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THE IMPACT OF TEMPERAMENT TYPE ON THE OCCURRENCE OF STEREOTYPIC BEHAVIOUR IN CHINCHILLAS

Natasza Święcicka[1], Mariusz Bogucki[1]✉, Anna Kołodziejska-Sawerska[2]

[1]Department of Animal Breeding and Nutrition, Bydgoszcz University of Science and Technology, Mazowiecka 28, 85-084 Bydgoszcz, Poland
[2]Veterinary Clinic Dino-Vet, Toruńska 6, 86-050 Solec Kujawski, Poland

ABSTRACT

The aim of the study was to define the extent of occurrence of stereotypic compulsive behaviour in chinchillas (biting the cage, licking the paws, fur chewing, aimless running around the cage) depending on the displayed character type (temperament). Thirty chinchillas were assigned to three character type (temperament) groups on the basis of a behavioural test. The conclusion of the analysis was that the chinchillas not displaying any signs of fear or hyper-excitability spent the least time on stereotypic compulsive behaviour. More timid individuals most frequently displayed oral compulsion such as paw licking or fur chewing, whereas hyperactive ones most frequently were observed to aimlessly run around the cage. It was concluded that the animal's disposition significantly influenced the amount of time spent on repetitive stereotypic behaviour ($P \leq 0.01$), and also that the time of day significantly influenced the frequency of chinchillas biting cage bars ($P \leq 0.05$). It was observed that chinchillas in group III manifested the analysed behaviour mainly during the night time, in the remaining two groups the intensity of studied traits was more diversified during both day and night. Additionally, a positive correlation was found between most analysed behaviours.

Key words: compulsive behaviour, character, temperament, chinchilla

INTRODUCTION

Chinchillas have long been treated as animals domesticated by humans. However, some individuals may be found among them which show various degree of tolerance towards the surrounding environment. Some of them in the course of domestication have developed the ability to suppress the innate fear of humans and submitted entirely to human will. Others, in turn, despite being completely dependent on humans are not able to fully socialize with them. Their sensory homeostasis is thus disturbed and compulsive behaviour is frequently an attempt to restore it. These behaviors develop in animals to bring about a balance between the body's internal environment and its surroundings. Stereotypicbehaviour reduces anxiety and ability to react to external stimuli, which in turn distracts the animals from the source of stress-generating factors such as: lack of varied space in the cage, size of the cage, bad living conditions and bad health condition [Bashaw et al. 2001, Mason 2007]. Prolonged repetition of the same behaviour internally strengthens this kind of stress response in an animal. According to many authors, stereotypical behaviour occurring in fur farming is mainly environment-oriented behaviour (running along the cage perimeter, jumping ,hitting the cage bars) and self-mutilation (fur chewing, paw or body licking) [Terlouw et al. 1991, Mason 2006, Novak et al. 2006, Sergiel et al. 2012, Święcicka 2018]. Aimless repetition of actions by chinchillas adversely affects their utility and reproductive features, and, above all, causes stress and suffering of the animals [Garner and Mason 2002, Schoenecker 2009]. Stereotypical behaviour is considered to be based on the conflict between avoiding the unpleasant stimulus and the need to reach the state of normalcy. Situations in which the animals are not able to reach this state are frustrating. The extent of the animals'

✉ bogucki@pbs.edu.pl

adaptation to the environment created for them by humans can vary depending on its sensitivity to surrounding stimuli. Therefore, it should be noted that wherever the animals are kept and for whichever purpose they are used, they are not identical in terms of their character, and, because of different personalities, may have various needs and expectations regarding the environment created for them by humans [Kaleta 2014]. Based on the Hippocrates typological system, four main temperament types can be distinguished: choleric, sanguine, phlegmatic, melancholic. Choleric type includes such traits as irritability, anxiety, aggressiveness, and excitability. Phlegmatic disposition, on the other hand, is characterized by passivity and caution. A melancholic individual prefers isolation and shows anxiety, and a sanguine is full of energy and ready to interact [Robinson 2001]. Studies on various animal species have shown that in determining the disposition of animals, the basic dimension consists of features whose variability is continuous between extreme values. Such features include shy/boldness exploration, activity, aggressiveness and social tendency [Reale et al. 2007].

