

Bipolar Choice in Experimental Chamber

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In 1961 Herrnstein published the results of his experiments which showed that the frequencies of pigeons' responses are proportional to the frequencies of reinforcements [1].

A pigeon in an experimental chamber had two keys controlled by independent programs of producing little grains. An experimenter could vary the frequencies of reinforcement and a pigeon could develop its line of behavior. The experimental data led to the hypothesis that pigeons' behavior is subject to the rule that was called the law of matching: the ratio of the numbers of strokes of the beak to the keys is equal to the ratio of the numbers of grains obtained as a result of these strokes.

Nobody was surprised by the revealed pattern because, at that time, the idea that the frequencies of choices are proportional to utilities was dominating. It was natural to consider the numbers of grains obtained by pigeons as "utility measure." More careful experiments have changed the situation. A systematic deviation from proportionality was found: the birds were pecking to one of the keys more often than the matching law required [2]. Moreover, the frequency of pecks is usually higher to the key whose program gives grains more sparsely. This result looked paradoxical: the leaner alternative turned out to be more attractive to the birds than the richer one. After this discovery, the matching law was replaced by the Generalized Matching Law [3], which described the phenomenon but did not explain it. Later on Baum [4] showed experimentally that the graph that was considered to be a continuous line, has a break.

In a completely different area of psychology which investigates human bipolar choice including moral choice, the reflexive model of choice was constructed [5]. Later on this model was connected with the axiom of repeated choice [6]. The model was presented mathematically and was able to predict the probability of choosing the positive pole, that is, it was verifiable.

To clarify what kind of choice we are talking about, let us consider the following situation. A person faces two alternatives: to tell the truth or to lie. Let saying truth be "good" for this person and lying is "bad". In addition, if this person tells the truth he will receive \$10, if he lies, then he receives \$10.000. This is an example of a choice that has two aspects: moral and utilitarian. In the utilitarian aspect, the alternatives are attributed with numbers corresponding to their utility. In the given example, the negative pole (lie) is more profitable than the positive pole (truth). However, without a model we cannot say with confidence what alternative will be chosen, because polarity and utility are incompatible with each other.

The reflexive model allows us to make predictions concerning the probabilities of choosing poles in this kind of experiments. It should be noted that conducting experiments in choosing between "good" and "bad" is facing some difficulties of ethical character. So, most of the analyzed experiments were conducted with evaluating various objects and events on bipolar scales. The model gives reason to believe that subjects' choice in such experiments based on the two aspects (the first one is connected with bipolarity and the second one with utility) and is subject to same rules as the moral choice.

The reflexive model helped to explain some psychophysical

phenomena, for example, a nonlinear ratio between magnitude and categorical evaluations of the same physical stimulus: length, weight, duration, area [7]. These results suggested that the model can describe not only human choice but the choice of animals as well. The analysis of Baum's experiments [4] demonstrated that Baum's pattern can be explained with the help of the reflexive model. The model also predicted the existence of other patterns [8].

The ability of the model based on the axiom of repeated choice to explain and predict the relation between the frequencies of responses and the frequencies of reinforcements is a fact important beyond the framework of studying animal behavior in experimental chambers. Now we can assume animals' choice in a broad class of situations is based on the two aspects similar to the human choice which is based on the two aspects. We are far from thinking that animals are capable for moral choice. However, the animals' evaluations are related either to the global slowly changing events or to local fast changing ones [9]. Former are connected with bipolar evaluations "positive" and "negative" and the latter with quantitative evaluations of alternatives' utility.

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