

Finally, our study was designed to evaluate whether or not equilibrium radionuclide blood pool imaging was reproducible and accurate in detecting left ventricular aneurysms in patients in cardiac failure. It might then be used as a non-invasive outpatient screening investigation in district general hospitals at a distance from regional cardiac centres. Patient pre-selection would help to relieve the great pressure on cardiac units by reducing the amount of unnecessary cardiac catheterisation. We think that a satisfactory isotope technique has not yet been established, and we have some reservation about whether the solutions suggested by Drs Bingham and Maisey will provide the answer.

HELEN SUTTON
DUNCAN ACKERY

Wessex Regional Department of Nuclear Medicine,
Southampton General Hospital,
Shirley, Southampton SO9 4XY

¹ Rigo P, Murray M, Strauss HW, Pitt B. *Circulation* 1974;50:985-91.

² Hopkins GB, Kan MK, Salel AF. *JAMA* 1978; 240:2162-5.

³ Kelly MJ, Giles RW, Simon TR, Berger HJ, Langou RA, Zaret BL, Wackers FJT. *Radiology* 1981; 139:167-73.

⁴ Winzelberg GG, Miller SW, Okada RD, et al. *Am J Roentgenol* 1980;135:569-74.

Puff volume increases when low-nicotine cigarettes are smoked

SIR,—In a recent paper Dr Ronald Herning and others (18 July, p 187) reported that cigarette smokers took a greater puff volume with low-nicotine than high-nicotine cigarettes. The authors concluded that "In their attempt to adjust smoking behaviour to obtain more nicotine from low-nicotine cigarettes smokers inhale more of the smoke," and that "the smokers must titrate mostly on nicotine delivery" (my italics). The implication is that the smokers are titrating the dose of nicotine which they are delivering to their central nervous system. However, as a leading article in the *British Medical Journal* pointed out,¹ the evidence for actual addiction to nicotine per se is very poor. Does the present work therefore demonstrate such addiction?

I would like to suggest that the work actually demonstrates the reverse. Study of the figure in this paper shows that the greater puff volume is present at the very first puff. Within the two seconds or so duration of that puff the subject has therefore decided to inhale more deeply. However, it is unlikely that the products of that inhalation could reach the central nervous system in less than eight seconds and hence the decision to inhale more deeply must be based on purely sensory factors. One possibility is that the subjects have learnt from prior exposure to different brands of cigarettes that strong and weak cigarettes taste different. In general, however, tar and nicotine quantities covary in commercial cigarettes and hence the central effects of some non-nicotine substance would be confused with the peripheral effects (be they on mouth, pharynx, or lungs) of nicotine. Hence the subjects would (erroneously) assume at the first inhalation that they were smoking a strong cigarette. By the last puff the lack of central effects would have disabused them of this belief and puff volumes would become relatively independent of nicotine content. Scrutiny of the figure suggests that indeed the differences in puff volume between cigarettes of different strengths become less as further puffs are taken.

In summary, the paper provides evidence not for nicotine addiction but rather for a

peripheral sensory effect of nicotine, coupled perhaps with a central addiction to a substance other than nicotine.

I C McMANUS

Department of Psychiatry,
St Mary's Hospital (Harrow Road),
London W9 3RL

¹ Anonymous. *Br Med J* 1977;iii:1041-2.

* * * We sent this letter to the authors, who reply below.—ED, *BMJ*.

SIR,—We find both Dr McManus's interpretation of our results (18 July, p 187) and his suggestion that nicotine is not an important factor in tobacco "addiction" or dependence interesting, but not clearly supported by our study or other recent research. We perhaps did not make clear two important points in the article. Firstly, the cigarettes were made from specially grown tobaccos and were unflavoured and unfiltered. Tar and other combustion products did not covary with the nicotine content. The cigarettes were quite similar in other aspects on leaf and vapour-phase analyses. Secondly, the light-up puff was excluded in our data analysis since an undetermined volume of air in addition to smoke flows through the cigarette during this puff.

