

BEHAVIORAL EFFECTS OF SPAYING AND NEUTERING



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Hierarchy of Scientific Evidence

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Expression of Behavior

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- Multiple levels of influence
- Species
 - Breed
 - Individual
 - Gender
 - Age
 - Experience
 - Environment
 - Hormone status



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Expression of Behavior

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Influence of testosterone

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- Enhancement of male, sexually dimorphic behaviors
- Dogs exposed to testosterone *and* displaying inappropriate or out of context behaviors... *modifier* rather than *cause* of behavior change
 - Decreased latency to react
 - Increased reactivity intensity
 - Longer duration of reactivity
 - Slower recovery after reaction
- Castration removes that present influence, no specific impact on learned behaviors

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Influence of estrogen

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- May have anti-anxiety effects along with oxytocin
- Role in reproductive cycle
- Relevant for interdog, irritable, maternal aggression
- Individual variability



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General impact of altering

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- Most likely to impact sexually dimorphic behaviors (maternal aggression, intermale aggression, etc.)
- Rapid decline of testosterone post neutering
- May not reverse or eliminate behavior patterns caused or influenced by hormones
- No impact on learning, rehearsal, reinforcement



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Does age matter?

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Long-term outcome of gonadectomy performed at an early age or traditional age in dogs

Lisa M. Howe, DVM, PhD, DACVP; Margaret R. Slater, DVM, PhD; Harry W. Boothe, DVM, MS, DACVP; H. Phil Hobson, DVM, MS, DACVP; Jennifer L. Holcom, BS; Angela C. Spann, BS

JAVMA, Vol 218, No. 2, January 15, 2001

- Comparison between dogs altered at <24 weeks and ≥ 24 weeks
 - 269 of 635 (42%) of dogs altered during study period
 - Median follow-up period of 48 months
- No difference: Incidence of behavior problems, rate of retention in home

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Does age matter?

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Effects of prepubertal gonadectomy on physical and behavioral development in cats.

Journal of the American Veterinary Medical Association

Stubbs, W P yr:1996 vol:209 iss:11 pg:1864 -71

- 31 clinically normal kittens
- Prospective, controlled study
- Groups neutered at 7 weeks, 7 months, left intact

- No behavior differences noted in first two groups
- Intact cats showed greater intraspecies aggression and were less affectionate



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Does age matter?

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Evaluation of the risk and age of onset of cancer and behavioral disorders in gonadectomized Vizslas

M. Christine Zink, *MS, PhD*; Parvaneh Farhoody, *MS*; Samra E. Eber, *MS*; Lynda D. Ruffini, *Tom A. Gibbons, MS*; Randall H. Rieger, *MS*

JAVMA, Vol 244, No. 3, February 1, 2014

- 2505 Vizslas born between 1992 and 2008
- Demographic, gonadectomy status, age at diagnosis of disease/disorder
- Anonymous online survey
- Increased odds (4.1 relative risk) of “fear of storms” – for all gonadectomized dogs
- Increased odds (1.8 relative risk) of behavioral disorder if gonadectomized at ≤6 months of age (NSF for other ages)

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Behaviors

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- Interdog aggression
- Human directed aggression
- Resource guarding
- Roaming
- Urine marking
- Fear
- Reactivity
- Maternal aggression
- Mounting
- Territorial aggression
- Noise phobia
- Separation anxiety
- Age related cognitive changes

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Interdog aggression

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- Neutering – often recommended for inter-male aggression
 - Unlikely to make situation worse
 - Removes genes from breeding pool (when appropriate)
- Spaying – variable recommendations/outcome
 - Removes hormonal fluctuation associated with cycle
 - Removes source of competition or arousal for males
 - Estrogen plays lesser role than testosterone in interdog issues



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Interdog aggression

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- Aggression noticeably reduced in 60% of 42 post-pubertal dogs after castration (Hopkins 1976)
- Neutering does not appear to decrease the likelihood of aggression in male dogs, other than perhaps for inter-male and territorial aggression (Hart 1997)
- No effect of neutering on inter-male aggression, roaming, mounting (Mengoli 2010)



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Human directed aggression

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- Data gathered by owner survey at 6 month intervals
- 150 dogs in each group (spayed/unspayed)



- OHE may increase aggression
 - Female dogs less than 1 yr
 - Already exhibiting signs of "dominance aggression"

Table 6. Changes in dominance aggression by age

Age	Aggression increases	Aggression stays the same	Aggression decreases	Total
11 months or less	S = 13 U = 4	S = 38 U = 31	S = 4 U = 6	S = 45 U = 41
12-24 months	S = 6 U = 6	S = 31 U = 26	S = 5 U = 7	S = 42 U = 39
2 years +	S = 14 U = 11	S = 38 U = 43	S = 11 U = 16	S = 63 U = 70
Total	S = 33 U = 21	S = 67 U = 100	S = 20 U = 29	

S Number of bitches in spayed group
U Number of bitches in unspayed group

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Human directed aggression

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- Data from modified C-BARQ questionnaire (translated)
- 852 questionnaires



- Altered dogs were *less* likely to score above the median for owner directed aggression



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Human directed aggression

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- 3226 questionnaires/dogs
- Subjects solicited from vet clinics

→Odds ratio of:

	F/I	M/I	F/S	M/N
Growling	1.0	2.05	2.15	2.49
Possessive aggression	1.0	0.98	1.17	1.41
Biting member of household	1.0	2.04	2.13	3.23

