BRIAN MULLEN AND ROERT ROSENTHAL. (1985). *Basic meta-analysis: Procedures and programs*. Hillsdale, NJ: Erlbaum. Pp. 128. $12.95

Meta-analysis is a new word for an old idea. Gene Glass first used the term in 1976 to describe his statistical integration of results from nearly 400 separate studies of the effectiveness of psychotherapy. But long before that, social scientists were gleaning correlation coefficients and proportions from the literature, analyzing the resulting sets of statistics, and writing reviews based on the accumulated findings. Glass breathed new life into this tradition, and quantitative research reviews have flourished in the social sciences ever since.

Robert Rosenthal, co-author of *BASIC Meta-Analysis*, was making important contributions to quantitative research reviewing before Glass gave the area its current name. Rosenthal's interest in the topic can be traced back at least to the early 1960s when he began comparing and combining results of studies dealing with experimenter expectancies. In 1976, the year in which Glass's first meta-analysis appeared, Rosenthal published a landmark synthesis of findings from 311 studies of interpersonal expectancies. Among its innovations were measurement of size of study effects with *d*, the standardized mean difference between an experimental and a control group, and the statistical analysis of the relation between study features and *d*. In his 1984 book *Meta-analytic Procedures for Social Science Research*, Rosenthal described the approach to quantitative research reviewing that he has developed over the years.

BASIC Meta-Analysis provides a brief and organized overview of this approach, but its real heart is a set of 14 computer programs, written in BASIC computer language, for implementing Rosenthal's approach to research integration. The book describes the programs, lists the source codes, and presents a log showing how the programs have been used interactively to solve various problems.

Eleven of the 14 programs (Programs A through K) deal with fundamental applications of Rosenthal's methodology: comparison or combination of either effect-size indices or probability levels associated with either two studies or three or more studies. Program L is a general-purpose program; it helps an analyst to construct a correlation matrix for relating study features to size of study effects. The two remaining programs deal with two rarely used meta-analytic techniques developed by other researchers. Program M carries out a discrete cluster analysis of effect sizes using a method devised by Hedges and Olkin. Program N helps the analyst to carry out a regression analysis with transformed effect sizes, as Glass and Smith did in an analysis of effects on class size.

The strengths and weaknesses of the programs are largely the strengths and weaknesses of Rosenthal's meta-analytic methodology. This methodology incorporates many widely accepted techniques of research integration. Nearly all meta-analysts today, for example, correlate study features and effect sizes, and nearly all find average effect sizes by weighting in some way the effect sizes of individual studies. The programs incorporating these aspects of Rosenthal's methodology will be useful to most meta-analysts.

But Rosenthal's methodology also has its idiosyncratic and controversial side. Rosenthal looks favorably upon the practice of combining probability levels from different studies; most other meta-analysts do not. He applies meta-analytic methods to as few as two related studies of a topic; most other meta-analysts insist on having more than two replications of a study before they try to find the pattern in the set of study results. And Rosenthal is so far the only major meta-analytic methodologist to judge the point-biserial r to be superior to d as an effect-size index for comparing discrete experimental and control groups. The programs that incorporate these parts of Rosenthal's methodology will probably be used infrequently in meta-analytic research.

Among the most controversial aspects of Rosenthal's methodology is his retrieval of effect sizes, without apology, from the sample size and the value of a test statistic associated with a study. Other meta-analysts, including Glass and myself, have pointed out that effect-size indices such as d cannot be determined from these two factors alone. A meta-analyst needs to know in addition something about the precision of the experimental design that produced the test statistic: whether the experimental design used blocking, matching, or any other device to increase the power of the statistical test.

For example, Rosenthal converts t and F statistics to the effect-size indicator d by using the following equation:

$$F = t^2 = d^2/(1/n^E + 1/n^C),$$

where n^E and n^C are the sample sizes for the experimental and control groups. This formula accurately summarizes the relation between an interpretable effect-size index d and F or t only when F or t comes from a posttest-only, two-independent-group experiment without covariates or blocking. When t or F statistics come from other experimental designs (and they usually do), Rosenthal's formula does not apply. Glass, McGaw, and Smith (1981, pp. 126–130) provides formulas for converting t and F ratios to effect-size indices for various other experimental designs.

A related problem is Rosenthal's estimation of size of treatment effects from sample sizes and the probability levels associated with the treatment effects. These two factors provide an even poorer basis for estimating size of effect than do sample size and test-statistic value. Meta-analysts who know the sample size and the probability level associated with a treatment effect also need to know what kind of statistical test produced the probability level. With a given sample size and a given probability level associated with the treatment, for example, effect sizes can vary widely depending on whether a parametric or nonparametric test was used in a study (Glass et al., 1981, pp. 130–131).

Finally, Rosenthal proposes applying contrast weights to studies in what he calls *focused* statistical tests. Rosenthal uses these focused tests to determine whether certain studies produce stronger effects than others do. Use of contrast weights makes sense with factors with fixed levels; contrast weights are not appropriate for random, sampled factors (Hays, 1973, p. 582), and studies carried out by different investigators at different times and in different places must surely represent a sampled factor rather than one with fixed levels. Furthermore, the denominator in the formula for Rosenthal's focused test reflects within-study variation in effect. Winer (1971, pp. 359–366) has shown that when a number of studies have been conducted under one condition and a number of other studies have been conducted under another condition (i.e., when studies are nested within conditions), the appropriate denominator in a test of effect of conditions is the term reflecting variation of studies within conditions, not the term reflecting within-study variation in effects.

Fortunately, Mullen and Rosenthal's programs can be revised to fit a user's needs. They can be expanded to prompt a user to provide more complete information about a study's research design and statistical analysis; additional calculating routines can be added; and the programs can be revised to produce more informative output. As they stand, the programs provide a good introduction to Rosenthal's methodology. But I would advise the serious meta-analyst to consider making revisions in the programs before using them in the important job of quantitative research reviewing.

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