Windows-Based Meta-Analysis Software Package

Version 2.0

The Hunter-Schmidt Meta-Analysis Programs Package includes six programs that implement all basic types of Hunter-Schmidt psychometric meta-analysis methods. Information on how to obtain this program package is provided at the end of the Appendix. Brief descriptions of the six programs are provided in section 4, ``Types of Analyses.'' A full description of the output of each program is given in section 10, "Full Description of Output of Individual Programs." These programs are intended to be used in conjunction with this book (henceforth referred to as ``the text'').

In response to feedback from users, we have made a number of improvements to the current version of these programs (version 2.0) that were not available in previous versions (versions 1.0 and 1.1). These include the following:

1. The programs now allow importation of data files from Excel.

2. The future version of the programs will produce forest plots. Forest plots can be useful in potential publication bias.

3. Confidence intervals (in addition to credibility intervals) are now provided for all mean values except bare bones meta-analysis means.

4. Output for corrected *r* and *d* values is now presented in tabular form, as well as in the more detailed

output form. The tabular form output includes the values that should be reported in Tables of meta-analytic results in papers submitted for publication. (Tabular form is not provided for bare bones meta-analysis results.)

5. Studies can now be coded for potential moderator analysis, making it more convenient to subgroup studies for moderator analysis. [1]

6. The programs now include a method of checking for publication bias—cumulative meta-analysis. See Chapter 13 for a discussion of this procedure.

7. Output now includes the correlation between observed *r* or *d* values and artifact effects on these values.

8. The maximum number of studies in a meta-analysis has been raised from 200 to 1000.

9. It is now possible to select saved data files for analysis by just clicking on the file name. (In older versions, the file name had to be typed in.)

10. It is now easier for users to access the supplementary programs for computing composite correlations and for converting point-biserial correlations to biserial correlations. These programs are no longer password protected. They can now be accessed by clicking on the appropriate icon.

11. The programs can be downloaded from the internet. Alternatively, a program package *CD* be provided.

12. Three small technical adjustments have been made. First, in the previous version, if an *r* or *d* value was entered as zero, the program would not run. This has been corrected. Second, the correction for the small bias in observed *rs* has been added. Third, in computing the sampling error variance of *d* values, the programs now use Equation (7.23a) instead of Equation (7.23). (These equations are in Chapter 7.) Use of Equation (7.23a) produces greater accuracy in those cases in which the sample

[1] To conduct moderator analysis, the user must use the "Enter data by Excel" option (see more details in the "Moderator Analysis" section.

size for one group is very small compared to the other group. It is also accurate when the group sample sizes are less unequal or equal in size. [2]

The programs are provided on a CD or downloaded from the internet and are compatible with Microsoft Windows® operating systems (Windows 95, 98, 98SE, ME, 2000, XP, and Windows 7). Program interface is logically and intuitively arranged so that people with basic familiarity with Windows-based applications can easily learn to use the program functions. Navigating through the different steps (pages) of the programs is achieved by single-clicking appropriate buttons or icons. Throughout all the steps (pages), there are built-in help functions in the form of roll-over pop-ups (i.e., help statements that appear when the cursor is rolled over certain predetermined areas) explaining the options and instructing the user in how to execute his or her desired tasks.

1. What Is in the Download or the CD Program Package?

All the files of the program package are included in a password-protected zip file ("HSMAPrograms.zip"). In addition to the core meta-analysis programs and supporting files, the program package contains (1) the Readme.pdf file (the file you are now reading), and (2) two utility programs in the form of Microsoft® Excel templates (Composites.xls and Point-Biserial.xls; details of these programs are described in the ``Extras'' section). These auxiliary programs help users convert correlations in the primary studies to appropriate forms before inputting them into the meta-analysis programs.

2. Installation

If you have an earlier version of the program package (version 1.0 or 1.1), you should uninstall it before installing the current version. Uninstallation can easily be done by using the ``Remove Hunter-Schmidt Meta Analysis Programs'' option available in the Windows Programs taskbar.

