



VETERINARIANS
WITHOUT BORDERS
VETERINARIOS
SIN FRONTERAS



Penn
Veterinary Medicine
UNIVERSITY OF PENNSYLVANIA

Behaviour assessment of male free-roaming dogs following surgical and non-surgical sterilization in Puerto Natales, Chile

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Background

- Veterinarians Without Borders – Canada in Latin America (since 2009): free-roaming dog research and management programs
- Interest in chemical sterilization as a form of rapid and easy sterilization in males
- Potential value in Latin American countries for its cultural acceptance
- Effects on behaviour (and testosterone levels) unknown



Puerto Natales, Chile

Chilean Patagonia

- 3,100 km south of Santiago
- 16,978 inhabitants (2002 census)
- Estimated dog population: 4,000
- Tourist town surrounded by rural area
- 2,000,000 sheep in region



Puerto Natales, Chile

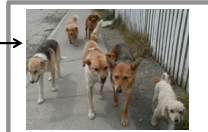
Justification

- One of the highest prevalence of hydatid disease in the world (Ministry of Health, SAG)
- Highly motivated to reduce/control dog population



Objectives

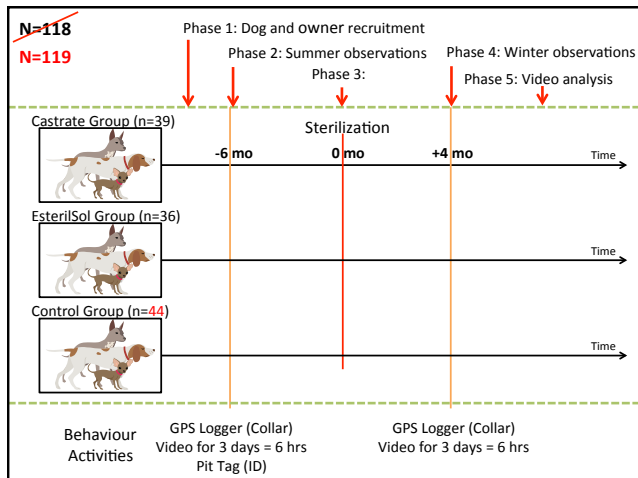
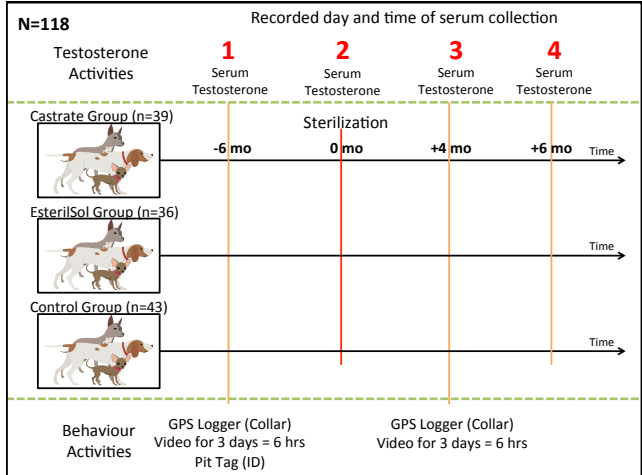
Sterilization
Surgical
Castration
vs
EsterilSol
Injection



Behaviour
Activity
Sexual
Dog Aggression

~60% of surgically castrated dogs change behavior
Maarschalkerweerd et al. (1997) Vet Rec. 140:617
Neilson et al. (1997) JAVMA. 211:180
Hopkins et al. (1976) JAVMA. 168:1108
Retrospective, home owned, and Owner Reported!

