

## THE AGE IMPACT ON THE URINARY BEHAVIOUR IN CATS - COMPARATIVE CASE STUDY

Simona NICOLAE, Iuliana CODREANU

University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Veterinary  
Medicine, 105 Splaiul Independentei, 050097, District 5, Bucharest, Romania

Corresponding author email: simona.calin93@yahoo.com

### *Abstract*

*The urinary behaviour in cats can be influenced by a series of physiological factors like age, physiological status and water intake. The present study highlights the age impact on the urinary behaviour, in terms of frequency and behavioural manifestation duration in different age groups. The study was carried out on 3 groups of clinically healthy cats, each consisting of 10 individuals grouped according to age: group 1 - youth, aged 3 months - 2 years old; group 2 - adults, aged 2-10 years old; group 3 - seniors, aged above 10 years old. The urinary behaviour was studied by performing individual ethograms, based on 24 hours/day video recordings, 5 consecutive days. The results showed that the highest urinating frequency/24 hours was recorded in youth, 62% higher than in adults, while in seniors the average frequency was 48.5% higher than in adults. Concerning the average length of the urinating session, the lowest mean value was recorded in youth, 27.9 seconds, 32.6% lower than adults, while in seniors the average value was 53.2 seconds, 28.5%, respectively 90.7% higher than adults, respectively youth.*

**Key words:** urinary behaviour, domestic cats, age.

### INTRODUCTION

The main physiological factors that have an impact on the urinary behaviour in felines are: age, weight, level of physical activity, as well as the physiological status - pregnancy/lactation.

The urinary behaviour is, from a physiological point of view, directly correlated with the dipsic behaviour in all animal species (Codreanu, 2022; Cunningham, 2019). Thus, an increased water intake will, invariably, leads to an increase of the urinary behaviour's manifestation, translated by the elimination of a larger volume of urine as well as by an increase of the frequency and duration of the urinating sessions (Codreanu, 2022).

From a physiological point of view, we can observe a sensitive diminution/accentuation of the urinary behaviour's manifestation depending on the environmental conditions, physiological status and, invariably, water intake (Batges & Polzin, 2011; Codreanu, 2017; Neilson, 2004), anuria, dysuria or polyuria being pathophysiological conditions.

As presented in the specialty literature, the age has a major impact on water consumption, therefore on the urinary behaviour as a direct

consequence, being also correlated with the level of physical activity (Deng et al., 2011).

The first stage of the ethological research is establishing the inventory of all the activities that form the behavioural repertoire of a species, this inventory being known as the individual's ethogram (Stanton et al, 2015; Codreanu, 2022). Therefore, in our study we performed individual ethograms, following the effect of age, as a main physiological factor with direct impact on the urinary behaviour in domestic cats, the two main coordinates used in order to characterise the urinary behaviour were the urinating frequency (times per 24 hours) and the average length of the urinating session (in seconds).

### MATERIALS AND METHODS

In order to perform this study we formed, according to age, 3 groups of healthy individuals, as follows: Group no. 1 (generally named: the youth group) - consisted of 10 individuals aged between 3 months and 2 years old; Group no. 2 (generally named: the adults group) - consisted of 10 individuals aged between 2 and 10 years old; Group no. 3 (generally named:

the seniors group) - consisted of 10 individuals 10 + years.

The gender was not a selection criterion, all 3 groups consisting of both males and females.

In order to create the groups, all individuals were subjected to both clinical and paraclinical examinations, namely: blood test - hemogram, biochemistry and blood smear, urine test - urine summary and sediment and also ultrasonography.

The study was performed in the time span August 2022 - December 2022, being an “on the field” study, the data was gathered by analysing the behaviour of each patient in its normal living conditions and performing ethograms. The data required for the ethograms was gathered by video recordings. The area of the litter box was recorded using the Xiaomi Smart Camera C300, the data being stored and processed using the Xiaomi Home mobile app,

Android version and the Huawei MatePad 11 tablet. Each individual’s litter box was monitored for 5 days, 24 hours a day.

The owners were required to sign an agreement for the video recording and also agreed to let us know if they observed the patient urinating in other place than their own litter box, as this aspect could influence the results of our study. None of the owners observed signs of urination outside the litterbox during our study.

## RESULTS AND DISCUSSIONS

The preliminary results were gathered in the form of group ethograms performed for each of the 5 days of monitoring, and that were used for the synthetic data. In Tables 1, 2 and, respectively, 3 are presented the ethograms performed for the individuals from the 3 studied groups on day one of monitoring.

