

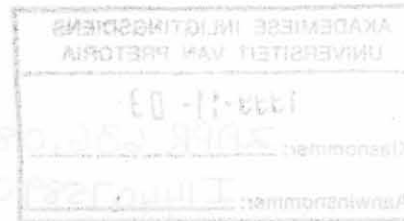
A PHYSIOLOGICAL BASIS FOR ANIMAL-FACILITATED PSYCHOTHERAPY

DECLARATION

Johannes Stefanus Joubert Odendaal

Submitted in partial fulfilment for the
requirements for the degree Philosophiae Doctor
in the Department of Physiology,
Faculty of Veterinary Science,
University of Pretoria

6 April 1999



DECLARATION

I herewith declare that the thesis submitted for the degree Philosophiae Doctor at the University of Pretoria has not previously been submitted for a degree at another University and that it is my own work.



J S J Odendaal

ACKNOWLEDGEMENTS

Thank you to Prof R Mearns, Dept of Physiology, Faculty of Veterinary Science, University of Pretoria.

My sincere appreciation to Prof Mouton who was inspired to start a multidisciplinary study. His keen interest in the subject and his constant contact as a supervisor made it possible to complete this study.

Thank you to Prof A L Swartz, Dept of Psychology, University of Pretoria.

"There is no such thing as an immaculate perception; we are inevitably part of the world we are trying to measure. And everywhere we look, we come face-to-face with randomness. We build our orders, but only at expense of creating randomness elsewhere. Complexity - this delicate tension between order and surprise - is a very fragile thing. Whether something appears simple, complex, or random depends on the observer as well as on the observed" - George Johnson.

Fire in the Mind. London: Viking, 1995: 134, 278, 287

University of Pretoria

To Dr Yvonne, thank you for her support during the project and for her help during the experiments. She was always friendly and helpful. Thank you for her helpful back problem. Her contribution proved to be very important to the study.

Supportive Services of the University of Pretoria

The Information Services, especially Mrs J Lourens and Mrs A Brouwer back: Statomet, especially Dr H Borraine, and the Support Services, especially Mrs R Dwan are thanked for their valuable support.

Typist

My thanks to Mrs Combrink, who was always willing to help during Christmas time. The high quality of her work is appreciated in the pages that will follow.

To Hanna, again

ACKNOWLEDGEMENTS

1. Prof R Meintjes, Dept of Physiology, Faculty of Veterinary Science, University of Pretoria
My sincere appreciation to Prof Meintjes who was prepared to take on a multidisciplinary study. His keen interest in the subject and guidance served as a continuous motivation to complete the study.
2. Prof A L Coetzee, Dept of Psychiatry, Faculty of Medicine, University of Pretoria
Again, my sincere thanks to Prof Coetzee who was also willing to cross disciplinary borders. He set an example by initiating a pet-facilitated psychotherapy programme at Weskoppies Hospital and that too served as an encouragement to do the study.
3. Technikon Pretoria, Department of Biological Sciences
The Technikon Pretoria, initially Prof R McCrindle and Dr J Engelbrecht, but especially Dr S M C Lehmann, helped to make the difficult analyses possible. Dr Lehmann made an exceptional effort to break new ground with regard to the analyses of dog neurochemicals. I am deeply indebted by her dedication and the success she achieved in the laboratory.
4. Dr S Yeates, Dept of Medicine, Faculty of Veterinary Science, University of Pretoria
To Dr Yeates, thanks for her support during the collection of specimens during the experiment. She was always friendly and helpful despite a painful back problem. Her contribution proved to be very valuable to the study.
5. Supportive Services of the University of Pretoria
The Information Services, especially Mrs A Lourens and Mrs A Breytenbach; Statomet, especially Dr H Borraine; and the Computer Services, especially Mrs R Owen are thanked for their valuable support.
6. Typist
My thanks to Mrs Combrinck, who was always willing to help, even during Christmas time. The high quality of her work is evident in the pages that will follow.

ABSTRACT

Since Boris Levinson published his pioneering studies on animal-facilitated psychotherapy in the sixties, human health professions had limited interest in this field. A particular problem in animal-facilitated psychotherapy is a lack of a theoretical foundation, which can provide a rationale for such therapy. The aims of this study were two-fold: firstly, to integrate existing theories on positive human-human and human-animal interaction; and secondly, to find common physiological support for such a theoretical foundation.

By using an elective approach, positive interaction (attention needs) was valued in 16 personology theories as an integral part of the psychological, emotional, social and cultural needs of all individuals. Attention was indicated as a basic need and that many of the therapeutic advantages claimed from human-animal interaction, are actually based on such a need. It was further indicated that positive interaction between man and animal is reciprocal and this mutual effect can contribute to the success of the therapy. The term used to describe this basic need of positive interaction is *attentionis egens*. A Latin term was chosen to avoid confusion with term attention-seeking behaviour, which is often associated with negative or problem behaviour.

A physiological framework was used to support the theoretical foundation. This was based on known studies related to human-human and animal-animal affiliation, providing measurable parameters for positive human-animal interaction. The method was to take baseline values before and measurements after positive interaction with a dog. Parameters were an anxiety questionnaire, blood pressure, phenylethylamine, norepinephrine, dopamine, endorphins, oxytocin, prolactin and cortisol. The indication to collect blood for chemical analyses was a decrease in blood pressure over a maximum period of 30 minutes of positive interaction. Participants were divided into two groups: the experimental group interacted with their own dogs and the control group with unfamiliar dogs. The effect of interacting with dogs was also compared to the effect of quiet book-reading with the same participants.

The results supported the mutual physiological effect in human and dogs as well as the theoretical foundation for animal-facilitated psychotherapy. Such physiological parameters paved the way for an encompassing theory on positive interaction behaviour and thus provided a rationale for animals in therapy, particularly where basic attention needs are to be fulfilled. The *attentionis egens* theory proved to be rather accommodating than opposing other positive interaction theories.

The main results were:

- a significant decrease in blood pressure (5-24 minutes) is a valid indicator of biochemical changes associated with positive interaction;
- the experimental group (ie people with their own dogs), had significant higher plasma levels of oxytocin and prolactin, indicating a long term bond;
- both species had significant changes of β -phenylethylamine, β -endorphin, dopamine, oxytocin and prolactin, indicating that the physiological response during positive human-dog interaction is reciprocal;
- there were similarities between an anxiety state questionnaire (feeling) and normal mean arterial blood pressure of humans, ie no significant anxiety was present;
- positive interaction with dogs can equal, and in some instances improve on the effect of an quiet, calm intervention such as book-reading;
- a neurochemical profile for positive human-dog interaction should include at least β -phenylethylamine, dopamine and oxytocin; and
- norepinephrine decreased, probably as a reaction to the intravenous blood collection and cortisol decreased significantly in humans and the control dog group. Dogs with their owners, were more excited about the new experience.

With regard to the application of this knowledge, animals in therapy could be described in a similar format used for medicinal therapies. It is further recommended that:

- animal-facilitated psychotherapy should become a commonly accepted approach in psychiatry and become part of the formal curricula for psychiatrists;
- that animal therapy programmes should be structured in a multidisciplinary way, always including veterinarians who should be responsible for the animals' welfare; and
- that programmes should be carefully planned, as for any other therapeutic regimen, using a suitable physiological rationale for clinical psychotherapy.

Keywords: positive human-dog interaction, physiological parameters, animal-facilitated psychotherapy, pets as prescription, human-human interaction theories, animal-animal interaction theories, human-animal interaction theories, therapeutic rationale, *attentionis egens*, psychiatric training.

Johannes Stefanus Joubert OORLOU

Bevestiging van die 1ste en 2de oorsigting
van die verloop van die graad Prokwozhia OORLOU
in die Departement Fisiologie
Fakulteit Mediese Wetenskappe
Universiteit van Pretoria

OPSOMMING

**'N FISIOLOGIESE BASIS VIR
DIER-FASILITERENDE PSIGOTERAPIE**

Johannes Stefanus Joubert Odendaal

Voorgelê vir die gedeeltelike vervulling
van die vereistes vir die graad Philosophiae Doctor
in die Departement Fisiologie,
Fakulteit Veeartsenykunde,
Universiteit van Pretoria

1999

OPSOMMING

Sedert Boris Levinson sy pionierstudie in die veld van dier-fasiliterende psigoterapie in die sestigs gepubliseer het, het menslike gesondheidsprofesies beperkte belangstelling daarin getoon. 'n Spesifieke probleem in dier-fasiliterende psigoterapie is die afwesigheid van teoretiese beginsels wat 'n rationale vir so 'n teorie kan voorsien. Die doelwitte van hierdie studie was dus tweevoudig: eerstens, om bestaande teorieë oor mens-tot-mens en mens-tot-dier te integreer en tweedens, om 'n gemeenskaplike fisiologiese ondersteuning vir sulke teoretiese beginsels te bepaal.

Deur gebruik te maak van 'n elektiewe benadering, is positiewe interaksie (aandagsoekende behoeftes) in 16 persoonlike teorieë geëvalueer as 'n integrale deel van die psigologiese, emosionele, sosiale en kulturele behoeftes van alle individue. Aandag was aangedui as 'n basiese behoefte en dat baie van die terapeutiese voordele waarop aanspraak gemaak word in mens-dier-interaksies, in werklikheid gebaseer is op so 'n behoefte. Verder is aange-
toon dat positiewe interaksie tussen mens en dier wederkerig is en hierdie onderlinge effek kan bydra tot die sukses van sulke terapieë. Die term wat gebruik is om hierdie basiese behoefte aan aandag te beskryf is *attentionis egens*. Latynse terminologie is verkies om verwarring te voorkom met die term aandagsoekende gedrag, wat dikwels geassosieer word met negatiewe of probleemgedrag.

'n Fisiologiese raamwerk is gebruik om die teoretiese beginsels te ondersteun. Dit was gebaseer op bekende studies wat verband hou met mens-mens en dier-dier affiliasie, ten einde meetbare parameters daar te stel vir positiewe mens-dier-interaksie. Die metode was om basislyn-waardes te bepaal en weer ná positiewe interaksie met 'n hond. Die parameters was 'n angs-skaal, bloeddruk, fenieletielamien, norepinefrien, dopamien, endorfiene, oksitosien, prolaktien en kortisol. 'n Aanduiding wanneer om bloedmonsters te versamel vir chemiese analyses, was 'n verlaging in bloeddruk oor 'n periode van maksimum 30 minute van positiewe interaksie. Deelnemers was verdeel in twee groepe, die eksperimentele groep wat met honde geïnterreageer het en 'n kontrole groep wat met onbekende honde geïnterreageer het. Die effek van die hond-interaksies was ook vergelyk met die effek van stil boeklees deur dieselfde deelnemers.

Die resultate het die onderlinge fisiologiese effek in mense en honde ondersteun, sowel as die teoretiese beginsels vir dier-gefasiliteerde psigoterapie. Sulke fisiologiese parameters het die weg gebaan vir 'n insluitende teorie oor positiewe interaksie gedrag, veral waar basiese aandagbehoefte vervul moet word. Die *attentionis egens*-teorie blyk eerder inklusief, as opponerend teenoor ander positiewe interaksie teorieë te wees.

Die belangrikste resultate was:

- 'n betekenisvolle vermindering in bloeddruk (5-24 minute) is 'n geldige indikator van biochemiese verandering wat geassosieer is met positiewe interaksie;
- die eksperimentele groep (di met eie honde), het betekenisvolle hoër plasmavlakke van oksitoniene en prolaktien getoon, wat op 'n langtermyn binding dui;
- beide spesies het betekenisvolle verskille van β -fenieletielamien, β -endorfiene, dopamien, oksitosien en prolaktien getoon, wat daarop dui dat die fisiologiese reaksie gedurende positiewe mens-hond-interaksie wederkerig van aard is;
- daar was ooreenkomste tussen 'n angs-status vraelys (gevoel) en normale gemiddelde arteriële bloeddruk van mense, di geen betekenisvolle angs was teenwoordig nie;
- positiewe interaksie met honde kan dieselfde, en in sommige gevalle 'n beter effek hê as 'n stil, kalm intervensie soos boeklees;
- 'n neurochemiese profiel vir positiewe mens-hond-interaksie behoort ten minste β -fenieletielamien, dopamien en oksitosien in te sluit; en
- norepinefrien het gedaal, waarskynlik as reaksie op die intraveneuse bloedkolleksie, en kortisol het betekenisvol in mense en die kontrole hondegroep gedaal. Honde wat by hul eienaars was, was meer opgewonde oor die nuwe ervaring.

Ten opsigte van die toepassing van hierdie kennis, kan diere vir terapie beskryf word in 'n soortgelyke formaat as vir medisinale behandeling. Dit word verder aanbeveel dat:

- diere-fasiliterende psigoterapie algemeen aanvaar word as 'n benadering vir psigoterapie en dat dit deel word van die formele kurrikula van psigiaters;
- dat diere in terapieprogramme gestruktueer word op 'n multidissiplinêre basis wat as 'n reël veeartse sal insluit om na die welsyn van die diere om te sien; en
- dat programme met oorleg beplan word op dieselfde wyse as vir enige ander terapeutiese benadering, terwyl 'n geskikte fisiologiese rationale vir kliniese psigoterapie gebruik word.

Slutelwoorde: positiewe mens-hond-interaksie, fisiologiese parameters, diere-fasiliteerde terapie, diere op voorskrif, mens-mensinteraksie teorieë, diere-diereinteraksie teorieë, mens-diereinteraksie teorieë, terapeutiese rationale, *attentionis egens*, psigiatriese opleiding.

INDEX

Page

Declaration	i
Acknowledgements	ii
Abstract	iv
Opsomming	viii
Index	xi
List of figures	xiv
List of tables	xxii
List of plates	xxiv
CHAPTER 1: HUMAN ANIMAL INTERACTION IN PERSONOLOGY CONTEXT	
CHAPTER 1: INTRODUCTION	1
1.1 Background and motivation	1
1.2 Problem statement	3
1.3 Hypothesis	3
1.4 Aim and objectives of the study	3
1.4.1 General aim	3
1.4.2 Specific objectives	3
CHAPTER 2: EXISTING INTERACTION THEORIES IN PERSONOLOGY	5
2.1 Introduction	5
2.2 Interaction theories	8
2.2.1 Alfred Adler	8
2.2.2 Gordon Allport	9
2.2.3 Karen Horney	10
2.2.4 Erich Fromm	11
2.2.5 Harry Stack Sullivan	13

2.2.6	Erik Erikson	14
2.2.7	John Dollard and Neal Miller	15
2.2.8	Albert Bandura	16
2.2.9	Henry Murray	18
2.2.10	Abraham Maslow	20
2.2.11	Carl Rogers	21
2.2.12	George Kelly	22
2.2.13	Victor Frankl	22
2.2.14	Kurt Lewin	24
2.2.15	Fritz Perls	25
2.2.16	Phenomenological psychology	26
2.3	Ideas from the natural sciences	27
2.3.1	Fritjof Capra	28
2.3.2	Danah Zohar and Ian Marshall	30
2.3.3	Paul Davis	32
2.3.4	Bryan Appleyard	34
2.4	Interpretation of interaction theories	35
2.5	Discussion	38
CHAPTER 3: HUMAN-ANIMAL INTERACTION IN HUMAN-HUMAN		
	CONTEXT	40
3.1	Introduction	40
3.2	Evolution of interaction behaviour	40
3.3	Attention needs and therapy	48
3.4	Discussion	50
CHAPTER 4: THE CURRENT STATUS OF ANIMAL-FACILITATED		
	PSYCHOTHERAPY	52
4.1	Introduction	52
4.2	Animals in therapy before 1960	53
4.3	Animal-facilitated psychotherapy: 1960-1979	54
4.4	Animal-facilitated psychotherapy: 1980-1989	56
4.5	Animal-facilitated psychotherapy: 1990-1999	63
4.6	A review on animal-facilitated psychotherapy literature	67
4.7	Animal-facilitated psychotherapy in South Africa	70
4.8	Discussion	71

CHAPTER 5: THE PHYSIOLOGY OF POSITIVE INTERACTION	74
5.1 Introduction	74
5.2 Interaction theories and physiological parameters	77
5.3 Neurotransmitters	81
5.3.1 Norepinephrine	84
5.3.2 Dopamine	84
5.3.3 Phenylethylamine	85
5.3.4 Endorphin	86
5.4 Hormones	86
5.4.1 Prolactin	86
5.4.2 Oxytocin	87
5.4.3 Cortisol	88
5.5 Absence of interaction	88
5.6 Discussion	89
CHAPTER 6: METHODOLOGY FOR ESTABLISHING PHYSIO- LOGICAL SUPPORT FOR INTERACTION THEORIES . .	91
6.1 Introduction	91
6.2 Hypothesis	92
6.3 Benefits arising from the experiment	92
6.4 Materials and method	92
6.4.1 Type of research	92
6.4.2 Pilot study	92
6.4.3 Sample selection	93
6.4.3.1 Human subjects	93
6.4.3.2 Dog subjects	94
6.4.4 Experimental design	94
6.4.4.1 Experimental and control group	95
6.4.4.2 Pre- and post-test control test (counter balancing design) with different groups	95
6.4.4.3 Pre- and post-test with different interventions	95
6.4.4.4 Questionnaire	96
6.4.5 Experimental model	97
6.4.6 Experimental procedures	98
6.4.7 Observation	101
6.4.8 Variables	101
6.4.8.1 Independent variables	101

6.4.8.2	Dependent variables	101
6.5	Validity and reliability of study	102
6.5.1	Validity	102
6.5.2	Reliability	104
6.6	Ethics	105
6.7	Statistics	105
CHAPTER 7: RESULTS OF ESTABLISHING PHYSIOLOGICAL PARAMETERS DURING POSITIVE HUMAN-ANIMAL INTERACTION		108
7.1	Biographical details of subjects	108
7.1.1	Humans	108
7.1.2	Dogs	108
7.2	Questionnaire to determine the state of anxiety of human subjects	109
7.3	Interpretation of results	110
7.4	Pilot study	110
7.4.1	Aims and method	110
7.4.2	Subjects of pilot study	111
7.4.3	Results of pilot study	111
7.4.4	Conclusion of pilot study	112
7.5	The main experiment	112
7.5.1	Results	112
7.6	Changes in MAP and selected biochemicals in humans interacting positively with dogs	113
7.6.1	Changes in MAP	113
7.6.2	Changes in plasma neurotransmitters	115
7.6.2.1	Phenylacetic acid as metabolite of phenylethylamine	115
7.6.2.2	Dopamine	116
7.6.2.3	β -endorphin	118
7.6.2.4	Norepinephrine	120
7.6.2.5	Oxytocin	123
7.6.2.6	Prolactin	126
7.6.2.7	Cortisol	128
7.7	Statistical differences between experimental and control human groups	131
7.8	Changes in MAP and selected biochemicals in dogs	131
7.8.1	Changes in MAP	131
7.8.2	Changes in plasma neurotransmitters	133

7.8.2.1	Phenylacetic acid as metabolite of phenylethylamine	133
7.8.2.2	Dopamine	134
7.8.2.3	β -endorphin	135
7.8.2.4	Norepinephrine	136
7.8.2.5	Oxytocin	137
7.8.2.6	Prolactin	138
7.8.2.7	Cortisol	139
7.9	Statistical differences between experimental and control dog groups	140
7.10	Physiological changes in humans and dogs	140
7.10.1	Changes in MAP	140
7.10.2	Changes in plasma neurotransmitters	141
7.10.2.1	Phenylacetic acid as metabolite of phenylethylamine	141
7.10.2.2	Dopamine	143
7.10.2.3	β -endorphin	144
7.10.2.4	Norepinephrine	145
7.10.2.5	Oxytocin	146
7.10.2.6	Prolactin	147
7.10.2.7	Cortisol	148
7.11	Statistical difference between humans and dogs	149
7.12	Quiet book-reading as a control to positive dog interaction	149
7.12.1	MAP changes	149
7.12.2	Changes in plasma neurotransmitters	150
7.12.2.1	Phenylacetic acid as metabolite of phenylethylamine	150
7.12.2.2	Dopamine	151
7.12.2.3	β -endorphin	152
7.12.2.4	Norepinephrine	153
7.12.2.5	Oxytocin	154
7.12.2.6	Prolactin	155
7.12.2.7	Cortisol	156
7.13	Statistical differences between quiet book-reading and positive dog interaction	157
7.14	Discussion	157
7.14.1	Results in perspective	158
7.14.2	Placebo effect	159

7.14.3	Neurochemical profile of human-animal interaction	161
7.14.4	Measurement of emotions	162

CHAPTER 8: HUMAN-ANIMAL INTERACTION THEORIES - A CRITICAL ANALYSIS 164

8.1	Introduction	164
8.2	Terminology	164
8.2.1	<i>Attentionis egens</i>	167
8.3	Existing theories on human-animal interaction	168
8.3.1	Brickel: 1982	169
8.3.2	Kidd and Kidd: 1987	169
8.3.3	Case: 1987	171
8.3.4	Bergler: 1988	171
8.3.5	Odendaal: 1988	173
8.3.6	Doi: 1991	174
8.3.7	Hills: 1993	175
8.3.8	Wilson: 1994	175
8.3.9	Human-Animal Interaction Conference, Geneva: 1995 . .	177
8.3.10	Costall: 1996	179
8.3.11	Cameron: 1997	180
8.3.12	Wilson: 1998	181
8.4	Discussion	181

CHAPTER 9: APPLICATIONS OF HUMAN-ANIMAL THEORY IN ANIMAL-FACILITATED PSYCHOTHERAPY 183

9.1	Introduction	183
9.2	Conditions for animal-facilitated psychotherapy	183
9.2.1	Therapist	184
9.2.2	Patient	184
9.2.3	Animal	184
9.3	Preconditions for animal-facilitated psychotherapy	184
9.3.1	Preconditions pertaining medical factors	185
9.3.1.1	Hygiene	185
9.3.1.2	Zoonoses	186
9.3.1.3	Injuries	188
9.3.1.4	Allergies	189
9.3.2	Preconditions pertaining to patient needs	190

9.3.2.1	Matching patient and animal	190
9.3.2.2	When animals, that patient became attached to, die	190
9.3.3	Preconditions pertaining the needs of animals used in therapy	192
9.3.3.1	People can abuse animals	192
9.3.3.2	Sources and selection of animals	192
9.3.3.3	Patients not able to care for animals anymore	193
9.3.4	Staff and management involved in animal-facilitated psychotherapy	193
9.3.4.1	Success of an animal-facilitated programmes	194
9.3.4.2	Staff	194
9.3.5	Financial aspects	196
9.3.5.1	Spectrum of financial liabilities in animal therapy	196
9.3.5.2	Sources of finances	196
9.4	Applied animal-facilitated psychotherapy	197
9.5	Animals on prescription	199
9.6	Discussion	201
 CHAPTER 10: SUMMARY AND EVALUATION OF STUDY		 206
10.1	Introduction	206
10.2	Summary of objectives	206
10.2.1	Existing interaction theories in personology	206
10.2.2	Human-animal interaction in human-human context	206
10.2.3	Current status of animal-facilitated psychotherapy	207
10.2.4	Determining a physiological basis for positive interaction	207
10.2.5	Methodology to investigate a physiological basis for human-animal interaction	208
10.2.6	Results of experimental procedures	208
10.2.7	Evaluating existing human-animal interaction theories	208
10.2.8	Application of human-animal theory in animal- facilitated psychotherapy	209
10.3	Evaluation of study in terms of its contributions	209
10.3.1	Converging a wide spectrum of interaction literature	209
10.3.2	Interspecies physiological indicators of positive interaction	210
10.3.3	Rationale for animal-facilitated psychotherapy	210

10.4	Self-criticism of the study	210
10.4.1	Elective approach	210
10.4.2	The comprehensive role of animals	210
10.4.3	Sample size	211
10.4.4	Questionnaire	211
10.4.5	Clinical studies	211
10.5	Further research	211
10.5.1	Biochemistry of interspecies interaction	212
10.5.2	Drug development	212
10.5.3	Theory in therapy	212
10.6	Recommendations	212
10.6.1	Education	212
10.6.2	Multidisciplinary approach	213
10.6.3	Planned programmes	213
10.6.4	Clinical application of the rationale	213
10.7	Conclusion	213
REFERENCES		215
ADDENDUM A: RAW DATA		244
ADDENDUM B: LETTERS OF CONSENT		245
ADDENDUM C: BILINGUAL QUESTIONNAIRE		246
7.1	Plasma oxycortin (OXO) of humans before and after interacting positively with own (n = 9) and unfamiliar (n = 9) dogs	116
7.2	Plasma prolactin (PRO) of humans before and after interacting positively with own (n = 9) and unfamiliar (n = 9) dogs	116
7.3	Plasma cortisol (COR) of humans before and after interacting positively with own (n = 9) and unfamiliar (n = 9) dogs	120

LIST OF FIGURES

3.1	Human-animal interaction in human-human context	51
5.1	A model based on physiological parameters to link human-human, animal-animal and human-animal interaction theories	90
6.1	Basic pre- and post-test design with different groups	95
6.2	Pre- and post-test with different interventions	96
7.1	Mean arterial blood pressure (MAP) of humans before and after interacting positively with own (n = 9) and unfamiliar (n = 9) dogs	113
7.2	Plasma phenylacetic acid (PAA) of humans before and after interacting positively with own (n = 9) and unfamiliar (n = 9) dogs	115
7.3	Plasma dopamine (DOP) of humans before and after interacting positively with own (n = 9) and unfamiliar (n = 9) dogs	116
7.4	Plasma beta-endorphin (END) of humans before and after interacting positively with own (n = 9) and unfamiliar (n = 9) dogs	118
7.5	Plasma norepinephrine (NEP) of humans before and after interacting positively with own (n = 9) and unfamiliar (n = 9) dogs	120
7.6	Plasma oxytocin (OXT) of humans before and after interacting positively with own (n = 9) and unfamiliar (n = 9) dogs	123
7.7	Plasma prolactin (PRO) of humans before and after interacting positively with own (n = 9) and unfamiliar (n = 9) dogs	126
7.8	Plasma cortisol (COR) of humans before and after interacting positively with own (n = 9) and unfamiliar (n = 9) dogs	128

7.9	Mean arterial blood pressure (MAP) of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)	131
7.10	Plasma phenylacetic acid (PAA) of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)	133
7.11	Plasma dopamine (DOP) of dogs before and after inter-acting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)	134
7.12	Plasma beta-endorphin (END) of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)	135
7.13	Plasma norepinephrine (NEP) of dogs before and after inter- acting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)	136
7.14	Plasma oxytocin (OXT) of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)	137
7.15	Plasma prolactin (PRO) of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)	138
7.16	Plasma cortisol (COR) of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)	139
7.17	Mean arterial blood pressure (MAP) of humans (n = 18) and dogs (n = 18) before and after interacting positively with each other	140
7.18	Plasma phenylacetic acid (PAA) of humans (n = 18) and dogs (n = 18) before and after interacting positively with each other	141
7.19	Plasma dopamine (DOP) of humans (n = 18) and dogs (n = 18) before and after interacting positively with each other	142
7.20	Plasma beta-endorphin (END) of humans (n = 18) and dogs (n = 18) before and after interacting positively with each other	143

7.21	Plasma norepinephrine (NEP) of humans (n = 18) and dogs (n = 18) before and after interacting positively with each other	144
7.22	Plasma oxytocin (OXT) of humans (n = 18) and dogs (n = 18) before and after interacting positively with each other	145
7.23	Plasma prolactin (PRO) of humans (n = 18) and dogs (n = 18) before and after interacting positively with each other	146
7.24	Plasma cortisol (COR) of humans (n = 18) and dogs (n = 18) before and after interacting positively with each other	147
7.25	Mean arterial blood pressure (MAP) of humans before and after interacting positively with dogs and quiet book-reading (n = 18)	148
7.26	Plasma phenylacetic acid (PAA) of humans before and after interacting positively with dogs and quiet book-reading (n = 18)	149
7.27	Plasma dopamine (DOP) of humans before and after inter-acting positively with dogs and quiet book-reading (n = 18)	150
7.28	Plasma beta-endorphin (END) of humans before and after interacting positively with dogs and quiet book-reading (n = 18)	151
7.29	Plasma norepinephrine (NEP) of humans before and after interacting positively with dogs and quiet book-reading (n = 18)	152
7.30	Plasma oxytocin (OXT) of humans before and after interacting positively with dogs and quiet book-reading (n = 18)	153
7.31	Plasma prolactin (PRO) of humans before and after interacting positively with dogs and quiet book-reading (n = 18)	154
7.32	Plasma cortisol (COR) of humans before and after interacting positively with dogs and quiet book-reading (n = 18)	156

8.1	Proposed theoretical model according to Bergler, 1998	172
8.2	Clients' needs to keep companion animals according to Odendaal, 1988	174
9.1	Needs Assessment Model according to Barnett, Quigley, 1984	195
7.1	Status of anxiety scores on a 5-point scale questionnaire before and after positive dog interaction	172
7.2	β-endorphin (PEA) values in human and dog subjects before and after positive interaction	173
7.3	β-endorphin (PEA) values in human and dog subjects before and after positive interaction (n = 9)	173
7.4	Concentrations of dopamine (log/f) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)	174
7.5	Concentrations of 5-endorphin (ng/ml) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)	174
7.6	Concentrations of dopamine (log/f) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)	174
7.7	Concentrations of 5-endorphin (ng/ml) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)	174
7.8	Concentrations of norepinephrine (log/f) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)	174
7.9	Concentrations of oxytocin (ng/l) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)	174
7.10	Concentrations of prolactin (ng/l) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)	174

LIST OF TABLES

6.1	Roster for experimental design	97
7.1	Characteristics of human and dog subjects participating in human-dog interaction	109
7.2	State of anxiety scores on a 5-point scale questionnaire before and after positive dog interaction	109
7.3	Phenylethylamine (PEA) values in human and dog subjects before and after positive interaction (n = 6)	112
7.4.	Mean arterial blood pressure of humans (mmHg) before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)	114
7.5	Concentrations of phenylacetic acid (pg/ℓ) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)	115
7.6	Concentrations of dopamine (pg/ℓ) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)	117
7.7	Concentrations of β-endorphin (pmol/ℓ) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)	118
7.8	Concentrations of norepinephrine (pg/ℓ) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)	121
7.9	Concentrations of oxytocin (mg/ℓ) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)	123
7.10	Concentrations of prolactin (ng/ℓ) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)	126

7.11	Concentrations of cortisol (nmol/ℓ) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)	128
7.12	Mean arterial blood pressure (mmHg) of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)	132
7.13	Concentrations of phenylacetic acid (pg/ℓ) in the plasma of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)	133
7.14	Concentrations of dopamine (pg/ℓ) in the plasma of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9) . . .	134
7.15	Concentrations of β-endorphin (pmol/ℓ) in the plasma of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)	135
7.16	Concentrations of norepinephrine (pg/ℓ) in the plasma of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)	136
7.17	Concentrations of oxytocin (ng/ℓ) in the plasma of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9) . . .	137
7.18	Concentrations of prolactin (ng/ℓ) in the plasma of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9) . . .	138
7.19	Concentrations of cortisol (nmol/ℓ) in the plasma of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)	139
7.20	Mean arterial blood pressure (mmHg/ℓ) of humans (n = 18) and dogs (n = 18) interacting positively with each other	141
7.21	Concentrations of phenylacetic acid (pg/ℓ) in the plasma of humans (n = 18) and dogs (n = 18) interacting positively with each other	142

7.22	Concentrations of dopamine (pg/ℓ) in the plasma of human (n = 18) and dogs (n = 18) interacting positively with each other	143
7.23	Concentrations of β-endorphin (pmol/ℓ) in the plasma of humans (n = 18) and dogs (n = 18) interacting positively with each other	144
7.24	Concentrations of norepinephrine (pg/ℓ) in the plasma of humans (n = 18) and dogs (n = 18) interacting positively with each other	145
7.25	Concentrations of oxytocin (ng/ℓ) in the plasma of humans (n = 18) and dogs (n = 18) interacting positively with each other	146
7.26	Concentrations of prolactin (ng/ℓ) in the plasma of humans (n = 18) and dogs (n = 18) interacting positively with each other	147
7.27	Concentrations of cortisol (nmol/ℓ) in the plasma of humans (n = 18) and dogs (n = 18) interacting positively with each other	148
7.28	Mean arterial blood pressure (mmHg/ℓ) of humans reading a book quietly (n = 18)	150
7.29	Concentrations of phenylacetic acid (pg/ℓ) in the plasma of humans reading a book quietly (n = 18)	151
7.30	Concentrations of dopamine (pg/ℓ) in the plasma for humans reading a book quietly (n = 18)	152
7.31	Concentrations of β-endorphin (pmol/ℓ) in the plasma for humans reading a book quietly (n = 18)	153
7.32	Concentrations of norepinephrine (pg/ℓ) in the plasma for humans reading a book quietly (n = 18)	154
7.33	Concentrations of oxytocin (ng/ℓ) in the plasma for of humans reading a book quietly (n = 18)	155
7.34	Concentrations of prolactin (ng/ℓ) in the plasma for humans reading a book quietly (n = 18)	156
7.35	Concentrations of cortisol (nmol/ℓ) in the plasma for humans reading a book quietly (n = 18)	157
8.1	Theories on human-animal interaction by author, key idea and link to <i>attentionis egens</i>	182

9.1	Conditions and preconditions for animal-facilitated psychotherapy	197
9.2	An example of an information leaflet on the use of animals in animal-facilitated psychotherapy in the format of a leaflet for the use of prescribed drugs	200

CHAPTER 1

LIST OF PLATES

INTRODUCTION

6.1 A posed example of the experimental conditions 97

1.1 Background and motivation

LIST OF ADDENDA

ADDENDUM A: RAW DATA 244

ADDENDUM B: LETTERS OF CONSENT 245

ADDENDUM C: BILINGUAL QUESTIONNAIRE 246

CHAPTER 1

INTRODUCTION

1.1 Background and motivation

The field of study known as human-animal interaction only became known in the eighties when scientific societies were established and international conferences were organised. In South Africa, the Human-Animal Contact Study Group was founded in 1984 and South Africa was also a founder member of the International Association of Human-Animal Interaction Organizations in 1992. Konrad Lorenz is honoured as the father of this field, for his publications on the subject in the fifties.¹ The field of study covers a broad scope which includes all interaction between man and animal on a continuum from no interaction, negative interaction to positive interaction.²

Despite this inclusive approach to human-animal interaction, it was mainly the emotional and positive aspects that caught the imagination of the public and researchers alike. It was specifically highlighted in the use of animals in therapeutic situations which involved disabled persons. In this regard the pioneer in the field of animal-facilitated psychotherapy was Boris Levinson, a psychiatrist who had his practice in New York. He began his observations in a very modest fashion, by noting that his own pet dog at home where his practice was situated, could assist him in the therapeutic approach to children with communication problems. Levinson had the courage to publish his observations in scientific papers, but not without receiving the expected criticism for his methods.^{3,4,5} History proved Levinson right and silenced many of his critics. He died in 1984, a successful, well-known and in certain circles even famous psychiatrist. His contribution to the field of human-animal interaction paved the way for further similar studies in psychiatry and he will always be seen as one of the main contributors in establishing this field.

In 1987, the field of human-animal interaction studies entered a new phase with the publication of its own scientific journal, *Anthrozoös*. It is an accredited journal which is indexed in many important related publications, inter alia the Science Citation Index. This journal is the vehicle which will take human-animal interaction studies into the future and the direction will be determined by the contributing scientists. The challenge is to keep the contents balanced between the variables of participating scientific fields. The nature of many of the studies is also multidisciplinary.

Anthrozoös is not only important for the publication of research, but the editorials should also be taken note of. The editor, Prof Andrew Rowan from Tufts University in Boston, enjoys high credibility among his peers from the academic and scientific spheres in which he is involved. In one editorial Rowan⁶ argued that there is already solid evidence of animal contact having significant health benefits and that it positively influences transient physiological states, morale and feelings of self-worth, but that more research funds are needed to identify the scope of the influence of animal contact. In another issue, under the heading "The Psychiatric Connection" Rowan⁷ pointed out how psychiatrists had played a role in establishing the field of human-animal interaction. He especially mentioned the contributions by Levinson, McCullough (who died in 1985) and Katcher. One year later, Rowan⁸ indicated his concern about the fact that health professions (veterinary medicine excluded) had shown limited interest in human-animal interaction studies, since the initial attention these received. He said:

"... the lack of medical interest remains a problem that must be addressed by those who wish to promote the wider acceptance of animal-assisted therapy."⁸

1.2 Problem statement

The problem with animal-facilitated psychotherapy is in essence a lack of the theoretical foundations on which its application can be based. If such a foundation can be found, at least some of the variables will be accounted for and could provide guidelines for predicted success, instead of an approach based completely on trial and error. The practical problem regarding the keeping of animals, as well as the hygienic aspects, could be solved when addressed in a multidisciplinary way.⁹ What psychiatry needs most, is a physiological rationale for using pets in therapy.

1.3 Hypothesis

If physiological parameters can support a theoretical basis for animal-facilitated psychotherapy, this will provide a rationale for using animals in psychotherapy.

1.4 Aim and objectives of the study

The general aim is followed with some specific objectives for the study.

1.4.1 General aim

The main aim of the study is to provide theoretical and physiological information on human-animal interaction which could enhance animal-facilitated psychotherapy.

1.4.2 Specific objectives

In order to investigate the relationship between a theoretical basis for animal-facilitated psychotherapy and some physiological indicators, the following objectives are stated:

- to organise a corpus of existing knowledge on human-to-human interaction theories in personology as an introductory theme for interaction studies;

CHAPTER 2

- to link human-animal interaction with aspects of human-to-human interaction theories, indicating a theoretical interface between the two concepts as a basis for animal-facilitated psychotherapy;
- to reflect the current status of animal-facilitated psychotherapy;
- to discuss physiological parameters for positive human-animal interaction based on known physiological parameters for human-human and animal-animal interaction;
- to describe a methodology for measuring physiological parameters during positive interaction on an interspecies level, in order to support the theoretical framework presented in chapters two and three;
- to discuss the results of the experimental investigation;
- to evaluate existing inclusive theories on positive human-animal interaction in relation to this study;
- to indicate the implications of this study, and how these can be applied to animal-facilitated psychotherapy; and
- to make recommendations based on this study.

The following chapter will deal with theories on human-human interaction.

Personality theories could emphasize the role of the person (personism), the situation in which the person acts (situationism) or the interaction between the characteristics of the individual and the situation in which the behaviour occurs (interactionism). This chapter will only deal with theories which emphasize the interaction between individuals (interactionism) or individuals and the environment (environmental interaction).

CHAPTER 2

EXISTING INTERACTION THEORIES IN PERSONOLOGY

2.1 Introduction

Personology is the scientific study that describes, explains and predicts human behaviour on the basis of conceptual systems known as personality theories. Personology is thus that part of psychology which concentrates on the study of the characteristics of the individual and on the characteristic differences between persons. In other words, it identifies those aspects which enable someone to say I know someone else well. The scientific study can be described as an extension of the general knowledge of human nature. Lay people commonly refer to a person's character or temperament in this regard. The first term concerns the person's values and how consistently these are realised. The second term, also known as a person's nature, concerns emotions and how these are dealt with. Differences between the two terminologies are that character is mostly based on socialisation and education (environmental influences) and temperament is mostly based on inherited, biological aspects (genetic influences).¹⁰ A popular psychological view of personology includes characteristics such as handwriting, signature, fashion and other specific choices, which reveal features of an individual's personality, and the contribution of that particular part to the outcome.

Personality theories could emphasise the role of the person (personism), the situation in which the person acts (situationism) or the interaction between the characteristics of the individual and the situation in which the behaviour occurs (interactionism). This chapter will only deal with theories which emphasise the interaction between individuals (interactionism) or individuals and the environment (environmental interaction).

Interaction personality theories are particularly useful as a basis for subjects such as social psychology and sociology. Social psychology was introduced by William McDougal in 1908 and he held the view that social behaviour stems from innate tendencies or instincts. This was followed by Floyd Allport in 1924, who argued that social behaviour stems from different factors, including the presence of other persons and their specific actions.¹¹

Today social psychology is known as the scientific study that seeks to understand the nature and causes of individual behaviour in social situations. However, the causes of social behaviour and thought are complex and consist of many variables, which mostly fall into the following categories:

- the behaviour and characteristics of other persons;
- the basic cognitive processes, such as meaning and reasoning, that underlie social cognition, our thoughts, beliefs, ideas and judgement;
- ecological variables, direct and indirect influences of the physical environment which developed in a new field, environmental psychology, which focuses on the interaction between the physical world and human behaviour, including animals, because social behaviour does not unfold in a cultural vacuum; and
- biological functions, because many of our preferences, behaviour and cognitive abilities are affected to some extent by our biological inheritance.¹¹

Social interaction, on the one hand, is based on social perceptions formed by non-verbal communication, attribution, a complex process in which we observe the behaviour of others and then infer the causes behind it, and self-attribution, the process of knowing ourselves. On the other hand, it is based on social

cognition, the use of information to develop ideas of how we make sense of the social world by taking mental short-cuts and the interplay between affect (feelings, emotions) and cognition. These processes include learning and verbal communication. Personality psychology is the field of study which seeks to identify and measure relatively enduring personality dispositions and to determine the role of these in influencing behaviour.¹¹

Sociology is the scientific study of social behaviour among human groups. It focuses primarily on the theme of social relationships, on people's attitudes and behaviour and on how societies are established and changed. As a field of study it has an extremely broad scope, including specialisations such as communication, social psychology, sociology of health and various types of group interaction. Comte (1808-1857), who coined the term sociology, believed that the systematic investigation of behaviour was necessary to improve society.¹² There are mainly three perspectives in sociology, viz:

- the functionalist perspective, which emphasises the way in which parts of a society are structured to maintain stability¹³;
- the conflict perspective, which assumes that social behaviour is best understood in terms of conflict among competing groups¹⁴; and
- the interactionist perspective, which generalises about fundamental or everyday forms of social interaction. From these generalisations, interactionists seek to explain both macro- and micro-level behaviour. Interactionism is a sociological framework for viewing human beings as living in a world of meaningful objects, which may include material things, actions, other people, relationships and even symbols (including animals)¹⁵.

Adler's theories developed through three stages. The first stage attributed to explain behaviour from a psychological point of

According to Van Leewen¹⁶, social psychologists try to understand the dynamics and effects of various kinds of social interaction on thought, feeling and behaviour, while sociologists tend to be more concerned with overall group characteristics such as the function of historical, economic and other factors. Despite these differences in focus, there is still some disciplinary overlap. Both study small-group dynamics and have an interest in how individuals acquire and perform social roles.

With regard to environmental psychology, it is suggested that the term human-environment interaction be used, rather than human and environment, because of the active mutual influences between the two concepts. The physical outer-world is divided into a predominantly man-made environment and a predominantly natural environment. Man, via his psychobiological abilities, is in constant contact with, and part of the natural-physical and cultural-physical characteristics of the environment. Human ecology is the study of an interdependent or interactive relationship between man and the living environment (animals, plants, humans and their behaviour) and the non-living environment (natural, climatic, man-made).¹⁷

2.2 Interaction theories

This background on terminological concepts will be followed by a literature study on interactionism. A number of theories of established psychologists, as well as recent views on human needs and interaction, were chosen for consideration and evaluation. The theories will be dealt with briefly and selectively in order to provide the necessary framework to be used as premise for the rest of this study. Where the role of animals could be added to the theories, it was indicated in brackets.

2.2.1 Alfred Adler

Adler's theories developed through three stages. The last stage attempted to explain behaviour from a psychological point of

view, instead of his previous psycho-analytic or physiological models. Adler's final theory¹⁸ is humanistic and in this sense it has had a notable influence on other psychological theories, such as those of Horney, Fromm, Rogers, Maslow, Frankl, Lewin, Kelly and Allport, all of whom will be discussed in this chapter.

Adler¹⁹ said that humans function as a whole and behaviour is determined by setting specific objectives in order to achieve superiority, perfection and totality. This is a creative process in which genetic and environmental factors play a role, but are not deterministic in nature. Man has an innate desire to be of service to the total community and even the universe. Individuals may be only partly aware of their final aims. Adler's theory of striving for superiority by setting specific objectives to reach certain aims, can be described as teleological. The aim determines the behaviour engaged in to reach it. If feelings of inferiority are not compensated for in a balanced way, an inferiority complex will develop.

In psychotherapy, the family constellation, i.e. the relationship between family members and specifically the relative status of individual members, forms an important part of a child's developmental environment and influences²⁰ (animals may play a role where they are seen as members of the family).

2.2.2 **Gordon Allport**

Allport studied the individual as a structured whole. His theory is seen as one of the humanistic theories which were in opposition to behaviourism and psycho-analysis because of their one-sided views on human behaviour.²¹ He did not reject the other theories outright, but used a systematic eclecticism.²² Allport's theory is sometimes referred to as the trait theory, because of the uniqueness of every personality, acquired from the person's background and childhood experiences.

Although traits among people are common and can be compared, there may still be unique individual traits. In the course of development, each person acquires motives as part of satisfying basic needs. This is called the concept of functional anatomy of motives. These motives continue to function autonomously without further reinforcement of the physiological conditions originally concerned in their acquisition.²³

The human is an open system who interacts continuously with his physical and social environment. However, the human is not influenced only by environmental stimuli and needs as the behaviourists believe, or only by drives and his past as the psycho-analysts believe, but his behaviour is also determined by future planning, aims and expectations. Human behaviour can thus only be predicted if the human-being is studied in totality.²⁴

Allport²⁵ differentiated between opportunistic and proprial functioning. The first level tends to secure a biological existence which is directed at satisfying individualistic drives, i.e. the need for survival, and is thus to a great extent predictable. The second level of proprial functioning is seen as more important and is based on the human's free choice, which can override genetic and environmental influences.

With regard to psychotherapy, Allport's view of a mature person is that there should be a high degree of self-extension. The person should be intensely involved in matters outside himself, such as other people, hobbies (animals), ideas and an occupation. He should be as active in these extensions as if they are part of him and this should include warm relationships with other people. This "maturity" could be another term for "mental health".²⁴

2.2.3 Karen Horney

Horney has an optimistic view about man, which is based on the supposition that the personality is inherently disposed towards constructive development and growth. There is thus only a

degree of difference between mentally ill and normal people. The development of the individual's potential could either be enhanced or thwarted by the person's interaction with his environment, in which cultural factors, such as a child's relationship with his parents, is the most important form of role play.²⁶

There are two critical needs which aid personality development, viz the need for security or safety and the need for satisfaction of physical and psychic needs. With sincere love, warmth and trustworthiness, the parents can create an atmosphere in which the child's needs can be fulfilled. If this does not happen, basic anxiety and hostility may develop.²⁷

Horney identified 10 needs which may occur in all people, but which could, on a continuum, also develop in problem behaviour. Some of these are the need for affection and appraisal, the need for power or dominance, the need for social recognition and prestige and the need for personal adoration (which could also be provided by companion animals). These needs were later categorised into people who move towards other people, those who move against other people and those who move away from people. Normal people use all three in interpersonal strategies on different occasions, but a mentally ill person may choose one reaction and always use it, whether it is appropriate or not.²⁸

Horney saw psychotherapy as the acceptance of the self and an extension of the person's relationship towards other (including pets). This helps the person to free himself of his fixation on one type of personality.²⁶

2.2.4 Erich Fromm

Fromm's views are applied to being human in general rather than the individual's unique characteristics. He saw humans as dualistic beings with an animal and a human nature. The human's physiological needs follow physical natural laws and they are seen as animal in nature, while self-awareness, reason

and conscience are seen as typical of human nature. Based on their ethical-rational abilities, humans can transcend their instinctive animal-like behaviour and their actions are thus mainly determined by conscience and not instinct. These unsolvable conflicts are inherent to human existence. The pain of being human is further part of the fact that the human on the one hand wants to be free, and unrestrained, but on the other hand also wants to escape loneliness and isolation. There is thus a conflict between the individual and society which can only be solved through a balance between individual and societal demands.²⁹

"The necessity to find ever-new solutions for the contradictions in his existence, to find ever-higher forms of unity with nature, his fellowmen and himself, is the source of all psychic forces which motivate man of all his passions, affects and anxieties".³⁰

Five human needs³⁰ which represent the true human nature were identified, viz:

- the need to belong;

"The necessity to unite with other living beings, to be related to them, is an imperative need of the fulfilment on which man's sanity depends".

"... a union with somebody, or something outside oneself, under the condition of retaining the separateness and integrity of one's self. It is an experience of sharing, of communion, which permits the full unfolding of one's inner activity. In the experience of love lies the only answer to be human, lies sanity"³⁰.

- the need to achieve transcendence, either by creating or destroying;
- the need for security and safety;
- the need to have an identity - awareness of oneself; and
- the need to have a point of reference.

(Animals may fulfil some of these needs).

Fromm³⁰ believed that society is "insane" and that psychotherapy must be aimed at a sane society which will produce sane people.

2.2.5 Harry Stack Sullivan

Sullivan³¹ had an interest in how interpersonal factors influence personality development. Like Horney and Fromm, he did not deny the influence of inheritance and physiology, but did not see these as determining the personality and believed that they are inferior to interpersonal relationships. There is no personality outside the social interpersonal field, because from birth onwards humans function within an interpersonal context. Personality is the result of interpersonal relationships and man is always in interaction with people or objects (such as animals). People concentrate on mutual characteristics of other people (one-genus-postulate) rather than on differences in personalities. Sullivan did not deny the uniqueness of individuals, but he believed that the science of human behaviour cannot be based on that.

Sullivan³¹ saw humans as energy systems which are primarily aimed at reducing tension, which is caused by needs. This tension lies on a continuum from euphoria to anxiety and terror. There are four sources of tension, viz physio-chemical needs, the need for sleep or total relaxation, the need to cope with existential anxiety and the need for "tenderness", a term which he preferred to the word "love".

Psychotherapy is seen as a learning process to establish effective interpersonal or interactive relationships which will decrease anxiety. This learning process should take place in a suitable environment, such as a psychiatric hospital where an atmosphere of acceptance and interaction can prevail³¹.

2.2.6 Erik Erikson

Erikson's theory³² indicated the way in which an individual will develop by:

- a genetically determined progression, the epigenetic principle;
- the individual's ego, i.e. the desire to adapt to an environment and to control such an environment; and
- the nature of the social and broader cultural environment.

A complimentary relationship exists between individual and community, so much so that no clear line between the person and environment is described, but rather that they integrate with each other.

"One can only conclude that the functioning ego, while guarding individuality, is far from isolated, for a kind of commonality links egos in a mutual activation. Something in the ego processes, then, and something in social processes is - well, identical".³²

The result of an individual's development is caused by two simultaneous and complex influences, viz the genetic and social influences. The optimally developed person is someone who can successfully cope with every stage of development causing crises and who thus has all the necessary ego strengths. Erikson saw development according to the epigenetic principle which determines that it happens in a holistic way.³²

The development is according to stages, but the crisis experienced during every stage should be worked through from the start. This means that ideally there is optimal development during every stage, which includes hope, will-power, purposefulness, competence, reliability, love, attentiveness and wisdom. Optimal development also implies a deep-seated unity between individual and society.³³

Psychotherapy is based on the interpretation of play and other rituals (such as with animals) and the psychotherapist relies on the patient's own ego and ability to solve crises spontaneously.³³

2.2.7 John Dollard and Neal Miller

Dollard and Miller³⁴ are behaviourists who stated that learning processes are the result of need or drive fulfilment. Tension (or anxiety) is caused by two types of drives, viz primary or innate and secondary or acquired needs. Primary drives are the result of physiological stimuli which motivate the individual to fulfil needs such as hunger, thirst and pain relief. Secondary drives are the result of the individual's learning experiences in the physical and social environment. They can be described as a tension-releasing model.

From this point of view there are no differences between man and animal, and habits form after repeated primary or secondary stimulus-response situations. However, it is explained that behaviour is not always a simple and direct stimulus(S)-response (R) event, but can become complex owing to, for example, generalisation or discrimination of stimuli and a variety of responses. It can become something like S-r-s-r-s-r-s-R and is called stimulus-organism-response psychology. This is an expansion of the original behaviourist view.³⁵

Dollard and Miller claimed that they had combined these great currents in psychology, namely the psycho-analysis, the behaviourism and social sciences (anthropology):

"The ultimate goal is to combine the vitality of psycho-analysis, the rigor of the natural-science laboratory, and the facts of culture".³⁴

This is a learning theory which is loosely connected to Freudism, with the emphasis on reward and reinforcement of behaviour and socially acceptable learned skills, while unacceptable social behaviour becomes inhibited. There are four psychological principles in the learning process when a stimulus is linked with a response: drive; cues that provoke, i.e. the stimulus which the reaction canalised; the result of the first two; and reward.

"This may be expressed in a homely way by saying that in order to learn one must want something, notice something, do something and get something".³⁴

In psychotherapy, it is important to provide an environment and conditions where reconditioning will be possible. A new learning situation should be created. The atmosphere should be safe and non-threatening and there should be a reward for acceptable behaviour.

"The therapist creates a social situation that is the exact opposite of the one originally responsible for attaching strong fears to talking and thinking".³⁴

The optimum development is for an individual to fulfil his needs (drives, primary and secondary) without creating conflict between the person and society (and this is where animals may play a role).

2.2.8 **Albert Bandura**

The social learning theory has more support among academic psychologists than any other personality theory, because it

integrates behaviour and the gestalt or field theories successfully.³⁶

Bandura's theory agrees with behaviourists that behaviour is mainly learned and that studies should concentrate on observable behaviour. However, it also deals with self-regulating processes such as thought, symbolism, expectations, planning, self-assessment and convictions. It does not include psycho-analyst concepts, but rather concepts from the cognitive, gestalt and phenomenology psychology. It also emphasises the role of observation as the most important part of learning and the fact that reinforcement is not always an essential part of learning. Behaviour is acquired through environmental, especially social influences, while genetic factors play a small role.³⁷

The principle of mutual determination means that behaviour is caused by the interaction of the individual, the situation and the behaviour which occurs during the situation. The person is now an active participant that observes stimuli, evaluates them, plans according to certain expectations and specific aims, makes the necessary plans to achieve these aims, evaluates the behaviour, replans and changes the behaviour if necessary. This is an explicit interaction viewpoint in which behaviour results from a mutual effect the individual and the environment have on each other. It is not a single matter of response to drives or stimuli which should be fulfilled or met, but the individual may select and interpret environmental factors and can subjectively punish or reward himself for his behaviour. The behaviour is situation or individual dependent. The individual's self-system is thus in control of his observation, planning and judgement and include functions such as perception, pride or shame about own behaviour and self-confidence, which leads to self-efficiency. Bandura rejects explanations of behaviour on the basis of needs, drives and the subconscious. The existence of certain biological needs are, however, accepted, but this is a complex matter.³⁸

Psychotherapy is based on the improvement of the person's self-effectivity in the situation which creates problems, e.g. by using

models. Such models need not necessarily be another person. Modelling is flexible and versatile³⁷ (and could include animals).

