

DEMENTIA IN GERIATRIC CATS

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DANIÈLLE GUNN-MOORE discusses causes, management options and methods of therapy associated with cognitive dysfunction syndrome – an increasingly common disorder in cats

THERE are now more elderly cats than ever before^{1, 2, 3}. Unfortunately, accompanying this growing geriatric population are increasing numbers of pets with signs of altered behaviour and apparent senility (Panel 1; Table 1)⁴.

These behavioural changes may result from many different disorders (**Panel 2**), and extensive diagnostics may be needed to determine the cause (**Panels 3 and 4**). Once all other causes have been ruled out, cognitive dysfunction syndrome (CDS) should be considered⁵⁻⁸.

The most common signs of CDS include altered interaction with the family (especially attention-seeking), inappropriate urination/defaecation, and/or inappropriate vocalisation (especially loud crying at night; **Panel 1; Table 1**).

Prevalence

A survey looking at older cats (seven years of age to 11 years of age) revealed 36 per cent of owners reported behavioural problems in their cats⁹, and this increased to 88 per cent in cats between 16 years of age to 19 years of age. A later study suggested 28 per cent of pet cats aged 11 years to 14 years develop at least one geriatric-onset behaviour problem that appears to relate to CDS, and this increases to more than 50 per cent for cats of 15 years of age or older. Excessive vocalisation and aimless activity were the most common problems in this older age group^{8, 10}.

Pathophysiology

The cause of the syndrome is still unknown, but compromised cerebral blood flow and chronic free radical damage are both believed to be involved^{8,11}.

Compromised cerebral blood flow

Numerous vascular changes can occur in the brain of old cats, including a decrease in cerebral blood flow, the presence of small haemorrhages around the blood vessels and a form of arteriosclerosis^{7,8}. In addition, the brain of elderly cats may also be subject to compromised blood flow and hypoxia due to heart disease, anaemia, blood clotting defects and/ or underlying hypertension.

Chronic free radical damage

A small amount of the oxygen used by cells in normal energy production is normally converted to free radicals.

As cells age they become less efficient, producing less energy and more free radicals. Normally, these free radicals are removed by the body's natural antioxidant defences, including a number of special enzymes and free radical scavengers, such as vitamins A, C and E.

The balance between the production and removal of free radicals can be upset by disease, age and stress.

An excess of free radicals can lead to damage and the brain is particularly susceptible because of its high fat content, a high demand for oxygen and a limited ability to self-repair^{7,12,13}.

Ultimately, chronic damage can eventually lead to disease processes similar to those seen in humans suffering from Alzheimer's disease (AD), with alteration of proteins in nerve cells (for example, tau hyperphosphorylation) and deposition of protein plaques outside the nerve cells (made from β -amyloid protein)¹¹.

In humans and dogs, genetics, diet and lifestyle choices have all been found to influence the prevalence and pattern of neuropathological changes (particularly β -amyloid plaques) and the nature of the cognitive dysfunction. While these relationships have still to be determined in cats, it is likely they will be similar.

Management

Although CDS cannot be cured, its clinical signs can be reduced with suitable intervention. Treatment options are usually extrapolated from studies of humans with AD and/or dogs with CDS.

In general, potential interventions include environmental management/modification, dietary modification and drug therapies^{14, 15}. To date, there have been a small number of dietary studies that have been shown to increase activity and/or reduce the signs of CDS in cats (Hill's data on file, 2008)^{16, 17}, plus a single placebo- controlled study into the use of a dietary supplement¹⁸.

Environmental management and dietary modification

Environmental factors can have positive or negative influences on the signs of CDS. Environmental enrichment can lead to mental stimulation, increased activity, an increase in nerve growth factors, the growth and survival of nerves and an increase in cognitive function⁸.

In contrast, lack of environmental stimulation may increase the risk of CDS when older and factors in the environment that cause frustration can exacerbate signs of CDS. These could include, for example, inconsistent feeding times or inconsistent locking of the cat flap.

Many older cats have concurrent disease and this can lead to further frustrations – for example, moving food bowls or litter boxes to different areas of the house when a cat with CDS is also blind, or supplying a high-sided litter box to a cat with CDS with severe arthritis. Sensible environmental adjustments for ageing cats are detailed in **Table 2**. Environmental application of synthetic feline appeasement pheromone (Feliway) can also help reduce feline anxiety.