The programs can be installed by simply unzipping the "HSMAPrograms.zip" file using the provided serial number and copying the contents at the root directory ("C:\" for most computer). The main programs and all the supporting files can then be found under folder ``C:\Meta Analysis Programs'' on your hard drive (unless you specify a different drive).

3. Starting the Program

The programs can be activated by selecting (clicking on) the ``Hunter Schmidt Meta Analysis Programs.exe'' in the ``C:\Meta Analysis Programs'' folder. You will be presented with the Start Page, where you can access the Readme file by clicking on the book icon at the upper right corner of the page.

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[2] This option (using the more accurate formula when one group has relatively small sample size) is only possible when data are entered by the "Enter by Excel" option (see the "Data Management" section later for more details)

There are also links which allow you to get access to the extra programs for computing composite correlations or point biseral correlations. To move on to the next page, in which you can select types of meta-analyses to be run, click on the red arrow icon at the lower right corner of the page. The ``Type of Analyses'' page will appear, presenting you with four options of analyses (described next).

4. Types of Analyses

The programs in this package do the following types of meta-analysis:

1. Meta-analysis of correlations corrected individually for the effects of artifacts. (These two programs are collectively referred to in the text as VG6.) These programs are used when (1) the user desires to estimate the correlation between variables, and (2) information on the statistical and measurement artifacts (i.e., range restriction, reliabilities on both variables) is available in all (or the majority) of the primary studies. These programs are illustrated in Chapter 3 of the text.

There are two subprograms under this type of meta-analysis:

A. Program that corrects for direct range restriction: To be used when range restriction is direct (i.e., selection occurs on one of the two variables being correlated). (This program is referred to in the text as VG6-D; see Chapter 3.)

B. Program that corrects for indirect range restriction: To be used when range restriction is indirect (i.e., selection occurs on a third variable that is correlated with both the variables of interest). (This program is referred to in the text as VG6-I; see Chapter 3.)

(Note: Both programs ask the user if there is any range restriction. If the answer is "No", the data entry field for the range restriction statistic (the *u* value) does not appear. When there is no range restriction, the results provided by the subprograms 1A and 1B are identical.)

2. Meta-analysis of correlations using artifact distributions. These programs are used when (1) the user desires to estimate the correlation between variables, and (2) information on the statistical and measurement artifacts is *not* available in most of the primary studies. (These two programs are collectively referred to in the text as INTNL; see Chapter 4.)

This meta-analysis program also includes two subprograms:

A. Program that corrects for direct range restriction: To be used when range restriction is direct (i.e., selection occurs on one of the two variables being correlated). (This program is referred to in the text as INTNL-D; see Chapter 4.)

B. Program that corrects for indirect range restriction: To be used when range restriction is indirect (i.e., selection occurs on a third variable that is correlated with both the variables of interest). (This program is referred to in the text as INTNL-I; see Chapter 4.)

(Note: Both programs ask the user if there is any range restriction. If the answer is "No", the data entry

field for the range restriction statistic (the *u* value) does not appear. When there is no range restriction, the results provided by the subprograms 2A and 2B are identical.)

3. Meta-analysis of *d* values corrected individually for measurement error.

This program is used when (1) the user desires to estimate the effect size (d value; standardized difference between groups), and (2) information on the reliability of the measure of the dependent variable is available in all (or most) of the primary studies. (This program is referred to in the text as D-VALUE; see Chapter 7.)

4. Meta-analysis of *d* values using artifact distributions.

This program is used when (1) the user is interested in estimating the effect size (*d* value; standardized difference between groups), and (2) information on the reliability of the measure of the dependent variable is *not* available in most of the primary studies. (This program is referred to in the text as D-VALUE1; see Chapter 7.)

The ``Type of Analyses'' page of the program shows four types of meta-analysis (1 to 4, listed above), and the user selects the most appropriate analysis. If the user selects option 1 or 2, the subprograms (1A and 1B or 2A and 2B) will appear on subsequent pages (under the Analysis section) for further choice of the exact program to be used (depending on whether range restriction is direct or indirect). As noted earlier, the user can also indicate that there is no range restriction.

