Psychological Review
1976, Vol. 83, No. 2, 172

LETTER TO THE EDITOR

Correction to "Parallel Psychometric Functions from a Set of Independent Detectors" by Green and Luce

As Dr. Barbara Sakitt has kindly pointed out to us, our argument in the Appendix of Green and Luce (1975) is faulty, and Brindley (1963) was correct in asserting that

$$P(I, m-1)^n = [e^{-I} \sum_{i=0}^{m-1} I^i/i!]^n$$

approaches $e^{-nI^m/m!}$ as $n \to \infty$. We apologize to him for saying he was in error.

The following demonstration of his result may be useful. For the limit to hold for values other than 0 and 1, I must approach 0 so as to maintain $nI^m = k$. So we evaluate

$$a = \lim_{n\to\infty} P\left[\left(\frac{k}{n}\right)^{1/m}, m-1\right]^n.$$

By Haight (1967, Equations 1.1-5 and 1.2-3),

$$P\left[\left(\frac{k}{n}\right)^{1/m}, m-1\right] = \int_{(k/n)^{1/m}}^{\infty} e^{-t}t^{m-1}dt/(m-1)!.$$

So, using l'Hospital's rule

$$\begin{aligned}\log a &= \lim_{n\to\infty} \frac{\log\left\{\int_{(k/n)^{1/m}}^{\infty} e^{-t}t^{m-1}dt/(m-1)!\right\}}{1/n} \\ &= -\lim_{n\to\infty} \frac{e^{-(k/n)^{1/m}}\left(\frac{k}{n}\right)^{(m-1)/m}\left(\frac{k}{n}\right)^{(1/m)-1}\left(-\frac{k}{n^2}\right)}{\frac{m}{n^2}\int_{(k/n)^{1/m}}^{\infty} e^{-t}t^{m-1}dt} \\ &= -\lim_{n\to\infty} \frac{ke^{-(k/n)^{1/m}}}{m\int_{(k/n)^{1/m}}^{\infty} e^{-t}t^{m-1}dt} \\ &= -k/m!,\end{aligned}$$

thus proving Brindley's result.

REFERENCES

Brindley, G. S. The relation of frequency of detection to intensity of stimulus for a system of many independent detectors each of which is stimulated by a m-quantum coincidence. *Journal of Physiology,* 1963, *169,* 412–415.

Green, D. M., & Luce, R. D. Parallel psychometric functions from a set of independent detectors. *Psychological Review,* 1975, *82,* 483–486.

Haight, F. A. *Handbook of the Poisson distribution.* New York: Wiley, 1967.

(Received January 16, 1976)

David M. Green, R. Duncan Luce
Laboratory of Psychophysics
Harvard University
Cambridge, Massachusetts 02138