Ponzio et al. [2012] observed that the most severe cases of trichotillomania (fur chewing) occurred in chinchilla females displaying elevated concentration of cortisol in urine, which would indicate their high sensitivity to environmental stimuli and their low resistance to stress.

The aim of the study is to show the intensity of stereotypic behaviour in chinchillas depending on their character traits (temperament) as well as to define the interrelations between the analysed types of behaviour.

MATERIAL AND METHODS

Thirty chinchillas: 2 year-old females of standard variety, were subjected to behavioural observation. Standard chinchilla is the only natural color variety in this animal species. Other color variations are mutations in the initial form, which is the standard chinchilla. It is characterized by very thick steel-gray fur, dark back, gradually brightening sides and white coat color. The eyes are black and the ears are gray.

Observation lasted 30 days, 24 hours a day, with the use of infra red wildlife cameras SGN-5220. Animals were selected for study purposes on the basis of the temperament test, performed on the spot and consisting in the observation of the animal's behaviour in its home cage in the presence of a human. Sixty-five subjects were used for the test, then thirty individuals with the most extreme values were separated based on its results and divided into three groups of ten animals each.

- Group I – chinchillas that remain motionless or go back to the angle of cage.
- Group II – chinchillas running nervously around the cage and attacking the hand of the experimenter.
- Group III – chinchillas that behave in the cage freely during the test.

This test best reflects the animal's temper and it is most frequently used in case of fur animals [Kowalska and Piechocka-Warzecha 2015, Zieliński and Ślaska 2015]. Two people conducting the test and an assistant recording the animal's reaction scores participated in the test. Both the tester and the assistant were not previously known to the animals.

The animals were not familiar with the person conducting the test. The test consisted in the person standing motionless in front of the open cage in which the animal was staying for approx. 3 minutes and then touching the elements of the cage: feeder and cage bedding. During the test performance the reactions and the way chinchillas behaved were observed. The observations involved:

- physical activity as natural behaviour – free movement around the cage, sniffing, touching person's hand, going out of the cage through open door, eating food and drinking water (each of these behaviours rated as 1 point); Such an individual exhibited a sanguine type that was bold and did not react nervously to the presence of a stranger. Showing proper exploratory and social behavior. About natural non-nervous activity and lack of aggression.
- physical activity as stress-induced behaviour – symptoms of aggression (attacking the person's hand), hiding in the corner of the cage, running inside the cage, jumping out through open door;
- This type of behavior indicates the type of choleric who has been seen to be aggressive. Great nervousness in exploration and at the same time shyness. No possibility of social contact with the animal.
- lack of animal's mobility – no movement of any kind.

The melancholic type of disposition is characterized by considerable environmental withdrawal. No area exploration or activity. Shy with limited social contact. The points obtained for each animal were added together and the mean was drawn. This value was decisive for classifying the animal into a given group.

On the basis of the performed test the animals were selected and divided into groups:

- Group I – animals which remain motionless or retreat towards the corner of the cage (melancholic type),
- Group II – animals which run hectically around the cage and attack the hand of the person conducting the test (choleric type),
- Group III – individuals behaving naturally in the cage during the test (sanguine type).

The cages of chinchillas under observation were additionally equipped with infra red cameras with a view to 24-hour long observation of animals in terms of manifestation of compulsive behaviour with a repetitive and

stereotypic sequence such as: biting the cage, licking the paws, fur chewing, running around the cage. Based on the wildlife camera footage it was possible to establish sequences of compulsive behaviour occurrence and their duration, analysed also with regard to the time of day when they were manifested. The day and night cycle was based on the time of artificial lighting switch on/switch off times (day, 6.00 a.m.–9.00 p.m.; night, 9.00 p.m.–6.00 a.m.). Data concerning time spent on observation of particular types of behaviour were compiled statistically Mean and standard deviation were calculated. Subsequently, there were calculations made with General Linear Model (GLM) and analysis of variance. In the model the following treatment effects were included: studied group and time of day:

$$y_{ijk} = \mu + \alpha_i + \beta_j + (\alpha\beta)_k + e_{ijklm}$$

where:

y_{ijk} – biting the cage, licking the paws, fur chewing, running around the cage,
μ – overall average,
α_i – impact of group,
β_j – impact of time of day,
$(\alpha\beta)_k$ – effect of interaction between determinants,
e_{ijklm} – random error.

In order to verify the significance of differences, Duncan test was used [Kot et al. 2011].