This is the first field trial study with direct behavioural observation after castration



Phase 1: Dog and owner recruitment

Initial start-up

- May to Aug 2011
- 179 owned dogs
 - Sample size of 150 (50/group)
- Inclusion criteria:
 - Intact, healthy male dog > 2 months
 - Access to the street at least part time
- Physical exam
 - Vaccination
 - Anti-parasitics (ecto- and endoparasites)



Phase 2/4: Summer/Winter observations

Methodology

- Video recording
 - One hour, morning & afternoon, 3 days (6 hours)



Phase 3: Sterilization

Methodology

- February 2-16, 2012
- All groups:
 - Physical exam
 - Endo- and ecto-parasiticide



Phase 3: Sterilization



Phase 5: Video-tracking analysis

Methodology

- August 1st to April 5th (8 months!!)
- Transcription of video to useable format for analysis



Time	Location	Activity	Distance	Speed	Acceleration	Angle	Heading	Roll	Pitch	Yaw
00:00:00	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:01	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:02	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:03	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:04	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:05	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:06	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:07	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:08	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:09	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:10	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:11	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:12	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:13	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:14	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:15	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:16	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:17	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:18	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:19	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:20	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:21	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:22	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:23	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:24	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:25	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:26	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:27	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:28	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:29	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:30	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:31	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:32	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:33	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:34	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:35	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:36	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:37	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:38	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:39	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:40	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:41	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:42	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:43	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:44	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:45	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:46	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:47	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:48	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:49	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:50	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:51	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:52	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:53	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:54	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:55	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:56	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:57	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:58	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:00:59	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
00:01:00	0,0	Rest	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

Phase 5: Video-tracking analysis

Methodology

- Ethogram developed
 - 58 male behaviours of interest
 - st4 st2 ly si res wa wother wgrou tro run jum
 - pl amdog fodog pldog co tailwa thdog thbydog fidog defdog mou mouby
 - chvehi chsmall chlarge cross
 - amper plper thper thbyper attaper avper foper
 - snif bark growl howl
 - sha stret yaw pan autogr allogr rub paw dig dri eat chew
 - urais ust ursq udoub def kigr copro out
- One-zero sampling
 - Observer recorded a “1” every time behaviour seen in a one-minute interval, 0 if not seen



1-Minute Video



Dog behaviour Puerto Natales.wmv

DOGS		Dogs (159)							
		Control (44)		Surgery (39)		EsterilSol (36)		Out of Study (40)	
		Pre (44)	Post (36)	Pre (39)	Post (36)	Pre (36)	Post (30)	Pre (40)	
SESSIONS	1	44	35	39	36	36	30		
	2	44	35	39	36	36	30		
	3	44	35	39	36	36	30		
	4	44	36	39	36	36	30		
	5	43	36	39	35	36	29		
	6	44	36	39	36	36	29		
	OVERALL		263	213	234	215	216	178	
		15,698	12,718	13,889	12,972	12,776	10,621		
		28,416		26,861		23,397			
OBSERVATION-MINUTES		78,674						5,770	

Group Allocation

	Control	EsterilSol	Surgery	Total
Random	18	20	27	65 (55%)
Owners Wanted	16	13	8	37 (31%)
Non-random	10	3	4	17 (14%)
Total	44 (37%)	36 (30%)	39 (33%)	119

Group Allocation

	Control	EsterilSol	Surgery	Total
Random	18	20	27	65 (55%)
Owners Wanted	16	13	8	37 (31%)
Non-random	10	3	4	17 (14%)
Total	44 (37%)	36 (30%)	39 (33%)	119

3 = too old
 1 = too wild
 6 = sample size
 1 = TVT
 2 = distemper
 1 = TVT
 1 = adverse reaction
 2 = aggressive

- How to deal with non-random dogs?
 - Assess selection bias
 - Compare models with/without non-randomized dogs
 - Conservative approach – eliminate non-randomized dogs

DOGS							
Dogs (65)							
Control (18)		Surgery (27)		EsterilSol (20)			
Pre (18)	Post (17)	Pre (20)	Post (17)	Pre (27)	Post (24)		
SESSIONS	1	18	17	20	17	27	24
	2	18	17	20	17	27	24
	3	18	17	20	17	27	24
	4	18	17	20	17	27	24
	5	18	17	20	17	27	24
	6	18	17	20	17	27	24
OVERALL	108	102	120	102	162	144	
	6,434	6,088	7,122	6,093	9,603	8,690	
	12,522		13,215		18,293		
	44,030						
OBSERVATION-MINUTES							

