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Detecting publication bias in random effects meta-analysis: An empirical comparison of statistical methods

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Detecting Publication Bias in Random Effects Meta-Analysis:

An Empirical Comparison of Statistical Methods

by

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DEDICATION

This dissertation is dedicated to my family for all the undocumented little things they did to make this possible. Most notable is my husband, Neil, who knew my desire to seek a doctorate since before the day we took our vows and still married me. Although I think he had an idea of the craziness that accompanies this process he certainly had to bear the good and bad. This dream came to fruition because Neil let me fly my kite by his side and helped keep the lines from tangling. For the last two years of my program my son Isidore has kept me motivated and grounded. Izzy was my little secret during qualifying exams and a very obvious expectation during my proposal defense. Since his birth Izzy's smile has given me the fuel I needed to keep on track. As a family I am reminded daily of the importance of our time together and as I transition into a new phase of my academic life I keep this privilege at the forefront.

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ABSTRACT

Publication bias is one threat to validity that researchers conducting meta-analysis studies confront. Two primary goals of this research were to examine the degree to which publication bias impacts the results of a random effects meta-analysis and to investigate the performance of five statistical methods for detecting publication bias in random effects meta-analysis. Specifically, the difference between the population effect size and the estimated meta-analysis effect size, as well as the difference between the population effect size variance and the meta-analysis effect size variance, provided an indication of the impact of publication bias. In addition, the performance of five statistical methods for detecting publication bias (Begg Rank Correlation with sample size, Begg Rank Correlation with variance, Egger Regression, Funnel Plot Regression, and Trim and Fill) were estimated with Type I error rates and statistical power. The overall findings indicate that publication bias notably impacts the meta-analysis effect size and variance estimates. Poor Type I error control was exhibited in many conditions by most of the statistical methods. Even when Type I error rates were adequate the power was small, even with larger samples and greater numbers of studies in the meta-analysis.

CHAPTER ONE: INTRODUCTION

Background

Publication bias (terms will be defined on Page 15) is one issue that researchers face when conducting a literature review, designing a new study, or conducting a *meta-analysis*. Unfortunately, when a researcher gathers literature their findings are not going to include all studies that have occurred regarding the specified content area searched. This phenomenon was discussed by Rosenthal (1979) as the "file drawer problem" or publication bias. Essentially, researchers may have studies that are sitting in their filing cabinets because they decided not to publish or were rejected by journals. Reasons for researchers to not submit studies or for journals to reject studies typically revolve around whether the results indicated significant findings, which are influenced by sample size, or large effects. In addition, published research can inadvertently contribute to publication bias when researchers exclude non-significant findings from results or report data poorly. Thus, there is a pattern in the published literature of a greater number of studies with significant findings and large effects.

Researchers conducting *meta-analytic studies* go to great lengths (or at least they should) to gather both published and unpublished studies on the content of their meta-analysis. This step in the meta-analysis design is time consuming but critical. When meta-analysts do not include unpublished studies, the results of the meta-analysis may be biased. Specifically, the meta-analysis results may indicate an inflated effect because the published studies are more likely to have significant results and large effects (Sharpe, 1997). Thus, publication bias is considered to be a threat to the validity of meta-analyses. One method for detecting publication bias is the visual interpretation of a *funnel plot* (a scatterplot of *effect size*s and sample sizes). However, the visual examination of the funnel plot is limited because the interpretation is subjective and the plot can be difficult to interpret when there are a small number of studies included in the meta-analysis (Greenhouse & Iyengar, 1994; Thornton & Lee, 2000). Consequently, some researchers have developed statistical methods for detecting publication bias that are not subjective.

The following statistical methods for detecting publication bias have been introduced and applied in the literature: (1) Begg Rank Correlation, (2) Egger Regression Method, (3) Funnel Plot Regression Method, and (4) Trim and Fill Method. Begg Rank Correlation method (Begg & Mazumdar, 1994) examines the relationship between the standardized treatment effect and the variance of the treatment effect using Kendall's Tau. The Egger Regression method (Egger, Smith, Schneider & Minder, 1997) treats the standardized treatment effect as the criterion and the precision of effect size estimation (the inverse of its standard error) as the predictor in a regression model (estimated by either OLS or WLS, with observations weighted by the inverse of their variances). The Funnel Plot Regression method, suggested by Macaskill, Walter, and Irwig (2001), uses a WLS regression model with the criterion variable being the treatment effect and study size being the predictor variable. The Trim and Fill method, introduced by Duval and Tweedie (2000a, 2000b), is a nonparametric approach which is based on the funnel plot. Using symmetry assumptions, the observed studies are ranked based on the absolute values of their deviations from the mean effect size; positive ranks for studies with effect sizes greater than the mean effect size, negative ranks for studies with effect sizes less than the mean effect size.

Statement of Problem

Three issues drove the pursuit of this research: (1) publication bias is a problem which is underreported in meta-analyses, (2) both the impact of publication bias and the comparison of statistical methods for detecting publication bias are lacking in the literature, and (3) publication bias issues have not been explored in random effects meta-analysis models. A wealth of literature documents the phenomenon of publication bias and the statistical bias that it presents to meta-analysts (Begg, 1994; Greenhouse & Iyengar, 1994; Rosenthal & Rubin, 1979; Sharpe, 1997; Smith, 1980; Sterling, 1959; Sutton, Abrams, Jones, Sheldon, & Song, 2000). This problem is compounded by the infrequent acknowledgement and application of methods for detecting (or adjusting for) publication bias. A review of 20 meta-analyses published in *Psychological Bulletin* from January 2003 to March 2005 identified 11 meta-analyses that addressed publication bias. The following methods were used to address publication bias: publication status as a predictor, funnel plot examination, the Trim and Fill Method (Duval & Tweedie 2000a, 2000b), and the Fail Safe N (Rosenthal, 1979). A similar review of seven meta-analyses published in *Review of Educational Research* from Spring 2003 to Winter 2004 revealed no meta-analyses addressing publication bias. These data indicate a need in the psychological and educational research disciplines for increasing the awareness and implementation of publication bias detection techniques. The second issue may be the reason why publication bias detection methods are inconsistently being implemented, there are few empirical investigations of the degree to which publication bias impacts meta-analysis results or the comparison of statistical methods to detect publication bias (Begg & Mazumdar, 1994; Bradley & Gupta, 1997; Duval & Tweedie, 2000a; Duval & Tweedie, 2000b; Macaskill, Walter, & Irwig, 2001; Rendina-Gobioff & Kromrey, 2004; Schwarzer, Antes, & Schumacher, 2002; Sterne, Gavaghan, & Egger, 2000). Lastly, there is a need in the literature to examine the impact of publication bias and the performance of publication bias detection methods within the random effects meta-analysis model. The review of *Psychological Bulletin* and *Review of Educational Research,* detailed above, also documented the meta-analysis model implemented (fixed effect or random effect). The 20 articles in *Psychological Bulletin* indicated six fixed effects, seven random effects, and three implementing both (the model could not be identified in four articles). The seven articles in *Review of Educational Research* indicated two fixed effects, one random effects, and one implementing both (the model could not be identified in three articles). This review indicates that the *random effects model* is being implemented and that there is confusion surrounding which model to implement (as evidenced by the frequency of both models being implemented). Therefore, investigation of the impact of publication bias and the performance of statistical methods to detect publication bias within random effects models are of value.

Purpose

There were two primary goals overarching this research endeavor, (1) examine the degree to which publication bias impacts the results of a random effects meta-analysis and (2) investigate the performance of five statistical methods for detecting publication bias in random effects meta-analysis. First, the impact on the meta-analysis results was estimated by examining the difference between the population effect size and the estimated meta-analysis effect size, as well as, the difference between the population effect size variance and the estimated meta-analysis effect size variance. Second, the performance of the five statistical methods (Begg Rank Correlation (V), Begg Rank Correlation (N), Egger Regression, Funnel Plot Regression, and Trim and Fill) was evaluated with estimated *Type I error rate*s and statistical power.

This research expands on the study conducted by Rendina-Gobioff and Kromrey (2004) by examining the performance of the statistical methods for detecting publication bias in a random effects model, rather than a *fixed effects model*. Using similar methods to Macaskill, Walter, and Irwig (2001), Rendina-Gobioff and Kromrey (2004) empirically compared Begg Rank Correlation, Egger Regression, Funnel Plot Regression, and Trim and Fill methods. This study simulated Hedges's g effect sizes with a fixed effects meta-analysis methodology. The results indicated that the Type I error rate performance was closest to nominal alpha level when Begg Rank Correlation method (with sample size) was used to detect publication bias. Two of the detection methods were found to have conservative Type I error rates, Funnel Plot Regression (with inverse variance weight) and Trim and Fill. All methods for detecting publication bias exhibited low power estimates. The Begg Rank Correlation (with sample size) exhibited the greatest power, however it was still well below the desired 0.80 target. The following research questions were of interest in this study:

Research Questions

1. To what extent does publication bias impact the estimated mean effect size and estimated variance in a random effects meta-analysis?
    a. To what extent does the number of *primary studies* included in the meta-analysis moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?
    b. To what extent does the mean sample size of groups (including balanced and unbalanced) in the primary studies included in the meta-analysis moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?
    c. To what extent do the group variances (homogeneous and heterogeneous) in the primary studies included in the meta-analysis moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?
    d. To what extent does the magnitude of the population effect size moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?
    e. To what extent does the variance of the population effect size moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?
2. To what extent do Type I error rates vary across statistical methods for detecting publication bias in a random effects meta-analysis?

a. To what extent does the number of primary studies included in the meta-analysis impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

b. To what extent does the mean sample size of groups (including balanced and unbalanced) in the primary studies included in the meta-analysis impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

c. To what extent do the group variances (homogeneous and heterogeneous) in the primary studies included in the meta-analysis impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

d. To what extent does the magnitude of the population effect size impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

e. To what extent does the variance of the population effect size impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

3. To what extent do power estimates vary across statistical methods for detecting publication bias in a random effects meta-analysis?

   a. To what extent does the number of primary studies included in the meta-analysis impact the extent that power estimates vary across statistical methods for detecting publication bias?

b. To what extent does the mean sample size of groups (including balanced and unbalanced) in the primary studies included in the meta-analysis impact the extent that power estimates vary across statistical methods for detecting publication bias?

c. To what extent do the group variances (homogeneous and heterogeneous) in the primary studies included in the meta-analysis impact the extent that power estimates vary across statistical methods for detecting publication bias?

d. To what extent does the magnitude of the population effect size impact the extent that power estimates vary across statistical methods for detecting publication bias?

e. To what extent does the variance of the population effect size impact the extent that power estimates vary across statistical methods for detecting publication bias?

Hypotheses

1. Publication bias will impact the estimated mean effect size and estimated variance in a random effects meta-analysis; as the strength of publication bias increases the mean effect size and estimated variance bias will increase.

    a. The number of primary studies included in the meta-analysis will not moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis; as the number of primary studies increases the mean effect size and estimated variance bias will be stable.

b. The mean sample size of groups (including balanced and unbalanced) in the primary studies included in the meta-analysis will moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis; as the mean sample size of groups increases the mean effect size and estimated variance bias will decrease.
c. The group variances (homogeneous and heterogeneous) in the primary studies included in the meta-analysis will moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis; as the degree of heterogeneity increases the mean effect size and estimated variance bias will increase.
d. The magnitude of the population effect size will moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis; as the magnitude of the population effect size increases the mean effect size and estimated variance bias will decrease.
e. The variance of the population effect size will moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis; as the variance of the population effect size increases the mean effect size and estimated variance bias will increase.

2. The Type I error rates will vary across statistical methods for detecting publication bias in a random effects meta-analysis; the Begg Rank Correlation (N) method will have Type I error rates close to the nominal 0.05 value, The Begg Rank Correlation (V) and Egger Regression will have Type I error rates greater than the nominal 0.05 value, and the Funnel Plot and Trim and Fill methods will have Type I error rates smaller than the nominal 0.05 value.
    a. The number of primary studies included in the meta-analysis will impact the extent that Type I error rates vary across statistical methods for detecting publication bias; as the number of studies increases the Type I error rates will approach the 0.05 value.
    b. The mean sample size of groups (including balanced and unbalanced) in the primary studies included in the meta-analysis will impact the extent that Type I error rates vary across statistical methods for detecting publication bias; as the mean sample size of groups in the primary studies increases the Type I error rates will approach the 0.05 value.
    c. The group variances (homogeneous and heterogeneous) in the primary studies included in the meta-analysis will impact the extent that Type I error rates vary across statistical methods for detecting publication bias; as the degree of heterogeneity increases the Type I error rates will deviate from the 0.05 value.
    d. The magnitude of the population effect size will impact the extent that Type I error rates vary across statistical methods for detecting publication bias; as the magnitude of the population effect size increases the Type I error rates will approach the 0.05 value.

e. The variance of the population effect size will impact the extent that Type I error rates vary across statistical methods for detecting publication bias; as the variance of the population effect size increases the Type I error rates will deviate from the 0.05 value.