Demographic and aggressive characteristics of dogs in a general veterinary caseload
 N.C. Guy^a, U.A. Laroche^a, S.E. Dobos^a, E. Spangler^a, J.B. Miller^a, I.R. Dobos^a, L.A. Bize^a

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Human directed aggression

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The human-canine environment: A risk factor for non-play bites?
 Lockley L, McV. Munnery^a, Philip H. Kane, Brian B. Chinnel, Lynette A. Hart
 Journal of Feline Medicine, Behaviour and Management 12(4) 2008

- Comparison of populations in Kingston, Jamaica and San Francisco, CA
- Interview data for 161 “biters” and 951 “non-biters”

→Relative Risk (RR) for non-play bites:

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Human directed aggression

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Applied Animal Behaviour Science 123 (2010) 108–123
 Applied Animal Behaviour Science
 Journal homepage: www.elsevier.com/locate/applanim

Factors associated with aggressive responses in pet dogs
 Yuying Hou^a, Lichang Sun^a

Neutering/spaying is sometimes employed as a means to reduce dog aggression but its effectiveness has been mixed (e.g. lower aggression in neutered/spayed dogs: Borchelt, 1983; Gershman et al., 1994; Messam et al., 2008; no significant difference: van den Berg et al., 2006; Bennett and Rohlf, 2007; higher aggression in neutered/spayed dogs: Podbersceck and Serpell, 1997a, 1997b; Guy et al., 2001a).

→Incidence likely dependent on factors in addition to spay/neuter status

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Human directed aggression

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National survey of owner-directed aggression in English Springer Spaniels

Ilana R. Reisner, DVM, PhD, DACVP; Katherine A. Houpt, VMD, PhD, DACVP; Frances S. Shofer, PhD

JAVMA, Vol 227, No. 10, November 15, 2005

- Survey of dogs aged 3-5 years (identify behaviors at/past social maturity)
- Identify aggression on screening questions, specific description of incident context
- 1053 dogs total: 494 males (327 intact), 559 females (210 intact)

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- Neutered > Intact males - more aggressive in 14/18 context of owner directed aggression
- Spayed > Intact females – more aggressive (10 variables)
- Spayed/Neutered = more likely to have bitten than intact dogs (no difference in M vs. F bite history overall)
- *** Neuter status in males was still associated with higher risk of aggression even when 29 male dogs that were neutered because of aggression were removed from the statistical analysis

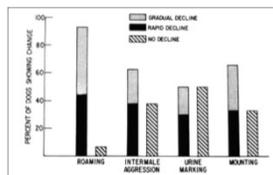
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Roaming

CASTRATION OF ADULT MALE DOGS - EFFECTS ON ROAMING, AGGRESSION, URINE MARKING, AND MOUNTING
S. MENGOLI
JOURNAL OF THE AMERICAN VETERINARY MEDICAL ASSOCIATION 188 (12), 1108-1110, 1976, PMID: 942256

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- 42 post-pubertal dogs – ~90% of dogs showed rapid or gradual decline in roaming



- No effect of neutering on inter-male aggression, roaming, mounting (Mengoli 2010)

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Fear and anxiety

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- Questionnaire data
- 367 respondents
- 413 dogs in population



- De-sexed dogs (compared to sexually intact):
 - More timid or nervous
 - Less anxious
 - Engaged in less destructive behavior

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Reactivity

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- All dogs were anesthetized, 7 were spayed
 - 14 dogs, assessed 4-5 months post surgery only
 - Limited to OHE of 5-10 month old GSDs
- Spayed female dogs were more reactive to approach of unfamiliar person/dog

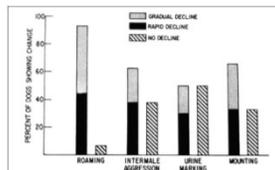
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Mounting

CASTRATION OF ADULT MALE DOGS - EFFECTS ON ROAMING, AGGRESSION, URINE MARKING, AND MOUNTING
S. MENGOLI
JOURNAL OF THE AMERICAN VETERINARY MEDICAL ASSOCIATION 188 (12), 1108-1110, 1976, PMID: 945256

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- 67% showed decrease in mounting
 - 7/8 toward people
 - 1/4 toward other dogs



- No effect of neutering on inter-male aggression, roaming, mounting (Mengoli 2010)

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Age related cognitive changes

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- 325 dogs older than 9 years
- Structured phone interviews

Prevalence and risk factors of behavioural changes associated with age-related cognitive impairment in geriatric dogs

G. ALONSO, S. GARCIA-BELTRAMI, G. CASÓN, B. ROSADO, M. LEÓN AND J. PALACIO

Journal of Small Animal Practice • Vol 50 • February 2009

- 22.5% incidence of cognitive changes overall
- Females and altered dogs were more likely to be affected than males and intact dogs
 - 42.5% of altered females (25.8% intact)
 - 26.3% of altered males (13.4% intact)

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Age related cognitive changes

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- 139 dogs aged 11-14 years
- Two interviews 12-18 months apart

Effect of gonadectomy on subsequent development of age-related cognitive impairment in dogs

Reijnen J, Hart C, van der Grinten J, et al

JAVMA, Vol 219, No. 1, July 1, 2001

- Intact males significantly less likely to progress from mild to severe impairment
- Too few intact females in population to draw any conclusions



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Take home messages

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- ❑ Contradictory data for many of the specific behaviors
- ❑ Hormone status is only one of the factors that influences behavior
- ❑ Overwhelming lack of recent, prospective, longitudinal, intervention based, controlled/blinded studies on which to base conclusions



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Questions?

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