

GRAPHIC RECORDING OF GROOMING AND ITS PARAMETERS IN DEVELOPING RATS

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The genetically determined structural and functional stereotypy which marks the course of specialized skin cleansing reflexes such as washing, scratching, licking, and shaking (collectively termed grooming) is increasingly attracting the attention of research workers [2, 9]. A characteristic feature of grooming is the rhythmicity of the movements. Meanwhile, the basic method of studying grooming has hitherto been visual observation with counting of the different grooming movements in a chosen time unit [7-9, 11]. The study of grooming rhythms, reflecting the working of CNS rhythm generators, demands a different approach technique. To study the rhythm of scratching movements, Arshavskii [1] used a combination of the visual method with pressing an electromagnetic marker and recording the marks of the rhythm on a kymograph. It was discovered for the first time that the rhythm of one type of grooming, namely the scratching reflex, changes during ontogeny of the animals, and the time when it reached maturity also was established. However, this method has not subsequently been used. The graphic method of Voino-Yasenetskii and Moskalenko [3] enabled the rhythm of scratching movements of young rats to be recorded before they acquired vision, under conditions of partial immobilization [5]. The most successful method for these purposes in experiments on unrestrained rats has been found to be to use an actograph, with piezoelectric transducer fixed to floor [6]. Oscillations produced by movement of the rats were amplified and recorded graphically on an ÉÉGPCh-2 electroencephalograph. The actographs are of a size which corresponds to the animals' weight and they are made of transparent plastic, so that visual observation of the animals is possible (Fig. 1, I). Graphic recording offers great opportunities for the comprehensive analysis of grooming parameters — not only the number of movements but also their rhythm and duration.

The aim of this investigation was to determine the time when grooming movements of rats reach maturity in the course of ontogeny, by means of graphic recording and analysis of the parameters of all grooming movements during the period of their first appearance and subsequent development.

Movements of 57 unrestrained young rats were recorded regularly during the first month of life and also in 27 adult rats. The duration of each experiment was 1 h. The main results of the investigation are illustrated in Fig. 1, II, a and b) and in Table 1, which gives the parameters of the grooming movements (rhythm, duration, number) in young rats at the time of first appearance of the rhythmic phase of grooming and in adult rats, and also the times of their appearance during ontogeny and of reaching the adult level.

During ontogeny the rhythmic phase of grooming appears [1, 4, 10] before the development of the tonic phase, when the animal simply moves its paw toward the site of stimulation without making rhythmic movements with it. The appearance of the rhythmic phase in the development of grooming movements was recorded in the present experiments earlier than had previously been described [1, 8, 10]. The rhythm of all grooming movements (washing, scratching, licking, shaking, biting the fur) was slower at the time of their first appearance than in adult animals. Their duration was shorter and they were fewer in number than in adult rats. Incidentally, early rhythms of washing, scratching, and shaking showed greater changes during ontogeny (on average threefold) than those appearing later (the rhythm of licking increased by only

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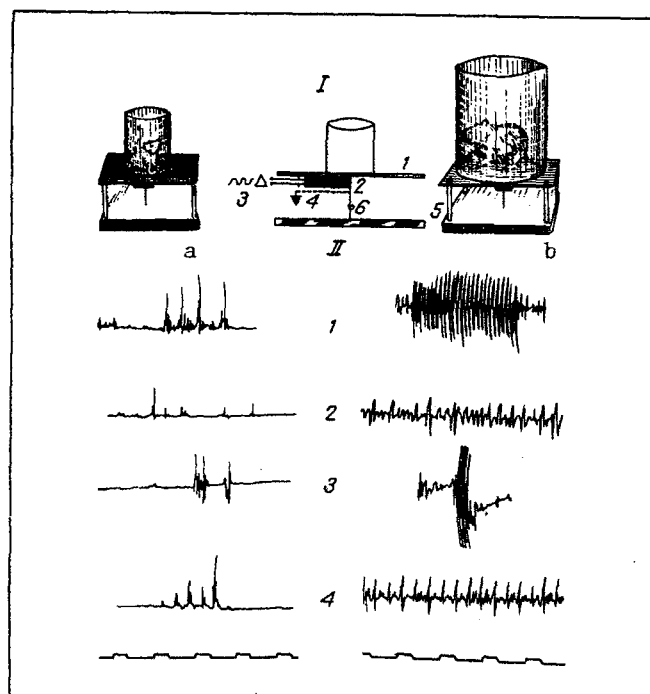


Fig 1. Graphic recording of grooming in developing rats. I) Diagram of actograph: 1) floor of actograph; 2) piezoelectric transducer; 3) amplification and recording system; 4) screen; 5) base of actograph; 6) needle of piezoelectric transducer; II) grooming by young rats (a) and adult rats (b). a) Scratching (1) and washing (2) by young rats aged 3 days; shaking (3) at age of 7 days and licking (4) at age of 10 days; b) scratching (1), washing (2), shaking (3), and licking (4) by adult rats. Time marker 1 sec.

TABLE 1. Grooming by Rats during Ontogeny

Type of grooming	Age, days		Parameter of grooming					
	appearance of grooming rhythms	maturation of grooming	young rats			adult rats		
			rhythm, per second	duration, sec	number in 1 h	rhythm, per second	duration, sec	number in 1 h
Washing	0—3	4	$1,6 \pm 0,2$	$4,5 \pm 0,2$	2 ± 1	$4,0 \pm 0,2$	$5,0 \pm 0,4$	2 ± 1
Scratching	1—3	15	$2,3 \pm 0,3$	$1,6 \pm 0,2$	1 ± 1	$10,5 \pm 0,7$	$2,4 \pm 0,5$	15 ± 4
Shaking	5—6	16	$6,0 \pm 0,5$	0,3	2 ± 1	$14,5 \pm 1,8$	0,4	4 ± 2
Licking	6—7	12	$2,5 \pm 0,3$	$1,2 \pm 0,1$	1 ± 1	$4,0 \pm 0,2$	$6,0 \pm 0,4$	3 ± 1
Biting	9—10	16—17	$10,0 \pm 0,8$	$1,0 \pm 0,1$	1 ± 1	$11,8 \pm 0,4$	$3,0 \pm 1,0$	4 ± 2

1.5 times), whereas the rhythm of biting the fur increased during the whole of ontogeny by only 1.2 times. The scratching reflex developed particularly rapidly: the rhythm of scratching movements increased by 4.5 times and the number of movements by about 15 times.

During ontogeny the values of all parameters of specialized movements increase, but in a comprehensive analysis of grooming, its rhythms reflecting the specific character of this type of behavior, because their stability is greatest in adult animals, are a decisive indicator for establishing times when grooming movements reach maturity. It can be concluded from the results of the investigation that the washing movements of grooming reach the maturity level on the 4th day of life of young rats, scratching movements on the 15th day, shaking on the 16th, licking on the 12th, and biting the fur on the 16th-17th day (Table 1). We confirmed data in the literature [1] on maturation of the scratching reflex in young rats at the age of 14-16 days and of shaking at the age of 15 days [10], and an increase in the number of grooming movements in rats during ontogeny [5, 8, 10, 11].

By graphic recording we were thus able to record and analyze the parameters of all grooming movements in unrestrained rats during ontogeny, to determine the precise times of appearance of the grooming rhythms, and to conclude that all grooming movements have attained the level of maturity by the time that the rats have acquired vision (the 16th-17th day after birth).

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