5. Data Management

After selecting the appropriate type of analysis, the user is presented with the ``Setting up the data'' page. Here the user can opt to input (enter) new data, to load existing (previously saved) data files, or to import data files from Excel (when selecting this option, the user will be provided with an Excel template for entering data). In all programs, users can elect to code studies by potential moderators to make subsequent moderator subgroup analysis more convenient. This is done by following the instructions in the programs (described in section 9 "Moderator Analysis"). The users can also conduct analysis to examine publication bias based upon the cumulative meta-analysis method described in Chapter 13 of the book (also see section 10 "Cumulative Meta-Analysis).

a. Entering Data:

For meta-analysis type 1 (i.e., meta-analysis for correlations, with information on statistical and measurement artifacts available in most primary studies; VG6 programs), the user need only enter data into one general data file. This data file can be entered by Excel or created with the program. To enter data by Excel, the users can click on the button "Enter Data by Excel". An Excel template will be opened with pre-

assigned fields/columns for the users to enter data from the primary studies.[3] After completing data entry, the users can click on the "Save Data" button inside the Excel Template to save the data. The users will need to give a name for the dataset which can be used to load the data later. After that, the Excel Template should be closed. For creating the data file inside the program, the users can click on the ``Enter data from primary studies'' button which then presents a page having a spreadsheet-like layout with six fields (spaces) so that relevant information for each study (i.e., code for moderator analysis [explained later in section 9 "Moderator Analysis"] , correlation, sample size, reliability of variable X [independent variable reliability, R_{xx}, reliability of variable Y [dependent variable reliability, R_{yy}], and range restriction ratio [u]) can be entered accordingly. Data are entered sequentially for each study. When corrections are needed, the user can click on the ``Modification'' buttons available in front of the data holder for each study. All the data fields must be filled. When there is no range restriction in a particular study, ``1'' should be entered in the range restriction (u) cell. Similarly, when a variable is assumed to be perfectly measured (very rare case), ``1'' should be entered in the corresponding reliability cell. In situations where information on an artifact ($R_{xx}$, $R_{yy}$, or u) of a study is not available, the user can simply enter ``99'' into the corresponding cell. The program will then automatically use the mean of all the relevant artifact values provided in other studies to replace the missing value.

There are spaces to enter data for eight studies in each page. After entering the data for each page, the user clicks on the ``Continue'' button to proceed to the next page. The two buttons, ``Back'' and ``Continue,'' can be used to navigate through the pages to modify and/or enter data. The maximum number of studies is 1000. After completing data entry, the user can press the ``Done'' button to exit to the previous page and start analysis (or choose other options, such as printing, saving, or modifying the data, as described later).

For meta-analysis type 2 (i.e., meta-analysis for correlations when information on statistical and measurement artifacts is *unavailable* in most primary studies; INTNL programs), the user enters data separately into several data files: The first data file consists of the code for moderators, correlations and the corresponding sample sizes of the primary studies (r and N). The second data file consists of the distribution of reliability coefficients of the independent variable (R_{xx} and freq). The third data file consists of the distribution of reliability coefficients of the dependent variable (R_{yy} and freq). And the fourth data file consists of the distribution of range restriction (u and freq). These data files can also entered using Excel

[3] When the users open the Excel temples the first time, a security warning, which reads "*Security Warning: Some active content has been disabled. <Options…>*", may be shown at the upper left corner of the screen. If that happens, the users should click on the "Options…" button and enable both the "Macro" and "Data Connection" sections of Excel (by selecting "Enable this content" under these two sections).

templates by selecting the four Excel buttons corresponding to the four above-mentioned distributions. It is very important to note here that when asked to name the data, the users must give the same name for all the four datasets so that they can be loaded together later. If information is not available (or the artifact is not applicable) for an artifact distribution (e.g., when there is no range restriction), the program will assume that such artifacts have values fixed at 1.00 and automatically place 1.00s in the relevant data file(s). This means no correction will be made for these artifacts.