Table 1. Ethogram of the urinary behaviour - day no. 1, in cats from the youth group (3 months - 2 years old)

TIME INTERVAL	INDIVIDUAL FROM THE YOUTH GROUP									
	1	2	3	4	5	6	7	8	9	10
0 A.M. - 1. A.M.				35 sec.		26 sec.			38 sec.	
1 A.M. - 2. A.M.		29 sec.					34 sec.			
2 A.M. - 3. A.M.	21 sec.		31 sec.					18 sec.		
3 A.M. - 4. A.M.										27 sec.
4 A.M. - 5. A.M.					38 sec.					
5 A.M. - 6. A.M.		26 sec.				23 sec.		24 sec.		
6 A.M. - 7. A.M.	23 sec.						42 sec.		32 sec.	
7 A.M. - 8. A.M.			27 sec.							
8 A.M. - 9. A.M.				38 sec.						
9 A.M. - 10. A.M.					33 sec.			27 sec.		
10 A.M. - 11. A.M.			21 sec.			30 sec.				35 sec.
11 A.M. - 12. P.M.	19 sec.									
12 P.M. - 13 P.M.							29 sec.			
13 P.M. - 14 P.M.								19 sec.		
14 P.M. - 15 P.M.		33 sec.	19 sec.							
15 P.M. - 16 P.M.	29 sec.			29 sec.		26 sec.			44 sec.	
16 P.M. - 17 P.M.										28 sec.
17 P.M. - 18 P.M.			22 sec.		41 sec.		32 sec.			
18 P.M. - 19 P.M.		21 sec.				18 sec.		33 sec.		
19 P.M. - 20 P.M.										
20 P.M. - 21 P.M.								17 sec.		
21 P.M. - 22 P.M.	20 sec.						25 sec.		29 sec.	
22 P.M. - 23 P.M.			29 sec.	33 sec.		32 sec.				43 sec.
23 P.M. - 0 A.M.					27 sec.			21 sec.		
<b>Number of urinating sessions/24 hours</b>	5	4	6	4	4	6	5	7	4	4
<b>The average number of urinating sessions/24 hours for the youth group</b>	4.9 times									
<b>Total time of the urinating sessions/24 hours</b>	112 sec.	109 sec.	149 sec.	135 sec.	149 sec.	155 sec.	162 sec.	159 sec.	143 sec.	133 sec.
<b>The mean time/urinating session</b>	22.4 sec.	27.2 sec.	24.8 sec.	33.7 sec.	37.2 sec.	25.8 sec.	32.4 sec.	22.7 sec.	35.7 sec.	33.2 sec.
<b>The mean time / urinating session for the youth group</b>	29.5 seconds									

 The manifestation of the urinary behavior


 Approaching the litter box (without actually urinating/defecating)

Table 1 shows the ethogram for the 10 individuals monitored in day no. 1. There are specified the time intervals when the urinary behaviour occurred in each individual (red colour), the time of each urinating session, the number of urinating sessions per 24 hours per individual, the average frequency and length of the urinating sessions per 24 hours per group, and, additionally, with green colour, the times the individuals approached the litterbox (as captured on video camera) without actually urinating or defecating, but, most likely with the intent of doing so. We did not statistically follow those periods as they do not present interest for our study, but, it can be easily observed in Table 3 that geriatric patients have the tendency to visit the litterbox more often than the individuals from the other two age

categories. This finding, although doesn't have specific significance for our study is in accordance with the data in the specialty literature (Landsberg et al., 2010; Davies, 2001).

We proceeded similarly for all 5 days of monitoring, performing each day ethograms like the one presented in Table 1. Then we corroborated the data from all 5 ethograms and obtained the synthetic results in the youth group.

The procedure was applied also for the other two groups. As well as in the youth group, the other two groups were monitored for 5 days, each day performing ethograms that gathered information used for the synthetic results in adult, respectively, senior patients.

