

Correction to Luce (2004)

C. T. Ng (2008) observed an important error in Corollary 2 to Theorem 1 of the article “Symmetric and Asymmetric Matching of Joint Presentations,” by R. Duncan Luce (*Psychological Review*, 2004, Vol. 111, No. 2, pp. 446–454). The correct result is as follows:

Given the background assumptions, the p-additive representation

$$\Psi(x, u) = \Psi(x, 0) + \Psi(0, u) + \delta\Psi(x, 0)\Psi(0, u),$$

and the definitions of \oplus found there, the following are equivalent:

- (i) Bisymmetry holds for \oplus_i , $i = l, r$, or s .
- (ii) There exists a constant $\gamma > 0$ such that either

$$\Psi(x, 0) = \gamma\Psi(0, x) \quad \text{if } \delta = 0 \tag{1}$$

or

$$1 + \delta\Psi(x, 0) = [1 + \delta\Psi(0, x)]^\gamma \quad \text{if } \delta > 0. \tag{2}$$

I incorrectly argued that bisymmetry forced either $\delta = 0$ or $\gamma = 1$.

The proof from (i) to (ii) is based on the observation that the argument given for Condition 1, which is based on the additivity of $\Psi(x, u)$ when $\delta = 0$, is correct, and on the observation that, for $\delta > 0$, $\Psi(x, u) = \ln[1 + \delta\Psi(x, u)]$ is also additive. So Condition 2 follows immediately from Equation 1. The converse is more difficult to prove.

Auditory data reported by Steingrímsson and Luce (2005), and three later articles that were summarized by Luce and Steingrímsson (2006), gave data strongly supporting bisymmetry but also gave data rejecting Condition 1. For more detail, see Luce and Steingrímsson (in press). The conclusion they should have drawn is that Condition 2 must hold. For signals far from the threshold, this becomes

$$\Psi(x, 0) \approx \delta^{\gamma-1}\Psi(0, x)^\gamma,$$

which for power functions at each ear means

$$\alpha_l x^{\beta_l} \approx \delta^{\gamma-1} \alpha_r x^{\beta_r \gamma}.$$

Thus,

$$\alpha_l \approx \delta^{\gamma-1} \alpha_r \quad \text{and} \quad \frac{\beta_l}{\beta_r} \approx \gamma.$$

On the basis of the erroneous published result, they misinterpreted their data as being more inconsistent with the prediction from bisymmetry than it really is. For more detail, see Luce and Steingrímsson (in press).

References

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