For meta-analysis type 3 (i.e., meta-analysis for effect sizes [*d* values], with information on statistical and measurement artifacts available in most primary studies; D-VALUE program), the procedures are similar to those of the type 1 meta-analysis described previously, except that the user enters only information on dependent variable reliability (R_{yy}); information on independent variable reliability (R_{xx}) and range restriction (u) is not required. This data file can be entered by Excel by following the same procedure as described above. As noted earlier, by using Excel to enter data, the users can have an option to use the more accurate formula to estimate sampling error for effect size when one group has a very small sample size compared to that of the other group (i.e., using equation 7.23a instead of 7.23). To do this, the users need to enter the sample size of the larger group (group 1) in column "N1" and the size of the smaller group (group 2) in column "N2" in the Excel Template. However, if the two groups are not much different, the users can simply enter the total sample size in column "N1" and leave column "N2" blank (in this case, equation 7.23 will be used).

For meta-analysis type 4 (i.e., meta-analysis for effect sizes [*d* values] when information on statistical and measurement artifacts is *unavailable* in most primary studies; D-VALUE1 program), the procedures are similar to those of the type 2 meta-analysis described previously, except that the user enters only information on the distribution of dependent variable reliability (R_{yy}); information on distributions of independent variable reliability (R_{xx}) and range restriction (u) is not required. Hence, there are only two data files rather than the four data files required for meta-analysis type 2. Again, these data files can be entered by using Excel.

b. Saving Data

After completing the entry of the data (by clicking on the ``Done'' button), the user is taken back to the previous page where several options are presented: ``Save,'' ``Print,'' ``Analysis,'' and ``Exit.'' Selecting the ``Save'' option allows the user to save the data file he or she has just entered. The user will be asked to provide the name for the data set so that it can be easily retrieved when needed. The data will then be saved at the following location: C:\Meta Analysis Programs\Data$i$\``datasetname'', with i being the number corresponding to the type of meta-analysis.

Alternatively, the user can simply start analyzing the data. After the meta-analysis results are presented, the user is given another opportunity to save the current data set.

c. Loading Previously Saved Data

To load the previously saved data, select the ``Load'' option in the ``Setting Up Data'' page. The user will be presented with names of all the previously saved data sets. He or she can select the appropriate data set to load into the program by clicking on the name of that data file.[4]

d. Viewing/Modifying Saved Data

After loading/entering data, the user can view the data by selecting the ``Entering/Modifying'' option. Data will be presented in the spreadsheet-like layout. Modifications (corrections) can be made by clicking the icon in front of each individual study.

e. Printing Data

The user can print the current data set (i.e., the data that have just been entered, loaded, or imported from Excel) for easy reviewing by selecting the ``Print'' option.

d. Conducting publication bias analysis

Section 10 ("Cumulative Meta-Analysis") below explains a procedure which enables the users conduct publication analysis based upon the cumulative meta-analysis method described in Chapter 13 of the book.

6. Analyzing Data

After entering/loading/modifying the data, the user can start analyzing the data by clicking on the ``Analyzing the Data'' button. For correlation-based meta-analysis (i.e., types 1 and 2; VG6 and INTNL programs), if the user has previously indicated there is range restriction, the user will next be asked to indicate the nature of range restriction existing in his or her data (i.e., direct or indirect, which means selecting between type 1A [VG6-D program] or 1B [VG6-I program] or selecting between 2A [INTNL-D program] or 2B [INTNL-I program]).

Both direct range restriction programs (VG6-D and INTNL-D) automatically assume that the independent variable reliabilities (R_{xx}) are from the unrestricted samples, and the dependent variable reliabilities (R_{yy}) are from the restricted samples. These assumptions agree with the nature of data available in research and practice. (See the text, Chapters 3, 4, and 5, for a more detailed discussion.)