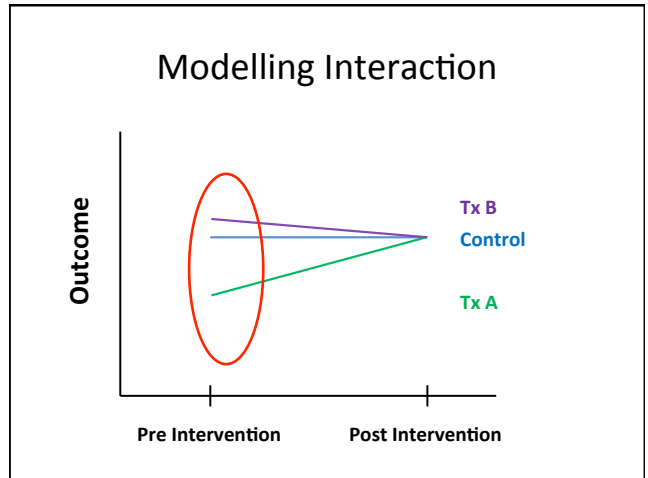
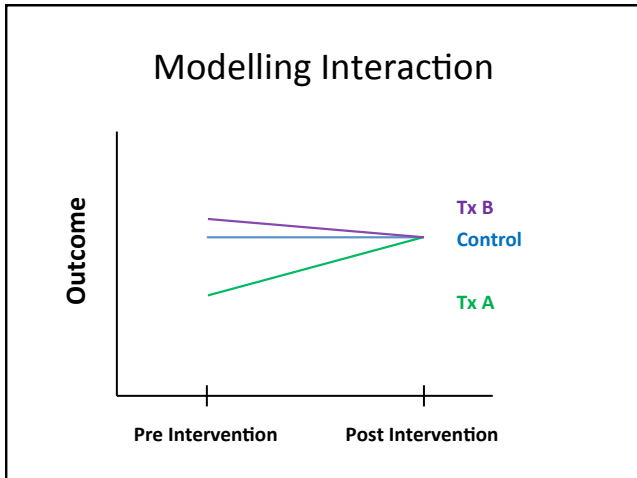
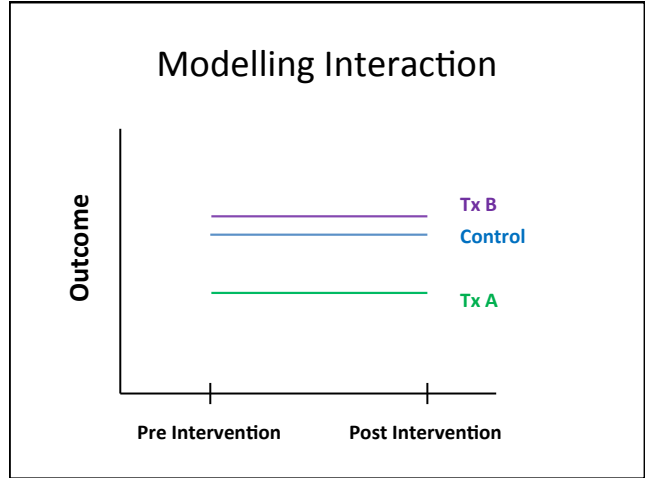
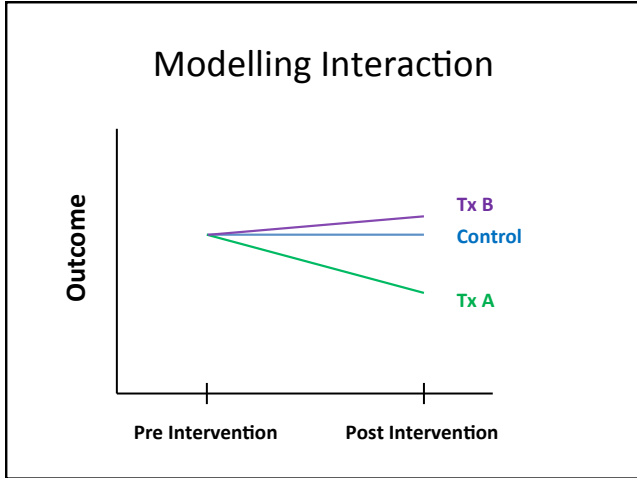
Methods