Diets enriched with antioxidants and other supportive compounds (for example, vitamin E, β -carotene and essential fatty acids) are believed to reduce oxidative damage, reduce β -amyloid production and improve cognitive function^{14, 19}. In humans, studies have shown a high intake of fruits, vegetables, vitamins E and C, folate and B₁₂ may improve cognition. In addition, α -lipoic acid and L-carnitine enhance mitochondrial function, and omega-3 fatty acids promote cell membrane health and have, in humans, been found to be beneficial in the treatment of dementia. In general, combinations of these compounds are believed to work best; however, excessive intake of some of these compounds can be harmful.

The combination of environmental stimulation (for example, toys, companionship, interaction and food hunting games) and a diet enriched with antioxidants is believed to have a synergistic action in improving cognitive function. In aged dogs, a fouryear study on the use of an antioxidant-enriched diet (for example, vitamins E and C, selenium, fruit and vegetable extract [β -carotene, other carotenoids, flavonoids]), mitochondrial cofactors (DL-lipoic acid and L-carnitine), and essential fatty acids (omega-3 fatty acids), plus environmental enrichment (for example, toys, kennel mate, walks and cognitive experience testing) revealed rapid (two weeks to eight weeks into treatment) and significant improvements in learning and memory that lasted throughout the two years of the study. Interestingly, while there was no reversal of existing pathology, the antioxidants did appear to prevent the deposition of more β -amyloid, while the environmental enrichment did not^{20, 21}.

The clinical signs of CDS in dogs have also been reduced by feeding a diet supplemented with plant-derived medium-chain triglycerides (MCTs), which provide ketones as a more efficient energy source for the brain²². Unfortunately, cats are generally not keen on eating diets enriched with MCTs so it is unclear if this approach will be useful for cats with CDS.

While a study similar to that using an alternative diet plus environmental enrichment has not yet been performed in cats with CDS, a five-year study feeding healthy old cats (seven years old to 17 years old) a diet supplemented with antioxidants (vitamin E and β -carotene), essential fatty acids (omega-3 and omega-6 fatty acids) and dried whole chicory root (which contains the prebiotic inulin to modify intestinal flora) resulted in the supplemented cats living significantly longer (and more healthily) than the un-supplemented ones^{23, 24}.

The most convincing data comes from a study of middle-aged and older cats that were fed a diet supplemented with a combination of fish oil, antioxidants, arginine and key B-vitamins, and were found to have enhanced brain functions compared to those fed a control diet¹⁷.

A deficiency of these nutrients – especially omega-3 fatty acids and B-vitamins – are proven risk factors for brain ageing, stroke and dementia in humans.

In another study, supplementing the diet of elderly cats with tocopherols, vitamin C, β -carotene, L-carnitine, docosahexaenoic acid and sulphur amino acids resulted in increased activity compared to controls¹⁶. Other similarly supplemented diets are now available designed for cats with osteoarthritis. For example, one diet is supplemented with a mixture of antioxidants – such as vitamins C and E, and β -carotene – essential fatty acids, chondroprotectants, such as methionine, glycosaminoglycans, glucosamine and chondroitin sulphate, and L-carnitine and lysine (to aid obesity management and the build-up of lean muscle). However, it has also been seen to help cats with CDS.

In a two-month study of 75 cats of 12 years of age or older that were not selected for signs of CDS or osteoarthritis, owner questionnaires suggested more than 70 per cent of the cats improved in one or more signs of cognitive function (and more than 50 per cent improved in one or more signs of mobility; Hill's data on file, 2008).

A number of diets have been developed that are supplemented with various compounds believed to help reduce stress – for example, L-tryptophan with or without milk protein hydrolysate (which is similar to the nutraceutical Zylkène – see further on), and while they are really aimed at younger cats – particularly those with feline idiopathic cystitis – there is a potential they may help to reduce stress in older cats with CDS. Trials will be needed to see if they are of any benefit in CDS.

There have been a number of studies investigating various food supplements in dogs with CDS^{5, 19, 14, 15, 25}. For example, a study of dogs more than six years of age, given a supplement containing omega-3 fish oils, vitamins E and C, L-carnitine, α -lipoic acid, coenzyme Q,

phosphatidylserine and selenium (sold in the UK as Aktivait) over a two-month period showed significant improvements in signs of disorientation, social interaction and house soiling²⁶. Unfortunately, a different formula is needed for cats as α -lipoic acid is toxic in this species²⁷, so products containing it should not be given. While the new felinesafe version of Aktivait is on the market, trials in cats still need to determine its efficacy.