Both indirect range restriction programs (VG6-I and INTNL-I) require the user to specify whether (1) the independent variable reliabilities (R_{xx}) are from the restricted or unrestricted samples and (2) whether the range restriction ratios are for true scores (u_T) or observed scores (u_X). For all cases, the program assumes that the dependent variable reliabilities are from the restricted samples. (See the text, Chapters 3, 4,

[4] Sometimes the programs cannot find the data (even when the users click on the button showing the dataset name). If that happens, the users should go back to the previous page and select the dataset in question again.

and 5, for a detailed discussion.)

When there is no range restriction, it does not matter which type of analysis (A or B) the user chooses; the programs will provide identical results.

The user will be asked to provide the title for the analysis (e.g., ``Interviews and job performance---Meta-analysis 1'') and the name of the output file where results will be saved.

7. Reporting Results

Results of the analyses are provided three different ways: (1) on screen (partial output), (2) on disk (at C:\Meta Analysis Programs\Output\``filename'', with ``filename'' being the name the user provided for the current analysis), and (3) print out (optional; which can be activated by clicking on the ``Printer'' option). As noted earlier, the printed output is present both in table form (some of the output) and in the more traditional output format (complete output). Due to space limitations, only partial output is presented on the screen. Complete output is saved to disk and printed with the print-out option.

A full listing and description of the output of each program is given later. The following are *some* of the items provided as output of the analysis:

1. Number of correlations (or d values) and total sample size.
2. Mean true score correlation (or mean corrected d value), the corresponding standard deviation (true score correlation SD_ρ or true effect size SD_δ), and the corresponding variances. These values are corrected for the biasing effects of all the artifacts considered in the meta-analysis. These values are estimates of mean construct-level relationships. Credibility intervals and confidence intervals are also provided.
3. Weighted mean observed correlation (or d values), observed variance and observed standard deviation, and variance and standard deviation corrected for sampling error only.
4. Sampling error variance, percentage of the observed variance due to sampling error variance, variance accounted for by all artifacts combined, and percentage of the observed variance due to all the artifacts combined.
5. The correlation between observed values and artifact effects is also presented. This is the square root of the proportion of variance accounted for by all artifacts combined.
6. For types 1 and 2 analyses (i.e., correlation-based meta-analyses), certain output is provided that is relevant to employment or educational selection research. The VG6 and INTNL programs provide the mean true validity and its standard deviation. Credibility intervals and confidence intervals are also provided. The true validity (also called operational validity) is the correlation between the predictor (X) and the criterion (Y) corrected for all the artifacts except for the

attenuating effect of measurement error in the predictor X. This value represents the mean correlation of the predictor *measures* with the criterion of interest. (In contrast, the true score correlation represents the mean construct-level correlation between the independent variable and the dependent variable.)

8. Illustrating Examples

The programs include several data sets used as examples in Chapters 3, 4, and 7. There are examples representing all six types of meta-analyses discussed previously. The user can practice doing analyses based on these data sets to familiarize him- or herself with the programs.

9. Moderator Analysis

The programs allow users to conduct analyses separately for each moderator value/category. Results will be presented for each value/category of the moderator. To specify moderator analysis, the user can enter values of the moderator of interest at the field labeled "Moderator value" when entering the data. The users must use Excel templates (as described above) to enter data in order for the moderator analysis to work. Values of the moderator should be entered using a number from 1 to k (with k being the number of categories of the moderator) for each study. If no moderator analysis is needed, the user can leave the field for moderator blank.

To conduct Moderator Analysis, the users first need to specify the appropriate analysis (out of the four types of analyses described above) then go to the "Setting Up Data" page and click on the "Load" button. Do not select any datasets in the "Loading Existing Data" page; instead, go to the bottom of the page and select the "Moderator Analysis" button on the right. Clicking on this button, the users will again be presented with all the available datasets. The users can then select the appropriate dataset by clicking on the red button on the left of its name. Results of Moderator Analysis will be automatically printed out and also saved in the C:\Meta Analysis Programs\OutputM\ folder in separate files which are named after the Moderator categories (i.e., "1.txt", "2.txt", ….). The users can also have option of plotting the results using Excel by clicking on the "Using Excel to Plot MR and SD" button.