RESULTS AND DISCUSSION

In Table 1 the average time during the day was presented during which chinchillas manifested stereotypic behaviour. It was observed that the individuals from group III devoted the shortest time to this type of behaviour. Those were the 'neutral' animals – not displaying any symptoms of fear or hyperactivity ($P \leq 0.01$). The average time devoted to such type of behaviour was from 11.7 min (paw licking) to 35.2 min (running around the cage). Due to diversified etiology of this kind of behaviour it is difficult to state whether diminished frequency of displayed stereotypy is the indication of easier adaptation to environmental conditions since the stimuli-response threshold varies or whether the animals try to deal with stress in a different way [Novak et al. 2006]. More timid chinchillas reacting to all kinds of stimuli with staying motionless or backing off (group I) devoted significantly more time to repetitive compulsive behaviour, particularly such as: paw licking (108.8 min) or fur chewing 81.8 min $P \leq 0.01$. Similar observations were made by Ponzio et al. [2012], who concluded that the phenomenon of trichotillomania occurred more often in timid chinchillas.

Animals of group II, characterized by hyperactivity and hypersensitivity to stimuli, spent most of their time aimlessly running around the cage (166.5 min), which clearly distinguished them from ones of the remaining groups $P \leq 0.01$. They devoted the shortest amount of time to paw licking (37.7 min). Hansen [2010] and Jeppesen et al. [2004] stated that minks, being more active animal species, tend to manifest this type of behaviour more frequently. Hyperactive individuals show a very strong reaction to stimuli, even of minor intensity, which in the confined space environment may lead to stereotypic behaviour. According to Hansen et al. [2007] and Korhonen et al. [2003], the access to larger surface area of the cage did not significantly affect the lower frequency of behavioural disorder in farmed minks. Hansen and Jeppesen [2009] however, claim that the size of cage surface area affects the activity and extent of occurring stereotypic behaviour since minks kept in small cages were more active and displayed higher level of stereotypic behaviour than the ones kept in cages of larger size.

We also observed in our study a significant effect ($P \leq 0.01$) of the animal's temperament (treatment group) on the length of time devoted to all the analysed types of compulsive stereotypic behaviour, as well as significant ($P \leq 0.05$) effect of the time of day on the amount of time the animals spent on biting cage bars. Furthermore, interaction was detected between two main factors, i.e.: temperament type group and time of day ($P \leq 0.01$) in relation to the above described behaviour (Table 2). Many authors claim that the cause of various types of compulsive disorders is not the same. Very often the factor triggering such types of behaviour in fur-bearing animals, including chinchillas, is stress resulting from limited stimulation or lack of stimulation in the environment where the animal is kept, which makes it impossible to initiate proper drive-related behaviour, as a consequence leading to recurring frustration and deprivation in animals [Toates 1995, Passini and Kaleta 1999, Bashaw et al. 2001, Tisljar et al. 2002, Kaleta 2003, Mason et al. 2007, Latham and Mason 2008, Latham and Mason 2010, Sergiel et al. 2012, Łapinski et al. 2014, Święcicka 2018]. Hansen [2010] claims that such types of behaviour are hereditary (h^2 0.25) and can be eliminated by the selection of animals with regard to these features. Similarly, Łapinski et al. [2014] stated that fur chewing in chinchillas may have genetic origin, enhanced by improper environmental conditions. In turn, Guja [2017] assessed the polymorphism of the Slitrk1 gene in chinchillas with trichilomania. Showing localization of A>G transit in the analyzed sequences (g. 2911A>G). She stated that the synonymous mutation did not change the encoded amino acid (leucine).

The intensity degree of stereotypic compulsive behaviour in all studied chinchillas changed depending on the time of day (Fig. 1). It was noted that only in case

Table 1. The average time ($\bar{x}$) and standard deviation (Sd) for the stereotyped compulsive behaviors in chinchillas depending on the activity chinchillas

Compulsive behaviors	Group I $\bar{x} \pm$ Sd	Group II $\bar{x} \pm$ Sd	Group III $\bar{x} \pm$ Sd
Biting the cage	$30.1^{A} \pm 5.77$	$83.0^{A} \pm 2.75$	$19.0^{A} \pm 4.32$
Licking the paw	$108.8^{B} \pm 6.49$	$37.7^{B} \pm 4.57$	$11.7^{B} \pm 2.90$
Fur chewing	$81.8^{C} \pm 4.5$	$72.9^{C} \pm 11.93$	$27.4^{C} \pm 2.32$
Running around the cage	$23.5^{D} \pm 2.49$	$166.5^{D} \pm 25.28$	$35.2^{D} \pm 8.26$

AA… – statistically significant differences between the groups at $p \leq 0.01$. The same letters mean significant differences.

