
ESTUDIOS E INVESTIGACIONES

Therapeutic Profit by Companion Animals' Employment In Health Care of Older People

Aldo Pacheco-Ferreira

Eficacia y eficiencia de los surfactantes pulmonares en recién nacidos con síndrome de dificultad respiratoria en la unidad de cuidado intensivo neonatal de la Fundación Cardiovascular de Colombia, enero de 2009-abril de 2011

Sandra Gutiérrez-Pereira

Silvia Prada-Serrano

Laura Rincón-Alvarez

Elsa María Vasquez-Trespacios

Análise do processo de trabalho dos gerentes no território da Estratégia Saúde da Família

Francisco Rosemiro Guimarães-Ximenes Neto

José Jackson Coelho-Sampaio

Diagnóstico de instituciones prestadoras de salud con habilitación de servicios oncológicos en Bogotá, Colombia

Mario Arturo González-Mariño

Sistema político, políticas públicas y calidad de la atención médica a las enfermedades cardiovasculares: caso de estudio en Caracas-Venezuela

Rodrigo Mijares-Seminario

Marino J. González-R.

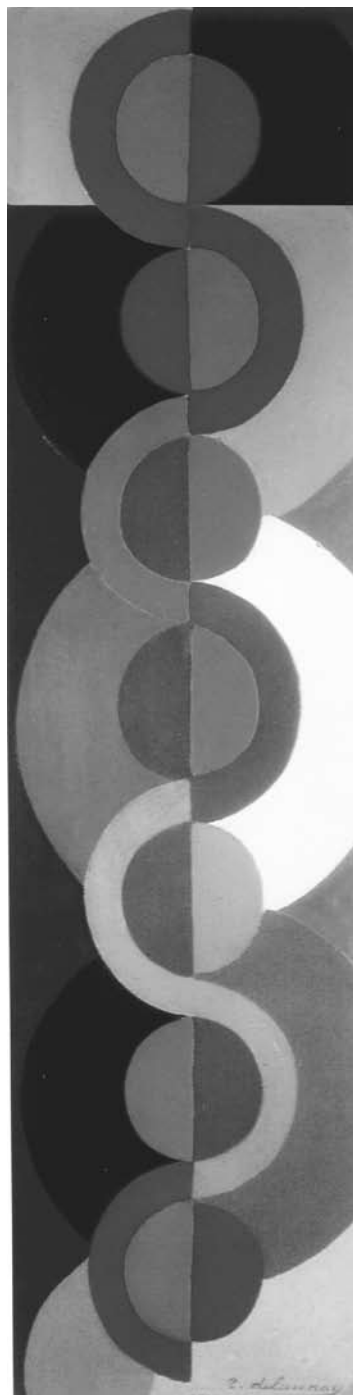
Elena Rincón-Osorio

Alejandro Oropeza

Acciones para la gestión de la calidad sanitaria e inocuidad de los alimentos en un restaurante con servicio bufet

Yuniesky González-Muñoz

Carolina Esthela Palomino-Camargo



Beneficios terapéuticos por empleo de los animales de compañía en el cuidado de salud de las personas mayores*

Therapeutic Profit by Companion Animals' Employment in Health Care of Older People

Benefícios terapêuticos do uso de animais de estimação nos cuidados de saúde dos idosos

Fecha de recepción: 10-01-12 Fecha de aceptación: 24-04-12

1657-7027(201206)11:22<58:BTEACC>2.0.TX;2-6

Aldo Pacheco-Ferreira**

* Resultado de investigación. Se desprende de la investigación titulada "Vigilância ambiental em Saúde". Entidad financiadora del Contrato: Faperj. Fecha de iniciación: marzo de 2008; fecha de finalización: en progreso.