3. The power estimates will vary across statistical methods for detecting publication bias in a random effects meta-analysis overall; the Begg Rank Correlation (N) method will have better power estimates, compared to the other methods investigated.
   a. The number of primary studies included in the meta-analysis will impact the extent that power estimates vary across statistical methods for detecting publication bias; as the number of primary studies increases power will increase.
   b. The mean sample size of groups (including balanced and unbalanced) in the primary studies included in the meta-analysis will impact the extent that power estimates vary across statistical methods for detecting publication bias; as the mean sample size increases power will increase.
   c. The group variances (homogeneous and heterogeneous) in the primary studies included in the meta-analysis will impact the extent that power estimates vary across statistical methods for detecting publication bias; as the degree of heterogeneity increases power will decrease.
   d. The magnitude of the population effect size will impact the extent that power estimates vary across statistical methods for detecting publication bias; as the magnitude of the population effect size increases power will increase.

e. The variance of the population effect size will impact the extent that power estimates vary across statistical methods for detecting publication bias; as the variance of the population effect size increases power will decrease.

Procedures

This research simulated meta-analyses using a Monte Carlo design. The use of simulation methods allowed for the control and manipulation of research design factors and the incorporation of sampling error into the analyses. The first and second steps in the simulation were to generate observations in primary studies under known population conditions and to compute the effect size. The next step in the simulation was to impose the publication bias using the obtained p-values from the primary studies. The following two steps included computing the meta-analysis mean effect size and the statistical tests for publication bias. The final step in the research was to compute the analyses for determining the performance of the statistical tests for publication bias, Type I error rate and power estimates. In addition, the impact of imposing publication bias on the meta-analysis estimated mean effect size and variance was calculated.

The simulation was modeled after that reported by Macaskill, Walter and Irwig (2001) and Rendina-Gobioff and Kromrey (2004), but extends the conditions examined to random effects meta-analyses, rather than fixed effects meta-analyses. For each primary study, *Hedges's g effect size* (Hedges & Olkin, 1985) was calculated based on the simulated data. The Monte Carlo study included six factors in the design. These factors were (a) the number of primary studies in each meta-analysis (10, 20, 50, and 100), (b) the sample sizes of the two groups in each primary study (with mean total sample sizes ranging from 10 to 100 as well as balanced and unbalanced conditions), (c) group variances in the primary studies (variance ratios of 1:2, 1:4, and 1:8, as well as a homogeneous variance condition), (d) the magnitude of the population effect size (Δ = 0.00, 0.20, 0.50, 0.80), (e) the variance of the population effect size (τ^2 = 0, .10, .33, .50, and 1.00), and (f) the magnitude of the publication bias (no bias, moderate bias, and strong bias).

Limitations

There are several limitations to consider in relation to this research study. The simulation method implemented in this study provides control of factors to investigate performance in specific situations. This benefit of simulation studies also limits the generalizability of the study findings. Thus, the controlled factors (number of studies, sample size, group variances, size of population effect size, and a random effects model) dictate the types of meta-analyses the results can be generalized to. Another restriction on generalizability is that only the Hedge's g effect size is investigated. The impact of publication bias and the performance of detection methods may vary across other effect size statistics. The final consideration of limited generalizability is the investigation of moderators. Although moderators are commonly explored in meta-analyses this simulation does not generalize to these analyses.

Another limitation to consider relates to the methods used to impose publication bias. Although there are many factors influencing the publication of studies (effect size, methodology, journal type, funding source, etc.), the function utilized to determine the selection of primary studies for the simulation of meta-analyses solely relies on the p-values. The benefit of the function utilized is that it does not have a sharp cut off ($p< .05$)

to determine the inclusion of primary studies. Therefore the function is in effect taking into consideration factors external to the p-value. However, the accuracy of the function to represent the reality of external factors is unknown. This method is consistent with other studies that have been done (Macaskill, Walter, & Irwig, 2001; Rendina-Gobioff & Kromrey, 2004).

Importance of Study

The detection of publication bias in the context of meta-analysis is important because the validity of a meta-analysis is partially determined by the selection of studies included in the synthesis. Examination of the performance of statistical methods for detecting publication bias provides information about the research conditions for which they are appropriate to apply. In addition, an increased use of statistical methods for detecting publication bias may result, rather than visually inspecting the funnel plot or not addressing publication bias at all. The reporting of publication bias detection will result in more accurate conclusions being drawn from meta-analysis results. Lastly, regular reporting of publication bias in meta-analysis designs may result in a more favorable perception of meta-analysis methodology.

Definitions

Effect Size A point value that indicates the strength and direction of the relationship of interest in the research study. The effect size is what makes meta-analysis possible because it is a, "statistical standardization of the study findings such that the resulting numerical values are interpretable in a consistent fashion across all the variables and measures." (Lipsey & Wilson, 2001, p. 4). There are many different effect sizes, which are dependent on the statistical methods employed in the research.

Fixed Effects Model Meta-analysis model that assumes the population effect size being sampled by the studies within the meta-analysis is the same across studies ($\theta_1 = \theta_2 = \theta_3 = ... = \theta_k$) (Shadish & Haddock, 1994).Thus, this model assumes that the estimated effect size will vary from the population effect size by the amount of sampling error due to the subjects associated with each study collected.

Funnel Plot A graphical display (scatterplot) of the effect size and precision (sample size, standard error, or inverse standard error) of studies included in a meta-analysis, a method for detecting publication bias (Begg, 1994; Hedges & Vevea, 1996; Macaskill et al., 2001)

Hedges's g Effect Size Effect size for standardized mean differences (Hedges, 1981), symbolized by g

Meta-Analysis The summarization of empirical studies using quantitative methods; the effect size results from empirical studies are collected and a summary statistics is calculated (Hedges & Vevea, 1998)

Meta-Analytic Studies Studies that utilize meta-analysis research design.

Power The probability of detecting a truly null hypothesis (the accurate rejection of a null hypothesis), the probability of having accurate statistically significant findings (Cohen, 1992)

Publication Bias Phenomenon introduced by Rosenthal (1979) as the "file drawer problem, which acknowledges that published literature is more likely to have statistically significant findings producing a statistical bias (published literature having a greater representation of statistical significance compared to non-published literature)

Primary Studies The original studies that make up the sample for a meta-analysis

Random Effects Model Meta-analysis model that assumes the population effect size distribution variance is greater than zero ($\sigma_\theta^2 \neq 0$) (Shadish & Haddock, 1994). This model includes two sources of error associated with the estimated effect size; (1) sampling error and (2) random effects variance (Raudenbush, 1994).

Random Effects Variance Component The unaccounted for and unidentifiable variation due to the studies sampled for the meta-analysis (Raudenbush, 1994). This variance is estimated and combined with sampling error in a random effects meta-analysis.

Reporting Bias The exclusion of non-significant findings in published research due to researchers' incomplete reporting (Begg, 1994; Sutton et al., 2000)

Retrieval Bias The exclusion of studies due to the ability to locate and access published and unpublished research (Sutton et al., 2000)

Standardized Effect Size In contrast to a raw effect size, which indicates the strength and direction of a relationship in the units of the scale that the relationship was measured; the standardized effect size is independent of the scale used to measure the relationship. An example of a raw effect size is simply the difference between two means. In contrast, an example of a standardized effect size is the difference between two means divided by the standard deviation. Examples of other standardized effect sizes are correlation (r) and proportion of explained variance (r^2). Examples of raw effect sizes are covariance and raw score regression slopes (Abelson, R. P., 1995)

Type I Error Rate The probability of inaccurately rejecting a null hypothesis (when the null hypothesis is true), the probability of having inaccurate statistically significant findings (Cohen, 1992)

CHAPTER TWO: LITERATURE REVIEW

This literature review focuses on two main areas; meta-analysis and publication bias. The meta-analysis section details the procedures, analyses, models (fixed effects and random effects), alternative methods, threats to validity, and limitations. Provided within the publication bias section are: non-statistical and statistical methods for detecting publication bias, prevalence and empirical evidence for statistical methods to detect publication bias, options for researchers, and a broad perspective on decreasing publication bias.

Meta-Analysis

The development of methods for conducting research syntheses has a long history that is documented as early as 1904 with Pearson's synthesis of correlations among typhoid inoculations and mortality (Cooper & Hedges, 1994a; Shadish & Haddock, 1994). Although research synthesis was introduced in the early 20th century, research synthesis was rare until the 1970's with the publication of the classic paper by Glass (1976) synthesizing psychotherapy research. At this time Glass introduced the term "meta-analysis" to describe the methods for research synthesis. Gene Glass is possibly the most famous name associated with meta-analysis, yet there were other researchers at the time who introduced other methods for meta-analysis: Rosenthal and Rubin (1982), Schmidt and Hunter (1977), and Hedges and Olkin (1985).

Meta-analysis is the summarization of empirical studies using quantitative methods. In short, the effect size results from empirical studies are collected and summary statistics are calculated (Hedges & Vevea, 1998). Lipsey and Wilson (2001) provide a nice description of meta-analysis methods by comparing the process to survey research. Conceptually, meta-analysis is similar to survey research because its methods involve surveying research reports, rather than people. During survey research a survey protocol is developed; similarly in meta-analysis the coding protocol is developed. In both methods, survey research and meta-analysis, a sample is gathered. The information or data are retrieved from the sample, people or research studies, with the survey or coding protocol. Lastly, the quantitative data from both survey research and meta-analysis are analyzed and summarized.

Lipsey and Wilson (2001) outline specific guiding principles for the application of meta-analysis. All of the principles underlying the application of meta-analysis focus on the sample, research studies being synthesized, because not all research can be synthesized. For example, the first principle is that studies must be empirical investigations of the phenomenon of interest. In other words studies such as theoretical reports, research reviews, and policy proposals are not appropriate for the meta-analysis sample. The second principle is that the research studies included in a meta-analysis must include quantitative data. Thus, qualitative research studies are not appropriate for inclusion in a meta-analysis. The third principle is that meta-analysis is applied to summary statistics provided by reports of previously conducted research. Accordingly meta-analysis is not conducted on complete data sets from previous research. Lastly, the research studies included in a meta-analysis must be similar in regards to: (1) the constructs and relationships being investigated, and (2) the research design and statistics. For example, research studies examining the relationship between self-efficacy and student achievement should not be combined with research studies examining the relationship between drug use and student achievement, two conceptually different constructs. Similarly, correlational research studies should not be combined with experimental research. This last principle will be discussed further in the threats to the validity of meta-analysis, “Apples and Oranges”, section.

Procedures

There are several aspects to collecting data for meta-analysis: (1) specifying the problem, (2) identifying sources, (3) defining inclusion/exclusion criteria, and (4) coding data. The first consideration for the meta-analyst is defining the problem of interest for the synthesis, which constructs and what type of relationship. In other words, which variables are being measured and what type of quantitative analysis is being conducted (central tendency, pre-post contrasts, group contrast, association) (Lipsey & Wilson, 2001). The following aspects of data collection are stipulated by this first consideration. Locating the primary studies to be included in the meta-analysis necessitates the specification of sources. Potential sources include electronic databases, dissertations, conference proceedings/abstracts, hand searches, and contacting key researchers in the field (Lipsey & Wilson, 2001). The next step is defining which types of studies will be included in the meta-analysis. A sample of criteria that may be used is: country where the study was conducted, language of the study, participants included, type of publication (published vs. unpublished), study design, and date of study (Lipsey & Wilson, 2001). Lastly, the information within the studies (effect size, sample size, moderators, etc.) must be coded with specified methods and entered into a database. When multiple coders are utilized for extracting the data from studies, inter-rater reliability should be conducted to make sure the data are being coded consistently.

Analyses

Meta-analyses combine the research findings, effect sizes, gathered from previously conducted studies. An effect size is a point value that indicates the strength and direction of the relationship of interest in the research study. The effect size is what makes meta-analysis possible because it is a, "statistical standardization of the study findings such that the resulting numerical values are interpretable in a consistent fashion across all the variables and measures." (Lipsey & Wilson, 2001, p. 4). There are many different effect sizes, which are dependent on the statistical methods employed in the research. For example, a research study investigating mean differences will have a different effect size calculation than a study investigating a correlation. However, the effect size from both types of research provide standardized information about the strength and direction of the relationship. The effect sizes gathered from the research studies that are included in the meta-analysis must be the same type (i.e., all correlation effect sizes) and appropriate for the statistical analyses conducted in the research studies.