Table 2. F empirical for groups and time of day in relation to the studied stereotypical compulsive behaviors

Compulsive behaviors	Temperament group		Time of day (day/night)		Interactions between personality group and time of day	
	Empirical F	P	Empirical F	P	Empirical F	P
Biting the cage	3162.85	0.01	6.42	0.05	34.38	0.01
Licking the paw	4212.57	0.01	0.48	0.488	2.24	0.111
Fur chewing	593.84	0.01	0.5290	0.468	1.224	0.298
Running around the cage	911.68	0.01	0.472	0.493	4.208	0.017

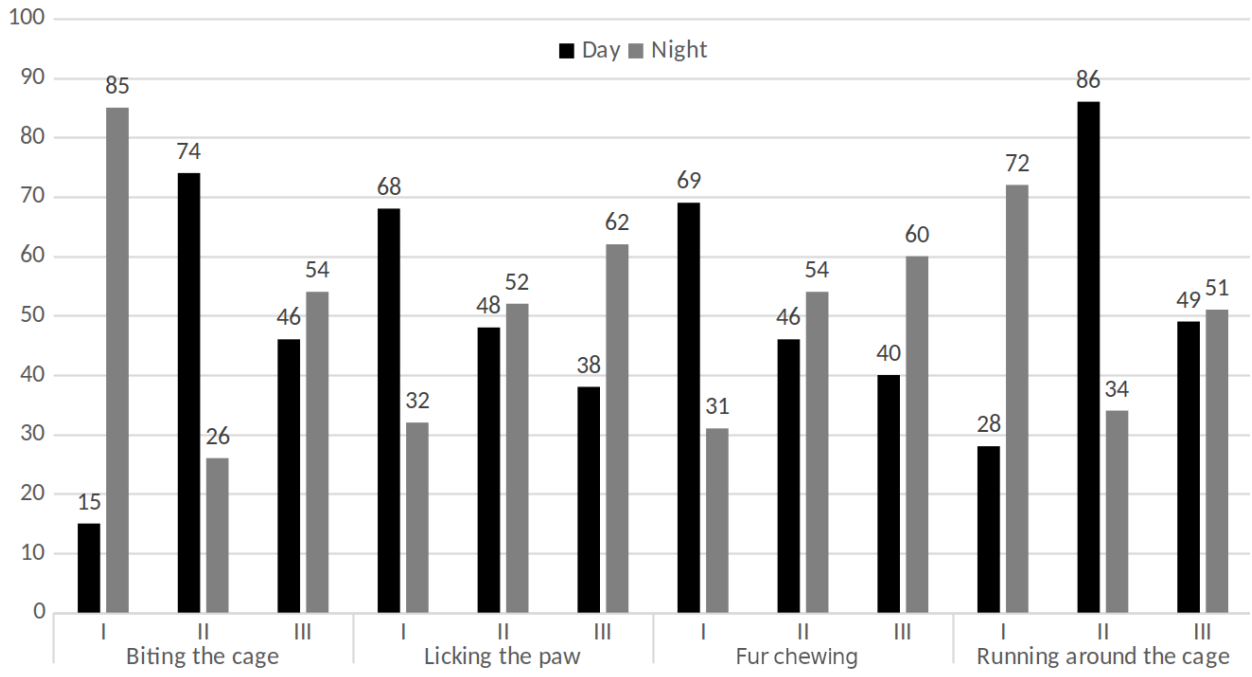

Fig. 1. The degree of stereotyped compulsive behaviors in chinchillas depending on the time of day

of chinchillas from group III the highest frequency of all studied compulsive behaviour types occurred during night time, which constituted from 51 to 62%. During the day chinchillas mainly rested or slept. Therefore it can be assumed that individuals characterized by high threshold of excitability and not showing symptoms of fear during the day manifested proper behaviour for this animal species. In case of two other groups, definitely more sensitive to all kinds of stimuli and cautious because of their state of anxiety, the intensity of studied abnormal behaviour was diversified. In chinchillas from group II biting cage bars and running around the cage took up much more time percentage during the day, respectively 74 and 86% whereas compulsion manifesting itself in paw licking and fur chewing was more frequently observed at night. The difference was slight, however (48 % during the day, 52 % during the night – paw licking and 46% during the day i 54% during the night – fur chewing). This was different in chinchillas characterized by hyperactivity, in which biting cage bars (85%) and running around