** Biólogo (Universidad Gama Filho, 1982), magíster en Ingeniería Biomédica (COPPE/UFRJ, 1996) y doctorado en Ingeniería Biomédica (COPPE/UFRJ, 2000). Investigador en la Escuela Nacional de Salud Pública Sérgio Arouca/Fiocruz. Trabaja en el área de salud colectiva, con énfasis en salud, trabajo y ambiente. Correo electrónico: aldopachecoferreira@gmail.com



Resumen

Objetivo: en este artículo se evaluó la compatibilidad de las relaciones humano-animales de compañía, las cuales fueron exploradas desde la perspectiva de los beneficios emocionales y psicológicos. Los principales objetivos eran desarrollar una medida de base que reflejara el uso de conceptos psicológicos y ver si los propietarios de animales o los conceptos de salud pueden ser explicados por la varianza de los predictores de salud conocidos. *Método:* ancianos de la comunidad pertenecientes al estudio (n = 267) proporcionaron información a través de entrevistas con cuestionarios estructurados. Se hicieron regresiones múltiples, examinando el posible papel predictivo de los hábitos de salud, de apoyo social, la propiedad del animal doméstico y el apego de los propietarios a los animales, con la salud y el bienestar. *Resultados:* este estudio confirma los beneficios terapéuticos que trae el empleo de animales de compañía en el cuidado de las personas mayores, lo que puede hacer una diferencia en el estado de salud. *Conclusión:* el proceso de envejecimiento implica nuevas demandas de servicios, beneficios y atención que constituyen retos para los gobiernos y la sociedad.

Palabras clave autor: políticas públicas de salud, envejecimiento de la población, animales de compañía, salud pública, formulación de políticas.

Palabras clave descriptor: Mascotas, políticas públicas de salud, relaciones hombre-animal.

Abstract

Objective: This article evaluated the compatibility of human-companion animal relationships, which were explored from the perspective of emotional and psychological benefits of companion animals. The main aims were to develop a measure of pet attachment that reflects psychologists' use of the attachment concept, and to see if pet ownership or attachment added to the health variance explained by known predictors. *Method:* Community-older adults (n=267) gave information by interview using structured questionnaire. Multiple regressions were then conducted to examine the possible predictive role of health habits, human social supports, pet ownership, and owners' attachment to the pet, on health and well-being. *Results:* This study confirm the results of therapeutic profit by companion animals' employment in health care of older people, which can make a difference to the health status levels. *Conclusion:* The aging process involves new demands for services, benefits and attention that constitute challenges for governments and society.

Keywords author: health public policy, elderly, companion animals, public health, police making.

Keywords plus: Pets, Health Public Policy, Human-animal relationships.

Resumo

Objetivo: Neste artigo foi avaliada a compatibilidade das relações humanos-animais de estimação explorada a partir da perspectiva dos benefícios emocionais e psicológicos acordados. Os objetivos principais foram desenvolver uma base de referência que refletisse o uso de conceitos psicológicos e conferir se os proprietários de animais ou os conceitos de saúde puderam ser explicados pela variância dos preditores de saúde conhecidos. *Método:* os anciãos da comunidade pertencente ao estudo (n = 267) forneceram informações através de entrevistas com questionários estruturados. Fizeram-se regressões múltiplas, examinando o possível papel preditivo de hábitos de saúde, apoio social, propriedade do animal de estimação e fixação dos proprietários dos animais, com a saúde e bem-estar deles. *Resultados:* Este estudo confirma os benefícios terapêuticos trazidos pelo uso de animais de estimação em cuidar do idoso, o que puder fazer a diferença no estado de saúde. *Conclusão:* O processo de envelhecimento traz novas demandas de serviços, benefícios e cuidados que são desafios para os governos e sociedade.

Palavras chave autor: políticas públicas em saúde, envelhecimento da população, animais de estimação, saúde pública, formulación de políticas.

Palavras chave descriptor: Animais de estimação, políticas públicas de saúde, relações humano-animal.