A number of other supplements have also been suggested for the treatment of dogs and cats with CDS. For example, placebo-controlled studies have shown significant improvements in dogs with CDS when given a supplement containing ginkgo biloba, vitamins B₆ and E, and resveratrol²⁸, and activity and awareness were improved when S-adenosyl-L-methionine (SAMe) was given as a supplement^{29, 30}.

A study gave SAMe to cats with CDS and it appeared to improve executive function¹⁸.

While there is now a growing list of compounds that have been suggested to have beneficial effects on the ageing feline brain¹⁴, we urgently need placebo-controlled studies looking at the use of dietary supplements in cats, either as single ingredients or in potentially synergistic combinations.

Severe CDS

Unfortunately, once cats develop significant signs of CDS, any changes can actually have a negative effect as these cats cope poorly with change and can become very stressed.

Stress can result from changes in their environment, daily routine, diet or the members of their household. The cat's response to this stress is to show more obvious signs of CDS (for example, anorexia, hiding and/or upset of toileting habits)³¹.

For these cats, where possible, change should be kept to a minimum, and when it cannot be avoided, it should be made slowly and with much reassurance. Some cats may become so demented and cope so poorly with change they may benefit from having their area of access reduced in size (for example, to a single room containing all their key resources; **Table 2**). This core territory can then be kept safe and constant.

Potential drug therapies

There are a growing number of possible drug options for AD in humans and CDS in dogs. These include various cholinesterase inhibitors (to increase the availability of acetylcholine at the neuronal synapses), selegiline (to manipulate the monoaminergic system), antioxidants (for example, vitamin E) and NSAIDs (to reduce neuronal damage).

However, there are very few that have been approved for the treatment of human dementia. Selegiline, propentofylline and nicergoline (not currently available) are the only drugs approved for

the treatment of canine dementia in either the UK or US.

While there are no drugs licensed for the treatment of CDS in cats, a number of drugs have been used “off label”^{14, 7, 15, 32, 33}. These include selegiline (suggested dose 0.25 mg/kg to 1.0 mg/kg every 24 hours orally), propentofylline (suggested dose 12.5 mg/cat every 24 hours orally) and nicergoline (suggested dose 0.25 mg/ kg to 0.5 mg/kg orally), all of which have been used in cats with varying degrees of success. For example, a small open trial using selegiline showed a positive effect¹⁵.

Other drugs used to treat particular signs of CDS in cats include anxiolytic drugs, such as a number of nutraceuticals, buspirone (not licensed) and benzodiazepines (for example, diazepam – although hepatotoxicity is a particular risk with this drug), or antidepressants (that lack anticholinergic effects) such as fluoxetine (under the cascade).

Summary

Increasing numbers of cats are living to old age and behavioural changes are common in these cats. The behavioural changes reported most frequently are loss of litter box training (particularly inappropriate urination) and crying out loudly at night.

The most typical causes of these problems are CDS, osteoarthritis, systemic hypertension (commonly secondary to chronic kidney disease or hyperthyroidism), hyperthyroidism (even without hypertension), deafness and brain tumours.

Almost one-third of pet cats of 11 years to 14 years of age develop at least one geriatric-onset behaviour problem that appears to relate to CDS, increasing to more than 50 per cent for cats of 15 years of age or older.

These conditions occur frequently in older cats, and many older cats suffer from a number of concurrent interacting conditions. Owners and vets often mistake these for “normal ageing changes” so many treatable conditions are neglected and go untreated.

References

- 1. Laflamme D P, Abood S K, Fascetti A J et al (2008). Pet feeding practices of dog and cat owners in the United States and Australia, *Journal of the American Veterinary Medical Association* **232** (5): 687-694.
- 2. Broussard J D, Peterson M E and Fox P R (1995). Changes in clinical and laboratory findings in cats with hyperthyroidism from 1983 to 1993, *Journal of the American Veterinary Medical Association* **206** (3): 302-305.
- 3. Gunn-Moore D A (2003). Considering older cats, *Compendium on Continuing Education for the Practising Veterinarian* **26A** (Suppl): 1-4.