2.2.9 Henry Murray

Murray³⁴ recognised the influence of physiological factors on behaviour. He believed in the working of the sub-conscious, he used social-sociological and social-psychological explanations to indicate the influence of social factors, but he also made provision for the individual's imagination and allowed for a phenomenological approach. Murray distinguished between bodily (viscero-genic) and psychological (psychogenic) needs and believed that the latter do not merely develop from the first. Happiness is not to live in a tension-free condition, but to live in the process of tension release. There is a difference between internal behaviour (which is not directly observable, such as thoughts, feelings, memories, fantasies, evaluations and future planning, although verbal communication may occur on the subject) and external behaviour (which includes activities with some object). Most concrete behaviour will consist of both. Murray was of the opinion that a person's personality, despite the changes and development thereof, has relatively permanent regulators, which are called establishments of personality. Such establishments determine the person's conduct and help to predict behaviour. Humans' behaviour is directed via the interaction between the individual's needs and the environmental pressure (situation). His definition of a need is as follows:

"A need is a construct (a convenient fiction) or hypothetical concept which stands for a force (the physico-chemical nature of which is unknown) in the brain region, a force which organizes perception, apperception (expectation), intellection, conation and action in such a way as to transform in a certain direction an existing, unsatisfying situation".³⁹

Needs can be caused by internal physiological conditions or environmental pressure. The need is expressed by a person looking for certain types of environmental pressure or avoiding it. Needs are characterised by accompanying tension until they are fulfilled. After a rest period they will return, the so-called periodicity of needs. Some of the needs described are:

- need linked to ambition, recognition, achievement;
- need to avoid humiliation;
- need to control or to be controlled;
- need to enjoy life;
- need to self-improvement;
- needs regarding information; and
- needs of affiliation and other human relationships³⁹ (all of which may involve animals).

Murray said it is impossible to understand and predict behaviour if the context of the interaction of the situation is not taken into account. The influence of the environment and objects in the environment is referred to as environmental pressure:

"The press of an object is what it can do to the subject or for the subject - the power that it has to affect the well-being of the subject in one way or another".³⁹

Identical objects may have different influences on different people and people will not react in the same way to such influences, because the individual's interpretations and expectations must be considered. This brought about the following famous passage:

"Every man is in certain respects

- like all other man,
- like some other man,
- like no other man".⁴⁰

Psychotherapy is thus based on the assumption that there is a universality, a similarity and a uniqueness in every individual's personality.

2.2.10 Abraham Maslow

Maslow's⁴¹ most important theme was the fulfilment of the individual's potential. The environment plays an important role in the fulfilment of basic needs and people need a positive environment to develop their best potential. He proposed five basic and hierarchical needs which form the basis for growth and the quest for self-fulfilment:

- | | | |
|---|---|--|
| <ul style="list-style-type: none"> - biological needs for physiological functions - needs for safety, stability and order - needs for love or affiliation - needs for recognition and self-esteem | <div style="border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; width: 50px; height: 50px; margin: 0 auto;"></div> | <p>Deficiency motives for survival</p> |
| <ul style="list-style-type: none"> - needs for self-actualisation | <div style="border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; width: 50px; height: 20px; margin: 0 auto;"></div> | <p>Growth motives</p> |

(Animals can play a role in fulfilling these needs in various ways).

Modern society often lacks quality affiliation, despite the fact that many people live close to one another. This causes feelings of loneliness and isolation. Affiliation may also include a specific environment and it may have links with environmental psychology.⁴²

Maslow⁴¹ postulated that the growth needs are a part of human needs just as the basic needs. It is possible that an individual's behaviour is not determined by needs of one level, but by more than one level and a person's needs can also descend from higher to more basic needs. Maslow was also prepared to acknowledge that there may be exceptions in his hierarchy of needs.

With regard to psychotherapy, self-actualisation cannot be achieved if the other needs are not fulfilled. The therapist should be a facilitator in this regard and should create the circumstances and atmosphere in which the person can fulfil his needs and grow.

2.2.11 Carl Rogers

Rogers⁴³ saw himself as a member of the humanistic-phenomenological school of thought. He believed in the constructive potential of the individual, and the individual's essential purposefulness, progressiveness and ability to change. The person's self-concept is important in his functioning, and the person is the central figure in achieving his potential, while the environment plays only a facilitating or inhibiting role in this regard. The actualisation of potential is achieved in an atmosphere of unconditional acceptance of what a person is and where such a person can feel free to develop without limitations from outside, in a non-threatening situation. Self-concept distinguishes humans from plants and animals, because humans are conscious of their life-world and they can evaluate their experiences. The person as central figure is referred to as an organism (total individual) who is in continuous interaction with its total life-experiences or phenomenon-field. Behaviour is furthermore determined by subjective observation of experiences and the self. The interaction is dynamic and ever-changing. A person with a self-concept of a cold and loveless personality can become aware of love, by showing love to a pet and this could be the beginning of a change in self-concept that can be extended to other people. The self-concept is developed gradually because of the individual's (organism's) interaction with the social environment, where the individual will receive evaluation from others. In this regard significant others play a determining role. Approval or disapproval is not always given verbally, but attitude and posture may have the same effect. An optimally functioning person is one with broad life-experiences and one who could realise his potential.⁴³

In psychotherapy the client is placed in a central position and the client should take responsibility for changes in his own life. The therapist acts as facilitator and creates an atmosphere of unconditional acceptance, warmth and empathy where the person can feel safe (non-threatening, as with a pet animal) and free to change to congruency and actualisation.

2.2.12 **George Kelly**

Kelly⁴⁴ was convinced that man's behaviour is based on cognition and on acting like a scientist, stating and testing hypotheses in order to predict and control his environment. This is achieved by a construction system with sub-systems. People may have alternative ways of interpreting and consulting their environment (or the world). It is more important to ask whether a construct is working (pragmatism), than to ask whether it concurs with a reality, because reality is of less importance than the individual's representation of his life-experiences (phenomenology).

In psychotherapy, the therapist should attempt to understand the other person's construction systems. The therapist must have a broad and flexible approach to incorporate other people's constructions. From this a desirable construction system is designed and the person is given a fixed role to play (fixed-role-therapy may include animals). This may lead to self-insight and provide the first step to reconstruct the person's construction system.⁴⁴

2.2.13 **Victor Frankl**

Frankl⁴⁵, as an existential phenomenologist, added another dimension to being human. He said man is essentially a spiritual being with freedom and responsibility and this makes him more than a highly developed animal whose behaviour is determined by heritability and environmental factors. Bodily functions, psychological and social factors of being human, represent the natural

aspects which could correspond with animal needs, but for humans it is more important to find the meaning of life than to struggle to survive.

"I believe there is no such thing as psychotherapy unconcerned with values, only one that is blind to values. A psychotherapy which not only recognises man's spirit, but actually starts from it may be termed logotherapy. In this connection logos is intended to signify 'the spiritual' and, beyond that, 'the meaning'".⁴⁵

The person who feels there is meaning in life, has found direction and a goal in life. Man is directed by values and ideals outside himself. To find meaning in life is stronger than any other motivation.⁴⁶

Man is an open system and can transcend and become more than what he is, even in difficult circumstances:

"It is a characteristic constituent of human existence that it transcends itself, that it reaches out for something other than itself. Man's heart is restless unless he has found and fulfilled, meaning and purpose in life".⁴⁶

The meaning of life is found by three types of experience which can be described as values, viz creative values, values via life-experiences (of which the most important and all-inclusive is the experience of love) and values of attitude:

"By changing ourselves (if we can no longer change our fate), by rising above and growing beyond ourselves, we exercise the most creative of all human potentials".⁴⁷

Logotherapy is essential to make a person aware of aspects outside himself which could elicit responsibility and which could stimulate love, care and involvement. The meaning of life is not prescribed, but the person's attention is drawn to it. In this way the person is directed at something outside himself which gives meaning to life. (Companion animals can be such a focus of attention).

"Through de-reflection, the patient is enrolled to ignore his neurosis by focusing his attention away from himself. He is directed to a life full of potential meanings and values that have a specific appeal to his personal potentialities".⁴⁷

2.2.14 Kurt Lewin

Lewin⁴⁸ described the dynamic interdependence between man and environment, known as the field theory. The individual's behaviour can be predicted by knowing his life-world which includes the total, subjective lived (also with animals) and psychological environment which could influence his behaviour, i.e. behaviour is the function of the life-world. This approach attempts to put forward a pure psychologically-orientated theory where neurological, physiological, biological and chemical concepts are ignored.

In Lewin's⁴⁸ holistic view, man is seen as part of the world. The person's life-world exists in two parts, namely the psychological environment (which is divided into demarcated areas), and the person (who is differentiated in the outer perceptual-motor area and the inner central and peripheral cells). The life-world is enclosed in the non-psychological environment ("foreign hull"). The non-psychological world cannot influence the person directly before it enters the psychological world as a fact. All borders are characterised by permeability. Identified areas in person and environment can communicate freely, less freely or only in one

direction and the distance between areas can make influence less effective.

The aim of psychological processes is to find equilibrium in all the dynamic changes of needs, energy, tension, valency and vector (force). In the same way that the individual and his environment form a psychological field, a group and its environment form a social field.⁴⁸

There is more to group behaviour than the properties of its individuals and they form dynamic wholes in sociology and social psychology. The group acts as a dynamic system and group therapy is thus an approach in psychotherapy⁴⁹ (and it may include companion animals).

2.2.15 Fritz Perls

Perls⁵⁰ was of the opinion that people must have the ability to make contact with their own being and environment and in doing so, gain control over their own life. Authenticity and honesty are part of such contact. The greater awareness is reached, the better self-regulation is possible. The person always functions as an integrated whole organism and as a unit (holism). Despite the fact that man functions as a unit, he cannot exist without his environment and he is always in contact with his environment. As the human organism needs his physical environment for oxygen, water, food and other physical needs, he also needs his social environment for the exchange of love, friendship and other social needs (animals can fulfil such needs). The most fundamental characteristic of man is still that he is a biological organism subject to the same processes which regulate all living organisms. Internal or self-regulation is an inherent characteristic of the organism which happens spontaneously; it is primarily directed at fulfilling the organism's needs. External regulation interferes with this spontaneous process of self-regulation, causing a disturbance between the organism's gestalt and his environment. Such a disturbance can split the unity between organism and

environment. An optimally functional person experiences unity between himself and the environment and is self-regulating. If the physiological needs or psychological contact needs become disturbed, these will attempt to find equilibrium by homeostasis. The two types of needs are, however, interdependent.

"Let me make it very clear, however, that this psychological process cannot be divorced from the physiological one, that each contains elements of the other".⁵⁰

Perls⁵⁰ said man has an ego boundary which should not be too rigid or too flexible, which is always in interaction with his environment (including animals) by contact and withdrawal in order to fulfil needs (incompleteness). Neither of the processes is in itself good or bad, as long as it is regulated to complete the organism's gestalt.

Perls saw problem behaviour as follows:

"All neurotic disturbances arise from the individual's inability to find and maintain the proper balance between himself and the rest of the world ... in neuroses the social and environmental boundary is felt as extending too far over into the individual".⁵⁰

Psychotherapy or gestalt-therapy is based on the experience between You and I in the Here and Now. The person must discover how he avoids taking responsibility for his own existence. It is a process of development and maturity, leading the organism to self-regulation - a complete gestalt.⁵²

2.2.16 Phenomenological psychology

Psychology as a science can be indifferent to the human condition. The problem is not to understand man at all, but to

understand something about the science of man. Man is in dialogue with a meaningful world, because he lives in relationship to the world. Heidegger in this regard, referred to man's "Dasein", his being-in-the-world:

"To be at all, to exist, is to be with fellow man and things. Our existence is mundane, which again simply means that whether we are living in the daily mode or in the authentic way our life is always structured in terms of the world. Our existence is ... always involved in our experience of world and fellow man".⁵²

Psychology has to take note of the fact that the human being is a self-interpreting creature. A person tells his own experiences and what these mean to him. All psychology rests upon communication and for phenomenologists the world is a system, a cosmic totality of meanings. Man is always the centre of his own world, but being human means being in relation to others (including animals) with whom the world is shared.

Psychotherapy is either a true encounter or nothing. Within this true encounter, the person gradually gains courage to be completely himself. People participate in the world, but people are also shaped by the world in turn. The person's lived experiences should be communicated to determine the person's existence in the real world. The more the human being is alienated, dehumanised and even depersonalised by technology and technocracy, the more sensitive people will need phenomenological psychology and psychotherapy.⁵²

2.3 Ideas from the natural sciences

To conclude the opinions on personality, ideas from modern natural sciences are discussed briefly. Although scientists in human behaviour rarely, or ever, give an opinion on physics, the

reverse is not true. In modern science philosophy, scientists from the so-called hard sciences often have opinions on human behaviour and human sciences.⁵³ In this section contributions from Capra, Zohar (with her husband Marshall) and Davies will be discussed, as well as the science writer, Appleyard. The purpose of the last four contributions is to indicate a bridge between human and natural sciences, a theme which also forms part of this study.

2.3.1 Fritjof Capra

Capra, a physicist, is of the opinion that holistic frameworks (which are often used in behavioural sciences) are as scientific as the reductional and mechanistic approaches in physics:

"Modern physics can show them that such a framework is not only scientific, but is in agreement with the most advanced scientific theories of physical reality".⁵⁴

Capra⁵⁴ said that scientific theories can never provide a complete picture of reality and will always be approximations to the true nature of things or bluntly put, scientists do not deal with truths. This idea is based mainly on the uncertainty principle in modern-day quantum physics. Capra quoted David Bohm, who said that one should not deal with the structure of objects, but rather with the structure of movement, thus taking into account both the unity and the dynamic nature of the universe. Mind and matter are interdependent and correlated, but not causally connected and are mutually enfolding projections of a higher reality which is neither matter nor consciousness.

Biologists know the alphabet of the genetic code but have almost no idea of its syntax. Less than 5% of the DNA is used to specify proteins and all the rest may well be used for integrative activities about which biologists are likely to remain ignorant as long as they adhere to reductionist models. In medicine, em-

phasis is often placed on the advancement of scientific knowledge instead of healing and that is why contradictory statements are sometimes made by leaders in this field. Medical scientists should relate their studies of the biological aspects of illness to the general physical and psychological condition of the human organism and its environment (which includes animals). The person's psychological state is crucial to the process of healing and the patient's psychological response to the physician plays an important part, perhaps the most important part of any therapy. Shlain, as quoted by Capra, said that the art of healing cannot be qualified. The current power of biomedical dogma dictates that biological mechanics are seen as the basis of life and mental events as a secondary phenomenon. Physicians who deal with mental illness are considered as somehow less important.⁵⁴

"In many cases, psychiatrists have reacted to this attitude by adhering rigorously to the biomedical model and trying to understand mental illness in terms of a derangement of underlying physical mechanisms in the brain. According to this view, mental illness is basically the same as physical illness; the only difference is that it affects the brain rather than some other organ of the body, and thus manifests itself through mental rather than physical symptoms. This conceptual development has led to a rather curious situation. Whereas healers through the ages have tried to treat physical illness by psychological means, modern psychiatrists now treat psychological illness by physical means, having convinced themselves that mental problems are diseases of the body.⁵⁴

In the chapters "The Systems View of Life" and "Wholeness and Health", Capra⁵⁴ explained that the new vision of reality is based on awareness of the essential interrelatedness and interdependence of all phenomena - physical, biological, psychological, social and cultural. It transcends current disciplinary and conceptual boundaries and will be pursued within new institutions. None of the theories and models will be any more fundamental than the others and all of them will have to be mutually consistent. There are larger manifestations of mind of which our individual minds are only sub-systems:

"Our attitudes will be very different when we realize that the environment is not only alive but also mindful, like ourselves".⁵⁴

The systems view of mind is not limited to individual organisms, but can be extended to social and ecological systems. Humans as social beings cannot keep well, physically or mentally, unless they remain in contact with other human beings. The systems view of living organisms can provide the ideal basis for a new approach to health and health care.

A healthy organism has to preserve its individual autonomy, but at the same time it has to be able to integrate itself harmoniously into larger systems, thus to be healthy means to be in synchrony with oneself - physically and mentally - and also with the surrounding world. Stress is an imbalance of the organism that occurs in response to environmental influences and when the organism loses its flexibility. The aim of therapy should be to create balance, flexibility and social contact (which include animals).⁵⁴

2.3.2 Danah Zohar and Ian Marshall

Both authors have backgrounds in the natural and human sciences. Zohar studied at the Massachusetts Institute of Technology in physics and at Harvard University in philosophy

and religion. She lectures at the Oxford Brookes University in science and culture. Marshall lectured in mathematics at Oxford University, studied psychology and philosophy and is currently a psychotherapist. They proposed that there are many analogies between quantum reality and the dynamics of the self and society.

However, the connection between physics and society is not a completely new idea. Auguste Comte, who first used the word "sociology" in 1838, had intended to name the new science "social physics". He rejected this term after a Belgian, Adolphe Quételet, began to make involved statistical studies of society which he also called "social physics". Eventually society was defined as men in interdependence and that became the subject matter of sociology.⁵⁵

In modern terms the quantum society is described as a "free-form dance company, each member a soloist in his own right but moving creatively in harmony with the others". The authors opposed a mechanistic approach to organisms and said that living systems (including animals) had been designed to cope with ambiguity and creative challenges. Man and society are compared to the quantum characteristics of being presented as either a particle as a measurable (quantum) energy or as a wave:

David Davies

"With our particle aspect we stand apart and experience life from our own point of view, with our wave aspect we are literally taken by, woven into, the being of others and all that surrounds us. It is this duality that makes us persons and members of a community. It accounts for the sense of fulfilment, the sense of truly coming home to ourselves, that each of us feels when we genuinely become part of something larger than ourselves".⁵⁶

is characterized by unusual properties which include the degree of complexity which is highly self-organized and harmonized to the extent that the

At a person's core (particle aspect) he is a recognisable but ever-changing pattern and at his periphery (wave aspect) he is a teaming web of relationships where he is both self and other. This is most strangely demonstrated in an intimate relationship where it often becomes impossible to say where "I" end and "you" begin.⁵⁶

Self-organising systems thrive on challenge and are poised on the brink between order and disorder. Too much disorder will result in the system being torn to pieces, but too much order will lead to dissipation. If the system falls out of dialogue with its environment, it will run down. A mind that ceases to take in new information grows less alert and conscious. Set routines are a threat to the self, including routine social relationships. Meeting others is both difficult and necessary and if people want to live full "quantum" lives, they should always balance habit with an openness to new experiences. At the quantum level measured qualities relate externally, but they do not get into emergent correlation, because their internal characteristics do not change with the relationship. It is when quantum qualities are in the unmeasured state that they become synchronised. They become defined in terms of the relationship and the relationship gives rise to new realities.⁵⁶

2.3.3 Paul Davies

Davies is a professor in Natural Philosophy at the University of Adelaide. He obtained a PhD from the University of London and held academic appointments at the Universities of London, Cambridge and Newcastle-upon-Tyne. Davies⁵⁷ is of the opinion that, although quantum effects are normally restricted to the micro-world of atoms, in principle physics should apply to everything, e.g. the quantum physics of the entire universe is known as quantum cosmology. A common language is also developed for the description of both living and non-living systems. However, life is characterised by a constellation of unusual properties which include the degree of complexity which is highly (self-) organised and harmonised to the extent that the

organism functions as an integrated whole. Every living organism is unique, both in form and development, although they seem to be both special and general in a rather precise way. At each new level of complexity in biology, new and unexpected qualities appear (such as the positive interaction between person and animal), qualities which cannot be reduced to the properties of the component parts. Despite the fact that many biological processes are essentially automatic and mechanical, organisms seem to possess an intriguing will of their own to become not fully predictable and they seem to be guided towards a final goal (teleology). Lastly, no living thing exists in isolation. All organisms are strongly coupled to their inanimate environment and require a continual throughput of matter and energy as well as the ability to export entropy. Davies described life as follows:

"The concept of life is fully meaningful only in the context of the entire biosphere".⁵⁷

While reductionists are looking for a Theory of Everything, progress occurs on the opposite front at the interface of physics and biology, where the goal is not to understand what things are made of, but how they function as an integrated whole. In a Theory of Organisation, the concepts are complexity rather than simplicity and organisation ("software") rather than structure ("hardware"). In these studies, it is becoming clear that there must be new general organising principles which are above the known laws of physics, laws which have yet to be defined. The self-organisation and complexity of nature may have their own laws, coming into operation at each emergent level. Davies referred to Elsasser, who called these laws biotonic. They act at the holistic level of the organisation and these laws can easily be missed when the traditional methods of scientific investigation are used.⁵⁷

It is a general property of complex systems that above a certain threshold of complexity, new qualities emerge that are not only absent but also meaningless at a low conceptual level. When the realm of conscious experience is entered again, a threshold of

organisational complexity is crossed, that yield its own new concepts of thoughts, feelings, hopes, fears, memories, plans and volitions.

"A major problem is to understand how these *mental events* are consistent with the laws and principles of the physical universe that produces them".⁵⁷

It does not mean that psychology must reject the laws of physics and find its own, but rather that there are additional kinds of theories and principles that operate at higher levels of any organisation. Davies predicted that the lower level of processes will never be fully understood unless the higher levels of laws are also understood. Mental events do not represent the pinnacle of organisation and complexity in nature, because there is yet a further threshold to cross. This is into the world of culture, social organisations, works of art, religion, philosophies and the principles of economics. These cannot be reduced to the laws of physics. These abstract entities transcend the mental experiences of individuals and represent the collective achievements of human society as a whole.⁵⁷

2.3.4 Bryan Appleyard

Appleyard⁵⁸ is a science writer who argued, referring to Wittgenstein, that even when all possible scientific questions have been answered, the problems of life remain mainly untouched. He felt that current science is a form of mysticism that proves peculiarly fertile in setting itself problems which only it can solve.

"Science begins by saying it can answer only *this* kind of question and ends by claiming that *these* are the only questions that can be asked. Once the implication and shallowness of this trick are realized, fully realized, science will be humbled and we shall be free to celebrate ourselves again. And that should

mean that science can become itself again rather than the quasi-religious repository of all our faith defined by popularizers. We would have forced science to co-exist by turning it into something else, something more human".⁵⁸

Appleyard⁵⁸ stated that what we are, is what we ordinarily are. Man is not what science tells him he is, but he is his own person with a unique history between birth and death. Human beings as a whole may have invented or evolved the idea of a soul, but does it make him any less real or less permanent, because it has outlasted all scientific conception. The implication for the understanding of human behaviour is that there is more to it than the science which was developed over the past four centuries. The ordinary life as experienced within its cultural context is often unmeasurable in scientific terms, but it is no less of a reality.

2.4 Interpretation of interaction theories

The previous section indicated in an elective way how 20 different recognised contributions in traditional personology and modern multidisciplinary commentaries confirmed that human-human, human-nonhuman and human-inanimate environment interaction is a fact of life. Furthermore, new approaches in science and therapy opened the way to less mechanistic and more natural methods of treating disturbed patients. An interpretation of statements about these contributions follows and the role companion animals can play is indicated.

- Man strives for superiority, e.g. control over a companion animal, by setting specific objectives which are teleological rather than deterministic in nature. If this aim is not met, an inferiority complex develops, which will be compensated for, and the person will become hypersensitive or will over-compensate.

- Man has general and individual traits or motives. As an open system, man interacts continuously with the physical and social environment. However, man is also influenced by more than genetics and environment by free choice and self-extension, by being active in matters including relationships outside himself, e.g. with a companion animal, as if it is part of himself.
- Man's personality is determined by development which takes place in either a negative or positive environment in which he interacts, including fulfilling basic needs such as love, e.g. with a companion animal.
- Man's physiological needs follow natural laws and do not differ greatly from animals, but self-awareness, reason and conscience are typical of human nature and these ethical-rational abilities can determine behaviour. Man wants to be unrestrained, but also escape loneliness, which could cause conflict between individual and society and which must be solved in a balanced way. To use animals as company in order to escape loneliness can avoid such conflict.
- Man is always in interaction with people or objects, such as companion animals, in order to fulfil basic needs.
- Man and his environment, including companion animals, is so intertwined that they become integrated. The individual's development is caused by the simultaneously complex influences of genetic and social influences.
- Man fulfils needs (also via companion animals) which could be innate or acquired, the first the result of physiological stimuli and the second the result of learning experiences.
- Man learns from particular models, including companion animal models, in an interactive way, known as social learning.

- One of man's basic needs is interaction with other humans, or companion animals as substitutes and in human behaviour there are signs of universality, similarity and uniqueness.
- Man's needs could be hierarchically defined as survival and growth motives, which include needs for safety, love and affiliation, all of which could be fulfilled by companion animals.
- Man's self-concept makes him conscious of his life-world and he can evaluate his experiences and the dynamics of his interaction with the environment, which includes interaction with companion animals as part of his environment.
- Man's behaviour is based on cognition and he constructs systems and subsystems which may involve companion animals.
- Man is over and above a physiological, psychological and social being also a spiritual being, seeking meaning in life outside himself, and companion animals can provide some meaning outside the self.
- Man and environment, including animals, are interdependent and both have an interaction influence on each other. Man should strive for a balance between needs and environment and social fields.
- Man functions as an integrated whole in his environment which again, could include companion animals. This unit (gestalt) is also self-regulating.
- Man is in dialogue with the world, he is self-interpreting and his personal experience and perception is what he is. The experiences and perceptions can include companion animals.

Concepts in modern science philosophy:

- Modern physics based on holistic frameworks is less reductionistic, but closer to complex biological systems. However, psychologists often still want to explain behaviour in a linear, mechanistic way. Companion animals as therapeutic agents may thus be acceptable in this modern systems approach.
- Quantum physics' principles of interaction, unpredictability, observer dependence and dynamics, which vary between measurable energies (quantum particles) and waves (free flow energy), are all applicable to human societies. Companion animals already play a significant role in human societies and should be considered as part of such dynamics.
- Complex systems produce new unidentified laws which operate in behaviour and mind. Basic physical laws are inadequate to explain these phenomena. Human-companion animal interaction is such a complex system with benefits which cannot always be explained by known physical laws.
- Man's science is not as objective as he wants it to be. Science is and will always only be a part of man's behaviour and behaviour must be studied from a human's point of view and not via a "science" outside man, i.e. the "self" is the frontier science which we are unable to cross. Although the use of companion animals as therapeutic agents may not be generally acceptable as "a traditional science" in psychiatry, "science" is changing, it is becoming more "human" and the inclusion of a common human experience such as the relationship with companion animals could now be quite acceptable.

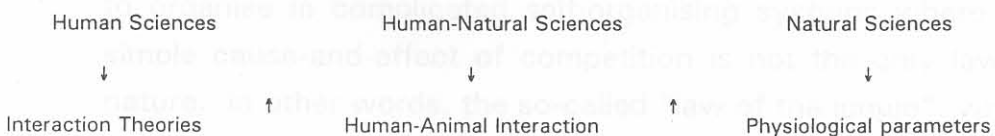
2.5 Discussion

It is clear from the corpus of knowledge in this chapter that two aspects about man were emphasised:

One is that man has all the characteristics of living organisms, namely the physiological functions which keep the body in homeostasis, as well as behaviour patterns which interact with the internal bodily functions and the outside environment. Man, however, is in his behaviour also more than other organisms, because of self-awareness or self-consciousness, language, abstract and symbolic ideas, creativity, finding meaning in life, spiritual experiences, self-evaluation and self-improvement.

The second aspect is that humans have complex social and environmental interactions with regard to culture (own group), intraspecies (other groups), interspecies (animals and plants) and the inanimate environment (man-made and natural environment). These interactions are governed by (biotonic) laws other than the currently known laws of physics and biology. It seems that complex phenomena organise themselves regardless of linear formulae of cause and effect. This could result in situations where phenomena occur successfully in ordinary life, but do not receive the status of "science", because of limitations that science has placed on itself. Science as a human endeavour is, however, subject to re-evaluation and change and what science is today, may not be science in the future. The use of animals as therapeutic agents may fit exactly these developments.

With these premises of man as special interactive organism and life sciences that could entail more than reductionistic mechanistic approaches, the next chapter will deal with the role of human-animal interaction in the context of human-human interaction, where the fulfilment of attention needs forms the basis in both cases. The line of thinking can be depicted as follows:



CHAPTER 3

HUMAN-ANIMAL INTERACTION IN HUMAN-HUMAN CONTEXT

3.1 Introduction

One of the fundamental characteristics of life is inherent mobility. Such motion, even if it is only growth, implies an effect on the environment of an organism. Without inherent mobility plus its contingent effects, an organism is dead. The further living organisms are developed, the greater meaning is attached to this mobility-and-effect in terms of behavioural patterns. In various organisms action-effect behaviour has developed into action-reaction behaviour, which is used mainly for survival. Remember that all organisms, including plants, are part of this argument, which is based on evolutionary principles. Survival has to do with the collection of food for energy (for continuing action or mobility) as well as reproduction. Survival activities are thus not only on the individual level, but also on the species level of continuous existence. This leads to competition in the environment, with accompanying self-defence or expansion with regard to territory, which includes resources, shelter and security. The effect of competition could be intraspecies, interspecies or may even include an effect on the non-biological environment. All behaviour up to this point is described as selfish and agonistic, and includes food chains and parasitism.⁹

3.2 Evolution of interaction behaviour

Biology, however, seems to be more than that, because it tends to organise in complicated self-organising systems where the simple cause-and-effect of competition is not the only law of nature. In other words, the so-called "law of the jungle", where only the strongest survives, appears not to be the whole truth. Organisms can also organise into cooperative systems, such as various types of symbioses and dynamic equilibriums between

organisms and their environment in terms of the use of resources and energy and the maintenance of the environment. Organisms can thus be instrumental in mutual ecological order while tolerance becomes another characteristic of biology. From an evolutionary point of view action (mobility) is followed by reaction (effects of mobility), but it can also develop into beneficial interaction (complementary mobility).⁹

In this regard Lewontin⁵⁹ argued that, on the micro-levels, it takes more than DNA to make a living organism, because environmental and genetic variations are not independent pathways. Genes affect how sensitive an organism is to the environment and environment affects how relevant the organism's genetic differences may be. The interplay between organism and environment is thus indissoluble. Genetic and environmental effects can be separated statistically only in a particular population of organisms at a particular time with a particular set of specified environments. Changes can occur in environments as well as in genes, which can be switched on or off.

"Modern biology has become completely committed to the view that organisms are nothing but the battle grounds between the outside forces and the inside forces", however, "just as there is no organism without an environment, there is no environment without an organism. Organisms do not experience environments. They create them. They construct their own environments out of the bits and pieces of the physical and biological world and they do so by their activities."⁵⁹

On a macro-level, Fraser⁶⁰ stated that the special bonding between animals, and between people and animals, is now universally accepted as a natural phenomenon. The relationships in pair bond associations are now recognised to be a form of symbiosis, although "mutualism" is now the preferred term for

this associative state. Such social organisations that develop among animals are observed by ethologists to add substantially to the animal's integration with its circumstances. The relationship between mankind and animals has become highlighted, in its social form, in the human-animal arrangements that are found to be so attractive and beneficial to people. The growth of respect for social relationships between people and animals is overdue. Surprising bonds have been documented between pairs of animals of different species. That such social pairings were of mutual benefit in creating alliances was a behavioural phenomenon there to be appreciated, but in fact overlooked. Without the opportunity to associate with individuals of their own species it is clear that both mankind and animals can create satisfactory alternative associations with individuals of other species. It may be that those animals recognised as the domestic species have the greatest capacity for alternative associations, but many other species have this capability and offer themselves to mankind in forms of special association. In all of this it is now clear that a wealth of associations awaits us.

motivated by simple reward. Animals are not only

The desire to establish an association is one of the principal behavioural characteristics of all species of animals. The motivation inherent in this is sufficiently specific and strong to deserve special recognition. One could give this an ethological title such as socio-tropism ("tropic" meaning the state of being directed or turned toward a specific stimulus - in these instances the stimulus is an associative opportunity). It may be that this factor is fundamental and inherent in many of the phenomena being considered here. Undoubtedly there is great social affinity inherent in the domestic species that stems from a root in behavioural organisation.⁶⁰

behaviour.

Affiliative motivation is evident everywhere within species and has such a priority in behaviour that it clearly has an important place in the animal's most basic behavioural programme. It is reasonable to presume that there must be commanding neural organisations, set in place in epigenesis for this purpose. Many people often feel a strong desire for an affiliation with animals to

serve them as social complements. It could be said that pets have owed their use and their existence to this desire from early times. Such complementary arrangements reveal to us that even persons who do not apparently require alleviation of physical or other problems can receive intangible psychological support from the enduring company of a given animal. In these arrangements the alliance is so intimate that the pet shares the home of its owner. The "child-dog dyad", now being studied scientifically, is one society has viewed with benign appreciation from early times. In ethology it is recognised that motivation is directed towards consummation; the affiliative effort is seen to have its achievement in the establishment of bonds. These are mutually supported forms of integration which, among other features, generally take the form of close physical contact that is maintained on a continuing basis. The social behaviour of animals is much more than simple associative activities. Starting with the natural objective of species' self-interest and perpetuation, major systems of associative behaviour are supported by numerous components of behaviour. These components represent tactics produced as variable modes. All of this is structured so as to combine flexibility with imperative activities in a social environment.⁶⁰

The structure of social behaviour consists of the following:

- Objective: To maintain a population by dynamic association within the species.
- Strategies: Systematic associative behaviour.
- Tactics: Components of strategies as variable modes of behaviour.

In the breakdown of social strategies and tactics, it is evident that the entire range of social behaviour is extensive in scope. This scope is greatly affected by learning in general, and by the effects of learning experience in particular. There is probably great scope for improving the social competence of many animals by en-

riching their early experiences. Such social capability would probably make these animals better equipped biologically.⁶⁰

Fraser⁶⁰ concluded that the most obvious feature in social behaviour could be termed "mutual contiguity". This state of close contact has its motivation and is preserved, not only in pair bonds, but also in the elaborate social tactics involving triple or multiple bonds. Among animals that have social status established in a hierarchical system, associative partnerships can be variously vertical and collateral in design. Whatever the specific tactic employed in these arrangements, contiguity is apparently the salient feature given priority. If special association between mankind and animals is to be recognised properly, it should be seen as a vital shock absorber in times and instances of social difficulty. Human-animal affiliations have created growing international awareness that behaviour, in the form of interactions between individuals, lends support to life.

The possible, and maybe accidental, advantages which may follow from positive interaction, create a need which seeks to be fulfilled repeatedly. In this way, beneficial interaction becomes part of the organism's basic needs and it stretches much further than mere mobility with effect and competition, because the behaviour is now an expression of give and take. The aim is to strive for a mutual benefit in the same ecological milieu and this positive interaction on an intraspecies level forms the basis of self-organising social systems. In higher order animals this behaviour as alluded to above, gains greater meaning because it is based not only on physiological needs, but also on emotional needs. In social systems, such a basic emotional need can be described as a need for attention.

"Humans are the most social of all the vertebrates. As such, we tend to assume that animals living in large groups are more advanced than those living solitary lives. Recent research tends to rebut that assumption. Whether or not a species lives a soli-

tary or social life depends on its ecology - the resources it needs to survive and reproduce and especially the way such resources are distributed in space and time. Social living has inevitable and occasional costs, as well as common and occasional benefits".⁶¹

Basic needs (physiological or emotional) are sometimes described as instincts. Cohen and Stewart⁶² are of the opinion that basic behaviour is established not only by an interplay between an organism and its own genetics (DNA) and between organism and environment, but also between organisms, a phenomenon which they refer to as cultural influences. Under the heading Cultural Club, they explained:

"Once a species has brains and senses there's another trick it can do. More accurately, the trick develops in tandem with the brain power. It is culture. Culture enables animals to pass survival kits on to their offspring by non-genetic routes. These routes can be far more adaptable than DNA chemistry; by the same token, they are not always stable. Non-genetic transfer between the generations is the rule in the animal kingdom rather than the exception, and primates generally take the trick much further".⁶²

And they continued:

"Compare the two alternatives. Is it more effective, in evolutionary terms, to specify all aspects of behaviour once and for all in DNA code, or to use DNA code to specify flexible brains that can learn, and pass the behavioural information from brain to brain, from generation to generation, bypassing the

genetic biochemistry? Like everything else, the answer to this question depends on context, but sometimes one route may be preferable, sometimes another."⁶²

Although the need for positive interaction already exists in the basic behavioural patterns of many living organisms, attention-need behaviour only becomes clearly identified in advanced and well-developed social systems as a universal emotional need. Attention-seeking behaviour is not a new idea and it is used especially when problem behaviour in man and social animals is described. In order to distinguish between problem behaviour and a normal need, a Latin description is chosen to standardise its use in all languages. The term *attentionis egens* describes the need for attention on a normal, basic emotional level as the prerequisite for successful social interaction, and deviations from the norm could be found on a continuum which stretches from withdrawal from attention on the one side, to a myriad of behavioural patterns aimed at getting excessive attention on the other side. The latter develops because of either a lack of attention or an addiction to attention. Positive interaction is seen as behaviour which is mutually beneficial and negative interaction as behaviour which is harmful or a bad experience to one of the parties.

The previous chapter indicated a number of theories which are based on positive interaction between human and human and these explanations could well support those theories from an evolutionary perspective. Intraspecies social systems are, however, not necessarily closed systems. Such systems can be expanded to be interspecies in nature. One of the marked examples of such an interspecies relationship is that between man and companion animals. The success of human-companion animal interaction is probably mainly based on a two-way fulfilling of *attentionis egens*. Animals suitable for companion animals are most often highly social animals, and if less social species are kept, these animals can still fulfil the need for attention of their human owners. The greater the need for attention or the more social behaviour an animal exhibits, the more successful the

bonding between human and animal can be. When such a beneficial interaction between two social species is set in equilibrium, it can be described as a social symbiotic relationship (mutualism on a social level). In this regard the dog is a prime example of such relationships, because of the long period and the wide distribution (universalism) of human-dog interaction. The dog can truly be seen as a prototype of companion animals.

The fact that attention needs are fulfilled interspecies rather than intraspecies, could possibly be explained on the basis that the two species in such a relationship do not compete for the same physiological needs, such as food. On the contrary, the human provides food, shelter and care, while at the same time the animal can also be used for utility purposes and security. This provides an atmosphere in which the two species can interact positively on the emotional level, because interaction on the physiological level is non-threatening. In this way a positive feedback cycle of need and fulfilment of attention is established.

A literature study on human-animal interaction, from a historical as well as a cross-cultural perspective, indicated that the psychological and emotional aspects of this relationship with the traditional companion animals, the dog and cat, were constantly present. A comparison between communities before 1950 and communities divided in western and non-western societies after 1950, showed in principle the same interaction, although western societies' interaction were more varied and possibly more intense than that of other communities. The choice, namely the year 1950, was based on the recognition of Konrad Lorenz as the father of the field of study now known as human-animal interaction.^{63,64} His books on this subject, *King Solomon's Ring* and *Man meets dog*, appeared in 1952 and 1954.¹

According to historical evidence and prehistoric speculations, it is believed that the social symbiotic relationship between man and dogs and cats developed without any coercion from the human's side.^{65,66} This means that domestication was a natural process and not a unilateral decision by humans to catch dogs

and cats to tame them for the benefit of man only. It is thus possible to explain the unforced, natural way of establishing a social symbiotic relationship between humans and companion animals by well-developed needs for attention, when viewed from a historic point of view. Whether the first step was taken by humans or animals, is of less importance. What is known, is that the interaction between *Homo sapiens* (wise man) and *Canis familiaris* (trustworthy dog) developed into a beneficial (utility) and meaningful (emotional) interaction which has lasted for at least 12 000 years.⁶⁷ It seems that the way new relationships develop today, does not differ much from the earliest information on human-companion animal relationships. If the first encounters were accidental, reinforced by rewards, encounters today can still be described in the same way. Even if such encounters are seen as a system with some teleological plan leading to such a relationship, this could also be true for today's interaction. The purpose is not to analyse the historic cause and effect of the interaction, but rather to understand the success in terms of the mechanism (*attentionis egens*) of the interaction which has not altered since the history of man-companion animal was first recorded.

3.3 Attention needs and therapy

The therapeutic role of companion animals is mainly established among the "weaker" people in society, such as physically and mentally handicapped people, socially maladapted persons, chronically ill patients, the lonely as in long-term social deprivation, emotionally disturbed persons, prisoners, substance-dependent addicts, the aged and children. There is not necessarily something wrong with the latter two categories, but they are included because these persons are often not part of the mainstream community activities as experienced by the economically active adult population. It means that all the above-mentioned persons may have an additional need for attention owing to their particular positions (peripheral to the mainstream) in the broader society. In other words, they cannot compete on an equal basis for attention among healthy, adult people, because of

their place in society in relation to the nucleus of activities. Obviously this picture is not black and white, or a matter of "them against us", but it rather emphasises the point that, where there is a possible lack of attention, companion animals which can provide attention in a reciprocal way, can be used to assist in therapy. Exceptions can occur: on the one hand so-called healthy, active people may also use animals for fulfilling *attentionis egens* and on the other hand the so-called marginalised people may not need animals to fulfil their needs for attention. What is then proposed, is that the current claims for success where animals are used to assist in therapy are mainly based on the fulfilment of *attentionis egens* and that the success is reinforced because of a positive feedback system.

In an article published in *Rehabilitation in South Africa*, Odenaal⁶⁸ mentioned the advantages of animal-facilitated therapy as reported in the literature: relief of loneliness by providing companionship;^{69,70} relief of tension or stress;^{69,71} "other life" can fulfil *attentionis egens* better than non-life (technology);⁷² companion animals are available to provide instant attention;⁷³ they can provide love and friendship and form a bond with people;^{74,75,76,77} the relationship can be dictated by the owner and they can exert control over the interaction;^{78,79} animals can fulfil specific substitute functions such as for parents, children and siblings;^{80,81} and companion animals are often seen as family members;^{82,83,84,85} pets can serve as love objects;^{70,86} they can act as social lubricants;^{78;87;88;89;90} they can be kept as status symbols;^{90,91,92,93} pets can be used as scape goats to redirect negative attention in a triangle situation;^{64,83,94} pets can be used as pretexts to get attention by projecting own problems onto the animal;^{92,95} they can provide occupational therapy by providing physical and emotional support;^{96,97} pets can help with reality therapy;^{87,89,98} companion animals can provide an ego boost for their owners;⁷⁶ pets can be objects of care and compassion (animal welfare);^{70,92,95} and pets can absorb negative behaviour from people without retaliation.

It was also indicated, however, that companion animals are not for everybody, because the need for attention could be fulfilled by other means that people prefer, previous negative experiences with animals and there could be practical limitations in keeping animals.⁶⁸

3.5 Discussion

Categorising aspects of behaviour always creates problems. It is obvious that some of these "categories" of the advantages of animal-facilitated therapy will overlap. It is also possible to ascribe more attributes to these interaction examples than only attention. However, the aim was to define the positive interaction between humans and animals, as described for animal-facilitated therapy in terms of *attentionis egens*.

As in identified behavioural patterns associated with a need, a great variety of intensity and frequency can be expected. The interaction between human and animal can vary from totally negative (or non-existent) and phobic to an extraordinary (pathological) bonding and attachment. It is proposed that this continuum in all its manifestations is based on the fulfilment of *attentionis egens*, which is normal and healthy but which could also deviate to the extremes of the continuum.

Attentionis egens of social species is usually fulfilled by members of the same species and this is also true for human-human interaction. This was clearly reflected in the interaction theories discussed in Chapter 2. The "categories" of interaction between humans and animals in this chapter, however, confirm the idea that typical positive attention between human and human can be replaced just as well by human-animal interaction. It is in this human-human interaction context that companion animals can truly be viewed as therapeutic agents. The argument can thus be summarised in the following diagram which includes evolutionary, cross-cultural, longitudinal and interspecies interaction explanations as well as reasons for a lack of human-animal interaction (Fig 2.1):

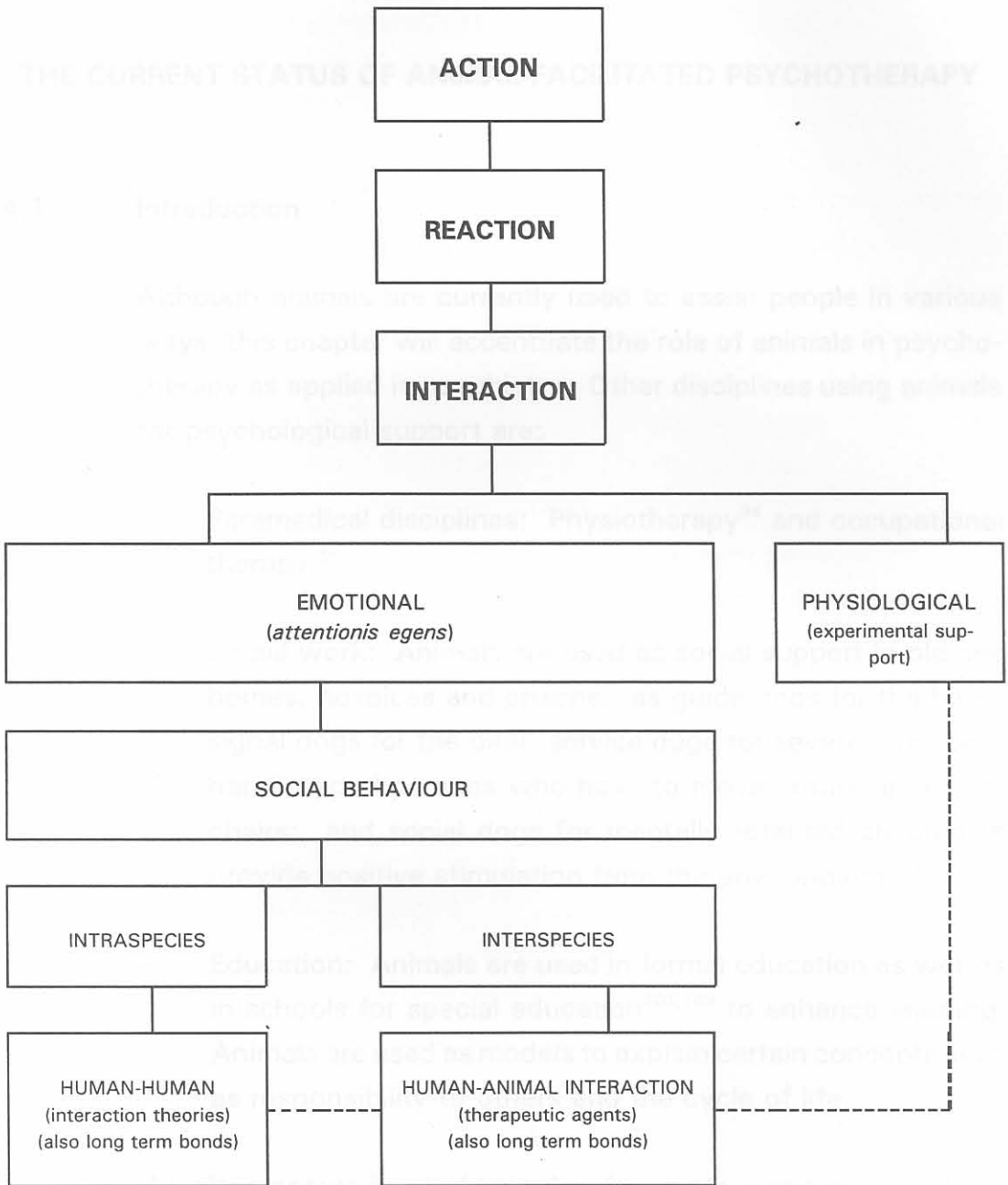


Fig 3.1: Human-animal interaction in human-human context

In the following chapter reports on animal-assisted therapy will be discussed.

CHAPTER 4

THE CURRENT STATUS OF ANIMAL-FACILITATED PSYCHOTHERAPY

4.1 Introduction

Although animals are currently used to assist people in various ways, this chapter will accentuate the role of animals in psychotherapy as applied in psychiatry. Other disciplines using animals for psychological support are:

- Paramedical disciplines: Physiotherapy⁹⁴ and occupational therapy.⁹⁹
- Social work: Animals are used as social support in old age homes, hospices and prisons; as guide dogs for the blind, signal dogs for the deaf, service dogs for severely physical handicapped persons who have to move around in wheel-chairs; and social dogs for mentally retarded children to provide positive stimulation from the environment.^{100,101}
- Education: Animals are used in formal education as well as in schools for special education^{102,103} to enhance learning. Animals are used as models to explain certain concepts such as responsibility to others and the cycle of life.

As often occurs in academic developments, various terms have been suggested to describe the same phenomenon. In the case of the use of animals in therapy, apart from animal-facilitated psychotherapy, "pet therapy" (PT), "pet psychotherapy" (PPT), and "pet-facilitated psychotherapy" (PFP) are used. Jules Cass defined "pet-facilitated therapy" (PFT) as:

"the introduction of a pet animal into the immediate surroundings of an individual or a group as a medium for interaction and rela-

tionships, with the therapeutic purpose of eliciting physical, psychosocial and emotional interaction and responses that are remedial".¹⁰⁴

Alternative terms used for "facilitation" were "pet-mediated therapy" (PMT) and "pet-orientated psychotherapy" (POP). Burch, Bustad, Duncan, Fredrickson and Tebay¹⁰⁵ added two more terms: "animal-assisted activities" (AAA), which:

"provide opportunities for motivational, educational, recreational, and/or therapeutic benefits to enhance quality of life and are delivered in a variety of therapeutic environments by a specially trained professional or volunteer, in association with animals".¹⁰⁵

and "animal-assisted therapy" (AAT), which is

"a goal-directed intervention in which an animal is used as an integral part of the treatment process".¹⁰⁶

In the latter case the therapy is applied by a health service professional with specialised expertise, such as a psychiatrist. For the purpose of this study in psychiatry, it was decided to use the term animal-facilitated psychotherapy (AFP), because animal is a more inclusive term than pet and their role in psychotherapy is to facilitate maintenance or improvement of mental health.

4.2 **Animals in therapy before 1960**

Despite the fact that Levinson has been recognised as a pioneer in the field of animal-facilitated psychotherapy since the 1960's human-animal interaction studies were established, animals were used to this avail long before the new field of human-animal interaction studies was established. Animals were systematically

used to benefit people in Gheel, Belgium as early as the middle ages. In the ninth century, a programme was founded where citizens provided family care to handicapped people. An integral part of this programme was to use animals as a "therapie naturelle".¹⁰⁷ In the 1790s a social therapy institution was founded in York Retreat, England by the Society of Friends. A Quaker, William Tuke, started this retreat because he was unhappy with the way patients were treated in psychiatric hospitals and asylums. He appointed a physician who was opposed to restraint methods and potent drugs. Instead, the patients received love, kindness, understanding and a manifestation of trust. A part of this approach included contact with animals such as rabbits and poultry. One of the aims was to provide patients with an opportunity to learn self-control by caring for the animals.¹⁰⁷

In 1867, Bethel was founded in Germany, where animals were kept to benefit handicapped people. It began as a home for epileptics, but is now an extensive centre for the care of disabled people with more than 5 000 patients and more than 5 000 personnel. Animals used are birds, cats, dogs, horses, farm animals and wild game in a park.¹⁰⁷

There may have been an unknown number of institutions and therapeutic programmes in which animals were used to facilitate therapy for people with psychiatric conditions, but they were not publicly recorded. The rest of the history of animal-facilitated psychotherapy will be discussed from the contributions of Levinson onwards.

4.3 **Animal-facilitated psychotherapy: 1960-1979**

Boris Levinson³ published his first work in this field in 1962. The title was "The dog as co-therapist". This was followed in 1964 and 1965 with titles such as "A special technique in child psychotherapy"⁴ and "Pet psychotherapy: Use of household pets in the treatment of behavior disorders in children".⁵ These pioneering works culminated in two books in 1972, "Pet-orient-

tated Child Psychotherapy" and "Pets and Human Development".^{78,108} Levinson noticed that his own pet could play a role in facilitating communication between a withdrawn child and himself as therapist, because he could reach out to the child via the dog. His psychiatric practice was at his home in New York, where he began using the term "pet therapy". Levinson was convinced that pets could play a psychotherapeutic role both in institutions, and in ordinary people's homes. The main aims of his approach were to:

- establish non-threatening contact between child and pet before therapy could begin;
- allow the animals to act as bridging objects (third party) between disturbed communication and normal communication; and
- use the animals to break down certain psychological barriers.

In the 1970s the husband and wife team, Professor Samuel and Doctor Elizabeth Corson, used animals at the psychiatric hospital at the Ohio University, where both occupied positions. Because they had only used animals as part of the therapy, they preferred the term "pet-facilitated psychotherapy". The rationale for using pets was to provide positive non-verbal communication based on the abilities of pets to offer love and tactile reassurance. The aims of their therapy were to:

- improve non-verbal communication of and between patients;
- stimulate self-confidence; and
- use animals for reality orientation.^{87,88,109,110}

In one study, 50 psychiatric patients were introduced to pet-facilitated psychotherapy mainly because other therapeutic

methods had failed. All the patients showed some to marked improvement, except for three who did not accept their pets.¹⁰⁹

Some standard books also started to appear, contributing to the broader field of human-animal interaction, but also including references to animal-facilitated psychotherapy as such.

The title of the first book was "Pet Animals and Society" with R S Anderson¹¹¹ as editor. The contents reflected contributions from probably the first official international meeting on human-animal interaction on 30 and 31 January 1974, in London. Apart from the Corson's¹¹⁰ chapter on "Pet-facilitated psychotherapy", which was a summary of their earlier work, Levinson, predicted in his "Forecast for the year 2000":

"Suffering from even greater feelings of alienation than those which are already attacking our emotional health, future man will be compelled to turn to nature and the animal-world to recapture some sense of unity with a world that otherwise will seem chaotic and meaningless".¹¹¹

4.4 Animal-facilitated psychotherapy: 1980-1989

According to Katcher,⁷⁰ a psychiatrist from Pennsylvania University, pets could have the following psychological advantages:

- to relieve loneliness;
- to fulfil a nurturing need; and
- to occupy people in such a way that they remain active and thus to combat idleness.

These three functions can help to relieve psychological depression and social isolation. Furthermore, other advantages are:

- to use animals as attachment figures which can be touched and pampered;
- to enjoy the aesthetic value of pets; and
- to experience a feeling of safety and security.

These functions can help to relieve anxiety and to enhance psychological stimulation.

Another advantage is to achieve relaxation through the use of animals for physical exercise.