Introducción

The Brazilian age structure has been changing in recent years. If, on the one hand, low fertility and continuous decrease mortality rates have caused changes in this structure, on the other hand, the advent of new technologies and improvements in health care have favoured the life expectancy. There was a significant increase in the number of elderly from 4% in 1940 to 9% in 2010, according to Brazilian Census (1). Moreover, projections indicate that by 2020, this segment could reach 15%, approximately 30 millions of elderlies.

Table 1 presents and quantify the transformations of the Brazilian age structure. It includes measures of the age structure according to large age groups and the values of the mean and median ages. Before analyzing the relationship between the large age groups, it is worth to observe the variation in the average values of the age distribution, particularly the median age. It eloquently shows the speed of change, since it duplicates over the period of reference. As a first approach to changes in the intergenerational relationships it can be seen that, due to ageing process, there are substantial modifications in the demographic dependency ratio. Although it is a purely demographic measure, since it takes the age as the only variable, in highly indicative of important intergenerational social and economic relationships that will happen. Both, the Child Dependency Ratio (CDR - ratio of population below 15 to population 15 to 64) and Aged Dependency Ratio (ADR - ratio of population above 64 to population 15 to 64), although with different evolution, determine the declining trend of the Total Dependency Ratio (TDR - ratio of population below 15 and population above 64 to population 15 to 64) that was practically constant and at high levels (around 80-90%) up to 1970. It starts to decrease exclusively due to the propor-

tionally higher reduction of the youngsters (column 2). Thus the total-dependency ratio would reach its minimum values during the period 2010 to 2020, due to fast reduction of the child-dependency ratio (CDR - column 6). The aged-dependency ratio component (ADR - column 4), that remains almost non-expressive until, say, 2010, will present significant increases after 2020/30, due to the increase of the elders (2).

Elderly compose the fastest increasing population in all world (3, 4). With people living longer more health issues will arise, meaning more people will require the help of the healthcare system. With almost 90% of people over 65 years of age having at least one chronic health condition, a major public health concern exists (5). However, although the majority of older individuals still remain active and integrated into social and cultural actions, the accelerating of population aging were not accompanied by adequate planning for elderly care. For this reason, this service is still lagged their needs (6).

In general, elderly people, encounter many problems and hardships, which make it possible to be systematically excluded from the mainstream of social, cultural, and economic life. As one ages, the individual is fewer likely to be married, to be in touch with relatives and friends, and to be implicated in more than just a few social relationships. These conditions are brought about through the death of others, physical movement away from the individual, and changes in personality factors (7, 8, 9). Such changes make it very complicated for the elderly to cultivate the kinds of intimate relationships so necessary in human life satisfaction (10).

The pressure of the patient's own life experiences and viewpoints on their approach to being a recipient of acute care must be a continuing source of concern. These interests



TABLE 1. BRAZIL: TOTAL POPULATION AND PROPORTIONAL DISTRIBUTION BY LARGE AGE GROUPS, DEPENDENCY RATIO AND ITS COMPONENTS, AND MEAN AND MEDIAN AGE – 1950-2050

Years	Total Population	Relative age distribution (%)			Dependency Ratios (%)			Mean Age	Median Age
		00-14	15-64	65+	TDR(a)	CDR(b)	ADR(c)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1950	53.977	41,6	55,5	3,0	80,3	74,9	5,4	23,5	19,2
1960	72.757	43,3	53,5	3,3	87,1	80,9	6,1	23,2	18,6
1970	96.021	42,4	54,0	3,7	85,3	78,5	6,8	23,6	18,6
1980	121.673	38,1	57,8	4,2	73,1	65,9	7,2	24,7	20,3
1990	147.939	34,8	60,9	4,3	64,1	57,0	7,1	26,2	22,7
2000	170.116	28,8	66,0	5,1	51,4	43,7	7,8	28,7	25,9
2010	190.876	25,3	68,4	6,3	46,2	37,0	9,2	31,3	29,4
2020	209.734	23,3	68,2	8,5	46,7	34,2	12,5	33,8	32,9
2030	225.161	21,5	66,6	11,8	50,0	32,3	17,7	36,2	35,5
2040	236.541	20,6	65,0	14,5	53,9	31,7	22,2	37,9	37,0
2050	244.228	20,1	62,6	17,3	59,6	32,0	27,6	39,0	38,2

Source: United Nations, 1999 (2)

developed in attention with older people in the health care sector, should be also a trend in these increasing elderly, led to healthier population who each more time require special health care services.