Table 2. Ethogram of the urinary behaviour - day no. 1, in cats from the adult group (2 - 10 years old)

TIME INTERVAL	INDIVIDUAL FROM THE ADULT GROUP									
	1	2	3	4	5	6	7	8	9	10
0 A.M. – 1. A.M.		48 sec.						51 sec.		
1 A.M. – 2. A.M.			50 sec.		33 sec.					
2 A.M. – 3. A.M.							49 sec.			
3 A.M. – 4. A.M.						46 sec.			43 sec.	
4 A.M. – 5. A.M.	45 sec.			51 sec.						
5 A.M. – 6. A.M.										41 sec.
6 A.M. – 7. A.M.			42 sec.							
7 A.M. – 8. A.M.					31 sec.					
8 A.M. – 9. A.M.										
9 A.M. – 10. A.M.										
10 A.M. – 11. A.M.										
11 A.M. – 12. P.M.							31 sec.			
12 P.M. – 13 P.M.	39 sec.									
13 P.M. – 14 P.M.					42 sec.					
14 P.M. – 15 P.M.		53 sec.						37 sec.		
15 P.M. – 16 P.M.										
16 P.M. – 17 P.M.			38 sec.						50 sec.	
17 P.M. – 18 P.M.						39 sec.				
18 P.M. – 19 P.M.	41 sec.									
19 P.M. – 20 P.M.							33 sec.			45 sec.
20 P.M. – 21 P.M.					39 sec.					
21 P.M. – 22 P.M.				42 sec.						
22 P.M. – 23 P.M.			33 sec.							29 sec.
23 P.M. – 0 A.M.									32 sec.	
<b>Number of urinating sessions/ 24 hours</b>	3	2	4	2	4	2	3	2	3	3
<b>The average number of urinating sessions/ 24 hours for the adult group</b>	2.8 times									
<b>Total time of the urinating sessions/ 24 hours</b>	125 sec.	101 sec.	163 sec.	93 sec.	145 sec.	85 sec.	113 sec.	88 sec.	125 sec.	115 sec.
<b>The mean time / urinating session</b>	41.6 sec.	50.5 sec.	40.7 sec.	46.5 sec.	36.2 sec.	42.5 sec.	37.6 sec.	44 sec.	41.6 sec.	38.3 sec.
<b>The mean time / urinating session for the adult group</b>	41.9 seconds									

 *The manifestation of the urinary behavior*


 *Approaching the litter box (without actually urinating/defecating)*

Table 3. Ethogram of the urinary behaviour - day no 1, in cats from the seniors group (> 10 years old)

TIME INTERVAL	INDIVIDUAL FROM THE SENIORS GROUP									
	1	2	3	4	5	6	7	8	9	10
0 A.M. – 1. A.M.		47 sec.					51 sec.			
1 A.M. – 2. A.M.			64 sec.						53 sec.	
2 A.M. – 3. A.M.				56 sec.						49 sec.
3 A.M. – 4. A.M.	61 sec.					67 sec.				
4 A.M. – 5. A.M.				42 sec.				54 sec.		
5 A.M. – 6. A.M.		53 sec.			71 sec.					
6 A.M. – 7. A.M.									46 sec.	
7 A.M. – 8. A.M.			49 sec.			51 sec.				
8 A.M. – 9. A.M.	44 sec.									
9 A.M. – 10. A.M.		42 sec.		61 sec.			58 sec.		42 sec.	
10 A.M. – 11. A.M.					53 sec.			57 sec.		
11 A.M. – 12. P.M.			57 sec.							
12 P.M. – 13 P.M.										61 sec.
13 P.M. – 14 P.M.										
14 P.M. – 15 P.M.	53 sec.			51 sec.						
15 P.M. – 16 P.M.					61 sec.				51 sec.	
16 P.M. – 17 P.M.										
17 P.M. – 18 P.M.			44 sec.			61 sec.				
18 P.M. – 19 P.M.		56 sec.		43 sec.						
19 P.M. – 20 P.M.								59 sec.		
20 P.M. – 21 P.M.	49 sec.						61 sec.		47 sec.	
21 P.M. – 22 P.M.				38 sec.						
22 P.M. – 23 P.M.		51 sec.				42 sec.				57 sec.
23 P.M. – 0 A.M.					46 sec.			41 sec.		
Number of urinating sessions/ 24 hours	4	5	4	6	4	4	3	4	5	3
The average number of urinating sessions/ 24 hours for the seniors group	4.2 times									
Total time of the urinating sessions/ 24 hours	207 sec.	249 sec.	214 sec.	291 sec.	231 sec.	221 sec.	170 sec.	211 sec.	239 sec.	167 sec.
The mean time / urinating session	51.7 sec.	49.8 sec.	53.5 sec.	48.5 sec.	57.7 sec.	55.2 sec.	56.6 sec.	52.7 sec.	47.8 sec.	55.6 sec.
The mean time / urinating session for the seniors group	52.9 seconds									



**The manifestation of urinary behavior**

**Approaching the litter box (without actually urinating/defecating)**

The synthetic data regarding the urinating behaviour in the three groups of cats, during the study period (5 days), is comparatively presented in Table 4 and Figure 1.