An example effect size combined in meta-analyses for the standardized mean difference is Hedges's g (Hedges, 1981). This effect size is calculated with the following:

$$g_i = \left[1 - \frac{3}{4N - 9}\right]\left[\frac{\overline{X_1} - \overline{X_2}}{s_p}\right]$$

Where N is the total sample size

$\overline{X_1}$ is the mean for group 1

$\overline{X_2}$ is the mean for group 2

s_p is the pooled standard deviation = $\sqrt{\dfrac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{(n_1 - 1) + (n_2 - 1)}}$

Where n_1 is the sample size for group 1

n_2 is the sample size for group 2

s_1^2 is the standard deviation for group 1

s_2^2 is the standard deviation for group 2

Weights

Study characteristics that vary among studies to be included in a meta-analysis can be accounted for by weighting the study effect size estimates before combining them. According to Shadish and Haddock (1994), there are three assumptions underlying the use of weights. First, the accuracy of a study will be affected by a characteristic based on theory or evidence. Second, prior to combining, the nature and direction of the bias is predictable. Third, the methods for calculating the weights are available and justified. Examples of characteristics for which weights are applied in meta-analysis include: sample size, reliability, validity, restriction of range, and study quality (Lipsey & Wilson, 2001; Shadish & Haddock, 1994). Although the appropriateness of some of these characteristics for weighting prior to combing effect sizes can be argued, weighting for sample size is universal and fulfills all three assumptions outlined by Shadish and Haddock (1994).

Since the sample sizes from research studies included in a meta-analysis are bound to vary it is critical to weight the effect size accordingly. Essentially, an effect size estimated from a large sample size study will be more precise, have less sampling error, than a comparable study with a smaller sample size. In other words, effect sizes estimated from different sample size studies do not have equal precision. Thus, weighting the estimated effect sizes from studies with varying sample sizes controls the contribution of each effect size to the mean effect size for precision (Lipsey & Wilson, 2001). The precision of effect sizes is estimated with the standard error of the effect size. Thus, the effect size weight used to accommodate for precision is the inverse squared standard error (variance). Therefore, when conducting a meta-analysis the researcher needs to be able to calculate/gather the effect size from the studies and calculate the inverse variance. The latter can be challenging when the calculation for the standard error associated with the effect size is not known (Lipsey & Wilson, 2001).

Continuing the example with Hedges's g effect size, a meta-analysis combining the effect sizes from standardized mean differences would weight the effect sizes to accommodate for precision differences due to varying sample sizes. The standard error for Hedges's g effect size is estimated with the following:

$$SE_i = \sqrt{\frac{n_1 + n_2}{n_1 n_2} + \frac{(g_i)^2}{2(n_1 + n_2)}}$$

Where g_i is the estimated effect size for study i

n_1 is the sample size for group 1

n_2 is the sample size for group 2

Therefore the weight for Hedges's g effect size is the inverse of the squared standard error, or:

$$w_i = \frac{2n_1 n_2 (n_1 + n_2)}{2(n_1 + n_2)^2 + n_1 n_2 (g_i)^2}$$

Combining Effect Sizes and Building Confidence Intervals

After gathering the effect sizes and calculating the weights for each effect size, the meta-analyst combines the effect sizes. The estimated mean effect size is a point estimate summary of the phenomenon of interest. The Hedges's g mean effect size is estimated with the following:

$$\overline{g} = \frac{\sum (w_i g_i)}{\sum w_i}$$

Where $\sum$ is the sum over studies in the meta-analysis

w_i is the weight for study *i*

g_i is the estimated effect size for study *i*

This formula can be applied to any effect size by substituting g_i with the effect size being summarized. In addition, the confidence interval around the estimated mean effect size is calculated by adding and subtracting 1.96 times the standard error of the mean $\left(SE_{\overline{g}} = \frac{1}{\sqrt{\sum w_i}} \right)$ from the estimated mean effect size $\left(\overline{g} \right)$. With the confidence interval the meta-analyst can test for statistical significance for the null hypothesis that there is no effect or $H_0 : \bar{g} = 0$ (Shadish & Haddock, 1994). If the confidence interval does not include zero then the null hypothesis is rejected and the mean effect size is significantly greater than zero.

Often meta-analysts are interested in investigating moderators, independent variables, which may influence the primary relationship of interest. For example, a meta-analysis summarizing the relationship (effect size) between Graduate Record Exam (GRE) scores and graduate program success might want to see if the relationship is different for males and females. Weighted least squares regression can be used to estimate mean effect sizes for moderators (Lipsey & Wilson, 2001). With this model the weights are the inverse variance (same as above), the effect sizes are the dependent variable, and the moderators are the independent variables.

Homogeneity of Effect Sizes

Although the heart of the meta-analysis results is the estimated mean effect size and the surrounding confidence interval, the meta-analyst should determine if all the variance has been accounted for by the observed effect sizes (Shadish & Haddock, 1994). Thus, the homogeneity of the effect sizes is estimated and the null hypothesis that the effect sizes differ only by sampling error ($H_0 : \sigma_\theta^2 = 0$ or alternatively $H_0 : \theta_1 = \theta_2 = \theta_3 = ... = \theta_k$) is tested (Hedges & Vevea, 1998). The examination of homogeneity provides evidence for whether the variance observed from the studies included in the meta-analysis is greater than what would be expected from sampling variance alone (Lipsey & Wilson, 2001). If heterogeneity is indicated then the effect sizes are not estimating a common population mean. In other words there may be study characteristics or moderators that are causing variability among the effect size.

A commonly used statistic for homogeneity is the chi-square distributed Q statistic (Hedges & Olkin, 1985). Conceptually the Q statistic is a ratio of the between variance and within variance (Hedges & Vevea, 1998). Computationally the value of Q is (Lipsey & Wilson, 2001):

$$Q = \sum w_i \left(g_i - \overline{g} \right)^2$$

Where w_i is the weight for study i

g_i is the effect size for study i

$\overline{g}$ is the estimated mean effect size

The estimated Q value is compared to the critical values for a chi-square with df=k-1 (k=number of studies). The null hypothesis of homogeneity is rejected when the Q value exceeds the critical value for chi-square, indicating that the effect sizes are heterogeneous. The Q statistic has been documented to have low power in meta-analyses with small sample sizes and large numbers of studies (Harwell, 1997). Other characteristics of primary studies included in a meta-analysis investigated by Harwell (1997) which affect the power of the Q statistic are non-normal score distributions, unequal sample sizes, and unequal variances. The consequence of the low power associated with the Q statistic is that researchers are more likely to conclude that the effect sizes are homogeneous when in fact they are not. Four options for the meta-analyst when heterogeneity is indicated are: (1) only interpret the result descriptively, (2) include moderators in the analyses, (3) use regression techniques that account for the variance, or (4) incorporate the variance into the model by using random effects methods (Shadish & Haddock, 1994).

Meta-Analysis Models

Fixed Effects Model

When a researcher assumes that there is one population effect size that should be represented by the selection of studies collected for a meta-analysis, the fixed effects meta-analysis model is the appropriate model to implement. In other words, the fixed effects model assumes that the population effect size being sampled by the studies within the meta-analysis is the same across studies ($\theta_1 = \theta_2 = \theta_3 = ... = \theta_k$) (Shadish & Haddock, 1994).Thus, this model assumes that the estimated effect size will vary from the population effect size by the amount of sampling error due to the subjects associated with each study collected. Consequently, the variance of the effect sizes collected for the meta-analysis is only due to sampling error. The estimated study effect size in a fixed effects model can be represented with the following formula:

$$T_i = \theta + \ell_i$$

Where θ is the true population effect size

ℓ_i is the error associated with the estimate or sampling error

The weights used in the analysis accommodate for the sample sizes of the studies included in the meta-analysis, thus adjusting for variance due to sampling error. Specifically, the weights are the inverse variance of the effect size statistic being summarized by the meta-analysis or $w_i = \frac{1}{v_i}$. The sample size of studies is inversely represented in the variances, as sample size increases the variance decreases (Shadish & Haddock, 1994). An example of a fixed effect weight for the standardized mean difference effect size (Hedge's g) is:

$$w_i = \frac{2n_1n_2\left(n_1+n_2\right)}{2\left(n_1+n_2\right)^2+n_1n_2\left(g_i\right)^2}$$

Random Effects Model

In contrast to the fixed effects model, in the random effects model the researcher assumes that the population effect size is a normal distribution of values, rather than one population effect size (Greenhouse & Iyengar, 1994). In other words, the random effects model assumes that the population effect size distribution variance is greater than zero ($\sigma_\theta^2 \neq 0$) (Shadish & Haddock, 1994). Thus, this model includes two sources of error associated with the estimated effect size; (1) sampling error and (2) random effects variance (Raudenbush, 1994). Sampling error is the variation due to the subjects selected within each of the studies included in the meta-analysis (also included in the fixed effects model). The random effects variance is unaccounted for and unidentifiable variation due to the studies sampled for the meta-analysis (Raudenbush, 1994). Some examples of study characteristics that may contribute to the random effect variance are the year the study was conducted, geographic location, characteristics of the person implementing treatment, cultural setting, and socioeconomic status of the communities participating (Raudenbush, 1994). Another way to describe the random effects model is a two-stage sampling design (Raudenbush, 1994). The first-stage variance component, random effects, is due to sampling studies from a population of studies. The second-stage variance component, sampling error, is due to sampling subjects from a population for a given study. Thus the variance of the effect sizes is due to variation in samples and variation in the studies. The variance associated with each study contributing to the estimated effect size can be represented with the following formula (Raudenbush, 1994):

$$v_i^* = \sigma_\theta^2 + v_i$$

Where σ_θ^2 is the variance associated with the random effects

v_i is the variance associated with sampling error

When the random effects variance is absent the value of σ_θ^2 will be zero and then the model provides estimates that are the same as a fixed effect model. In other words the only difference among the fixed effects model and the random effects model is the inclusion of the random effects variance estimate (Raudenbush, 1994). The estimated study effect size in a random effects model can be represented with the following formula:

$$T_i = \bar{\theta} + v_i^*$$

Where $\bar{\theta}$ is the population mean effect size

v_i^* is the error associated with the estimate or the combination of random effects error and sampling error

The weights used in the analysis are a combination of an accommodation for the sample sizes in the studies included in the meta-analysis and an accommodation for the random variation among the studies. The estimate for the *random effects variance component* (REVC) (Shadish & Haddock, 1994) is:

$$\sigma_\theta^2 = \frac{Q-(k-1)}{\sum w_i - \left(\sum w_i^2 / \sum w_i\right)}$$

Where Q is the estimate of homogeneity detailed earlier

k is the number of studies included in the meta-analysis

w_i is the inverse variance weight used in a fixed effects model

The REVC is set to 0 when computationally negative because conceptually it cannot be negative (Hedges & Vevea, 1998). The final weight used to calculate the random effect mean effect size is the inverse of the sum of the REVC (σ_θ^2) and the sampling error variance (v_i).

Problems with the estimate of random effects variance revolve around the number of studies included in the meta-analysis. Essentially, the random effects variance component will have poor precision when the number of studies included is small (Raudenbush, 1994). As a result the inferences based on the random effects model with small numbers of studies will be inaccurate. This problem will still be significant even when the sample sizes within the studies are large. In other words the accuracy is dependent on the number of studies included in the meta-analysis, not the sample sizes within those studies (Hedges & Vevea, 1998).

There are advantages to using a random effects model (Raudenbush, 1994). First, the random effects model allows researchers to generalize beyond the studies included in the meta-analysis, which is often the intent of the researcher. Second, random effects models can provide results in a parsimonious way because the effects of study variation are incorporated. This has the greatest impact when there are lots of studies included in the meta-analysis. The third advantage is that the studies included in a meta-analysis are rarely replications that do not differ methodologically or substantively (Shadish &

Haddock, 1994). Since in reality the studies available to the meta-analyst have aspects that vary, the random effects model is more appropriate.

Two threats to the validity of random effects meta-analysis include: (1) random effects are estimated from the studies included, and (2) the random effects are assumed to be normally distributed (Raudenbush, 1994).

Fixed Effects vs. Random Effects Models

Shadish and Haddock (1994) provide two aspects to consider when deciding between the random effects and fixed effects models: (1) statistics and (2) concepts. Statistically one can choose the model based on the results of the test for heterogeneity among the effect sizes (Q-test). If the Q-test indicates homogeneity then one would choose the fixed effects model. In contrast, if heterogeneity is indicated by the Q-test then the random effects model would be implemented. Hedges and Vevea (1998) call this "Conditionally Random-Effects" (p.495). The other aspect to consider a priori when determining whether to implement random effects versus fixed effects, is the type of conceptual conclusion the researcher desires to make. When the researcher is interested in generalizing only to the studies included in the meta-analysis, then the fixed effects model is appropriate. Hedges and Vevea (1998) call these "Conditional Inferences". However, it is more typical that a researcher is interested in generalizing beyond the studies included in the meta-analysis, to which the random effects model is more appropriate. According to Hedges and Vevea (1998) these are "Unconditional Inferences". Hedges and Vevea (1998) consider this second aspect, the conceptual, to be the most important influence for determining the model.

The decision to use the fixed effects or random effects model may be dependent on the number of studies included in the meta-analysis. When there are a small number of studies included in a meta-analysis the random effects variance estimate will have poor precision (Raudenbush, 1994). This means that the generalizable statements from a random effects meta-analysis with a small number of studies could be inaccurate. For example, if one did a meta-analysis with 2 studies one would be skeptical of generalizing to a population of studies since the variance could be erratic with a sample of 2.

