Female Homosexuality

EISINGER *et al.*[1] conclude from a study of 37 volunteer members of a lesbian organization that, although there were few or no organic differences between lesbians and normal women, on the Eysenck personality inventory the lesbians had significantly higher scores for neuroticism, and lower for extroversion, thus "showing the lesbian group to be clearly dysthymic, that is, prone to anxiety and nervousness, with obsessive tendencies".

It should be emphasized that this conclusion, which has received some press publicity[2], ought not to be generalized unless it can be shown that willingness to become a member of a "lesbian organization", and voluntarily to submit to such inquiries, is not itself correlated with anxiety, nervousness, and obsessive tendencies. That is far from being self evident: and yet, without proof that the small and self-selected sample really was typical, it would be quite unsafe to apply these results to the population of homosexual women as a whole.

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[1] Eisinger, A. J., Huntsman, R. G., Lord, J., Merry, J., Polani, P., Tanner, J. M., Whitehouse, R. H., and Griffiths, P. D., *Nature*, **238**, 106 (1972).
[2] *The Times*, "Science Report" (July 17, 1972).

GENERAL

Measurement of Signal-detectability

A NEW measure, C, of a subject's ability to detect a signal has been postulated[1]; there are, however, a number of shortcomings to this communication.

Hammerton and Altham refer to a signal-detection task in which, at successive cued instants, a stimulus is presented which is either signal superimposed on noise or noise alone. The subject is instructed to rank his response to each stimulus, example responses being:

Yes, the signal is present (given rank 1); and
No, the signal is not present (given rank r), $r \geq 2$

The $(r-2)$ remaining categories of response refer to intermediate degrees of certainty. The signal-detection-theory (SDT) analysis of this experiment for $r>2$ does not, as asserted by the authors, require that the two assumed underlying distributions[2] have equal variances; for $r>2$ the variance ratio is simply introduced as a further parameter and estimated by, for example, the method of maximum-likelihood[3-5]. This procedure allows far more flexibility in the SDT model, though, if the variance ratio is very different from unity, at the same time complicates the measurement of detectability[4,6].

Further, I have shown[6] that the predictions of the SDT model with underlying uniform (rectangular) distributions agree well with those of the model with underlying normal distributions. Therefore d', the difference in mean values of the two populations, would seem to be a robust measure with respect to the form of the underlying distributions.

The most serious shortcoming of the communication is the statement that "It can be shown that C is monotonically related to d'". This statement is misleading as it implies that C and d' measure, the same thing; this is not so.

In the simplest case, $r=2$, the SDT model requires a variance ratio of unity. Let us suppose that a subject has S stimuli that are signal and S stimuli that are noise and that his responses are as follows:

	Yes	No
Signal	α	$S-\alpha$
Noise	$S-\beta$	β

The measure C proposed[1] gives

$$C=\alpha/S-(1-\beta/S)$$

$$\text{that is, } C=\Phi(z-d')-\Phi(z)$$

where Φ is the standard normal distribution function and d' and z are the usual SDT parameters, the measure of the subject's signal-detectability and the cut-off on the "decision axis", z. We see from this relationship that C is quite a different measure from d'. A frequent finding in SDT analyses of vigilance studies[7] has been that over a long period of time a subject's d' value remains fairly constant but his z value increases, that is, his power of detectability remains the same but he becomes more cautious as time-on-task progresses. The parameter C would, in such an example, indicate a change in the subject's power of signal-detectability, quite at variance with the SDT finding. As the success and popularity of SDT are due to its separation of omissions and false-positives into d' and z, with just the former as the measure of signal-detectability (a measure that has given "meaningful" results) I find it unlikely that C will prove to be of any general practical use. More discussion on C and d' is given by Altham[8].

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[3] Dorfman, D. D., and Alf, E., *J. Math. Psychol.*, **6**, 487 (1969).
[4] Grey, D. R., and Morgan, B. J. T., *J. Math. Psychol.*, **9**, 317 (1972).
[5] Ogilvie, J. C., and Creelman, C. D., *J. Math. Psychol.*, **5**, 377 (1968).
[6] Morgan, B. J. T., *Brit. J. Math. Statist. Psychol.* (in the press).
[7] Mackworth, J. F., *Vigilance and Attention* (Penguin, Manchester, 1970).
[8] Altham, P. M. E., *Brit. J. Math. Statist. Psychol.* (in the press).

Distance between Sets

BY proving the triangle inequality, Levandowsky and Winter[1] show that the measure of dissimilarity of two sets

$$d(S_i, S_j) = 1 - \frac{|S_i \cap S_j|}{|S_i \cup S_j|} \text{ (absolute value denoting a set measure)}$$

can be used as a distance function. The proof given is, however, surprisingly complicated and they ask whether a simple proof exists. Here is one.

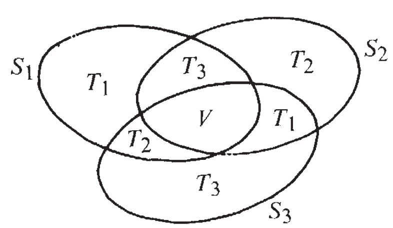

Fig. 1 Representation between sets and sub-sets.

Considering the triangle inequality for the three sets S_i let $U=\cup S_i$, $V=\cap S_i$ and T_i be the three sets shown in Fig. 1.

$$\text{Then } \frac{|T_1|+|T_2|+|T_3|}{|U|} = 1 - \frac{|V|}{|U|} \geqslant d(S_i, S_j) \geqslant \frac{|T_i|+|T_j|}{|U|}$$

from which the triangle inequality follows immediately.

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[1] Levandowsky, M., and Winter, D., *Nature*, **234**, 34 (1971).