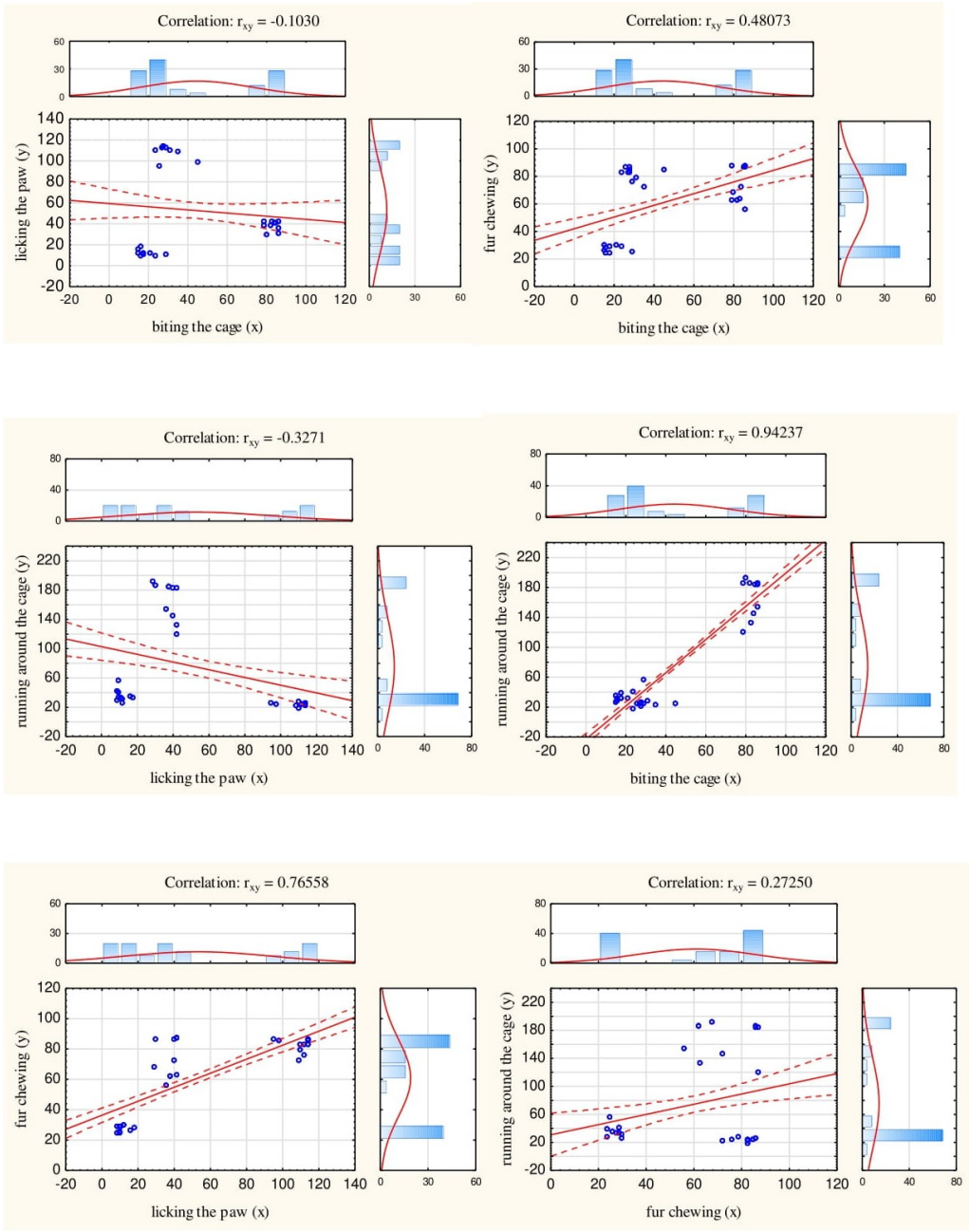

Fig. 2. Correlation coefficient (r_{xy}) for the analyzed stereotypical compulsive behaviors in chinchilla