When fixed effects models are applied to random effects data (heterogeneous effect sizes) there are consequences to the accuracy of the confidence intervals. In other words if a researcher assumes that there is no random effects variance (applying the fixed effects model) when in fact there is variance, the total variance will be underestimated. As a result the confidence interval will be smaller than it should be (indicating a more precise estimate) (Hedges & Vevea, 1998). Thus, in this situation the confidence interval may be 90% when the conclusions are being drawn thinking that the confidence interval is 95%. The inaccuracy of the confidence interval estimate will increase with increasing heterogeneity among the effect sizes and decreasing numbers of studies (Hedges & Vevea, 1998). Although the confidence interval estimates will vary for the two models when applied to heterogeneous effect sizes, the estimated mean effect size will be similar (Hedges & Vevea, 1998).

Alternative Methods: Rosenthal and Rubin and Hunter and Schmidt

The previously described meta-analysis methods were developed by Hedges and Olkin (1985). However, there are other methods that have been developed within the meta-analysis framework. Each of the methods was generated in a different field (Shulze, Holling, Grofsmann, Jutting, & Brocke, 2003). The Rosenthal and Rubin method (Rosenthal & Rubin, 1982) originated in educational research, whereas the Hunter and Schmidt method (Hunter & Schmidt, 1990) originated in I/O psychology. The Hedges and Olkin method was developed focusing on the statistical steps involved in conducting a meta-analysis.

The three methods have similarities and differences. The Rosenthal and Rubin method is similar to the Hedges and Olkin method except for the determination of statistical significance (Field, 2001). Since there is minimal difference among the Rosenthal and Rubin method and the Hedges and Olkin method, the following discusses the differences between the Hunter and Schmidt method and the Hedges and Olkin method. Shulze et al. (2003) outline four distinctions between the Hedges and Olkin and Hunter and Schmidt methods: (1) transformation of effect sizes, (2) weights, (3) standard error estimates, and (4) homogeneity testing. In addition to the four differences that Schulze et al. (2003) outline, the Hunter and Schmidt method advocates using "artifact corrections" for the reliability of measures, variable restriction of range, dichotomization of continuous variables, and construct validity (Hunter & Schmidt, 1990).

The final distinction of interest among all three methods is the consideration of fixed effects and random effects models. The Rosenthal and Rubin method did not specify random effects models (Field, 2001), thus these methods are only applicable to fixed effect models. As described earlier, the Hedges and Olkin method distinctly specifies different methods for each of the models (fixed and random). The fixed effects and random effects application of the Schmidt and Hunter model is less clear (Field, 2001; Schulze, 2004; Schulze et al., 2003). Field (2001) discusses the Hunter and

Schmidt method as a random effects method. However, Field (2001) acknowledges a reviewer's comment that the sample size weight utilized in the calculation of the mean effect size assumes a fixed effects model. Schulze et al. (2003) point out the discrepancies among the reporting by Hunter and Schmidt regarding whether their method is for fixed versus random effects models.

Threats to Validity

There are several potential threats to the validity of meta-analyses, which relate to the primary studies included or the meta-analysis process. Several threats that relate to the primary studies included in the meta-analysis are: (1) unreliability (2) restriction of range, (3) missing effect sizes, (4) incompatible constructs, and (5) poor study quality. The first two threats (poor reliability of measures and measures with restricted range) attenuate the effect size in the primary study, thus rendering the combined effect sizes across studies attenuated (Matt & Cook, 1994). The third threat, missing effect sizes, occurs when researchers provide incomplete results which do not include statistically non-significant findings (Matt & Cook, 1994). The consequences of this threat are that the estimated mean effect size will be inflated. When primary studies vary in the constructs being measured or variables of interest they should not be combined in a meta-analysis, also called "Apples and Oranges" threat to validity (Sharpe, 1997). Lastly, the quality of studies included in a meta-analysis can introduce error, also called "Garbage In Garbage Out" (Lipsey & Wilson, 2001; Sharpe, 1997).

Other sources for validity threats in meta-analysis are associated with the processes involved: (1) incomplete data collection, (2) inaccurate data collection, (3) poor methodology, and (4) inadequate power. Meta-analysts should strenuously attempt to gather all studies (Matt & Cook, 1994), however when researchers do not publish or make accessible the results of their findings the effect sizes included in the meta-analysis are incomplete. This is also called publication bias (Lipsey & Wilson, 1994; Matt & Cook, 2001; Sharpe, 1997). The second threat, inaccurate data collection, can occur when the data from primary studies are inaccurately coded or when the effect sizes from primary studies are inaccurately transformed or calculated (Matt & Cook, 1994). There are several ways that a meta-analyst can implement poor methodology: combining effect sizes that are not independent, failing to weight effect sizes for precision, and inappropriately applying fixed or random effects models (Matt & Cook, 1994). Finally, when the meta-analyst is interested in performing many statistical tests (moderator analyses) the number of studies included in the meta-analysis should be considered to determine the available power.

Limitations

Among the appeals for conducting a meta-analysis are the reduction of sampling error and the ability to summarize across settings, researchers, and circumstances. However, there are limitations to consider when interpreting the results of a meta-analysis. Cooper and Hedges (1994b) detail three limitations: (1) evidence is correlational, (2) post hoc analyses, and (3) primary research needs. The first limitation is due to the nature of the previously generated studies being summarized. Essentially, the meta-analyst is unable to randomly assign variables (especially moderators) in a meta-analysis. This limits the conclusions drawn to be correlational, not causal. In rare cases where all the primary studies combined in a meta-analysis are experimental, causal interpretations may be appropriate. The second limitation is that meta-analysis is a post hoc procedure, the generation of hypotheses are dependent on the data used to test it. In other words, the research studies included in a meta-analysis are what prompt the hypotheses that the researcher has developed (without the primary studies there would not be theories to support the synthesis). The last limitation is that there is a dependent relationship among primary research and meta-analysis. Both types of research are valuable and each should provide new directions for the other (a circular evolution).

Often the meta-analyst is interested in generalizing the results of the synthesis to the general population and/or universe, however there are limits to these statements to consider. The ability to generalize to certain settings and populations is dependent on the primary studies included in the synthesis (Lipsey & Wilson, 2001). In other words, if all of the primary studies included in a meta-analysis include children age 5 to 13 years, then it is not appropriate to generalize the findings from the synthesis to adults. The same principles of generalization in primary studies apply to meta-analysis, however the criteria determining the boundaries for generalizing are the characteristics of the primary studies.

Publication Bias

Publication bias is one issue that researchers face when conducting a literature review, designing a new study, or conducting a meta-analysis. Unfortunately, when researchers gather literature their findings are not going to include all studies that have occurred regarding the specified content area searched. This phenomenon was discussed by Rosenthal (1979) as the “file drawer problem” or publication bias. Essentially, researchers may have studies that are sitting in their filing cabinets because they decided not to publish or were rejected by journals. Typically, researchers do not submit studies when the results lack significant findings (which are influenced by sample size) or large effects; similarly, journals often reject studies that lack significant findings. This can also be called selective publication or objective publication bias (Begg, 1994). There are several reasons that a researcher might choose not to publish studies, affecting the inclusion of results in a meta-analysis: students who leave academia, the researcher's personal interests can be in conflict with results, researcher's political beliefs, and interference by the funding source (Sutton et al., 2000).

Publication bias is assumed to encompass both retrieval and *reporting bias* (Greenhouse & Iyengar, 1994). *Retrieval bias* is associated with the ability to locate and access unpublished results. Studies presented at conferences that were not subsequently published can sometimes contribute to retrieval bias (Sutton et al., 2000). Even the researchers most dedicated to gathering unpublished research will still have some studies that are unattainable. Begg (1994) describes subjective publication bias as the practice of exaggerating, or only including, statistically significant results, also called reporting bias. In addition, authors may publish the same results in multiple journals; this can cause a bias due to the duplication of studies in a meta-analysis (Sutton et al., 2000). Regardless of the source contributing to publication bias, there is a pattern in the published literature of a greater number of studies with significant findings (Sterling, 1959) and large effects (Smith, 1980).

To aid in describing the publication bias phenomenon Table 1 presents the impact of variance and effect sizes (small and large) on the potential for publication. Thus, one can see that when a study has small variance there is likely to be a large sample and statistical significance (Sutton et al., 2000). In this situation the probability of publication is likely regardless of the effect size (small or large). In contrast, when a study has large variance there is likely to be a small sample and non significant findings (Sutton et al., 2000). In this situation the probability of publication is dependent on the size of the effect, larger effects being more likely to be published (Begg, 1994; Sutton et al., 2000). Begg (1994) indicates that when examining the relationship among study design features (sample size, randomization, prospective/retrospective) and effect size to detect publication bias that sample size has the largest influence on publication bias. Note that both the statistical significance of findings and the size of the effect found are contributing to the phenomenon of publication bias.

Table 1. Simplified description of the impact of the relationship among the variance and effect size observed in a study on the likelihood of publication.

		Effect Size	
		Small	Large
Variance	Small (N=large)	Published (Statistical Significance)	Published (Statistical Significance)
	Large (N=small)	Not Published (No Statistical Significance)	Published (Statistical Significance)

The prevalence of publication bias has a long history of documentation. Sterling (1959) reviewed 294 articles published in psychology journals and found 286 (97%) to report statistically significant results. The magnitude of effect sizes were found to be greater in published, compared to non-published, studies in a small sample of meta-analyses (k=12) by Smith (1980). Lipsey and Wilson (1993) reviewed 92 psychological and educational meta-analyses that reported mean effects separately for published and unpublished studies. The results indicated that published studies reported larger (0.14 SDs higher) mean effect sizes than their comparable unpublished studies.

Researchers conducting meta-analytic studies go to great lengths (or at least they should) to gather both published and unpublished studies on the content of their meta-analysis. This step in the meta-analysis design is time consuming but critical. When meta-analysts do not include unpublished studies, the results of the meta-analysis may be biased, a limitation that should be discussed. Specifically, the meta-analysis results may be statistically biased because their results indicate an inflated effect due to publication bias which argues that published studies are more likely to have significant results and large effects (Begg, 1994; Sharpe, 1997; Sutton et al., 2000). Thus, publication bias is considered to be a threat to the validity of meta-analyses. Begg (1994) emphasized the impact of publication bias on meta-analysis by stating that, "Publication bias presents possibly the greatest methodologic threat to validity of a meta-analysis." (p. 407). The importance of detecting publication bias within the realm of meta-analysis is not only that the results will be inflated but they will have additional credibility due to false precision, imposed by the synthesis of multiple studies (Begg, 1994).

According to Sutton et al. (2000), there has been little empirical evidence regarding the impact of publication bias on the results and conclusions of meta-analyses. One study addressing the impact of publication bias on the results of meta-analyses was conducted by Bradley and Gupta (1997). This study presents a formula for estimating the mean effect size resulting from controlled population mean effect sizes and controlled missing studies (based on the value of the effect size that would eliminate the study from being included in the meta-analysis). The first conclusion of this study is that as the percentage of missing studies decreases, the estimated mean effect size approaches the population mean effect size. Second, this research indicates that as the population mean effect size increases, the proportion of studies not included in the meta-analysis decreases. Although these conclusions are somewhat intuitive, the surprising aspect of the results is the magnitude of the difference between the population mean effect size and the estimated mean effect size. For example, when the population mean effect size was 0 and all studies with an effect size of 0 or less were not included in the meta-analysis, the estimated mean effect size was 0.79, a difference of 0.79.

Non - Statistical Methods for Detecting Publication Bias

One method for detecting publication bias, which is widely used, is the visual interpretation of a funnel plot (a scatterplot of effect sizes and sample sizes) (Begg, 1994; Hedges & Vevea, 1996; Macaskill et al., 2001). An example funnel plot with no publication bias (Figure 1) based on a simulation of 100 studies and an example funnel plot with publication bias present (Figure 2) based on the removal of 10 studies from the 100 studies simulated for Figure 1 are provided. The plot should take the shape of a funnel with the peak at the population true effect size when no publication bias is present. In contrast, when the funnel plot is skewed, or missing studies related to small samples and small effect sizes, the plot indicates publication bias.