10. Cumulative Meta-Analysis

Cumulative Meta-Analysis can be conducted by following a similar procedure to that of Moderator Analysis described in the previous section. Here instead of clicking on the "Moderator Analysis" button, the users should choose the "Cumulative Meta-Analysis" button at the left side of the bottom of the "Load Existing Data" page. Results will be saved in the C:\Meta Analysis Programs\OutputN\ folder in separate files which are named based on the number of studies included in the analysis (e.g., "1.txt" is result of analysis based on one study with the largest sample size, "2.txt" includes result based on two studies with largest sample sizes,…and so on). The users also have option of plotting results using Excel by clicking on

the "Using Excel to Plot MR and SD" button (i.e., showing the forest plot).

11. Extras (Auxiliary Programs)

There are two utility programs in the form of Microsoft Excel® templates that aid in examining and processing data before entering data into the meta-analysis programs. The user must have Microsoft Excel to use these programs. During the process of installing the main (meta-analysis) programs, these utility programs will be automatically copied onto your hard drive at the following location: ``C:\Meta Analysis Programs\Extras.'' The first program (``Composite.xls'') combines correlations within a study; it computes the correlation between a composite (summed) independent or dependent variable and the other variable. This program also computes the reliability of the composite measure. (Both these procedures are described in Chapter 10 of the text.) The second program (``Formula to compute biserial r.xls'') computes the biserial correlation from a point biserial correlation provided in a primary study. This conversion should be carried out when a continuous (and normally distributed) variable has been artificially dichotomized in a primary study (as described in Chapters 6 and 7 of the text.

12. Full Description of Output of Individual Programs

The standard program output is divided into three sections: (1) Main Meta-Analysis Output, which presents results corrected for all artifacts; (2) Bare Bones Meta-Analysis Output, which presents results corrected for sampling error only; and (3) Validity Generalization Output, which presents validity results relevant to tests and other procedures used in employment and educational selection. Section 3 is provided only for meta-analyses of correlations (i.e., type 1 meta-analysis [based on the VG6 programs] and type 2 meta-analyses [based on the INTNL programs]). It is not provided for meta-analyses of *d* values (type 3 meta-analysis [based on the D-VALUE program] and type 4 meta-analysis [based on the D-VALUE1 program]). The sections of program output always appear in the same order: The Main Output is always presented first, followed by the Bare Bones Output, followed by the Validity Generalization Output (if applicable). The Bare Bones output is identical for VG6 and INTNL program output. Hence, to avoid repetition, we present this first below.

A. Bare Bones Output for VG6 (type 1 meta-analysis) and INTNL (type 2 meta-analysis).

1. Sample-size-weighted mean observed correlation.
2. Variance of correlations after removing sampling error variance.
3. Standard deviation (*SD*) of correlations after removing sampling error variance. (This is the square root of item 2.)
4. Sample-size-weighted variance of observed correlations.
5. Sample-size-weighted *SD* of observed correlations. (This is the square root of item 4.)

6. Variance due to sampling error variance.
7. *SD* predicted from sampling error alone. (This is the square root of item 6.)
8. Percentage variance of observed correlations due to sampling error variance.
9. The Correlation between observed values of *r* and their sampling errors. (This is the square root of the proportion of variance accounted for by sampling error; see item 8.)

