A COMPARISON OF CONDITIONED REFLEXES USING DIFFERENT REINFORCING STIMULI

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In determining types of higher nervous activity, the standard tests are used, and in these the essential indications are given by conditioned reflexes based on response to food. However it is being reported with increasing frequency in the literature, that the conditioned reflex activity of one single animal, determined on the basis of only one kind of reinforcement, may differ from that determined by using a different reinforcing stimulus.

I. I. Korotkin [5], using feeding and defense as reinforcements, found that only in 2 out of the 9 children investigated was there agreement in respect of type, when two different reinforcements were used.

O. P. Kapustnik and V. K. Faleeva [3] report a different rate of extinction of conditioned reflexes in children, according to whether the reinforcement was by feeding, orientation, or speech.

L. E. Khozak [11], in establishing conditioned reflexes and inhibitions using food, orientation, and defensive reaction, as reinforcements in children, found that according to the three methods, one child could be classified as belonging at the same time to several different higher nervous activity types.

A. G. Ivanov-Smolensky [2], dealing with work of this kind, thinks that "together with the general sympathetic type of higher nervous activity, one may also talk of a partial, component type, whose characteristic is either a heightened or a lowered feeding, defense, sexual, or exploratory activity, or a greater or less tendency to establish conditioned associations." He considers this to apply not only to increase or decrease in excitability, but also to lability or inertia.

A. P. Chesnokova [12], M. S. Alekseev [1] and M. V. Troitskaya [9], working with animals, using food and acid as reinforcements, and applying a low standard in defining higher nervous activity, found different characteristic types according to the reinforcement used.

It can be seen from the literature, therefore, that one cannot determine the type of higher nervous activity of an animal, purely on the basis of the feeding method.

In the present paper we report results obtained during an investigations of the relation between conditioned and unconditioned reflexes, in the case of reinforcement with food, acid, or electrical stimulation of the skin. In this way, we can compare the conditioned reflex responses obtained with each kind of reinforcement in one and the same animal, i.e., we can describe the characteristics of a type in a greater number of ways.

It must be noted that we made a more or less detailed determination of type, only in the case feeding reinforcement; when using acid or giving electrical skin stimuli, we investigated only the rate of development, magnitude, and consistency of the conditioned reflexes, and the speed and stability of the differentiation. Taking into account that all these indications are of considerable importance in determining an animal type, we can now to some extent determine a type of higher nervous activity on the basis of experiments using several different reinforcing stimuli.

In the case of conditioned reflexes to food or acid or to stimulation of the defense reaction, we had to break up the stereotyped behavior and to reinforce the differentiated stimulus, and this allowed us to form conclusions as to what type the animal was when acid was given or electrical stimuli were applied to the skin. When we compared the different indices of conditioned reflex activity in each animal, obtained by using different reinforcements, we found that conditioned reflex behavior with one kind of reinforcement was sharply distinguished from that shown in response to another kind, and that the strength of the processes in the cortex might be quite different according to the kind of unconditioned stimulus.

The results are shown in the following table.

Conditioned Reflex Behavior with Different Kinds of Reinforcement

Dogs used	Reinforcement with		
	Food	Acid	Electrical stimulation of skin
Irtysh	Strong balanced (Sanguine)	Strong unbalanced	Strong balanced
Dozor	Strong balanced (phlegmatic)	Weak	Strong balanced
Ruslan	Strong unbalanced	Weak	Weak
Agap	Weak	Strong balanced	Weak
Golub	Weak	Strong unbalanced	Strong unbalanced
Boi	Weak	Weak	Weak

From this table we see that of the 6 dogs used in the experiment, in 2 there was agreement as to type for all three reinforcing stimuli; one of these was shown in each case to have the strong type of nervous system, and the other the weak type in all three tests. In the remainder, the conditioned reflex behavior was a function of the kind of reinforcement. We must however point out once more that in talking of the defense reflexes, and those stimulated by acid, we refer only to the reflex in a general way and have not carried out the special tests required for an accurate determination of the type of higher nervous activity.

It is known that the subcortical centers constitute a source of energy which is necessary for the activity of the cortical cells. It is also known that the different conditioned reflexes are of different strengths in the one animal. It is natural therefore, when the reinforcement is related to a strong unconditioned reflex, that the unconditioned reflex behavior will be associated with strong cortical processes, and conversely, when the reinforcement affects only a weak unconditioned reflex, the conditioned reflex activity will be characterized by the weakness of the cortical processes.

We must also emphasize that in nearly all the animals, with reinforcement by acid or by electrical stimulation of the skin, differentiation was obtained with far greater difficulty than when food was used.

The explanation of this is to be found in the tendency, in the case of the defense reflexes, for the excitatory condition to radiate, a tendency which results in a greater degree of generalization of the positive conditioned reflex.

SUMMARY

In the course of establishing conditioned reflexes in dogs on the basis of unconditioned – food, acid and motor – defensive reflexes, typological peculiarities of each dog have been studied. Conditioned reflex activity under all of the three reinforcements has shown a coincidence of typological peculiarities in two dogs – one of the strong, the other of the weak type of nervous activity. As to the remaining four dogs each demonstrated individual typological peculiarities to each reinforcement of conditioned reflex activity. In almost all of the dogs the inhibitory cortical process was relatively weaker than the stimulating one.

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