Another important point to be discussed refers to animals. Over the years animals have played many roles in our lives. More recent, animals fit into many niches of society, become companions (11-15). They are involved in everything from entertainment and companionship to being service providers as well as therapy assistants. Companion animals can also reduce anxiety, loneliness, and depression. They serve as a source of tactile comfort by increasing sensory stimulation while decreasing blood pressure and heart rate (16, 17).

The elderly population, most of the time, is psychologically dependent on companion

animals, including for medical prescription. Infectious diseases are common causes of increased morbidity and mortality in elderly patients and reveal how common problem frequent in daily geriatrics practice (18). Infections in elderlies are different features that are presented in the young population, these differences being attributed to immunological changes or malfunction organic (which decline with age) (19).

Research concerning the strong associations between human-animal interactions (HAI) and health benefits in people can provide the necessary scientific evidence for companion animals to be viewed as a source of therapy (20). More research needs to be conducted and replicated to make the connection between HAI and health benefits a stronger one. It's necessary to have realistic expectations of the benefits of companion animals given the number of other interacting social

and behavioural risk factors that impinge on the health and functioning of elders. There is a need to identify the meaning of companion animals in daily life and to explore the ways in which the presence of companion animals can affect the health and well-being of elders.

The intent of this study is to explore the relationship between companion animals and their elder owners and to ascertain whether or not this relationship has an effect on the elder owners' emotional well-being, in a sample of the elderly population from Jacarepaguá, Rio de Janeiro, Brazil.

Materials and Methods

Local Study

According to the Demographic Census (1), the municipality of Rio de Janeiro is the capital city of the State of Rio de Janeiro, the second largest city of Brazil, and the third largest metropolitan area and agglomeration in South America, boasting approximately 6.3 million people within the city proper, making it the 6th largest in the Americas, and 26th in the world (21).

Population target

Were eligible for the study all elderly (60 years or older) of both sexes who have companion animals at home, residents in the municipality of Rio de Janeiro and had appeared to a municipal health post located at Retiro dos Artistas, Jacarepaguá, in the period of the national influenza vaccination campaign in 2011 (from April 30th to May 13th). Were identified 267 elderly in this campaign who agreed with the term assent for the study.

Questionnaire: Data Collection

The possible emotional and psychological benefits of companion animals were evaluated through use of a composite questionnaire. The questionnaire was self-administered at the study. It was designed to evaluate the subjects' happiness and depression levels as well as serving to confirm or contradict the physical activity measurements. It included a section inquiring about general health complaints and demographic variables such as age, gender, self-rated health, life-events in the past year, and medical history. It also involved a section on companion animal ownership status including reasons for having a companion animal and reasons for wanting or not wanting an animal for current non-pet owners.

Ten questions concerning animals ownership status were written and added to the animal attitude section of the questionnaire. A medical history check list was obtained from a client health questionnaire, and the list of life events was modified based on a previously published report.