The results obtained showed that the highest urinating frequency/24 hours was recorded in youth, being 62% higher than in adults, while in seniors the average frequency was 48.5% higher than in adults. Therefore, we can observe a decrease of the urinating frequency in adults compared to youth and an increase in seniors compared to adults.

Concerning the average length of the urinating session, the lowest mean value was recorded in youth, 27.9 seconds, 32.6% lower than adults, while in seniors the average value was 53.2 seconds, 28.5%, respectively 90.7% higher than adults, respectively youth.

Therefore, there can be observed a gradual increase of the average time spent at the

litterbox as the individuals get older. The results obtained are similar to the ones found in speciality literature (Churchill & Firmann, 2021; Davies, 2001).

In youth, the increased urination frequency (62% higher than in adults) can be justified by the high level of physical activity that translates into less sleep, a longer awake period and an increase of the dipsic behaviour manifestation (Deng et al., 2011).

The speciality literature also mentions that cubs and youth show a higher level of physical activity than adults and geriatric individuals, therefore, they consume larger amounts of water, and the frequency of watering and, consequently the frequency of the urination sessions is also higher in these age categories (Neilson, 2004; Bartges & Polzin, 2011).

Although the urination frequency is high, the time spent at the litter box is the shortest in all

3 groups, due to, most likely, their agility and the small capacity of the bladder. The increase of the urinating behaviour manifestation in senior cats (with 48.5% compared to adults) and also the concomitant increase of the time spent at the litter box (28.5% more than adults and 90.7% more than youth) are most likely correlated with the degeneration of the excretory system, a tendency for polyuria as the kidneys age (Codreanu, 2017; Neilson, 2004; Bartges & Polzin, 2011).

Also, studies show that in seniors and geriatric patients the urinating sessions' frequency is higher due to a decrease of the bladder's sphincter's tonus, this being also a cause of periuria in these patients (Cline, 2011; Fortney, 2012; Davies, 2001).

The speciality literature mentions a separate category of pathophysiological factors related to age, that have resonance, tangentially, on the urinary behaviour in this species, namely the

locomotory system disorders, with a direct impact on the patients' mobility and locomotion capacity (Gunn-Moore et al., 2007; Landsberg et al., 2010). Thus, in geriatric patients, the impairment of locomotion will lead to the modification of a wide range of behavioural manifestations (Bradshaw, 2018; Landsberg et al., 2010), in the case of the urinating behaviour, periuria is most often recorded as well as difficulties in reaching and properly using the litterbox (Fortney, 2012).

In our study, the increased length of the urinating session in senior cats is in accordance with the results and studies in the specialty literature (Churchill & Firmann, 2021; Fortney, 2012), as we can assess that the long time spent at the litter box can be caused by the decreased mobility that comes with older age and that leads to slower movements and difficulties in reaching, entering and leaving the litter box.

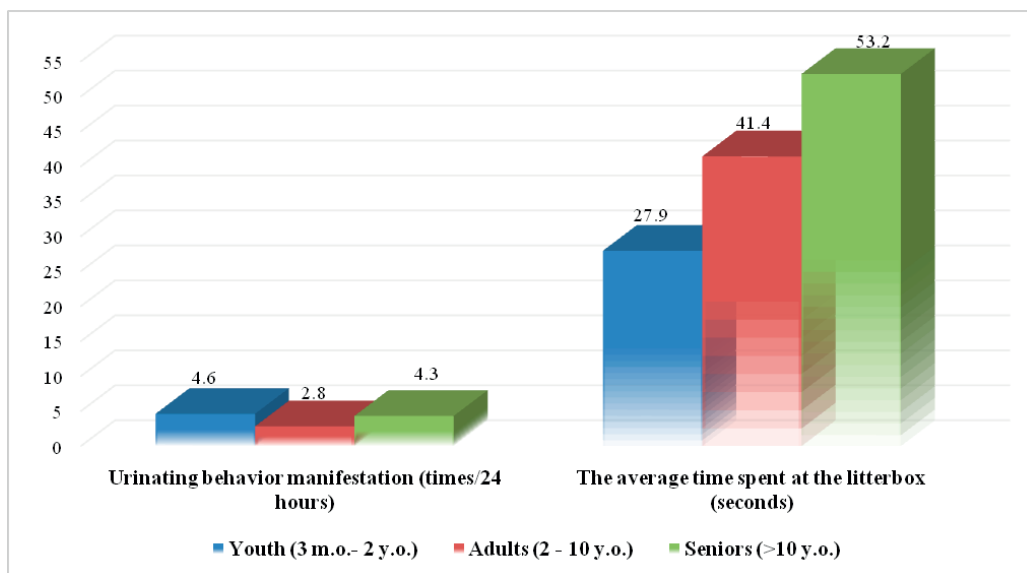


Figure 1. The comparative average data regarding the urination frequency and urination session time for the 3 studied groups of cats

