false negative rate is the number of diseased subjects passed by the screen divided by the total number of diseased subjects and the false positive rate is the number of nondiseased subjects failed by the screen divided by the total of nondiseased subjects.

Table 1 shows the differences in rates for the two methods as well as the rates reported by McFarland et al. It is clear that the two methods produce vastly different estimates of false positive and false negative rates. It is also clear that the McFarland et al. rates are in disagreement with the false negative rates computed by method No. 2 and with the false positive rates computed by method No. 1. The agreement between the McFarland et al. rates and the rates computed by the other methods is fortuitous and is caused by the small number of subjects with hearing impairment and the large sample size.

The fact that two accepted methods for computing false negative and false positive rates produce widely disparate results is disconcerting. Given the lack of agreement among statisticians and epidemiologists about which method is preferred, researchers and consumers of research must, at the very least, recognize the differences of opinion and come to their own conclusions about which method they accept or prefer. In any event, readers should recognize the discrepancy between the false negative and false positive rates reported by McFarland et al. and the rates arrived at by the two different methods of computation reported herein.

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Reply to Ventry

We disagree with Ventry that our results are "misleading". We believe our results were clearly presented and our method of computing false positive and false negative rates was clearly defined in Table 1. The fact that our false positive and false negative rates do not agree completely with either of the "accepted" methods cited by Ventry is not surprising as it was not intended they should. The basic dilemma, it appears to us, is that the two "accepted" methods produce such disparate results.

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"The Effect of Response Methods on the Difficulty of Speech Discrimination Tests, A Response to Wilson and Antablin, *JSHD* 1980"

This letter is a comment on *A Picture Identification Task as an Estimate of the Word-recognition Performance of Nonverbal Adults* (Wilson & Antablin, 1980). In that paper, the authors describe a closed set picture identification test for estimation of word-recognition performance for nonverbal adults. This test should provide a useful addition to the audiologist's test battery. In order to make the test more useful in a clinical situation, the authors obtained normative data by comparing their test with the more commonly used *Northwestern University Auditory Test No. 6* (NU-6) (Tillman & Carhart, 1966). It is this comparison and some speculations raised in their discussion that prompted this letter.

The problem facing Wilson and Antablin in standardizing the test was that the picture identification test is inherently a closed-response set test, while the NU-6 test is an open-response task. They met this problem in two ways. First, both tests were administered as open-response set tests with the normal-hearing subjects writing their responses on an answer form. Performance-Intensity functions for the two tests were practically identical. Unfortunately, this says little about the picture identification test since the addition of the response choices (in the closed-set format) increases the number of cues available and thus makes the test considerably easier. Consequently, Wilson and Antablin modified the NU-6 test so that it too could be presented in a closed-response set format, with the response choices displayed as words on the response sheets. Presentation of the two tests in the closed set format showed that they were no longer equal in difficulty. The authors say that:

> The identification of words was easier than the identification of pictures. The reason for this relationship is unclear but one may speculate that additional cognitive processes are required to transform a picture into a lexical unit (p. 231).

While this explanation may be the correct one there is an alternative explanation which does not require a trip into the unknown world of cognitive processes.

The difficulty of a closed-response set test depends to a large degree on the similarity of the response foils to the stimulus. Clearly, if a particular stimulus item sounds similar to the foils offered, then the item will be more difficult than if it is perceptually dissimilar to the foils.

Therefore, two tests which are equal in difficulty in the open-response set mode need not be so in the closed-response set mode. It is thus possible that the difference in difficulty of the two tests compared by Wilson and Antablin was caused by differences in the response choices offered. Even when the stimulus and response choices differ in only one consonant, the difficulty of the test will depend on how the consonants differ (voicing, manner or place of articulation, duration, etc.; Miller & Nicely, 1955). Furthermore, an attempted matching of two speech tests by taking into account such factors as these would be extremely difficult since the nature of the perceptual confusions between different consonants depends on the hearing loss of the individual undergoing the test (Welzl-Muller, 1979).

The speculation about different response choice presentation methods (i.e. words versus pictures) leading to different test difficulties can be easily resolved. If the same test was administered to a group of subjects under both picture and word response presentation methods, any difference in scores then could be clearly attributed to different cognitive processes. Such a result would be of interest to those who study the cognitive factors involved in speech discrimination and reading, and could be beneficial in interpreting picture identification test results in the clinic.