However, the visual examination of the funnel plot is limited because the interpretation is subjective and the plot can be difficult to interpret when there are a small number of studies included in the meta-analysis (Greenhouse & Iyengar, 1994; Tang, & Liu, 2000; Thornton & Lee, 2000). In other words there needs to be enough studies included in the funnel plot to have varying sample sizes represented (Sutton et al., 2000). Tang and Liu (2000) argue that the scale used to represent precision (inverse standard

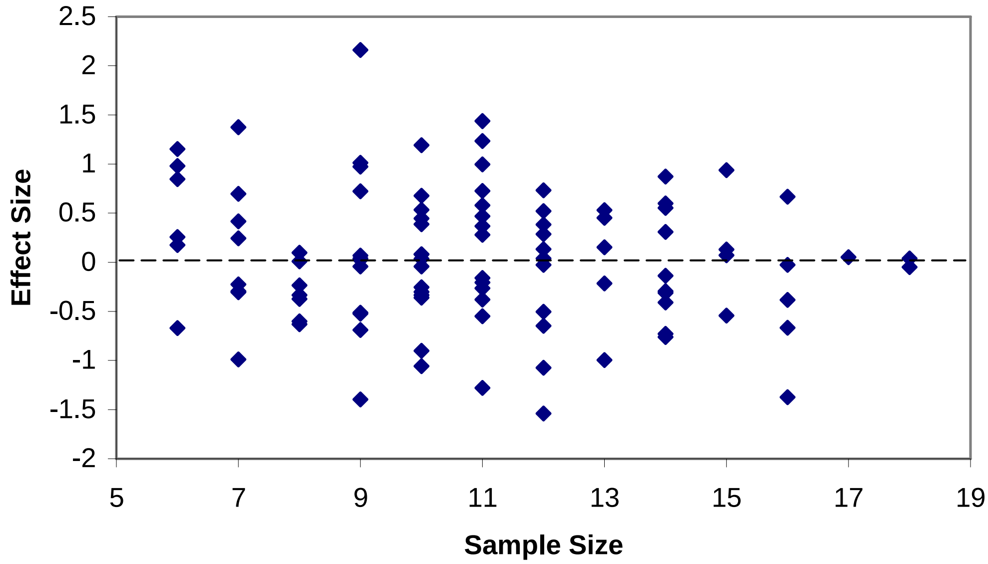

Figure 1. Example funnel plot with no publication bias and a true effect size of zero.

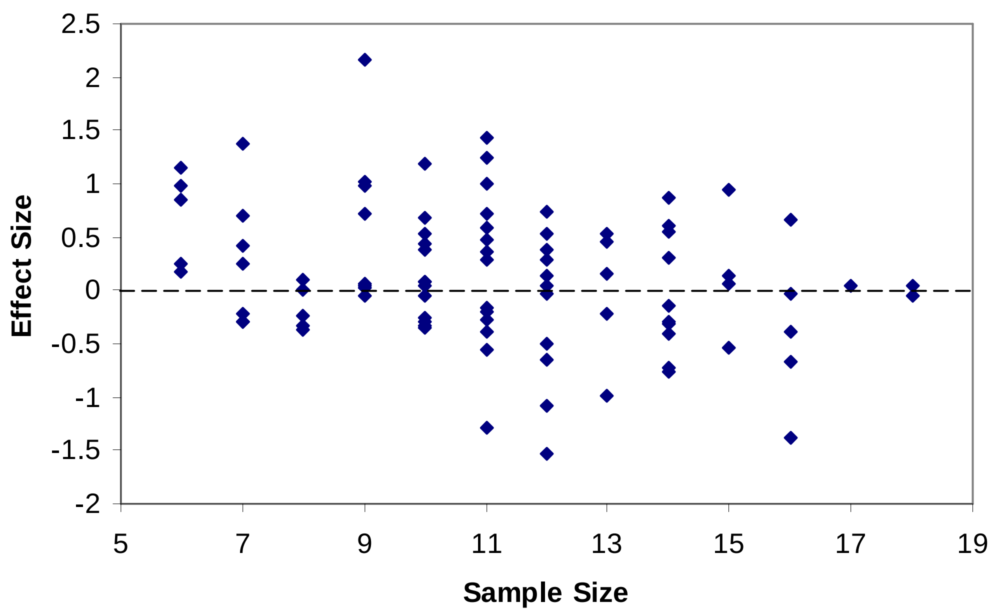

Figure 2. Example funnel plot with publication bias and a true effect size of zero.

error vs. sample size) can alter the interpretation of the funnel plot. In addition, asymmetry in a funnel plot can be an indication of other study characteristic variance (methodological design, inadequate analyses, choice of effect measure, fraud, and chance) (Sutton et al., 2000). Consequently, some researchers have developed statistical methods for detecting publication bias that are not subjective.

Statistical Methods for Detecting Publication Bias

The methods for detecting publication bias to be investigated in this research all examine the relationship among the effect sizes and the precision of the effect sizes. The various methods use different approaches for standardizing the effect size (or not standardizing it) and different definitions of precision (sample size, variance, inverse variance). However, the methods are all examining the relationship that is displayed in a funnel plot and the assumption that the absence of studies with small effect sizes and minimal precision (small sample size or large variance) provide evidence of publication bias. Therefore, a strong relationship is an indication of publication bias. An overview of the methods for detecting publication bias is presented in Table 2 along with the variables and analyses that are utilized with the method.

Table 2. Overview of methods for detecting publication bias.

Method for Detecting Publication Bias	Variables from Primary Studies Examined		Analysis
Funnel Plot	Effect Size	Sample Size	Visual Interpretation (non-statistical)
Begg Rank Correlation (V)	Standardized Effect Size	Variance of Effect Size	Rank Correlation
Begg Rank Correlation (N)	Standardized Effect Size	Sample Size	Rank Correlation
Egger Regression	Standardized Effect Size	Precision	OLS Regression
Funnel Plot Regression	Effect Size	Sample Size	WLS Regression
Trim and Fill	Deviation of Effect Size from Mean Effect Size	Number of studies included in Meta-Analysis	Nonparametric Rank Method

Note. The standardized effect size included in the Begg Rank Correlation and Egger Regression analyses are calculated differently.

As an aid for the presentation of the following statistical methods for detecting publication bias, a hypothetical sample of 10 studies were simulated with an average sample size of five observations in each of two groups. For each study, the sample effect size was calculated. These data (see Table 3) will be used to illustrate each method.

Table 3. Formula variables and their values for a hypothetical sample of 10 effect sizes.

Study	n_1	n_2	g_i	v_i	$\frac{1}{v_i}$	$\frac{g_i}{v_i}$	g_i^B	v_i^s	g_i^E
1	3	4	0.9740	0.6511	1.5359	1.4959	1.3903	0.6065	1.2070
2	8	4	1.0686	0.4226	2.3664	2.5288	1.9151	0.3779	1.6438
3	8	7	0.7538	0.2868	3.4868	2.6283	1.7528	0.2422	1.4075
4	8	7	-1.7505	0.3700	2.7027	-4.7311	-2.8782	0.3254	-2.8778
5	9	3	-0.5828	0.4586	2.1806	-1.2708	-0.7367	0.4140	-0.8606
6	4	3	-0.4348	0.5968	1.6755	-0.7286	-0.4388	0.5522	-0.5629
7	3	4	0.3858	0.5940	1.6836	0.6496	0.6673	0.5493	0.5006
8	6	3	-0.8983	0.5448	1.8354	-1.6488	-1.1163	0.5002	-1.2170
9	6	7	-0.6207	0.3243	3.0832	-1.9136	-0.9679	0.2797	-1.0898
10	5	3	0.2982	0.5389	1.8557	0.5533	0.5788	0.4943	0.4062
Sum					22.4057	-2.4371			

$\overline{g_i}$ = -0.1088

Begg Rank Correlation Method

Begg Rank Correlation method (Begg & Mazumdar, 1994) examines the relationship between the standardized treatment effect and the variance of the treatment effect using Kendall's Tau. The standardized treatment effects are estimated as:

$$g_i^B = \frac{g_i - \overline{g}_i}{\sqrt{v_i^S}}$$

Where g_i is the i^{th} observed study effect size

$\overline{g_i}$ is the weighted average effect size = $\frac{\sum w_i g_i}{\sum w_i}$

Where w_i is the weight or inverse of the effect size variance (v_i)

v_i^s is the standardized variance of the treatment effect = $v_i - \left(\sum \frac{1}{v_i}\right)^{-1}$

The relationship between the standardized treatment effect and the variance is illustrated in Figure 3. Ranks are assigned for the observed standardized treatment effects and the variances of those treatment effects (alternatively, the sample sizes may be ranked rather than the estimated variances). The correlation between these ranked values (Kendall's Tau) leads to a statistical test for the presence of publication bias.

The standardized treatment effects (g_i^B) are provided in Table 3. In this sample of effect sizes the weighted mean effect size is -0.1088 and the sum of the reciprocals of the sampling variances is 22.4057. The standardized treatment effect for the first study is

$$g_1^B = \frac{g_1 - \overline{g}_i}{\sqrt{v_1^S}} = \frac{0.9740 - (-0.1088)}{\sqrt{0.6511 - \frac{1}{22.4057}}} = 1.3903$$

Cliff and Charlin (1991) derived the estimated sampling variance of Kendall's tau as

$$\text{var}(t_{12}) = \frac{4\left[\sum_i \left(\sum_h t_{ih12}\right)^2 - n(n-1)^2 t_{12}^2\right] - 2\left[\sum_i \sum_h t_{ih12}^2 - n(n-1)t_{12}^2\right]}{n(n-1)(n-2)(n-3)}$$

where t_{ih12} = a concordance indicator (equal to 1 if observations *i* and *h* are ranked in the same order on variables 1 and 2, equal to -1 if they have opposite ranks, and equal to zero if they are tied), and

t_{12} = the sample estimate of tau.

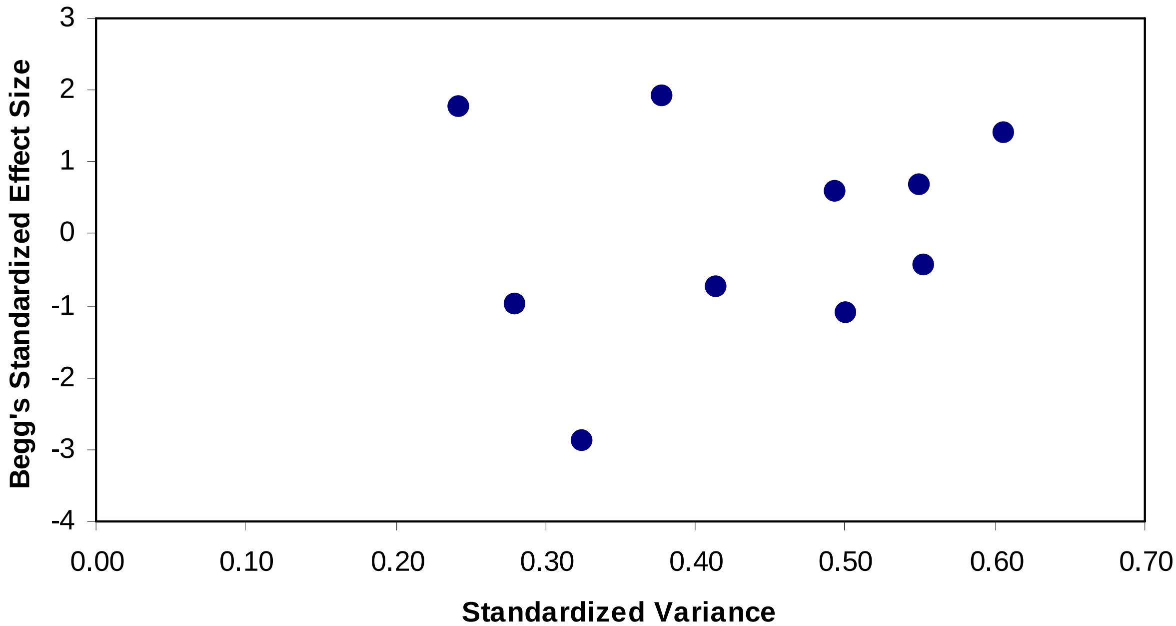

Figure 3. Begg Rank Correlation plot with standardized effect size by standardized variance.

The Kendall's tau for the hypothetical data example is 0.111 and its variance is 0.0830, using the effect size variance in the calculation. The ratio $z = \frac{t_{12}}{\sqrt{\text{var}(t_{12})}}$ is compared to a critical value from a standard normal distribution to provide a test of the null hypothesis that Tau = 0. For these data, $z = \frac{0.1111}{\sqrt{0.0830}} = 0.3853$, $p > .05$, and the null hypothesis is not rejected. Thus, these data do not provide sufficient evidence that publication bias exists in this sample of studies.

Egger Regression Method

The Egger Regression method (Egger, Smith, Schneider & Minder, 1997) treats the standardized treatment effect as the criterion and the precision of effect size estimation (the inverse of its standard error) as the predictor in a regression model (estimated by either OLS or WLS, with observations weighted by the inverse of their variances). The standardized treatment effects are estimated as:

$$g_i^E = \frac{g_i}{\sqrt{v_i}}$$

Where g_i is the observed study effect size for study i

v_i is the variance of the effect size for study i

For example, for study 1 in Table 1, $g_1^E = \frac{0.9740}{\sqrt{0.6511}} = 1.2070$. For Egger Regression method, the precision of the effect size is estimated as: $\frac{1}{\sqrt{v_1}}$.

Examining the example data, an OLS regression with the standardized treatment effect as the criterion and the precision as the predictor resulted in a slope of -0.7222 and intercept of 0.9268 (see Figure 4). Although not conducted for these sample data, this regression model can also be estimated with WLS regression. The slope of this regression equation provides an estimate of the true effect and the intercept is expected to have the value of zero when no publication bias exists. Thus, a test of the null hypothesis that the regression intercept equals zero provides a test of publication bias. In the example, the null hypothesis would not be rejected (t = 0.3972, p > .05, df=8), thus these data do not suggest a relationship between standardized treatment effects and precision of estimation. Therefore, these data do not provide sufficient evidence that publication bias exists in this sample of studies.