- 4. Gunn-Moore D A (2011). Cognitive dysfunction in cats: clinical assessment and management, *Topics in Companion Animal Medicine* **26** (1): 17-24.
- 5. Chapman B L and Voith V L (1990). Behavioural problems in old dogs: 26 cases (1984-1987), *Journal of the American Veterinary Medical Association* **196** (6): 944-946.
- 6. Ruehl W W, Bruyette D S, DePaoli A et al (1995). Canine cognitive dysfunction as a model for human age-related cognitive decline, dementia and Alzheimer's disease: clinical presentation, cognitive testing, pathology and response to 1-deprenyl therapy, *Progress in Brain Research* **106**: 217-225.
- 7. Landsberg G L and Araujo J A (2005). Behaviour problems in geriatric pets, *Veterinary Clinics of North America. Small Animal Practice* **35** (3): 675-698.
- 8. Gunn-Moore D A, Moffat K, Christie L A and Head E (2007). Cognitive dysfunction and the neurobiology of ageing in cats, *Journal of Small Animal Practice* **48** (10): 546-553.
- 9. Landsberg G (1998). Behaviour problems of older cats. In Schaumburg I (ed), *Proceedings of the 135th Annual Meeting of the American Veterinary Medical Association*, San Diego, CA: 317-320.
- 10. Moffat K S and Landsberg G M (2003). An investigation of the prevalence of clinical signs of cognitive dysfunction syndrome (CDS) in cats, *Journal of the American Animal Hospital Association* **39**: 512 (abstract).
- 11. Gunn-Moore D A and Gunn-Moore F J (2010). Growing old is not for wimps, *Journal of Feline Medicine and Surgery* **12** (11): 835-836.
- 12. Dimakopoulos A C and Mayer R J (2002). Aspects of neurodegeneration in the canine brain, *The Journal of Nutrition* **132** (6 Suppl 2): 1579S-1582S.
- 13. Roudebush P, Zicker S C, Cotman C W et al (2005). Nutritional management of brain aging in dogs, *Journal of the American Veterinary Medical Association* **227** (5): 722-728.
- 14. Landsberg G M, Denenberg S and Araujo J A (2010). Cognitive dysfunction in cats: a syndrome we used to dismiss as "old age", *Journal of Feline Medicine and Surgery* **12** (11): 837-848.
- 15. Landsberg G (2006). Therapeutic options for cognitive decline in senior pets, *Journal of the American Animal Hospital Association* **42**(6): 407-413.
- 16. Houpt K, Levine E, Landsberg G et al (2007). Antioxidant fortified food improves owner perceived behaviour in aging the cat, *Proceedings of the ESFM Conference*, Prague, Czech Republic.
- 17. Pan Y, Araujo J A, Burrows J et al (2013). Cognitive enhancement in middle-aged and old cats with dietary supplementation with a nutrient blend containing fish oil, B vitamins, antioxidants and arginine, *The British Journal of Nutrition* **110** (1): 40-49.
- 18. Araujo J A, Faubert M L, Brooks M L et al (2012). NOVIFIT (NoviSAME) tablets improve executive function in aged dogs and cats: implications for treatment of cognitive dysfunction syndrome, *International Journal of Applied Research in Veterinary Medicine* **10**(1): 90-98.
- 19. Head E and Zicker S C (2004). Nutraceuticals, aging, and cognitive dysfunction, *The Veterinary Clinics of North America. Small Animal Practice* **34**(1): 217-228.
- 20. Milgram N W, Head E, Zicker S C et al (2004). Long-term treatment with antioxidants and a program of behavioral enrichment reduces age-dependent impairment in