Behavioural variables of interest

- General Activities
 - Standing
 - Sniffing
 - Walking
 - Trotting
 - Crossing Road
 - Running
 - With Others
 - Following Person
 - Panting
 - Tail Wagging
 - Amicable Person
 - Urinating
- Dog Aggression
 - Fight Dog
 - Threaten Dog
 - Growl
- Sexual Behaviour
 - Follow Dog
 - Mounting

Methods

- Models based on presence/absence and on counts of observation-minute in important variables as identified by factor analysis
 - Negative Binomial Model
 - Count data
 - Exposure = minutes observed
 - Logistic regression
 - Presence/Absence data
- Interaction
 - Treatment (Surgery, EsterilSol, Control)
 - Pre / Post intervention
- Accounted for AM vs PM
- Repeated measures
 - Accounted for with fixed effects
- Statistical Significance was set at $p < 0.05$





Behaviour

Interpretation

- Findings can NOT apply to house dogs
- Only to FRD in this setting
- NOT comparable!

Results

Behavioural variables of interest

- General Activities
 - Standing *
 - Sniffing *
 - Walking *
 - Trotting *
 - Crossing Road
 - Running
 - With Others *
 - Following Person
 - Panting *
 - Tail Wagging
 - Amicable Person *
 - Urinating *
- Dog Aggression
 - Fight Dog
 - Threaten Dog
 - Growl
- Sexual Behaviour
 - Follow Dog *
 - Mounting *

Growling

LOGISTIC – Presence/Absence (Probabilities)

Predictive Margins of treatment#tx with 95% CIs

$p=0.002$

Negative Binomial - COUNT

Predictive Margins of treatment#tx with 95% CIs

$P<0.001$

- Surgery and Esterilol dogs had higher probabilities to growl after procedure
- Not much insight gained on growling frequencies

Future Analyses

- Use Factor Analysis
 - Reduce 58 variables to ~5 or 6 factors
 - Overarching behaviour trait that is responsible for the observed variables
 - Generates scores
 - Validation Required
 - Continuous scale
 - Increase sample size dramatically
 - Not subjective
- With Factor Scores
 - Further assess selection bias
 - Assess treatment effect on 'behaviour trait'
 - Assess effect of testosterone on 'behaviour trait'

Conclusions

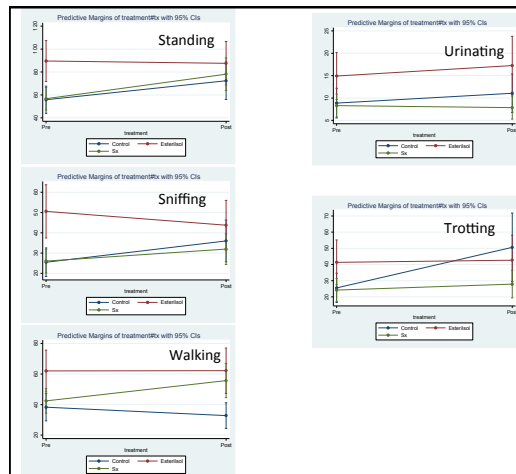
- First field trial with direct behavioural observations after castration
 - FRDs in a remote town in Latin America
 - Range of age in male dogs (~6 months to 12 years)
 - Enrollment issues
 - Deaths / lost / drop outs
 - Owner preference / welfare concerns
 - Individual variation
- Inconclusive results at this point
 - No real effect from treatment?
 - Sample size issue?
 - Testosterone variation within some groups
 - Magnitude in change of behaviours?
 - If there are effects – likely small

