Correspondence

BRIEF COMMENTS on 'Electrical Auditory Stimulation in the Management of Profound Hearing Loss' by J. C. Ballantyne, E. F. Evans and A. W. Morrison, *J.L.O.* Supp. 1, 1978.

This report, by Ballantyne *et al.*, provides a comprehensive survey of work on electrical auditory stimulation in the profoundly deaf, together with some detailed comments and recommendations for work to be done in the United Kingdom.

While the report is of considerable value, there are a number of points which we feel have been omitted or need clarification or expansion.

(1) Section 5 makes detailed recommendations having features which closely resemble those of the approach which we have applied since 1976 (Douek *et al.*, 1977; Fourcin *et al.*, 1979)—although the similarity is not acknowledged in this important part of the report.

These features include:

(a) The use of extra-cochlear (round window) stimulation, which involves minimal risk and no structural damage to the cochlea.

(b) The investigation of the nature of the percepts evoked by electrical stimulation, and the discriminability of speech-relevant stimulus features (such as periodic versus random discrimination and frequency discrimination).

(c) The extraction of simple pattern features from speech and the presentation of these features in a form which is matched to the discrimination abilities of the patient—as opposed to the use of the complete speech signal.

(d) The use of speech pattern features which are not visible to the deaf lip reader, so as to enhance the total speech communication process. This is feasible by giving voice fundamental frequency information, which is basic both to sentence intonation and to voiced-voiceless discriminations.

(e) The development of tests for the quantitative evaluation of the benefit of the stimulation both in lip reading and in speech production.

(2) An important aspect of evaluation of the research (as opposed to its applications at the clinical level), which is not discussed in the report, concerns the simulation of the speech reception task facing the deaf lip reader. When simple speech pattern features are used, it is possible to present normal subjects with acoustic stimuli specially designed so that they are matched both in discriminability and in perceptual quality to those used with our deaf patients. This approach not only allows the contribution of different speech pattern features to be assessed but also permits the development with normal listeners of rehabilitation procedures for the deaf. (Our own work along these lines is already well advanced.) An additional advantage of this simulation is that it

provides a basis for the comparative assessment of vibrotactile and other prostheses.

(3) Our experience does not indicate 'that a single channel stimulation can be effective . . . almost irrespective of the underlying pathology' (see section 5.1.3). Whilst only a few surviving nerve fibres may allow detection of stimulation at low intensity levels and lead to a 'normal' electro-auditory threshold, they may not provide a sufficient basis for the discrimination of speech-relevant stimulus changes. We have found substantial performance differences in this respect between patients having similar electro-auditory thresholds for steady sinusoidal stimulation (Fourcin *et al.*, 1979).

(4) Collaboration is also important, especially when resources must be utilized optimally, and from the beginning of our project we have made our results, techniques and apparatus available to other workers. Finally, and perhaps most importantly for the deaf population capable of profiting from electro-cochlear stimulation, we believe that if another team is established in the United Kingdom for the purpose of scientific and clinical evaluation, its aims should be in some respects complementary, rather than exactly parallel, to our own. In this way both the greatest advantage to the deaf population and the best contribution to our knowledge of this area are likely to be obtained.

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