

## Meta-analysis programs

RALF SCHWARZER

Freie Universität Berlin, Berlin, West Germany

The term *meta-analysis* (Glass, 1976) refers to a set of data analysis strategies for the integration and comparison of empirical research findings in the absence of the original data. A variety of advanced techniques for conducting meta-analyses are described in textbooks published recently (e.g., Hedges & Olkin, 1985; Rosenthal, 1984; Wolf, 1986). The present program package has been designed to provide a convenient tool for handling different kinds of data sets and different algorithms. It can be considered as a more advanced alternative to the programs offered by Gorman, Primavera, and Karras (1983).

After typing in "META," a main menu appears with the following 10 subprogram options:

1. **Data File Management.** The filer allows input of data according to three file structures, which are intended for use with either probabilities  $p$ , effect sizes  $d$ , or effect sizes  $r$  (correlations). The filer allows the user to list, print, append, edit, and select data records.

2. **Combination of Effect Sizes  $d$ .** This subroutine runs a meta-analysis for  $d$  values obtained from experimental studies.  $d$  is defined as the standardized difference between means, that is, the mean of the experimental group minus the mean of the control group or the pooled standard deviation (Fricke & Treinies, 1985; Glass, McGaw, & Smith, 1981; Hedges & Olkin, 1985).

3. **Cluster Analysis of Effect Sizes  $d$ .** The distribution of effect sizes from a number of studies may be heterogeneous. Grouping smaller numbers of studies into more homogeneous subsets is achieved by a disjoint cluster analysis. By employing this strategy and by inspecting the resultant subgroups, potential moderator variables can be detected.

4. **Combinations of Effect Sizes  $r$  (Correlations).** This program runs a meta-analysis for effect sizes  $r$  obtained either directly from correlational studies or from statistics that have been transformed with program 7.

5. **Cluster Analysis of Effect Sizes  $r$  (Correlations).** Same as in program 3 for effect sizes  $d$ .

6. **Combination of Probabilities  $p$ .** This program uses the Stouffer method of integrating one-tailed exact  $p$  values after transformation to the normal distribution  $Z$ . It should be used only when effect sizes are unavailable.

7. **Transformation of Coefficients.** Not all studies in the literature provide the appropriate effect sizes. Instead, some report  $t$  values,  $F$  values, chi-squares, or

other statistics. In such cases, a transformation is required and can easily be done by this program.

8. **Weighted Means.** Some authors of empirical studies report not only one but a number of effect sizes based on several independent subsamples. In this case, the meta-analyst has to decide whether all effect sizes should be considered separately or should be pooled. It is for the latter purpose that this program has been written.

9. **Significance of Correlations.** This program determines whether a correlation is statistically significant and whether coefficients differ significantly from each other.

10. **Stem-and-Leaf Display for Correlations.** This is a convenient display technique for effect sizes  $r$ , and it provides more information than traditional histograms.

**Input.** After typing in "META," the program package is completely menu driven. The filer allows input for three kinds of data:  $p$  values,  $d$  values, and  $r$  values. Sample size input is necessary. Reliabilities are optional, and missing values are considered.

**Output.** Brief results are presented on the screen, and line printer output is optional.

**Hardware and Language.** The program package has been written in Turbo Pascal for the IBM PS/2, IBM PC, or compatibles (MS-DOS 2.10 with 256K RAM). It requires 212K of disk storage space.

**Manual.** A 16-page manual including formulas and examples is provided on the disk as a text file called "META.DOC."

**Availability.** Version 3 of this program package is available either on a 5.25-in. or on a 3.5-in. floppy disk. The software is free of charge, but a fee of \$10 is requested for update information, foreign air mail postage, and handling. The software can be ordered by sending to the author a formatted disk accompanied by a check. The user may feel free to make copies for others, but not for commercial use.

## REFERENCES

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The author's mailing address is Freie Universität Berlin, Institut für Psychologie, FB 12 WE 7, Habelschwerdter Allee 45, D-1000 Berlin 33, West Germany.