Arousal-Reducing Effects of Chronic Stimulant Use

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A variety of studies with habitual users of nicotine, caffeine, cocaine, and amphetamines have shown that administration of these stimulants has the paradoxical effect of lowering arousal states. Research on transmarginal inhibition shows that when subjects are presented with a succession of stimuli monotonically increasing in intensity, GSR and related arousal responses increase first and then begin to decline beyond a certain point of stimulus intensity. That is, following repeated exposure to intense stimuli, continued more intense stimulation has the effect of lowering arousal. Since stimulants subjectively heighten stimulus intensity, the transmarginal inhibition data provide a basis for explaining opposing effects of stimulants on arousal, depending on dose and frequency of use. It was hypothesized that when dose levels are low and usage is infrequent, arousal increases with stimulant intake. In contrast, when dose levels are high and frequent, arousal shows decrements with new intakes of stimulant. A new questionnaire measure of characteristic arousal was developed and correlated with subjects' reports of habitual levels of stimulant and sedative intake. Weekly total stimulant use correlated significantly and negatively with characteristic arousal level, providing support for the hypothesis. This lowered arousal of frequent stimulant users was not a confound of, or due to, concomitant frequent sedative use, since total stimulant and sedative use levels were uncorrelated.

Evidence from a variety of sources indicates that habitual use of stimulants is conducive to lowered arousal states in users. The bulk of available findings relates to nicotine from cigarettes. Agué (1973) assessed "activa-

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tion" (defined to subjects as a continuum ranging from deep dreamless sleep to a high level of fear) in relation to nicotine content of cigarettes the subjects smoked. Activation decreased linearly with increasing nicotine content of cigarettes and was lowered the most by cigarettes of highest nicotine content.

Heightened arousal is a significant component of the emotional states of anxiety, fear, and pain, as well as of aggression and anger (Russel & Mehrabian, 1974). If administration of nicotine reduces arousal in the habitual smoker, then anxious, aggressive, or pain responses also should decrease with nicotine administration.

Heimstra (1973) permitted some habitual smokers to smoke during performance of multihour tasks while depriving other subjects. Compared with those who were not permitted to smoke, subjects who smoked reported significantly lower levels of aggression and anxiety. Cherek (1981) investigated two categories of aggressive response for differing levels of nicotine administration. The aggressive responses consisted of taking money away from a (fictitious) other in the experimental situation and administering blasts of white noise to that person. Habitual smokers produced progressively lower levels of both categories of aggressive response with increasing amounts of nicotine administration.

In relation to pain tolerance, Nesbitt (1973) found that habitual smokers endured stronger intensities of electrical shock while they smoked than while they simulated smoking. Indeed, those smoking a high-nicotine cigarette tolerated more shock than those smoking a low-nicotine cigarette. Thus, for habitual smokers, the decrease in arousal while smoking also decreased pain.

Parallel findings with monkeys indicated that chronic administrations of small doses of nicotine reduced postshock biting (Hutchinson & Emley, 1973) and that this effect was similar to that produced by administration of tranquilizers. Gilbert (1979) reviewed the fear- and anxiety-reducing effects of nicotine in animals and noted, "Indices of fear and anxiety in animals have typically been reduced by nicotine, but these effects have been less consistent than the effects of nicotine on aggression" (p. 649).

Data relating to other stimulants are sparse. Hire (1978) obtained a significant negative correlation between trait anxiety and habitual levels of caffeine consumption. This result paralleled those reported by Lynn (1973).

A dull or dispirited (i.e., low-arousal) feeling has been reported as one of the effects of extended cocaine use (Bejerot, 1970; Spotts & Shontz, 1980). Further, very large doses of cocaine have been shown to produce catatonia with accompanying parasympathetic activity (Gutiérrez-Noriega, 1949).

The primary source of evidence on the emotional impact of chronic amphetamine use is the effect of amphetamines and Ritalin (an am-