Katcher also found that:

"A therapist is perceived as more trustworthy and less threatening because of the animal's presence, and the animal provides a safe and stimulating topic for discussion. Once contact and trust are established, therapy can move forward".¹¹²

McCulloch⁹⁴ did a study on psychologically depressed outpatients who owned pets. He reported that the patients continuously referred to the support their animals provided. Some of the advantages mentioned were:

- companionship;
- drawing attention away from matters that bothered them;
- a feeling that the animals needed them;
- love;
- relief of a feeling of desolation; and
- providing play and humour.

except for the presence of caged liches in one of the rooms. All McCulloch felt that animals could be prescribed by psychiatrists for chronically ill patients or disabled persons, for people feeling isolated and lonely, people who have no hope for the future and those who have a feeling of hopelessness and low self-esteem, and people who lack a sense of humour. However, he warned that the following aspects should be taken into consideration:

- previous experiences with pets are a recommendation;
- monitor the situation if a pet should die;
- match patient and pet;
- coordinate a prescribed pet with other therapeutic approaches;
- choose the right time to introduce a pet as therapy;
- evaluate the total situation to ensure that the environment is suitable to keep animals; and
- if animal therapy has no beneficial effect, make sure that the situation does not deteriorate before other support is given.

Beck, Seraydarian and Hunter¹¹³ studied the effect of the presence of animals in a therapy environment during the rehabilitation of psychiatric inpatients. The aims of the study were to evaluate

- the impact of animals on therapy; and
- the activity of groups exposed to animals.

Two matched groups of psychiatric inpatients in their twenties were used, one group of eight and another of nine. Daily sessions of the group were held for 11 weeks in identical rooms,

except for the presence of caged finches in one of the rooms. All patients were evaluated before and after the sessions, using standard psychiatric rating scales. The group that met in the room that contained animals showed significantly better attendance and participation during therapy sessions. They also improved significantly in areas that were assessed by the Brief Psychiatric Ratio Scale's subscale.

In 1981, two books were published. The one, "Interactions between people and pets" by Bruce Fogle¹¹⁴ was a compilation of contributions to another symposium held in London during 1980. Two chapters, "Pet-facilitated Therapy in Human Health Care" by Cass¹⁰⁴ and "A Child Psychiatrist's Perspective on Children and their Companion Animals"¹¹⁵ dealt with animal-facilitated psychotherapy. The first of these chapters referred to many practical and general aspects of animal-facilitated psychotherapy and the second explained the positive and negative interaction between children and pets. Family drawings and case reports were added to establish the role of companion animals in the development of children.

The second book, "Between Pets and People - the importance of animal companionship", was written by Alan Beck and Aaron Katcher.⁸² In a chapter, "Pets as therapists", they discussed the variety of circumstances in which pets can play a therapeutic role, ie from home to institution environments. They also discussed the then current research in this field. The authors warned against "bandwagon" contributions and said that pet therapy had become the "darling of the mass media":

"A major research area that remains to be addressed is simply to identify just what pet therapy is ... We need to balance enthusiasm about the value of pet-facilitated therapy with guidelines for its judicious use and continued research to 'fine tune' its application and develop its potential diagnostic

The value. Most of all, we must conduct proper studies to validate its effectiveness so as to justify its implementation along with other forms of appropriate therapy".⁸²

Bruce Fogle's¹¹⁶ second book on human-animal interaction was published under the title "Pets and their People". He also added a chapter, "Pets in therapy", in which case reports and studies were discussed. He emphasised the proper defining and planning of programmes, before they are implemented.

Katcher and Beck¹¹⁷ also published their second book, "New perspectives on our lives with companion animals".

The next year indicated that some "knowledge explosion" in the field of human-animal interaction had taken place after the cautious beginning of the sixties and seventies. Three notable books appeared in 1984. The first by Phil Arkow,⁹⁹ "Dynamic Relationship in Practice: Animals in Helping Professions", covered a wide range of topics, but did not deal with psychiatry as such. However, two useful contributions which could be of importance in animal-facilitated psychotherapy were made in this book, viz The American Veterinary Medical Association's Guidelines for Veterinarians in Animal-facilitated Therapy Programs and information on pet policy in nursing homes, animal visitation regulations and pet programme guidelines.

The second book, "The Pet Connection - its influence on our health and quality of life" by Anderson, Hart and Hart,¹¹⁸ was again a compilation of presentations at conferences on human-animal interaction in Minnesota and California-Irwin in 1983. Although quite a few studies referred to the use of pets for emotionally disturbed and handicapped children, autistic children, the aged, prisoners, people with depression in nursing homes and the chronically ill, no specific reference was made to the use of animals in psychiatric therapy.

The third book, "Pets and the Elderly - the therapeutic bond", by Cusack and Smith⁸⁹ focused on animals for the elderly, and provided useful practical information on how to implement a successful animal-facilitated therapy programme. They referred to a number of programmes that worked well in the USA and supported the idea that pets could also be prescribed as therapy. The following two programmes involved psychiatric patients.

A study conducted under the supervision of Gloria Francis, Professor of Psychiatric Mental Health Nursing at the Virginia Commonwealth University, investigated the value of companion animal visitation to semi-institutionalised elderly people living in group homes. Two homes in which the residents were chronically mentally ill persons, who had been discharged from psychiatric facilities, were used for the study. Animals with four handlers visited the one group once a week for three hours during an eight-week evaluation period. The control group received human visitors. Each group was pre- and post-tested for eight variables, viz health self-concept, life satisfaction, psychological well-being, social competence and interest, personal neatness, psychosocial and mental function and depression. The residents who interacted with the animals improved in six out of the eight areas mentioned. No differences were found for personal neatness and health self-concept. No improvement was found among the control group in any of the areas. The conclusion was that it was a simple and inexpensive but successful therapeutic approach.⁸⁹

Mary Thompson and colleagues conducted a study at the Coatesville Veterans Administration Medical Center to examine the parameters of behaviour change that may occur in psychiatric patients exposed to animal contact, and to establish guidelines for implementation and operation of pet-facilitated psychotherapy in institutions. The study was conducted among an experimental and control group of 10 patients each and the ages ranged between 40 to 60 years. While the control group was not exposed to animal interaction over a six-week period, the experimental group interacted with animals during 18 sessions

over the same period. Sessions lasted 45 minutes and included instructions on animal care and handling, petting and playing with the pets, as well as a group discussion involving animals. Dogs, cats, parakeets and guinea pigs were used. Overall results indicated that patients with moderate functional impairment improved significantly over both the control group and those with low and high impairment in the experimental group. The conclusion was that patient selection for pet therapy is important.⁸⁹

A problem that arose from these publications which appeared in close succession in the early eighties, was that many cross-references were given for the same therapy programmes and that the contributions were not always representative of new progress.

In 1987 a book, "The Four-Footed Therapist - how your pet can help solve your problems", was published by a psychotherapist, Janet Ruckert.¹¹⁹ She used her dog during therapy sessions and offered simple exercises one can do at home with a pet to help face and solve problems such as loneliness, anxiety, passivity, lack of self-confidence, job stress, divorce, conflict in relationships, child-rearing and ageing. She also provided guidelines to families who wanted to adopt a pet and hints on how to introduce pets to infants and to teach children responsibility.

In 1988 "Pets and Mental Health" by Cusack¹²⁰ appeared. One chapter was devoted to "Psychiatric Patients" and many previous studies were repeated once again, but there were also updated studies and new case reports. She quoted a report by the Director and a Professor in Psychiatry on patients in a psychiatric halfway house as follows:

"Pet dogs in a psychiatric residential setting provide a wide spectrum of helpful benefits to patients - uncritical affection, comfort, tactile resonance, the joys of energy release, the opportunity for responsibility, the bridge

to relationships with fellow residents as well as outside neighbors. The dogs exert a stabilizing influence upon the residents' lives. The capacity to give and accept love helps the psychiatric patient feel equal with his pet at a deep emotional level. Since egalitarian socialisation is an integral element in the development and formation of friendships, the relationship with a pet is a rich opportunity to bring new capabilities and a feeling of increased confidence in human relationships".¹²¹

The key concept in this quotation is egalitarian socialisation fulfilling deep emotional needs.

4.5 **Animal-facilitated psychotherapy: 1990-1999**

Draper et al¹²² were still unconvinced by the scientific research of the previous three decades and they also found the terminology confusing. They said that, despite claims of effectiveness in treating mental and emotional illness, almost no cases were described in psychiatric literature.

To improve research on the subject, they proposed rating scales to generate numerical values for statistical analysis from video-taped observations. For this purpose they exposed 10 referred cases which had diagnoses such as dementia, post-traumatic brain syndrome and mental retardation to interaction with a dog. All patients scored various degrees of positive responses. Blind ratings indicated high interrater correlations.

Nielsen and Delude¹²³ introduced a tank of guppies and a cage of guinea pigs into an interim residence for former psychiatric inpatients. The residents showed great concern for the animals and quickly developed social relationships with them. All residents talked to the guinea pigs and most petted them. They

also commiserated with the surviving guppy after the death of its companion. Responses on a questionnaire indicated that the residents found the presence of the animals beneficial and strongly approved of their continued presence. After the termination of the study period, additional fish were acquired by the residents and proposals were made to upgrade the guinea pig holding area.

However, the residents were unable to maintain this level of concern without the researcher's involvement. The animals later had to be removed from the home. The researchers concluded:

"This ultimate outcome raises the issue of long-term efficacy of the use of animals as therapeutic adjuncts among psychiatric and other populations - an issue on which adequate research is lacking".¹²³

Walsh, Mertin, Verlander and Pollard¹²⁴ did a study on the effects of the presence of a dog among patients with dementia in a psychiatric ward. Two matching groups with regard to age, gender and diagnosis were used, one being a control group. Assessment included general daily functioning, physiological measures, namely blood pressure and heart rate, as well as a measure of general ward noise levels. Results indicated significant differences in the experimental group with relation to decreased heart rate, but not blood pressure. The latter was probably due to the various medications the patients had received. Ward noise levels were also substantially lower in the experimental ward when the dog was present.

Banman¹²⁵ used animals for adolescents in a psychiatric facility. The research finding suggested pets may have various therapeutic functions when working with young persons in a psychiatric environment.

Voelker¹²⁶ reported on the status of animal-facilitated therapy in an article in the Journal of the American Medical Association, under the title "Puppy love can be therapeutic, too". It is estimated that there are about 2 000 animal-assisted programmes in the USA. The most common of these programmes are in psychotherapy and physical rehabilitation, and the dog is the animal most often used in these therapies. At the Rehabilitation Institute in Chicago, dogs are evaluated by a group called Chenny Troupe, prior to entering a therapy programme. Only about 3% of dogs tested are found suitable. This group provided dogs for about 6 000 patients. Despite the extensive use of animals in therapy, there is still a need among doctors for proof of the positive effects by scientific methods:

"Some researchers have recognized that traditional study designs won't adequately capture outcomes from animal-assisted therapy".¹²⁶

Voelker¹²⁶ reported on Katcher's research, on which he had spent a few years measuring the effects of animal-assisted therapy on children with attention-deficit disorders and conduct disorders. A standard clinical group was used with a control group. The clinical group spent up to four hours of their school week in a special programme where they had to care for animals such as gerbils, hamsters, chinchillas, a pot-bellied pig and a dwarf goat. They also learned how to handle and present their animals at hospitals and nursing homes. Within three months of animal interaction the children had a decrease in symptomatology. The percentage of decline was equivalent to one standard deviation. During the same period, the control group experienced about 35 episodes of very aggressive behaviour, compared to none in the clinical group. This programme had already continued for more than four years.

Zisselman, Rovner, Shmuely and Ferrie¹²⁷ assessed the efficacy of using animals' companionship programmes for hospitalised elderly persons, by evaluating the effect of pet therapy on 58 geriatric psychiatric patients. Disorders of the patients included depression, dementia, Parkinson's disease, stroke and accompanying medical disorders. Patients were randomly assigned to the project, which included visits with dogs, brief talks about dogs or an exercise intervention for one hour per day for five days. Assessment was done using the Multidimensional Observation Scale for Elderly Subjects before and after the intervention week. The results showed no significant treatment differences between the two groups. However, irritable behaviour scores improved in women with dementia.

One of the latest books in this field is "The Waltham Book of Human-Animal Interaction: benefits and responsibilities of pet ownership" edited by Robinson.¹²⁸ In the chapter, "Pets in Therapeutic Programmes", it is mentioned that animal-facilitated psychotherapy continues to develop and that the applications are expanding. Burch¹²⁹ reported on a study where animal-facilitated psychotherapy was used effectively with children who had prenatal exposure to drugs, as a result of their mothers using substances such as crack, cocaine or heroin during pregnancy:

"These children often have health, neurological and behavioural problems, attention deficits and language or other developmental delays. Often socially withdrawn and resistant to touch, many of these children will respond to an animal".¹²⁹

Another book, published in the same year, "Animal-assisted Therapy - a guide for health care professionals and volunteers" by Bernard,¹³⁰ does not deal with therapy as such, but describes a step-by-step approach on how to initiate and manage animal therapy programmes.

The latest book in this field is Wilson and Turner's¹³¹ "Companion animals in Human Health". The contents was based on selected papers presented at the 7th International Conference on Human-Animal Interaction in 1998. Although health aspects are dealt with, there is no specific chapter on PFP.

4.6 **A review of literature on animal-facilitated psychotherapy**

Literature since the nineties on the use of animals in psychiatric context is scanty. One of the reasons could be the lack of a proper theoretical rationale for therapy. Other negative remarks have been that the effectiveness of one programme did not last very long and that patients in the other programme showed very little improvement. In the first instance, it is clear that stimulation to focus attention away from the self will not carry on automatically. It would be the same as to report that patients took their medicine the first month while the nurse supervised, but lost interest in medication when the nurse did not control it any more. Concern about this point can be solved very easily (as other long term programmes indicated) by keeping the involvement going with the continuous support of professionals. Two aspects are also important in the second negative report. Five days are far too short to evaluate an animal programme and secondly, one should know exactly what should be assessed. The aims were too general, the conditions too varied and the assessment did not focus on particular parameters. Despite these less positive results, most studies were properly structured, statistically analysed and scientifically reported.

Reports on animal-facilitated psychotherapy since the sixties can be divided into three phases. The first two decades brought awareness of the possible advantages animals may have for psychiatric patients. During the eighties (especially the first half thereof) awareness developed into the "bandwagon syndrome". In a short time many reports and books appeared on animals as adjuncts in therapy. This was followed by criticism from scientists in the field, that claims cannot be made if studies do

not meet the criteria for scientific methods.¹³² During the third phase in the nineties, results were less ecstatic, more balanced, more tentative and scientifically researched and reported.

Despite the hype in the early eighties, the field of animals in therapy failed to attract funding for elaborate research in this field. Possible sponsors were encouraged as follows:

"... much more attention has been given to the scholarly investigation of human-animal interaction but significant support still eludes the field ... A few large grants would, however, change the negative or neutral attitudes of many academics since there is nothing quite like the lure of significant research funding to concentrate the mind and convert even the most cynical of sceptics".⁶

One reason for a lack of financial support could be that the use of animals in therapeutic situations is underreported.

Levinson¹⁰⁸ found in a survey among 435 psychotherapists that 39% of them used animals in therapeutic procedures. This could be an indication that, although not many publications appear on the subject, animals are used to play a subtle but positive role in improving troubled people's existence. Furthermore, that this beneficial effect is understood and used by a significant number of psychotherapists.

Rice, Brown and Caldwell¹³³ found that, out of 190 members of the American Psychological Association in the USA, 21% reported some use of animal content in their psychotherapy programmes.

In an overview by Phil Arkow, he reported in 1977 in the USA that 15 humane societies were involved in animal therapy programmes and eight universities had research projects inves-

tigating such programmes. In 1984 he reported that 75 humane society programmes and 44 academic projects were being conducted.⁸⁹

In a survey among psychotherapists by Wolff¹³⁴ in the USA, it was found that 48% of those institutions who participated in the survey used animals as facilitators in psychotherapy.

Blackshaw and Crowley¹³⁵ conducted a telephone survey among nursing homes, retirement villages, institutions for the elderly and handicapped in hospitals in Brisbane, Australia. Of the 103 that replied, 68,6% had resident pets and 11,8% said that they had conducted pet therapy programmes before.

Hughes¹³⁶ did a survey among 250 occupational therapists and found that of the 70% who returned the questionnaire, 11% used animals as part of their therapy.

Hume¹³⁷ reported that animal-facilitated therapy can now also be traced on the Internet World Wide Web as follows:

URL:<http://www.rehabnet.com/aft/index.html>

Under the title "What is Animal-Facilitated Therapy?" she reported:

"Animals have been used in institutional settings for years to comfort lonely and depressed patients, alleviate boredom, and help make facilities more 'homelike'. The use of animals, especially dogs, by hospitals in actual treatment sessions to assist neurologically disabled patients work toward achievement of goals related to speech, movement and socialization, is a more recent development".¹³⁷

4.7

Animal-facilitated psychotherapy in South Africa

The same criticism of too few medical reports on animal-facilitated psychotherapy is true for South Africa. In the tenth anniversary issue of The Human-Animal Contact Study Group's journal, "Companion", three articles referred to animals in psychiatric/psychological context.

The first examined the role of pets in post-traumatic stress. It has been determined what profile of patient would benefit from animals and what their preferences of animal species are. Earlier experience with animals was stated as an important factor and the animals chosen in order of popularity were dogs, horses, cats, birds. Five patients were exposed to animals in a therapeutic programme and studied in-depth and on a long-term basis. Although animals were not the only positive factor in the persons' lives, they certainly helped to get them back into the community as balanced people.¹³⁸

The second article was published by students of the Department of Occupational Therapy, University of Pretoria. A survey was done on the effect of companion animals on 13 psychiatric patients from the Eersterust suburban area. The project lasted five weeks and check lists were used to monitor emotions, interpersonal behaviour and awareness towards the animals. Again animals were not the only therapy applied during the project and it is difficult to assess their exact contribution. However, indications were found that animals have a positive effect on emotions and interpersonal behaviour.¹³⁹

Thirdly, a clinical psychologist used his dog as a co-therapist in his consulting room and he published a few case reports on the advantages of having a dog in therapeutic situations. The presence of the dog made the patients relax and enhanced communication.¹⁴⁰

In a later issue of "Companion", Van Heerden¹⁴¹ discussed the implementation of a companion animal visiting programme at the Weskoppies psychiatric institution in Pretoria. She said such a programme should pass through a preparation, planning, implementation and evaluation phase. Results are not yet available.

Cage birds were used as part of a research project for a masters degree, in an institution for mentally retarded persons at Witrand, Potchefstroom. Patients were randomly selected from a specific category and divided into an experimental and a control group (n = 40). A pre-post-method of evaluation was used. Four standard scales were applied as measuring instruments and the results were analysed statistically. In comparison with the control group, the experimental group showed distinct improvement in social adaptability, which was evident in the more constructive use of language, more self-reliance and responsibility, better social interaction and a significant reduction in aggression, rebelliousness and withdrawal behaviour.¹⁴²

4.8 Discussion

Apart from the scientific literature, the general perception that animals are good for human health may also justify a serious re-evaluation of animals in therapy. A recent article, "Health enhancement and companion animal ownership", in the Annual Review of Public Health¹⁴³ is one such example. In a popular medical booklet by Dr Tom Trauer,¹⁴⁴ titled "A family guide to healthy living - coping with stress", he gave the following advice with regard to pet therapy:

"Pets can play a very useful part in the campaign against stress. For people living on their own, who might otherwise feel lonely, aimless and isolated, they provide much-needed company, a sense of responsibility and a certain amount of exercise. Indeed, research has shown that lonely heart

attack victims with pets tend to live longer than those who do not have pets".¹⁴⁴

To add to this, in a cover story, "The Evolution of Despair", the idea was popularised that modern man was not genetically prepared for his current environment. The main emphasis lies on the social level, where animals can play a role:

"The problem is that too little of our 'social' contact is social in the natural, intimate sense of the word".¹⁴⁵

The role of companion animals in human society is quite mundane and ordinary. However, this very familiar phenomenon in many people's homes could serve as a strong indicator of the psychological role pets can play in modern society. It signifies a need for attention other than, or additional to human or electronic contact. The question arises, despite all obstacles and odds against the use of animals in health environments, whether this natural option is not more commonly in use than the situation today's scientific methods allow practitioners to investigate and report on suggests? The positivistic approach that only things that can be measured convince, or even worse exist, may be the wrong one in this field. The alternative is that researchers should know exactly what they want to measure and that such measurements should be based on acceptable theoretical research.

Apart from the studies mentioned in this chapter and the commonsense indicators that animals can enhance human health, academia also responded to the challenge of understanding human-animal interaction. This subject is currently studied and taught at many universities and other learning institutions throughout the world. The field is duly organised via the International Association of Human-Animal Organizations (IAHAIO). Only one representative society per country is allowed to join the Association and at the moment 37 countries are members. The IAHAIO organises international conferences on human-animal

interaction, including sections on animals in therapy, every third year. In 1998 the eighth conference of this kind was held in Prague, Czech Republic. At the previous conference in Geneva, the Association obtained the support of the World Health Organisation and two resolutions which were adopted at that conference are of particular importance to this study:

- To ensure regulated companion animal access into hospitals, retirement and nursing homes and other centres for the care of people of all ages who are in need of such contact.
- To officially recognise as valid therapeutic interventions those animals that are specifically trained to help people overcome the limitations of disabilities; to foster the development of programmes to produce such animals; and to ensure that education about the range of capabilities of these animals is included in the basic training of the health and social service professions.

The next chapter will discuss the physiology of positive interaction.

CHAPTER 5

THE PHYSIOLOGY OF POSITIVE INTERACTION THEORIES

5.1 Introduction

In 1929 it was found that when a person strokes a dog, the dog's blood pressure will drop, but it was only some fifty years later that it was determined that the person's blood pressure also drops with such positive interaction.⁸⁹ Erika Friedman,¹⁴⁶ a Professor and Chairperson of the Department of Health and Nutrition Sciences, Brooklyn College of the City University of New York, is a pioneer in this field. She earlier published with co-authors, but recently she published an article titled "The role of pets in enhancing human well-being: physiological effects", in which she discussed research on this topic since 1980. Parameters recorded were diastolic and systolic blood pressure, plasma cholesterol, plasma triglyceride and skin conductance responses. Other symptomatic indications of physiological effects were anxiety and stress relief, or in physiological terms the effects of the autonomic nervous system.

The theoretical perspective behind these measurements is that when people get upset, they have a stress response which activates the sympathetic nervous system. As part of the so-called fight-or-flight reaction, blood pressure rises and there is an increase in the heart and respiratory rates as well as hormonal changes which prepare the individual to cope with a threat. This response is adaptive when the individual is going to respond and after the activity of fight or flight, the physiological levels return to normal. However, if the activity does not take place there is no quick return to normal physiological levels. Frequent repetition or sustained periods of this response without quick relief, can cause damage to the cardiovascular system. Stress reduction techniques help a person to be less reactive to stressors, to redefine stressors to be less intense, or to remove the built-up

stress hormones quickly. Animals can help people to avoid stress responses or decrease their impact, and they can help remove the stress hormones more rapidly by encouraging people to exercise.¹⁴⁶

"Thus, it has been hypothesised that pets can decrease anxiety and sympathetic nervous system arousal by **providing a pleasant external focus for attention** (my accentuation) promoting feelings of safety and providing a source of contact comfort. They can decrease loneliness and depression by providing companionship, promoting an interesting and varied lifestyle and providing an impetus for nurturing. Certain types of pets could help improve physical fitness by providing a stimulus for exercise. Pets therefore have the potential to moderate the development of stress related diseases such as coronary heart disease and hypertension. The range of benefits that owners might derive from their pets may not pertain only to pet owners; one could speculate that anyone, not just pet owners, could benefit from the presence of friendly animals".¹⁴⁶

Apart from Friedmann and her co-workers, other reports also reflected animals as companions to be beneficial to human health in general. In an analysis of 52 published papers on research in the field of human-companion animal relationships, between 1988 and 1993, Barba¹⁴⁷ found that 11 studies dealt with the effect of animals on human health and illness. Most of these found a positive association between animal contact and health. However, three did not find such an association. With regard to stress, three found that animals can reduce such levels and one found no significant difference between owners and non-owners. The studies involving animals as specific therapeutic interventions were unanimous in reporting success. Other findings were that animal interaction tended to make people happier, more alert, less

lonely, it stimulated touch, talk and smiling, owners exercised more and they were more satisfied with their social, physical and emotional status. Animal owners who had successful relationships often viewed their animals as members of the family.

Serpell¹⁴⁸ did a study on "Evidence for long term effects of pet ownership on human health" and he concluded:

"The findings overall suggest that pet ownership can have a positive impact on human health and behaviour, and that in some cases these effects are relatively long lasting".¹⁴⁸

Some results indicated that the pet-owning group reported a highly significant reduction in minor health problems, significant improvements in psychological well-being and self-esteem and they were less afraid of being victims of crime. Pet owners also took considerably more physical exercise.

Wilson¹⁴⁹ found that pets can be an anxiolytic intervention for people who experience anxiety. She used 92 self-selected undergraduate students, aged between 18 and 39 years. Students were not hypertensive and were healthy. Blood pressure was measured over a 10 minute baseline period for three test (stress) conditions, namely reading aloud, reading quietly and interaction with a friendly dog which was not their own dog. At the end students had to complete the state and then the trait scale of the Spielberger Self-Evaluation Questionnaires. The results indicated that the presence of a pet dog had a relaxing or anti-anxiety effect similar to relaxation activities such as quiet reading.

Anderson, Reid and Jennings¹⁵⁰ concluded in their study that pet owners in their clinic population had lower levels of accepted risk factors for cardiovascular disease, and this was not explicable on the basis of cigarette smoking, diet, body mass index or socio-economic profile.

Patronek and Glickman¹⁵¹ came to very much the same conclusions:

"In addition to known physiologic factors, such as hypertension, smoking and elevated plasma cholesterol, psycho-social factors including anxiety, marital status and social isolation have been shown to contribute to the risk of coronary disease. There is increasing evidence suggesting that pet ownership is associated with clinically significant health effects in people, including improved survival after a coronary event".¹⁵¹

The role pets play in this regard is seen as their ability to have a positive influence on psycho-social risk factors (such as providing attention). Pets should, however, not be considered as drugs to be taken whenever one feels unwell, but rather as having the ability to modify one's lifestyle and thus enhance health and quality of life.¹⁴⁶

5.2 Interaction theories and physiological parameters

The studies discussed above focused on human health as related to stress and anxiety relief, and from this it is clear that physiological factors do play a role in positive human-animal interaction. Measurements, however, were only directed at relief symptoms (blood pressure, heart rate, etc) of already stressed persons, but apart from this "stress theory", they did not attempt to offer physiological support for a comprehensive theory of human-animal relationships. Physiological parameters which indicate such positive interaction supporting interaction theories, should thus still be established.

It has already been confirmed that, during positive human-human interaction, physiological parameters such as the role of neurotransmitters and hormones can support human-human interaction theories. Some measurements were done among humans and

other were extrapolated to humans from interaction among other species. All information on this level was gathered on an intraspecies basis.

Walsh stated that:

"Our needs for nurturance, affiliation, and attachment have never, as far as I am aware been considered anything but rooted in the biology of the species".¹⁵²

This may, however, include interspecies interaction. A difference is made between romantic love as passion (eros) and the various other forms of love as compassion (a combination of agape - a concern for the well-being of others, and philia - friendship and companionship). The general love principle that is rooted in our biology, moves people to exert physical and psychic energies to move towards unity and growth.¹⁵²

Michael Liebowitz,¹⁵³ a psychiatrist, is one of the pioneers in explaining positive interaction physiologically. His book "The Chemistry of Love" in 1983 popularised the concept that any thought, feeling or action people undertake, occurs only because of some form of biochemical activity in the brain. Adding a biological perspective helped him to become more effective in understanding and working with many individuals experiencing relationship difficulties. There is a biochemical basis for the normal "ups and downs" in relationships. It was also found that there are many similarities between these relationship highs and lows and other intense feelings.

The latter statement should be considered in terms of a statement by Barrett¹⁵⁴ when he inquired about the placebo effect of animals when they are used in therapy. If animals do cause some positive effect because of the novelty of this attention or even added attention by other people (therapists) involved in animal therapy, one can call it a placebo effect, but it is also explicable

within the attention need theory. Because more than one emotion is associated with the same physiology, one should be cautious not to use a "placebo" which can elicit the same emotional response, because then it is no placebo any more. Attention needs are like hunger needs - there is no placebo for it, it is either fulfilled or not at all. One cannot fake the fulfilment of a basic need.

Liebowitz¹⁵³ felt that the association of psychological and emotional experiences with biochemical changes and vulnerabilities, was something very new. The tendency to separate biology from our important emotional experiences has led to a kind of psychiatry with either psychological or biochemistry thinking. However, people's ability to deal with separation or positive interaction depends on a complex combination of biological (biochemistry), psychological and social (cultural) factors.

An aspect of the effect of natural biochemical substances is (as in the case of administered drugs) that a gradual increase or decrease of the chemical has a less intense effect than sudden changes. This is known as tolerance - the brain learns to tolerate the drug. Changes in receptors are a possible mechanism for this. Chronic exposure to certain psycho-active drugs, or an excess of the neurotransmitters they stimulate, seems to lead to a reduction in the number of receptors, and this may be the explanation for certain forms of drug (or nondrug) experiences losing their impact. Tolerance appears to develop in many unchanging situations to which we are constantly exposed:¹⁵³

"Tolerance to nondrug stimuli may be an important but largely unrecognized aspect of human experience".¹⁵³

Other drug principles include physical dependence, rebound and addiction. However, these effects are complex. Human beings cannot be reduced to simple biological reflexes and reactions, but they should also not be treated as entirely ethereal, spiritual or psychological creatures without bodies and brains. Drugs do not

create any new biological reactions, but only alter the rate at which ongoing bodily functions proceed. Therefore, the same biochemical mechanisms that govern drug effects may play a role as well in shaping our biological, and thus emotional, reactions to potent nondrug experiences. In general, there are a limited number of ways of feeling good.¹⁵³

Within thirty to sixty minutes after taking 10mg of amphetamine per os, increased alertness, decreased fatigue, elevated mood, greater initiative and an enhanced sense of self-confidence follow. Intravenous effects tend to be more rapid and more intense. Prolonged use can be followed by mental depression and fatigue when the drug is stopped, or by paranoia leading to psychosis if continuously administered over a period of days or repeatedly used in escalating doses over a longer period of time. Most human beings find single doses of an amphetamine to be generally pleasurable. However, certain depressed individuals whose brain chemistry is disrupted in some way do not even become temporarily euphoric in response to amphetamine. Sometimes they actually feel more sad or despondent following administration of the drug. Given similarities between drug-induced and naturally occurring excitement, it would appear that any nondrug experience is the result of tapping into some brain chemical reservoir, causing an outpouring of certain neurotransmitters. Just because the chemical effects are the same, it in no way means that amphetamines are a valid substitute for pursuing natural pleasure or excitement. What stimulant drug induction does, is to create a sense of excitement without accomplishing anything - a short-circuit of the natural effect.¹⁵³

Physiological reactions are not the same for every individual, although there may be a general tendency to react the same to certain stimuli. In a population, reactions will be varied on a continuum and some people will be less responsive while other will be highly responsive. This is an important aspect for therapists using animals in therapy must keep in mind, because individual variations with regard to biochemical reactions should be allowed for:

"What it comes down to, finally, is that (positive) feelings are not totally specific nor just nonspecific arousal which may then label as one feeling or another. Rather, they involve our highly individualized feeling of ... attachment, which are biologically, psychologically and culturally shaped, plus our secondary intellectual fine-tuning. While this may sound complex, we should be consoled. It tends to happen instantaneously and involuntarily - at least the first reaction. And it does make for variety".¹⁵³

Psychiatrist Helen Kaplan¹⁵⁵ stated that the brain's love centre is located in the limbic system and even in primitive vertebrates, this system is the emotional control centre. In humans, this system has remained unchanged. The limbic system contains both activating and inhibitory centres linked to the so-called pleasure and pain centres of the brain. Love behaviour is shaped by the seeking of pleasure and avoidance of pain.

Although these studies were aimed at passionate love, Hatfield and Rapson¹⁵⁶ were of the opinion that most emotions have more similarities than differences with regard to neurotransmitters or other chemicals which increase or decrease the sensitivity of the brain receptors. Walsh¹⁵² reaffirmed this statement, referring to phenylethylamine (PEA), when he stated that the relationship of PEA to love may still for the moment be speculative, but "there is little doubt that PEA is an important emotion-regulator".

5.3 Neurotransmitters

According to Guyton¹⁵⁷ more than 40 different chemical substances are proved or postulated to function as synaptic transmitters. There are two groups, namely the small molecule, rapid-acting transmitters and the larger molecule, slow-acting neuropeptides.

Rapid-acting neurotransmitters cause most of the acute responses of the nervous system, such as sensory signals to and inside the brain and motor signals to the muscles. These transmitters are synthesised in the cytosol of the presynaptic terminal and are then absorbed by active transport into the many transmitter vesicles in the terminal. Each time an action potential reaches the presynaptic terminal, a few vesicles at a time release their transmitter into the synaptic cleft, usually within a millisecond or less. The subsequent action on the postsynaptic membrane receptors usually also occurs within a millisecond or less. Most often the effect is to increase or decrease conductance through ion channels, e.g. increased Na^+ conductance causes excitation and increased K^+ or Cl^- conductance causes inhibition. Almost invariably only a single rapid-acting neurotransmitter is released by each type of neuron. It means that the presence of such a neurotransmitter can be highly indicative of behaviour associated therewith. However, the terminals of the same neuron may also release one or more neuropeptides at the same time. Whatever neurotransmitters are released at one terminal of the neuron, the same transmitters will be released at all other terminals of the same neuron, whether these be few in number or many thousands, as well as wherever these terminate within the nervous system or in peripheral organs. Examples of this group of neurotransmitters are:

- Class I: Acetylcholine
- Class II: The amines such as norepinephrine, epinephrine, dopamine, serotonin, histamine and phenylethylamine
- Class III: Amino acids such as gamma-aminobutyric acid, glycine, glutamate and aspartate.¹⁵⁷

Neuropeptides usually cause more prolonged action, such as long term changes in a number of receptors, long-term closure of certain ion channels and possibly even long-term changes in the numbers of synapses. They are synthesised by the ribosomes as integral parts of large protein molecules in the neuronal cell body.

The protein molecules are transported immediately into the endoplasmic reticulum, and subsequently the Golgi apparatus function together to enzymatically split the original protein into smaller fragments, releasing either the neuropeptide itself or its precursor. The Golgi apparatus packages the neuropeptide into minute transmitter vesicles that are released into the cytoplasm. Then the transmitter vesicles are transported all the way to the tips of the nerve fibres by axonal streaming of the axon cytoplasm, travelling at the slow rate of only a few centimetres per day. Finally these vesicles release their neurotransmitter in response to action potentials in the same way as the rapid-acting molecules. The vesicle is then autolysed and not reused. Because of this slow process, much smaller quantities of neuropeptides are released. However, this is partly compensated for because the neuropeptides are generally a thousand or more times as potent as the rapid-acting transmitters and they are longer-acting. Some of these effects can last for days or perhaps even months or years. Examples of these neuropeptides are:

- Class I: Hypothalamic-releasing hormones such as thyrotropin-releasing and luteinize-releasing hormone
- Class II: Pituitary peptides such as acetylcortico-trophic hormone, beta-endorphin, prolactin, vasopressin and oxytocin
- Class III: Peptides acting on the digestive system and brain, such as methionine, enkephalin, gastrin, cholecystokinin, neurotensin, insulin and glucagon
- Class IV: Neuropeptides from other tissue such as angiotensin II, bradykinin, carnosine, sleep peptides and calcitonin

Fisher¹⁵⁸ said that attraction (the beginning of positive interaction) may begin with a small molecule, called PEA, which has an amphetamine-like effect. It is known as the excitant amine, causing feelings of elation, exhilaration and euphoria. Other neurotransmitters, such as norepinephrine and dopamine, may also play a role.

5.3.1 Norepinephrine

Norepinephrine, acting as a neurotransmitter, usually exerts an inhibitory effect through the activation of β -adrenoreceptors, although there are some excitatory effects on both α - and β -receptors. Norepinephrine has been postulated to affect mood, functional reward systems and arousal. Norepinephrine is a neurotransmitter that is synthesised from tyrosine in noradrenergic neurons. Following synthesis, dopamine is further hydroxylated to form norepinephrine. Norepinephrine is stored in prejunctional vesicles and, when released, interacts with noradrenergic receptors. The effects of norepinephrine are primarily terminated by re-uptake at the prejunctional neuron, similar to dopamine. Norepinephrine is also broken down by monoamine oxidase.¹⁵⁹

5.3.2 Dopamine

The distribution of dopamine in the brain is nonuniform but far more restrictive than that of norepinephrine. A large proportion of the brain's dopamine is found in the corpus striatum, the part of the motor system concerned with coordinated movement. Dopamine has also been found to be high in some regions of the limbic system. The monoamine group is divided into two classes, catecholamines and indoleamines. The catecholamines (norepinephrine), adrenaline (epinephrine) and dopamine are all synthesised from the same amino acid, tyrosine, and share a common chemical structure. The indoleamines serotonin (5-hydroxytryptamine) and melatonin are synthesised from tryptophan. The cell bodies for the neurons that produce these neurotransmitters are present in small groups of nuclei located in a relatively small area of the brainstem. The distribution of axons from these nuclei has a rather diffuse disposition affecting a large number of cells in various areas of the brain. Catecholamines are the neurotransmitters associated with the arousal of the autonomic nervous system.¹⁶⁰

5.3.3 Phenylethylamine

Liebowitz¹⁵³ and his colleague Klein from the New York State Psychiatric Institute speculated that the feeling of attraction (or attention) comes about when neurons in the limbic system become sensitised by PEA and/or other brain chemicals. They came to the conclusion that some of their patients are what they called "attraction junkies" - people who crave a relationship, which often fails, indicating a need for PEA. These patients were given monoamine oxidase (MAO) inhibitors which block the action of a special enzyme MAO which breaks down PEA and other neurotransmitters such as norepinephrine, dopamine and serotonin. Thus, MAO inhibitors boost levels of PEA and other natural amphetamines. Within weeks, one perpetually lovesick man began to choose partners more carefully and he could also live without a mate. He was previously unsuccessful in applying what he had learned because of an overriding emotional response which was now controlled by the antidepressant drug, a MOA inhibitor. Psychiatrist Sabelli, Carlson-Sabelli and Javaid¹⁶¹ independently arrived at the same conclusion about PEA. In a study of 33 people who were happily attached to a "significant other" and who reported that they felt great, all were found to have high levels of PEA metabolite in the urine. On the other hand, PEA levels were low in a man and a woman going through divorce.

PEA also has a positive effect on non-humans according to behaviour described in mice and Rhesus monkeys after they had been injected with PEA or PEA-like substances. However, it appears that PEA provides no more than a short-term feeling of exhilaration and apprehension. It is a chemical that accompanies a range of experiences, including positive interaction. Cultural (environmental experiences) may determine who one loves, when one loves and where one loves, but PEA and other chemicals will probably direct how you feel as you love. Love behaviour, like other behavioural patterns, is also determined by environmental and biological (genetic) factors. Likewise, in most identifiable

behaviour traits there seems to be a variation in this experience from one individual to another.¹⁵⁸ A continuum of the need for attention may reveal that some people have no or little need for certain types of attention and some may have unusual ways of attracting attention owing to a craving for attention.

Liebowitz¹⁵³ found that after the initial positive feeling, an even more meaningful emotion emerges, namely attachment. This is the warm, comfortable and secure feeling caused by other chemicals, the endorphins. Like PEA, endorphins reside at the brain's nerve synapses and pool in specific areas in the brain, causing a sense of safety, stability and tranquillity. These effects may also be related to the stress-relief response postulated as theory for positive human-animal interaction by Friedman¹⁴⁶ and co-workers in section 5.1.

5.3.4 Endorphin

The neuropeptide group of short-chained amino acids includes endorphins, substance P and substance K. They function mainly as modulators of other neurotransmitters, evoking facilitation or inhibition of neurotransmitter activity at the postneuron receptor site. Central nervous system endorphin release has been implicated in some compulsive disorders.¹⁶⁰

5.4 Hormones

Other chemicals involved in positive interaction are the hormones oxytocin, vasopressin, prolactin and cortisol.

5.4.1 Prolactin

Bekkedal and Panksepp¹⁶² indicated that in domestic chicks, prolactin may be involved in social-bonding experiences other than maternal behaviour. Carter and Altemus¹⁶³ came to the conclusion that in mammals, oxytocin is important in a variety of positive social behaviours. With regard to prolactin they said that

there is evidence that prolactin can reduce activity in the hypothalamic-pituitary-adrenal axis, but that the behavioural effects of prolactin and the possible actions of prolactin on behaviour and the nervous system has not been well-defined.

5.4.2 Oxytocin

Gingrich, Huot, Wong and Insel¹⁶⁴ found that oxytocin and vasopressin are involved in the formation of affiliative bonds in the monogamous prairie vole in a gender-specific manner. Vasopressin facilitates the formation of selective affiliation in males and oxytocin does the same in females. Ritters and Panksepp¹⁶⁵ observed that vasotocin (similar to vasopressin in mammals) in male Japanese quail appears to inhibit intermale aggression, which plays a role in social status.

Uvnäs-Moberg¹⁶⁶ said that, until now, only one oxytocin receptor has been identified but that data are emerging, showing that subpopulations of oxytocin receptors exist. Steroids and estrogen in particular stimulate the synthesis of oxytocin and the affinity to its receptors in certain regions. These morphological characteristics of the oxytocinergic system indicate that activation of oxytocin release may cause an integrative effect pattern. In various animal experimental models, oxytocin was shown to facilitate bonding or attachment or simply to increase the amount of social contact between individuals.

Hatfield and Rapson¹⁵⁶ said that neuro-scientists know little about the biological basis of companionate love and tenderness. They only recently began to identify oxytocin as the hormone which seems to promote close intimate bonds. The receptor areas for this powerful peptide in the brain are the ventral medial nucleus, amygdala and hypothalamus areas that are involved in joyous, affectionate, sexual and reproductive behaviour. It facilitates tactile contact between animals and is the beginning of the development of social attachment. In studies of rats, rabbits, sheep and other animals, researchers found that oxytocin acts on

regions of the brain involved in affectionate behaviour. Oxytocin also promotes intense bonds between parents and children by increasing eagerness to nurture. It stimulates feelings of pleasure and satisfaction during bodily contact and is sometimes called the "happiness hormone".^{167,168}

5.4.3 Cortisol

Carter, de Vries, Taymans, Roberts, Williams and Getz¹⁶⁹ reported an unanticipated finding that socially naive prairie voles respond to exposure to a novel stranger of the opposite sex with a decline in corticosterone, suggesting the hypothesis that pair bonding in prairie voles might be inhibited by the hormones of the hypothalamic-pituitary-adrenal axis. Removal of the adrenal gland facilitated the development of a preference for a particular partner. An endogenous increase in corticosterone production inhibited pair bond formation in female prairie voles, an effect that was reversed by adrenalectomy.

5.5 Absence of interaction

Proof that positive interaction is part of humans' and other social animals' basic needs, is not only based on the physiological framework in which the existing need can be fulfilled, but also in the negative reaction of the body if there is no interaction. Hebb¹⁷⁰ found that:

"merely taking away the usual sights, sounds and bodily contact from a healthy university student for a few days can shake him right down to the base; can disturb his personal identity".¹⁷⁰

Studies where healthy volunteers were exposed to an environment of social deprivation indicated that it is just as detrimental to the body to have no contact than to have negative or stressed experiences.¹⁷¹ Among animals it was also found that rats which were kept in different environments, from those which came from

a stimulus-rich environment could learn much more quickly to find their way through a maze than those coming from a stimulus-poor environment.¹⁷²

5.6 Discussion

From the above, *attentionis egens* among humans as indicated by physiological parameters^{153,155,156,158} supports the interaction theories in personology (Chapter 2), and there are also indications that the same physiology plays a role in the *attentionis egens* among animals which supports the ethological and evolutionary theories of interaction.^{158,173} Furthermore, the mutual benefits for humans and animals exist not only on the basic utility level (such as humans providing food for animals and animals protecting humans), but also on the emotional-psychological need level (Chapter 3) with similar sets of physiological factors associated with it. What is missing is to find support from physiological parameters to link the interspecies positive interaction.

The main criticism against need theories is that they are circular in nature. A need is described as a cause of behaviour, while the behaviour is taken as an indication of the need. It is, however, possible that basic needs are circular in nature, because they operate as a feedback system. Murray¹⁷⁴ said in this context, that:

"A wide variety of studies have shown that the brain remodels itself as it encounters the world ... the brain is built by behavior, even as behavior is predisposed by the brain".¹⁷⁴

From a positivistic point of view, it is important to find some parameters which can objectively and repeatedly verify the feedback system in a measurable format. Thus, if physiological parameters can be identified which indicate the same behaviour in both human and animal during positive interaction on an interspecies level, and if these parameters are the same as were

found to support positive human to human interaction theories and intraspecies animal affiliation, it can provide a theoretical framework for positive human to animal interaction (Fig 5.1).

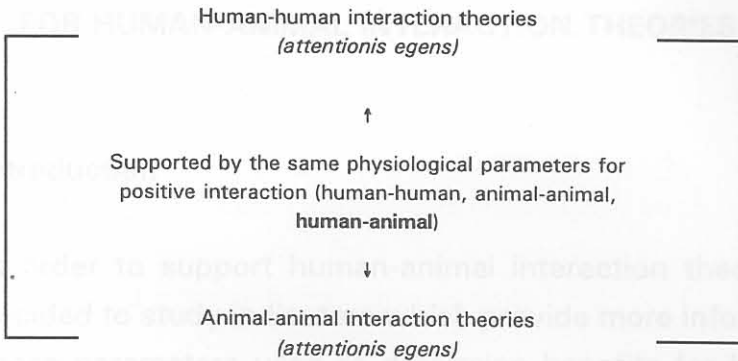


Fig 5.1: A model based on physiological parameters to link human-human, animal-animal and human-animal interaction theories

What is thus still needed is to extend the establishment of the same physiological parameters to an interspecies basis in order to link the positive interaction theories.

The next chapter will describe the methodology to measure physiological parameters during positive human-animal interaction.

Establishing physiological parameters as indicators of positive human-animal interaction does not explain the underlying mechanism completely. As indicated by Fisher¹⁴ earlier, these parameters may not cause the positive relationship, but are merely evidence of the feeling experienced during the positive interaction. However, providing parameters which could be measured objectively and their role objectively and repeatedly to indicate a positive feedback system.

CHAPTER 6

METHODOLOGY FOR ESTABLISHING PHYSIOLOGICAL SUPPORT FOR HUMAN-ANIMAL INTERACTION THEORIES

6.1 Introduction

In order to support human-animal interaction theories, it was decided to study indicators which provide more information than those parameters used to determine benefits for humans with regard to cardiovascular diseases, stress and anxiety. Skin conductance tests, triglyceride and cholesterol plasma levels were thus not considered for measurement. Blood pressure was included in the test for two reasons. The one is that nowhere in the literature reference is made to blood pressure being measured in both species during the same positive interaction. A decrease in blood pressure was recorded in animals⁸⁹ and in humans,⁷¹ but not in a particular situation where the blood pressure of both species was taken during the same positive interaction. The second reason is that changes in blood pressure could be a measurable sign that other chemical-physiological changes could have taken place. This experiment will thus focus on neurochemicals or their metabolites which could play a role during positive human-animal interaction. Such measurements have as yet not been recorded on an interspecies basis.

Establishing physiological parameters as indicators of positive human-animal interaction does not exclude the circular argument completely. As indicated by Fisher¹⁵⁸ earlier, these chemicals do not cause the positive relationship, but are merely responsible for the feeling experienced during successful interaction. It will, however, provide parameters which could be measured, verifying their role objectively and repeatedly to indicate a biological feedback system.

6.2 Hypothesis

The measurement of plasma levels of specific neurochemicals and hormones will indicate physiological responses associated with positive human-dog interaction.

6.3 Benefits arising from the experiment

6.3.1 Positive results can support the interaction theories of human-animal interaction and thus link interaction theories of human-human and animal-animal interaction.

6.3.2 Such a theoretical basis can provide a rationale for animal-facilitated psychotherapy.

6.3.3 The parameters may serve as indicators for the successful application of animal-facilitated psychotherapy in psychiatry.

6.4 Materials and method

The type of research, the subjects and materials, the experimental design and procedures are as follows:

6.4.1 Type of research

Research with the objective to explain physiological influences and their effects on human-animal interaction is known as explanatory research. The main preconditions for such research are control over independent variables and the random assignment of subjects.¹⁷⁵

This study could also be described as basic research because the main purpose is to advance knowledge in disciplines¹⁷⁵ (physiology, psychiatry).

6.4.2 Pilot study

A pilot study was done to determine whether a decrease in blood

pressure could be used as an indication of neurochemical changes which are associated with positive human-dog interaction. Six people with six dogs, unfamiliar to them, were used in the same way as described under the experimental procedures (6.4.6), but in this case only PEA was determined as an example of interaction biochemical changes.

6.4.3 Sample selection

The samples consisted of the following human and dog subjects:

6.4.3.1 Human subjects

To recruit human subjects, an open invitation was sent via e-mail and by notices, stating that people were needed on a voluntarily basis to participate in the trial. The criteria for inclusion in the trial were:

- people should be healthy and not using prescription drugs;
- people should be over 18 years of age (adults);
- both sexes should be represented in the group;
- dog owners should "love" their dogs. Love was not defined, but it was left to the owners to decide what they thought their love for their dog meant. Ownership should have lasted for longer than one year;
- other people should be willing to interact with friendly dogs which had not been known to them before. These subjects should either have had a dog before or have a dog at home; and
- it should be practically possible for the people to attend the sessions.

6.4.3.2 Dog subjects and control group

For the animal subjects, dogs were chosen because dogs are, according to archaeological findings, the prototype of positive human-animal interaction.⁶⁷ Dogs are not only the first recorded companion animals, but are still the most popular and widespread pets among most communities globally.⁶³ Measurement of physiological changes in the dog as model for this investigation is thus appropriate and it also provides a practical model for collecting the necessary blood samples. Furthermore, the neurochemicals under investigation are present in both species.

The criteria for inclusion of dog subjects were:

- dogs should be healthy and not using prescription drugs;
- dogs should be over two years of age (adults);
- both sexes should be represented in the group;
- dogs should weigh > 15kg to draw blood easily and repeatedly from the vena cephalica (ie for the size and integrity of the veins);
- dogs with a known aggressive temperament were excluded; and
- bitches should not be in oestrus.

Dogs for the control group (non-owners) were from the Companion Animal Unit, Department of Veterinary Ethology, Faculty of Veterinary Science, University of Pretoria.

6.4.4 Experimental design

Three different controls were used in this experiment.

6.4.4.1 Experimental and control group

The experimental group consists of dog lovers interacting with their own dogs and the control group consists of dog lovers interacting with unfamiliar dogs.

6.4.4.2 Pre- and post-test control test (counter-balancing design) with different groups

A basic experimental design (pre- and post-test control group) was used because of the biological variables which may affect the interaction.¹⁷⁵ This meant that the effect of the interaction of every subject, human and dog, were measured against the subject's own baseline values (Fig 6.1):

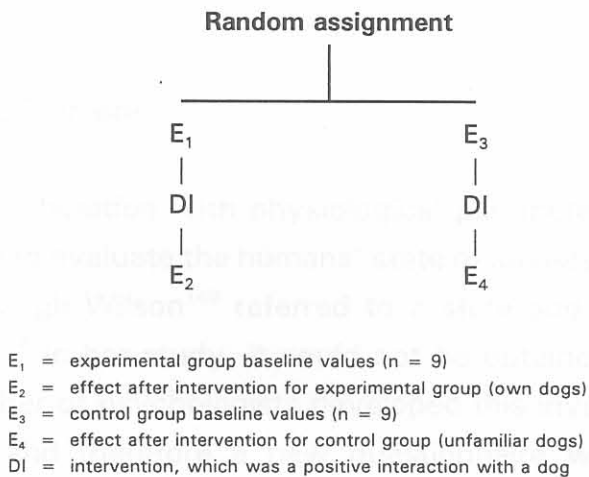


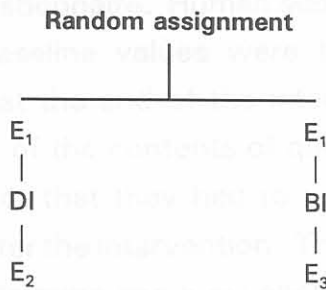
Fig 6.1: Basic pre- and post-test design with different groups

The experimental group had a long-term relationship with their own dogs and the control group had no relationship with the dogs used.

6.4.4.3 Pre- and post-test with different interventions

As a group, all human subjects were also exposed to different types of intervention also in a counter-balancing design.¹⁷⁵

Human subjects were exposed to positive human-dog interaction and the same subjects to quiet book-reading interaction (Fig 6.2):



- E₁ = same group (all humans) baseline values (n = 18)
- E₂ = effect after human-dog interaction
- E₃ = effect after human-book-reading interaction
- DI = intervention, human-dog interaction
- BI = intervention, book-reading

Fig 6.2: Pre-test and post-test with different interventions

6.4.4.4 Questionnaire

In combination with physiological parameters, a checklist was used to evaluate the humans' state of anxiety as another control. Although Wilson¹⁴⁹ referred to a state and trait anxiety inventory¹⁷⁶ in her study, it could not be obtained. It seems as if a number of psychologists developed this inventory for their own use and therefore a new questionnaire was compiled. The objectives of the questionnaire were to establish the subjects' feelings with regard to their:

- personal life (current and future life, health, finances)
- relatives or close friends (current and future relationships)
- work situation and country (or not at home)
- global affairs (eg global warming, ozone layer, pollution).

The questionnaire was pretested among three non-participants to ensure that the questions were clearly understood. A five-point scale was used to indicate the level of anxiety related to the issues in the questionnaire. Human subjects completed questionnaires before baseline values were taken for the human-dog interaction and at the end of the interaction. Subjects had no prior knowledge of the contents of questionnaires and were not aware of the fact that they had to complete a second, similar questionnaire after the intervention. The purpose of the questionnaire was to determine some psychological moods which could be linked to the physiology as well as to determine whether the interaction with the dog had any effect on such a mood on the very short term. Results of the questionnaire could also serve as a control with regard to the general state of anxiety of the group and their mean arterial blood pressure.

6.4.5 Experimental model

The experimental and control groups were randomly assigned to testing by drawing numbers from a hat. People from the experimental group and those from the control group were tested alternately. All the human subjects, in the same order (as far as practically possible) as during the dog interaction, were tested one week later for book-reading interaction and those first tested for book-reading, were tested in the same order for dog interaction (Table 6.1).