- discrimination and reversal learning in beagle dogs, *Experimental Gerontology* **39**(5): 753-765.
- 21. Milgram N W, Head E, Zicher S C et al (2005). Learning ability in aged beagle dogs is preserved by behavioural enrichment and dietary fortification: a two-year longitudinal study, *Neurobiology of Aging* **26**(1): 77-90.
 - 22. Pan Y, Larson B, Araujo J A et al (2010). Dietary supplementation with medium-chain TAG has longlasting cognition-enhancing effects in aged dogs, *The British Journal of Nutrition* **103**(12): 1,746-1,754.
 - 23. Cupp C J, Clementine J P, Kerr W W et al (2006). Effect of nutritional interventions on longevity of senior cats, *The International Journal of Applied Research in Veterinary Medicine* **4**(1): 34-50.
 - 24. Cupp C J, Kerr W W, Clementine J P et al (2008). The role of nutritional interventions in the longevity and maintenance of long-term health in aging cats, *The International Journal of Applied Research in Veterinary Medicine* **6**(2): 69-81.
 - 25. Ikeda-Douglas C J, Zicker S C, Estrada J et al (2004). Prior experience, antioxidants, and mitochondrial cofactors improve cognitive function in aged beagles, *Veterinary Therapeutics* **5**(1): 5-16.
 - 26. Heath S, Barabas S and Craze P (2007). Nutritional supplementation in cases of canine cognitive dysfunction, *Applied Animal Behaviour Science* **105**: 284-296.
 - 27. Hill A S, Werner J A, Rogers Q R et al (2004). Lipoic acid is 10 times more toxic in cats than reported in humans, dogs or rats, *Journal of Animal Physiology and Animal Nutrition* **88**(3-4): 150-156.
 - 28. Araujo J A, Landsberg G M, Milgram N W and Miolo A (2008). Improvement of short-term memory performance in aged beagles by a nutraceutical supplement containing phosphatidylserine, Ginkgo biloba, vitamin E, and pyridoxine, *The Canadian Veterinary Journal* **49**(4): 379-385.
 - 29. Bottiglieri T (2002). S-Adenosyl- L-methionine (SAME): from the bench to the bedside-molecular basis of a pleiotrophic molecule, *The American Journal of Clinical Nutrition* **76**(5): 1151S-1157S.
 - 30. Rème C A, Dramard V, Kern L et al (2008). Effect of S-adenosylmethionine tablets on the reduction of age-related mental decline in dogs: a double-blinded, placebo-controlled trial, *Veterinary Therapeutics* **9**(2): 69-82.
 - 31. Houpt K A and Beaver B (1981). Behavioral problems of geriatric dogs and cats, *The Veterinary Clinics of North America. Small Animal Practice* **11**(4): 643-652.
 - 32. Landsberg G L, Hunthausen W and Ackerman L (2003). The effects of aging on behaviour in senior pets. In *Handbook of Behaviour Problems in the Dog and Cat* (2nd edn), W B Saunders, London: 269-304.
 - 33. Studzinski C M, Araujo J A and Milgram N W (2005). The canine model of human cognitive aging and dementia: pharmacological validity of the model for assessment of human cognitive-enhancing drugs, *Progress in Neuro-psychopharmacology and Biological Psychiatry* **29**(3): 489-498.
 - 34. Colodner R, Kometiani I, Chazan B and Raz R (2008). Risk factors for community-

- acquired urinary tract infection due to quinolone-resistant *E coli*, *Infection* **36**(1): 41-45.
- 35. Bennett D, Zainal Ariffin S M and Johnston P (2012). Osteoarthritis in the cat: how common is it and how easy to recognise? *Journal of Feline Medicine and Surgery* **14**(1): 65-75.
 - 36. Mayer-Roenne B, Goldstein R E and Erb H N (2007). Urinary tract infections in cats with hyperthyroidism, diabetes mellitus and chronic kidney disease, *Journal of Feline Medicine and Surgery* **9**(2): 124-132.

Panel 1. Possible signs of dementia in elderly cats

- spatial disorientation - for example, forgetting where the litter box is, resulting in inappropriate urination and/ or defaecation;
- loud crying, especially at night;
- altered behaviour – for example, increased attention seeking or aggression, increased anxiety, or decreased responsiveness;
- changes in sleeping patterns;
- changes in activity - for example, aimless pacing or reduced activity;
- decreased grooming; and
- temporal disorientation - for example, forgetting they have just been fed.

Panel 2. Potential causes of dementia in geriatric cats

- cognitive dysfunction syndrome;
- pain in general;
- arthritis (the pain and/or dysfunction of arthritis is often under-recognised in elderly cats)*;
- systemic hypertension (high blood pressure may be primary or secondary to hyperthyroidism, chronic kidney disease, hyperadrenocorticism and, possibly, diabetes mellitus, acromegaly and

chronic anaemia);

- hyperthyroidism;
- chronic kidney disease;
- diabetes mellitus;
- urinary tract infection (especially some quinolone-resistant toxin-producing strains of *Escherichia coli* – as can be found in elderly humans)³⁴;
- gastrointestinal disease;
- liver disease (hepatic encephalopathy);
- neurological defects (either sensory or motor deficits);
- reduced vision or hearing;
- brain tumours (for example, meningioma and lymphoma);
- infectious disease (for example, feline immunodeficiency virus, feline leukaemia virus, toxoplasmosis, feline infectious peritonitis, urinary tract infections and so on);
- dental or periodontal disease;
- inflammatory disease in general; and
- true behavioural problems.

*The importance of arthritis should not be overlooked. Radiographic evidence of degenerative joint disease is present in up to 90 per cent of cats more than 10 years of age³⁵. Associated pain and/or dysfunction can result in reduced activity and mobility, aggression, altered interactions with the family, loss of litter box training and/or crying out loudly.

