

Consider for a moment the Mackworth clock. In the typical application of this task, a subject stares for more than an hour at a clock face without numbers, watching for the second hand to occasionally stutter ahead two 'seconds' rather than 'one'. Psychopharmacologists who view this task as a model of the cognitive demands of every day life must lead an excruciatingly tedious existence.

I am not arguing that one type of task is intrinsically better than another nor that every study should employ a battery of tasks, but generalizing about the effect of a drug upon something as broad as cognitive performance from the results of only one task or one type of task is a recipe for disaster. Theorists in behavioral pharmacology need to base their generalizations about the cognitive effects of a drug upon a wide range of tasks which differ in task demands and complexity.

### Conclusions

To the outsider, this discussion concerning proper methodology for assessing the effects of smoking and nicotine upon human cognitive performance might appear to be an esoteric dispute among scientists. In fact, the implications of methodological errors which lead researchers to conclude incorrectly that smoking benefits cognitive performance in some general fashion are both far-reaching and costly. For example, the 1964 US Surgeon General's Report (US DHEW, 1964), the 1978 WHO report (WHO, Technical Report Series, No. 618, 1978, p. 8) as well as the 1984 NIDA report (US DHHS, 1984, pp. 19-20) concur that disturbances in cognitive performance are a hallmark of an addictive substance. If the effects of smoking upon human cognitive performance are not clearly understood due to a narrow and confined manner in which research is conducted, our knowledge of addictive processes will suffer.

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### Does cigarette smoking increase stress?

Andy Parrott

One of the issues raised in West's (1993) editorial concerns the role of stress in smoking.

The relationship between cigarette smoking and feelings of stress has long been a subject for controversy. This relates to the complex mood state changes which accompany both cigarette smoking, and periods without cigarettes. The act of smoking is generally associated with positive moods; "Individuals report that they smoke because it improves their affective state, reducing negative and/or increasing positive affect" (Gilbert & Wesler, 1989, p. 188). Whereas without access to cigarettes, regular smokers often experience a range of negative moods, including irritability, tension, and nervousness. These deleterious feeling state changes have been widely documented during long-term smoking cessation (Hughes *et al.*, 1990), but it has become increasingly apparent that they also occur quite rapidly after cigarette extinction. Thus Perkins *et al.* (1992) noted that the positive mood effects of smoking had disappeared 10 minutes after the last inhalation, in subjects performing a high challenge (high stress) task.

Various models have been proposed for the

smoking/stress relationship, including suggestions that it may be an epiphenomenon (Pomerleau & Pomerleau, 1991). However there are two main types of explanation, which differ in the emphasis placed on the positive effects of smoking, and the negative effects of deprivation. The nicotine resource model emphasizes the positive effects of smoking: "It seems that cigarette smoking is a mood modifier for smokers, calming and reducing the smoker's feelings of anxiety and anger. Certainly, smokers increase their smoking in stressful circumstances, and it is not surprising that people miss these benefits when they stop smoking" (Warburton, 1992, p.57). In contrast, the deprivation reversal model states that smokers gain nothing from smoking: "Smoking is not anxiety-reducing but rather no smoking or insufficient nicotine is for the heavy smoker anxiety-increasing. . . The heavy smoker gets nothing out of smoking. He smokes only to prevent withdrawal" (Schachter 1978, p.210-213).

These contrasting models are not easy to resolve empirically. This stems from the difficulty of deciding the 'natural' level of stress/anxiety for any one individual. Without this information, it is difficult to decide whether smoking has lessened stress, or deprivation increased it. However, three indirect sources of information can be brought to bear upon this problem: the average stress levels of smokers versus non-smokers; the daily patterning of stress change in active smokers; and feelings of stress on smoking-cessation. In the comparison between smokers and non-smokers, if the positive mood effects of smoking were predominant, then smokers should generally be less stressed than non-smokers. In contrast, if the negative effects of acute deprivation were more important, then smokers would often be more stressed than non-smokers. Current evidence largely supports the latter viewpoint. Thus West (1992, p.166) noted: "Against the anxiety reduction theory is the finding that smokers do not present as less anxious than non-smokers. Indeed, in surveys they emerge as significantly more anxious overall". In a similar vein, on general stress questionnaires, active smokers are scored as being more stressed than non-smokers (e.g. Wheatley, 1993). If smoking were an effective anxiolytic, smokers should be scored as being less stressed.