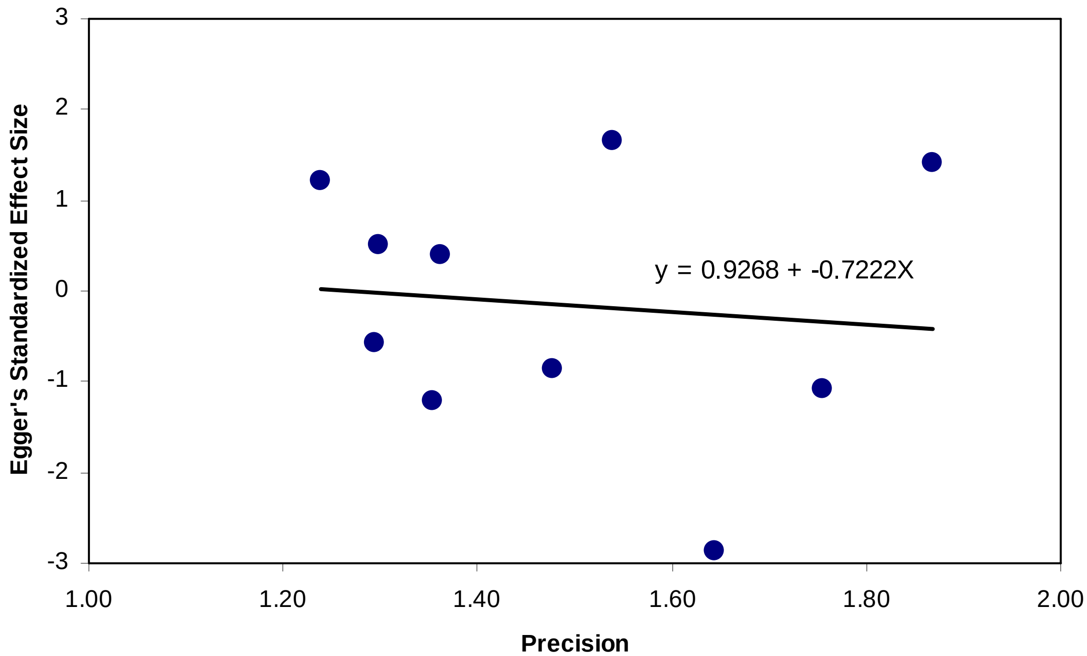

Figure 4. Egger regression plot with standardized effect size by precision.

Funnel Plot Regression Method

The Funnel Plot Regression method, suggested by Macaskill, Walter, and Irwig (2001), uses a regression model with the criterion variable being the treatment effect and study size being the predictor variable. Estimation by WLS is recommended for such a model, using as weights the inverse of the estimation variance (e.g., v_i^{-1}). For example, for study 1 in Table 1, the weight is:

$$\frac{1}{v_1} = \frac{1}{0.6511} = 1.5359$$

A WLS regression with the treatment effect as the criterion and the study size as the predictor resulted in a slope of -0.0660 and intercept of 0.6374 for the example data (see Figure 5). In contrast to the Egger method, in this regression equation the slope will indicate no publication bias when it has the value of zero and the intercept in this regression equation will indicate the true effect. Thus, a test of the null hypothesis that the regression slope equals zero provides a test of publication bias. In the example, the null hypothesis would not be rejected (t = -0.9714, p > .05, df = 8). Therefore, these data do not suggest a relationship between the observed effect sizes and sample size, and these data do not provide sufficient evidence that publication bias exists in this sample of studies.

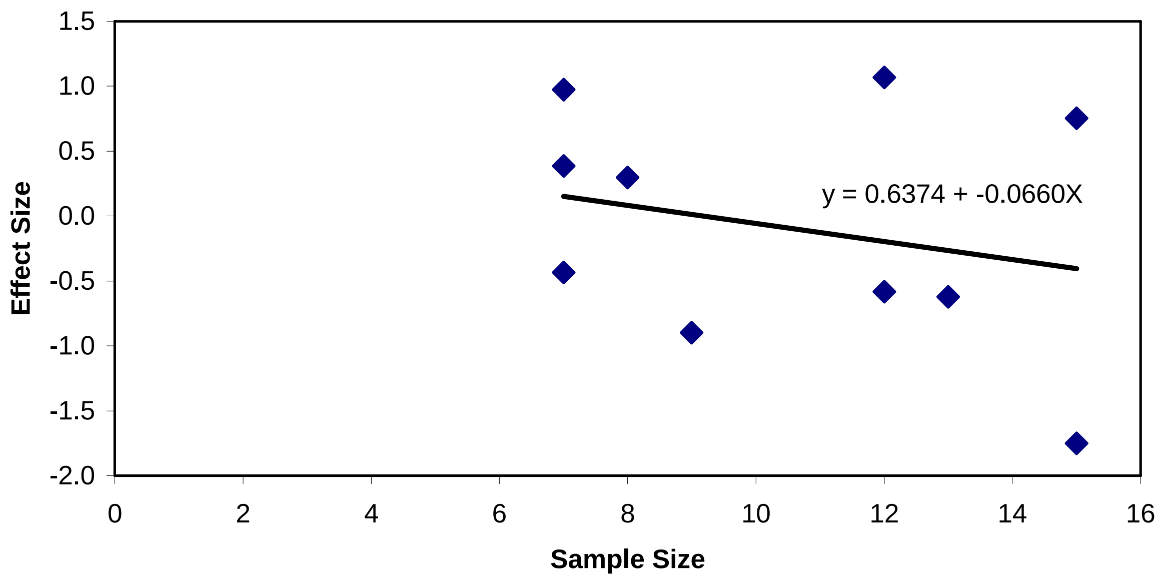

Figure 5. Funnel Plot Regression method with effect size by sample size.

Trim and Fill Method.

The Trim and Fill method, introduced by Duval and Tweedie (2000a, 2000b), is a nonparametric approach which is based on the funnel plot. Using symmetry assumptions the observed studies are ranked based on the absolute values of their deviations from the mean effect size; positive ranks for studies with effect sizes greater than the mean effect size, negative ranks for studies with effect sizes less than the mean effect size. The ranks are estimated as:

$$r_i^* = rank\left(\left|g_i - \overline{g}_i\right|\right)$$

For example, for study 1 in Table 1, $r_1^* = rank\left(\left|0.9740 - (-0.1088)\right|\right) = rank(1.0827) = 8$.

A negative algebraic sign is assigned to ranks where the g_i is less than the $\overline{g_i}$.

For example, the rank for study 4 would be assigned a negative algebraic sign:

$$r_4^* = rank\left(\left|-1.7505 - (-0.1088)\right|\right) = rank(1.6417) = -10$$

Using these ranks the number of research studies missing from the funnel plot due to publication bias is estimated by:

$$R_0 = \gamma^* - 1 = 0 - 1 = -1$$

where R_0 is the estimated number of studies concealed due to publication bias,

$$\gamma^* = k - r_h^* = 10 - 10 = 0,$$

where *k* is the number of studies included in the meta-analysis, and

r_h^* is the largest negative rank

Publication bias is evidenced when $R_0 > 3$, with power greater than 0.80 and $\alpha = .05$ (Duval & Tweedie, 2000a). In this example, the R_0 is not greater than 3 and thus would suggest that these data do not provide sufficient evidence that publication bias exists in this sample of studies.

As indicated earlier, the methods for detecting publication bias examined in this research are similar in their focus on the relationship between the effect sizes and the precision of the effect sizes. The various methods differ in their approaches to standardizing the effect size (or not standardizing it) and estimating precision (sample size, variance, inverse variance). In addition, these methods utilize different statistical procedures for estimating the relationship between the effect sizes and their precision. The Begg Rank Correlation method employs Kendall's tau correlation, whereas the Egger Regression and Funnel Plot Regression methods employ OLS and WLS regression, respectively. In contrast, the Trim and Fill method is a nonparametric rank method, which satisfies assumptions for both fixed effect and random effect meta-analysis methods (Sutton et al., 2000).

Statistical Methods for Detecting Publication Bias: Prevalence and Empirical Evidence

Prevalence

As a means for investigating the prevalence of the application of the above mentioned statistical methods for detecting publication bias, a search for studies citing the introductory article of each method (Begg & Mazumdar, 1994; Duval & Tweedie, 2000a; Duval & Tweedie, 2000b; Egger et al., 1997; Macaskill et al., 2001) was conducted (Table 4). The search returned a total of 1,007 citations, the majority were from Egger Regression method (N=611). Each of the citations were coded for type of study: (a) applied, (b) methodology, and (c) descriptive. Applied studies included meta-analyses that cited the method to detect publication bias. Methodology studies included studies that compared methods to detect publication bias. Descriptive studies included studies that provided explanations of the phenomenon of publication bias and methods to address publication bias. The other aspect of the citations that was coded was the discipline of the journal; (a) medical, (b) education/psychology, and (c) other. The results indicate that the medical journals are publishing more applied, methodology, and descriptive studies citing the statistical methods for detecting publication bias. In contrast, the education/psychology journals are publishing very few applied articles and none within the methodology and descriptive categories. Finally, Egger Regression method was the most cited in the medical journals. In contrast, the Trim and Fill method was most cited in the education/psychology journals. These results imply that the education and psychology disciplines are not addressing publication bias detection methods in their application of meta-analyses or exploring the methodology of these methods.

Another source for investigating the prevalence of applying publication bias detection methods was a review of two journals, *Psychological Bulletin* and R*eview of Educational Research*. A review of 20 meta-analyses published in *Psychological Bulletin* from January 2003 to March 2005 identified 11 meta-analyses that addressed publication bias. The following methods were used to address publication bias: publication status as a predictor, funnel plot examination, the Trim and Fill Method (Duval & Tweedie 2000a, 2000b), and the Fail Safe N (Rosenthal, 1979). A similar review of seven meta-analyses published in *Review of Educational Research* from Spring 2003 to Winter 2004 revealed no meta-analyses addressing publication bias. Thus, according to this search the application of publication bias detection methods is lacking in the psychological and educational research disciplines.

Table 4. Frequency of articles citing the four statistical methods to detect publication bias by article type and journal type.

Citation	Medical	Journal Type Education/ Psychology	Other
Begg Rank Correlation (N=231)			
Applied	184	0	9
Methodology	12	0	5
Descriptive	14	0	7
Egger's Regression (N=611)			
Applied	527	4	10
Methodology	20	0	4
Descriptive	41	0	5
Funnel Plot Regression (N=23)			
Applied	15	3	1
Methodology	2	0	2
Descriptive	0	0	0
Trim and Fill (N=71)			
Applied	35	9	7
Methodology	8	0	4
Descriptive	4	0	4

Note: N represents the total number of times the introductory article was cited.

Empirical Evidence

Each of the statistical methods for detecting publication bias described above has been empirically investigated in previous literature (Begg & Mazumdar, 1994; Duval & Tweedie, 2000a; Duval & Tweedie, 2000b; Macaskill, Walter, & Irwig, 2001; Rendina-Gobioff & Kromrey, 2004; Schwarzer, Antes, & Schumacher, 2002; Sterne, Gavaghan, & Egger, 2000). Schwarzer, Antes, and Schumacher (2002) simulated one fixed effects meta-analysis with 30 studies (n=34-236), imposed publication bias by identifying all studies with effect sizes less than the population effect size, then applied Begg Rank Correlation method and Egger Regression method. In this specific meta-analysis the Begg Rank Correlation method failed to detect publication bias and the Egger Regression method accurately detected publication bias. Using similar methods, Duval and Tweedie (2000b) simulated one random effects meta-analysis of 35 studies with a population mean effect size of 0. Publication bias was imposed by removing 5 studies from the funnel plot. In this situation, the three detection methods applied (Begg Rank Correlation, Egger Regression, and the Trim & Fill) accurately detected publication bias. However, both of these studies have very limited generalization to other meta-analysis situations since in each case only one meta-analysis was simulated under one set of conditions.

Begg Rank Correlation method (with variance correlated) was empirically investigated to examine the power associated with the test by Begg and Mazumdar (1994). In a fixed effects meta-analysis simulation study, power estimates were compared across several conditions; (a) small (k=25) and large (k=75) meta-analyses, (b) small and large effect size variances, (c) strong and moderate publication bias, and (d) various effect sizes (range from 0 to 3.0). The overall results indicated that power estimates for small meta-analyses are moderate and that larger meta-analyses have better power estimates. Another simulation study investigated the power associated with Begg Rank Correlation method (with variance correlated) and Egger Regression method (Sterne, Gavaghan, & Egger, 2000). The factors controlled in the meta-analysis of log odds ratios included the number of studies (k=5, 10, 20, 30), various sample sizes, and two levels of publication bias. Overall the results indicate that power estimates increase with increasing numbers of studies (k) and that Egger Regression method exhibited higher power than Begg Rank Correlation method (with $p<.10$). However, both of these studies did not provide the Type I error rates associated with the power estimate. Thus, the Type I error rates may have been beyond the nominal values.