Table 6.1: Roster for experimental design

Specimen collection	Date 1	Date 2	Date 3	Date 4
A decrease in blood pressure was taken as indication to collect intravenous blood	4 dog owners 4 persons with other dogs	First group of 8 persons reading a book	Second group of 10 persons reading a book	5 persons with other dogs 5 dog owners

Experimental and control groups were tested over successive periods (Date 1 and 2 and Date 3 and 4) purely because of

logistical considerations. The week between the two types of intervention (dog or book) was also based on practical reasons, namely to ensure that the veins used for blood collection recovered well enough for further blood collection.

6.4.6 Experimental procedures

Hourly appointments were made with the participants. On arrival, participants were taken to a room, which was empty apart from two tables for the blood pressure apparatus and collection material, two chairs, one for a veterinary physiologist who took the blood pressure measurements and collected blood samples from the dogs, and one for the medical nurse, who collected blood samples from the humans. The curtains were drawn, but natural light filtered through to such an extent that the neon lights in the room could be switched off. The subjects sat on the floor for the sake of proper interaction with the dogs. Bedding was provided to make the area of contact comfortable. The first questionnaire was completed and placed in an envelope. Participants had about 10 minutes to adapt to the new environment before the baseline values were recorded.

The random assignment of participating subjects was done before commencement of the procedures. To minimise variables which could be present on a specific day, alternation of experimental and control group subjects was determined by the random assignment. Baseline values were taken as a covariate to ensure that individual differences in the dependent variables were considered when the effect of the interaction was evaluated.

The intervention with the dogs consisted of social gestures only, and included talking softly to the dog, stroking, low-key playing and scratching the body and ears of the dog. The person's attention was completely focused on the dog. The other intervention was to read a book quietly. The genre of the books was evaluated by a specialist in the field of language (qualified on doctorate level), as being the same. Three books in English and

three in Afrikaans, were available to choose from and the topic was "neutral" animal stories. Book-reading as a control was chosen because it had been used as a control for human-pet interaction before.¹⁴⁹

The procedures used for the collection of data were as follows:

- completion of first questionnaire and marking of the envelopes and allowing 10 minutes for adaptation;
- determining baseline blood pressure values by using an automatic Dinamap TP Blood Pressure Unit (Critikon Vital Signs Monitor 1846SX). Five readings were used to establish the baseline and the apparatus was applied to the non-active arm of the human and the base of the dog's tail;^{177,178,179,180}
- collection of blood samples, shortly after baseline values for blood pressure had been determined, into two 5mℓ heparised vacu-tubes which were treated with the following enzyme inhibitors: aprotonin (Sigma, USA) and soya bean tripsin inhibitor (Sigma, USA). All samples were properly labelled after collection;
- stable (five) blood pressure changes, i.e. a drop of at least 5-10%, were taken as an indication whether to collect further blood samples during the interventions. Time allowed for interventions was a maximum of 30 minutes;
- completion of second questionnaire and marking of the envelopes;
- blood samples were centrifuged at 4°C immediately after collection, transported to the Biochemistry Laboratory of the Department of Biological Sciences, Technikon Pretoria, where they were analysed in a polychrome diode array detector, high-performance liquid chromatography (HPLC) system (Varian 9065, SMM Johannesburg).¹⁸¹

The following measurements were taken:

- the mean score for the experimental and control groups' (n = 18) questionnaires before and after the interaction with dogs;
- the mean arterial blood pressure of all subjects (n = 36) before (baseline) and after the two interventions (effect);
- the analysis of plasma levels of beta-phenylethylamine metabolite, norepinephrine, dopamine, endorphins, oxytocin, prolactin and cortisol^{182,183,184,185,186,187,188,189,190,191,192,193,194} of all subjects (n = 36) before (baseline) and after the two interventions (effect).



Plate 6.1: A posed example of the experimental conditions

6.4.7 **Observation**

The total programme was organised, managed and observed by the researcher. Co-workers were selected on the basis of their expertise, namely a veterinary physiologist, a medical nurse, a biochemist and a chemist who determined the plasma levels of the neurochemicals. The questionnaire was compiled by the researcher and approved by a psychologist.

The researcher was not present during the actual interaction, because he was familiar with some of the people. The physiologist and nurse were the only co-workers present in the room and were unknown to all the subjects. Influences from persons knowing each other were thus excluded, and all subjects experienced the same test environment.

6.4.8 **Variables**

The variables of the study are defined as follows:

6.4.8.1 **Independent variables**

Independent variables consist of a limited positive interaction period, i.e. until the blood pressure drops sufficiently (maximum 30 minutes), during positive dog interaction or reading a book. The types of intervention were thus the same for all subjects, i.e. the human and dog interaction and humans reading books.

6.4.8.2 **Dependent variables**

Dependent variables consisted of a feeling or mood of anxiety as reflected in a questionnaire completed before and after the intervention; the mean arterial blood pressure of human and dogs (where applicable) before and during the intervention; and plasma levels of neurochemicals, as described above, in humans and dogs (where applicable) before and during the intervention.

6.5 Validity and reliability of the study

The validity of an experiment is the extent to which one measures what is supposed to be measured and reliability indicates the repeatability of results.¹⁷⁵

6.5.1 Validity

The internal validity of the experiment was kept as high as possible by controlling the following variables:

- representative subjects were randomly assigned to participate in the experiment to avoid ascertainment bias and satisfy probability requirements for appropriate statistical analysis;
- baseline values were used to control individual differences;
- the hypothesis was based on a *a priori* specification;
- subjects in the experimental and control groups were tested alternately;
- subjects were tested in two groups of which one first interacted with dogs and the other first read a book;
- the same room with the same environment was used for all interventions;
- the recording of blood pressure and collection of blood were done by the same people;
- the same staff analysed the chemicals in the same laboratory and the same apparatus, including the blood pressure apparatus, was used consistently;
- baseline values were taken on the same day as the intervention;

- the blood pressure apparatus was always applied on the non-active (non-stroking) arm and to the base of the dogs' tails;
- noise was limited outside the room on the days the experiment was executed;
- because the experiment was completed in three weeks, the weather conditions were fairly constant throughout the whole period (summer, $\pm 28^{\circ}\text{C}$);
- experiments on different days were all executed between 07:30 and 12:30;
- both people and dogs were adults, healthy and did not take prescription drugs. This definition helps to ensure consistency in physiological changes within normal ranges;
- during the pilot study it was found that in the dogs, it would have been more disturbing to insert a canula and withdraw blood with a syringe, than to use vacu-tubes. A needle puncture through the skin has a minimal disturbing effect when done by an efficient, professional person;
- although a choice of three books was offered, they had the same stimulation value from a literary point of view;
- three controls were used: baseline values versus effects, dog owners versus unfamiliar dogs, dogs versus books. A feeling of anxiety was compared to the mean arterial blood pressure;
- the subjects could not affect the plasma levels of the neurochemicals measured. Although the humans had some idea of what the experiment was about, it would have been impossible to manipulate the parameters (ie a "blind effect"); and
- the researcher was not involved during the interaction, collection of blood samples, the analysis of the neurochemicals

or the statistical analysis thereof. No bias towards, or manipulation of the results from the researcher was thus possible.

Despite all the measures taken to ensure high internal validity, two points should be considered: the experiment was executed in an artificial environment (the experimental room) with strange people (physiologist and nurse) taking measurements and collecting blood from the subject. Secondly, neurochemicals can be very sensitive to environmental changes over a very short period. What people (and to a lesser extent the dogs) experienced shortly (a few hours) before the test, as well as the experimental environment and experience, could affect the plasma levels of those chemicals. Because the experiment includes two biological entities (human and dog) interacting, it will never be possible to completely exclude the experimental environment and experience, as well as other unrelated emotional experiences.

6.5.2 Reliability

The reliability of the experiments were based on the following aspects:

- repeatability of results was aimed at using the largest sample practically possible, at least large enough for statistical analysis. Eighteen human subjects and 18 dog subjects were used and both sexes were represented in both species. The ages of the people and dogs varied from young adult to senior adult. Although emotion, blood pressure and neurochemicals can vary in people and dogs, the fact that all the subjects were healthy adults not using any medication, experience the same in a controlled environment, could limit unacceptable variation in order to make results reliable for similar groups in the population. The sample size could thus be accepted as adequate;

- dependent and independent variables were properly identified;
- the experiment and experimental procedures were described in detail; and
- statistical procedures were specified.

Obviously the reliability of this experiment will only be known after the results are replicated in similar studies by other researchers.

6.6 Ethics

The research protocol was approved by the Ethics Committee of the Faculty of Veterinary Science, University of Pretoria. The only invasive procedure was the collection of venous blood and this was done by a medical nurse and a veterinarian. Animals which people were interacting with, did so only in a positive manner under the supervision of a veterinarian. A medical doctor was available during every session of the experiment. The dogs were all well-tempered, whether they were own or unfamiliar dogs.

6.7 Statistics

The following measurements were statistically analysed;

- the scores of the questionnaires of humans before versus after interaction with a dog;
- the effect on individuals of the experimental and control groups before versus after the intervention for mean arterial blood pressure and the neurochemicals;
- the effect on all humans before and after the intervention versus the effect on dogs before and after the intervention for mean arterial blood pressure and the neurochemicals. This was

done because of it being an interaction study, evaluating the physiology of both species during the same contact;

- the effect of interaction with dogs versus book-reading on humans.

In order to test the effect of the interaction on the anxiety scores, neurotransmitters or hormone levels, the baseline values (i.e. before interaction measurements) are compared to the corresponding values after interaction. The before and after interaction measurements of a subject (human or dog) form a pair and are analyzed accordingly. A distribution-free statistical test, namely the signed rank test¹⁹⁴ was used. This test is also known as the Wilcoxon test for symmetry.¹⁹⁵ A distribution-free test is used when little to no information is available on the probability distribution of the population of measurements from which a sample is drawn. Fewer assumptions regarding statistical properties are needed than is usually the case with parametric tests, for instance, the well-known t-test.

The null hypothesis that the median difference between the measurements before and after interaction is zero, is tested against the alternative that the median difference is not zero at the 5% level of significance. In a study of this nature, where coherent information is not available, the alternative hypothesis is two-sided. The null hypothesis will be rejected when there is either a significant increase or decrease in the median biochemical levels after interaction. If the null hypothesis is rejected, it can be concluded that there is a statistically significant difference between the before and after treatment values, without specification of the direction of the difference. The direction of the difference can be observed in the data and suggests a tendency.

Note that the median difference is used. The median (50th percentile) is the central value of a data set. Half of the observations in a data set are smaller than the median. When the distribution of the data is symmetric, the median is equal to the mean. If outliers are present in the data, the median is a better

estimate of the central value of a data set, especially in the case of a small sample.

The tables in Chapter 7 (7.4 - 7.35) will give the following information:

- means before and after interaction.¹⁹⁶ Arithmetic mean of measurements before as well as after interaction. These values, together with the minimum, maximum and median are presented in the matching bar graphs, and are used to indicate the range and distribution of the measurements;
- standard deviations before and after interaction.¹⁹⁶ The standard deviation is an indication of the variability of the measurements before and after interaction;
- median before and after interaction.¹⁹⁶ As in the case of the means and standard deviations, the medians of the before and after interaction measurements is reported respectively; and
- p-value, the exceedance probability of the signed rank test.¹⁹⁷ Note that the p-value is not derived from the median values before and after interaction. These values were given to describe the observations before and after interaction took place.

The experimental (own dogs or owner) and control groups were also compared to test whether the familiarity level had any effect on the change in biochemical levels after interaction. In this case the two groups compared are considered to be independent. The Wilcoxon rank sum test¹⁹⁵ was used to test the null hypothesis that the median change in biochemical levels after interaction is the same in the experimental and control group versus the alternative hypothesis that there is a significant difference between the two groups' median change. A 5% level of significance was used.

The following chapter will present and discuss the results.

CHAPTER 7

RESULTS OF ESTABLISHING PHYSIOLOGICAL PARAMETERS DURING HUMAN-ANIMAL INTERACTION

7.1 Biographical details of subjects

An analysis of first the human subjects and then the dog subjects will be given.

7.1.1 Humans

Humans ($n = 18$) were of European origin and the number of 18 was the total number of people who indicated that they are willing to participate in the experiment. All participants completed the experiment as arranged.

Half of the human subjects had their own dogs and nine interacted with unfamiliar dogs. Eight of the humans were male and 10 were females, of which four males and five females had their own dogs while four males and five females had dogs unfamiliar to them.

The ages of the subject ranged from 19 to 55. The average age for males ($n = 8$) was 32,4 and for females ($n = 10$) 28,1 years, while the average for all humans was 30 years.

7.1.2 Dogs

All the control (unfamiliar) dogs ($n = 9$) were Beagles. The experimental dogs ($n = 9$) were two Labradors, Labrador-cross, Border Collie, Border Collie-cross, Cocker Spaniel, Dachshund (standard, smooth hair), Staffordshire Bull Terrier and a Bull Dog-cross. All dogs completed the experiment as arranged.

Seven of the dogs were males of which three were castrated, and 11 were females of which five were spayed.

The ages of the dogs ranged from two years to 12 years. The average age for the males ($n = 7$) was 5,4 and for females ($n = 11$) 7,0 years, while the average age for dog subjects was 6,4 years.

The following table summarizes the characteristics of the subjects (Table 7.1):

Table 7.1: Characteristics of human and dog subjects participating in human-dog interaction ($n = 36$)

Humans	Gender	Age in years	Ethnic orientation
($n = 18$)	8 males 10 females	19-55 30 average	European
Dogs	Gender	Age in years	Breeds
($n = 18$)	7 males 11 females	2-12 6,4 average	9 Beagles (control) 3 Labradors 2 Border Collies 1 Cocker Spaniel 1 Dachshund 1 Staffordshire Bull Terrier 1 Bull Dog

7.2

Questionnaire to determine the state of anxiety of human subject

The average for all participants before and after interaction ($n = 18 + 18 = 36$) was 2,72 on a scale where the median is 3,00. The range of scores were 1,0 to 3,8. The results are reflected in Table 7.2.

Table 7.2: State of anxiety scores on a 5-point scale questionnaire before and after positive dog interaction

Groups	Average before dog interaction	Standard deviation	Average after dog interaction	Standard deviation
Whole group ($n = 18$)	2,72	0,81	2,68	0,77
Experimental group ($n = 9$)	2,58	1,00	2,64	0,88
Control group ($n = 9$)	2,87	0,60	2,72	0,70

Differences in the scores before and after dog interaction as well as differences (after - before) of the control and experimental groups were compared. The differences were not significant on a 95% confidence level ($p > 0,05$).

7.3 Interpretation of the results

It is not expected that the state of anxiety will change dramatically in less than an hour, except in cases where a pertinent threat is experienced during such a period. This was obviously not the case during the experiment. A slight decrease in the state of anxiety after intervention, however, could be an indication of emotional feelings being affected even after a very brief positive interaction with a dog. It may have also contributed to the decrease in blood pressure experienced by the subjects.

A mean score of 2,72 for the whole group is slightly lower than the median of 3,00 of the scale. None of the participants showed an unacceptable high score (i.e. > 4) on the anxiety scale and this could be an indication that the participants who were healthy, adult, dog-loving persons, had no unacceptable levels of anxiety during the experiment. In other words, there were indications that from an emotional point of view, the participants complied with the definition for the human subjects. The absence of extreme anxiety on the day of the experiment can also contribute to the external validity of the results if one would consider to generalize the findings to the rest of balanced, healthy, dog-loving adults of the human population.

7.4 Pilot study

A pilot study was conducted in order to establish the feasibility of the experiment.

7.4.1 Aims and method

The aims of the pilot study were as follows:

- to establish whether a decrease in blood pressure could be taken as an indicator for neurochemical changes associated with positive human-dog interaction. Based on the pioneering work of Liebowitz¹⁵⁴ on positive human-human interaction, it

was decided to use plasma PEA^{182,200,201,202,203,204,205} as an example of the neurochemicals to be investigated during positive human-animal interaction; and

- to establish whether an experiment of such a nature would have been logistically feasible.

The same method as for the main experiment was used, except that the blood pressures of the dogs were not recorded. Samples from the dogs were taken at the same time as those from the humans, that is after the humans' blood pressure has decreased.

All participants used their own dogs with which they had a positive relationship for more than a year. Only one of the participants in the pilot study, was used again for the main experiment. A different laboratory, namely from the Dept of Pharmacology, Faculty of Medicine, Medical University of Southern Africa, than the one used for the experiment, was used as well as a different analysis.²⁰⁴ Plasma concentrations of β -phenylethylamine was detected directly on a high performance liquid chromatography system (Microcep, Waters, USA).

7.4.2 Subjects of pilot study

Six adult humans (22-46 years) participated on a voluntary basis. Three were males and three females. The dog subjects were also adults (2-8 years), three females and three males. One of the males was castrated and 2 females were spayed. The breeds or cross breeds were 3 Labradors, 1 Bull Terrier, 1 German Shepherd Dog and 1 Collie.

7.4.3 Results of pilot study

Results indicated that statistically significant increases of PEA were recorded in the human subjects ($p < 0,04$) according to the t-test¹⁹⁷ as well as in the dog subjects ($p < 0,01$) (Table 7.3).

Table 7.3: Phenylethylamine (PEA) values in human and dog subjects before and after positive interaction (n = 6)

Subject	PEA(pg/100mℓ) before interaction	Standard deviation	PEA (pg/100mℓ) after interaction	Standard deviation
Humans	540 0 0 370 430 0		966 2780 2890 857 381 1930	
Average	223,3	250,6	1364,0	129,9
Dogs	0 0 780 510 1350 390		6160 2540 3750 1904 2850 2700	
Average	505,0	512,4	3317,3	174,5

7.4.4 Conclusion of pilot study

The pilot study indicated that decreased blood pressure could serve as an indicator to collect blood plasma for neurochemical analyses during positive human-dog interaction at least for the human subjects. It also proved that an experiment of this nature is possible from a practical point of view.

7.5 The main experiment

The independent variable is the positive interaction between healthy, dog-loving, adult humans and healthy, well-tempered, adult dogs. Controls are before versus after measurements (counter-balancing) of own dogs (experimental group) versus unfamiliar dogs (control group), dog interaction versus quiet book reading, followed by neurochemical and hormonal changes.

7.5.1 Results

The results of the following eight parameters as dependent variables are reported in histograms, which include the range, mean and median of blood pressure, phenylacetic acid (metabolite

of β -phenylethylamine), dopamine, beta-endorphins, norepinephrine, oxytocin, prolactin and cortisol. The tables show the mean, standard deviation and median and the statistical significance of the values ($p < 0,05$). The block on the right hand side of every figure is explained as follows:

- Mean = Topline of the histograms
- Max = Maximum value
- Min = Minimum value
- Median = Median of values.

7.6 Changes in MAP and selected biochemicals in humans interacting positively with dogs

MAP which was used as indicator for biochemical changes will be reported first, followed by plasma levels of the neuropeptides and hormones.

7.6.1 Changes in MAP

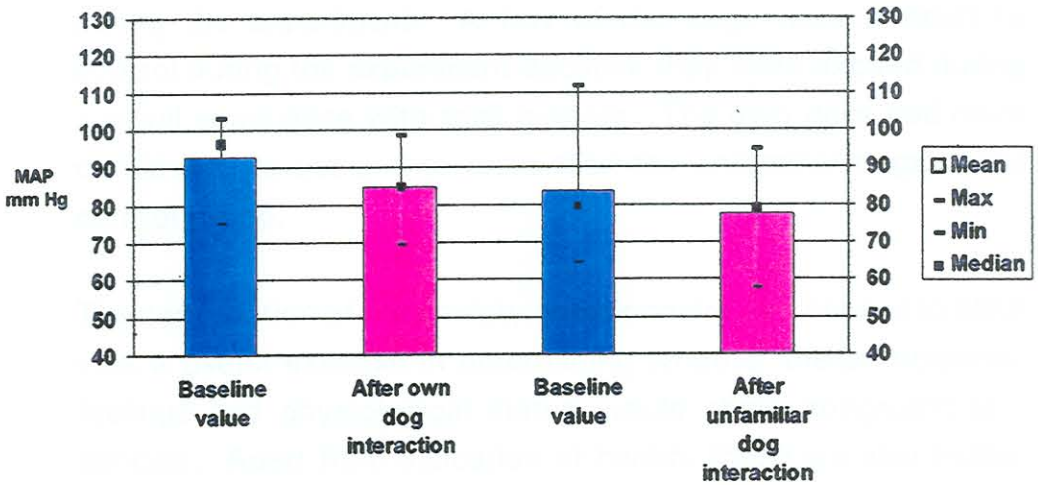


Figure 7.1: Mean arterial blood pressure (MAP) of humans before and after interacting positively with own (n=9) and unfamiliar dogs (n=9)

Table 7.4: Mean arterial blood pressure of humans (mmHg) before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)

MAP (own dogs)				MAP (unfamiliar dogs)			
	Before	After	p-value		Before	After	p-value
Mean	92,5	84,5	-	Mean	83,4	77,3	-
Standard deviation	9,0	8,2	-	Standard deviation	14,7	14,2	-
Median	96,2	84,5	-	Median	79,6	78,6	-
Significance	-	-	0,01	Significance	-	-	0,06

The time taken for MAP to decrease by 5-10% for blood collection, was six to 18 minutes for the owners and five to 24 minutes for human subjects with unfamiliar dogs.

From the results of the anxiety state questionnaire it was assumed that all the participants were healthy, non-anxious adults. The results of the blood pressure measurements supported this assumption, because the MAP of both groups fell within normal range. A higher baseline MAP for people in the experimental group could be attributed to their dogs' behaviour during the experiment. A few of the dogs were difficult to control during the experiment because they were excited during a novel experience with their owners. The own dogs had more confidence to act and to react than the unfamiliar dogs in the control group.

The contribution of the anxiety questionnaire as a control to MAP was a useful exercise in determining whether the participants' feelings and physiological status would show congruent tendencies. Apart from indication of health, these are also indications of the body-mind unity, and this in turn supports the theory that one physiological change can be used to measure other biochemical changes.

7.6.2 Changes in plasma neurotransmitters

7.6.2.1 Phenylacetic acid as metabolite of phenylethylamine

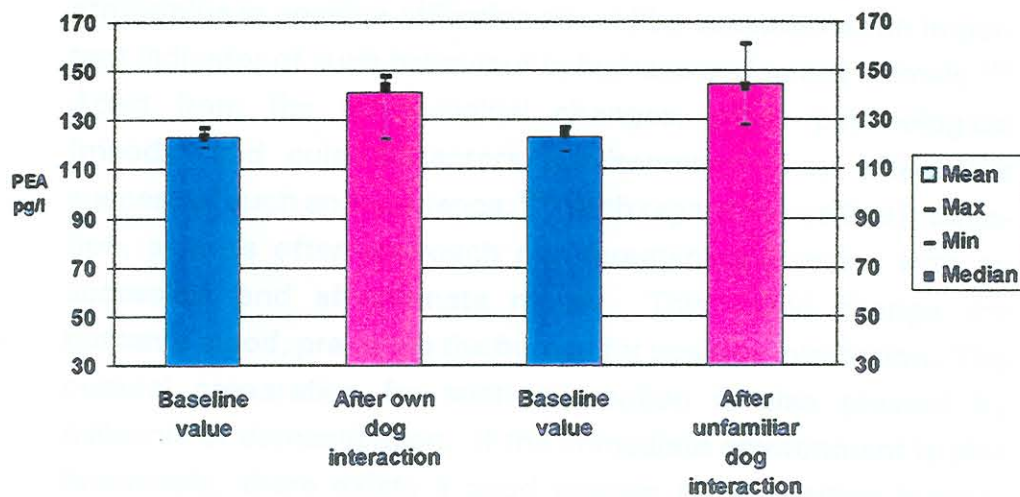


Figure 7.2: Plasma phenylacetic acid (PEA) of humans before and after interacting positively with own (n = 9) and unfamiliar dogs (n = 9)

Table 7.5: Concentrations of phenylacetic acid (pg/l) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)

PAA (own dogs)	Before	After	p-value	PAA (unfamiliar dogs)	Before	After	p-value
	Mean	122,8	140,7		-	Mean	123,0
Standard deviation	2,4	7,7	-	Standard deviation	3,6	11,7	-
Median	123,0	143,0	-	Median	124,0	143,0	-
Significance	-	-	0,00	Significance	-	-	0,00

The results indicate that β -phenylethylamine showed a significant increase ($p < 0,05$) after interaction.

Phenylethylamine is responsible for a feeling of elevated mood and decreased fatigue, because it is an amphetamine-like chemical. The feeling tends to happen instantaneously and voluntarily and it is of short duration, often as a first positive

reaction.¹⁵³ It is present in the limbic system where it acts as an emotion-regulator.^{152,156}

Although other neurotransmitters such as dopamine and serotonin received more attention in recent literature, the role of phenylethylamine in positive affiliation should be accepted as an important indicator of such behaviour in humans and social animals.¹⁵⁸ Apart from the physiological changes, other psychological (moods) and cultural factors (environment) may affect the success of such an experience.¹⁵³ With regard to positive interaction, animals often approach non-threatening humans with an accessible and affectionate mood. This could change the human's mood, preparing the human for positive interaction. The cultural preparation for such interaction is also present by millennia of domestication. If the immediate environment is also favourable, there exists a good change for a positive human-animal interaction to succeed and to produce phenylethylamine effects.

7.6.2.2 Dopamine

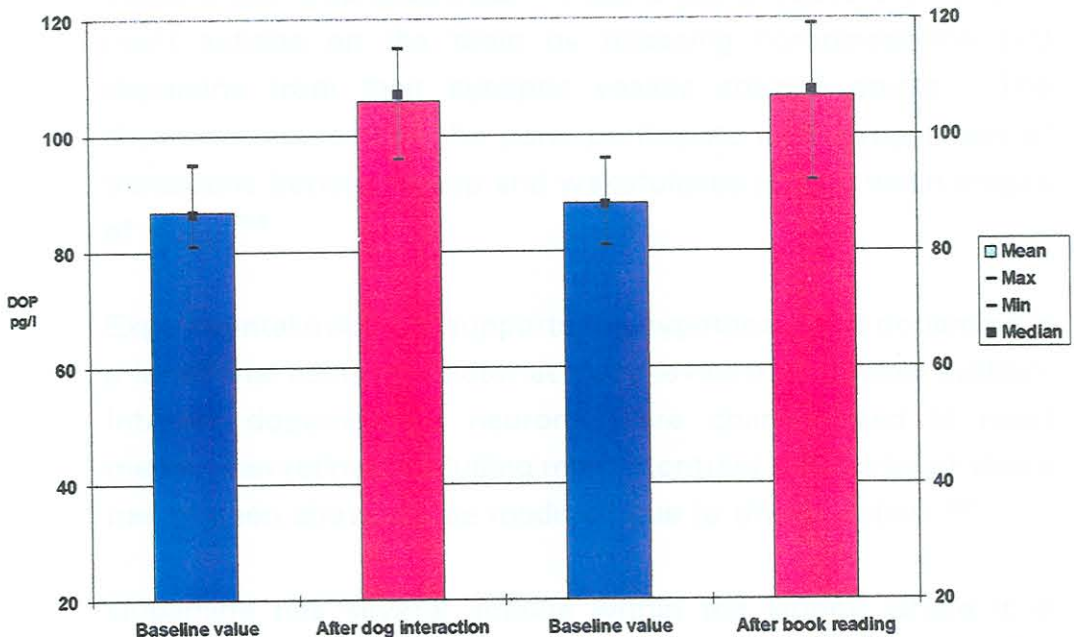


Figure 7.3: Plasma dopamine (DOP) of humans before and after interacting positively with own (n=9) and unfamiliar dogs (n=9)

Table 7.6: Concentrations of dopamine (pg/ℓ) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)

DOP (own dogs)	Before	After	p-value	DOP (unfamiliar dogs)	Before	After	p-value
	Mean	87,8	106,3		-	Mean	85,6
Standard deviation	4,8	5,2	-	Standard deviation	4,3	5,9	-
Median	87,0	108,0	-	Median	86,0	104,0	-
Significance	-	-	0,00	Significance	-	-	0,00

Positive human-dog interaction showed a significant increase ($p < 0,05$).

Dopamine is contained in relatively few neurons. These neurons are grouped together in restricted regions of the brain, mainly the raphe nuclei, the locus coeruleus and the substantia nigra respectively. These neurons project to virtually all regions of the central nervous system. Dopamine is synthesized from the amino acid tyrosine and it plays a role in regulating emotional responses. It also plays a crucial role in the control of complex movements. Dopamine appears to facilitate pleasurable sensations and is known to mediate the exhilaration that people seek in taking cocaine and amphetamines. These drugs produce their excitement actions on the brain by releasing norepinephrine and dopamine from their synaptic vesicle storage points. The dopamine neurons of the pons participate in the regulation of transitions between sleep and wakefulness and between stages of sleep.²⁰⁵

Experimental evidence supports the hypothesis that dopamine is a functional neuromodulator at many levels of the visual system. Intrinsic dopaminergic neurons were characterized in most mammalian retinas, including man. Contrast sensitivity of vision has to been shown to be modified due to this affection.²⁰⁶

Dopamine has several actions within the kidney where it is produced in the proximal tubule and dopaminergic neurons in the kidneys. It acts as a vasodilator, increases the renal blood flow, inhibiting renin secretion and inhibits NaCl and water reabsorption in the proximal tubule.²⁰⁷

Mesencephalic dopamine-containing neurons that innervate limbic regions, notable nucleus accumbens, are thought to be involved in the control of a variety of species-typical behaviours such as male copulatory behaviour, feeding and drinking. Their precise function remains, however, a source of conjecture.²⁰⁸

7.6.2.3 β -endorphin

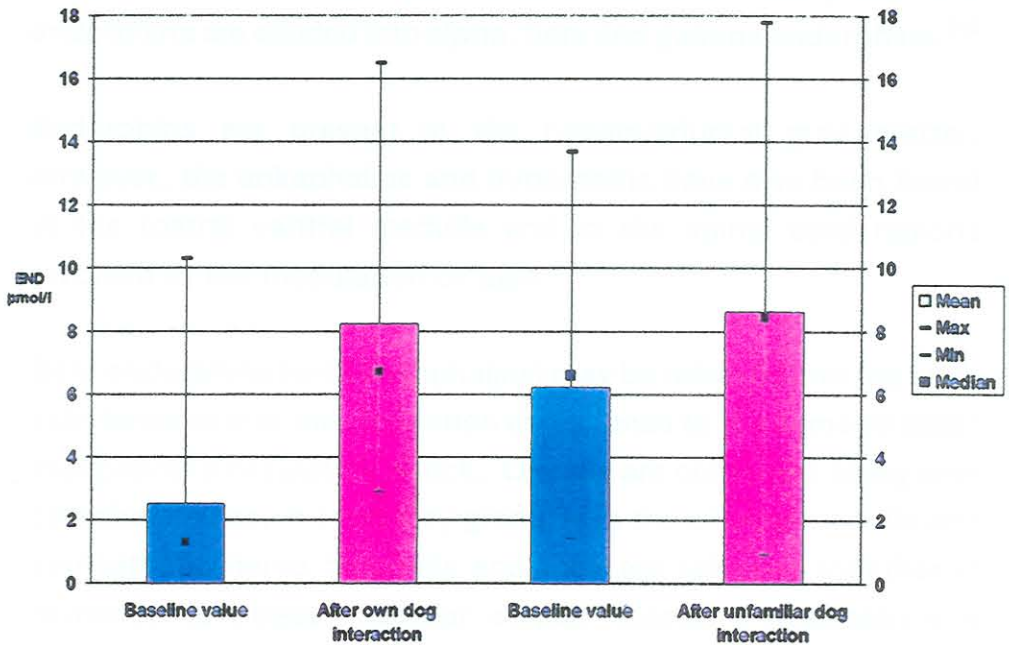


Figure 7.4: Plasma beta-endorphin (END) of humans before and after interacting positively with own (n=9) and unfamiliar dogs (n=9)

Table 7.7: Concentrations of β -endorphin (pmol/l) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)

END	END (own dogs)			p-value	END (unfamiliar dogs)			p-value
	Before	After			Before	After		
Mean	2,5	8,2	-	0,00	6,2	8,5	-	0,00
Standard deviation	3,1	4,8	-		3,9	5,3	-	
Median	1,3	6,7	-		6,6	8,4	-	
Significance	-	-	-		-	-	-	

The significant increase ($p < 0,05$) in endorphin concentrations in plasma, could indicate that it plays a role in stress-relief reported during human-animal interaction.⁷¹

The endorphins are endogenous opioids and are derived from the precursor protein β -lipotropin. They have been found to elicit similar biological reactions as morphine, namely, analgesia, euphoria, respiratory depression and to slow the release of transmitters that activate contraction of intestinal muscles. There are three major classes of endogenous opioid peptides in mammals, namely, enkephalins, endorphins and dynorphins and endorphins are divided into alpha, beta and gamma endorphins.²⁰⁹

Endorphins are present in the periaqueductal gray matter, however, the enkephalins and dynorphins have also been found in the rostral ventral medulla and in the spinal cord regions involved in the modulation of pain.²⁰⁹

Beta-endorphins (with enkephalins) may be released into the brain substance or into the circulation in response to the same stresses that provoke circulatory shock. Opioids are contained along with catecholamines, in secretory granules in the adrenal medulla and sympathetic nerve terminals and they are released together in response to stress. Similar stimuli release β -endorphin and adrenocortico-tropic hormones from the rostral pituitary gland. Opioids depress the brain stem centres that mediate some of the compensatory anatomic adaptations to blood loss, endotoxemia and other shock-provoking stresses. Hypothalamo-hypophyseal tracts can integrate multiple simultaneous pituitary responses with each other and regulate pituitary function in accordance with change in temperature, energy needs, or fluid balance. β -endorphin acts as neurotransmitter for efferent impulses to the median eminence. These impulses regulate the discharge of releasing hormones and inhibiting hormones into the adjacent capillaries. Dopamine and β -endorphin also modulate efferent hypothalamic outflow by transmitting signals between areas of the hypothalamus.²⁰⁹

The release of β -endorphin from the anterior pituitary gland is stimulated by serotonin and norepinephrine.²¹⁰

Behavioural interaction in monkey social groups can be divided into four categories, namely, investigation, aggression, affiliation and sexual interaction. Among these, grooming is an important affiliative behaviour and as sexual behaviour also has a substantial affiliative grooming component, it is likely that such activities may also be accompanied by an increase of β -endorphin. Nalaxone (morphin antagonist) will decrease affiliative as well as sexual activities. This is not to imply that the endorphins are the "affectional" peptides, because they have been shown to influence the release of other peptide transmitters in the limbic system (oxytocin, vasopressin) as well as the classical neurotransmitters (noradrenalin, acetylcholine). Oxytocin and vasopressin are closely linked to pair-bonding in other mammals.²¹¹

7.6.2.4 Norepinephrine

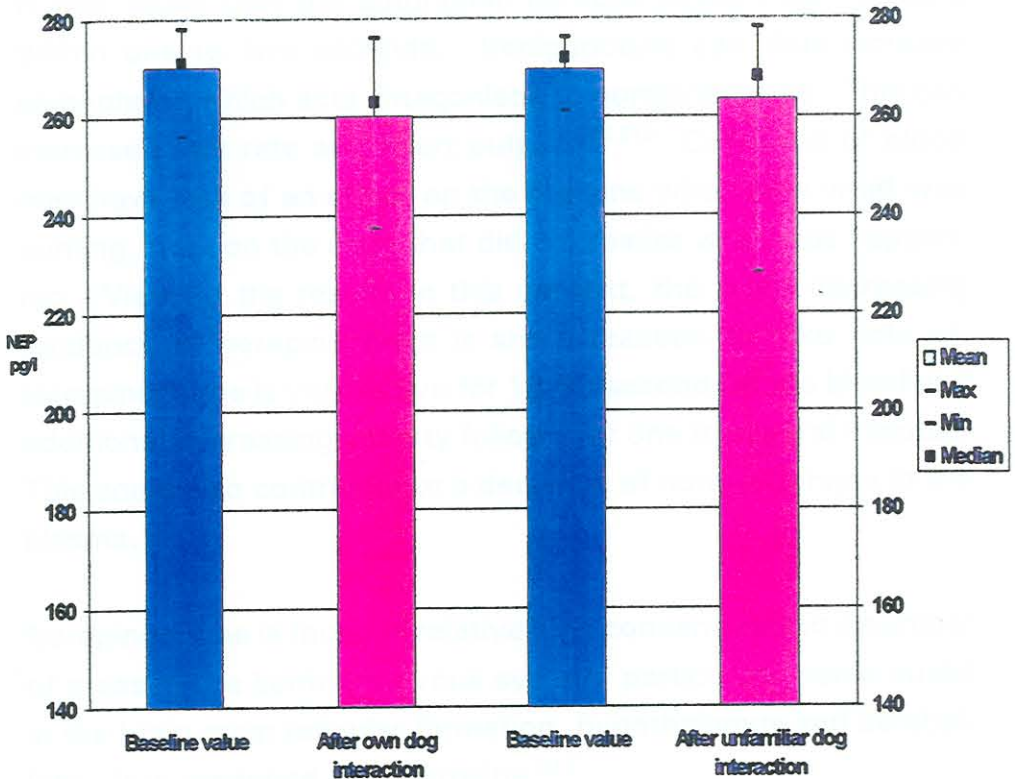


Figure 7.5: Plasma norepinephrine (NEP) of humans before and after interacting positively with own (n=9) and unfamiliar dogs (n=9)

Table 7.8: Concentrations of norepinephrine (pg/ℓ) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)

NEP (own dogs)				NEP (unfamiliar dogs)			
	Before	After	p-value		Before	After	p-value
Mean	270,0	259,8	-	Mean	269,5	263,2	-
Standard deviation	6,6	14,0	-	Standard deviation	5,3	15,4	-
Median	271,0	263,0	-	Median	272,0	268,0	-
Significance	-	-	0,066	Significance	-	-	0,67

Norepinephrine did not change significantly with human-dog interaction, but a tendency to decrease was found and more so in humans with their own dogs. Norepinephrine may be more sensitive than the other neurochemicals to the process of blood collection.

It was found that the autonomic nervous system can respond within one to two seconds. Venipuncture can thus increase epinephrine which acts antagonistic to norepinephrine. This can increase heart rate and heart output.^{209,212} Collection of blood may have less of an effect on the humans who knew what was coming, than on the dogs that did not realize what was happening. Viewing the results in this context, the slight decreasing tendency of norepinephrine is still a reaction to take note of. Norepinephrine is very active for 10-30 seconds in the blood and additional decreasing activity follows for one to several minutes. This could also contribute to a decrease of norepinephrine in the plasma.¹⁵⁷

Norepinephrine is found in relative high concentrates in a number of areas in the central nervous system, particularly some nuclei in the brain stem reticular formation, hypothalamus and cerebellum. It is produced from tyrosine.²¹³

Norepinephrine acting as a neurotransmitter in the brain appears to play a complex role in initiating and stopping ingestion

to play a complex role in initiating and stopping ingestion behaviour and the regulation of body temperature. The locus coeruleus in the pons is a concentrated collection of cell bodies of neurons that secrete the neurotransmitter norepinephrine which triggers emotional arousal. Excessive norepinephrine in the brain over a too long period of time is implicated in severe stress reactions, while too little results in depression. Norepinephrine may also play a part in producing feelings that an organism experiences as pleasurable.²⁰⁹

It is presumed that the norepinephrine system especially, and perhaps the serotonin system as well, normally function to provide motor drive to the limbic system to increase a sense of well-being, happiness, contentment, appetite, appropriate sex drive, psychomotor balance, although too much can cause mania. In support of this concept is the fact that the pleasure and reward centres of the hypothalamus and surrounding areas receive large numbers of nerve endings from noradrenergic neurons.¹⁵⁷

Despite extensive research, the biochemical abnormalities underlying the predisposition to and the pathogenesis of affective disorders remain to be clearly established. Efforts to study norepinephrine output and function point to a dysregulation of the noradrenergic neurons. Depressed patients excrete relatively more norepinephrine in urine and its major extraneural metabolite, normetanephrine, than control subjects.²¹⁴

Only during the past decade has oxytocin, acting as a neurotransmitter, been implicated in positive interpersonal interaction.^{16,16,17,18} It has been called the "happy hormone". The tendency for oxytocin to increase in both human groups with dog interaction was highly significant ($p < 0.05$).

7.6.2.5 Oxytocin

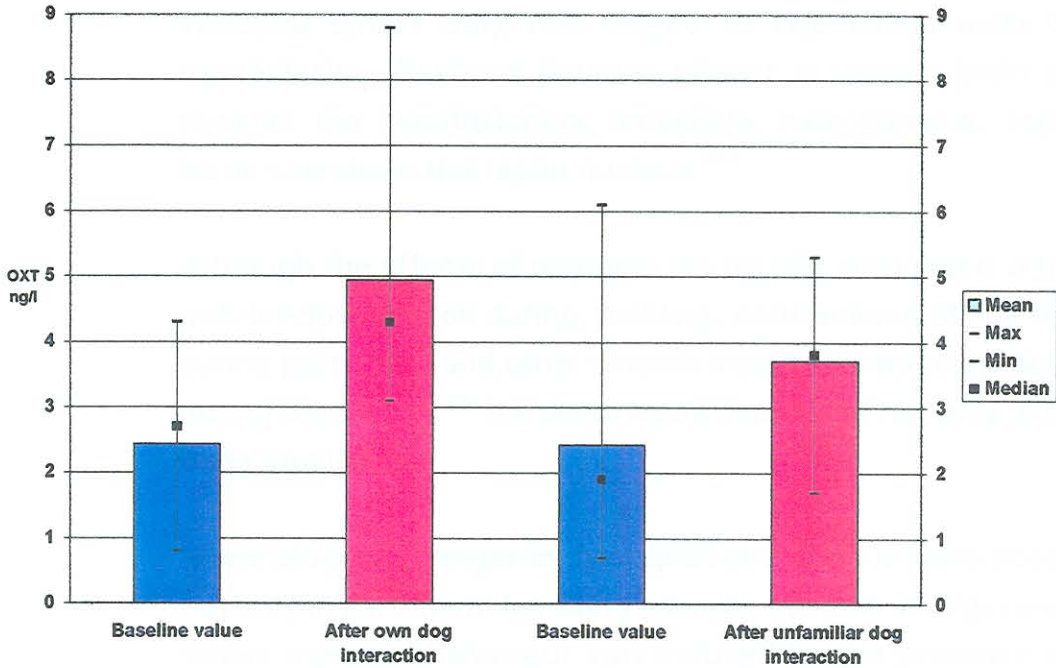


Figure: 7.6: Plasma oxytocin (OXT) of humans before and after interacting positively with own (n=9) and unfamiliar dogs (n=9)

Table 7.9: Concentrations of oxytocin (mg/l) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)

OXT (own dogs)	Before	After	p-value	OXT (unfamiliar dogs)	Before	After	p-value
Mean	2,4	4,9	-	Mean	2,4	3,7	-
Standard deviation	1,3	1,9	-	Standard deviation	1,7	1,1	-
Median	2,7	4,3	-	Median	1,9	3,8	-
Significance	-	-	0,00	Significance	-	-	0,01

Only during the past decade has oxytocin, acting as a neurotransmitter, been implicated in positive intraspecies interaction.^{164,166,167,168} It has been called the "happiness" hormone. The tendency for oxytocin to increase in both human groups with dog interaction was highly significant ($p < 0,05$).

Oxytocin is a polypeptide (nonapeptide) hormone which is synthesized in the paraventricular and supraoptic nuclei of the hypothalamus and is secreted by the neurohypophysis. The structure differs only with regard to two amino acids from vasopressin. Oxytocin neurons project to various brain areas such as the hypothalamus, amygdala, hippocampus, septum, locus coeruleus and raphe nucleus.²¹³

Although the effects of oxytocin are usually associated with the milk-let-down reflex during suckling, contractions of the uterus during parturition and other smooth muscle contractions such as during copulation,¹⁵⁷ its role as neurotransmitter has only recently been studied.

Morphological changes in the supraoptic nucleus were observed not only in parturient, lactating animals, but also in virgin animals where maternal behaviour was induced by the presence of rat pups. The supraoptic nuclei of lactating and maternally behaving virgin animals had a higher incidence of dendritic bundling relative to non-maternal virgin animals.²¹⁵

Oxytocin is not confined to the hypothalamo-neurohypophysial system but present elsewhere in the body, however, the significance of the peptide in such peripheral sites is unclear. Oxytocin was found to be a male gonadal hormone and is regulated by factors which alter gonadal function.²¹⁶

Two types of oxytocin binding sites have been detected. One, widely distributed throughout the central nervous system, is comparable to the uterine type receptor. A second, sexually dimorphic slightly different type, is found in the ventromedial nucleus of the limbic system. This is the case for the influence of vasopressin on social communication, temperature regulation, epilepsy, and barrel rotation which may be an animal model of febrile convulsions, and some aspects of the central regulation of the cardiovascular system and for oxytocin on sexual behaviour,

7.02.6 Protein

social communication, and grooming. Nonendocrine C-terminal conversion products seem to exert their effects exclusively on other parts of the brain. These neuropeptides modulate learning and memory processes, social recognition, and rewarded behaviour. The neuroendocrine and neuropeptide effect of vasopressin, oxytocin and related neuropeptides often exert their central nervous system effects in an opposite way. Neurochemical and electrophysiological studies suggest that norepinephrine, dopamine, serotonin, and glutamate are the neurotransmitters involved in the function. It appears that adequate amounts of vasopressin and oxytocin to induce these effects are released at the appropriate sites of action. It is postulated that the mix of neuropeptides released in the brain in response to environmental changes qualifies the behavioural, neuroendocrine, and immune response and the response of the autonomic nervous and vegetative systems of the organism.²¹⁷

Oxytocins' visceral functions include the regulation of the cardiovascular and gastro-intestinal systems. It facilitates maternal, grooming and feeding behaviour and is reported to both stimulate and inhibit sexual behaviour under different circumstances. Oxytocin appears to have an amnesic effect, inhibiting memory processes and also regulates water excretion.²¹⁰

A combination of behavioural, neuroanatomical and pharmacological evidence underscores a critical and interactive role for oxytocin and gonadal steroids in mammalian sociosexual behaviour. Underlying mechanisms of oxytocin action includes the activation of neurotransmitter networks that affect oxytocin gene expression and secretion, or homologous modulation of oxytocin neurosecretion.²¹⁹

Oxytocin increased significantly after interaction. On an individual basis it was indicated that the neurochemicals play a role in social bonding.²¹⁹

7.6.2.6 Prolactin

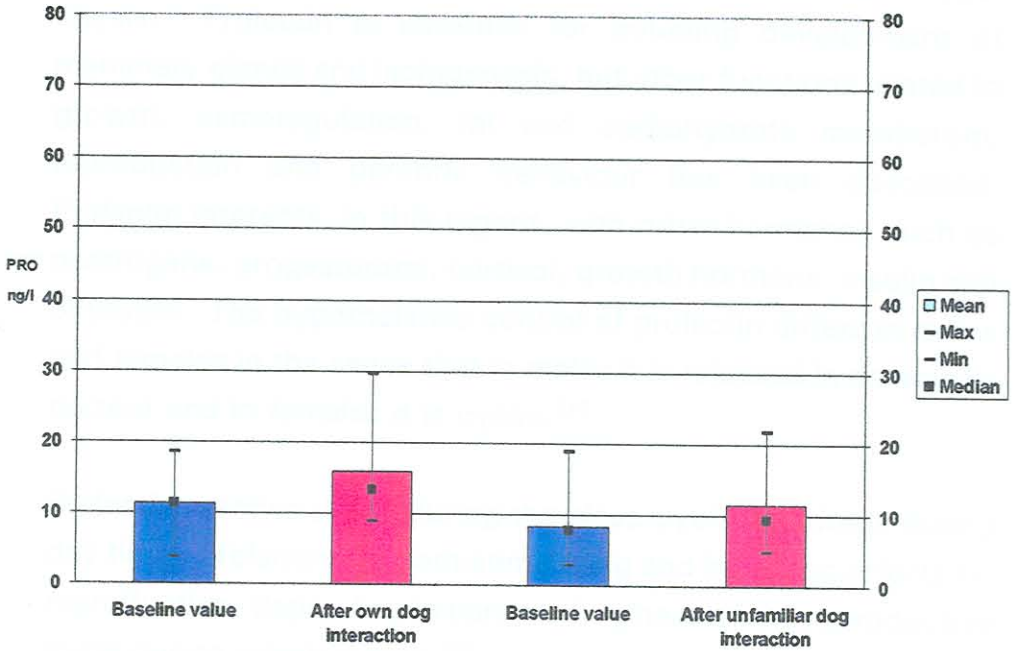


Figure 7.7: Plasma prolactin (PRO) of humans before and after interacting positively with own (n=9) and unfamiliar dogs (n=9)

Table 7.10: Concentrations of prolactin (ng/l) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)

PRO	PRO (own dogs)			PRO (unfamiliar dogs)		
	Before	After	p-value	Before	After	p-value
Mean	11,1	15,8	-	8,2	11,3	-
Standard deviation	4,4	6,5	-	5,5	5,9	-
Median	11,3	13,3	-	7,8	9,4	-
Significance	-	-	0,00	-	-	0,01

Prolactin increased significantly after interaction. On an intra-species basis it was indicated that this neurochemical could play a role in social bonding.¹⁶³

Dopamine acts as a prolactinostat while serotonin, endorphins and thyroliberin stimulate secretion of prolactin.²¹³ Prolactin is produced in lactotroph (mammotroph) cells in the adenohypophysis. Prolactin is essential for initiating development of mammary glands and lactogenesis, but other functions related to growth, osmoregulation, fat and carbohydrate metabolism, reproduction and parental behaviour has been described. Prolactin interacts, in this regard, with other hormones such as oestrogens, progesterone, cortisol, growth hormone, insulin and oxytocin. The hypothalamic control of prolactin differs in males and females in the sense that in males it is released in an acyclic pattern and in females it is cyclic.²¹⁰

Prolactin reaches peaks during the sleep cycle and drops during day time. Prolactin has both stimulating and inhibiting effects on reproduction, depending in part on the phase of the reproductive cycle during which it acts.²⁰⁹

Prolactin, a trophic hormone, is also required for normal development and growth of the prostate as well as other tissues (e.g. haemopoietic tissues). In males, oxytocin regulates prostate citrate production.²²⁰

At physiological levels prolactin is also trophic for lymphocytes. Either too much, or too little prolactin may be immunosuppressive. Lymphocytes produce a prolactin-like substance and prolactin may play a role in a number of auto-immune processes.^{221,222}

In mammals, prolactin is associated with learning, reduction of body temperature and increased corticosterone secretion. Secretion is strongly stimulated in the female rat on exposure to pups.²²³

7.6.2.7 Cortisol

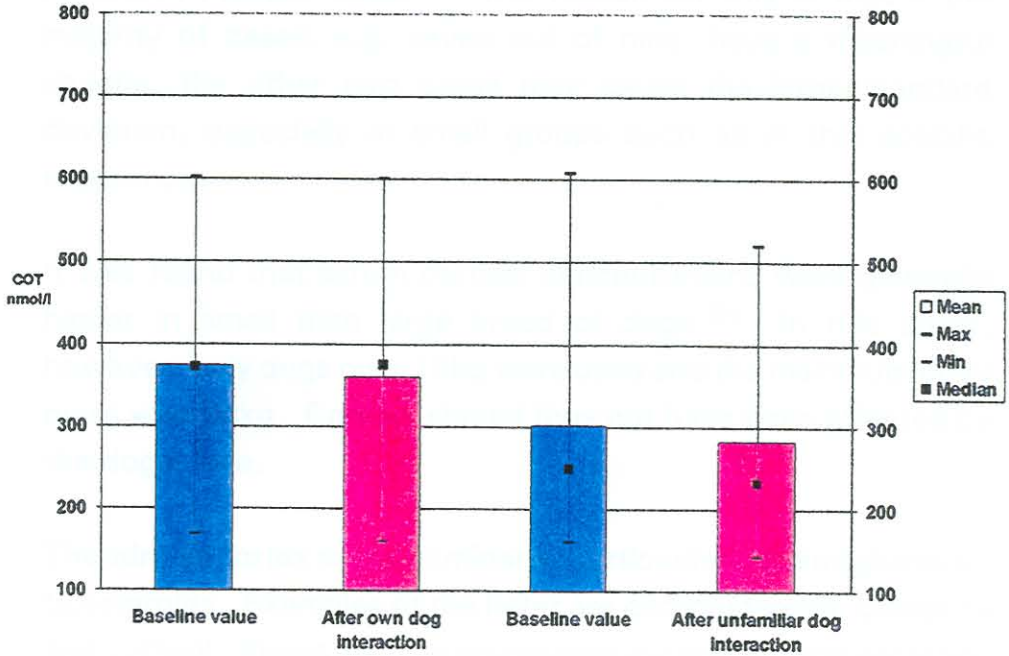


Figure 7.8: Plasma cortisol (COT) of humans before and after interacting positively with own (n = 9) and unfamiliar dogs (n = 8)

Table 7.11: Concentrations of cortisol (nmol/l) in the plasma of humans before and after interacting positively with own dogs (n = 9) and unfamiliar dogs (n = 9)

COR (own dogs)				COR (unfamiliar dogs)			
	Before	After	p-value		Before	After	p-value
Mean	373,1	359,2	-	Mean	301,6	281,1	-
Standard deviation	155,7	154,9	-	Standard deviation	146,1	128,0	-
Median	372,0	374,0	-	Median	248,0	232,0	-
Significance	-	-	0,01	Significance	-	-	0,01

Cortisol is a well-known parameter in stress measurement. The significant decrease in cortisol values ($p < 0,05$) in both groups is indicative that this hormone has an effect during positive interaction with dogs. Companion animal ownership is often associated with better general health, because it may serve as a stress reliever.^{6,82,128} These results support this idea on a physiological level, other than a decrease in blood pressure.

Despite the fact that the standard deviation is large in both groups, the significance could still be meaningful according to the statistical method used.¹⁹⁵ The reason for this is that if the majority of cases, e.g. seven out of nine, have a meaningful change, the other two cases may cause the large standard deviation, especially in small groups such as in this specific experiment.

It was found that serum cortisol concentrations were generally higher in small than large breed of dogs.²²⁴ In this study, however, only dogs over 15kg were used and the maximum body mass was 28kg. Cortisol should thus not have been affected by the dogs' size.