We'd like to thank our funders:

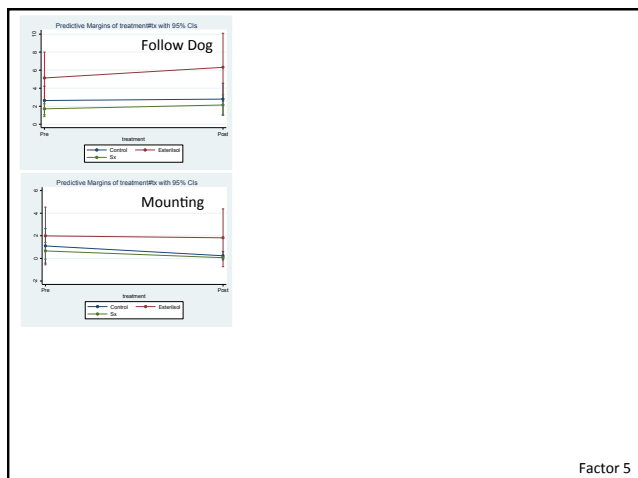
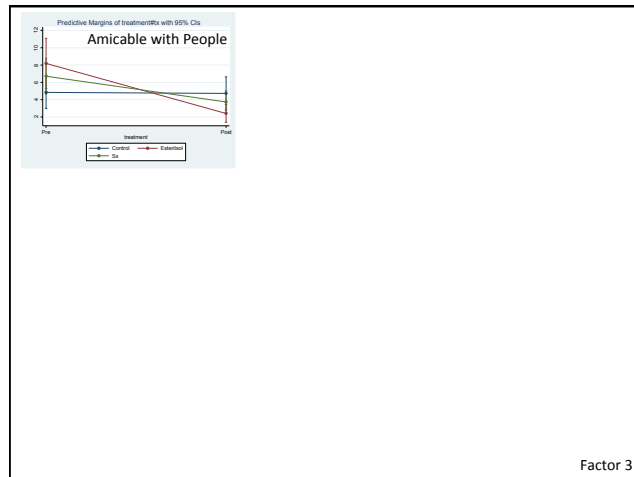
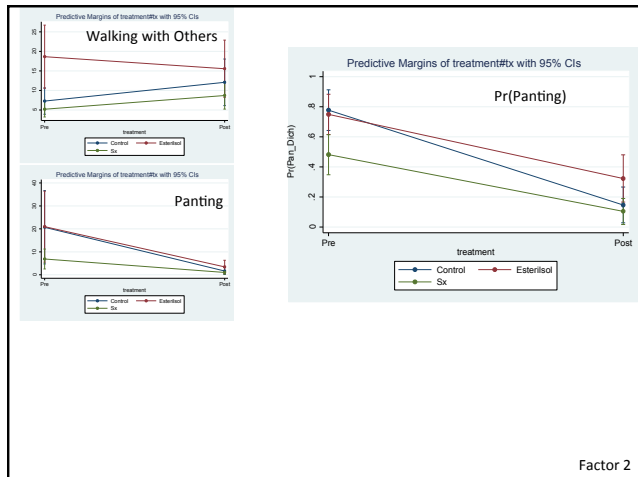


Special thanks to:

- The community of Puerto Natales
- Municipality of Puerto Natales
- Volunteers & Students



Factor 1



Factor Loading Values

Variable	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6
st4	0.8699					
res	-0.6927					
wa	0.7989					
wother		0.6541				
tro	0.6362					
run		0.734				
fodog					0.6442	
tailwa			0.6673			
thdog				0.6304		
fidog				0.4719		
mou					0.6488	
cross	0.6234					
amper			0.6585			
foper		0.5838				
snif	0.8651					
growl				0.5677		
pan		0.5569				
paw						0.6781
dig						0.6715
urais	0.7406					
kigr	0.4117					