Questionnaire Measures

Measures of life contentment based on happiness and depression status by means of two validated questionnaires were used to examine possible psychological and emotional benefits of exposure to companion animals. Both the happiness and depression range provided a measure of these life-states. The happiness range was formatted so that each question had answer options ranging from *less true* (1) to *more true* (4). The depression range had four answer options (0 to 3) ranging from *rarely or none of the time* to *most or all of the time*. A high score for each scale was indicative of a high level of that particular life-state. The subject answered each question based on how the particular



account applied to them. All answers were totalled at the end of the questionnaire section to get an overall score of happiness and an overall score of depression. Self-reported health from the study was evaluated to see if there were any changes in perceived personal health. The options for self-reported health were *poor*, *fair*, *good*, and *excellent*, corresponding to values 1, 2, 3, and 4 respectively. To determine if the subjects' attitudes with companion animals in relation its health, animal attitude scores were evaluated. The number of health complaints, which were obtained from the medical history section, was either evaluated to determine if the subjects would report fewer health complaints. A Chronbach's alpha was obtained for the Oxford Happiness Inventory (OHI) (22) used for evaluating happiness, the Center for Epidemiologic Studies Depression Scale (CES-D) was used to measure depression (23), and the Pet Attitude Scale (PAS) to evaluate aspects of pet ownership (24).

The analyses were performed to examine the possible differences in step counts based on subjects' happiness level, depression level, pet-ownership status, and self-reported health. To experiment these comparisons, repeated measures analyses were performed again including *happy* as a factor. The same was done for *depressed*, *pet-lover*, and *healthy*. The significance level was set at $\alpha = 0.05$ (25).

The median score for the happiness scale based on the average of the first questionnaire score and the last questionnaire score was used as a cut-off point dichotomizing subjects as *happy* or *not happy*. The same was done for the depression scale. Subjects were dichotomized as *healthy* if they had an average score above 2.5 and *not healthy* if they had an average score equal to or below 2.5. Self-reported health scores of 1, 2, 3, and 4 corresponded to *poor*, *fair*, *good* and *excellent*, respectively.

The statistics were made using SPSS software for windows version 15.0 (SPSS Inc. Chicago, III., USA).

Ethical aspects

The ethical aspects were respected according to the Diretrizes and Normas Regulamentadoras - 196/96 resolution, through a Free Informed Consent Term and by the consent of the Institution Ethical Committee, where this research was developed.

Results

Descriptive statistics

Two hundred sixty-seven people agreed to participate in the study with 183 women and 84 men. The average age of the sample was 66.4 years. People who owned companion animals made up 86,89% (232/267) of the sample population. One hundred seventy-seven of the animals owned were dogs, forty-one were cats and fourteen persons owned both. Two hundred and four animals' owners chose *to have a friend* as the most important reason for having their animals. Other answer options included *to have something to motivate me to get out and walk*, *to feel safer or for protection*, *to help meet new people*, *to have something to take care of*, and *other*.

Twelve out of two hundred sixty-seven subjects reported that they would like to have a companion animal with nine saying they would like a dog and three saying they would like a cat. Of the people who said they would like a companion animal, five said they would like the companion animal so as *to have something to take care of* and three persons wanted a companion animal so as *to have a friend*. Four people stated the reason they wanted a companion animal was

to have something to motivate them to get out and walk.

Twenty-three people answered that they would not want to have a companion animal. Eleven of the 23 answered because it would be *too hard to care for* and twelve people would not want a companion animal because their *living arrangement did not suit animals*.

Questionnaire Measures

The analysis obtained with descriptive statistics for questionnaire responses are showed in Table 2. One hundred eighty-eight subjects completed the happiness scales, 174 subjects completed depression scales, 87 subjects completed PAS scales, 203 subjects completed self-reported health questions, and 217 subjects completed health complaints inquiries. The median happiness score was 89.0. The median depression score was 22.0. For self-reported health, the median response of the study was 2.0. The median number of health complaints of the study was 6. The median PAS score was 84.0. The Chronbach's alpha values for the OHI, CES-D, and PAS were 0.9809, 0.9596, and 0.8030 respectively.

Measures analyses results including the newly-created dichotomous variables are

presented. The mean step counts for each group in a cohort study investigating the possible changes in activity levels (steps) when comparing subjects were: happy x non-happy (p-value = 0.818), depressed x non-depressed (p-value = 0.541), have/want a companion animal x non-have /want (p-value = 0.042), healthy x non-healthy (p-value = 0.574), have a companion animal x non-have (p-value = 0.340). No other comparison was statistically significant at the 5% level.