the cage (72%) were mostly manifested when the light in the enclosure was switched off, while auto hygiene-related compulsion (licking the paws and fur chewing) constituted up to 68 and 69% of their time during the day (Fig. 1). According to Franchi et al. [2016] the maximum intensity of such type of behaviour in chinchillas occurs at night. The animals devoted the smallest amount of time to fur chewing between 1.00 p.m. and 5.00 p.m. Simultaneously the authors observed that fur chewing is not the only anomalous behaviour in chinchillas, but it is the most frequently reported one, for commercial reasons, by fur farmers. Equally often chinchillas bit cage bars; the highest intensity of this type of behaviour was also observed during night time [Franchi et al. 2016].

The analysis of data comprised in Fig. 2 showed interrelation between most of the studied features. The highest degree of correlation ($r_{xy} = 0.94$, $r_{xy} = 0.77$, $P \leq 0.01$) was indicated in such types of behaviour like biting the cage and running around the cage as well as licking the paws and fur chewing. Equally significant positive cor-

relation was observed between behaviour such as biting the cage and fur chewing (r_{xy} = 0.48, P $\leq$ 0.01), as well as running around the cage and fur chewing (r_{xy} = 0.27, P $\leq$ 0.01). Negative and insignificant correlation was observed between paw licking and biting the cage (r_{xy} = –0.33, P $\leq$ 0.23). On the basis of the obtained correlation results it can be stated that most of the occurring types of stereotypic compulsive behaviour incur the appearance of new stereotypic behaviour in chinchillas, the exception being the interaction between such behaviour as paw licking and biting cage bars.

CONCLUSION

Concluding the conducted research, it can be reasoned that not only the environmental conditions or genetic factors, as other authors claim, have impact on the occurrence of stereotypic behaviour in chinchillas. It is also the charakteer type represented by a given animal, which allows it to adapt to a certain environment. Animals with high threshold of excitability, not displaying symptoms of stress group III) manifested behaviour much less frequently than the individuals from groups I and II, in which sensitivity to stimuli was much higher and manifested itself in hyperactivity (group II) or complete stillness and withdrawal (group I).

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WPŁYW TYPU USPOSOBIENIA NA WYSTĘPOWANIE ZACHOWAŃ STEREOTYPOWYCH U SZYNSZYLI

STRESZCZENIE

Celem badań było określenie stopnia stereotypowych zachowań kompulsywnych u szynszyli (gryzienie klatki, lizanie łap, żucie włosów, bezcelowe bieganie po klatce) w zależności od typu usposobienia (temperamentu) wykazywanego u tych zwierząt. Przeanalizowano 30 szynszyli, podzielonych na trzy grupy na podstawie testu behawioralnego. W wyniku przeprowadzonych badań stwierdzono, że szynszyle, które nie wykazywały objawów lęku czy nadpobudliwości, poświęcały najmniej czasu stereotypowym zachowaniom kompulsywnym. Bardziej bojaźliwe osobniki najczęściej wykazywały zachowania kompulsywne oralne, jak lizanie łap czy żucie futra, podczas gdy nadpobudliwe najczęściej biegały bez celu po klatkach. Stwierdzono, że usposobienie zwierzęcia istotnie wpływało na ilość czasu przeznaczanego na powtarzane stereotypowe zachowania ($P \leq 0.01$), a pora dnia istotnie wpływała na częstość gryzienia krat klatki przez szynszyle ($P \leq 0.05$). Zaobserwowano, że w grupie III szynszyle wykazywały analizowane zachowania głównie w nocy, w pozostałych dwóch grupach intensywność badanych cech była bardziej zróżnicowana zarówno w dzień, jak i w nocy. Dodatkowo stwierdzono dodatnią korelację pomiędzy większością analizowanych zachowań.

Słowa kluczowe: zachowania kompulsywne, usposobienie, temperament, szynszyla

Natasza Święcicka https://orcid.org/0000-0002-5429-1267
Mariusz Bogucki https://orcid.org/0000-0002-7524-7417
Anna Kołodziejska-Sawerska https://orcid.org/0000-0001-9743-5307