DRUG EFFECTS ON FEAR AND FRUSTRATION: POSSIBLE LIMBIC SITE OF ACTION OF MINOR TRANQUILIZERS

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Is the anti-anxiety effect of the benzodiazepines therefore a central anti-adrenergic phenomenon? And if so, what is the role of brain norepinephrine in the chain of events which leads to psychoneurotic fear?

—Zbinden and Randall (1967, p. 284)

1. INTRODUCTION

This chapter attempts to answer the following linked questions:

1. What is the simplest adequate description of the effects of the “minor tranquilizers” on “emotional behavior” (terms I shall define below)?
2. What underlying psychological processes are altered by these drugs to produce these behavioral effects, and in what way are they altered?
3. On what brain structures or systems do these drugs act to produce these behavioral effects?

In the course of constructing answers to these questions we shall offer a fairly thorough review of certain of the behavioral effects of the minor tranquilizers.
tranquilizers. In approaching this review, we shall start with the barbiturates, especially sodium amobarbital (SA). The choice of this drug as a starting point is dictated by several considerations: Its behavioral effects are remarkably specific with respect to reinforcement conditions; these effects have been studied in the laboratory in relatively great detail; and they have been investigated with relatively careful theoretical attention paid to the question of the underlying psychological processes affected by the drug. However, we shall see that most of the conclusions applicable to SA are equally applicable to other barbiturates, to ethanol and to the benzodiazepines. These, then, are the drugs covered by the term, "minor tranquilizers" as it is used in this chapter. Considerations of space have made it necessary to exclude meprobamate, which has major similarities with the drugs whose effects are reviewed. Brief mention will be made, however, of Δ⁸-tetrahydrocannabinol (THC), the major active principle of cannabis, which also has a number of striking similarities with the minor tranquilizers (Section 8.2, below).

The data I shall draw upon are almost entirely taken from experiments with animals. However, the link between many of these experiments and the clinical effects of the minor tranquilizers in man is quite close. Indeed, psychologists who have studied the effects of SA on rats have often regarded themselves as investigating the changes produced by this drug in emotional states (especially "fear" and "frustration") which are thought to be essentially similar to the emotional states whose control is the aim of clinical intervention with the minor tranquilizers in man. These experiments on rats have usually been conducted within the framework of "learning theory," and it is within this framework that they will be discussed here.

2. LEARNING THEORY BACKGROUND

If we are to make efficient use of this framework, some preliminaries are in order concerning the treatment accorded the emotions within learning theory. As discussed elsewhere (Gray, 1972a, 1975), the most common strategy (e.g., Spence, 1956; Mowrer, 1960; Amsel, 1962; Millenson, 1967; Weiskrantz, 1968) is to treat the emotions as states elicited by instrumentally reinforcing stimuli or by stimuli which have been associated with such reinforcing stimuli. Although the details differ from author to author, this strategy usually forms part of a version of "two-process theory," according to which goal-directed behavior is the outcome of an interaction between two fundamental learning processes, one being classical conditioning (Pavlov, 1927), and the other, instrumental or operant conditioning (Skinner, 1938). The particular version of two-process theory in which it is proposed here to embed the emotions is one I have recently spelled out in some detail (Gray, 1975). The description given of it here can therefore afford to be—as indeed it must be—brief.