Discussion and Conclusion

Domestic companion animals provide valuable assistance to the physical and mental health of their owners. The 267 elderly residents in Jacarepaguá who attended the national influenza vaccination campaign in 2011 owned at least one domestic animal. The population sample studied was predominantly female, preferred dogs as companion animal and most of them kept the animals inside the residence.

The findings of the present study provide further support for the general proposition that the quality of the relationship between people and their companion animals has consequences for the owner's health. The particular theoretical model which was tested proved to be accurate in various

TABLE 2. DATA OBTAINED FOR QUESTIONNAIRES RESULTS EXPRESSING DATA IN HAPPINESS AND DEPRESSION SCORES

Variable	# scales completed Completed	Median score Score	Mean score score	Range	n
Happiness	17	89.0	81.6	30,114	188
Depression	16	22.0	23.0	6,44	174
PAS	11	84.0	88.5	45,126	87
SRH	17	2.0	2.5	1,4	203
HC	17	6.0	6.0	0,14	217

n = number of subjects completing scales or inquiries

SRH = self -reported health score

HC = reported number of health complaints

Source: own work.



respects. In addition to rethinking some of these theoretical links in future studies, it might also be fruitful to extend the health variables. More generally, it might also be enlightening to consider the effects of the pet-owner relationship on the animal's health, and perhaps the implications of this for the owner's health.

The elderly population, most of the time, is psychologically dependent on companion animals, including medical prescription. Infectious diseases are common causes of increased morbidity and mortality in elderly patients and show a very frequent problem in daily geriatrics practice. Infections in elderly people are different from the ones presented by the young population, differences that can be due to immunological changes or organic malfunction (which decline with age).

Elderly people may lack the balance, strength or flexibility to become active. It is this lack of balance and strength that contributes to falls systematically. Fear of falling may reduce the motivation to engage in activities. Older adults may not have a place to engage in activities, they may not be interested in most activities, or they may not be educated and aware of the importance of staying active. Because lack of motivation is such an important factor contributing to inactivity, a strong influence in getting the elderly motivated is needed. A companion animal needs attention as well as someone to feed and take it for walks. It is believed that a companion animal can provide the necessary motivation to get a senior citizen up and moving. Emotional state is another aspect greatly influenced by relationships with companion animals.

Although increased longevity represents a victory for population and science, still socially prevalent idea that aging is something to be avoided. In a context in which the cult of youth is increasingly strengthened, old age

is filled with stereotypes and prejudices which reduces it to a phase of decline and loss.

It is noteworthy that the results of this study are limited in its power of generalization. Thus, they are descriptive and explanatory power for the present sample, and may, with due caution generalize to other samples of elderly people. In addition, the cross-sectional design of this work only allows you to consider their results as exploratory, and therefore need more studies in order to reach conclusive results.

The aging process involves new demands for services, benefits and attention that constitute challenges for governments and society. Thus, the elderly population deserves the interest for public policies. Moreover, it is necessary to promote the expression of expectations and desires in order to obtain improvements in their quality of life. It is therefore important, before this scenario, the health-related sciences to focus on studies that may favour the quality of life for older people.

References

1. Instituto Brasileiro de Geografia e Estatística. Censo Demográfico Brasileiro do IBGE 2010. Accessed on August 6, 2011. Retrieved from <http://www.ibge.gov.br>
2. United Nations. The Sex and Age Distribution of Populations: the 1998 revision. New York: ONU; 1999.
3. United Nations. Report of the Second World Assembly on Aging. Madrid, Spain: United Nations; 2002.
4. Kinsella K, Velkoff V. U.S. Census Bureau. An Aging World: 2001. Washington, DC: U.S. Government Printing Office 2001; series P95/01-1.
5. King ACP, Rejeski WJP, Buchner DMM, MPH. Physical Activity Interventions Targeting Older Adults: A Critical Review and Recommendations. *American Journal of Preventive Medicine* 1998; 15: 316-33.

