Crudely, r could be considered to be the maximum change in success probability that one would expect given that ESP exists. Also, these distributions are the "extreme points" over the class of symmetric unimodal conditional densities, so answers that hold over this class are also representative of answers over a much larger class. Note that here $r \leq 0.25$ (because $0 \leq \theta \leq 1$); for the given data the $\theta > 0.5$ are essentially irrelevant, but if it were deemed important to take them into account one could use the more sophisticated binomial analysis in Berger and Delampady (1987).

For g_r, the Bayes factor of H_1 to H_0, which is to be interpreted as the relative odds for the hypotheses provided by the data, is given by

$$B(r) = \frac{(1/(2r))\int_{.25-r}^{.25+r} \theta^{122}(1-\theta)^{355-122}\,d\theta}{(1/4)^{122}(1-1/4)^{355-122}}$$

$$\cong \frac{1}{2r}(63.13) \cdot \left[\Phi\left(\frac{r-.0937}{.0252}\right) + \Phi\left(\frac{-(r+.0937)}{.0252}\right)\right].$$

This is graphed in Figure 1.

The P-value for this problem was 0.00005, indicating overwhelming evidence against H_0 from a classical perspective. In contrast to the situation studied by Jefferys (1990), the Bayes factor here does not completely reverse the conclusion, showing that there are very reasonable values of r for which the evidence against H_0 is moderately strong, for example 100/1 or 200/1. Of course, this evidence is probably not of sufficient strength to overcome strong prior opinions against H_0 (one obtains final posterior odds by multiplying prior odds by the Bayes factor). To properly assess strength of evidence, we feel that such Bayes factor computations should become standard in parapsychology.

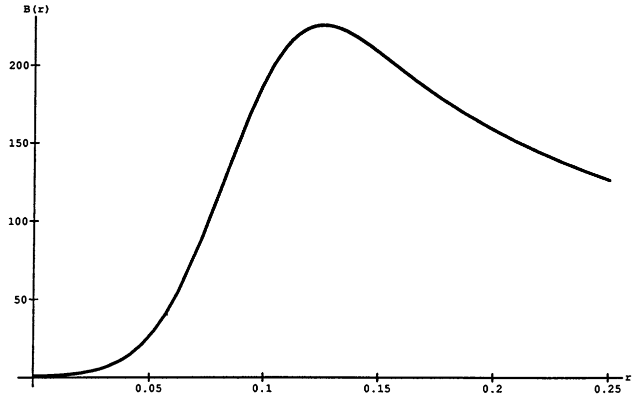

FIG. 1. *The Bayes factor of H_1 to H_0 as a function of r, the maximum change in success probability that is expected given that ESP exists, for the ganzfeld experiment.*

As mentioned by Professor Utts, Bayesian methods have additional potential in situations such as this, by allowing unrealistic models of iid trials to be replaced by hierarchical models reflecting differing abilities among subjects.

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Comment

Ree Dawson

This paper offers readers interested in statistical science multiple views of the controversial history of parapsychology and how statistics has contributed to its development. It first provides an account of how both design and inferential aspects of statistics have been pivotal issues in evaluating the outcomes of experiments that study psi abilities. It then emphasizes how the idea of science as replication has been key in this field in which results have not been conclusive or consistent and thus meta-analysis has been at the heart of the literature in parapsychology. The author not only reviews past debate on how to interpret repeated psi studies, but also provides very detailed information on the Honorton–Hyman argument, a nice illustration of the challenges of resolving such de-

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