Owners can help their arthritic cats by making minor modifications in their house – for example, by raising food and water bowls up by a few centimetres off of the floor to reduce stress on arthritic elbows; adding ramps to allow easier access to favoured sleeping areas; providing deep, comfortable bedding that will support and protect the cat's joints (heated beds can be particularly soothing); and placing low-sided litter boxes, food and water bowls all within easy reach of the cat.

Panel 3. Initial investigation of behavioural changes in geriatric cats should include:

- Full history, including the possibility of previous trauma (risk of arthritis), any potential exposure to toxins or drugs and any recent environmental changes (in the household, family members, diet and so on). Asking specific questions about alterations in the cat's behaviour can help in determining how the cat has changed (**Panel 4**).
- Full physical examination, including assessment of bodyweight, calculation of percentage weight change, body condition score, muscle condition score and retinal examination.
- Assessment of systemic blood pressure – this is very important as hypertension occurs commonly in older cats and may cause many of the same signs as CDS.
- Mobility assessment, plus neurological and orthopaedic examinations, which can be challenging in some cats.
- Assessment of haematology and serum biochemistry, including thyroxine concentration. | Urine analysis, including urine protein to creatinine ratio and bacterial culture (even if the urine sediment appears non-reactive³⁶).

Further investigation may include:

- Where appropriate, serological testing for FeLV, FIV, toxoplasmosis, feline coronavirus or other infectious diseases.
- Thoracic, abdominal or skeletal radiography, abdominal ultrasound examination, ECG, echocardiography, intestinal endoscopy/exploratory laparotomy and biopsy collection, as indicated from initial findings.
- CT or MRI of the head.

Panel 4. Mobility and cognitive dysfunction questionnaire*

It can be difficult to differentiate between many of the changes caused by CDS and those caused by arthritis. Indeed, the two conditions often occur concurrently in old cats and many of the

treatments for one condition also help the other.

* Ensure there have been no environmental reasons for the change(s).

My cat...	Yes	Maybe	No
Is less willing to jump up or down	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Will only jump up or down from lower heights	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shows signs of being stiff at times	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is less agile than previously	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shows signs of lameness or limping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has difficulty getting in or out of the cat flap	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has difficulty going up or down stairs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cries when is picked up	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has more accidents outside the litter tray	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spends less time grooming	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is more reluctant to interact with me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plays less with other animals or toys	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sleeps more and/or is less active	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cries out loudly for no apparent reason/to try to gain my attention	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Appears forgetful	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

*Ensure there have been no environmental reasons for the change(s).

	1995 1,134 owners	2010 1,016 owners
Increased affection to owner	81 per cent	30 per cent
Less tolerant of other animals in the house	26 per cent	21 per cent
More tolerant of other animals in the house	24 per cent	12 per cent
More vocal [*]	66 per cent	54 per cent
More vocal at night [*]	30 per cent	37 per cent
<p>[*]Halls V (2002). Unpublished data; and author unpublished data. [*]Cries out loudly for no apparent reason and/or to try to gain my attention.</p>		

Table 1. Changes in interaction with the family (questionnaire studies of cats of 12 years of age or more [median 15 years] as observed in two studies from the UK, 15 years apart*).

Key resource	All resources should be easily accessed. If an elderly cat has to walk too far for its food or water, it may do without.
Food	Place on a lower surface or provide ramps for easy access. Raise the food bowl up by a couple of inches, especially for arthritic cats. Food should be separate from water.
Water	Place on a lower surface or provide ramps for easy access. Raise the water bowl up by a couple of inches, especially for arthritic cats. Water should be separate from food.
Resting places	Provide multiple, elevated platforms with padded, comfortable bedding. Provide ramps for easy access. Warmed beds can be soothing.
Latrine sites	Provide one litter box per cat, plus one in multiple cat households. Use large, low-sided boxes for easy access. Keep boxes within easy reach of the cats. Sandy-type litter is usually easier on cats' paws.
Hiding places or exit routes	Provide easily accessed hiding places, including elevated sites. Provide ramps for easy access. In multi-pet households, ensure cats can have time alone when they want it. Do not assume an elderly cat can comfortably use a cat flap.
Companionship	Elderly cats may have a decreased or increased desire for human or animal companionship. Cats may grieve at the loss of a long-time companion. Introduction of a new cat or dog can be very stressful for elderly cats.

Table 2. Environmental adjustments for ageing cats.