B. Main Output for VG6 programs (type 1 meta-analysis)

1. Number of correlations in the meta-analysis.
2. Total sample size. (Sum of study sample sizes.)
3. Mean true score correlation ($\bar{\rho}$).
4. Variance of true score correlations (S_ρ^2) .
5. *SD* of true score correlations (SD_ρ) . (This is the square root of item 4.) Note: For most purposes, the key output is items 3 and 5.
6. 80% credibility interval for true score correlation distribution (See Chapter 5.)
7. 95% confidence interval around the mean true score correlation (See Chapter 5.)
8. Observed variance of the corrected correlations $(S_{r_c}^2)$. (Each correlation is first corrected for measurement error and other artifacts; then the variance of these corrected correlations is computed. This is the variance of the corrected correlations before sampling error variance is removed. As described in Chapter 3, the corrections for artifacts, while eliminating systematic downward biases, increase sampling error.)
9. *SD* of the corrected correlations SD_{rc}. (This is the square root of item 8.)
10. Variance in corrected correlations due to sampling error. [Note: This figure is larger than the variance in *uncorrected* (*observed*) correlations due to sampling error variance, which is reported in the Bare Bones Output section. This is because the artifact corrections, while removing systematic downward biases, increase sampling error variance. Note: variance due to other artifacts is included in this variance because the effects of these artifacts have been previously corrected for.]
11. *SD* of corrected correlations predicted from sampling error. (This is the square root of item 9.)
12. Percentage variance in corrected correlations due to sampling error and other artifacts.
13. The correlation between the corrected *rs* and their sampling errors. (This is the square root of the proportion of variance in the corrected correlations accounted for by all artifacts; see item 12.)

C. Validity Generalization Output for VG6 programs (type 1 meta-analysis)

1. Mean true validity. (Same as mean true score correlation, except it is not corrected for the attenuating effects of measurement error in the independent variable; see Chapter 3 of text.)
2. Variance of true validities.
3. *SD* of true validities. (This is the square root of item 2.)
4. 80% credibility interval for true validity distribution. (See Chapter 5)
5. 95% confidence interval around mean true validity. (See Chapter 5)
6. Observed variance of the corrected validities. (Each validity is first corrected for measurement error in the dependent variable and for range restriction; then the variance of these corrected validities is computed. This is the variance of the corrected validities before sampling error is subtracted out. As described in Chapter 3, the corrections for artifacts, while eliminating systematic downward biases, increase sampling error.)
7. *SD* of the corrected validities. (This is the square root of item 6.)
8. Variance in corrected validities due to sampling error. [Note: This figure is larger than the variance in uncorrected (observed) validities due to sampling error variance, which is reported in the Bare Bones output section. This is because the artifact corrections, while removing systematic downward biases, increase sampling error. Note: Variance due to other artifacts is included in this variance because the effects of these artifacts have previously been corrected for.)
9. *SD* of corrected validities predicted from sampling error and other artifacts. (This is the square root of item 8)
10. Percentage of variance accounted for by sampling error. (Note: variance due to other artifacts is included in this because these artifacts have previously been corrected for.)
11. The correlation between corrected *rs* and artifact effects. (This is the square root of the proportion of variance in the corrected *rs* accounted for by artifacts; see item 10.)

D. Main Output for INTNL programs (type 2 meta-analysis)

1. Number of correlations in the meta-analysis.
2. Total sample size. (Sum of study sample sizes)
3. Mean true score correlation ($\bar{\rho}$).
4. Variance of true score correlations (S_ρ^2).
5. *SD* of true score correlations (SD_ρ). (This is the square root of item 4.) Note: For most purposes, the key output is items 3 and 5.
6. 80% credibility interval for true score correlation distribution. (See Chapter 5)
7. 95% confidence interval around mean true score correlation. (See Chapter 5)

8. Variance in observed correlations due to all artifacts combined. (See Chapter 4)
9. *SD* of observed correlations predicted from all artifacts. (This is the square root of item 8.)
10. Variance of observed correlations after removal of variance due to all artifacts (residual variance [SD_{res}]; see Chapter 4).
10. Percentage variance of observed correlations due to all artifacts.
11. Correlation between observed *rs* and artifact effects. (This is the square root of the proportion of variance in observed *rs* accounted for by artifacts; see item 10)

E. Validity Generalization Output for INTNL programs (type 2 meta-analysis)

1. Mean true validity. (Same as mean true score correlation, except not corrected for the attenuating effects of measurement error in the independent variable.)
2. Variance of true validities.
3. *SD* of true validities. (This is the square root of item 2.)
4. 80% credibility interval of true validity distribution. (See Chapter 5)
5. 95% confidence interval around mean true validity. (See Chapter 5)
6. Variance of observed validities due to all artifacts combined. (See Chapter 4)
7. *SD* of observed validities predicted from all artifacts. (This is the square root of item 6.)
8. Variance in observed validities after removal of variance due to all artifacts (residual variance [SD_{res}]; see Chapter 4).
9. Percentage variance in observed validities due to all artifacts.
10. Correlation between observed validities and artifact effects. (This is the square root of the proportion of variance in observed validities accounted for by artifacts; see item 9.)