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"The Picture Identification Task, A Reply to Dillon"

Dillon (1982) makes two pertinent comments regarding the influence of the response mode on word-recognition or identification performance. The primary issue concerns the word-recognition/identification performance of listeners when picture-pointing (closed set), word-pointing (closed set), and oral-recall (open set) responses are used with the same speech materials. As Dillon suggests, the differences in the word-identification performances between the picture-pointing and word-pointing responses reported in the initial investigation (Wilson & Antablin, 1980) may have been due to the different word lists used in the two conditions.

A subsequent investigation (Duffield & Wilson, 1980) studied the effects of the three response modes on recognition/identification performance with one set of test materials (the Picture Identification Task lists). The picture-pointing and oral-recall response modes were the same as in the earlier report (Wilson & Antablin, 1980). For the word-pointing response, printed words replaced the pictures in the same quadrant arrangement. The CVC words were administered at eight ascending signal-to-noise ratios in 70-dB SPL speech-spectrum noise to 24 listeners with normal hearing. The presentation order of the conditions was counterbalanced. The psychometric functions (third-degree polynomials) for the three response conditions are shown in Figure 1. Below the 80% correct point and at corresponding signal-to-noise ratios, the recognition performance on the open-set (oral recall) response was about 35-45% (9-12 dB) poorer than the identification performance attained on the closed-set response modes. The performance differences between the picture-pointing and oral-recall responses were significant (t-test, $p < .05$). The differences between the identification performances attained on the two closed-set responses, below the 80% correct point, were about 8% (2 dB) and also were significant ($p < .05$). The data shown in Figure 1 support our original suggestion, ". . . that additional cognitive processes are required to transform a picture into a lexical unit" (p. 231).

The second issue raised by Dillon involves disparities in word-identification performance in the closed-set response mode when the response alternatives are minimally varied (the response choices are similar except for one phoneme, e.g., hose, bows, toes, and nose) as opposed to maximally varied (all phonemes in the response options are different, e.g., hose, match, ball, and tub). Corbett (1979) examined the word-

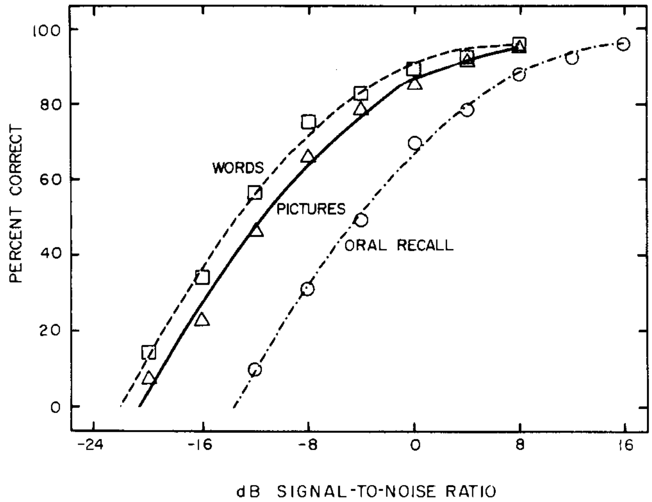

FIGURE 1. The percent correct responses (ordinate) for the three response modes depicted as a function of the decibel signal-to-noise ratio (abscissa) of the signal-presentation level. The Picture Identification Task words were presented in 70-dB SPL speech-spectrum noise. The lines connecting the datum points are the best-fit third degree polynomials. (The figure is taken from Wilson, Fowler, and Shanks, 1981).

identification performance of 24 young adults with the picture-pointing response to the minimally and maximally varied response sets. Two signal-to-noise ratios (0 dB and −6 dB) were studied in 70-dB SPL speech-spectrum noise. The order of the conditions was counterbalanced. The results of this experiment are given in Table 1. At both signal-to-noise ratios, significantly ($p < .05$) better word-identification performance was obtained with the maximally varied response materials than was obtained with the minimally varied response materials. In fact, each subject performed better on the maximally varied materials.

The data from the two experiments clearly demonstrate that word-identification performance on a closed-set response mode can be altered by changes in the response options. Although the data reported here were obtained on young normal adults, one may speculate that the disparities among the performance levels attained with the different response modes may be altered (exaggerated or reversed) when individuals with language and/or cognitive disorders are studied.

TABLE 1. The percent correct word-identification performance for two response conditions ($N = 24$) attained in 70-dB SPL speech-spectrum noise at two signal-to-noise ratios. The standard deviations are given in parentheses.

	Signal-to-Noise Ratio	
Condition	*0 dB*	*−6 dB*
Minimally Varied	84.1 (6.7)	62.2 (12.1)
Maximally Varied	97.7 (1.9)	80.1 (12.5)

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