The adrenal cortex secretes mineralocorticosteroids and glucocorticosteroids. Examples of the latter are corticosterone, cortisone and cortisol. Stress leads to an increase in corticoliberin secretion from the hypothalamus and corticotropin secretion from the adenohypophysis. This in turn stimulates secretion of glucocorticosteroids. They affect many bodily functions, namely through their role in carbohydrate, protein and fat metabolism. Cortisol increases blood glucose concentrations by stimulating glyconeogenesis and by inhibiting the effect of insulin. Catabolism of proteins, especially in bone, skin and muscle, is stimulated by cortisol. Glucocorticoids are also active in lipolysis of fat, together with other hormones such as thyroid hormone, growth hormone and the catecholamines which stimulate hormone sensitive lipase. In some regions in the body, glucocorticoids may have an opposite effect, namely lipogenesis and fat accumulation.²¹³

The secretion of cortisol by the zona fasciculata is controlled by corticotropin (ACTH), the secretion of which in turn is controlled by corticoliberin. All the factors that influence ACTH secretion will affect cortisol secretion. Plasma levels of the latter follow the former by 15-30 minutes. Thus cortisol like ACTH exhibits distinct diurnal variation with a peak just before the subject awakens in the morning and the lowest levels just after the

subject falls into slow-wave sleep. Cortisol increases the rate of glomerular filtration by decreasing preglomerular resistance and increasing glomerular plasma flow. The hormone is also essential for rapid excretion of a water load through its inhibitory effect on vasopressin (ADH).²⁰⁹

Cortisol also facilitates maturation of the foetus, decreases connective tissue, inhibits inflammatory and immune responses and maintains cardiac output, increases arterial tone and decreases endothelial permeability. Cortisol plasma levels are higher during pregnancy and it plays a role in parturition with other hormones. There is an intimate anatomic and physiological relationship between the adrenal medulla and cortex.²⁰⁷

Adrenal glands are complexed multifunctional endocrine organs that are essential for life. The cortex (80-90% of the gland) is derived from mesodermal tissue and is the source of corticoid hormones. The medulla is derived from neuroectodermal cells of the sympathetic ganglia and it is the source of the catecholamine hormones. There are three cortical zones which differ histologically. The outermost zona glomerulosa is thin and consists of small cells, the middle zona fasciculata is the widest and consists of columnar cells and the innermost zona reticularis consists of a network of interconnecting cells. Glucocorticoids are largely synthesised in the zona fasciculata with some contribution from the zona reticularis. Cortisol is the dominant glucocorticoid and it is synthesised from cholesterol. The medulla is the source of the circulating hormone epinephrine and small amounts of norepinephrine, nominally a neurotransmitter, which in select circumstances may also function as a hormone. The adrenal medulla essentially represents an enlarged and specialised sympathetic ganglion, but the neural cell bodies of the medulla do not have axons and they discharge their catecholamine hormones directly into the bloodstream. Its function is thus rather endocrine than nerve cells. Apart from the close anatomical relationship of the cortex and medulla, physiological they both play a role in stress reactions. In acute stress, the medulla via the peripheral sympathetic system produces in the "fight or flight" reaction,

while in continuous stress the cortex, via glucocorticoids produces a complexed metabolic reaction to adapt or survive.²⁰⁹

Cortisol modulates excitability, behaviour and mood of individuals by influencing the electric activity of neurons. Glucocorticoid receptors of both type I and II are present in various areas of the brain, particularly in the limbic system and hippocampus.²⁰⁷

7.7 Statistical difference between experimental and control human groups

The only statistical difference was oxytocin ($p < 0,05$), which was higher in the own dog group. The other parameters between the groups did not differ significantly.

7.8 Changes in MAP and selected biochemicals in dogs

7.8.1 Changes in MAP

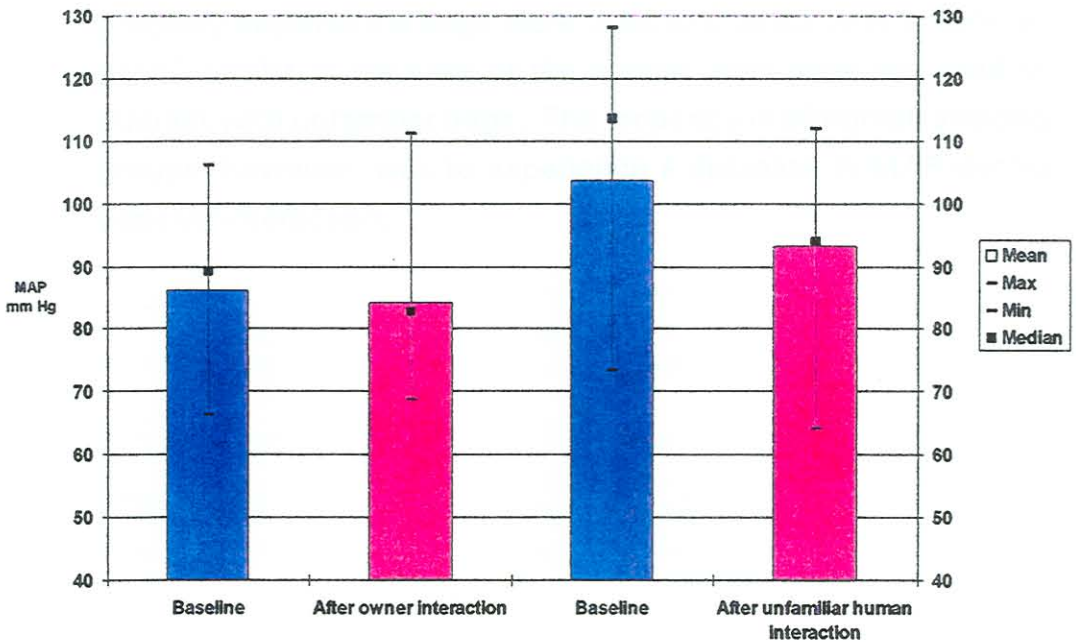


Figure 7.9: Mean arterial blood pressure (MAP) of dogs before and after interacting positively with owners (n=9) and unfamiliar dog lovers (n=9)

Table 7.12: Mean arterial blood pressure (mmHg) of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)

MAP (owners)				MAP (unfamiliar people)			
	Before	After	p-value		Before	After	p-value
Mean	86,1	84,0	-	Mean	103,5	93,1	-
Standard deviation	12,9	12,8	-	Standard deviation	19,5	16,7	-
Median	89,2	82,6	-	Median	113,6	94,0	-
Significance	-	-	0,17	Significance	-	-	0,01

The time taken for MAP to decrease sufficiently for blood collection, was five to 19 minutes for own dogs and five to 23 minutes for unfamiliar dogs.

There was a significant decrease in the MAP of those dogs interacting with unfamiliar people, but not in those interacting with their owners. This phenomenon could be explained in terms of the dogs' behaviour as described below Table 7.4. The placid dogs of the control group did better than the dogs with owners, probably because the dogs were used to interact with unfamiliar people whilst in the case of the people, they were not used to interact with unfamiliar dogs. The tendency in all human and dog groups, however, was to experience a decrease in MAP during positive interaction.

This highly significant result correlates that found in humans. The observation is as important as the group observation is humans. The fact that 8-phosphaethylaminobenzamide in the same fashion indicates that human-dog interaction is beneficial to both species. It also supports the theory that the dog, as highly social animal, not only can act as a substitute for human positive interaction, but that the effect is reciprocal. This is not only

7.8.2 Changes in plasma neurotransmitters

7.8.1 Phenylacetic acid as metabolite of phenylethylamine

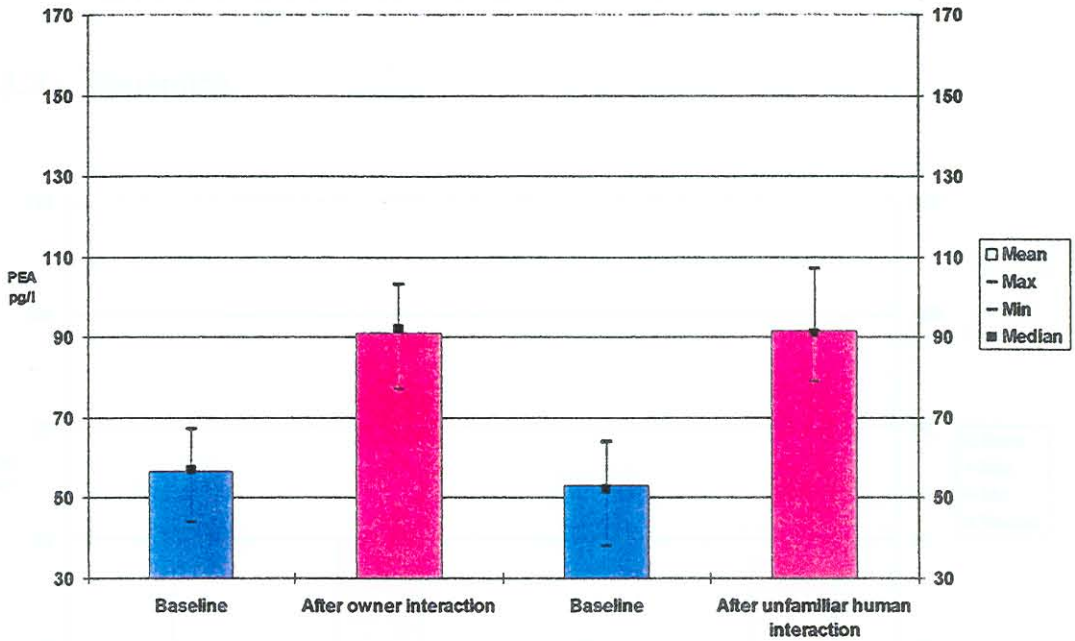


Figure 7.10: Plasma phenylacetic acid (PEA) of dogs before and after interacting positively with owners (n=9) and unfamiliar dog lovers (n=9)

Table 7.13: Concentrations of phenylacetic acid (pg/l) in the plasma of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)

PAA (owners)	PAA			p-value	PAA (unfamiliar people)	PAA			p-value
	Before	After				Before	After		
Mean	56,3	91,0	-	0,00	Mean	52,8	91,5	-	
Standard deviation	7,4	7,5	-		Standard deviation	8,5	8,0	-	
Median	57,0	92,0	-		Median	52,0	91,0	-	
Significance	-	-	-		Significance	-	-	0,00	

This highly significant result correlates that found in humans. The observation is as important as the similar observation in humans. The fact that β -phenylethylamine increased in the same fashion indicates that human-dog interaction is beneficial to both species. It also supports the theory that the dog, as highly social animal, not only can act as a substitute for human positive interaction, but that the effect is reciprocal. This in turn could

explain the human-dog interaction over the centuries in so many different peoples. As the main indicator of positive interaction on a physiological level, this finding can also be seen as the main support for the *attentionis egens* theory on an interspecies level.

7.8.2.2 Dopamine

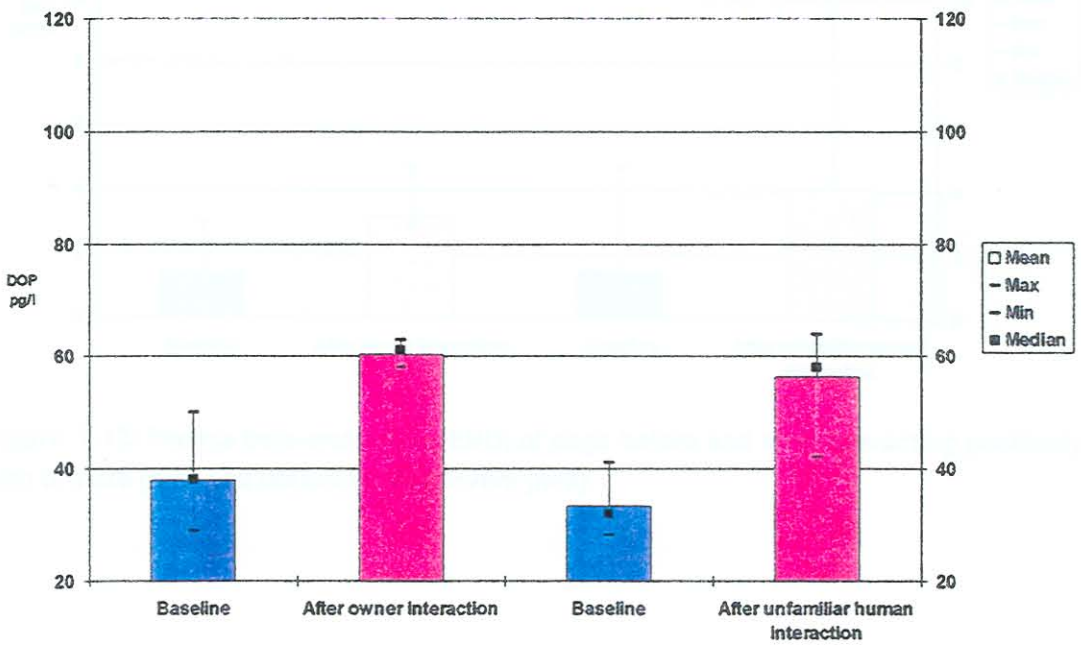


Figure 7.11: Plasma dopamine (DOP) of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)

Table 7.14: Concentrations of dopamine (pg/l) in the plasma of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)

DOP (owners)				DOP (unfamiliar people)			
	Before	After	p-value		Before	After	p-value
Mean	37,8	60,3	-	Mean	33,2	56,2	-
Standard deviation	6,5	1,9	-	Standard deviation	4,5	7,2	-
Median	38,0	61,0	-	Median	32,0	58,0	-
Significance	-	-	0,00	Significance	-	-	0,00

As in the case of humans, the dopamine also increased significantly and once more it is an indication of similar physiological effects during positive interaction.

7.8.2.3 β -endorphin

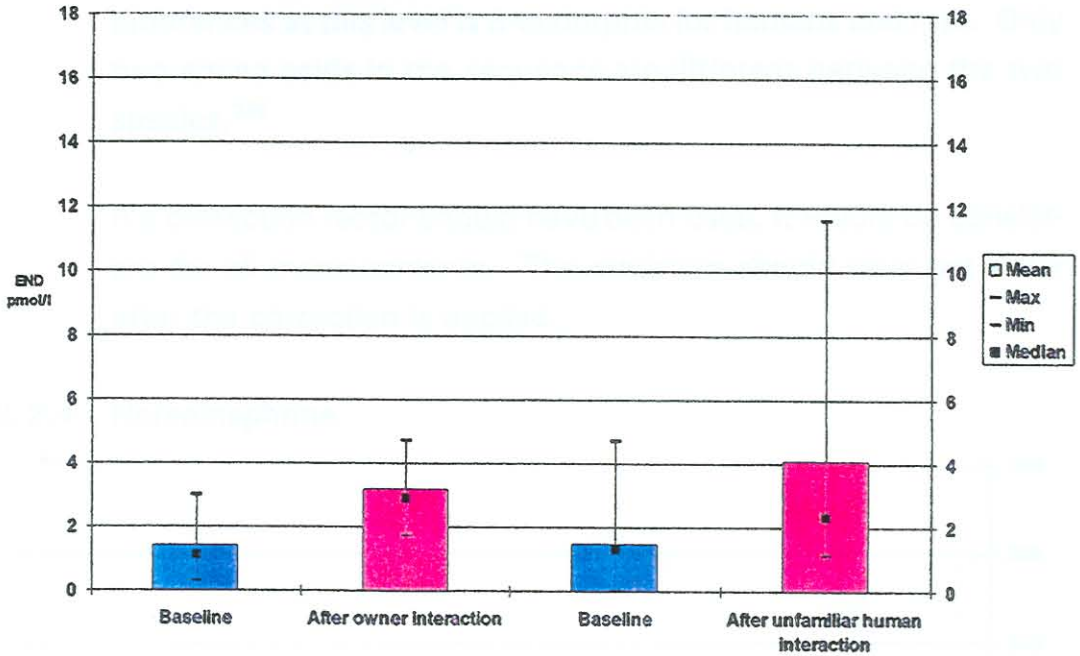


Figure 7.12: Plasma beta-endorphin (END) of dogs before and after interacting positively with owners (n=9) and unfamiliar dog lovers (n=9)

Table 7.15: Concentrations of β -endorphin (pmol/l) in the plasma of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)

END (owners)				END (unfamiliar people)			
	Before	After	p-value		Before	After	p-value
Mean	1,4	3,1	-	Mean	1,4	4,0	-
Standard deviation	0,9	1,0	-	Standard deviation	1,3	3,8	-
Median	1,1	2,9	-	Median	1,3	2,3	-
Significance	-	-	0,00	Significance	-	-	0,00

The observations followed the same tendency as in humans. However, the Laboratory indicated that another neuropeptide may have interfered with the reading obtained. The retention time for humans was 12,78 minutes and for dogs 11,05 minutes. Retention time refers to the time peaks develop on the HPLC apparatus. For quantification of canine β -endorphin, human standards were used. The peak closest to the human peak was

thus taken as dog β -endorphin, however, there is a slight chance that it could be another peptide. An example of known species differences at this level is β -endorphin for humans and rats. Only two amino acids in the sequence are different between the two species.²²⁵

If a correction factor should have been used, it would be consistent for all measurements. The statistics should thus not differ after the correction is applied.

7.8.2.4 Norepinephrine

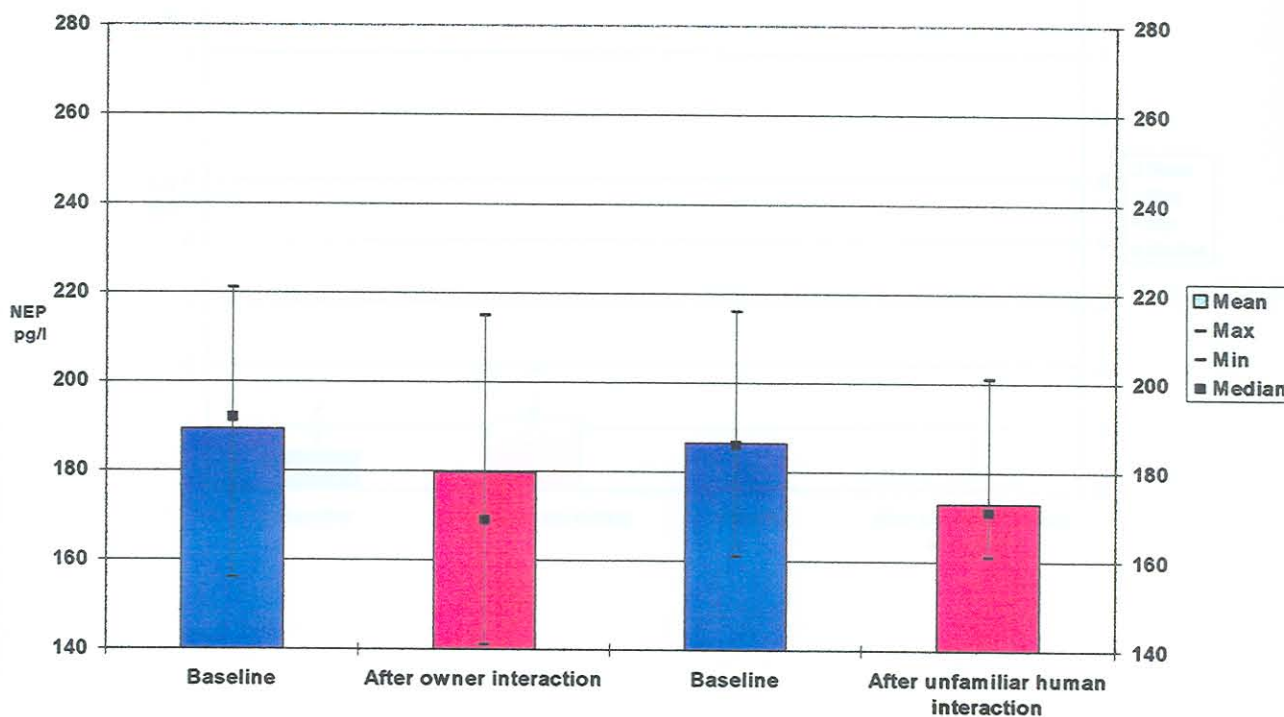


Figure 7.13: Plasma norepinephrine (NEP) of dogs before and after interacting positively with owners (n=9) and unfamiliar dog lovers (n=9)

Table 7.16: Concentrations of norepinephrine (pg/l) in the plasma of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)

NEP (owners)	NEP			p-value	NEP (unfamiliar people)	NEP			p-value
	Before	After				Before	After		
Mean	189,3	179,5	-		Mean	186,4	172,8	-	
Standard deviation	22,7	22,5	-		Standard deviation	19,2	12,3	-	
Median	192,0	169,0	-		Median	186,0	171,0	-	
Significance	-	-	0,08		Significance	-	-	0,06	

These results are not statistically significant and it could be ascribed to factors such as venipuncture. In humans the same procedure had a lesser effect because, unlike dogs, they knew what to expect.

7.8.2.5 Oxytocin

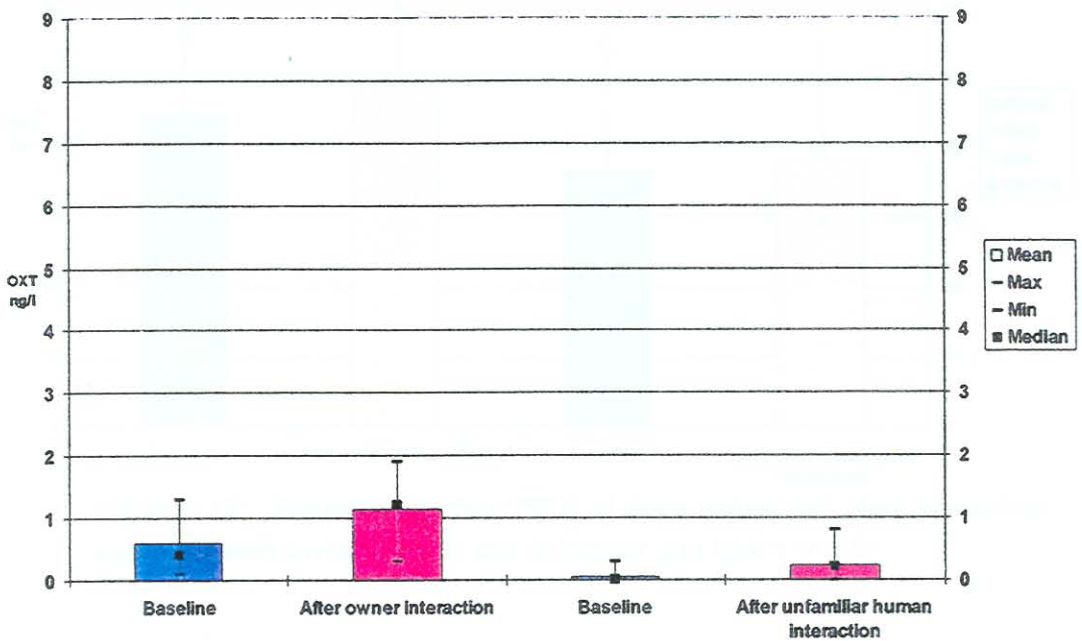


Figure 7.:14: Plasma oxytocin (OXT) of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)

Table 7.17: Concentrations of oxytocin (ng/l) in the plasma of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)

OXT (owners)				OXT (unfamiliar people)			
	Before	After	p-value		Before	After	p-value
Mean	0,5	1,1	-	Mean	0,04	0,2	-
Standard deviation	0,4	0,5	-	Standard deviation	0,10	0,2	-
Median	0,4	1,2	-	Median	0	0,2	-
Significance	-	-	0,00	Significance	-	-	0,09

In the group where a long relationship was established between dog and owner, the oxytocin increased in a highly significant manner. Although still significant, the difference was less marked in the contact between people with unfamiliar dogs.

7.8.2.7 Prolactin

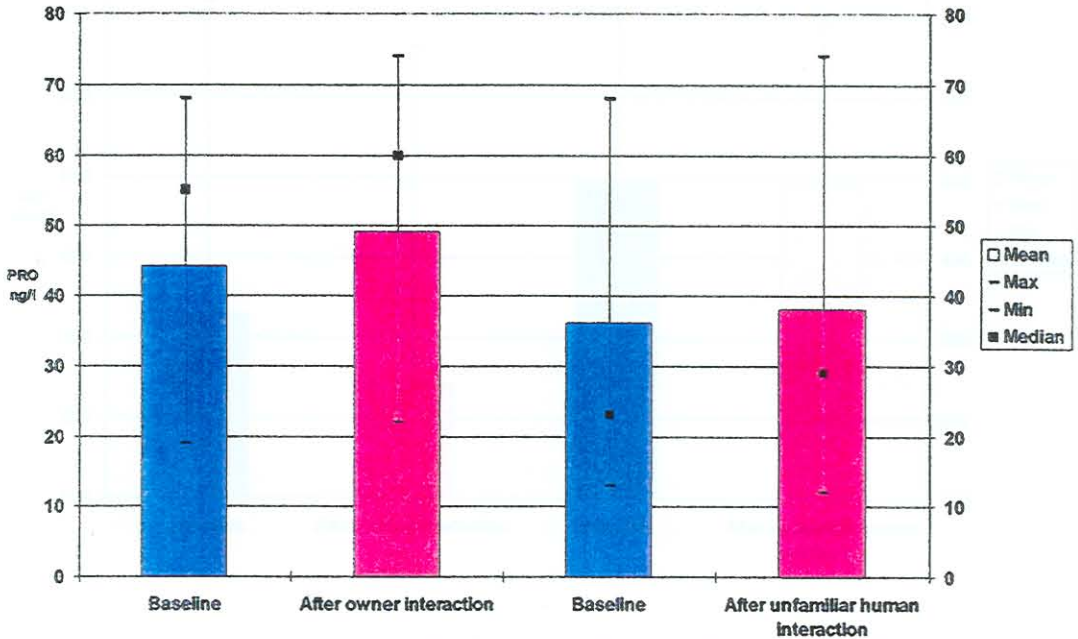


Figure 7.15: Plasma prolactin (PRO) of dogs before and after interacting positively with owners (n=9) and unfamiliar dog lovers (n=9)

Table 7.18: Concentrations of prolactin (ng/l) in the plasma of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)

PRO	PRO (owners)			p-value	PRO	PRO (unfamiliar people)			p-value
	Before	After				Before	After		
Mean	44,2	49,1	-	0,03	Mean	36,1	38,1	-	0,20
Standard deviation	19,9	21,7	-		Standard deviation	21,6	23,5	-	
Median	55,0	60,0	-		Median	23,0	29,0	-	
Significance	-	-	-		Significance	-	-	-	

As in humans, a significant increase in value was obtained following interaction between owners and their dogs, but not with the unfamiliar people group. Other substances which have the same retention time as prolactin, may be present as the peak area for dogs was larger than that for human standards. This finding could be normal for the dog, but on the other hand,

another peptide with a similar retention time may be involved.

7.8.2.8 Cortisol

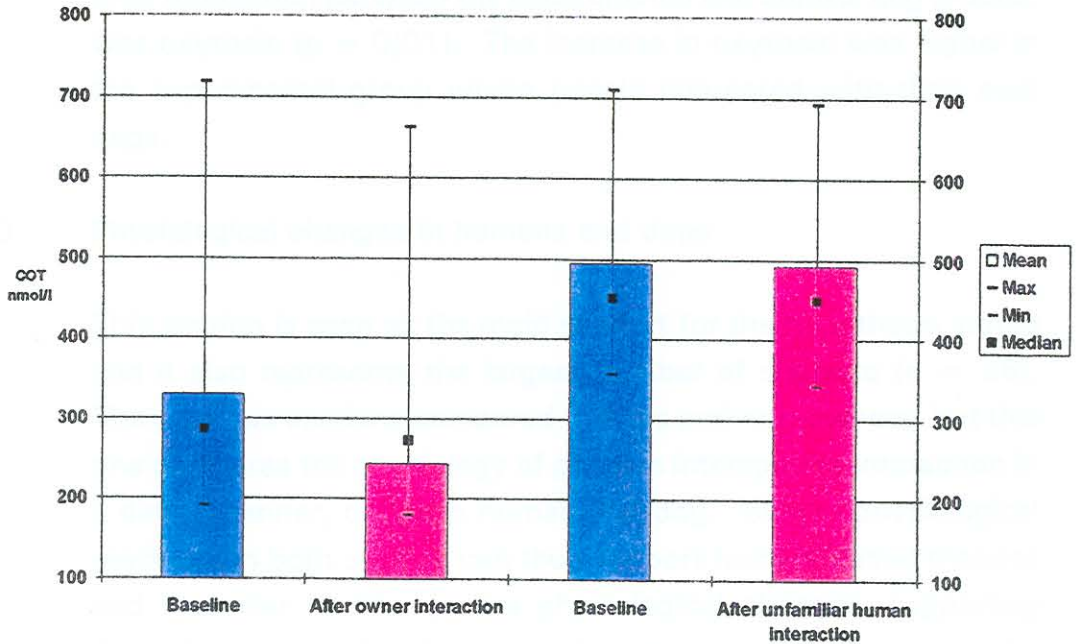


Figure 7.16: Plasma cortisol (COT) of dogs before and after intracting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)

Table 7.19: Concentrations of cortisol (nmol/l) in the plasma of dogs before and after interacting positively with owners (n = 9) and unfamiliar dog lovers (n = 9)

COR (owners)	COR			p-value	COR (unfamiliar people)	COR			p-value
	Before	After				Before	After		
Mean	330,0	243,0	-	Mean	493,5	490,7	-		
Standard deviation	156,0	160,9	-	Standard deviation	125,0	122,5	-		
Median	286,0	273,0	-	Median	452,0	449,0	-		
Significance	-	-	0,44	Significance	-	-	0,44		

Cortisol levels did not decrease significantly in dogs. Factors such as the circadian cycle and diet of the dogs could have affected the results as well as the unfamiliar experimental environment. The tendency, however, was for cortisol levels to decrease.

7.9 Statistical differences between experimental and control dog groups

The only statistical significant result in the difference before and after interaction between the experimental and control dog groups, was oxytocin ($p = 0,01$). The increase in oxytocin was higher in the experimental group where people interacted with their own dogs.

7.10 Physiological changes in humans and dogs

This section is seen as the main support for the hypothesis stated and it also represents the largest number of subjects ($n = 36$). The previous sections compared owners and non-owners, but this one compares the physiology of positive interspecies interaction in a direct manner, between human and dog. Similar physiological reactions in both species can thus support human-animal theories and if similar to intraspecies physiological changes, supporting those interaction theories, an inclusive interaction theory can be proposed.

7.10.1 Changes in MAP

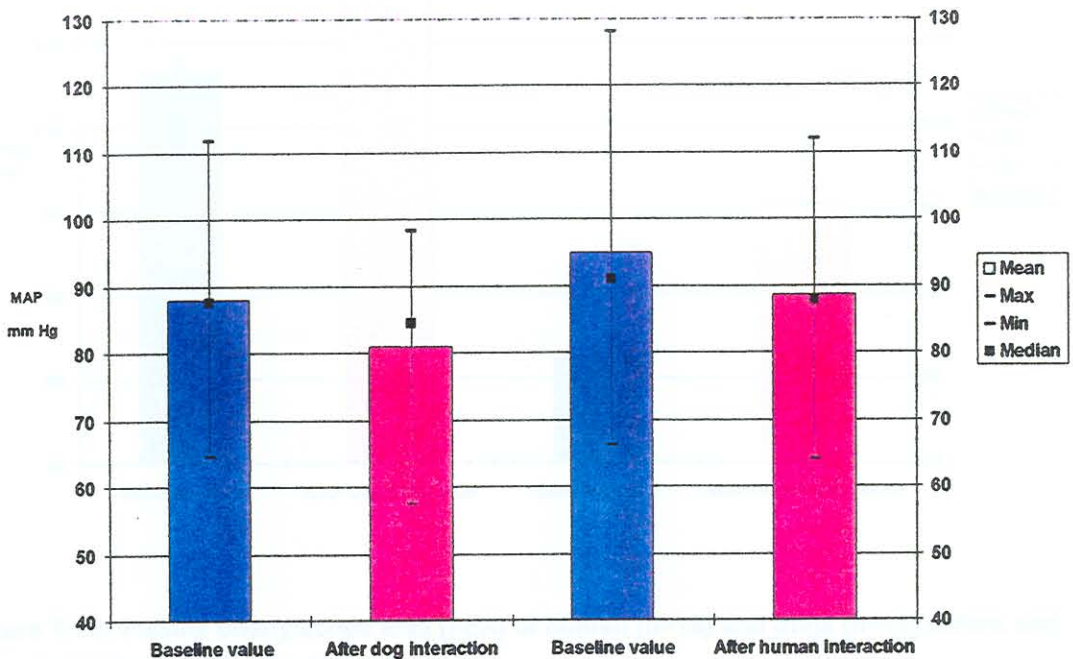


Figure 7.17: Mean arterial blood pressure (MAP) of humans ($n = 18$) and dogs ($n = 18$) before and after interacting positively with each other

Table 7.20: Mean arterial blood pressure (mmHg/l) of humans (n = 18) and dogs (n = 18) interacting positively with each other

MAP (humans)	Before	After	p-value	MAP (dogs)	Before	After	p-value
	Mean	87,9	80,9		-	Mean	94,8
Standard deviation	12,7	11,8	-	Standard deviation	18,4	15,2	-
Median	87,6	84,4	-	Median	91,0	87,7	-
Significance	-	-	0,00	Significance	-	-	0,00

The time taken for MAP to decrease sufficiently for blood collection as five to 24 minutes for humans and five to 23 minutes for dogs. The tendency in both species was to show a decrease in MAP during positive interaction.

7.10.2 Changes in plasma neuro transmitters

7.10.2.1 Phenylacetic acid as metabolite of phenylethylamine

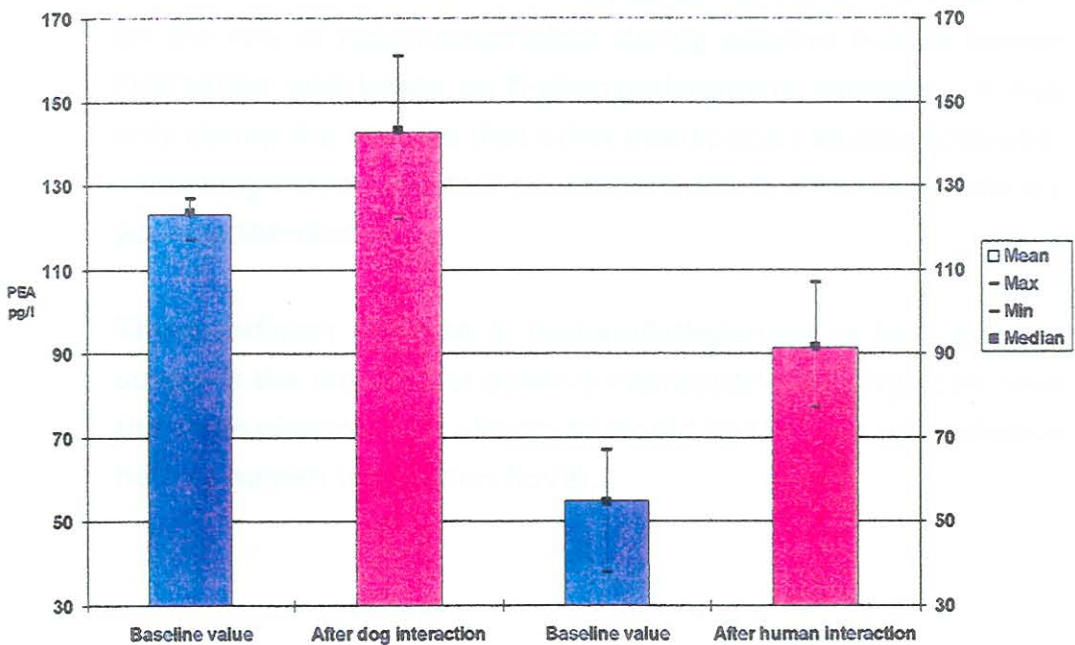


Figure 7.18: Plasma phenylacetic acid (PEA) of human (n=18) and dogs (n=18) before and after interacting positively with each other

Table 7.21: Concentrations of phenylacetic acid (pg/ℓ) in the plasma of humans (n = 18) and dogs (n = 18) interacting positively with each other

PAA (humans)				PAA (dogs)			
	Before	After	p-value		Before	After	p-value
Mean	122,9	142,4	-	Mean	54,6	91,2	-
Standard deviation	2,9	9,7	-	Standard deviation	7,9	7,5	-
Median	123,5	143,0	-	Median	54,5	91,5	-
Significance	-	-	0,00	Significance	-	-	0,00

The tendency in both species was to show a significant increase ($p < 0,05$) in β -phenylethylamine during positive interaction.

This was a very important measurement in the context of this study, because the basis of the theory that the physiological changes interspecies will be the same as intraspecies, was built on the work of Liebowitz.¹⁵³ His pioneering work in the eighties on the role of neurotransmitters during positive human-human interaction was based on β -phenylethylamine changes. It was only during the nineties that other interspecies studies followed, indicating the role of other neurochemicals and hormones during positive interaction.

The significant increase in β -phenylethylamine in both species supports the theory that positive interaction with dogs can have the same physiological effects as would be the case with positive human-human interaction (love).

both species showed a significant increase ($p < 0,05$) in dopamine during positive interaction.

7.10.2.2 Dopamine

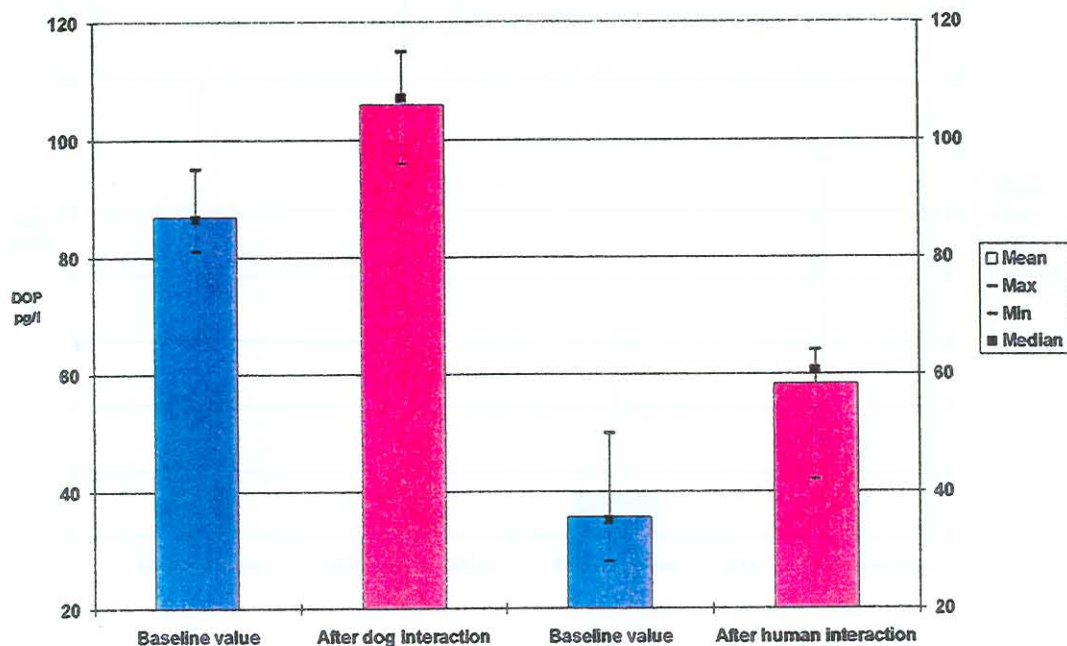


Figure 7.19: Plasma dopamine (DOP) of humans (n=18) and dogs (n=18) before and after interacting positively with each other

Table 7.22: Concentrations of dopamine (pg/l) in the plasma of humans (n = 18) and dogs (n = 18) interacting positively with each other

DOP (humans)				DOP (dogs)			
	Before	After	p-value		Before	After	p-value
Mean	86,7	105,8	-	Mean	35,5	58,2	-
Standard deviation	4,6	5,4	-	Standard deviation	5,9	5,5	-
Median	86,5	107,0	-	Median	35,0	60,5	-
Significance	-	-	0,00	Significance	-	-	0,00

Both species showed a significant increase ($p < 0,05$) in dopamine during positive interaction.

7.10.2.3 β -endorphin

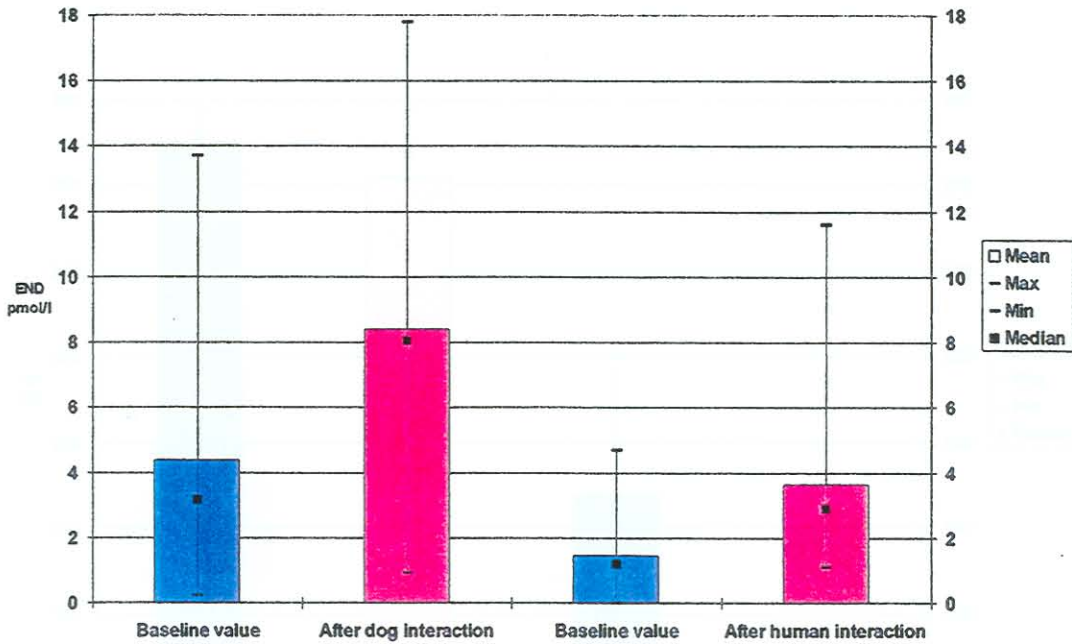


Figure 7.20: Plasma beta-endorphin (END) of humans (n=18) and dogs (n=18) before and after interacting positively with each other

Table 7.23: Concentrations of β -endorphin (pmol/l) in the plasma of humans (n = 18) and dogs (n = 18) interacting positively with each other

END	Before	After	p-value	END	Before	After	p-value
(humans)				(dogs)			
Mean	4,3	8,3	-	Mean	1,4	3,6	-
Standard deviation	3,9	4,9	-	Standard deviation	1,1	2,7	-
Median	3,1	8,0	-	Median	1,2	2,8	-
Significance	-	-	0,00	Significance	-	-	0,00

Both species showed a significant increase in β -endorphin during positive interaction.

7.10.2.4 Norepinephrine

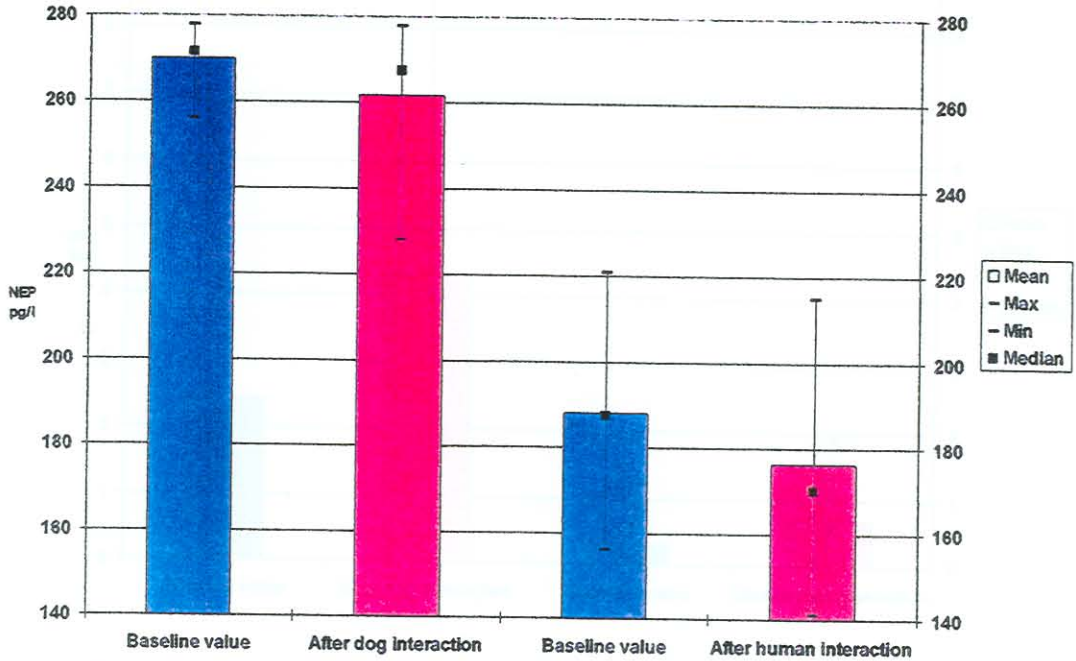


Figure 7.21: Plasma norepinephrine (NEP) of humans (n=18) and dogs (n=18) before and after interacting positively with each other

Table 7.24: Concentrations of norepinephrine (pg/l) in the plasma of humans (n = 18) and dogs (n = 18) interacting positively with each other

NEP (humans)	NEP			p-value	NEP (dogs)	NEP			p-value
	Before	After				Before	After		
Mean	269,7	261,5	-	Mean	187,8	176,2	-		
Standard deviation	5,8	14,4	-	Standard deviation	20,5	18,0	-		
Median	271,5	267,5	-	Median	187,5	170,0	-		
Significance	-	-	0,07	Significance	-	-	0,00		

The norepinephrine decreased in both species, but for humans the decrease was not statistically significant.

7.10.2.5 Oxytocin

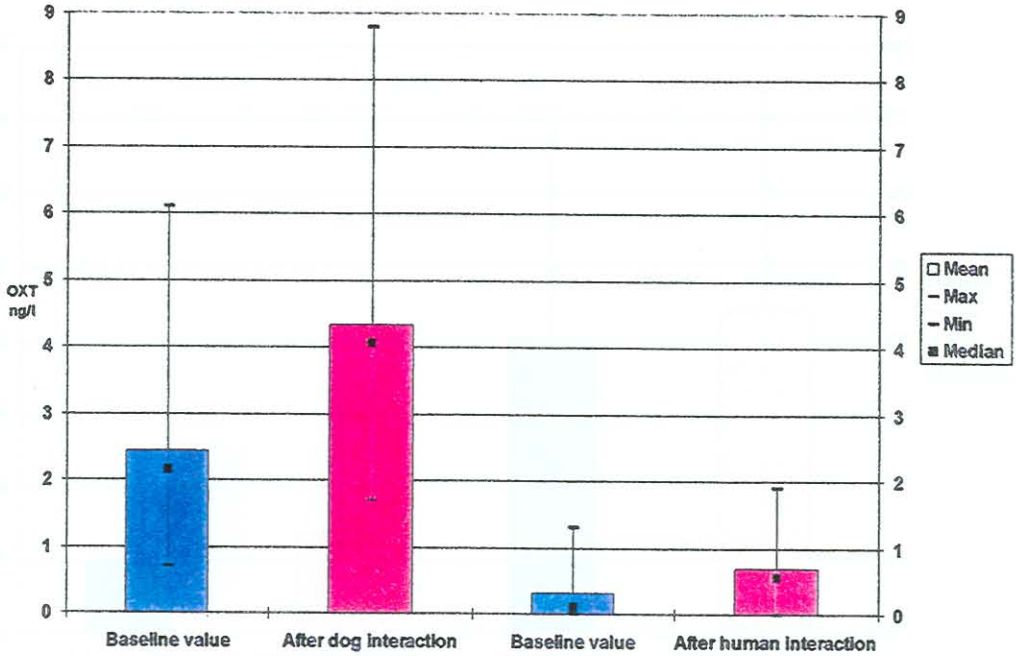


Figure 7.22: Plasma oxytocin (OXT) of humans (n=18) and dogs (n=18) before and after interacting positively with each other

Table 7.25: Concentrations of oxytocin (ng/l) in the plasma of humans (n = 18) and dogs (n = 18) interacting positively with each other

OXT (humans)	Before	After	p-value	OXT (dogs)	Before	After	p-value
Mean	2,4	4,3	-	Mean	0,3	0,6	-
Standard deviation	1,5	1,6	-	Standard deviation	0,4	0,6	-
Median	2,1	4,0	-	Median	0,1	0,5	-
Significance	-	-	0,00	Significance	-	-	0,00

Both species showed a significant increase in oxytocin during positive interaction.

7.10.2.6 Prolactin

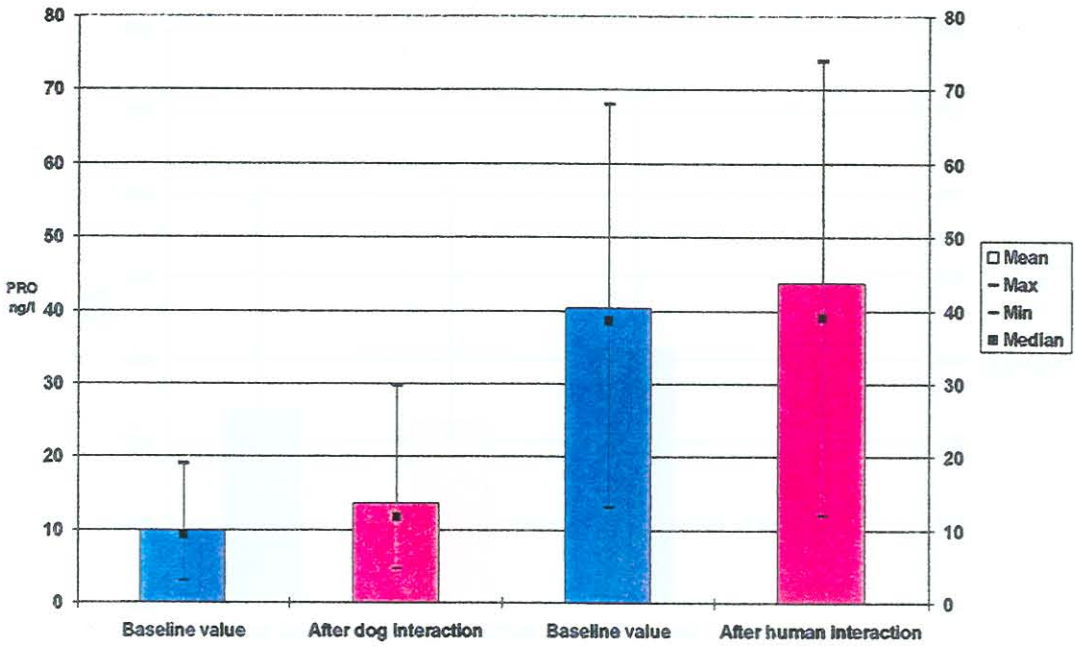


Figure 7.23: Plasma prolactin (PRO) of humans (n=18) and dogs (n=18) before and after interacting positively with each other

Table 7.26: Concentrations of prolactin (ng/l) in the plasma of humans (n = 18) and dogs (n = 18) interacting positively with each other

PRO	PRO (humans)			p-value	PRO (dogs)	PRO (dogs)			p-value
	Before	After				Before	After		
Mean	9,7	13,5	-	0,00	40,1	43,6	-	0,01	
Standard deviation	5,0	6,4	-		20,6	22,7	-		
Median	9,2	11,6	-		38,5	39,0	-		
Significance	-	-	-		-	-	-		

Both species showed a significant increase in prolactin during positive interaction.

7.10.2.7 Cortisol

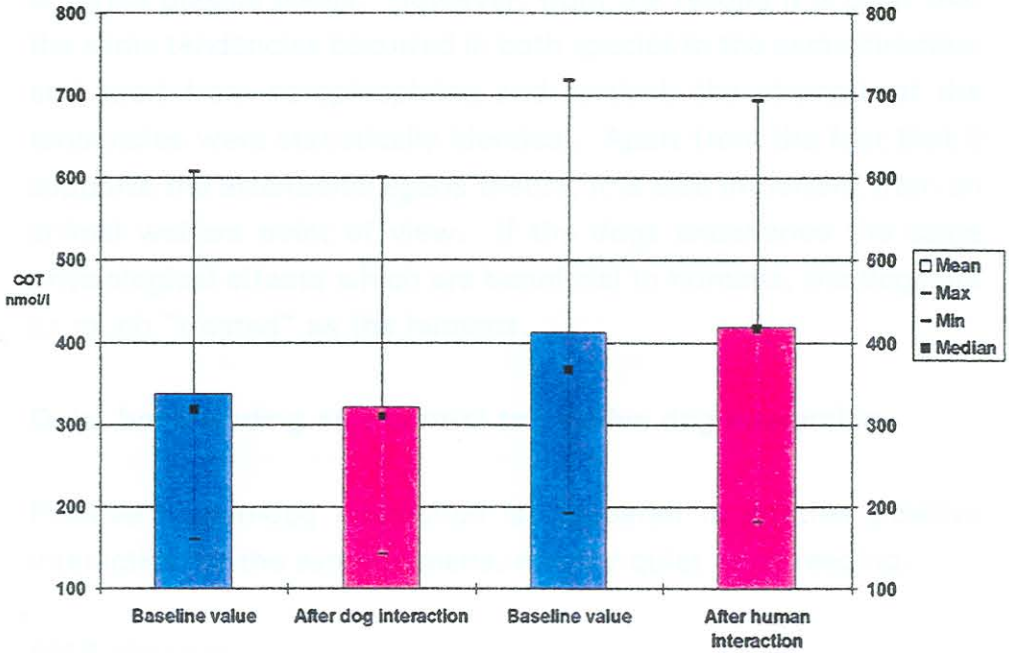


Figure 7.24: Plasma cortisol (COT) of humans (n=18) and dogs (n=18) before and after interacting positively with each other

Table 7.27: Concentrations of cortisol (nmol/l) in the plasma of humans (n = 18) and dogs (n = 18) interacting positively with each other

COR (humans)	Before	After	p-value	COR (dogs)	Before	After	p-value
Mean	337,3	320,4	-	Mean	411,8	416,8	-
Standard deviation	151,0	143,5	-	Standard deviation	161,4	158,2	-
Median	317,0	309,0	-	Median	366,5	416,0	-
Significance	-	-	0,00	Significance	-	-	0,30

Cortisol decreased in both species, but in dogs the decrease was not statistically significant.

7.11 Statistical differences between humans and dogs

It was not possible to compare the two species' results statistically, because of possible species differences in the chemistry and different plasma levels. However, from the results it is clear that the same tendencies occurred in both species in the same direction and apart from norepinephrine and cortisol, the strength of the tendencies were statistically identical. Apart from the fact that it supports the *attentionis egens* theory, it is also important from an animal welfare point of view. If the dogs experience the same physiological effects which are beneficial to humans, the dogs are as much "treated" as the humans.

7.12 Quiet book-reading as a control to positive dog interaction

Positive human-dog interaction is compared to another positive interaction by the same humans, namely quiet book-reading.

