The operant type learning behaviors in the spontaneously hypertensive rat (SHR). Masahiko NOMURA and Masataka OHTSUJI. Dept. of Physiol. School of Med. Fujita-Gakuen Univ. Toyoake, Aichi 470-11, JAPAN.

INTRODUCTION It is already known that the SHR is more sensitive to stress like an electric shock in escape or avoidance performance than the WKY, due to its higher level of activity of the sympathetic nervous system. We examined the learning behaviors of these two strains of rats using the operant type Skinner box, in order to characterize the physiological aspects of hypertension under this novel environment. We intended to discover whether changes of this behavior are due to the genetic difference between two strains of rats or not.

MATERIAL AND METHODS The SHR and the WKY were housed in individual cages at the 11 weeks of age. They were food deprived for one week until their body weights went down to 85% of the body weight of ad libitum. They remained at this weight for the duration of the experiments. After having been shaped in the Skinner box, the rats were trained to perform the lever press task to obtain the food pellet. After continuous reinforcement for several days, two learning schedules were given to the two strains of rats.

1). Brightness discrimination learning was examined on the Multi-VII Extinction schedule, and the rat was reinforced by the food pellet under the variable interval 15 seconds when he pressed the lever while S+ (1,000 times as bright as S-) was given. With S-, no food pellet was given. One session consisted of 20 S+ and 20 S- per a day. The correct response ratio (R+/R++R-) was employed as an index of learning acquisition. The acquisition of brightness discrimination learning performance was done when the level of 85% correct response ratio continued at least for 3 days.

2). Fixed ratio schedule was given on the fixed ratio 50 (FR-50), through fixed ratio 10 to fixed ratio 20. One session consisted of 20 trials per a day. A response rate of the response per a minute compared the two strains of rats.

RESULTS 1). The brightness discrimination learning test: The SHR showed that the number of R+ increased from 100 at the 1st session to 300 at the 30th session, and the number of R- kept constant around 80 to 100 for 30 sessions. So the correct response ratio was less than 80% for 30 sessions. On the contrary, the WKY showed that the number of R+ increased from 150 at the 1st session to 260 at the 30th session, and the number of R- decreased from 120 at the 1st session to 45 at the 30th session. So the correct response ratio was more than 85% after the 25th session.

2). The FR-50 schedule test: The SHR showed that the response rate increased from 50 at the 1st session to 70 at the 30th session. In contrast, the response rate of the WKY was around 30 through 30 sessions.

DISCUSSION The acquisition data of the brightness discrimination learning performance differed greatly between the SHR and the WKY. The SHR did not perfect acquisition of the discrimination performance within 30 sessions. On the contrary, the WKY completed it at the 25th session. It depends on no decrease of the number of R-, and the increase of R+ in the SHR. This data shows that the number of errors in the SHR was larger than that of the WKY. It might be considered that the SHR did not acquire discrimination learning. On the FR-50 schedule, the SHR showed a much higher response as a response rate. This means that the SHR showed hyperactivity in the lever-press task, and no postreinforcement interval during the period, whereas the WKY showed a low activity and a certain interval between sessions. The change of learning behavior in the SHR was completely different from that of the WKY. From the pharmacological point of view, we should examine the correlation between the change of hypertension and behavior in the SHR treated with some antidepressant drugs, on both positive and negative reinforcement schedules.

Thus we can conclude that the behavioral changes in the hypertensive rat are partly due to their hypertension or that some other disorders of the central nervous system have occurred.