There are two studies empirically comparing the statistical methods for detecting publication bias that are similar to the research study being proposed (Macaskill, Walter, & Irwig, 2001; Rendina-Gobioff & Kromrey, 2004).

In a simulation study of log odds ratio effect sizes with a fixed effects meta-analysis methodology Macaskill, Walter, and Irwig (2001) compared the Begg Rank Correlation, Egger Regression, and Funnel Plot Regression methods. The results indicate that the Funnel Plot Regression method (with inverse variance weight) and the Begg Rank Correlation (with sample size correlated) exhibited the best Type I error rates. In contrast, the Egger Regression (weighted and unweighted) and Begg Rank Correlation (with variance correlated) exhibited the highest power, due to their corresponding inflated Type I error rates. Overall all of the methods exhibited low power when the number of studies included in the meta-analysis was low.

Using similar methods to Macaskill, Walter, and Irwig (2001), Rendina-Gobioff and Kromrey (2004) empirically compared Begg Rank Correlation, Egger Regression, Funnel Plot Regression, and Trim and Fill methods. This study simulated Hedges's g effect sizes with a fixed effects meta-analysis methodology. The results indicated that the Type I error rate performance was closest to nominal alpha level when Begg Rank Correlation method (with sample size) was used to detect publication bias. Two of the detection methods were found to have conservative Type I error rates, Funnel Plot

Regression (with inverse variance weight) and Trim and Fill. All methods for detecting publication bias exhibited low power estimates. The Begg Rank Correlation (with sample size) exhibited the greatest power, however it was still well below the desired 0.80 target.

Publication Bias Detected: Options for Researchers

There are few options for a researcher when publication bias is detected. One option is to return to the search for studies, seeking additional unpublished studies. Another option, which is probably the most likely to occur, is for the researcher to proceed with the meta-analysis and use caution when interpreting the results. Begg (1994) advocates conservative interpretations or the exclusion of statistical significance testing. Lastly, there are statistical analyses that provide results which are corrected for the effects of publication bias. The utilization of these statistical methods is controversial (Begg, 1994; Sutton et al., 2000). Sutton et al. (2000) indicate that the use of correcting methods in meta-analysis should only be used as a sensitivity analysis. The researcher can do a sensitivity analysis by conducting the meta-analysis with and without the corrections to see if the results are different.

The statistical methods related to publication bias in meta-analysis that focus on correcting for the bias can be categorized in three ways: (a) sampling frames, (b) identification of potential unpublished studies, and (c) modeling the selection process (Hedges, 1992). Sampling frames for correcting publication bias utilize sampling frames that are not affected by the study results to select studies for a meta-analysis (Begg, 1994). These methods are dependent on databases like trial registries, lists of studies accepted by boards, and the researcher diligence in finding unpublished studies. Simes (1986) is an example of a study conducted with the sampling frame method. Methods that identify potential unpublished studies assume that the researcher only has access to published studies and corrects the results based on the internal consistency of the studies collected (Begg, 1994). Examples include the fail-safe N (Rosenthal, 1979) and the capture recapture method (Bennett, Latham, Stretton, & Anderson, 2004). The third type of method used to correct for publication bias attempts to model the selection process (publication bias) (Hedges, 1992). Several researchers have proposed models of this type (Cleary & Casella, 1997; Copas & Jackson, 2004; Copas & Shi, 2000; Dear & Begg, 1992; Hedges, 1992; Hedges & Vevea, 1996; Vevea & Hedges, 1995)

Decreasing Publication Bias: A Broad Perspective

The perspectives and procedures within the research community need to be modified to decrease the publication bias phenomenon. One procedural change, which has been implemented in the medical field, is to register trials (studies) in computer databases (Begg, 1994; Sutton et al., 2000). Having studies registered at the inception of the study helps the meta-analyst identify studies that were not published but that fit the meta-analysis literature search parameters. In addition, registries can standardize the reporting of results. The standardization of results might decrease the amount of inaccurately reported data, which is another reason for studies to be missing from a meta-analysis. Another procedural change that could reduce publication bias relates to the publication process (Sutton et al., 2000). Changing the mindset of researchers and publishers to a model emphasizing research methods rather than results would increase the number of published studies with non-significant results. Sutton et al. (2000) argue that increases in the number of electronic journals with minimal space restrictions will increase the publication of studies based on research methods, rather than results. Lastly, the perspectives of publishers and reviewers, regarding the quality of unpublished literature, needs to change (Sutton et al., 2000). Some still argue that unpublished literature should not be included in meta-analyses due to compromised methods in these studies. However, unpublished studies are not necessarily of lower quality.

This literature review is pertinent for understanding the research questions in the present study. The literature regarding meta-analysis methods provides support for the importance of random effects models, which has not currently been examined in the area of publication bias. Although publication bias is well established as a threat to the validity of meta-analysis, the impact that publication bias has on the results of meta-analysis is unknown. Furthermore, it is apparent that the development and application of statistical methods to detect publication bias have been dominated by the medical field. Finally, the examination of the performance of these statistical methods under conditions similar to those in the field of education and psychology is needed.

CHAPTER THREE: METHOD

The methods employed in this study, including the purpose, research questions, sample, procedures, and data analyses, are detailed in this chapter.

Purpose

There were two primary goals overarching this research endeavor: (1) examine the degree to which publication bias impacts the results of a random effects meta-analysis and (2) investigate the performance of five statistical methods for detecting publication bias in random effects meta-analysis. First, the amount of impact on the meta-analysis results was estimated by examining the difference between the population effect size and the estimated meta-analysis mean effect size. Similarly, the impact on the meta-analysis results was estimated by examining the difference between the population effect size variance and the estimated meta-analysis effect size variance. Second, the performance of the five statistical methods was estimated with Type I error rates and statistical power. This research expands on the study conducted by Rendina-Gobioff and Kromrey (2004) by examining the performance of the statistical methods for detecting publication bias in a random effects model, rather than a fixed effects model. The following research questions were of interest:

Research Questions

1. To what extent does publication bias impact the estimated mean effect size and estimated variance in a random effects meta-analysis?
    a. To what extent does the number of primary studies included in the meta-analysis moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?
    b. To what extent does the mean sample size of groups (including balanced and unbalanced) in the primary studies included in the meta-analysis moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?
    c. To what extent do the group variances (homogeneous and heterogeneous) in the primary studies included in the meta-analysis moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?
    d. To what extent does the magnitude of the population effect size moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?
    e. To what extent does the variance of the population effect size moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?
2. To what extent do Type I error rates vary across statistical methods for detecting publication bias in a random effects meta-analysis?

a. To what extent does the number of primary studies included in the meta-analysis impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

b. To what extent does the mean sample size of groups (including balanced and unbalanced) in the primary studies included in the meta-analysis impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

c. To what extent do the group variances (homogeneous and heterogeneous) in the primary studies included in the meta-analysis impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

d. To what extent does the magnitude of the population effect size impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

e. To what extent does the variance of the population effect size impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

3. To what extent do power estimates vary across statistical methods for detecting publication bias in a random effects meta-analysis?

   a. To what extent does the number of primary studies included in the meta-analysis impact the extent that power estimates vary across statistical methods for detecting publication bias?

b. To what extent does the mean sample size of groups (including balanced and unbalanced) in the primary studies included in the meta-analysis impact the extent that power estimates vary across statistical methods for detecting publication bias?

c. To what extent do the group variances (homogeneous and heterogeneous) in the primary studies included in the meta-analysis impact the extent that power estimates vary across statistical methods for detecting publication bias?

d. To what extent does the magnitude of the population effect size impact the extent that power estimates vary across statistical methods for detecting publication bias?

e. To what extent does the variance of the population effect size impact the extent that power estimates vary across statistical methods for detecting publication bias?

Sample

Conceptually the sample has two levels: (1) primary study samples and (2) meta-analysis samples. However, the samples that directly contribute to the investigation of the statistical methods for detecting publication bias are the meta-analyses samples.

Primary Studies

The first level of the sample consisted of generating primary study observations which produced primary study statistics (sample size, effect size, p-value). The number of primary studies simulated per meta-analysis (k=10, 20, 50, and 100) was controlled as one of the simulation conditions. The application of publication bias was administered to the primary studies before the meta-analysis statistics were calculated. The final results of the first sample level were the primary study statistics and the meta-analysis summary statistics (mean effect size and variance of effect sizes).

Meta-Analyses

The data that resulted from the first level make up the second level of the sample, meta-analyses. Each of the simulation conditions for the first level were generated 10,000 times. Thus, for each condition there were 10,000 meta-analyses contributing to the evaluation of the publication bias statistical methods.

Procedures

The procedures followed a three stage framework. The first stage related to the primary studies and had three steps: (1) generate observations for the primary studies, (2) compute effect sizes from primary studies, and (3) impose publication bias. The six Monte Carlo study factors controlled within this stage were: (a) the number of primary studies in each meta-analysis (10, 20, 50, and 100), (b) the sample sizes of the two groups in each primary study (with mean total sample sizes ranging from 10 to 100, as well as balanced and unbalanced conditions), (c) group variances in the primary studies (variance ratios of 1:2, 1:4, and 1:8, as well as a homogeneous variance condition), (d) the magnitude of the population effect size (Δ = 0.00, 0.20, 0.50, 0.80), (e) the variance of the population effect size (τ^2 = 0, .10, .33, .50, and 1.00), and (f) the magnitude of the publication bias (no bias, moderate bias, and strong bias). Please see Appendix A for the code created for the simulation and calculation of detection methods.

The results of the first stage (primary study data) were used in the second stage, which had two steps. The first step involved the computation of the meta-analysis summary statistics. This step was followed by the application of each of the publication bias detection methods to each of the meta-analyses.

The final stage was to evaluate the impact of publication bias and the performance of the publication bias detection methods. The stages and steps involved in the procedure are graphically presented in Figure 6.

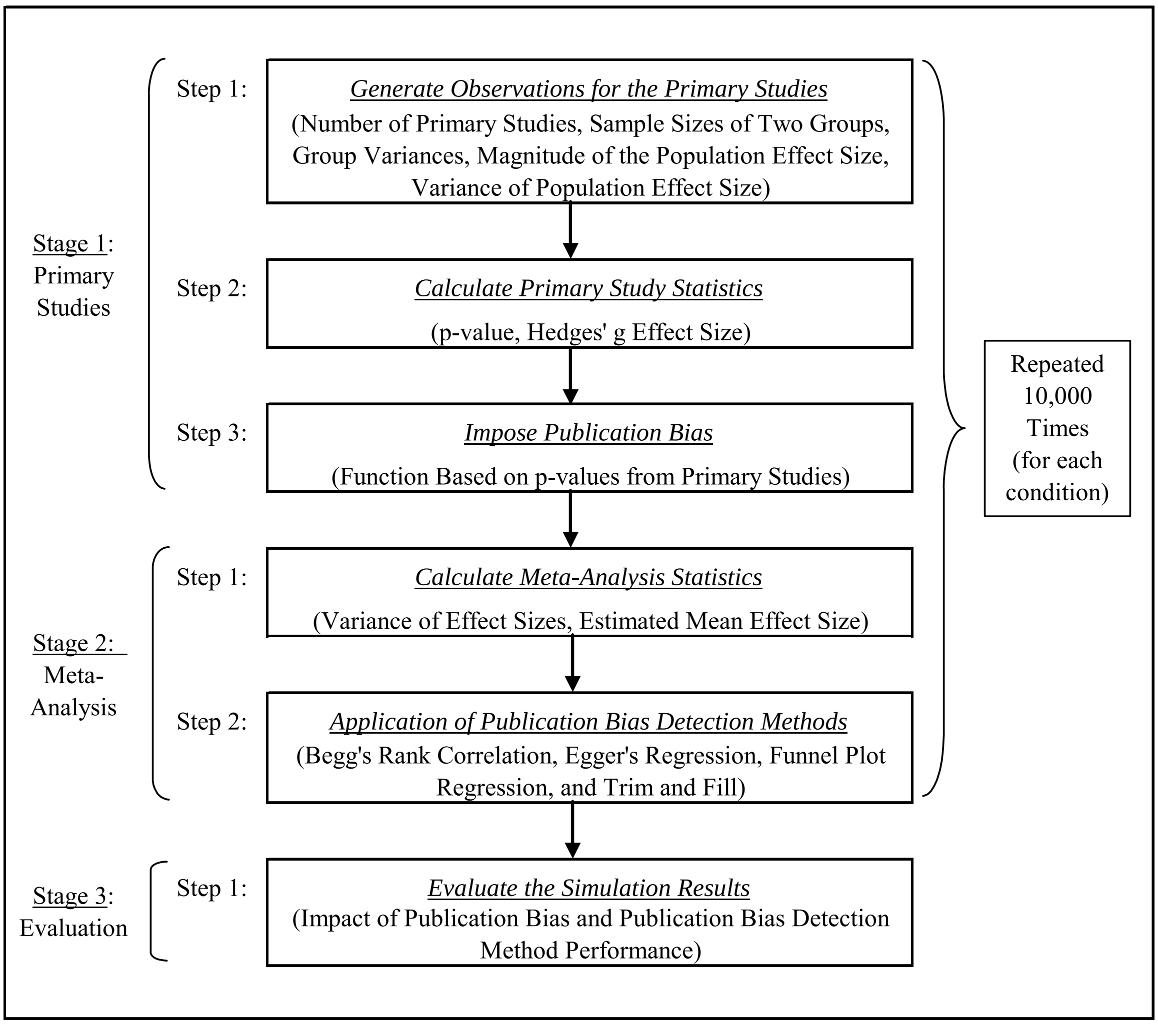

Figure 6. Flowchart depicting stages and steps in the Monte Carlo design.