F. Bare Bones Output for D-VALUE and D-VALUE1 programs (meta-analysis types 3 and 4). (Bare Bones Output is identical for these two types of meta-analyses.)

1. Sample-size-weighted mean effect size (mean d value).
2. Variance of d values after removing sampling error variance.
3. *SD* of d values after removing sampling error variance. (This is the square root of item 2.)
4. Sample-size-weighted variance of observed d values.
5. Sample-size-weighted standard deviation of observed d values. (The square root of item 4)
6. Variance in observed d-values due to sampling error variance.
7. *SD* predicted from sampling error variance alone. (This is the square root of item 6.)
8. Percentage variance in observed d values due to sampling error variance.

9. Correlation between observed *d* values and their sampling errors. (This is the square root of the proportion of variance accounted for by sampling error; see item 8.)

G. Main Output for D-VALUE program (type 3 meta-analysis)

1. Number of effect sizes (d values) in the meta-analysis.
2. Total sample size. (Sample sizes summed across studies.)
3. Mean true effect size ($\bar{\delta}$).
4. True variance of effect sizes (S_{δ}^2).
5. *SD* of delta (SD_{δ}). (This is the square root of item 4.) Note: For most purposes, the key output is items 3 and 5.
6. 80% credibility interval for delta distribution. (See Chapter 8)
7. 95% confidence interval around the mean delta. (See Chapter 8)
8. Observed variance of corrected d values $(S_{d_c}^2)$. (Each d value is corrected for measurement error in the dependent variable; then the variance of these corrected d values is computed. This is the variance of the corrected d values before sampling error variance is removed. As described in Chapter 7, the correction for measurement error, while eliminating the systematic downward bias, increases sampling error variance.)
9. Observed *SD* of the corrected d values (SD_{d_c}). (This is the square root of item 8.)
10. Variance in corrected d values due to sampling error. (Note: This figure is larger than the variance in *uncorrected* [*observed*] d values due to sampling error variance, which is presented in the Bare Bones Output section. This is because the correction for measurement error, while removing the systematic downward biases, increases the sampling error variance. Note: Variance due to measurement error differences is included in this variance figure, because measurement error has previously been corrected for.)
11. *SD* of corrected d values predicted from sampling error variance. (This is the square root of item 10.)
12. Percentage variance in corrected d values due to sampling error variance. (Note: Variance due to measurement error differences is included in this value because the effects of this artifact have previously been corrected for.)
13. Correlation between corrected *d* values and their sampling errors. (This is the square root of the proportion of variance accounted for by sampling error; see item 12.)

H. Main Output for D-VALUE1 program (type 4 meta-analysis)

1. Number of effect sizes (d values) in the meta-analysis.
2. Total sample size. (Sample sizes summed across studies.)
3. Mean true effect size ($\bar{\delta}$).
4. True variance of effect sizes (S_{δ}^2).
5. *SD* of delta (SD_{δ}). (This is the square root of item 4.) Note: For most purposes, the key output is items 3 and 5.
6. 80% credibility interval for delta distribution. (See Chapter 8)
7. 95% confidence interval around mean delta. (See Chapter 8)
8. Variance in observed d values due to sampling error and measurement error differences between studies. (See Chapter 7)
9. *SD* of observed d values predicted from sampling error and measurement error differences. (This is the square root of item 8.)
10. Variance in observed d values after removal of variance due to sampling error and between-study measurement error differences (residual variance $[S_{\text{res}}^2]$; see Chapter 7).
11. Percentage variance in observed d values due to sampling error and differences in measurement error.
12. Correlation between observed *d* values and the combined effects of sampling error and differences in measurement error. (This is the square root of the proportion of variance due to all artifacts in item 11.)