With reference to the daily patterns of stress

change in active smokers, a recent series of studies has confirmed the positive mood effects of smoking, and the deleterious mood changes found in between cigarettes (Parrott, 1992, 1994). Individual variation was however also apparent. Subjects with high scores on the Smoking Motivation Questionnaire (SMQ) sedative subscale, produced the greatest degree of stress modulation, while those with low SMQ sedative subscale scores reported minimal stress change. However, the high SMQ sedative subjects reported above-average stress prior to smoking, rather than below-average stress after smoking (Parrott, 1994). Thus sedative smokers used smoking to 'normalize' poor pre-cigarette moods, rather than to achieve advantageous/beneficial moods after-smoking. Again these data were consistent with the deprivation-reversal model.

Two recent longitudinal studies have monitored feelings of stress on smoking-cessation. Cohen and Lichtenstein (1990) followed smokers attempting to quit on their own. Those who failed to quit, or stopped for only a brief period, reported high levels of stress throughout the study. In contrast, those who remained abstinent for the whole six month period, reported a steady decrease in stress over time. Some smokers quit for a period, but then returned to smoking; they reported increased stress on resumption. In the other longitudinal cessation trial, involving 2mg nicotine gum, successful quitters reported a significant decrease in stress over the 6 months of confirmed abstinence (Parrott *et al.*, 1993). The incidence of stressful life events was unchanged in frequency over the same period. Thus successful quitters experienced a true reduction in propensity for stress. Both longitudinal studies therefore demonstrated that smoking-cessation led to reduced stress. This was opposite to the predictions of the nicotine resource model (i.e. that without access to the resource of nicotine, former smokers will suffer from increased stress). It was however consistent with the deprivation-reversal explanation (i.e. that without the repetitive daily experiences of nicotine withdrawal, feelings of stress will decrease).

Although the deprivation-reversal model has a long history its implications for smoking and stress have never been fully explored. The most important consequence is that *smoking is a cause of stress*. Many smokers suffer adverse feeling states during acute nicotine withdrawal; these

deleterious moods are then 'normalised' by the next cigarette. Acute withdrawal problems soon re-occur, to be alleviated by another cigarette. Hence the repetitive cycle of cigarette use (ie. addiction). Regular smokers therefore suffer from a major source of stress not experienced by non-smokers: acute nicotine withdrawal. On the positive side, it should be pointed out that smokers have at their fingertips, a method for stress-control over real environmental stressors (ie. not just for the stress of nicotine withdrawal). This notion that the smoking habit is a cause of stress may be counter-intuitive, but it fits the available evidence. It agrees with the positive mood effects of smoking, with the use of cigarettes for mood-modulation by smokers, with the negative effects of withdrawal, with the high average daily stress of smokers, and with the reduced feelings of stress which accompany smoking-cessation.

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### Beneficial effects of nicotine: reprise

Robert West

The study of behaviour is full of uncertainties. As a psychologist one has to learn to live with doubt. The link between data and conclusion is mostly tenuous; the concepts are frequently vague and the terminology is often loosely applied and itself the subject of strenuous debate. One has to strike a balance between pedantic refusal to accept anything as proven and willingness to accept conclusions that are supported by data only weakly or not at all. Where one strikes that balance is a matter of judgement. The important thing is to strike it in the same place for data that conflict with one's views and those that support them. Despite having produced some data myself in support of the view that nicotine might have some performance-enhancing effects, my reading of the literature as a whole led me to the conclusion drawn in my editorial (West, 1993) that at present we *simply do not know* whether nicotine has beneficial psychological effects of the kind that smokers report they obtain from cigarettes but that the failure to find consistent effects is suggestive that any such effects are ephemeral. Thus we do not know whether smokers can concentrate better on whatever it is they are doing (whether it be writing articles or laying bricks) because they smoke than if they had never smoked. Neither do we know whether smokers are better able to cope with the life stresses because they smoke than if they had never smoked. In their commentaries, Henningfield, Spilich and Foulds broadly agreed with the view and used it as a stepping-off point for some interesting further observations. Richmond chided me for not considering the social and anthropological dimension, while Warburton vigorously defended the view that smoking has beneficial effects.

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