7.12.1 MAP changes

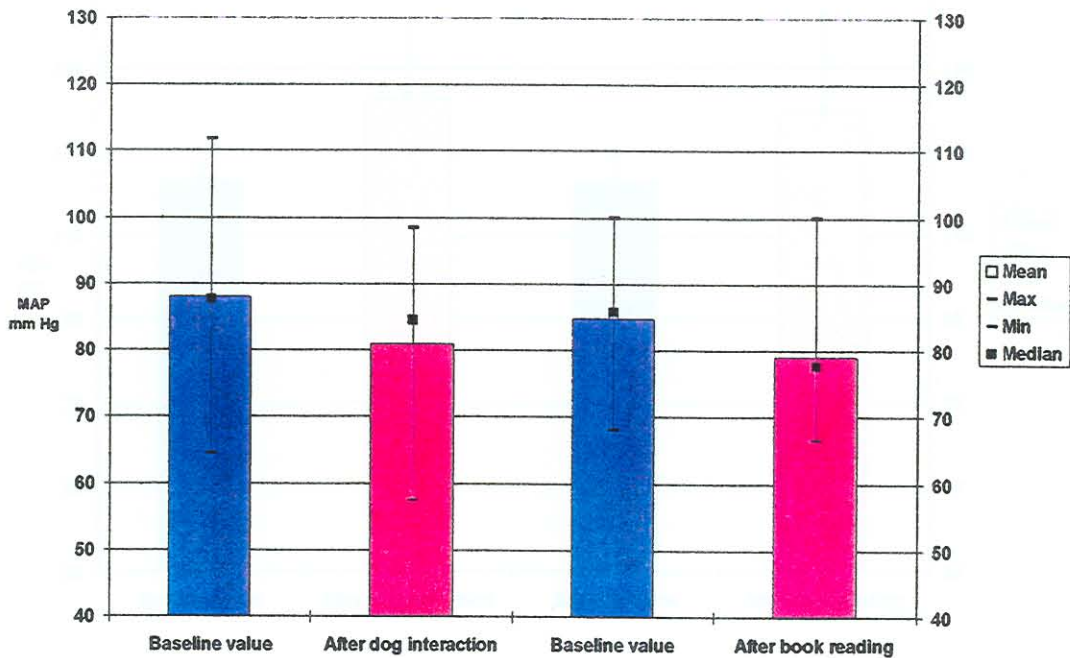


Figure 7.25: Mean arterial blood pressure (MAP) of humans before and after interacting positively with dogs and quiet book-reading (n = 18)

Table 7.28: Mean arterial blood pressure (mmHg/l) of humans reading a book quietly (n = 18)

MAP	Before	After	p-value
Mean	84,6	79,0	-
Standard deviation	8,7	8,8	-
Median	85,7	77,6	-
Significance	-	-	0,00

Time taken for MAP to decrease sufficiently before blood collection was five to 24 minutes for dog interaction and four to 10 minutes for quiet book-reading.

During quiet book-reading the MAP decreased significantly in the same way as during positive dog interaction.

7.12.2 Changes in plasma neurotransmitters

7.12.2.1 Phenylacetic acid as metabolite of phenylethylamine

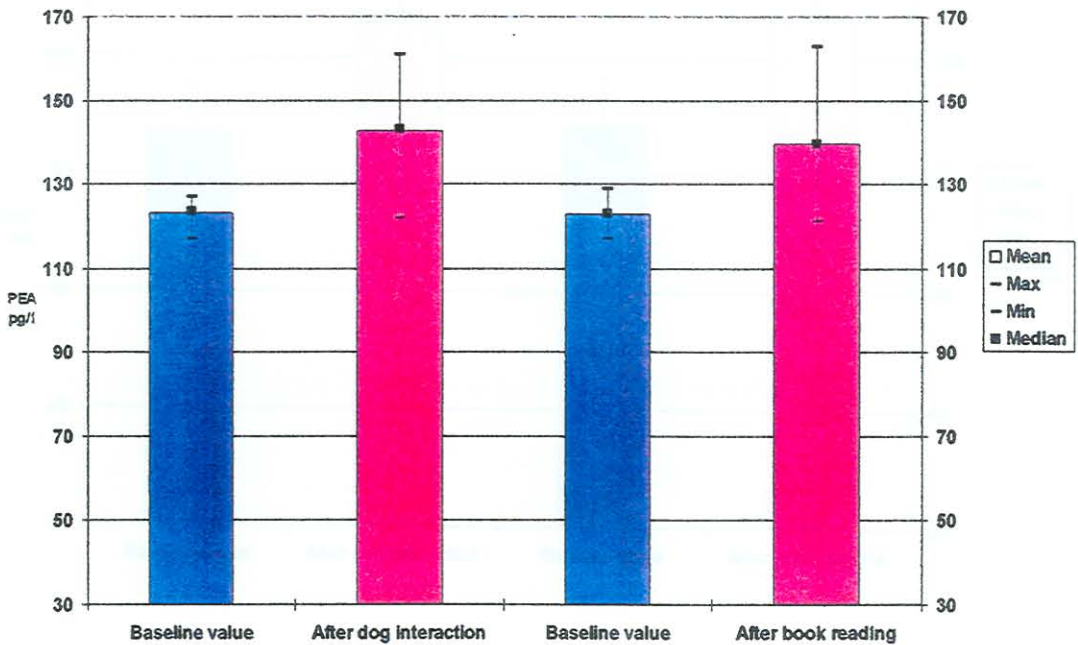


Figure 7.26: Plasma phenylacetic (PEA) of humans before and after interacting positively with dogs and quiet book-reading (n=18)

Table 7.29: Concentrations of phenylacetic acid (pg/l) in the plasma of humans reading a book quietly (n = 18)

PAA	Before	After	p-value
Mean	122,7	139,6	-
Standard deviation	3,2	15,1	-
Median	123,0	139,5	-
Significance	-	-	0,00

During quiet book-reading, the changes observed in the plasma neuropeptides and hormones, were all similar to those seen with positive human-dog interaction. It may be possible to describe book-reading as a positive self-interaction with a similar effect to that of positive interaction with others.

7.12.2.2 Dopamine

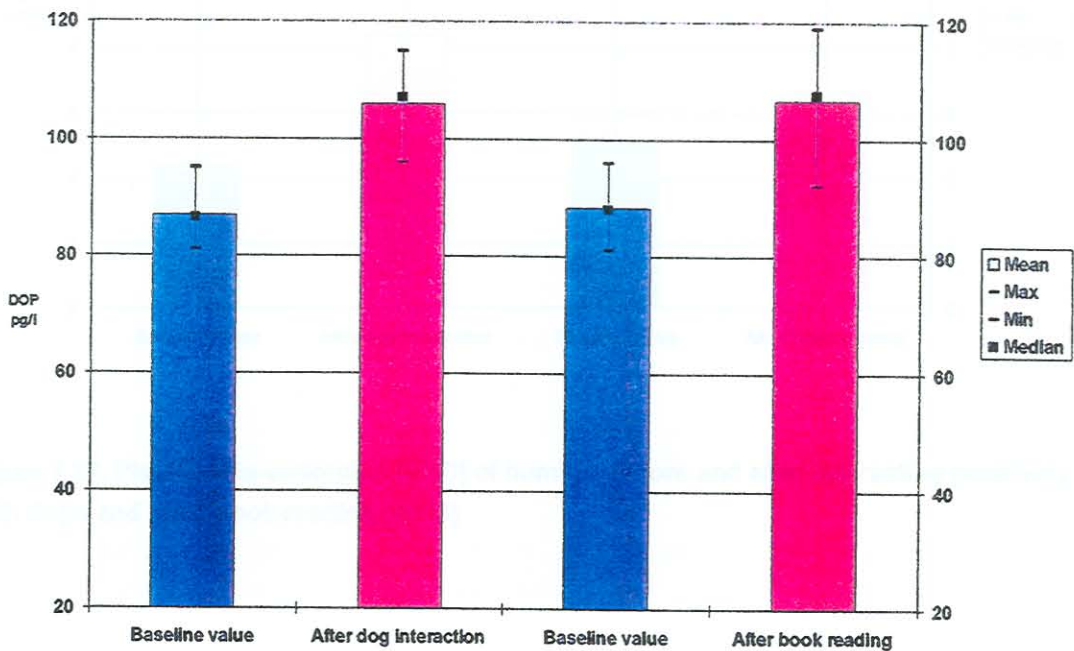


Figure 7.27: Plasma dopamine (DOP) of humans before and after interacting positively with dogs and quiet book-reading (n=18)

Table 7.30: Concentrations of dopamine (pg/l) in the plasma for humans reading a book quietly (n = 18)

DOP	Before	After	p-value
Mean	88,1	106,5	-
Standard deviation	5,0	7,1	-
Median	88,0	107,5	-
Significance	-	-	0,00

7.12.2.3 β -endorphin

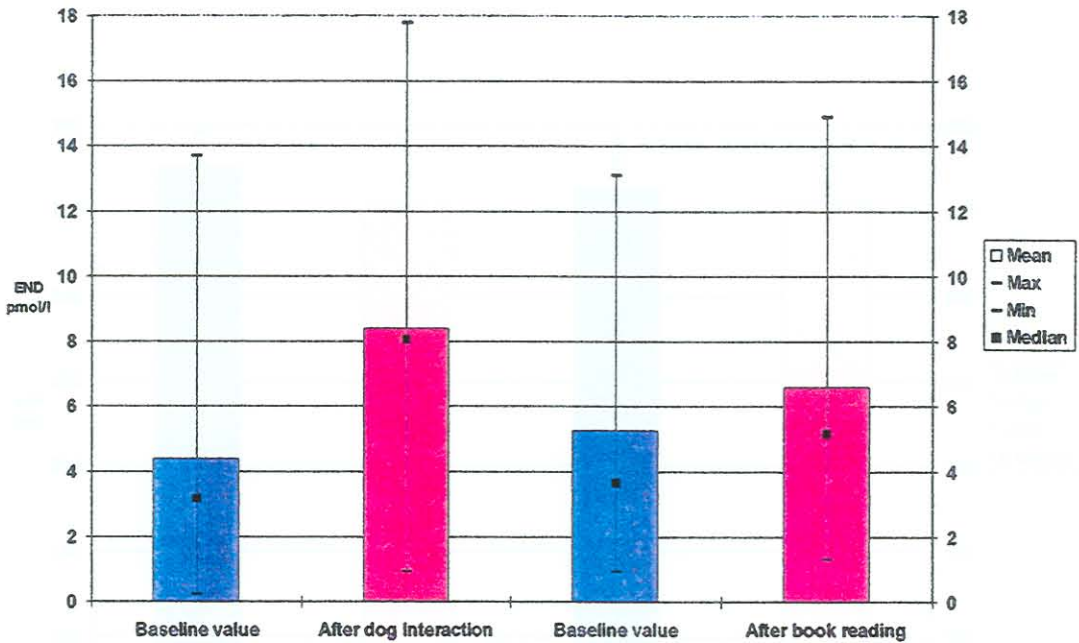


Figure 7.28: Plasma beta-endorphin (END) of humans before and after interacting positively with dogs and quiet book-reading (n=18)

Table 7.31: Concentrations of β -endorphin (pmol/l) in the plasma for humans reading a book quietly (n = 18)

END	Before	After	p-value
Mean	5,2	6,5	-
Standard deviation	4,1	4,1	-
Median	3,5	5,1	-
Significance	-	-	0,00

7.12.2.4 Norepinephrine

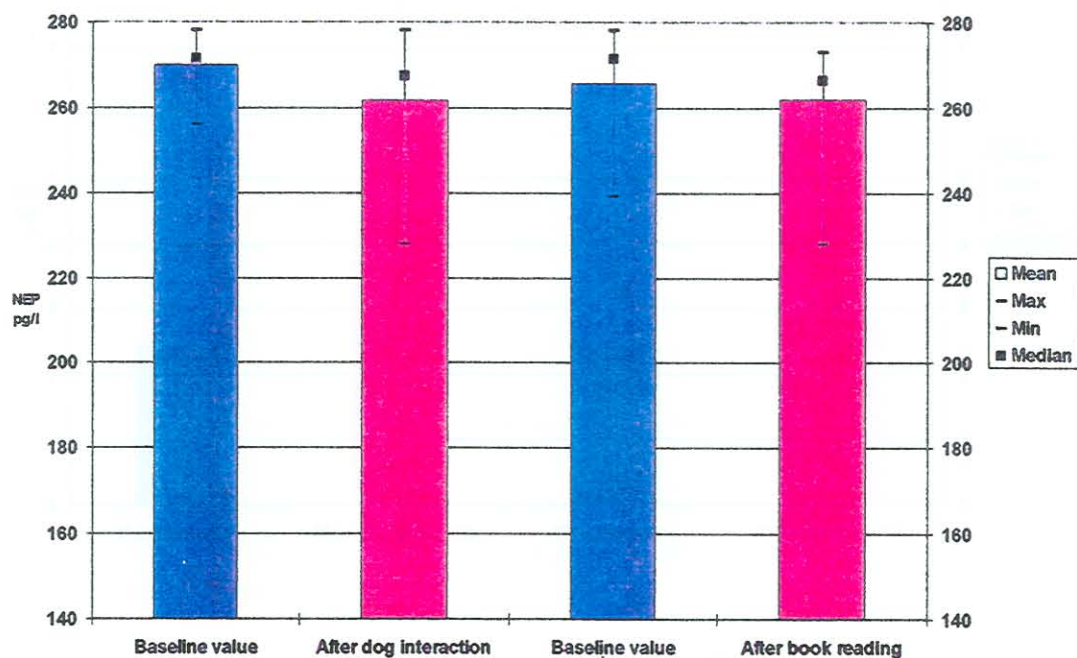


Figure 7.29: Plasma norepinephrine (NEP) of humans before and after interacting positively with dogs and quiet book-reading (n=18)

Table 7.32: Concentrations of norepinephrine (pg/l) in the plasma for humans reading a book quietly (n = 18)

NEP	Before	After	p-value
Mean	265,6	261,7	-
Standard deviation	12,7	11,4	-
Median	271,5	266,5	-
Significance	-	-	0,05

7.12.2.5 Oxytocin

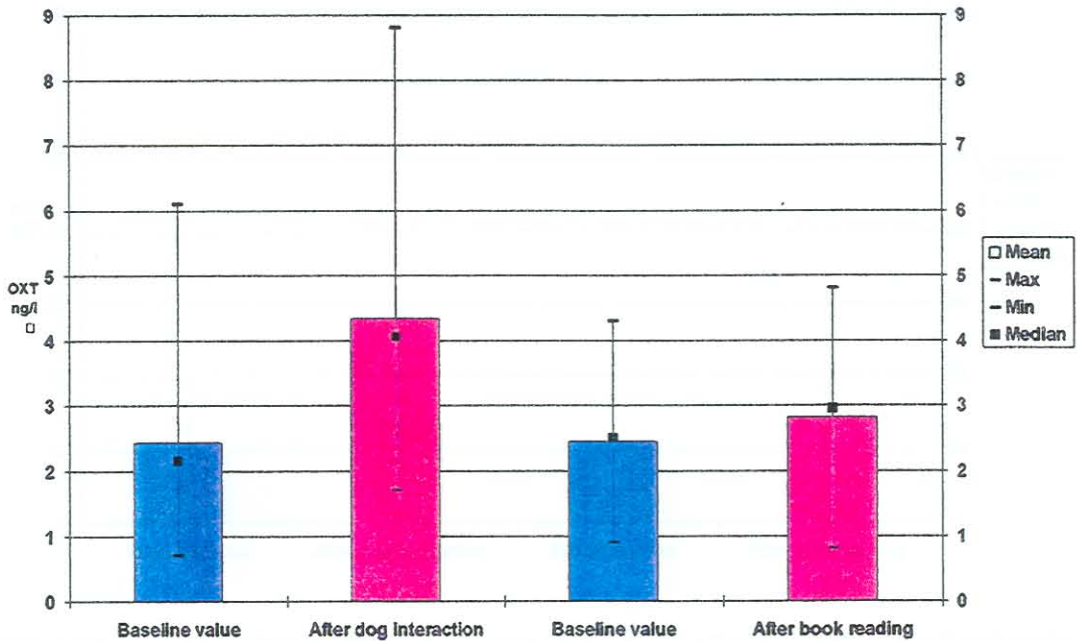


Figure 7.30: Plasma oxytocin (OXT) of humans before and after interacting positively with dogs and quiet book-reading (n=18)

Table 7.33: Concentrations of oxytocin (ng/l) in the plasma for of humans reading a book quietly (n = 18)

OXT	Before	After	p-value
Mean	2,4	2,8	-
Standard deviation	1,1	1,1	-
Median	2,5	2,9	-
Significance	-	-	0,01

7.12.2.6 Prolactin

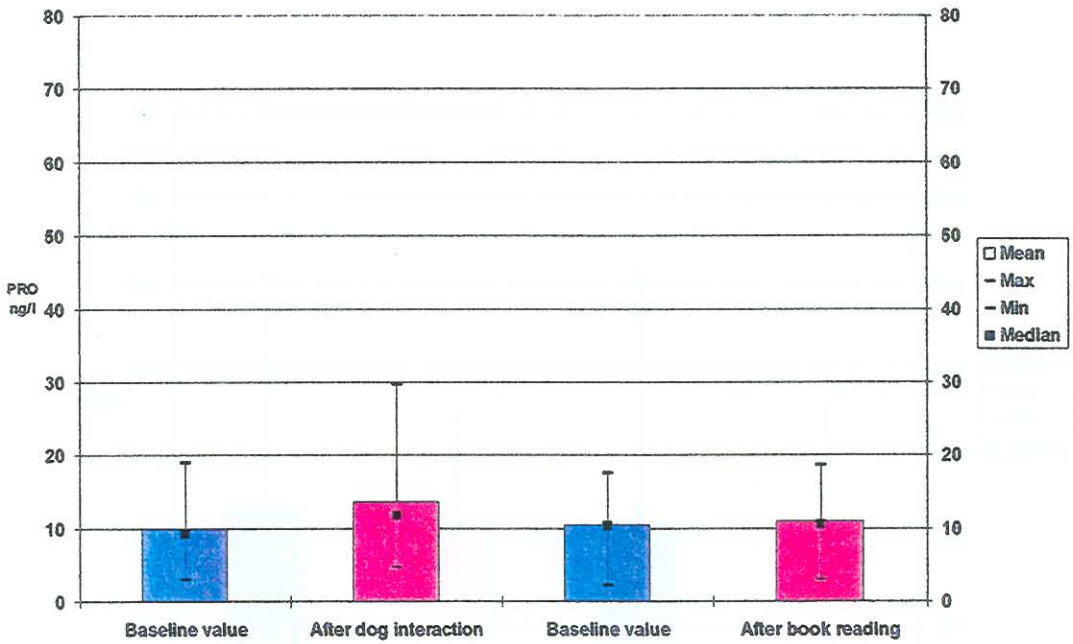


Figure 7.31: Plasma prolactin (PRO) of humans before and after interacting positively with dogs and quiet book-reading (n=18)

Table 7.34: Concentrations of prolactin (ng/l) in the plasma for humans reading a book quietly (n = 18)

PRO	Before	After	p-value
Mean	10,4	10,9	-
Standard deviation	4,6	4,5	-
Median	10,2	10,4	-
Significance	-	-	0,00

7.12.2.7 Cortisol

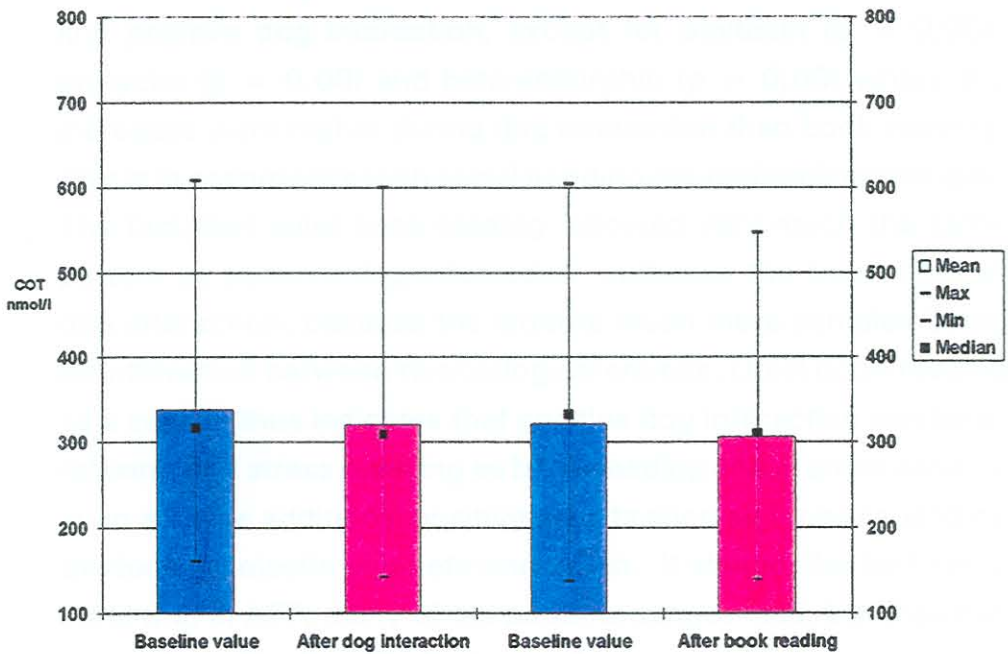


Figure 7.32: Plasma cortisol (COT) of humans before and after interacting positively with dogs and quiet book-reading (n=18)

Table 7.35: Concentrations of cortisol (nmol/l) in the plasma for humans reading a book quietly (n = 18)

COR	Before	After	p-value
Mean	321,5	305,9	-
Standard deviation	144,6	135,0	-
Median	332,5	309,5	-
Significance	-	-	0,00

7.13 Statistical differences between quiet book-reading and positive dog interaction

There were no significant differences between quiet book-reading and positive dog interaction, except for oxytocin ($p = 0,00$), prolactin ($p = 0,00$) and beta-endorphin ($p = 0,00$) where the increases were higher during dog interaction than book-reading. This is in accordance with social bonding neurochemical changes. The fact that quiet book-reading followed very much the same pattern as positive dog interaction, indicates the true effect of dog interaction, because the latter is much more complex being an interaction between two biological entities. Quiet book-reading as a control thus indicates that positive dog interaction can be as relaxing and stress relieving as book-reading and in some aspects even achieve additional positive effects such as those caused by oxytocin, prolactin and beta-endorphin. It should also be kept in mind that in AFP, many of the patients cannot read, but they can interact positively with dogs.

7.14 Discussion

The results of this experiment strongly supports the theoretical basis for animal-facilitated psychotherapy. Once the physiology is known, i.e. the role that neurochemicals and hormones might play during positive interaction, it is possible to use this information as a rationale for using animals in psychotherapy. The research thus supports the hypothesis stated in 1.3.

7.14.1 Results in perspective

From the results the following aspects should be considered:

- a significant decrease in blood pressure and thus all the other physiological effects can be achieved between five and 24 minutes of positive dog interaction. This information is important in therapy. After allowing a short period to get familiar with the contact situation, \pm 10 minutes, the actual contact need not be long. In practical terms it means that in a AFP contact session should be rather repeated more often than for a very long period of time. For example, rather three 15-20 minute sessions per day than one 60 minute session;
- this is the first time that *attentionis egens* (affiliation behaviour, positive interaction) is described on the neurochemical level and on an interspecies basis. The importance of the measurements in both species is that, during AFP, the dog experiences the same physiological effects as the patient. These physiological changes may be linked to a feeling of well-being and the facilitator is thus being "treated" as much as the patient. This is exactly what the *attentionis egens* theory proposes;
- the theory that a decrease in blood pressure could be an indicator of concurrent biochemical changes is supported by the results. If biochemistry is not available, a much simpler measurement such as blood pressure could be a valid indicator whether the interaction has the necessary physiological effects;
- the controls proved to be valuable. The questionnaire which reflects the state of anxiety of participants, indicated that a "healthy feeling" could be linked to a "healthy physiological" status. The latter was indicated by the participants' health reports and normal blood pressure. Baseline values for every participant was also valuable. This control ensured that

physiological changes could be individualized and that the range for healthy adult participants could be established. The control between humans with their own dogs (experiment group) and those with unfamiliar dogs (control group) was valuable in the sense that long term bonding appears to have some additional advantages because of the effects of oxytocin, prolactin and β -endorphin. Lastly, to use another intervention (book-reading) which could also contribute to relaxation proved that positive dog interaction, although much more complicated, could have the same physiological advantages. Dog interaction can also have more advantages with regard to the effects of bonding, which is only possible with other live interaction;

- the observations are new in veterinary physiology, because the baseline values for the neurochemicals as well as the response thereof on positive interaction have not been analysed before. The analyses of the dog neuropeptides and hormones posed a challenge to the Laboratory, despite the fact that the human analyses had been done as part of their routine work. Species differences, even on the molecular level, were found to occur. Specific adaptations had to be made to cater for these subtle differences, especially with regard to preparing a standard against which the dog sera could be measured. Comments were made earlier with regard to the β -endorphin and prolactin measurements;
- physiological parameters used during the experiment are not seen as causes of any process. They are regarded as effects of a complex biological interaction and in a sense the physiological changes are results of the phenomenon of human-dog interaction.

7.14.2 Placebo effect

It is possible that AFP was not generally accepted by physicians as a valid medical approach, because it was seen as a placebo effect.

In their significant contribution on this subject Shapiro and Shapiro²²⁶ discussed the placebo effect in depth in their book "The Powerful Placebo". They defined a placebo as follows:

"any treatment that is used for its ameliorative effect on a system or disease but that actually is ineffective or is not specifically effective for the condition being treated".²²⁶

Until recently (the fifties) the history of medical treatment was essentially the history of the placebo effect. Developments that have decreased the placebo effect include the use of scientific method, controls and the double blind method. However, not all problems were eliminated, using these approaches.²²⁶

This experiment complied with the methodological safeguards suggested by Shapiro and Shapiro.²²⁶ The main criticism of the use of animals in psychotherapy is that it could be non-specific. Shapiro and Shapiro²²⁶ suggested that measurement of plasma variables is the best method to ensure accurate and specific changes. Furthermore, they agreed that there is consensus that psychotherapy is beneficial for many patients, but additional studies are needed before it can be said with certainty that such therapy is more than a placebo. This study provided such additional physiological information. The authors concluded their book by indicating that the underlying mechanisms of the body (physiology) that control and maintain health still elude us:

"If the nonspecificity of the placebo effect can be rendered specific and its strength can be unleashed, the terms *placebo* and *placebo effect* can appropriately disappear into medical history".²²⁶

The results of this study attempted to do just that with regard to AFP.

7.14.3 Neurochemical profile of human-dog interaction

Based on the results of this study, a decreased blood pressure could be sufficient as indicator of neurochemical changes. However, if a profile of neurochemicals is necessary to measure effect or to determine rationale, the following proposal is made:

Humans:	phenylethylamine	Dogs:	phenylethylamine
	dopamine		dopamine
	oxytocin		oxytocin
	β -endorphin		
	prolactin		

Norepinephrine concentrations in plasma might be affected by the process of venipuncture and cortisol concentrations showed too much variation. Until problems with the measurement of β -endorphin and prolactin in dogs can be solved, it is suggested that these parameters not be included in the profile.

It was reported that the role of oxytocin on behaviour could be extensive. Repeated oxytocin injections in rats caused lowered blood pressure and decreased cortisol plasma levels, forming an anti-stress pattern.²²⁷ These links were also found in this study. Oxytocin has been shown to influence a variety of behaviour, it promotes sexual, maternal and social behaviour, probably playing an important role in *attentionis egens* needs, because the same effects were recorded after the rats were stroked for five minutes on their abdomens.²²⁷ It was also found that oxytocin stimulates prolactin release, another link which was also recorded in this study.^{163,164,167,227} Keeping this in mind, prolactin may be removed from the neurochemical list for humans, because it follows an increase of oxytocin plasma levels.

From a psychotherapy point of view, it was stated that β -phenylethylamine has recently been implicated in the aetiology of affective disorders²²⁸ (*attentionis egens* disorders) and this neurotransmitter together with oxytocin, could thus be the minimum neurochemical profile to measure positive interaction.

7.14.4 Measurement of emotions

Joseph Le Doux²²⁹ is a leading authority in the field of neural science and his book "The Emotional Brain" published in 1998, has relevancy. Critical questions often asked about the results of the physiology involving emotions are, how reliable and valid are they. With regard to internal validity, this must be high because of all the controls built into the experimental design. The question rather has bearing on the external validity (generalisation) which may go hand in hand with reliability (repeatability).

Le Doux²²⁹ described emotions as biological functions (physiology) of the nervous system. The measurement of neurochemicals can be helpful in understanding emotions and this approach contrasts with the more typical approach to understand emotions as psychological states, independent of the underlying brain mechanisms. Although psychological research has been extremely valuable, brain function is far more powerful in understanding emotions. There are specific classes of emotions and some of them are universal among vertebrate, despite the fact that there are also species differences. Emotional responses are for the most part, generated unconsciously and feelings often follow on physiological changes. He then made this very important statement which reflects on the results of this study:

"If, indeed, emotional feelings and emotional responses are effects caused by the activity of a common underlying system, we can then use the objectively measurable emotional responses to investigate the underlying mechanism, and, at the same time, illuminate the system that is primarily responsible for the generation of the conscious feeling. And since the brain system that generates emotional responses is similar in animals and people, studies of how the brain controls these responses in animals are a pivotal step towards understanding the mechanisms that generate emotional feelings in people".²²⁹

People have little direct control over their emotions and they often set up situations as external events (such as positive dog interaction) so that the stimuli that automatically trigger emotions will be present. While conscious control over emotions is weak, emotions can flood consciousness, because the brain connections from the emotional systems to the cognitive systems are stronger than the connections from the cognitive systems to the emotional systems. Once emotions occur, they become powerful motivators of future behaviour. Mental health is maintained by emotional hygiene. Mental problems to a large extent reflect a breakdown of emotional order and emotions can have both useful and pathological consequences.²²⁹

From this it is clear that what was measured in this experiment, is part of "universal physiology" in the sense that results should be (within normal ranges) repeatable and have external validity, despite the relative small number of participating subjects. Variations in normal physiological responses are attributed to genetic potential. The transmitters that neurons produce or can respond to, are genetically specified. In fact, most characteristics of individual neurons such as their size, shape and amalgamation with other neurons to form specific brain parts, are largely determined by genes. Certain patterns of neural circuitry are also specified by genes.²²⁹

The next chapter will discuss other human-animal interaction theories.

CHAPTER 8

HUMAN-ANIMAL INTERACTION THEORIES - A CRITICAL ANALYSIS

8.1 Introduction

Interaction theories were explained in terms of *attentionis enges*. As often happens in behavioural sciences, however, the same word may have different meanings and different words may have the same meaning. In evaluating existing human-animal interaction theories, it is thus necessary to first discuss the meaning of terminology.

8.2 Terminology

As for all identifiable, normal or expected behaviour patterns, attention needs can be experienced on a continuum. Such a continuum can lead to the use of different terms to describe the same underlying need. Particularly, terms such as nurturing, dependence, affiliation, love, attachment, bond, social facilitation, companionship, relationship, friendship, social symbiosis (mutualism), touch or other bodily contact and shared exercise or recreation could fulfil *attentionis engens*. These terms will be discussed briefly in order to place them in attention need context.

- Nurturing and dependence

The term nurturing is usually used for parental behaviour of humans as well as animals.²³⁰ In ethograms for animals the basic needs for care-giving and care-seeking are described as epimeletic and etepimeletic behavioural systems. Many interpretations may be given to such behaviour, but it could be an indication that development cannot take place without special attention from the nurturing party. Such behaviour could also be redirected or displaced on an interspecies basis.²³¹ Katcher and Beck¹¹⁷ indicated that this could be one of the motivations for successful human-animal interaction and

this was later supported by other studies.⁹⁵ Nurturing is thus more than feeding and security.

- Affiliation

The Integrative Neurobiology of Affiliation was recently highlighted in the Annals of the New York Academy of Sciences, Volume 807.¹⁷³ The publication represents the proceedings of a conference sponsored mainly by The National Institute of Mental Health in the USA:

"The central purpose and theme of this meeting was to examine the biological and especially the neural substrates of affiliation and related social behaviors".¹⁷³

These studies were based on an intraspecies level, but were also meant "to improve our understanding of human interaction". This places the physiology of human-human, and for that matter human-animal interaction, on the cutting edge of mental health studies. One of the editors is also a psychiatrist. It was stated that affiliation as an independent topic had not been studied seriously before, as recently as 1990. Affiliation is defined as social behaviour that brings individuals closer together and includes positive forms of association such as attachment, parent-offspring interaction, pair-bonding and coalitions. Affiliation provides a social matrix within which other behaviour may occur. Despite the fact that social behaviour is dealt with in psychology, sociology, anthropology, psychiatry and evolutionary biology, little attention has been directed at the regulatory physiology and neural processes that subserve affiliation. The editors concluded:

"The work represented in this volume also has important implications for the study of serious neuropsychotic disorders. For example, episodes of certain of these disorders can be induced by social stressors; in

other disorders a marked decrease in affiliative behaviors is a prominent feature of the patients' difficulties. Furthermore, abnormalities in animal systems implicated in the neurobiology of affiliation have also been documented for major depression in humans. At the conference, the evolutionary and mechanistic perspectives converged on the theme that studies of affiliative behaviors cannot be fully interpreted in isolation from other social behaviors; neither can they effectively be isolated from the biological and social contents that shape their expression".¹⁷³

- Love and affection

Love, as explained earlier,¹⁵² was seen by the Greek philosophers as an experience varying in intensity, viz platonic love (friendship), agape (concern for others), philia (compassion) and eros (romantic love). All these variations indicate levels of intensity on the one hand, but on the other hand they also indicate expressions of a special fulfilment of *attentionis egens*.

- Attachment and bonding

Since Bowlby's²³² work on attachment between infant and mother, it has also been proven that infants can develop bonds with individuals or objects other than the mother and that relationships other than the mother-infant dyad can also be characterised as attachments. Attachment is based on a longer term successful positive interaction.^{233,234,235}

- Social facilitation

The social facilitation role of animals, as originally described by Messent and Serpell²³⁶, is behaviour where animals can play a role in enhancing human to human contact and communication. In such cases, animals act as a trigger mechanism to fulfil the social needs of humans.

- Companionship, relationship, friendship and social symbiosis
Companionship, relationship and friendship may all be explained by means of the different ways the ancient Greeks explained love. The basis for such positive interaction is that the need for attention is fulfilled in a non-threatening and even pleasurable and satisfying way. Mutual trust between the parties concerned is usually implied for success in this interaction, which is always a two-directional experience.
- Touch and other bodily contact
Touch and other bodily contact such as stroking, is behaviour which is more explicit than a positive feeling. Close contact adds to the other senses of sight, smell and hearing with regard to positive interaction.
- Exercise and recreation
Play and other mutual physical activities, such as walking together, are forms of recreational interaction which can fulfil attention needs by means of physical excitement.²³⁷ Social behaviour which is triggered by attention needs can be represented by various types of interaction, including physical activities, communication and emotional feelings.

8.2.1 *Attentionis egens*

It is clear that it is not necessary to fall into the semantics trap when positive interaction is defined in terms of *attentionis egens*. All descriptions with their different connotations, interpretations and perceptions may be useful and acceptable in describing aspects of this basic, normal need. The term *attentionis egens* is therefore inclusive rather than exclusive. It also allows for the description of the need on the different levels or in different contexts, such as physiological, biological, social, emotional and psychological. Furthermore, the physiological basis for the exhibition of the behaviour is present in man and animal. The well-known ethologist, Michael Fox,²³⁷ concluded his studies of such similarities as follows:

"Between animal and man are many similarities. The animal in man shares similarities in basic brain structure, emotions, needs and in communication, development, and socialization in infancy with other members of the animal kingdom. Greetings and other social rituals, social distance and personal space, and biorhythms and internal time are seen in both human and non-human animals alike".²³⁷

In an attempt to explain the phenomenon of human-animal interaction, a number of papers have been published on identifying motives for people keeping animals, the establishment of correlations between certain general personality traits and ownership, attitudes and perception towards and of animals by people, and the different roles animals play in human life.^{238,239,240,241} These contributions, however, did not provide a theoretical framework for therapy. For psychotherapy specifically, one cannot focus on all the roles pets may play, but only on those which have a defined psychological effect. Bruce Fogle²⁴² expressed this area of interaction in the following way:

"It's a false impression however, that pet-keeping is an unnecessary luxury, a frivolous invention of the idle rich. Most so-called primitive cultures keep animals for companionship without any other obvious practical motives in mind".²⁴²

Human-animal interaction must thus have psychological effects which are more than meets the eye. Such "invisible" or "unmeasurable" effects could be described as fulfilling the need for attention on an interspecies basis.

8.3 Existing theories on human-animal interaction

Despite any previous attempts at establishing theories, it was believed during the late eighties that there is still a lack of a

coherent theory to explain human-animal interaction.²⁴³ Proposals for such a theory will now be discussed in chronological order.

8.3.1 **Brickel: 1982**

Brickel²⁴⁴ published an article, "Pet-facilitated psychotherapy: a theoretical explanation via attention shifts". The argument was that the manner in which pets reduce emotional discomfort is theoretically explained by the competing-response theory of extinction via attention shifts. Using this model, pets are viewed as emotionally distracting stimuli that allow for exposure to, instead of avoidance of anxiety-generating stimuli. Therapist-directed alternative response patterns are developed in this way.

Pets are viewed as a form of stimulus for human behaviour and pet behaviour as a form of reward for human behaviour towards pets. When two humans interact positively, each serves as a stimulus for the other and this is also true of human-animal interaction. This approach is representative of the learning theory of a stimulus-reward relationship.

8.3.2 **Kidd and Kidd: 1987**

The editor of *Anthrozoös* opened a debate on a theory of human-animal interaction studies by asking leaders in the field to respond to an article by Kidd and Kidd,²⁴³ titled "Seeking a theory of the human-companion animal bond". They stated that studies already undertaken in this field have been based on animal-animal, human-human and human-object relationships as analogous theories most likely to provide the comprehensive inductive, deductive and functional theoretical bases needed. They suggested that the weaknesses of each model should be rigorously analysed for similarities and differences and that those data that do not seem to fit any of the model analogues, must be pinpointed for more exacting research. They defined a theory as a set of related statements that seem to explain satisfactorily a variety of apparently related events, data or results. It should

therefore provide a suitable organisational method, an acceptable explanation and a reliable prediction for future studies. Their conclusion was:

"The best that can be said is that sometimes, under some circumstances, and in some ways, human-animal relationships are analogous to animal-animal, or human-human, or to human-object relationships".²⁴³

For these authors the theoretical formulations, as discussed, were inadequate and incomplete.

In response to the article, Herzog and Burghardt²⁴⁵ felt that the paper did not provide significant new insight into the question of why humans form intense relations with members of other species. They were also of the opinion that the proposal of a theory of this nature is premature, because the field of study is still new and relations between animals are diverse and complex. Even in the field of human psychology, there is still a need for a unifying theoretical perspective.

Lawrence²⁴⁶ said that conclusions are a long time away, but her interest lies with those people who do not keep animal companions.

Messent²⁴⁷ believed that:

"It is my contention that if a positive selective reason could be found for affiliative interspecies relations (such as attention needs: author), it would go some way forward in providing a testable theory".²⁴⁷

Rollin²⁴⁸ was not convinced that models are needed to explain phenomena in human-animal interaction. He stated that anecdotes about interaction with animals, which all people share and

which are immortalised in literature, tell more about human-animal interaction than "scientific" surveys do.

Serpell²⁴⁹ suggested that perhaps the most fascinating aspect of research on human-animal relationships is its potential for providing a theoretical bridge between animal and human studies.

Kidd and Kidd's²⁴³ reply to these opinions on their proposal did not add new arguments, but merely either agree or disagree on aspects mentioned by their peers.

8.3.3 Case: 1987

Case²⁵⁰ was of the opinion that, because of the current interest in pets and their therapeutic effects, a need has developed for a comprehensive model of pet ownership. She proposed to use a "web model" designed to explain organisational computing systems as a useful metaphor for dog ownership. The web model considers the resources to be an ensemble of equipment, applications and techniques, with costs and benefits only partially identifiable. A complex infrastructure is necessary to support the resource. Both resource and infrastructure are social objects, highly charged with meaning. However, not every aspect of the web model fits dog ownership perfectly, since some parts are specific to the application of technological systems in organisations.

8.3.4 Bergler: 1988

Bergler²⁵¹, a psychologist, came up with a comprehensive model to explain human-animal interaction. His proposal is based on weighing up psychological cost and benefit factors and if the benefits are more important, it may lead to an experience that enhances well-being and quality of life. He referred to the importance of need and the perceived probability of need satisfaction. Some of the psychological benefit factors are affection, socialibility, closeness to nature and security (Fig 8.1).

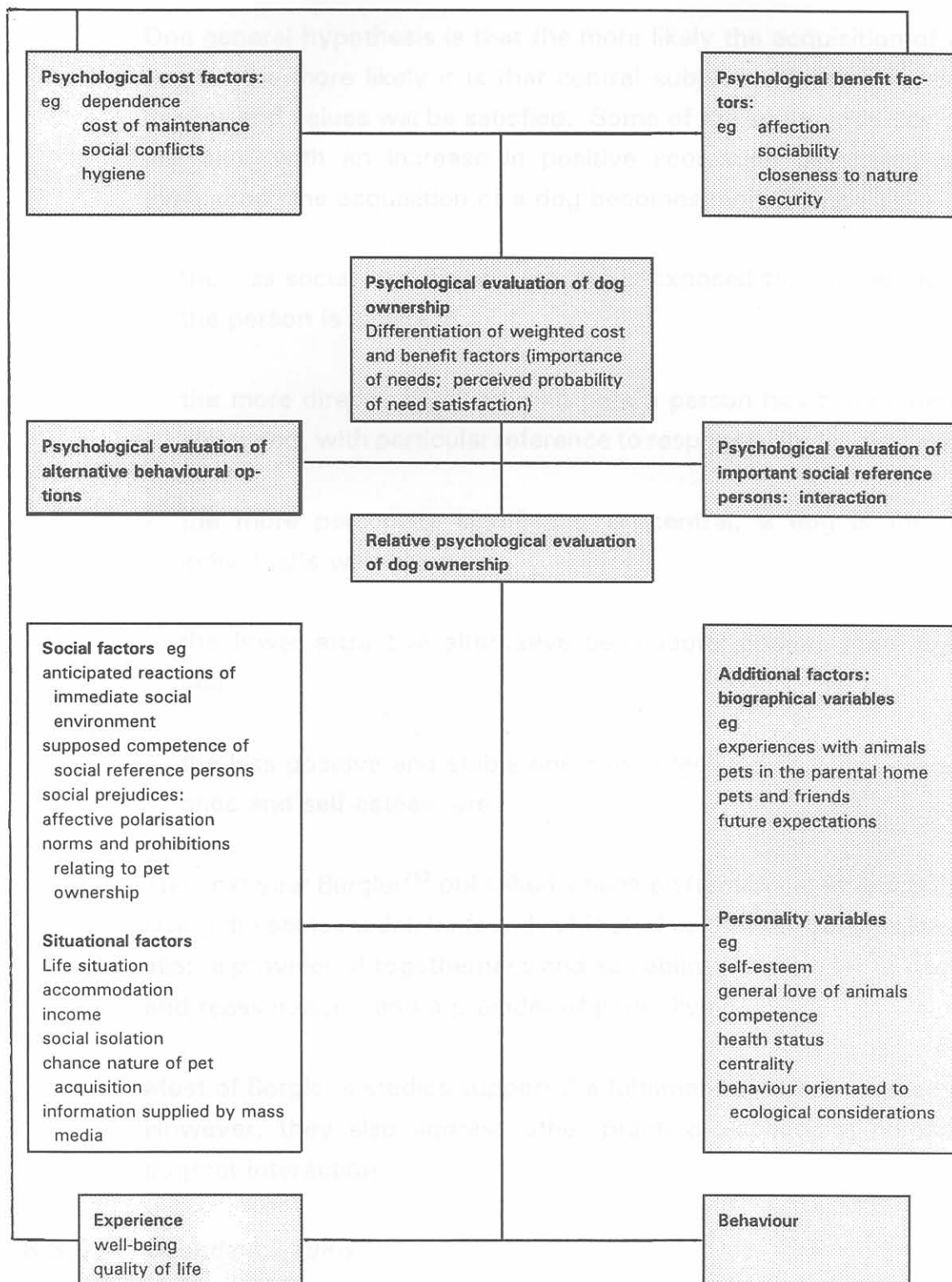


Fig 8.1: Proposed theoretical model according to Bergler 1988, p82²⁵¹

One general hypothesis is that the more likely the acquisition of a dog is, the more likely it is that central subjective (basic) needs, desires and values will be satisfied. Some of the subhypotheses²⁵¹ are that, with an increase in positive scores on psychological evaluation, the acquisition of a dog becomes more likely:

- the less social stimulation a person is exposed to, i.e. the more the person is isolated;
- the more directly involved with pets a person has been during childhood, with particular reference to responsibility for pet care;
- the more personally significant, or central, a dog is for to individual's well-being;
- the fewer attractive alternative behavioural options there are; and
- the less positive and stable one's own feelings of social assurance and self-esteem are.

The next year Bergler²⁵² published a book on human-cat interaction. Using the same model, he found in his studies that the cat was *inter alia*: a provider of togetherness and sociability; a provider of calm and reassurance; and a provider of joyful living.

Most of Bergler's studies support the fulfilment of attention needs. However, they also address other practical aspects of human-dog/cat interaction.

8.3.5 Odendaal: 1988

Odendaal²⁵³ proposed a theory to explain companion animal ownership and specifically how it can precipitate in veterinary practice. Based on a historical and cross-cultural literature study and a survey among veterinary clients (n = 600), it was concluded

that people are involved with companion animals for mainly two reasons, viz psychological reasons and reasons associated with the animal's natural abilities, also called utility reasons. The latter include economic involvement with animals and the basic care of the animals. Although many psychological and social reasons were given as to why people keep companion animals, most of them could be associated with attention needs. The following model was provided to link reasons for keeping animals and veterinary consultations (Fig 8.2):

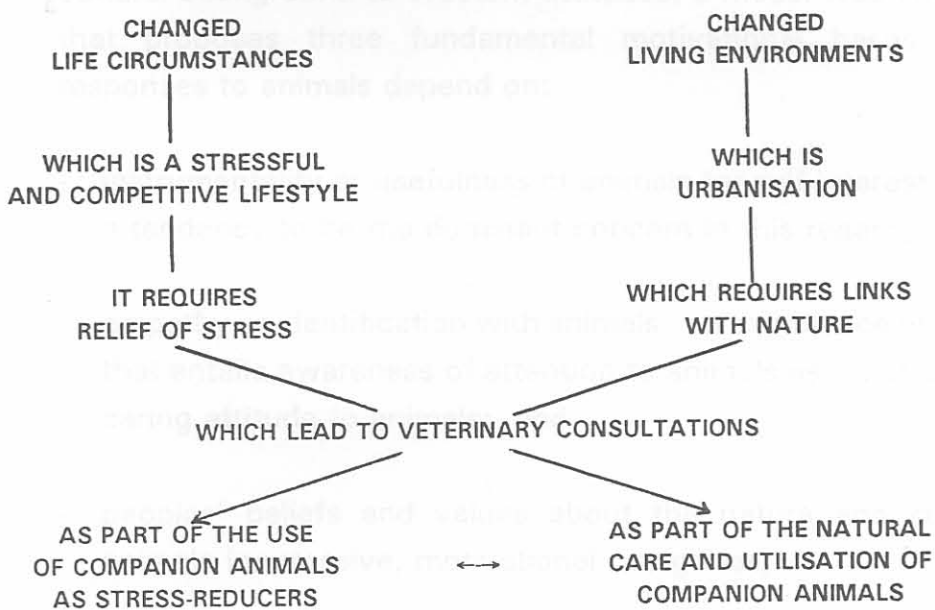


Fig 8.2: Clients' needs to keep companion animals according to Odendaal, 1988, p162²⁵³

8.3.6 Doi: 1991

Doi²⁵⁴ used a concept deriving from the Japanese word "amae" to explain the bridge between dependence and attachment - two conceptually different states. The word refers primarily to what an infant feels when it seeks its mother, but it is the same feeling in an adult who is emotionally close to another. The feeling of "amae" is not mediated by word, though it can be acknowledged as such a reflection. Also, when frustrated, it can lead to a desire for such a

feeling. Its central importance is true also in non-Japanese contexts and examples from French and American stories were used to indicate universality. The psychology of keeping companion animals can also be understood in terms of "amae".

8.3.7 Hills: 1993

Hills²⁵⁵ addressed the theoretical grounding of the human-animal relationship from the perspective of the motivational basis of attitudes toward animals. Building on recent developments in attitude theory and integrating themes from the historical and cultural background to Western attitudes, a model was developed that proposes three fundamental motivational bases, where responses to animals depend on:

- instrumentality or usefulness of animals for self-interest, having a tendency to be the dominant concern in this regard;
- empathy or identification with animals: an experience of animals that entails awareness of attention to animals associated with a caring attitude to animals; and
- peoples' beliefs and values about the nature and status of animals (expressive, motivational categories).

8.3.8 Wilson: 1994

Seven years after the debate by Kidd and Kidd,²⁵³ Wilson²⁵⁶ published an article in *Anthrozoös* on "A conceptual framework for human-animal interaction research: the challenge revisited". As in the previous case, the editor of the journal asked leading scientists in the field of human-animal interaction to comment.

Wilson²⁵⁶ claimed that research has shown that pets can lower blood pressure, heart rate, anxiety, decrease depression and enhance social environments, but that little attention has been paid to a theoretical basis for human-animal interaction research and studies to include normal and non-normal populations, different

cultures, non-traditional relationships and those not interested in animals. There is also a lack of developmental (longitudinal) studies to determine the benefits of pet ownership over time. Her proposal is to use a "Quality of Life approach" as a conceptual framework for evaluating potential benefits for pet owners:

"Quality of life refers to clinically relevant aspects of subjective symptoms, feelings, and well-being".²⁵⁶

Quality of Life should be evaluated by refined psychometric instruments. Her previous model considered variables such as gender, age, ethnicity, socio-economic status, educational levels, a pet history, housing variables, health status, current attitudes toward animals, level of attachment and the individual's well-being. However, she felt that there were limitations to that model, as both intentionally and unintentionally, life events were not always covered. Selection of an instrument (test) is not always an easy task, because there are more than 80 tests to measure Quality of Life. None of the studies evaluating the health benefits of human-animal interaction has attempted to measure all domains of Quality of Life and this is seen as a point of criticism.²⁵⁶

Allen²⁵⁷ feared that without further structure, this model would be disregarded in much the same manner as its predecessors. She suggested that the study of Quality of Life, as it relates to human-animal interaction, should be treated as an applied area within each of the respective disciplines - rather than to try to create a new interdisciplinary field.

Lago²⁵⁸ commented that in multivariate research, this inclusive definition of Quality of Life runs the risk of confounding variables defined as baseline conditions, or mediating factors, with outcome measures. Just as health status represents a complex domain baseline, mediating, and outcome measures, so does the complex array of human relationships or the lack of them, that concern particular human-animal interaction.

Marx²⁵⁹ was of the opinion that instruments used in the social sciences are rarely valid or reliable enough to predict specific effects and that the relationship between human emotions and subsequent health effects are always complex and in many cases speculative.

Melson²⁶⁰ found that, to document Quality of Life changes as a result of pet ownership or involvement with animals in other ways, is an important challenge to researchers. This will raise further questions, such as what the underlying processes that account for Quality of Life.

Wilson²⁵⁶ concluded that, what was needed was to build a scientific literature that has a unified theory base that allows evolution of the impact and the process of human-animal interaction in a wide variety of samples.

8.3.9 Human-Animal Interaction Conference, Geneva: 1995

The challenge mentioned by the previous scientist was in a sense taken up and discussed further by contributors to the seventh International Conference on Human-Animal Interaction, held on 6 September 1995. Although only the abstracts are available (full length articles have not been published yet), it was worthwhile to evaluate some of these most recent proposals. The Quality of Life approach was discussed by two Americans (the original proposal was also made by an American). A new biological framework was presented by an Englishman and a panel discussion was organised by a group of French scientists. It seems as if the non-Americans ignored the Quality of Life model.

Barofsky²⁶¹ asked the question "Conceptualizing Quality of Life: How do Companion Animals fit?". He defined Quality of Life as an activity in which people ordinarily engage and this is important, because any formal assessment of Quality of Life will have to reflect how people think about and generate such assessments. Four elements have been identified as being involved in Quality of Life: a description of the state a person is in; scaling these states; stating preferences for being in a particular state; and aggregating such preferences into an

index that summarises the Quality of Life of the person. He proposed that one of the reasons why the importance of animals to people had not been definitively demonstrated, is that much of the benefit of animal companionship is implicitly acquired and that the occurrence of such learning has not been adequately assessed.

Katcher's²⁶² paper was titled "Tools for resolving contradictions in one's knowledge about companion animals: Space, Context, Behavior and Biophilia". He said that at least four different investigative methods are used to discern how animals influence Quality of Life:

- experimental or observational studies which contrast human behaviour with and without the animal present;
- surveys of the general population in which subjects are asked a battery of questions chosen by the experimenter;
- similar studies of people who are defined as patients or are specifically recruited; and
- narratives told by observers or subjects about the significance of companion animals.

The second and third methods revealed very little influence of the presence of a companion animal on health or Quality of Life, yet some studies of clinical populations have documented an influence of animals on health. The first and last method, however, revealed very strong effects of human-animal interaction and these disparate results may reflect the effects of difference in methodology. Studies are required which bridge these methodologies and examine how results are influenced by context, conceptual space, selection of subjects and the investigative situation. Furthermore, the concept of biophilia which posits a communality between experiences with place, animals and nature may be a valuable addition to the theoretical tools for understanding the interdependence between people and nature.²⁶²

Bradshaw's²⁶³ paper, "Social interaction between animals and people - a new biological framework", acknowledged the problem that development in the field of human-animal interaction studies is currently hampered because its empirical approaches being largely undisciplinary instead of multidisciplinary. The reason for this is that each approach derived directly from a single academic tradition, such as biology, psychology or anthropology. Companion animals may have had a function as regulators of human social behaviour, but why human societies should have such a need, capable of being fulfilled by an animal, is still unclear.

Montagner²⁶⁴ and his panel of contributors dealt with the following topics under the title "The theoretical basis for the human-animal bond":

- cultural and scientific obstacles which hampered the development of a theory for the human-animal bond;
- genetic factors and eco-ethological conditions which may have facilitated human-animal interaction;
- genetic, ethological, eco-ethological factors which may have underlain a particular attachment; and
- factors which may underlie the long-standing human-animal bond.

None of these contributions addressed a rationale for therapy in a specific manner.