6. Berquó E. Considerações sobre o envelhecimento da população no Brasil. In A. L. Neri & G.G. Debert (Eds.), *Velhice e sociedade*. Campinas, SP: Papirus; 1999.
7. Garrett NAP, Brasure MP, Schmitz KHP, Schultz MMM, Huber MRM. Physical Inactivity Direct Cost to a Health Plan. *American Journal of Preventive Medicine*. 2004; 27: 304-09.
8. AARP. National Blueprint: Increasing Physical Activity Among Adults Age 50 and Older. Princeton: The Robert Wood Johnson Foundation; 2001. Available at: <http://www.rwjf.org/search/allresults.jsp?query=Blueprint>. Accessed June 5, 2011.
9. CDC. Health Information for Older Adults. In: Control CfD, ed. *Injuries Among Older Adults*. Available at: http://222.cdc.gov/aging/health_issues.htm. Accessed July 11, 2010.
10. Blazer D. Life Events, Mental Health Functioning, and the Use of Health Care Services. *American Journal of Public Health*. 1980; 70: 1174-79.
11. Benseal RW. Historical Perspectives of Human Values for Animals and Vulnerable People. *The Pet Connection*. Minneapolis, Minnesota: University of Minneapolis, Center to Study Human-Animal Relationships and Environments, 1983: 2-13.
12. Serpell J. *In the Company of Animals-A Study of Human-Animal Relationships*. Canto ed: New York, New York: Cambridge University Press; 1996.
13. Beck A, Katcher A. *Between Pets and People*. West Lafayette, Indiana: Purdue University Press; 1996.
14. Hart LA. The Role of Pets in Enhancing Human Well-Being: Effects for Older People. *The Waltham Book of Human-Animal Interactions: Benefits and Responsibilities*. Tarrytown, New York: Elsevier Science Inc.; 1995.
15. Serpell J. Beneficial effects of pet ownership on some aspects of human health and behavior. *Journal of the Royal Society of Medicine* 1991; 84: 717-20.
16. Rogers J, Hart LA. The role of pet dogs in causal conversations of elderly adults. *Journal of Social Psychology* 1993; 133: 265.
17. Wilson CC, Barker SB. Challenges in Designing Human-Animal Interaction Research. *American Behavioral Scientist*. 2003; 47: 16-28.
18. Gerba CP, Rose JB, Hass CN. Sensitive Populations: Who Is at the Greatest Risk? *Int J Food Microbiol*. 1996; 30: 113-23.
19. Werner H, Kuntsche J. Infection in the Elderly what is Different? *Zeit für Geront Geriat*. 2000; 33 (5): 350-56.
20. Hemsworth PH, Barnett JL. Human-animal interactions. *Vet Clin North Am Food Anim Pract*. 1987; 3 (2): 339-56.
21. Forstall RL, Greene RP, Pick JB. Which Are the Largest? Why Published Populations for Major World Urban Areas Vary so Greatly. *City Futures Conference*. University of Illinois at Chicago: USA; 2004.
22. Hills P, Argyle M. The Oxford Happiness Questionnaire: A Compact Scale for the Measurement of Psychological Well-Being, Personality and Individual Differences. 2002; 33: 1073-82.
23. Clark CH, Mahoney JS, Clark DJ, Eriksen LR. Screening for Depression in a Population: the Reliability and Validity of the Center for Epidemiologic Studies Depression Scale (CES-D). *Journal of Advanced Nursing*. 2002; 40: 361-69.
24. Templer DI, Salter CA, Dickey S, Baldwin R, & Veleber DM. The Construction of a Pet Attitude Scale. *Psychological Record*. 1981; 31: 343-48.
25. Ott LR, Longnecker M. *Statistical Methods and Data Analysis*. 5th ed. Pacific Grove, California: Duxbury; 2001.