As suggested by Dr McManus, it is possible that the non-brain sensory effects of nicotine on throat or pulmonary system may have influenced puffing behaviour but by the first puff after the light-up puff enough time has lapsed for nicotine to reach the central nervous system. Since differences in most if not all non-nicotine substances, as well as draw and burning characteristics, were controlled by the use of the special cigarettes, the changes in puffing behaviour were most likely to be due to the nicotine differences in the cigarettes.

The role of nicotine in tobacco dependence has been previously investigated. The results of those studies reviewed by the *BMJ* in the leading article Dr McManus refers to were inconclusive. The delivery of nicotine and the measurement of smoking were inadequate to evaluate the role of nicotine in tobacco dependence in those early studies. Russell¹ has recently reviewed evidence for the involvement of nicotine in the development of tobacco dependence and he concludes that high central nervous system levels of nicotine, obtained during rapid-bolus doses, are responsible for tobacco addiction. The smoker's ability to regulate his nicotine intake, as noted in our study, does not necessarily imply that the smoker is dependent on nicotine. However, it suggests that a smoker is exquisitely sensitive to the nicotine content of a cigarette by either central or peripheral mechanisms and can adjust puffing to obtain a desired dose. The adjustment is made on the basis of the central and possibly the sensory effects of nicotine. Thus our research provides collaborative support for the role of nicotine in tobacco dependence.

RONALD S HERNING
REESE T JONES

Department of Psychiatry

ALLAN H MINES

Department of Physiology,
University of California,
San Francisco, California 94143,
USA

JOHN BACHMAN

Department of Psychiatry,
Stanford University School of Medicine,

¹ Russell MAH. *J Psychosom Res* 1980;25:253-64.

Squash ball to eye ball

SIR,—The paper on squash ball injuries (October, p 893) and the letter from Dr R I Stuart (17 October, p 1057) serve to underline the concern which is felt by ophthalmologists in relation to this subject.

While it is clear that the incidence of eye injury in squash ball players is of a relatively low order, none the less when these injuries do occur they often have serious and longstanding implications for sight. Indeed, the last two cases in the writer's experience have suffered major loss of vision in one eye.

It is clear that the wearing of appropriate protection, which has achieved favour in other sports such as cricket, is a sensible precaution to be adopted by players. It is perhaps worthy of note that the October issue of *Squash News* the official paper of the Squash Racket Association, has seen fit to draw attention to these dangers and is proposing to promulgate a safety code for the assistance and protection of players.

While it is the considered view of ophthalmologists that the players of ball game such as squash and badminton would be well advised to consider the use of appropriate eye protectors, only a relatively limited range of these is available in this country at the present time. The proposal by the Squash Racket Association to set up a study group to investigate the possibility of a design guide for approved guards can only be welcomed.

M J GILKE
Ocular Safety Subcommittee
Faculty of Ophthalmologist

Sussex Eye Hospital,
Brighton BN2 5BE

SIR,—In the article by Mr G V Barrell and others (3 October, p 893) dealing with squash ball injuries to the eye the use of eye protector is suggested as a means of avoiding injury. An additional or alternative means is to understand and avoid the circumstance where the injury is likely to take place. The usual preceding sequence of events is for the striker to hit the ball and fail to watch it as he returns to the T-position in the centre of the court and the ball rebounds from the front wall to his opponent behind him. Having regained the centre court position he turns from facing the front wall to face his opponent and is then struck in the face by his opponent's shot.

Thus keeping one's eye on the ball figuratively will greatly reduce the chance of its occurring literally.

DAVID BULLIMORE

St James's Hospital,
Leeds LS9 7TF

Compulsory seat belts in 1982

SIR,—The forthcoming seat-belt legislation still produces controversy in your columns (10 October, p 986). The question of whether legal compulsion is reasonable is not here at issue but whether pregnant women should be free from compliance with such compulsion. May I suggest that pregnant women should not be treated as special or abnormal cases?

The most common seat belts in this country are "lap and diagonal" or "diagonal" alone. The lap belt should lie comfortably across the anterior superior iliac spines and (for a front-seat passenger in an English car) the diagonal