8.3.10 **Costall: 1996**

Costall²⁶⁵ reflected on a symposium by the British Psychological Society's annual conference with the theme, "Theoretical and practical aspects of person-pet relationships". She found that the papers relegated the status of the animal's concern to independent

variables, while the person-pet relationship is after all a relation - it is mutual or reciprocal. The relation or interaction itself deserves to become the focus of future inquiry:

"It seems to me that the logic of the problem demands that, ultimately, we must adopt a 'mutualist approach'. To repeat, the pet-person relation is a relation. It is mutually defining and irreducible. A pet is a pet by virtue of its relation to people, and, conversely, its human companion is such by virtue of his or her relation to the pet".²⁶⁵

8.3.11 Cameron: 1997

Cameron²⁶⁶ presented a paper at the American Veterinary Society for Animal Behaviour with the title "Canine Attention Addiction".

Although this contribution did not attempt to suggest a general theory, the published abstract of the paper support the attention need theory. Despite the fact that emphasis is placed on excessive attention-giving or -seeking as attention addiction, the introductory remarks are of specific relevance to this study:

"Attention is a major behavior driving force for many of the more highly evolved genera including canis, felis, and homo. It does not rank with food, shelter, and sex, but it is close. In the human world, whole industries and professions are based on, or at least driven by, the need for attention. Witness the entertainment and fashion industries, politicians, even the auto industry. On the darker side, a significant degree of criminal activity is driven by the need for attention, and many of our sports celebrities are more known for their antics than their skills.

With this model in mind, it should not be any surprise that a close look at our pets' actions reveals comparable behavior that is explainable in no other way than an inherent strong need for individual recognition".²⁶⁶

What is important here is that attention needs are seen as a major driving force (need) in many of the more highly developed genera, i.e. interspecies fulfilment of the need is thus an obvious result of positive interaction between the species. The premise of this study suggests that attention needs lie on the same level as any other basic need (food, shelter, sex).

8.3.12 **Wilson: 1998**

At the 8th International Conference on Human-Animal Interaction in Prague, Czech Republic, Wilson²⁶⁷ expanded on her earlier theory. She said that relationships between humans and animals involve a combination of positive and negative exchanges which are as diverse as the individuals and animals involved. She emphasized that animals can have an impact on a person's life situation who has to play the care-giver's role. Such a role could be stressful and charged with negative elements. The two streams of interaction, namely the positive and negative aspects of social exchanges between care-givers and companion animals provide a broad multidimensional framework to view the potential of social exchange theory as a new approach to explain care-giving companion animal interaction. Such a framework could provide a checklist during therapeutic interventions. Care is part of special attention.

8.4 **Discussion**

None of the theories proposed contradicts or refutes the theory proposed in this study. A summary of the main points of the theories presented in this study is presented as follows (Table 8.1):

Table 8.1: Theories on human-animal interaction by author, key idea and link to *attentionis egens*

Author	Key idea
1. Brickel	Pets can provide attention shifts
2. Kidd & Kidd	Analogies between human-human, human-animal interaction
3. Case	Pet ownership as a web model
4. Bergler	Pets can provide psychological benefits such as affection
5. Odendaal	Pets can fulfil psychological needs
6. Doi	Relationships with pets can explain the bridge between dependence and attachment
7. Hills	Contact with animals lies on a continuum of instrumental, empathy (psychological factors) and dependence/dominance
8. Wilson	Quality of Life model (fulfilling needs, creating feelings of well-being)
9. Bradshaw	Biological framework for man-animal relationships may have a biological (physiological) basis
10. Costall	Positive interaction between owner and pet is a mutualist relation
11. Cameron	Attention is a basic need in both humans and animals
12. Wilson	Social exchange theory to explain care-giving

Although these ideas are reconcilable with *attentionis egens* theory, it is not meant to explain all interaction between humans and animals. The proposal is for a specific human-animal interaction, namely a rationale for psychotherapy. Instead of "one unified theory" it forms a basis as supported by physiological parameters, for the role animals can play in therapy by providing attention to those people who are in need of attention, because of some psychiatric conditions.

Variables such as development (longitudinal studies), cross-cultural aspects, age, gender, socio-economic environment and educational levels or background will not affect successful human-animal interaction if the basis of such interaction is found in a universal need which is present in normal function (physiology) of both humans and animals, throughout their lives.

To evaluate the application of this theory in order to establish how animals can facilitate therapy, the next chapter will deal with the possible use of animals in psychiatry.

CHAPTER 9

APPLICATIONS OF HUMAN-ANIMAL THEORIES IN ANIMAL-FACILITATED PSYCHOTHERAPY

9.1 Introduction

Theory without application will make no sense in an applied field such as psychiatry. The question is where a therapy which involves animals fits into a health system which is known for its high technology and potent drugs. Maybe the answer lies in the "Megatrends" predicted by John Naisbitt²⁶⁸ in the last part of this century - a century marked by a technological explosion. The trend is described as follows:

"High tech/high touch is a formula I use to describe the way we have responded to technology. What happens is that whenever new technology is introduced into society, there must be a counterbalancing human response - that is, *high touch* - or the technology is rejected. The more high tech, the more high touch.

The parallel growth of high tech/high touch took place during the last three decades, a period that appeared chaotic, but that really had it's own rhythm and sense".²⁶⁸

This chapter will deal with conditions and preconditions for animal-facilitated psychotherapy as well as a "prescription classification" of such a therapy.

9.2 Conditions for animal-facilitated psychotherapy

The conditions for using animals as therapy adjuncts in psychiatry refer to the minimum requirements before the therapy can be applied.

9.2.1 Therapist

A qualified therapist who is familiar with animal-facilitated psychotherapy and all the aspects associated with it, is required. Knowledge of a medical drug or procedure is always part of a therapist's choice for a specific treatment. The main reason why therapists do not use animals in therapy could specifically be that they are not trained in this aspect. If they do not know the "drug" or "procedure", they will obviously be hesitant to use it or they may even avoid it completely.

9.2.2 Patient

A psychiatric patient with a condition of which attention needs form part of the symptoms, either as a primary or as a secondary need resulting from the condition. Considering *attentionis egens* as basic as other physiological needs such as eating, sleeping and exercise, most psychiatric patients will benefit from attention, other than the formal contact during therapy.

9.2.3 Animal

Any suitable animal which can fulfil attention needs. Like in many other therapeutic approaches, there are also a wide variety of choices with regard to which animal for which patient with which condition and under what circumstances (therapeutic setting and staff).

9.3 Preconditions for animal-facilitated psychotherapy

If the preconditions for having a successful animal-facilitated psychotherapy programme are met, most of the problems which can arise during such a programme can be avoided. In other words, failure is usually due to preconditions which were ignored or not followed properly. If the preconditions for the use of drugs according to the MIMS Desk Reference Volume 25²⁶⁹ are considered, it is clear that no chemical therapy can be used indiscriminately. The same is true for surgical and other non-

invasive procedures. It is as important to meet the preconditions in animal-facilitated psychotherapy as those in any other therapeutic approach in the medical field. Some of the most important preconditions will be listed.

9.3.1 Preconditions pertaining to medical factors

The following four factors have medical implications:

9.3.1.1 Hygiene

Perceptions may have a determining influence on decisions. One perception about animals in a hospital setting is that animals will cause an unacceptable standard of hygiene. Animals cannot be seen as "dirty" per se, while all other factors are seen from a different perspective. Hygiene includes all steps taken to minimise infection due to an environmental build-up of potentially harmful microbes. Hygienic measures are thus mainly preventive in nature. If animals are used, they should fall within the general and standard procedures of keeping the environment as hygienic as possible. Reports on lapses in hygiene where animals were used in therapy, have not been received up to now, and it should at the moment not be seen as a particular problem which is separate or even more important than any other aspect of hygiene.

Perceptions of a "sterile" environment should also be discussed. Sterility means death, a lack of growth or infertility. Among microbes it often leads to the serious problem of resistance, causing greater threats to life than the non-resistant types. Apart from very special unnatural conditions for short periods of time, all people live naturally in the presence of microbes. The presence of animals, plants and other objects which are not sterilised, can thus be seen as "normalising" an environment - not only because such objects occur naturally in human environments, but also because they form part of the humans' natural execution of hygienic procedures such as washing hands after playing with an animal.

The precondition for hygiene during the use of animals in therapy should thus merely be an extension of existing hygienic regimes. It will also depend on the type of animal involved, eg a small aquarium fish bowl will have fewer hygienic implications than a farm animal yard.

9.3.1.2 Zoonoses

Disease transmissible from animals to humans may be the most serious criticism against the use of animals in therapy, from a medical point of view. This may be of even greater importance if animals are used for the aged, people who are infirm or handicapped. Schantz,²⁷⁰ who evaluated this situation, found that "so far, pet therapy has a good safety record". He concluded after an objective and comprehensive evaluation of all potential hazards, that most risks are preventable by carefully selecting the appropriate species and temperament of individual animals. In this regard medical veterinary involvement, educated staff, and where possible informed patients, should continuously be aware of potential dangers and how to avoid them.

Waltner-Toews²⁷¹ found in a survey of 42 hospitals in North America that the few zoonotic diseases that are a real concern, are easily controlled. This was despite the fact that his greatest concern was that very few programmes had printed guidelines, protocols or training programmes which would set out the simple steps necessary to prevent infection.

In a comprehensive study on zoonoses, McCrindle²⁷² said that a variety of different classification systems for zoonotic diseases have been proposed. One is an epidemiological approach divided into:

- direct zoonoses perpetuated by a single vertebrate species, e.g. Rabies and Brucellosis;
- cyclozoonoses which require more than one vertebrate species for maintaining the cycle, e.g. Taeniasis and Hydatid disease;

- metazoonoses where maintenance of the cycle requires both vertebrate and invertebrate species, e.g. Arbovirus and Trypanosomiasis; and
- saproozoonoses which are dependent on inanimate reservoirs as well as vertebrate hosts, e.g. Sporotrichosis and cutaneous larva migrans.

Another classification is according to primary host:

- anthroozoonoses where the primary host is an animal, e.g. Rabies;
- zoo-anthroozoonoses, where man is the primary host, e.g. Tuberculosis; and
- amphizoonoses, where animal and man are primary hosts, e.g. Staphylococcus.

Zoonoses can also be classified according to the aetiological agent of the disease:

- viral, e.g. Rabies and Herpes virus;
- bacterial, e.g. Leptospirosis and Salmonellosis;
- rickettsiosis, e.g. Typhus and Q-fever;
- protozoal, e.g. Toxoplasmosis and Giardiasis;
- mycotic zoonosis, e.g. Candidiasis and Cryptococcus;
- helminths, e.g. Cestodes, Trematodes and Nematodes; and
- ectoparasites, e.g. Cordylobiosis.

From a practical point of view, zoonoses between adult companion animals and adult people are rare. This is especially true where animals selected for therapy are under constant veterinary care and if routine hygiene principles are practised. If animals are dewormed, vaccinated regularly and if they are clinically healthy, two zoonoses may still pose a problem. One is dermatomycosis from cats, because cats may be carriers without any clinical signs. The other is psittacosis caused by *Chlamydia psittaci* of which the host is mostly (70%) cage birds from the parrot family. In both cases effective treatment is available if diagnosed in time.²⁷²

A precondition should be to regard these possible hazards to be as serious as any other possible hazard that may accompany any other therapeutic approach. The type of animal can also make a difference in the probable occurrence of zoonoses and if all the necessary steps are taken, zoonoses could be prevented to a great extent.

9.3.1.3 Injuries

In the survey of Schantz,²⁷⁰ many figures regarding animal bites were quoted. Bites occurred from own dogs, stray dogs, cats and wild carnivores, in this order of frequency. In most cases children under 14 years were involved and large breeds of dogs caused the most severe and fatal attacks. One to two percent of cases required hospitalization and in the decade between 1979 and 1988, there were 183 to 204 dog-bite-related fatalities per year in the USA.

It is obvious that the population situation is not comparable to an institutional setting, but it is appropriate to take note of the relatively low incidence of serious dog bites even in the given population.

The precondition is obvious - select a suitable species, breed and individual animal for every situation. It would be easy to meet

this requirement and it is no wonder that this was never reported as a problem in animal-facilitated psychotherapy.

9.3.1.4 Allergies

Allergies can be caused by a plethora of allergens (foreign protein). Animals as carriers of such allergens form a small part of all the possibilities. Respiratory symptoms can vary from light to severe and sensitivity can vary from none to very sensitive. It was found that cats, guinea pigs and horses, in that order, cause the most allergic reactions, but dogs and pet birds are also high on the list. Some people are only allergic to certain breeds of cats and dogs.²⁷⁰

Dog and cat breeds with a curly coat generally cause fewer or no allergies, because shedding of hair is limited. If patients are in need of animal companionship, therapists can thus consider substituting breeds or even species. Sensitivity to cats, for example, can lead to a decision to replace cats with cage birds or fish. If a patient is multi-allergic for most animals used in therapy, the use of animals could become a contra-indication for therapy, as could happen in the case of certain medicines. The precondition is to attempt to establish a specific cause of an allergy and then to act accordingly.

Following a national survey in the USA, Stryler-Gordon, Beal and Anderson²⁷³ came to the conclusion that animals involved in therapy programmes pose fewer health risks to patients than human visitors. In a study conducted over one year in 284 nursing institutions, it was found that for every one million hours of exposure, there was only one animal-related incident compared to 506 non-animal incidents. The researchers concluded that the common fears related to having pets in nursing homes have no basis in fact, if this data is a reflection of other studies. Schantz²⁷⁰ found that bites, zoonoses and allergies are the main pet-associated human health hazards among human populations:

"However, it should be easier to control pet-associated health problems in supervised institutional settings than it is in the community at large".²⁷⁰

9.3.2 Preconditions pertaining to patient needs

The following two factors have implications for the patient:

9.3.2.1 Matching patient and animal

Just as it is necessary for psychiatrists to evaluate the effect of a specific therapeutic approach or dosage on an individual patient, it is also of importance to match animals used in therapy to every individual patient. Furthermore, some patients may have no affiliation for animals in general. Animals should not be forced upon such patients. On the other hand, those patients who enjoy the company of animals should not be denied such interaction.

In a study of 176 pet owners it was found that people who are relatively more compatible with their pets reported better mental health overall and fewer physical symptoms. Social support and pet attachment were positively associated with mental health.²⁷⁴

The precondition is thus that selection of patient and animal should take place prior to the beginning of therapy.

9.3.2.2 When animals, that patients have become attached to, die

The loss of a loved one is possible, not only with regard to an animal, but also to family, nursing staff and therapists. If a close bond has been formed between patient and animal, it is important to acknowledge it as a matter of concern and it should be dealt with accordingly.^{275,276} One should also keep in mind that animals in general have shorter lifespans than humans.

The precondition is thus that the necessary emotional and psychological support should be provided if such an animal should die.

Wilson, Netting and New²⁷⁷ compiled a Pet Attitude Inventory which was designed for animal owners and non-owners to be used in community settings. It was intended to measure pet ownership attitudes and attachment levels, as well as to answer questions related to the fields of medicine, psychology, social work and ageing. The Inventory can be administered by an interviewer or by the person himself/herself in approximately five to ten minutes. Johnson, Garrity and Stallones²⁷⁸ developed a scale for the assessment of emotional attachment of owners to their pets, known as the Lexington Attachment To Pets Scale. Although continued psychometric evaluation is suggested to improve the Scale, this and the aforementioned Inventory could be helpful in establishing the bond between patient and animals in therapy.

It was also pointed out that there could be a distinct difference between attitudes towards animals in pet owners versus non-owners. It was said of those who had been pet owners that:

"These participants produced significantly more descriptions of the dogs' behavior in terms of desires, feelings and understanding than those with little or no experience of pets".²⁷⁹

Inventories and scales can help match people and animals before animal therapy is considered. The danger is that the phenomenon of positive interaction between people and pets is so common that the possibility of accepting this interaction between patient and animal is seen as obvious and that no proper matching is done beforehand. An evaluation of the psychological effect of the animal on the patient should be done continuously during therapy.

9.3.3 Preconditions pertaining to the needs of animals used in therapy

The following three factors have implications for the animals:

9.3.3.1 People can abuse animals

Although patients abusing animals in therapy have not been reported yet, the possibility should always be kept in mind. The opposite is also true. Patients sometimes get so involved with animals that they take great care of the animal's welfare.

The precondition is that whenever animals are used, their welfare should also be considered and that control over animal therapy programmes should also include the animal's well-being.

9.3.3.2 Sources and selection of animals

The source of animals for therapy should be part of the selection of animals. If the source from which animals are obtained is unknown, it is difficult to establish important information such as behaviour tendencies of animals related to the animal of choice, whether proper socialisation has been done and why the animal is available for therapy.

A precondition is that the more is known about the animal selected for therapy, the more accurate the prediction of the animal's interaction with patients could be.²⁸⁰

Horvath²⁸¹ reported on Corson, who did a prospective long-term study in several breeds of dogs. He established two major genetically determined types, namely the low adaptation dogs which exhibited a complex pattern of persistent psychophysiological and neuro-endocrine reactions. Analysis of cardiac and respiratory orientation reactions could serve as predictors for this classification. The first group had more intense, persistent and highly fluctuating orientation reactions and the second group

showed rapid orientation reaction habituation. Such evaluation could be valuable in selecting suitable dogs for therapy. Corson, one of the pioneers in using dogs for psychiatric patients, was also involved in evaluating and selecting suitable dogs for therapeutic purposes.

9.3.3.3 Patients unable to care for animals any longer

It is important to see the animal as a social being and not as an "expendable tool" in therapy. Patients may not be able to continue caring for animals which are used as companions and patients may even die before the animal. Although it is well-known that dogs can become very dependent and attached to their owners, Heath²⁸² warned that even cats, which are often seen as individualistic animals, can become overdependent on their owners.

The precondition is not to expect too much of the patient whose condition may deteriorate. It is important to decide beforehand what should happen to the animal if the bond between patient and animal is broken.

It should be clear that animal welfare should be part and parcel of animal therapy, especially because there are people who are very sensitive to issues relating to the use of animals for the benefit of humans. Ethics committees involved in controlling therapy programmes to protect human patients should also consider the well-being of the animals. In this regard, a coopted veterinarian could help with the selection and care of animals.

9.3.4 Staff and management involved in animal-facilitated psychotherapy

The following factors have implications for the management of the programme:

9.3.4.1 **Success of an animal-facilitated programme**

It is possible that animal therapy programmes that had failed might not have been reported (this does not refer to clinical success or failure). However, it is very important to plan properly for such programmes. When the strict controlling and monitoring of other therapeutic approaches are considered, one of the reasons why animal therapy programmes could fail is the half-hearted way in which the therapy is planned.

The precondition is to plan the programme in the same way as other therapeutic regimes, with continuous evaluation and adaptation where necessary.

9.3.4.2 **Staff**

Authorities and staff involved should understand what they can expect and that the approach, from a professional point of view, will be no different than in any other therapeutic approach. Staff involved in such programmes should also be selected on the basis of their knowledge of animals, liking for animals and willingness to help in taking responsibility for the programme. Whether an animal programme will cause more work for the staff will depend on the type of animal (eg fish bowls versus horse-riding programmes), the way in which animals are applied (visits from outside versus a full-time programme) and whether the staff love animals (animal-loving people do not experience animals as a burden). Animals may occupy patients in such a way that the workload of nursing staff actually decreases.

The precondition for ensuring that the planning of animal therapy programmes succeed, is that everybody should be well-informed in advance. Lack of detailed information about the programme may pose a real threat to the outcome of the therapy.

Barnett and Quigley²⁸³ offered a Needs Assessment Model to be used for animals in long-term care facilities. Such a model can

help to identify the needs which may develop during the programme and solutions to solving the problems can be implemented.

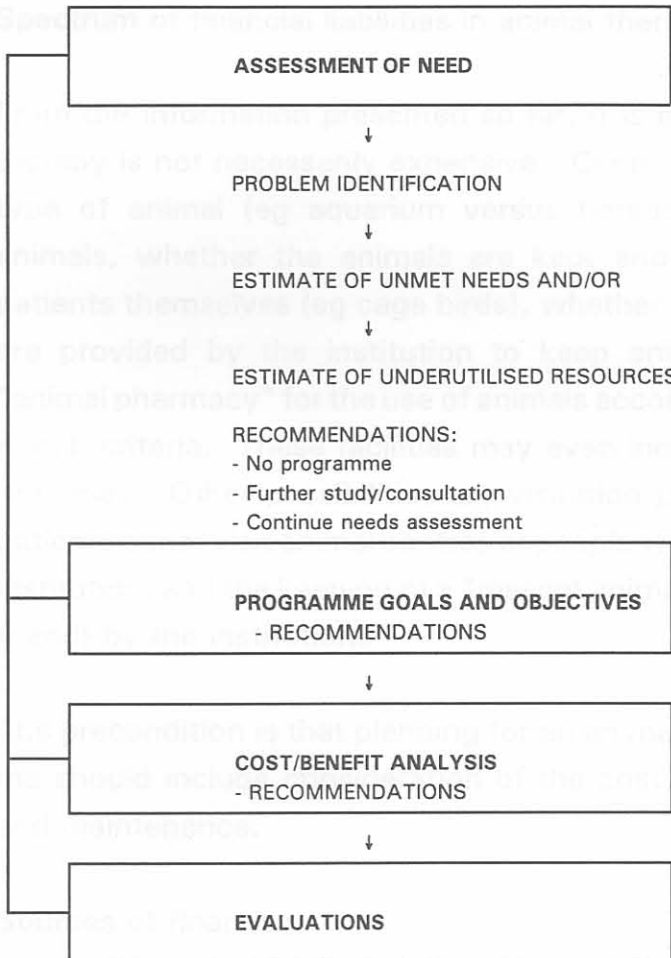


Fig 9.1: Needs Assessment Model
according to Barnett & Quigley, 1984, p4²⁸¹

The latest manual for animal therapy programmes by the Delta Society,²⁸⁴ USA, is known as "Standards of Practice for Animal-Assisted Activities and Therapy". It is of the utmost importance that these already available guidelines be studied before any programme is initiated, because they are based on a wide spectrum of practical experience.

9.3.5 Financial aspects

Finances have implications for every therapy programme.

9.3.5.1 Spectrum of financial liabilities in animal therapy

From the information presented so far, it is evident that animal therapy is not necessarily expensive. Costs will depend on the type of animal (eg aquarium versus horses), the number of animals, whether the animals are kept and cared for by the patients themselves (eg cage birds), whether extensive facilities are provided by the institution to keep animals, such as an "animal pharmacy" for the use of animals according to select-and-match criteria. These facilities may even include breeding programmes. Other possibilities are visitation programmes where patients either visit animal centres or people with animals visit the institution, and the keeping of a "mascot animal" (an everybody's friend) by the institution.

The precondition is that planning for an animal therapy programme should include consideration of the cost of implementation and maintenance.

9.3.5.2 Sources of finances

Although studies rarely, if ever, reflect the financial implications of animal programmes, it is obvious that these should be part of the decision-making. Fortunately, there are a wide spectrum of choices, as described under the heading above, and such a programme may cost next to nothing, depending on the choice of animal contact. It can also cost much less than most other therapeutic approaches. The only expensive approach is an "animal pharmacy" and breeding unit, although this has its own advantages.

The precondition is that animal therapy programmes should be affordable and if an expensive unit is used, sponsors can be approached for funds.

The conditions and preconditions to be considered for an animal-facilitated psychotherapy programme can be summarized as follows (Table 9.1):

Table 9.1: Application of animals in psychiatric therapy

Consideration	Factors involved
Conditions	Therapist → Qualified
	Patient → Needs attention
	Animal → Specifically selected
Preconditions	Medical factors → Hygiene
	→ Zoonoses
	→ Injuries
	→ Allergies
	Patient needs → Matching with animals
	→ Attachment
	Animal needs → Animal welfare
	→ Selection and sources of animals
	→ Support
	Management and staff → Planning and facilities
→ Communication/Information	
Financial factors → Variety of possibilities	
→ Sources of finance	

9.4 Applied animal-facilitated psychotherapy

In a recent article Brian Kirkpatrick²⁸⁵ of the Maryland Psychiatric Research Center, Department of Psychiatry, University of Maryland, exposed the opinion that affiliative behaviours are relevant to several neuropsychiatric disorders. Loss of relationships, or critical relationships, increases the subsequent risk of recurrence of major depression, a neurobehavioural syndrome with complex biological changes. Living with a critical, intrusive person increases the risk of exacerbation of psychotic symptoms in patients with schizophrenia and there are also disorders in which it is the nature of the person's affiliative behaviours that is abnormal.²⁸⁶ Childhood autism is defined at least in part by a lack

of seeking social relationships, whereas borderline personality disorder is characterised partially by the particular nature of the person's relationships.²⁸⁷ The deficit syndrome of schizophrenia is also defined in part by a lack of interest in relationships:

Drummett and Willcox²⁸⁸ found that the research which exploring

"Thus, the neurobiology of social behavior is one of the 'basic sciences' of psychiatry. However, changes in complex behaviors can often fruitfully be studied by considering somewhat simpler functions, such as temperature regulation, exchange of nutrients, or attention. A similar situation may be emerging in the study of patients with the deficit syndrome of schizophrenia".²⁸⁵

Drummett and Willcox²⁸⁸ found that the research which exploring

Kirkpatrick²⁸⁵ stated that from the perspective of human suffering and costs to society, schizophrenia is one of the most burdensome illnesses of humanity. It is usually a chronic condition which may stretch from childhood to late adult life, with many patients unable to work. In the USA, schizophrenia may account for 2,5% of total annual health care expenditure, 10% of the permanently disabled population and 14% of homeless people in big cities. Furthermore, its 1-2% lifetime prevalence makes it one of the most common serious diseases.

A marked decrease in affiliative behaviours is found among patients with schizophrenia who exhibit "destruction of the personality" symptoms. These patients exhibit a group of clinical features that, within a chronic schizophrenia sample, are robustly intercorrelated. It is called the deficit syndrome. These patients show a decrease in affiliation, they lose their ability to experience pleasure and they take part in fewer goal-directed activities which extend to areas other than affiliation, e.g. they report increased physical anhedonia. However, these patients exhibit a decrease in affiliative behaviours that is quite striking and its clinical features are unique. It was found that typical neuroleptic antipsychotic drugs had a less pronounced effect on the social

withdrawal of deficit patients than on other people with schizophrenia. The negative symptoms of deficit patients could not be attributed to neuroleptic side-effects.²⁸⁵

Brummett and Williams²⁸⁸ found that recent research exploring the association between hostility and risk for disease is generally supportive of the previous literature that suggests the existence of a link between hostility and health. If such hostility between patients and other people can be substituted by possible positive animal interaction (attention), it indicates another area where animals can attribute to health in general.

The information leaves the door wide open to positive human-animal interaction as an indication for therapy. Where affiliative, communication and social disorders occur, animals should be considered as substitute attention as part of the therapy.

9.5 Animals on prescription

In order to place the application of animal therapy in perspective, it would be possible to compare a "pharmacological" information leaflet with the standard information given for drug therapy (Table 9.2).

Table 9.2: An example of an information leaflet on the use of animals in animal-facilitated psychotherapy in the format of a leaflet for the use of prescribed drugs

Animals used to facilitate psychotherapy

Scheduling status: S4

Proprietary name (and dosage form): Animal-facilitated psychotherapy

Composition: Any suitable animal for use in therapeutic situations. Suitability is determined by the choice of species, breed, gender (intact or sterilised) and age of the animal. Biological factors such as size, hair coat, facility needs, health demands and behavioural traits can be considered in relation to the therapeutic situation and the patient.

Pharmacological classification: 1.1.1. Also see 3.1 and 17.3.

Pharmacological action: Positive human-animal interaction evokes natural physiological changes which may include decreased blood pressure, increased plasma levels of phenylethylamine, dopamine, endorphins, oxytocin and prolactin. By fulfilling basic affiliation or attention needs, the experience may act as an anxiolytic in patients who are in need of attention as well as a feeling of elation. The complete action of positive human-animal interaction may not be known.

Indications: Specific indication would be to use animals to fulfil attention or affiliation needs in psychiatric patients, especially in cases where human contact, environmental stimulation and chemical intervention did not control attention deficits completely. Animals can be used as adjuncts to any other therapeutic approach.

Contra-indications: Never force an animal upon a patient. Never initiate animal therapy before a well-planned programme has been submitted. If suitable selected animals are used, there is no specific contra-indication to use animals for approved psychiatric patients.

Warning: Provision should be made for the survivor in case an animal in therapy should die or a patient should die, or become unable to maintain the care of the animal.

Dosage and directions for use: Animals can be used in different ways

- provide animals to patients, eg cage birds or an aquarium on a one-to-one basis or an aquarium in a common room
- a mascot animal of the institution for everybody who wants to interact with it on an informal basis
- visiting scheme where people with trained animals visit the patients in the institution on a regular basis
- outside visits where patients are taken to make animal contact in a structured way, eg visits to an animal shelter or zoo
- patients keeping their own personal pets
- outside facilities with animals such as a step-in aviary, pens with farm animals and poultry, or with exotic pets such as tortoises, rabbits and guinea pigs. In certain circumstances horse-riding could also be provided
- animal programmes as part of a post-therapy rehabilitation effort.

Contact can be provided

- on request
- unlimited without supervision
- specific contact sessions with set intervals and for a predetermined period of time in the presence of a therapist
- during visiting schemes
- continuous when personal pets are kept.

Interaction could include

- visual stimuli
- auditory stimuli
- tactile stimuli
- olfactory stimuli
- exercise stimuli
- animal subject communication.

Contact could be of an active or passive nature and should last about 15-25 minutes per session.

Side-effects and special precautions: Precautions should be taken regarding the zoonoses per species of animal, possible trauma, confirmed allergies and hygienic considerations. The welfare of the animals concerned should also be ensured.

Special note: Pregnant woman should be tested for immunity against Toxoplasmosis and children should be dewormed for Ascariasis and Ancylostomiasis as a rule.

Known symptoms of overdose and particulars of its treatment: A threshold of contact between human and animal can be exceeded. Discomfort shown by any of the two species could be an indication to terminate the human-animal interaction. Sometimes there could be an indication to alternate such interaction with another stimuli.

Overdependence may develop in the patient as well as the animal. Since this is known to occur, therapy programmes should be structured in such a way that overdependence does not develop, otherwise it would be necessary to treat withdrawal symptoms in either or both species. Such treatment could include social support, substitutes and anxiolytic drugs for separation anxiety.

Conditions of registration: Animals used as facilitators in psychiatry should be prescribed by a qualified therapist and a veterinarian should certify the animal for suitability and health.

Identification: Any suitable animal as described under Composition.

Presentation: Any suitable animal as described under Composition.

Storage instructions: Animal facilities should meet the needs of the particular animal. This information can be gained from a veterinarian. It is important to be careful when new animals are obtained. Obtain exact information on the animal's family traits, socialisation history and the reasons why it is available for therapy.

Registration number: Breeding records.

Name and business of the application: Obtain animals from approved sources.

The layout and sections have been taken from a medicine information leaflet, and are exactly the same as they appear on the leaflet. Adaptations could also be made for specific animals and different programmes. If this information is compared to many other medicines on the market, such a presentation seems to be quite appropriate. Animals in psychiatry are placed under Schedule 4 because these should be prescribed by a psychiatrist and the animals should be under the supervision of and selected by a veterinarian. The classification numbers are for amphetamines, endorphins and oxytocin.

It is clear that, like drugs, animals may not be the only suitable treatment to obtain the same effect. Hart²⁸⁹ referred to a study where a comparison was made between animals used for therapy and other attention. The researcher compared the behaviour of nursing home residents under three different visiting conditions; no visit, human visitors, and human and dog visitors. The last types of the visiting programmes were equally effective at increasing alertness and smiling for many nursing home residents, whereas the group with no visit did not show any improvement. Visiting with a dog may, however, be more rewarding for the visitor, given the social lubricant effect of the animal. In cases where human contact is limited, animals can play a therapeutic role by giving attention on their own.

9.6 Discussion

Although the belief²⁹⁰ that animals are beneficial to health is generally growing, the medical profession is still cautious to get involved in this field on a broad spectrum. During an award presentation by the Delta Society, USA, Dr Katcher (a psychiatrist) received the Michael McCulloch Award (another psychiatrist). In Katcher's address he honoured another psychiatrist, Dr Boris Levinson. This all appears to be very positive, but unfortunately it seems that not many psychiatrists are prepared to become known for the applied use of animals in therapy.

However, many may already use animals without publishing results and that may be another problem. It was pointed out that Levinson's publications were cited only 55 times between 1962 and 1972. In the Science Citation Index for the period between 1970 and 1993, 89 citations were found from 45 authors to the five publications of Levinson and one of Friedmann and co-workers. About one-third came from veterinary literature and another third from the psychological and psychiatric literature.²⁹¹

The two main reasons why animals are not used and studied more by psychiatrists are a lack of knowledge and a lack of acceptance of the concept of animals in hospitals. Animal-facilitated psychotherapy is not yet part of the mainstream curricula for psychiatrists and this means that this approach is unknown to most psychiatrists. There may also be a psychological resistance against the use of animals in psychiatric institutions. The "idea" is a contradiction with the standard regulations for a sterile, clinical approach. There may also be a feeling that animals as lesser species are not acceptable as adjuncts in human therapy. However, if one considers that the medical profession is experimenting with organ transplants from animal tissue, there should be no reason for not using animals in other ways. Many animal-related research eventually helps humans to regain their health and most of the pharmacological medicines are tested on animals before being used on humans. This includes drugs for psychiatric conditions. It seems that, if the existing human-animal connection is considered, the application of animals in psychiatry is a small step to take in making such an approach acceptable.

In a textbook written for students to prepare themselves for the membership examination of the Royal College of Psychiatrists, Weller and Eysenck²⁹² pointed out that numerous scientific disciplines underpin and inform the practice of psychiatry. They stated:

"The purpose of this book is to present a concise survey of the principal contributions made by these disciplines. Within so vast a field of study the aim has been to emphasize care concepts and interconnections".²⁹²

They noticed that clinical psychology had taken two paths, namely psychometric testing and personal therapy, using both behavioural and psychotherapeutic procedures. Practising psychiatrists could also learn from this. In the chapter "Changing Frontiers" they said that, like the homeostatic processes in the body, the activities of the brain can be compared to the operation of a complex feedback system.²⁹² Such a system actually makes provision for a physiological and psychological needs system, including *attentionis egens*.

Under the heading "Social interaction", it was confirmed that poor integration of the individual in society and anomic social cohesion are conducive to illness. Furthermore, it was also compared to the social life of animals as described by Nobel prize winner and ethologist Konrad Lorenz, indicating a common need among humans and animals. These social factors can alter perceptions and moods and behaviour is modified by a host of subtle indications given unconsciously in a number of non-verbal ways, including autonomic changes.²⁹²

What is notable in this textbook is a chapter on "Ethology".²⁹³ Although no mention is made of animal-facilitated psychotherapy (or any of the other terms used for this therapy), the study of animal behaviour is seen as an integral part of the curriculum in psychiatry. Ethology is defined by the authors as the biological study of behavioural processes, often social, that are not explained by "learning theory". This allows an interpretation that the unlearned behaviour could be basic physiological and psychological needs (or species-specific behaviour) because the term "instinct" has fallen into decline in certain circles. Although the phenomenon of human-animal interaction was not described,

it was indicated that ethological models had been used to understand human behaviour and that psychotropic drug research relied on strategies for modifying animal behaviour. A few examples of parallel behaviours were also mentioned, viz the imprinting effects of maternal deprivation, displacement activities as seen in repetitive behaviour, social hierarchies and releasers of behaviour.

In their concluding remarks, the authors said that it is now recognised that humans are social organisms within the family, and in the wider society, operating in a social order with a system of social signals "in alignment with other animals". Ethology has contributed to this change in attitudes and emphasised particular avenues of therapeutic approach in psychiatric care. The importance of detailed attention to the therapeutic environment is increasingly being recognised:

"Unfulfilled needs may exaggerate maladaptive behaviour rather than reduce it, and patients may be helped by efforts to reduce motivation and techniques of behavioural modification. Ethology is a fascinating field of study, which until recently, has been relatively neglected by psychiatrists, but which, in time, should prove a fruitful source of new ways of understanding and helping our patients".²⁹³

These positive predictions, which were made in the publication of 1992, are coming close to fulfilment with this study. The only outstanding step by psychiatrists who saw the connection between Ethology and Psychiatry was to apply the knowledge on an interspecies level. This is where animals can fulfil social (attention) needs and help the patients.

The famous physicist Carl Sagan²⁹⁴ said that science is a way of thinking much more than it is a body of knowledge. Archimedes, recognized as one of the top three mathematicians in the history of man, disclosed in his Method that his mind proceeded towards

CHAPTER 10

SUMMARY AND EVALUATION OF STUDY

10.1 Introduction

This chapter will summarize the objectives stated for this study, evaluate the study in terms of the contribution it made, present some self-criticism, indicate further research following on this study and make some recommendations based on the findings of the study.

10.2 Summary of objectives

In terms of the objectives set for this study, the following section will indicate how the objectives were met.

10.2.1 Existing interaction theories in personology

The objective was to illuminate the importance of positive human-human interaction in personology. By using an elective approach, positive interaction was valued in the 16 theories studied, as an integral part of the psychological, emotional, social and cultural needs of all individuals. The latter part of the chapter explained how modern science recognizes studies on complexity such as interaction between biological entities to be part of mainstream science. It means that science should open up to less positivistic approaches if scientists want to include all of reality. It is not a matter of either a positivistic approach or other approaches, but seemingly "unmeasurable" realities should be used to compliment traditional measurements. The aim is to find a balance between dogma and dynamics.

10.2.2 Human-animal interaction in human-human context

The objective of this chapter was to indicate that the need for attention is a basic need and that many of the therapeutic

advantages claimed from human-animal interaction, are actually based on such a need. It was also indicated that positive interaction between man and animal is two-directional and has a mutual beneficial effects. Lastly, it was also explained why some people are not involved with animals. If the same theoretical basis is found between human and animal as what is applicable to human-human positive interaction, then interaction theories in personology can be extended to human-animal interaction where the animal fulfils a substitute or additional social function. The term used to describe the basic need for positive attention is *attentionis egens* and this need can be fulfilled by either human or companion animal.

10.2.3 Current status of animal-facilitated psychotherapy

The object was to reflect the scope of scientific literature on the use of animals in psychiatry. This was achieved by reporting the current status of reports in a chronological order and a separate review on the status in South Africa. Although there is evidence that animals were used in psychiatry ages ago, literature over the past three to four decades indicated that the use of animals in psychiatry were not abundantly reported. However, some surveys could serve as indicators that a much wider use of animals in psychotherapy occurs than that is revealed in scientific literature.

10.2.4 Determining a physiological basis for positive interaction

The object was to formulate a physiological framework for positive human-animal interaction, based on human-human and animal-animal interaction. Interaction physiology is a relatively new research field. A physiological basis for positive intra- and interspecies animal interaction or affiliation could thus provide measurable parameters to link interaction theories. Such basis does not only pave the way for an encompassing theory on interaction behaviour, but could also provide a rationale for animal-facilitated psychotherapy.

10.2.5 **Methodology to investigate a physiological basis for human-animal interaction**

The object was to design and implement a methodology which could reveal the same physiological basis for human-animal interaction as for human-human and animal-animal interaction. The parameters chosen were β -phenylethylamine, oxytocin, prolactin, cortisol, norepinephrine, dopamine and β -endorphin. The choice of these parameters were based on existing information on human-human and animal-animal interaction studied. The indication when to collect blood for plasma level chemical analyses was a superficially determined physiological change, namely a decrease in blood pressure. A state of anxiety questionnaire was used to determine the participant's emotional feeling on the day that the positive human-animal experiment took place. Controls were baseline values, dog owners versus people interacting with unfamiliar dogs and dog interaction versus quiet book reading.

10.2.6 **Results of experimental procedures**

Snyder²⁹⁷ said that in science one never "proves" a theory. After initial experiments provided data suggesting a particular hypothesis, further experiments should be conducted to test such a hypothesis. Results of the study are such "initial experiments" and the door is opened for further tests. However, the results of this research support to a great extent the theoretical framework which it was supposed to confirm. Even if this study is seen as more descriptive or explanatory of nature than cause and effect, it served its purpose and it also supports the hypothesis as stated in the Introduction.

10.2.7 **Evaluating existing human-animal interaction theories**

The object was to evaluate existing inclusive theories on human-animal interaction and determine whether these theories could be reconciled to this study. This investigation supported the idea

that the theory used for this study, terminology included, is rather accommodating than opposing to other theories. Although this theory is not claimed to be a final "one-unified-theory", it meets the criteria to propose a rationale for animal-facilitated psychotherapy by linking existing theories and providing a physiological basis for such a rationale.

10.2.8 Applications of human-animal theory in animal-facilitated psychotherapy

Bloom and Lazerson²⁰⁹ said that:

"The behaviour disorders that lie beyond our present knowledge represent as much our failure to understand the biology of the cognitive and emotional operations of the brain as they do our inability to characterize the mechanisms underlying its disorders".²⁰⁹

Although this study dealt with the physiology of healthy adults, such understanding can be the rationale for clinical work. By using this rationale of fulfilling *attentionis egens*, the object of this chapter was indicating how it should be applied in psychiatry. For the first time, animals in therapy were described in a similar format used for medicinal therapies. The conditions and preconditions for the application of human-animal theories in psychiatry made it possible for theory and practice to merge into a useful therapeutic approach.

10.3 Evaluation of study in terms of its contributions

The main contributions of this study are as follows:

10.3.1 Converging a wide spectrum of interaction literature

This study brought together what belongs together with regard to interaction literature. This is done on an intra- and interspecies basis.

10.3.2 Interspecies physiological indicators of positive interaction

For the first time, neurotransmitters were used as indicators of interspecies' positive interaction. In this process baseline values for neurotransmitter plasma levels in dogs were also determined for the first time.

10.3.3 Rationale for animal-facilitated psychotherapy

Based on the *attentionis enges* theory and physiological support for that, a specific rationale for the use of animals in psychotherapy is proposed.

10.4 Self-criticism of the study

The following criticism can be considered:

10.4.1 Elective approach

The elective approach in theory formation may not be acceptable to everybody. However, the aim was to form a metatheory which include most of the existing theories on interaction. It would be very difficult to propose a completely new theory for an age-old phenomenon such as human-animal interaction which has already been described many times in many ways, and which is studied in depth since the eighties. The approach was rather to find the necessary links between the existing interaction information in order to compile an inclusive theory which could bring human-human, animal-animal and human-animal theories closer together.

10.4.2 The comprehensive role of animals

This study proposed a specific rationale for the use of animals in psychotherapy, but it did not address the complete role which animals may play in people's lives. It may be possible to fine-

tune the use of animals by using the theory of this study partially, or other rationales could be added. This contribution is merely one premise for psychiatrists when they consider the use of animals in therapy.

10.4.3 **Sample size**

Although the sample may be large enough for a biological phenomenon which occurs consistently in humans and animals, it is true that there could be a great variety of manifestations on a continuum for any basic need. The practical execution of the experiment was, however, difficult. To coordinate people, dogs, blood collectors, facilities and apparatus, the laboratory and the researcher repeatedly on specific times and at the same place, were no easy task. It was also necessary to complete the study in the shortest period of time to minimize variables. A larger sample size, according to the experience of this study, would possibly be constrained by logistical factors and finances.

10.4.4 **Questionnaire**

The state of anxiety questionnaire was not a standardized instrument and it probably discriminate insufficiently. However, it served its purpose as indicator of feeling during this specific experiment.

10.4.5 **Clinical studies**

The rationale has not been applied in clinical studies yet, because such practical applications fall outside the scope of this study. It should be evaluated by qualified psychiatrists.

10.5 **Further research**

The following research may generate from this study:

10.5.1 **Biochemistry of interspecies interaction**

The role of biochemicals, especially the neurotransmitters and hormones, is only in the initial stages of investigation. In the light of improving technical abilities, it may come easier to study and measure biochemicals during interaction. The specific role of biochemicals on an interspecies basis is still a wide open field for further research.

10.5.2 **Drug development**

As often happened in the past, biochemistry could be mimicked by laboratory work. The use of specific neurotransmitters in the treatment of interaction disorders is a possibility which is at this stage only under speculation.

10.5.3 **Theory to therapy**

Research regarding the rationale of this study in psychiatry, should be tested in clinical cases. This can only be done by qualified therapists in real-life situations. Field trials instead of laboratory environment is thus suggested for such investigations.

10.6 **Recommendations**

The following recommendations can be made from this study:

10.6.1 **Education**

Animal-facilitated psychotherapy should become a commonly accepted approach in psychiatry. This can only happen when it becomes part of the formal training of psychiatrists. The current lack of information in this field can be seen as the greatest obstacle in the implementation of this therapy. Such knowledge will not only explain the proper use of animals in therapy, but it will also clear scepticism and misconceptions regarding the therapy. The physiological basis for such therapy makes it

possible to teach animal-facilitated psychotherapy as mainstream medicine.

10.6.2 Multidisciplinary approach

In times when there is a widely recognized sensitivity towards the use of animals for the benefit of humans, it is important to ensure the welfare and well-being of the animals involved. An advantage of the theory proposed in this study is that it is based on mutual emotional benefit for humans and the animals. It is recommended that programmes which involved animals, should include veterinary selection of and care for the animals.

10.6.3 Planned programmes

Animal-facilitated therapy should not be considered unless it is well-planned and structured. Apart from a lack of knowledge, poorly planned programmes is the other main reason why programmes could fail. A motto of "plan before therapy" is true for animal-facilitated therapy as is true for any other therapeutic approach.

10.6.4 Clinical application of the rationale

The rationale for the use of animals, as proposed in this study, should be applied in psychiatry. Following a new trend, without having a rationale for therapy in place, is unacceptable in medical science. It is thus strongly recommended to use physiological parameters as a specific rationale for the use of animals for psychiatric patients who are diagnosed with *attentionis egens* needs.

10.7 Conclusion

This study came a long way since Katcher²⁹⁸ declared in 1985 that data is lacking on the physiologic responses of companion animal-human interaction. Animal-facilitated psychotherapy may

have a tentative beginning in psychiatry, but there is little doubt that this therapeutic approach can grow in recognition and application in the years to come. The reason is that human-animal interaction is a common natural phenomenon of which more and more scientific understanding is gained. If the conditions and preconditions are met, animal-facilitated psychotherapy can take its rightful place along with any other therapeutic regimes in psychiatry. The physiological basis altered the approach to animal-facilitated psychotherapy from "magic" to "medicine".

In terms of the hypothesis stated in chapter 1, this study indicated that physiological parameters can support a theoretical basis for animal-facilitated psychotherapy and in doing so, provides a rationale for the use of animals in psychotherapy.

"All the normal functions of the healthy brain and the disorders of the diseased brain, no matter how complex, are ultimately explainable in terms of basic structural components of the brain and their function".²⁰⁹

9. O'Connell, D.M. The dog as co-therapist. *Manuscript*, 1994.
10. Meyer WF. Paraculogie. In: Meyer WF, Moore C, Vapori HO, Eds. *Paraculie: Histories van Freud tot Frank*. 2nd Ed. 1980: Lexicon Publishers, 1983:3-8.

