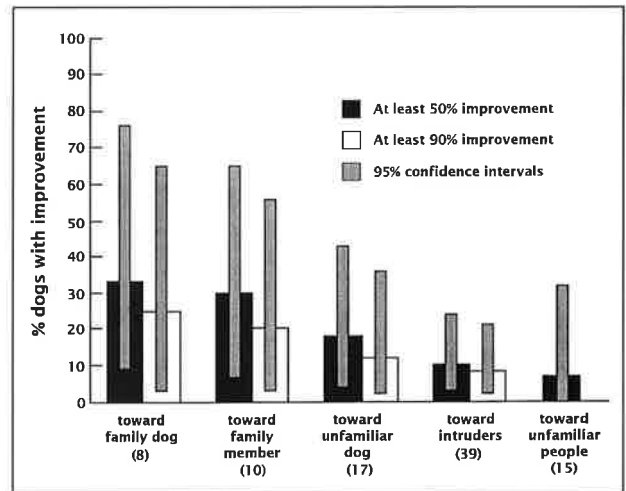


Figure 2—Percentage of male dogs with a decrease (improvement) in problem behaviors involving aggression after castration. Results are depicted with 95% confidence intervals at the 50 and 90% levels of improvement (percentage of dogs at the 50% level includes those at the 90% level). Numbers in parentheses indicate the number of dogs in the study with each of the respective problem behaviors.

ing, aggression toward human family members, and aggression toward other dogs in the family. Results of Spearman's rank correlation analysis and Kendall's *t*-test did not indicate a significant correlation. Spearman's rank correlation analysis resulted in somewhat higher *r* values than did Kendall's *t*-test (Table 1). Interestingly, about half of the coefficients associated with problem behaviors were positive, revealing, if anything, a slight tendency for dogs that were older or that had had a problem behavior for a long duration (more experienced) to have a change in those behaviors after

Table 1—Spearman's rank correlation coefficients for comparison between age or duration of problem behavior and percentage of improvement for problems in which at least 30% of dogs had improvement (decrease) at the 50% level

Behavior	No.	Age at castration		Duration of problem	
		r value	P value†	r value	P value†
Urine marking	18	-0.33*	0.19	-0.10*	0.71
Mounting	16	-0.21*	0.44	-0.39*	0.13
Roaming	15	0.16	0.57	-0.24*	0.39
Aggression toward human family member	10	0.59	0.07	0.56	0.12
Aggression toward other dog in household	8	0.11	0.80	0.30	0.47

*Indicates a negative correlation (eg, the younger the dog, the greater the percent change in behavior).
†A value of $P < 0.05$ was considered significant.

castration; the lowest P values were those associated with positive correlation coefficients. Negative correlation coefficients, indicating a higher probability of change after castration of dogs that were younger or had had a problem behavior for a short duration (less experienced), were associated with urine marking, mounting, and roaming; however, P values ranged from 0.13 to 0.71. Calculation of 95% confidence intervals for correlation coefficients (data not presented) indicated that r values could be as high as ± 0.6 , using a small sample size, when there actually was no significant correlation. Even with larger sample sizes, therefore, significant correlations would not have been expected.

Discussion

In a study² published in 1976, it was reported that 50 to 60% of dogs castrated because of urine marking in the house, mounting, or aggression toward other male dogs had resolution or marked improvement in the problem. In that study, there was no apparent relationship between age of the dog and tendency to respond to castration, although this relationship was not examined statistically. Our study was predicted on the assumption that, when male dogs engaging in a male-typical problem behavior are castrated, some dogs may have virtual elimination of the problem behavior, some may have an improvement (decrease without complete resolution), and some may have no change. Accordingly, dog owners were asked about the percent change in behavior they observed; however, the interviewer avoided asking leading questions or suggesting appropriate answers.

Urine marking, mounting, and roaming were behavioral problems in which the highest percentage of dogs had improvement at the 50 or 90% level. Specifically, 25 to 40% of dogs had improvement at the 90% level, and 60 to 80% of dogs had improvement at the 50% level. Findings in a previous study,² in which 50 to 60% of dogs had resolution of problem urine marking and mounting, are intermediate between the percentage of dogs in the present study that had improvement at the 50 and 90% levels and are well within the 95% confidence intervals for improvement at both lev-

els. Urine marking and mounting are highly sexually dimorphic behaviors that are expected to be altered by castration. In our study, castration⁴ had a significant effect on all of the behavioral problems related to aggression toward unfamiliar people. However, the percentage of dogs that had an improvement in aggressive behaviors, even at the 50% level, did not exceed 33%. In terms of practical information to provide to clients, results of our study indicated that for 50 to 70% of adult male dogs, decreases between 50 and 90% in urine marking, mounting, and roaming behaviors can be expected following castration. With regard to aggression toward other canine or human members of the family, approximately 25% of dogs can be expected to have a 50 to 90% level of improvement after castration. A comparable reduction in aggression toward unfamiliar dogs or human territorial intruders can be expected in 10 to 15% of dogs after castration.

When castration is performed to treat a problem behavior, there is likely to be some apparent placebo effect, just as there is with treatment with a pharmaceutical agent. This effect may be imagined or brought about by the client instituting concomitant behavior modification.⁵ However, it is almost impossible to distinguish such apparent placebo effects from the effects of castration.

Results of our study confirm, quantitatively, what has been claimed elsewhere in the literature^{4,6}: that there is little or no relationship between effects of castration on problem behaviors and age at the time of castration or duration of the objectionable behaviors prior to castration. For 5 behavioral patterns in which $\geq 30\%$ of the dogs had improvement following castration, age at the time of castration and duration of the problem were not significantly related to degree of improvement. In fact, behavioral patterns with the smallest P values were those in which there was a positive r value, which is the opposite of that intuitively predicted for age of the dog or duration of the problem behavior (experience). In this regard, our results were consistent with results of a laboratory studies⁷ on rodents and dogs that indicated that prior sexual experience does not affect retention of male sexual behavior.

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