Table 4. The average urination frequency and urination session time for the 3 studied groups of cats

Age group	The average frequency of urination/24 hours	The average time spent at the litter box
Youth (3 months - 2 years old)	4.7 times	27.9 seconds
Adults (2 - 10 years old)	2.9 times	41.4 seconds
Seniors/Geriatrics (> 10 years old)	4.3 times	53.2 seconds

## CONCLUSIONS

The age has an important influence on both the manifestation of the urinary behaviour and the time length of the urinating sessions.

In youth, the increased level of physical activity has an impact on the urinary behaviour in this species, with an increased number of urinating sessions, each session lasting approximately 30% less than in adults.

In senior patients, the advanced age effects on the urinary behaviour translate into more urinating sessions per 24 hours, the urination frequency being approximately 60% higher than in adults and into the highest urinating frequency in all three age groups – approximately 30% higher than adults and 90% higher than youth. All these changes observed being, most likely, the consequence of the degeneration of the kidney function, the urinary incontinence and the low physical activity and mobility that come with the advanced age.

## ACKNOWLEDGEMENTS

This study is part of the research carried out during the doctoral studies of PhD student Călin (Nicolae) Simona and will be widely presented in the doctoral thesis “*Research on the physiological and pathophysiological factors involved in the modification of diptic and urinating behavior in cat*”.

## REFERENCES

Bartges, J.W. & Polzin, D.J. (2011). *Nephrology and Urology of Small Animals*. Blackwell, Tennessee, SUA: Wiley Publishing House.

- Bradshaw, J.W. (2018). Normal feline behaviour: ... and why problem behaviours develop. *J Feline Med Surg.*, 20(5), 411-421, doi: 10.1177/1098612X18771203.
- Cline, J. (2011). Introduction: nutrition, geriatrics, and behavior. *Top Companion Anim Med.*, 26(1), 1, doi: 10.1053/j.tcam.2011.01.007.
- Codreanu, I. (2022). *Tratat de etologie și etopatologie veterinară*. Bucharest, RO: Printech Publishing House.
- Codreanu, M.D. (2017). *Patologie și clinică medicală veterinară*. Bucharest, RO: Printech Publishing House.
- Churchill, J.A., Eirmann, L. (2021). Senior Pet Nutrition and Management. *Vet Clin North Am Small Anim Pract.*, 51(3), 635-651, doi: 10.1016/j.cvsm.2021.01.004.
- Cunningham, J. (2019). *Textbook of Veterinary Physiology, 7<sup>th</sup> Edition*. Saunders Elsevier Inc.
- Davies, M. (2001). Elderly companion animal healthcare. *Vet Rec.*, 48(6), 188.
- Deng, P., Grant, R.W., Swanson, K.S. (2011). Physical activity level of adult cats with varied feeding frequency. *British Journal of Nutrition*, 106, S166–S169, doi:10.1017/S0007114511001863.
- Fortney, W.D. (2012). Geriatrics. *Vet Clin North Am Small Anim Pract.*, 42(4), 11-12, doi: 10.1016/j.cvsm.2012.05.002.
- Gunn-Moore, D.A., Moffat, K., Christie, L.A., Head, E. (2007). Cognitive dysfunction and the neurobiology of ageing in cats. *J Small Anim Pract.*, 48(10), 546-553, doi: 10.1111/j.1748-5827.2007.00386.x.
- Landsberg, G.M., Denenberg, S., Araujo, J.A. (2010). Cognitive dysfunction in cats: a syndrome we used to dismiss as 'old age'. *J Feline Med Surg.*, 12(11), 837-848, doi: 10.1016/j.jfms.2010.09.004.
- Neilson, J.C. (2004). Thinking outside the box: feline elimination. *J Feline Med Surg.*, 6: 5–11.
- Stanton, L.A., Sullivan, M.S., Fazio, J.M. (2015). A standardized ethogram for the Felidae: a tool for behavioral researchers. *Appl Anim Behav Sci.*, 173, 3-16.