REFERENCES

1. Odendaal JSJ. 'n Historiese perspektief op mens-dierinteraksies as studieveld. Tydskrif van die Suid-Afrikaanse Veterinêre Vereniging. 1989; 60(3):169-172
2. Vermeulen H, Odendaal JSJ. A proposed typology of animal abuse. Anthrozoös. 1993; 6(4):248-252
3. Levinson BM. The dog as co-therapist. Mental Hygiene. 1962:46-59
4. Levinson BM. A special technique in child psychotherapy. Mental Hygiene. 1964; 48:243
5. Levinson BM. Pet psychotherapy: use of household pets in the treatment of behavior disorders in children. Psychological Reports. 1965; 17:695
6. Rowan AN, Beck AM. The Health Benefits of Human-Animal Interaction. Anthrozoös. 1994; 7(2):85-89,87
7. Rowan AN. The Psychiatric Connection. Anthrozoös. 1994; 7(4):222-223
8. Rowan AN. Medical Disinterest in Human-Animal Bond Research? Anthrozoös. 1995; 8(3):130-131
9. Odendaal JSJ. Die rol van die geselskapsdier in die moderne gemeenskap, met spesiale verwysing na die betrokkenheid van die veearts. [Doctoral thesis]. Pretoria: University of Pretoria; 1988:63-129
10. Meyer WF. Personologie. In: Meyer WF, Moore C, Viljoen HG. Editors. Persoonlikheidsteorieë van Freud tot Frankl 2nd Ed. Isando: Lexicon Publishers, 1990:3-9

11. Baron EA, Byrne D. Social Psychology - understanding human nature. 6th Ed. Boston: Allyn Bacon, 1991
12. Schaefer RT, Lamm RP. Sociology. 4th Ed. New York: McGraw-Hill Inc, 1992
13. Davis K. The sociology of prostitution. American Sociological Review. 1937: October 2:744-755
14. Agger B. Do books write authors? A study of disciplinary legemony. Teaching Sociology. 1989: July 17:365-369
15. Henslin J. Editor. Down to Earth Sociology. New York: Free Press, 1972
16. Van Leeuwen MS. The Person in Psychology. Michigan: Wm B Eerdmans Publishing Company, 1985
17. Jordaan J, Jordaan J. Mens in Konteks. 2nd Ed. Isando: Lexicon Uitgewers, 1989
18. Meyer WF, Moore C, Viljoen HG. Editors. Persoonlikheidsteorieë - van Freud tot Frankl. 2nd Ed. Isando: Lexicon Uitgewers, 1990
19. Adler A. Individual Psychology. In: Murchison C. Editor. Psychologists of 1930. Worcester MA: Clark University Press, 1930
20. Ansbacher HL, Ansbacher RR. Editors. The individual psychology of Alfred Adler: A systemic presentation in selections from his writings. New York: Basic Books, 1956
21. Allport GW. The person in psychology: Selected essays. Boston: Beacon, 1968
22. Allport GW. A unique and open system. In: Sills DL. Editor. International Encyclopedia of the Social Sciences, Volume 12. New York: MacMillan, 1968

23. Allport GW. Personality: A psychological interpretation. New York: Holt, 1937
24. Allport GW. Pattern and growth in personality. New York: Holt, Rinehart & Wilston, 1961
25. Allport GW. Becoming: Basic considerations for a psychology of personality. New Haven CT: Yale University Press, 1955
26. Horney K. Neurosis and human growth. New York: Norton, 1950
27. Horney K. The neurotic personality of our time. New York: Norton, 1937
28. Horney K. Our inner conflicts: A constructive theory of neurosis. New York: Norton, 1945
29. Fromm E. Man for himself: A enquiry into the psychology of ethics. London: Routledge & Kegan Paul, 1947
30. Fromm E. The sane society. London: Routledge & Kegan Paul, 1956:2,5,30,32
31. Sullivan HS. The interpersonal theory of psychiatry. London: Tavistock, 1953
32. Erikson EH. Identity: Youth and crisis. New York: Norton, 1968:224
33. Erikson EH. Childhood and society. 2nd Ed. New York: Norton, 1963
34. Dollard NE, Miller J. Personality and Psychotherapy: An analysis in terms of learning, thinking and culture. New York: McGraw-Hill, 1950:1,3,230
35. Louw DA. Menslike Ontwikkeling. 2nd Ed. Pretoria: HAUM, 1990

36. Pervin LA. *Personality: Theory and Research*. 4th Ed. New York: Wiley, 1984
37. Meyer WF. Die sosiale leerteorie van Bandura en andere. In: Meyer WF, Moore C, Viljoen HG. Editors. *Persoonlikheidsteorieë van Freud tot Frankl* 2nd Ed. Isando: Lexicon Publishers, 1990:233-256
38. Bandura A. *Social learning theory*. Englewood Cliffs NJ: Prentice-Hall, 1977
39. Murray HA. *Explorations in personality: A clinical and experimental study of fifty men of college age*. New York: Oxford Science Editions, 1938:121,123-124
40. Kluckhohn C, Murray HA. *Personality formation: The determinants*. In: Kluckhohn, Murray HA, Schneider DM. 2nd Ed. New York: Knopf, 1967:53
41. Maslow AH. *Motivation and Personality*. 2nd Ed. New York: Harper, 1970
42. Van Staden FJ. From crowding to density: conceptual developments, methods and research. *South African Journal of Psychology* 13:128-134
43. Moore C. Die self-konsep-teorie van Carl Rogers. In: Meyer FW, Moore C, Viljoen HG. Editors. *Persoonlikheidsteorieë van Freud tot Frankl* 2nd Ed. Isando: Lexicon Uitgewers, 1990:395-420
44. Kelly GA. *A theory of personality: The psychology of personal constructs*. New York: Norton, 1963
45. Frankl VE. *The doctor and the soul: psychotherapy to logotherapy*. New York: Knopf, 1965:x-xi
46. Frankl VE. *Man's search for meaning: An introduction to logotherapy*. Boston: Beacon, 1959:51

47. Frankl VE. The will to meaning: Foundations and applications of logotherapy. New York: World Publishing, 1967:43,162
48. Lewin K. Field theory in social sciences. New York: Harper, 1951
49. Aronstam A. Die individu en sy wêreld - K Lewin. In: Du Toit SI, Aronstam A, Erasmus JAK, Grobler E, Van Vuuren R. Editors. Cape Town: Academia, 1986:152-169
50. Perls FS, Hefferline RF, Goodman P. Gestalt Therapy. New York: Dell, 1973:7,31
51. Perls FS. The Gestalt approach and eye witness to therapy. New York: Bantam, 1951
52. Kruger D. An introduction to Phenomenological Psychology. Cape Town: Juta & Co Ltd, 1988:33
53. Odendaal JSJ. Die veearts in praktyk: 'n Sisteemteoretiese perspektief. [Doctoral thesis]. Pretoria; University of Pretoria, 1995:14-34
54. Capra F. The turning point - science, society and the rising culture. Glasgow: William Collins, Sons & Co Ltd, 1982:34,142,316
55. Timasheff NS. Sociological Theory - Its nature and growth. 3rd Ed. New York: Random House, 1967
56. Zohar D, Marshall I. The Quantum Society - mind, physics and a new social mission. London: Harper Collins Publishers, 1994
57. Davies P. The Cosmic Blueprint. London: Penguin Books, 1995:-95,189
58. Appleyard B. Understanding the Present - science and the soul of modern man. London: Pan Books Ltd, 1993:249

59. Lewontin RC. The doctrine of DNA - biology as ideology. London: Penguin Books, 1993:109
60. Fraser AF. Animal Affiliations. *Anthrozoös*. 1987; 1(2):73-75
61. Grier JW, Burk T. *Biology of Animal Behavior*. 2nd Ed. St Louis: Mosby Year Book, 1992:392
62. Cohen J, Stewart I. The Collapse of Chaos - discovering simplicity in a complex world. London: Penguin Books, 1994:349-350,435
63. Odendaal JSJ, Weyers A. 'n Kultuurvergelykende studie oor mens-tot-geselskapsdierverhoudings. *South African Journal of Sociology*. 1990; 21(1):21-30
64. Serpell J. *In the Company of Animals - a study of human-animal relationships*. Oxford: Basil Blackwell, 1986
65. Markowitz A. *This is your Dog*. Johannesburg: Caxton Publishers, 1978
66. Wright M, Walters S. *The Book of the Cat*. London: Pan Books Ltd, 1980
67. Davis SJM, Valla FR. Evidence for domestication of the dog 12 000 years ago in the Natufian of Israel. *Nature*. 1978; 276:608-610
68. Odendaal JSJ. Fundamentele gedragsspatrone in die rehabilitasierol van geselskapsdiere. *Rehabilitation in South Africa*. 1990; 34(2):145-151
69. Andryscio RM. A study of ethologic and therapeutic factors of pet-facilitated therapy in a retirement-nursing community. [Doctoral thesis]. Ohio; Ohio State University. 1982
70. Katcher AH. Interaction between people and their pets: form and function. In: Fogle B. Editor. *Interrelations between People and Pets*. Illinois: Charles C Thomas, 1981:41-67

71. Katcher AH, Friedmann E, Beck AM, Lynch J. Looking, talking and blood pressure: the physiological consequences of interactions with the living environment. In: Katcher AH, Beck AM. Editors. *New Perspectives on our Lives with Companion Animals*. Philadelphia: University of Pennsylvania Press, 1983:351-362
72. Long L. *Pets are wonderful companions*. Chicago: Pets are Wonderful Council, 1985:1-13
73. Hutton JS. A study of companion animals in foster families: perceptions of therapeutic values. In: *The Human-pet Relationship*. Vienna: IEMT, 1986:64-70
74. Lorenz KZ. *King Solomon's Ring*. London: Methuen & Co Ltd; 1952
75. Bergin BM. Companion animals for the handicapped. In: Arkow P. Editor. *Dynamic Relationships in Practice: animals in helping professions*. Alameda: Latham Foundation, 1984:191-207
76. Bergler R. *Man and his dog: psychology of a relationship*. Boston: Abstracts of the Delta Society Conference, 1986:1-18
77. Lee DR. Pet therapy - helping patients through troubled times. *Californian Veterinarian*. 1983; 5:24-25,40
78. Levinson BM. *Pet-orientated Child Psychotherapy*. Illinois: Charles C Thomas, 1972
79. Laufer RS, Wolfe M. Privacy as a concept and a social issue: A multi-dimensional development theory. *Journal of Social Issues*. 1977; 33:22-42
80. Levinson BM. The pet and the child's bereavement. *Mental Hygiene*. 1967; 51:197-200
81. Levinson BM. *Pets and environment*. In: Anderson RS. Editor. *Pet Animals and Society*. London: Ballière Tindal, 1975:8-18

82. Beck AM, Katcher AH. Between Pets and People - the importance of animal companionship. New York: GP Putnam's Sons, 1983:59-77,157-186,186
83. Cain AO. A study of pets in the family system. In: Katcher AH, Beck AM. Editors. New Perspectives on our Lives with Companion Animals. Philadelphia: University of Pennsylvania Press, 1983:72-81
84. Lewis RE. Profile of clients. Australian Veterinary Practitioner. 1980; 10:175-176
85. Voith VL. Attachment of people to companion animals. Veterinary Clinics of North America: Small Animal Practice. 1985; 15(2):289-295
86. Levinson BM. Household pets in residential schools. Mental Hygiene. 1968; 52:411-414
87. Corson SA, Corson EO. Pets as mediators of therapy. In: Maserun JH. Editor. Current Psychiatric Therapies. New York, 1979:195-205
88. Corson SA, Corson EO. Pet animals as non-verbal communication mediators in psychotherapy in institutional settings. In: Corson SA, Corson EO. Editors. Ethology and Non-verbal Communication in Mental Health. Oxford: Pergamon Press, 1980:83-110
89. Cusack O, Smith E. Pets and the Elderly - the therapeutic bond. New York: The Haworth Press, 1984:13-16
90. Messent PR. Pets as social facilitators. Veterinary Clinics of North America: Small Animal Practice. 1985; 15(2):387-393
91. Odendaal JSJ, Osterhoff DR. eienaar-hond-verhoudings - 'n dekade later. Journal of the South African Veterinary Association. 1988; 59(3):145-148

92. Odendaal JSJ, Scheepers E, Nel R. Interaksie tussen veearts, kliënt en pasiënt. *Journal of the South African Veterinary Association*. 1989; 60(1):15-19
93. Corson SA. Pet-facilitated psychotherapy. Lecture to the Human-Animal Contact Study Group. Bloemfontein: University of the Orange Free State; 1985
94. McCulloch MJ. Pets in therapeutic programmes for the aged. In: Anderson RK, Hart BL, Hart LA. Editors. *The Pet Connection - its influence on our Health and Quality of Life*. Minneapolis: University of Minnesota, 1984:30-37
95. Odendaal JSJ, Weyers A. Human-companion animal relationships in the veterinary consulting room. *Journal of the South African Veterinary Association*. 1990; 61(1):14-23
96. Hart LA. Therapeutic riding: assessing human versus horse effects. *Anthrozoös*. 1992; 5(3):138-139
97. Van Dyk E, Odendaal JSJ, Botha L. Horse riding for the cerebral palsy - a case report. *Companion*. 1994; 11(3):8-17
98. Gläser WG. Reality therapy. *Current Psychiatric Therapies*. 1972; 12:58-61
99. Arkow P. *Dynamic Relationships in Practice: animals in helping professions*. Alameda: Latham Foundation, 1984:217-284,309-318
100. Hutton JS. Social workers act like animals in their case-work relations. *Supplement to Society for Companion Animal Studies Newsletter*. 1982:1-4
101. Lago DJ, Connel CM, Knight B. The effects of animal companionship on older persons living at home. In: *The Human-Pet Relationship*. Vienna: IEMT, 1986:34-39

102. Bergesen FJ. The effects of pet-facilitated therapy on the self-esteem and socialization of primary school children. [Masters dissertation]. Johannesburg: University of the Witwatersrand, 1989
103. McCrindle CME. A Veterinary perspective on the use of animals in preschool education. [Doctoral thesis]. Pretoria: University of Pretoria, 1995
104. Cass J. Pet-facilitated therapy in human health care. In: Fogle B. Editor. *Interrelations Between People and Pets*. Illinois: Charles C Thomas, 1981:124-145
105. Burch MR, Bustad LK, Duncan SL, Fredrickson M, Tebay J. The role of pets in therapeutic programmes. In: Robinson I. Editor. *The Waltham Book of Human-Animal Interaction: benefits and responsibilities of pet ownership*. Oxford: Pergamon, 1995:55-69
106. Delta Society. *Pet partners: helping animals help people with animal-assisted activities workshop manual*. Washington: Delta Society, 1992
107. Bustad LK, Hines L. Historical Perspectives of the Human-Animal Bond. In: Anderson RK, Hart BL, Hart LA. Editors. *The Pet Connotation - its influence on our health and quality of life*. Minneapolis: University of Minnesota, 1984:15-29
108. Levinson BM. *Pets and Human Development*. Illinois: Charles C Thomas, 1972
109. Corson SA, Corson EO, Gragmore D, Arnold C. Pet dogs as non-verbal communication links in hospital psychiatry. *Comprehensive Psychiatry*. 1977; 18:61-72
110. Corson SA, Corson EO, Gwynne PH. Pet-facilitated psychotherapy. In Anderson RS. Editor. *Pet Animals and Society*. London: Ballière Tindal, 1975:19-26

111. Anderson RS. Editor. *Pet Animals and Society*. London: Ballière Tindal, 1975:155
112. Katcher AH. *How Pets Aid Health*. Health and Medical Horizons 1984 Yearbook. New York: MacMillan Education Company, 1984:49
113. Beck AM, Seraydarin L, Hunter GF. Use of animals in the rehabilitation of psychiatric inpatients. *Psychological Reports*. 1986, 58(1):63-66
114. Fogle B. *Interrelations Between People and Pets*. Illinois: Charles C Thomas, 1981
115. Van Leeuwen J. A child psychiatrist's perspective on children and their companion animals. In: Fogle B. Editor. *Interrelations Between People and Pets*. Illinois: Charles C Thomas, 1981:175-194
116. Fogle B. *Pets and their People*. London: Collins Harvill, 1987:191-215
117. Katcher AH, Beck AM. *New Perspectives on our Lives with Companion Animals*. Philadelphia: University of Pennsylvania Press, 1983
118. Anderson RK, Hart BL, Hart LA. Editors. *The Pet Connection - its influence on our health and quality of life*. Minneapolis: University of Minnesota, 1984
119. Ruckert J. *The Four-Footed Therapist - how your pet help solve your problems*. Berkeley: Ten Speed Press, 1987
120. Cusack O. *Pets and Mental Health*. New York: The Haworth Press Inc, 1988

121. Allen LD, Burdon, RD. The clinical significance of pets in a psychiatric community residence. *American Journal of Social Psychiatry*. 1982; 2(4):41-43
122. Draper RJ, Gerber GJ, Layng EM. Defining the role of pet animals in psychotherapy. *Psychiatric Journal of the University of Ottawa*. 1990; 15(3):169-172
123. Nielsen JA, Delude LA. Pets as adjunct therapists in a residence for former psychiatric patients. *Anthrozoös*. 1994; 7(3):166-171,166
124. Walsh PG, Mertin PG, Verlander DF, Pollard CF. The effects of a "pets as therapy" dog on persons with dementia in a psychiatric ward. *Australian Occupational Therapy Journal*. 1995; 42(4):161-166
125. Banman JK. Animal-assisted therapy with adolescents in a psychiatric facility. *Journal of Pastoral Care*. 1995; 49(3):274-278
126. Voelker R. Puppy love can be therapeutic, too. *Journal of the American Medical Association*. 1995; 274(24):1897-1899,1898
127. Zisselman MH, Rovner BW, Shmuelly Y, Ferrie P. A pet therapy intervention with geriatric psychiatric inpatients. *American Journal of Occupational Therapy*. 1996; 50(1):47-51
128. Robinson I. Editor. *The Waltham Book of Human-Animal Interaction: benefits and responsibilities of pet ownership*. Oxford: Pergamon, 1995
129. Burch MR. Animal-assisted therapy and crack babies: a new frontier. Washington: Pet Partners Newsletter, 1991
130. Bernard S. *Animal Assisted Therapy - a guide for Health Care Professionals and Volunteers*. Tyler: Tyler Press, 1995

131. Wilson CC, Turner DC. Companion Animals in Human Health. Sage Publication Inc. Thrasads Oaks, California, 1998:310
132. Beck AM, Katcher AH. A new look at pet-facilitated therapy. Journal of the American Veterinary Medical Association. 1984; 184(4):414-421
133. Rice SS, Brown L, Caldwell H. Animals and psychotherapy: a survey. Journal of Community Psychology. 1973; 1(3):323-326
134. Wolff E. A survey of the use of animals in psychotherapy in the United States. In: Allen KM. The Human-Animal Bond - An Annotated Bibliography. Metuchen: The Scarecrow Press Inc, 1985:101
135. Blackshaw JK, Crowley P. A survey to determine the presence and claimed therapeutic use of pets in selected institutions. Australian Veterinary Practitioner. 1991; 21(1):11-13
136. Hughes MH. The use of animal-assisted therapy within the occupational therapy profession. In: Anderson DC. Editor. The Interactions Bibliography. 1995; 6(12):5
137. Hume L. Animal facilitated therapy. Computer data: RehabNet. 1997
138. Kruger D. Die rol van troeteldiere in post-traumatiese terapie. Companion, 1994; 11(4):4-5
139. Department of Occupational Therapy. 'n Ondersoek na die terapeutiese effek van geselskapsdiere op psigiatryes-gestremde persone in die Eersterust gemeenskap. Companion. 1994; 11(4):9-16
140. Nel PW. Diere as hulpterapeute in die konsultasiekamer. Companion. 1994; 11(4):33-38
141. Van Heerden M. Die implementeringsproses van 'n geselskapsdier-program binne inrigtingsverband. Companion. 1997; 14(1):7-9

142. De Jager HC. Die invloed van troeteldiere op die gedrag van geïnstusionaliseerde verstandelik-gestremde persone. [Masters degree dissertation]. Potchefstroom: University of Potchefstroom for Christian Higher Education, 1989
143. Beck AM, Meyers NM. Health Enhancement and Companion Animal Ownership. Annual Review of Public Health. 1996; 17:247-257
144. Trauer T. Coping with Stress - how to relieve tension for a healthier life. Cape Town: Tafelberg Publishers, 1990:75
145. Wright R. The Evolution of Despair. Time International. 1995; 146(9):49
146. Friedman E. The role of pets in enhancing human well-being: physiological effects. In: Robinson I. Editor. The Waltham Book of Human-Animal Interaction: benefits and responsibilities of pet ownership. Oxford: Pergamon, 1995:33-53,39
147. Barba E. A critical review of research on the human-companion animal relationship: 1988 to 1993. Anthrozoös. 1995; 8(1):9-15
148. Serpell JA. Evidence for long term effects of pet ownership on human health. In: Burger IH. Editor. Pets, benefits and practice. Harrogate: Waltham Symposium No 20, 1990:1
149. Wilson CC. The pet as an anxiolytic intervention. The Journal of Nervous and Mental Disease. 1991; 179:482-489
150. Anderson WP, Reid CM, Jennings GL. Pet ownership and risk factors for cardiovascular disease. The Medical Journal of Australia. 1992; 157 (September 7):298-301
151. Patronek GJ, Glickman LT. Pet ownership protects against the risks and consequences of coronary heart disease. Medical Hypotheses. 1993; 40:245-249,245

152. Walsh A. *The Science of Love: Understanding Love and its Effects on Mind and Body*. New York: Prometheus Books, 1991:16,188
153. Liebowitz MR. *The Chemistry of Love*. Boston: Little, Brown & Co Ltd, 1983:61,127
154. Barret SP. *Pet Therapy*. Internet: APIC ICP listserver, 1996; (October 1):1
155. Kaplan HS. *Disorders of sexual desire: and other concepts and techniques in sex therapy*. New York: Brunner/Mazel, 1979
156. Hatfield E, Rapson RL. *Love, Sex and Intimacy: Their Psychology, Biology and History*. New York: Harper Collins College Publishers, 1993
157. Guyton AC. *Basic Neuroscience - Anatomy and Physiology*. Philadelphia: WB Saunders Co, 1991:88-97
158. Fisher HE. *Anatomy of Love - a natural history of adultery, monogamy and divorce*. London: Simon & Schuster Ltd, 1992
159. Overall KL. *Clinical Behavioural Medicine for Small Animals*. St Louis: Mosby, 1997:297-300
160. Landsberg G, Hunthausen W, Ackerman L. *Handbook of Behaviour Problems of the dog and cat*. Oxford: Butterworth Heineman, 1997:49-51
161. Sabelli HC, Carlson-Sabelli L, Javaid JI. *The thermodynamics of bipolarity: a bifurcation model of bipolar illness and bipolar character and its psychotherapeutic applications*. *Psychiatry*. 1990; 53:346-348

162. Bekkedal MYC, Panksepp J. Prolactin and modulation of social processes in domestic chicks. In: Carter CS, Lederhendler II, Kirkpatrick B. Editors. *The Integrative Neurobiology of Affiliation*. New York: The New York Academy of Sciences Annals, Vol 807, 1997: 472-474
163. Carter CS, Altemus M. Integrative functions of lactational hormones in social behavior and stress management. In: Carter CS, Lederhendler II, Kirkpatrick B. Editors. *The Integrative Neurobiology of Affiliation*. New York: The New York Academy of Sciences Annals, Vol 807, 1997:164-174
164. Gingrich BS, Huot RL, Wang Z, Insel TR. Differential fos expression following micro-injection of oxytocin or vasopressin in the prairie vole brain. In: Carter CS, Lederhendler II, Kirkpatrick B. Editors. *The Integrative Neurobiology of Affiliation*. New York: The New York Academy of Sciences Annals, Vol 807, 1997:504-505
165. Ritters LV, Panksepp J. Effects of vasotocin on aggressive behavior in male Japanese quail. In: Carter CS, Lederhendler II, Kirkpatrick B. Editors. *The Integrative Neurobiology of Affiliation*. New York: The New York Academy of Sciences Annals, Vol 807, 1997:478-480
166. Urnäs-Moberg K. Physiological and endocrine effects of social contact. In: Carter CS, Lederhendler II, Kirkpatrick B. Editors. *The Integrative Neurobiology of Affiliation*. New York: The New York Academy of Sciences Annals, Vol 807, 1997:146-163
167. Angier N. Oxytocin, the Happiness Hormone. *International Herald Tribute*. 1991; (January 24):8
168. Witt DM, Winslow JT, Insel TR. Enhanced social interactions in rats following chronic, centrally infused oxytocin. *Pharmacological Biochemistry in Behavior*. 1992; 43:855-886

169. Carter CS, de Vries AC, Taymans SE, Roberts RL, Williams JR, Getz LL. Peptides, Steroids and pair bonding. In: Carter CS, Lederhendler II, Kirkpatrick B. Editors. *The Integrative Neurobiology of Affiliation*. New York: The New York Academy of Sciences Annals, Vol 807, 1997:260-272
170. Hebb DO. The motivating effects of exteroceptive stimulation. *American Psychologist*. 1958:13
171. Bexton WH, Heron W, Scott TH. Effects of decreased variation in the sensory environment. *Canadian Journal of Psychology*. 1954:8
172. Greenough WT, Wood WE, Madden TC. Possible memory storage differences among mice reared in environments varying in complexity. *Behavior and Biology*. 1972; 7:17-22
173. Carter CS, Lederhendler II, Kirkpatrick B. Editors. *The Integrative Neurobiology Affiliation*. New York: The New York Academy of Sciences Annals, Vol 807, 1997:xiii-xviii
174. Murray DW. Towards a Science of Desire. *The Sciences*. 1995; (July/August):44-49,47
175. Dane FC. *Research Methods*. Pacific Grove: Brooks/Cole Publishing Co, 1990
176. Spielberger CD, Gorsuch RL, Lushene R et al. *Manual for the State - Trait Anxiety Inventory*. Palo Alto. 1983
177. Yeates SV, Odendaal JSJ. Human-dog interaction: an interspecies evaluation of blood pressure changes as possibilities of stress release. Abstracts 225: 3rd Congress of the International Society for Pathophysiology, Lathi, Finland. 23 June - 3 July 1998
178. Bodey AR, Young LE, Bartnam DH, Mitchell AR. A comparison of direct and indirect (opscillometric) measurement of arterial blood pressure in anaesthetised dogs, using tail and limb cuffs. *Research in Veterinary Science*, Vol 54, 1996:265-269

179. Coulter DB, Kath JC. Blood pressure obtained by indirect measurement in conscious dogs. *Journal of the American Veterinary Medical Association*, Vol 184(1), 1984:375-1378
180. Bodey AR, Mitchell AL. Epidemiological study of blood pressure in domestic dogs. *Journal of Small Animal Practice*, Vol 37, 1996:116-125
181. Lehmann SMC, De Beer WHJ. High-Performance Liquid Chromatographic Analysis with Diode-Array Detection of Bradykinin, Neuropeptide K, and Substance P in Human Plasma. *Journal of Chromatographic Science*, Vol 36, 1998:306-310
182. Huebert ND, Schwach V, Richter G, Zreika M, Hinze C, Haegele KD. The measurement of β -phenylethylamine in human plasma and rat brain. *Analytical Biochemistry*. 1994; 221:42-47
183. Mabuchi H, Nakahashi H. Systematic separation of medium-sized biologically active peptides by high-performance liquid chromatography. *Journal of Chromatography*. 1981; 213:275-286
184. Feldman JA, Cohn ML, Blair D. Neuroendocrine peptides - analysis by reversed phase high performance liquid chromatography. *Journal of Liquid Chromatography*. 1978; 1(6):833-848
185. Lin J-H, Chiang B-H. A modified procedure for caseinophosphopeptide analysis. *Journal of Chromatographic Science*. 1996; 34:358-362
186. Hearn MTW, Bishop CA, Hancock WS, Harding DRK, Reynolds GD. Application of reversed phase high performance liquid chromatography in solid phase peptide synthesis. *Journal of Liquid Chromatography*. 1979; 2(1):1-21
187. Reynolds EC, Riley PF, Adamson NJ. A selective precipitation purification procedure for multiple phosphoserine-containing peptides and methods for their identification. *Analytical Biochemistry*. 1994; 217:277-284

188. Regnier FE, Gooding KM. High-performance liquid chromatography of proteins. *Analytical Biochemistry*. 1980; 103:1-6
189. Compton BJ, Kreilgaard C. Chromatographic analysis of therapeutic proteins. *Analytical Chemistry*. 1994; 66(23):1175-1178
190. Yoshida T. Peptide separation in normal phase liquid chromatography. *Analytical Chemistry*. 1997; 69(15):3038-3041
191. Desiderio DM, Stein JL, Cunningham MD, Sabbatini JZ. High-performance liquid chromatography and field desorption mass spectrometry of hypothalamic oligopeptides. *Journal of Chromatography*. 1980; 195:369-377
192. Yamaki S, Isobe T, Okuyama T, Shinoda T. High-performance liquid chromatography of peptides on a microspherical carbon column. *Journal of Chromatography*. 1996; 729:143-153
193. Theodorsson-Norheim E, Norheim I, Öberg K, Brodin E, Lundberg JM, Tatemoto K, Lindgren PG. Neuropeptide K: A major tachykinin in plasma and tumour tissue from carcinoid patients. *Biochemical and Biophysical Research Communications*. 1985; 131(1):77-83
194. Schöneich C, Hühmer AFR, Rabel SR, Stobaugh JF, Jois SDS, Larive CK et al. Separation and analysis of peptides and proteins. *Analytical Chemistry*. 1995; 67(12):155-177
195. Steyn AGW, Smit CF, Du Toit SHC, Strasheim C. *Modern Statistics in Practice*. J L van Schaik, Pretoria. 1994:589-594
196. SAS. *Statistical Analysing System Introductory Guide*. 3rd Edition. Carry NC. SAS Institute Inc, 1985
197. BMDP Statistical Software Inc. USA. 1993

198. Yamada S, Hirano M, Nishi S, Inokuchi T, Uchimura H. Temperament traits associated with platelet monoamine oxidase activity and plasma 2-phenylethylamine in healthy volunteers. *Biogenic Amines*, Vol 10(4), 1994:295-302
199. Milgram NW, Ivy GO, Murphy MP, Head E, Wu PH, Ruehl WW, Yu PH, Durden DA, Davis BA, Boulton AA. Effects of chronic oral administration of *l*-deprenyl in the dog. *Pharmacology Biochemistry and Behaviour*, Vol 51(2/3), 1995:421-428
200. Barroso N, Rodriguez M. Action of β -phenylethylamine and related amines on nigrostriatal dopamine neurotransmission. *European Journal of Pharmacology*, Vol 297, 1996:195-203
201. Fontana F, Bernardi P, Pick EM, Boschi S, De lasio R, Spampinato S, Grossi G. Opioid peptide modulation of circulatory and endocrine response to mental stress in humans. *Peptides*, Vol 18(2), 1997:169-175
202. Holden RJ, Pakula IS, Mooney PA. A neuroimmunological model of schizophrenia and major depression: a review. *Human Psychopharmacology*, Vol 12, 1997:177-201
203. Adden RJ, Pakula IS, Mooney PA. A neuroimmunological model of antisocial and borderline personality disorders. *Human Psychopharmacology* Vol 12, 1997:291-308
204. Lategan AJ, Odendaal JSJ, Du Plooy WJ, Modipane A. The therapeutic value of positive human-animal interaction: the role of β -phenylethylamine. *South African Journal of Science*, Vol 94(9), 1998:1
205. Brown AG. *Nerve Cells and Nervous Systems - an introduction to neuroscience*. Springer-Verlag, London. 1991
206. Masson G, Mestre D, Blin O. Dopaminergic modulation of visual sensitivity in man. *Fundamental & Clinical Pharmacology*, Vol 7(8), 1993:449-63

207. Berne RM, Levy MN. *Physiology*. 4th Ed. Mosby, St Louis, 1998
208. Mitchell JB, Gratton A. Involvement of mesolimbic dopamine neurons in sexual behaviours: implications for the neurobiology of motivation. *Reviews in the Neurosciences*, Vol 5(4), 1994:317-29
209. Bloom FE, Lazerson A. *Brain, Mind and Behaviour*. 2nd Edition. New York, W H Freeman and Company. 1988
210. Brown RE. *An Introduction to Neuroendocrinology*. Cambridge University Press, Cambridge. 1994
211. Keverne EB, Nevison CM, Martel FL. Early learning and the social bond. In: Carter CS, Lederhendler II, Kirkpatrick B. Editors. *The Integrative Neurobiology of Affiliation*. New York: The New York Academy of Sciences Annals, Vol 807, 1997:335-337
212. Esler M. Clinical applications of noradrenaline spillover methodology: delineation of regional human sympathetic nervous responses. *Pharmacology & Toxicology*, Vol 73(5), 1994:243-253
213. Meyer BJ, Meij HS, Meyer AC. *Human physiology: chemical, physical and physiological principles*. 2nd Ed. Kenwyn-Juta, Pretoria, 1997
214. Potter WZ, Manji HK. Catecholamines in depression: and update. *Clinical Chemistry* Vol 40(2), 1994:279-287
215. Modney BK, Hatton GI. Maternal behaviors: evidence that they feed back to alter brain morphology and function. *Acta Paediatrica Supplement*, Vol 397, 1994:29-32
216. Nicholson HD, Pickering BT. Oxytocin, a male intragonadal hormone. *Regulatory Peptides*, Vol 47(1-2), 1993:253-256
217. De Wied D, Diamant M, Fodor M. Central nervous system effects of the neurohypophyseal hormones and related peptides. *Frontiers in Neuroendocrinology*, Vol 14(4), 1993:251-301

218. Purves D, Augustine GJ, Fitzpatrick D, Katz LC, La Manta A-S, McNamara JO. Neuroscience. Sinauer Associates Inc. Sunderland, MA. 1997
219. Witt DM. Regulatory mechanisms of oxytocin-mediated socialsexual behaviour. In: Carter CS, Lederhendler II, Kirkpatrick B. Editors. The Integrative Neurobiology of Affiliation. New York: The New York Academy of Sciences Annals, Vol 807, 1997:287-301
220. Costello LC, Franklin RB. Effects of prolactin on the prostate. Prostate, Vol 24(3), 1994:162-166
221. Reber PM. Prolactin and immunomodulation. American Journal of Medicine, Vol 95(6), 1993:6337-6344
222. Hooghe R, Delhase M, Vergani P, Malur A, Hooghe-Peters EL. Growth hormone and prolactin are paracrine growth and differentiation factors in the haemopoetic system. Immunology Today, Vol 15(1), 1994:39
223. Sobrinho LG. The psychogenic effects of prolactin. Acta Endocrinologia, Vol 129(Supplement 1), 1993:38-40
224. Reimers TJ, Lawler DF, Sutaria PM, Correa MT, Erb HN. Effects of age, sex and body size on serum concentrations of thyroid and adrenocortical hormones in dogs. American Journal of Veterinary Research, Vol 51(3), 1990:454-457
225. Sigma. Biochemicals and Reagents for Life Science Research. Sigma-Aldrich Co, Johannesburg. 1998:1161
226. Shapiro AK, Shapiro E. The Powerful Placebo. The Johns Hopkins University Press, London. 1997
227. Uvnäs-Moberg K. Antistress pattern induced by oxytocin. News Physiological Science, Vol 13(2), 1998:22-26

228. Davis BA. Biogenic amines and their metabolites in body fluids of normal, psychiatric and neurological subjects. *Journal of Chromatography*, Vol 466, 1989:89-218
229. Le Doux J. *The Emotional Brain - the mysterious underpinnings of emotional life*. New York: Touchstone Book, 1998
230. Sluckin W, Herbert M. *Parental Behaviour*. Oxford: Basil Blackwell, 1986
231. Poresky RH. Companion Animals and other factors affecting young children's development. *Anthrozoös*. 1996; 9(4):159-168
232. Bowlby J. *Attachment and Loss, Vol 1. Attachment*. London: Hogarth, 1969
233. Mendoza SP, Mason WA. Attachment relationships in new world primates. In: Carter CS, Lederhendler II, Kirkpatrick B. Editors. *The Integrative Neurobiology of Affiliation*. New York: The New York Academy of Sciences Annals, Vol 807, 1997:203-209
234. Stallones L, Johnson TP, Garrity TF, Marx MB. Quality of attachment to companion animals among US adults 21-64 years of age. *Anthrozoös*. 1990; 3(3):171-183
235. Stern M. Psychological elements of attachment to pets and responses to pet loss. *Journal of the American Veterinary Medical Association*. 1996; 209(10):1707-1711
236. Messent PR, Serpell JA. An historical and biological view of the pet-owner bond. In: Fogle. Editor. *Interrelations between People and Pets*. Illinois: Charles Thomas, 1981:5-22
237. Fox MW. *Between Animal and Man*. Malbar: Robert E Krieger Publishing Company, 1986:221
238. Endenburg N, t'Hart H, Bouw J. Motives for acquiring companion animals. *Journal of Economic Psychology*. 1994; 15:191-206

239. Belk RW. Metaphoric relationships with pets. *Society and Animals*. 1996; 4(2):121-145
240. Cameron P, Mattson, M. Psychological correlates of pet ownership. *Psychological Reports*. 1972; 30:286
241. Wilson CC, Netting FE. New directions: challenges for human-animal bond research and the elderly. *Journal of Applied Gerontology*. 1987; 7(2):51-57
242. Fogle B. The Human-Pet Relationship: our link to nature. Address at the IEMT Conference: Animals and Us. Vienna: University of Veterinary Medicine, 1992; (September 2):4
243. Kidd AH, Kidd RM. Seeking a theory of the human-companion animal bond. *Anthrozoös*. 1987; 1(3):145,153-157
244. Brickel CM. Pet-facilitated psychotherapy: a theoretical explanation via attention shifts. *Psychological Reports*. 1982; 50:71-74
245. Herzog HA, Burghardt GM. Are we ready for a theory of human-animal relations? *Anthrozoös*. 1987; 1(3):145-146
246. Lawrence EA. Those who dislike pets. *Anthrozoös*. 1987; 1(3):147-148
247. Messent PR. Problems with an encompassing theory. *Anthrozoös*. 1987; 1(3):149-150
248. Rollin BE. Scientism and the human-animal bond. *Anthrozoös*. 1987; 1(3):150-152
249. Serpell J. In defence of ethology. *Anthrozoös*. 1987; 1(3):152-153
250. Case DB. Dog ownership: a complex web? *Psychological Reports*. 1987; 60:247-257

251. Bergler R. Man and Dog - the psychology of a relationship. Oxford: Blackwell Scientific Publications, 1988:67-93
252. Bergler R. Man and Cat - the benefits of cat ownership. Oxford: Blackwell Scientific Publications, 1989:12-19
253. Odendaal JSJ. Die rol van die veearts tydens die verlies van 'n geselskapsdier. Journal of the South African Veterinary Association. 1986; 57(3):145-149
254. Doi T. The concept of "amae". Psychiatrie de L'Enfant. 1991; 34(1):227-284
255. Hills AM. The motivational bases of attitudes towards animals. Society and Animals. 1993; 1(2):111-127
256. Wilson CC. A conceptual framework for human-animal interaction research: the challenge revisited. Anthrozoös. 1994; 7(1):4-12
257. Allen K. A conceptual framework for human-animal bond research: the challenge revisited. Anthrozoös. 1994; 7(1):12-14
258. Lago D. Conceptual framework for human-animal bond research: a commentary. Anthrozoös. 1994; 7(1):14-18
259. Marx MB. Utilize what we know. Anthrozoös. 1994; 7(1):18-19
260. Melson GF. Reflections on a quality of life model for assessing impact of pets on humans. Anthrozoös. 1994; 7(1):19-21
261. Barofsky I. Conceptualizing Quality of Life: how do companion animals fit? Geneva: Abstracts of the 7th International Conference on Human-Animal Interaction, 1995; (September 6):1
262. Katcher AH. Tools for resolving contradictions in our knowledge about companion animals: space, context, behavior and biophilia. Geneva: Abstracts of the 7th International Conference on Human-Animal Interaction, 1995; (September 6):16-17

263. Bradshaw JWS. Social interactions between animals and people - a new biological framework. Geneva: Abstracts of the 7th International Conference on Human-Animal Interaction, 1995; (September 6):2-6
264. Montagner H. The theoretical basis for the human-animal bond. Geneva: Abstracts of the 7th International Conference on Human-Animal Interaction, 1995; (September 6):112-113
265. Costall A. Psychology and the pet owners. Newsletter of the International Society for Anthrozoology. 1996; 12:2-4
266. Cameron DB. Canine attention addiction. Newsletter of the American Veterinary Society of Animal Behavior. 1997; 19(2):9
267. Wilson CC. Human-animal interactions, social exchange theory, and caregivers: a different approach. Abstracts: 8th International Conference on Human-Animal Interaction, Prague, Czech Republic, 10-12 September 1998:93
268. Naisbitt J. Megatrends - ten new directions transforming our lives. London: Macdonald & Co, 1984:39
269. MIMS Desk Reference. Monthly Index of Medical Specialities Desk Reference. Pretoria: Times Media. 1997; Vol 32:26a-43a
270. Schantz PM. Preventing potential health hazards incidental to the use of pets in therapy. Anthrozoös. 1990; 4(1):14-22,22
271. Waltner-Toews D. Zoonotic disease concerns in animal-assisted therapy and animal visitation programs. Canadian Veterinary Journal. 1993; 34(9):549-551
272. McCrindle CME. A veterinary perspective on the use of animals in preschool education. PhD thesis, University of Pretoria, 1995:52-96

273. Stryler-Gordon R, Beal N, Anderson RK. Facts and fiction: health risks associated with pets in nursing homes. *People-Animals-Environment*. 1986; 4:8
274. Budge RC, Spicer J, Jones B, St George R. Health correlates of compatibility and attachment in human-companion animal relationships. *Society and Animals*. 1998; 6(3):219-234
275. Quackenbush J. The death of a pet: how it can affect owners. *Veterinary Clinics of North America: Small Animal Practice*. 1985; 15(2):395-402
276. Kay WJ, Nieburg HA, Kutscher AH, Gray RM, Fudin CE. *Pet Loss and Human Bereavement*. Iowa: Iowa State University Press, 1984
277. Wilson CC, Netting FE, New JC. The pet attitude inventory. *Anthrozoös*. 1987; 1(2):76-84
278. Johnson TP, Garrity TF, Stallones L. Psychometric evaluation of the Lexington Attachment to Pets Scale (LAPS). *Anthrozoös*. 1992; 5(3):160-175
279. Fidler M, Light P, Costall A. Describing dog behavior psychologically: pet owners versus non-owners. *Anthrozoös*. 1996; 9(4):196-200
280. Grandia T. *Genetics and the behaviour of domestic animals*. New York: Academic Press, 1988:67-111 and 299-318
281. Horvath M. The 75th birthday of Samuel A Corson. *Activitatis Nervosae Superioris*. 1985; 27(2):167
282. Heath S. Over bonding: problems of over-dependence. *Veterinary Times*. 1994; November:15
283. Barnett JC, Quigley J. Animals in long-term care facilities: a framework for program planning. *Journal of Long-term Care Administration*. 1984; 12(4):1-8

284. Delta Society. Standards of practice for animal-assisted activities and therapy. Washington: The Delta Society. 1996
285. Kirkpatrick B. Affiliation and neuropsychiatric disorders: the deficit syndrome of schizophrenia. In: Carter CS, Lederhendler II, Kirkpatrick B. Editors. The Integrative Neurobiology of Affiliation. New York: The New York Academy of Sciences Annals, Vol 807, 1997:455-468
286. Kupfer DJ, Frank, E. Role of psychosocial factors in the onset of major depression. In: Carter CS, Lederhendler II, Kirkpatrick B. Editors. The Integrative Neurobiology of Affiliation. New York: The New York Academy of Sciences Annals, Vol 807, 1997:429-439
287. Grossman JB, Carter A, Volkmar FR. Social behavior in autism. In: Carter CS, Lederhendler II, Kirkpatrick B. Editors. The Integrative Neurobiology of Affiliation. New York: The New York Academy of Sciences Annals, Vol 807, 1997:440-454
288. Brummett BH, Williams RBJ. Hostility and risk disease. Current opinion in psychiatry. 1998; 11(6):607-613
289. Hart LA. Dogs as human companions: a review of the relationship. In: Serpell A. Editor. The Domestic Dog - its evolution, behaviour and interaction with people. Cambridge: Cambridge University Press, 1995:170-171
290. Burger IH. Editor. Pets, benefits and practice. Harrogate: British Veterinary Association Publications, 1990
291. Rowan AN. Do companion animals provide a health benefit? Anthrozoös. 1991; 4(4):212-213
292. Weller MPI, Eyseneck MW. Editors. The Scientific Basis of Psychiatry. 2nd Ed. London: WB Saunders Company Ltd, 1992

293. Weller M, Priest RG. Ethology. In: Weller MPI, Eyseneck MW. Editors. The Scientific Basis of Psychiatry. 2nd Ed. London: WB Saunders Company Ltd, 1992:443-459,459
294. Sagan C. Broca's Brain - reflections on the romance of science. New York: Ballantine Books, 1990:15
295. Strathern P. Archimedes and the Fulcrum. London: Arrow Books Ltd, 1998:7,61
296. Davies P. About Time - Einstein's unfinished revolution. New York: Simon & Schuster, 1996:51,92,93
297. Snyder SH. Drugs and the Brain. New York: Scientific American Library, 1998
298. Katcher AH. Physiologic and Behavioral Responses to Companion Animals. Veterinary Clinics of North America: Small Animal Practice, Vol 15(2), 1985:403-410

UNITS FOR BLOOD PRESSURE AND CHEMICALS

ADDENDUM A: RAW DATA

The following units were used for animal blood pressure and the different chemicals:

MAP mmHg = Mean arterial blood pressure in millimetres mercury

PAA pg/l = Phenylethanolamine, metabolite of prazosin, in picogram per litre

DDP pg/l = Dopamine in picogram per litre

END pmol/l = Beta-endorphin in picomol per litre

NE pg/l = Norepinephrine in picogram per litre

OXO ng/l = Oxytocin in nanogram per litre

PRU ng/l = Prolactin in nanogram per litre

COR nmol/l = Cortisol in nanomol per litre

UNITS FOR BLOOD PRESSURE AND CHEMICALS

The following abbreviations were used for units of blood pressure and the different biochemicals:

MAP mmHg = Mean arterial blood pressure in millimeter mercury

PAA pg/ℓ = Phenylacetic acid, metabolite of phenylethylamine
in picogram per litre

DOP pg/ℓ = Dopamine in picogram per litre

END pmol/ℓ = Beta-endorphin in picomol per litre

NEP pg/ℓ = Norepinephrine in picogram per litre

OXT ng/ℓ = Oxytocin in nanogram per litre

PRO ng/ℓ = Prolactin in nanogram per litre

COR nmol/ℓ = Cortisol in nanomol per litre

Humans and own dogs

Humans and unfamiliar dogs

OBS	NOMMER	VRAELYS	TYD	MAP	SP	DP	PEA	DOP	NA	OKS	PROL	END	COT	WANNEER
1	1	2	0	99.0	140.0	74.0	124	86	274	0.8	18.6	0.4	280	1
2	1	2	10	98.4	133.6	76.2	137	110	276	3.7	29.6	11.3	261	2
3	2	3	0	81.4	113.2	78.4	124	92	268	1.2	13.8	1.3	168	1
4	2	3	15	69.2	99.4	61.2	122	108	241	3.8	19.8	13.8	160	2
5	3	1	0	96.2	139.6	69.2	123	82	278	1.5	15.1	0.2	485	1
6	3	1	8	91.8	129.8	60.8	144	96	237	3.1	20.3	3.1	433	2
7	4	2	0	98.6	120.8	76.4	119	94	271	4.3	7.8	3.3	602	1
8	4	2	9	80.6	101.6	62.8	143	108	252	7.8	11.4	4.8	600	2
9	5	3	0	96.8	117.6	79.0	121	88	274	2.7	3.7	0.8	194	1
10	5	2	6	87.6	105.4	68.4	148	109	271	4.7	8.8	9.3	182	2
11	6	2	0	103.2	139.0	70.8	125	82	275	3.2	10.1	1.1	278	1
12	6	3	18	84.4	114.4	65.2	146	106	263	4.4	16.7	2.9	267	2
13	7	3	0	75.2	106.8	56.0	127	85	270	2.8	7.8	3.1	372	1
14	7	3	12	78.6	99.4	57.6	145	110	267	3.9	10.8	6.7	374	2
15	8	4	0	93.2	112.2	80.2	121	87	264	1.1	11.3	2.0	418	1
16	8	3	14	86.2	105.2	74.0	141	99	258	4.3	13.3	5.4	404	2
17	9	4	0	89.2	130.6	67.0	122	95	256	4.3	12.3	10.3	561	1
18	9	4	15	84.5	118.8	59.8	141	111	274	8.8	11.8	16.5	552	2

Humans and unfamiliar dogs

OBS	NOMMER	VRAELYS	TYD	MAP	SP	DP	PEA	DOP	NA	OKS	PROL	END	COT	WANNEER
1	1	3	0	86.0	112.0	66.8	126	82	272	6.1	7.8	1.4	167	1
2	1	3	5	86.2	112.2	69.0	158	115	268	5.3	14.2	2.3	154	2
3	2	3	0	111.8	149.4	92.2	125	89	266	3.6	14.6	9.6	215	1
4	2	3	9	94.8	126.8	68.4	128	110	268	4.9	19.3	13.6	221	2
5	3	3	0	74.8	93.4	57.2	127	88	268	0.7	18.9	13.7	248	1
6	3	2	14	66.2	97.8	47.6	161	99	249	3.1	21.7	17.8	232	2
7	4	3	0	84.4	125.8	60.4	124	81	276	1.8	3.2	4.8	160	1
8	4	3	17	78.6	111.8	54.8	146	112	228	4.4	4.7	8.4	141	2
9	5	3	0	64.4	94.0	45.6	126	81	273	2.4	2.9	6.6	381	1
10	5	2	24	58.4	80.4	42.0	141	103	278	3.7	8.5	7.7	364	2
11	6	3	0	100.2	132.4	81.4	123	86	261	3.6	8.3	8.3	608	1
12	6	3	18	92.6	124.4	65.0	143	101	264	3.8	9.4	10.2	520	2
13	7	2	0	69.8	98.2	49.0	118	83	272	1.9	3.8	6.7	354	1
14	7	2	23	57.4	89.4	41.4	153	98	273	4.2	10.1	10.8	351	2
15	8	4	0	79.6	112.6	57.2	117	94	263	0.8	10.1	1.6	389	1
16	8	4	19	87.8	117.0	65.4	129	106	270	1.7	9.2	0.9	377	2
17	9	2	0	79.4	130.0	60.0	121	87	275	0.9	4.7	3.2	193	1
18	9	2	9	73.8	110.0	54.2	138	104	271	2.3	5.1	5.6	175	2

Unfamiliar dog and humans

Own dogs and humans

OBS	NOMMER	VRAELYS	TYD	MAP	SP	DP	PEA	DOP	NA	OKS	PROL	END	COT	WANNEER
1	1	.	0	82.2	118.4	60.4	67	38	156	0.4	68	0.8	218	1
2	1	.	17	70.6	89.6	57.2	92	63	168	0.8	74	4.1	211	2
3	2	.	0	77.4	111.8	57.8	52	31	206	0.1	57	1.1	718	1
4	2	.	19	78.4	115.6	59.8	93	58	191	0.3	68	4.7	521	2
5	3	.	0	89.2	119.0	64.2	61	42	168	0.4	62	3.0	281	1
6	3	.	8	82.6	107.4	61.4	87	61	141	0.7	60	4.1	273	2
7	4	.	0	106.2	114.4	96.6	63	32	192	0.1	28	1.7	365	1
8	4	.	5	78.8	108.0	63.4	98	61	201	1.2	31	2.8	663	2
9	5	.	0	100.2	139.0	80.2	48	38	198	0.8	27	0.9	342	1
10	5	.	15	90.8	130.0	73.6	91	62	168	1.4	22	2.9	419	2
11	6	.	0	90.0	135.0	68.0	60	40	215	0.7	55	2.7	286	1
12	6	.	12	84.0	119.0	65.0	85	58	195	1.2	64	3.9	266	2
13	7	.	0	66.2	91.6	53.6	57	29	167	1.1	61	1.7	330	1
14	7	.	5	111.3	134.5	100.0	103	62	169	1.8	69	2.3	321	2
15	8	.	0	92.0	124.6	65.8	44	50	221	1.3	19	0.3	191	1
16	8	.	7	91.6	130.6	62.6	77	58	215	1.9	23	1.7	180	2
17	9	.	0	72.2	103.2	59.2	55	41	181	0.3	21	0.4	240	1
18	9	.	15	68.6	99.6	54.6	93	60	168	0.9	31	2.1	233	2

Unfamiliar dog and humans

OBS	NOMMER	VRAELYS	TYD	MAP	SP	DP	PEA	DOP	NA	OKS	PROL	END	COT	WANNEER
1	1	.	0	98.6	133.4	81.2	48	31	176	0.0	52	0.0	488	1
2	1	.	16	94.4	123.2	71.0	97	42	166	0.4	54	1.8	521	2
3	2	.	0	128.2	166.6	99.8	52	38	216	0.0	21	1.8	614	1
4	2	.	5	111.8	151.2	82.2	91	61	201	0.3	29	2.3	603	2
5	3	.	0	80.4	125.0	63.4	49	37	199	0.1	68	0.4	356	1
6	3	.	11	85.8	118.2	64.2	87	58	174	0.8	74	1.1	349	2
7	4	.	0	116.8	155.2	88.6	54	28	210	0.0	63	0.5	443	1
8	4	.	9	110.8	152.0	86.6	88	61	173	0.2	69	1.4	441	2
9	5	.	0	73.4	81.8	63.6	63	28	186	0.3	19	1.3	452	1
10	5	.	23	64.0	95.0	48.3	92	55	163	0.2	18	1.7	449	2
11	6	.	0	113.6	168.0	95.0	61	31	178	0.0	17	1.6	391	1
12	6	.	21	89.6	74.4	74.4	107	47	182	0.0	15	3.8	413	2
13	7	.	0	86.2	100.4	52.2	38	33	161	0.0	49	0.9	368	1
14	7	.	14	75.8	106.4	60.0	79	61	171	0.1	47	3.1	342	2
15	8	.	0	113.6	137.8	84.2	64	41	189	0.0	13	2.0	621	1
16	8	.	22	94.0	125.2	76.2	97	64	161	0.0	12	11.6	606	2
17	9	.	0	121.2	156.2	95.6	47	32	163	0.0	23	4.7	709	1
18	9	.	11	112.0	149.8	90.2	86	57	165	0.0	25	9.8	693	2

Humans reading

OBS	NOMMER	VRAELYS	TYD	MAP	SP	DP	PEA	DOP	NA	OKS	PROL	END	COT	WANNEER
1	1	.	0	80.6	117.8	63.0	118	88	271	2.3	14.7	1.3	431	1
2	1	.	10	79.2	113.8	58.6	124	107	268	3.0	14.3	4.4	391	2
3	2	.	0	86.8	109.4	64.0	121	92	278	3.8	16.8	2.8	137	1
4	2	.	4	79.2	106.4	63.6	126	111	266	3.4	17.1	5.2	139	2
5	3	.	0	98.8	131.2	74.4	129	84	241	0.9	15.0	13.1	335	1
6	3	.	7	100.0	128.0	74.6	128	119	248	1.2	15.4	14.9	311	2
7	4	.	0	76.4	108.8	52.2	123	82	239	4.0	10.1	12.4	166	1
8	4	.	5	72.0	103.8	49.2	128	94	228	4.8	11.0	12.9	164	2
9	5	.	0	89.4	137.0	62.6	128	92	278	1.8	4.3	10.9	291	1
10	5	.	8	85.4	128.8	57.4	123	113	268	1.8	4.6	12.8	280	2
11	6	.	0	84.0	111.8	61.2	122	94	274	1.7	14.6	6.6	440	1
12	6	.	7	72.0	99.4	54.4	122	110	271	2.3	14.8	6.5	427	2
13	7	.	0	85.6	129.0	56.6	124	87	277	2.1	7.5	2.0	190	1
14	7	.	10	72.0	115.6	47.6	128	113	269	2.9	8.6	3.4	187	2
15	8	.	0	86.6	106.0	69.0	124	96	274	4.3	8.4	1.8	429	1
16	8	.	10	77.6	99.6	59.0	121	107	273	4.2	9.3	3.7	407	2
17	9	.	0	100.0	136.0	77.0	122	82	277	0.9	13.7	8.6	566	1
18	9	.	7	88.4	126.0	68.0	163	114	271	1.7	14.0	10.1	546	2
19	10	.	0	68.0	100.2	50.2	123	81	267	4.2	7.7	1.3	363	1
20	10	.	8	66.4	95.2	48.2	159	92	251	3.9	9.3	1.8	357	2
21	11	.	0	96.2	131.8	74.2	123	91	272	1.1	17.6	3.7	441	1
22	11	.	7	88.4	117.2	71.4	145	108	258	1.9	18.6	4.5	440	2
23	12	.	0	73.8	116.2	52.2	119	86	253	2.7	12.3	4.7	160	1
24	12	.	9	77.2	106.6	56.2	136	98	267	3.8	11.9	5.6	141	2
25	13	.	0	91.2	118.2	69.4	125	84	266	2.9	4.1	0.9	143	1
26	13	.	9	73.0	103.6	55.8	148	103	256	3.3	5.2	1.3	141	2
27	14	.	0	85.8	122.8	66.0	126	88	274	1.3	4.9	11.1	177	1
28	14	.	9	79.0	108.8	61.0	157	110	272	1.6	5.6	12.7	164	2
29	15	.	0	78.0	103.2	58.6	117	81	251	2.9	13.8	1.9	344	1
30	15	.	7	71.6	96.6	96.8	161	98	265	2.3	14.8	3.2	308	2
31	16	.	0	88.4	125.2	68.6	124	93	252	2.8	10.3	3.6	604	1
32	16	.	8	77.6	98.4	62.6	144	108	253	3.1	9.9	4.9	541	2
33	17	.	0	78.4	106.2	57.8	119	96	265	0.9	2.2	4.1	330	1
34	17	.	9	93.0	110.2	73.2	143	107	258	0.8	3.0	5.4	335	2
35	18	.	0	75.0	110.8	55.6	123	89	273	3.3	9.6	3.3	240	1
36	18	.	8	71.0	102.0	57.6	157	106	269	4.7	9.3	5.1	228	2

ADDENDUM B: LETTERS OF CONSENT IDENTIFIC TRAIL

I have been advised that the trial was explained to me by a veterinarian. I agree that my dog may participate in the trial and that the following samples may be collected from my dog.

✓ Venous blood by venipuncture of the cephalic vein

OWNER NAME

DATE

VET-PHYSICIAN

DATE

LETTER OF CONSENT TO USE MY DOG IN A SCIENTIFIC TRIAL

I herewith declare the trial was explained to me by a veterinarian. I agree that my dog may participate in the trial and that the following samples may be collected from my dog.

- Venous blood by venipuncture of the cephalic vein.

CLIENT NAME

CLIENT SIGNATURE

VETERINARIAN

DATE

PROJECT LEADER

ADDENDUM C: ETHICAL QUESTIONNAIRE

LETTER OF CONSENT TO PARTICIPATE IN A SCIENTIFIC TRIAL

I _____ hereby give consent for the proposed procedure to be performed on me as part of the research project/Some physiological parameters as an evaluation of the effect of positive human-dog interaction.

Prof Odendaal has given me a full explanation of the probable advantages and possible dangers inherent in the procedure described below.

- The procedure consists of: Intravenous blood collection with a vacu-tube and the measurement of blood pressure.

It will be executed by a qualified nurse.

My consent is freely given on the understanding that it may be withdrawn at any time.

SIGNATURE

DATE

PROJECT LEADER

ADDENDUM C: BILINGUAL QUESTIONNAIRE

Matters to be considered	1	2	3	4	5
1. General life situation in general					
2. Family life					
3. Your present and future relations with your partner (if you have a relationship)					
4. Your future and the future of your relations with your partner					
5. Your external environment, such as your work situation, your living conditions, etc.					
6. The future of your country					
7. Your health					
8. Your financial situation (if you have a job)					
9. Your social life					
10. Your religious and moral beliefs					
11. Your political views					

RAELIYU

Matters to be considered	1	2	3	4	5
1. General life situation in general					
2. Family life					
3. Your present and future relations with your partner (if you have a relationship)					
4. Your future and the future of your relations with your partner					
5. Your external environment, such as your work situation, your living conditions, etc.					
6. The future of your country					
7. Your health					
8. Your financial situation (if you have a job)					
9. Your social life					
10. Your religious and moral beliefs					
11. Your political views					

QUESTIONNAIRE

Indicate your level of anxiety about the following matters by ticking a ✓ on a scale of 1 to 5. One means no anxiety, two means a slight feeling of anxiety, three means a neutral feeling, four means a feeling of anxiety and five a feeling of high anxiety. The questionnaire will be handed in anonymously and will take no longer than 10 minutes to complete.

Matters to be considered	1	2	3	4	5
Your current life situation in general					
Your future life					
Your close relatives or friends with whom you have a relationship					
Their future and the future of these relationships					
Your external environment, such as your work situation (not at home)					
The future of your country					
Your health					
The current level of crime (your safety)					
Financial prospects					
Global ecological problems such as global warming, ozone layer, pollution					

VRAELYS

Dui die vlak van angstigheid wat u oor die volgende sake voel aan deur met 'n ✓ te merk op 'n skaal van 1 tot 5. Een beteken geen angstigheid, twee beteken 'n effense gevoel van angstigheid, drie beteken neutrale gevoel, vier beteken 'n gevoel van angstigheid en vyf beteken 'n gevoel van hoë angstigheid. Dit sal nie langer as 10 minute neem om die vraelys te voltooi nie en dit word anoniem ingehandig.

Sake om te oorweeg	1	2	3	4	5
U huidige lewensomstandighede oor die algemeen					
U toekomstige lewe					
U naby familie of vriende met wie u 'n verhouding het					
Hulle toekoms en die toekoms van die verhoudings					
U eksterne omgewing soos u werksituasie (nie by die huis)					
Die toekoms van u land					
U gesondheid					
Die huidige vlak van geweld (u veiligheid)					
Finansiële vooruitsigte					
Globale ekologiese vraagstukke soos verwarming van die aarde se atmosfeer, die osoonlaag en besoedeling					