Primary Study Generation

Primary studies were simulated using a Monte Carlo design with several factors controlled. There were primary study characteristics that were controlled, as well as, population characteristics.

Primary Studies: Number

The number of primary studies in each meta-analysis had four levels (10, 20, 50, and 100). These levels were chosen as representing those frequently observed in psychological and educational meta-analyses. Lipsey and Wilson (1993) investigated 317 meta-analyses published in the psychology and education fields. Interested in describing the number of studies included in the meta-analyses investigated by Lipsey and Wilson (1993) the researcher conducted an analysis of the number of studies reported by Lipsey and Wilson (1993). The psychology meta-analyses, total of 136, ranged from 5 to 475 studies included, with a median of 37.5 (25^{th} percentile = 20 and 75^{th} percentile=64.5). The educational meta-analyses, total of 181, ranged from 6 to 302, with a median of 41.0 (25^{th} percentile = 22 and 75^{th} percentile=71). Based on the information gleaned from the Lipsey and Wilson (1993) data, the number of studies included in this Monte Carlo simulation was appropriate.

Primary Studies: Sample Sizes of the Two Groups

The sample sizes of the two groups in each primary study had mean total sample sizes ranging from 10 to 100. The sample size standard deviation was half of the mean sample size. For example, when n1=5 and n2=5 the mean total sample size is 10 with a standard deviation of 5. Specifically, half of the value 10 (n1 + n2) would be multiplied by the random number and then added to 10. In addition there were balanced (homogeneous) and unbalanced (heterogeneous) conditions. A total of 9 levels for the sample sizes of the primary studies were controlled. Table 5 details the mean sample sizes for each group.

Table 5. Controlled primary study mean sample sizes for each group.

Homogeneous		Heterogeneous	
Group 1, Group 2	SD	Group 1, Group 2	Group1, Group 2
5, 5	2.5	4, 6	6, 4
10, 10	5.0	8, 12	12, 8
50, 50	25.0	40, 60	60, 40

Primary Studies: Group Variances

The group variances in the primary studies had the following variance ratios: 1:2, 1:4, and 1:8, as well as a homogeneous variance condition.

Population Effect Size: Magnitude

The magnitude of the population effect size was controlled with 0.00, 0.20, 0.50, and 0.80 values. This range of population effect sizes is often described as none, small, medium, and large (Cohen, 1992).

Population Effect Size: Variance

The variance of the population effect size was controlled with 0, .10, .33, .50, and 1.00 values. These values control the degree of random effects variance contributing to the meta-analysis weights. When the variance of the population effect size is zero, the calculations for the mean effect size produce similar weights as the fixed effects model. However, all values greater than zero will increase the amount of variance contributing to the weights by contributing random effects variance to the weights. These values correspond to values others have used in simulations (Field, 2001).

Following the generation of the primary studies, step 1 in stage 1 of the simulation, the effect sizes were computed, and publication bias was imposed (steps 2-3). The computation of the mean effect sizes for each primary study was Hedges's g, which is appropriate for standardized mean differences (Hedges, 1981). The third step was to select the primary studies for inclusion in the meta-analysis, to impose publication bias, which is one of the Monte Carlo factors being controlled.

Selection of Primary Studies: Magnitude of Publication Bias

The magnitude of the publication bias had three levels: no bias, moderate bias, and strong bias. The publication bias in the meta-analyses was manipulated by generating a weight function to establish the probability of a simulated study being included in the meta-analysis, with the probability of inclusion being inversely related to the *p*-value obtained in the simulated study (Begg & Mazumdar, 1994). That is, samples that yield statistically significant results are more likely to be published than those that do not yield statistically significant results (Sutton et al., 2000). The weight functions are illustrated in Figure 7.

In a similar study to the one being proposed, Rendina-Gobioff and Kromrey (2004) implemented the same method for selection of studies to be included in meta-analyses. The average proportion of studies selected when the imposed publication bias was moderatel was .66 (min=.49 and max=.97). When the imposed publication bias was strong the average proportion reported was .54 (min=.31 and max=.95).

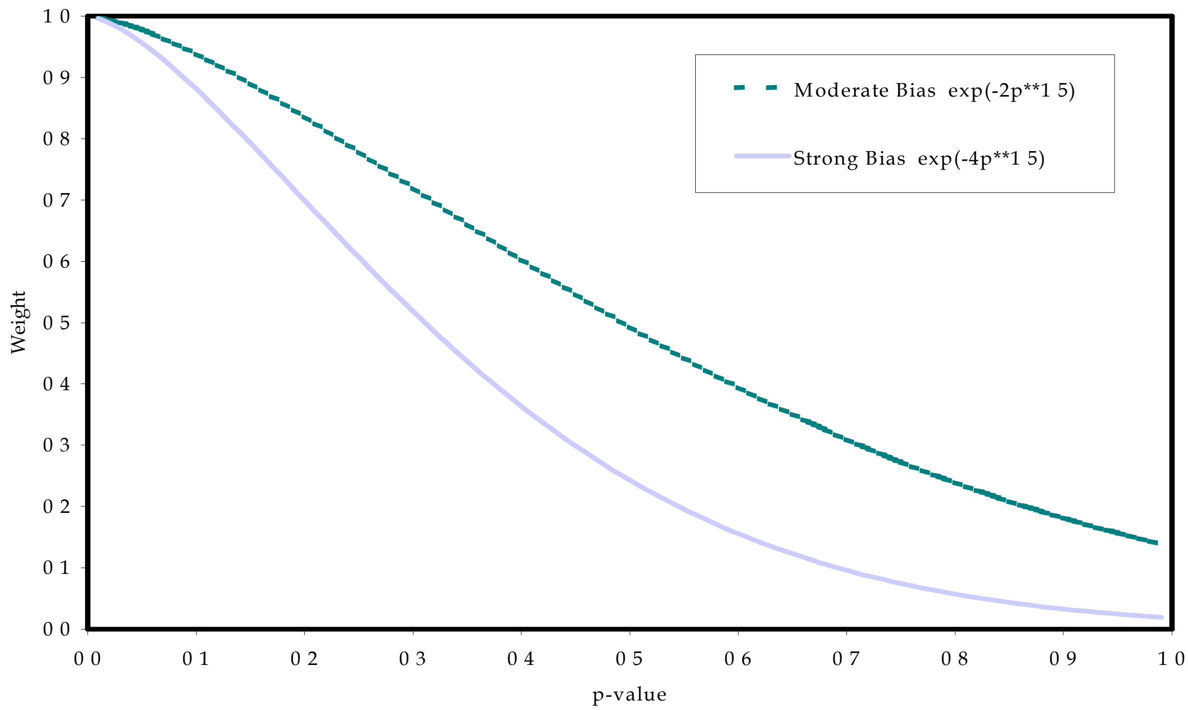

Figure 7. Weight functions to establish probability of inclusion in a meta-analysis as a function of the p-value.

The following primary study data were the product of stage 1: total sample sizes, effect sizes, and p-values.

The first step in the second stage of the simulation was to calculate the meta-analysis statistics. The variance of the effect sizes was calculated and the mean effect size was estimated using random effects weights (sampling error and between study variance).

Publication Bias Tests Applied

The next step in stage 2 of the simulation was the application of the statistical methods to detect publication bias. In each simulated meta-analysis, publication bias was assessed using the Begg Rank Correlation method (using both the estimated variance and the sample size), the Egger Regression method, the Funnel Plot Regression method suggested by Macaskill, Walter and Irwig (2001) and the Trim and Fill method suggested by Duval and Tweedie (2000a, 2000b). For the Egger Regression, OLS estimation was employed because preliminary analyses suggested that WLS estimates were substantially biased (Rendina-Gobioff & Kromrey, 2004).

The following meta-analysis data were the product of stage 2: variance of effect sizes, mean effect size, and whether publication bias was detected (for each of the methods). The estimate for the variance of the effect sizes or random effects variance component (REVC) (Shadish & Haddock, 1994) was estimated with:

$$\sigma_\theta^2 = \frac{Q-(k-1)}{\sum w_i - \left(\sum w_i^2 / \sum w_i\right)}$$

Where Q is the estimate of homogeneity detailed earlier

k is the number of studies included in the meta-analysis

w_i is the inverse variance weight used in a fixed effects model

The REVC was set to 0 when computationally negative because conceptually it cannot be negative (Hedges & Vevea, 1998).The mean effect size was estimated with a random effects weight that combines the REVC with sampling error variance. Specifically, the weight was the inverse of the sum of the REVC and sampling error variance. In this case, for Hedges's g effect size, the sampling error variance was estimated with the following:

$$SE_i = \sqrt{\frac{n_1+n_2}{n_1 n_2} + \frac{(g_i)^2}{2(n_1+n_2)}}$$

Where g_i is the estimated effect size for study *i*

n_1 is the sample size for group 1

n_2 is the sample size for group 2

The final stage (3) was to evaluate the impact of publication bias on estimated mean effect sizes and effect size variances. In addition, the performance of the publication bias methods implemented was evaluated. These evaluations are discussed in detail in the data analysis section.

Programming

This research was conducted using SAS/IML version 9.1. Conditions for the study were run under Windows platforms. Normally distributed random variables were generated using the RANNOR random number generator in SAS. A different seed value for the random number generator was used in each execution of the program. The program code was verified by hand-checking results from benchmark datasets.

For each condition examined in the Monte Carlo study, 10,000 meta-analyses were simulated. The use of 10,000 samples provides a maximum 95% confidence interval width around an observed proportion that is $\pm$ 0.0098 (Robey & Barcikowski, 1992).

Data Analysis

Research Question 1: Evaluation of the Impact of Publication Bias

Research Question 1, evaluation of the impact of publication bias on the meta-analysis results, was addressed by examining the mean difference between the population effect size and the meta-analysis estimated mean effect size. In addition, the difference between the population effect size variance and the meta-analysis estimated effect size variance was investigated. These differences were averaged over all conditions and averaged separately for each condition (number of primary studies, mean sample size of groups, group variances, magnitude of population effect size, and variance of the population).

Research Question 2 and 3: Evaluation of Methods to Detect Publication Bias

Research Questions 2 and 3, evaluating the performance of the methods for detecting publication bias, were addressed by examining the Type I error rates and estimated power. The proportion of simulated meta-analyses for which publication bias was indicated by each detection method was calculated. For simulation conditions with no publication bias, these proportions represent estimates of Type I error rates. Conversely, for conditions that included publication bias, these proportions estimate the statistical power. Hence, for Research Question 2 the Type I error rates were averaged over all conditions and averaged separately for each condition (number of primary studies, mean sample size of groups, group variances, magnitude of population effect size, and variance of the population effect size). In addition, the proportion of studies with adequate Type I error rates for each condition and across all conditions were calculated. Type I error rates that ranged from 0.025 to 0.075 were considered to be adequate based on Bradley's (1978) liberal robustness criteria.

Maximum power estimates over all conditions and separately for each condition (number of primary studies, mean sample size of groups, group variances, magnitude of population effect size, and variance of the population effect size) were calculated for Research Question 3. The maximum power estimates were reported, rather than averages, because some power estimates were not reported due to inadequate Type I error control.

CHAPTER FOUR: RESULTS

This chapter details the results of the study in relation to each of the research questions. The chapter is organized in the order of the research questions. However, before presenting results for each of the research questions the proportion of studies included in each of the meta-analyses by study conditions is presented. Next the first research question is addressed by presenting the degree that publication bias impacted the results of the meta-analyses. This section is followed by details regarding the second research question, the Type I error rates of each of the statistical methods to detect publication bias for each study condition. The final section presents the power estimates for each of the statistical methods across study conditions, attending to the third research question. The following research questions are addressed by the results:

Research Questions

1. To what extent will publication bias impact the estimated mean effect size and estimated variance in a random effects meta-analysis?
    a. To what extent does the number of primary studies included in the meta-analysis moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?

b. To what extent does the mean sample size of groups (including balanced and unbalanced) in the primary studies included in the meta-analysis moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?

c. To what extent do the group variances (homogeneous and heterogeneous) in the primary studies included in the meta-analysis moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?

d. To what extent does the magnitude of the population effect size moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?

e. To what extent does the variance of the population effect size moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?

2. To what extent do Type I error rates vary across statistical methods for detecting publication bias in a random effects meta-analysis?

   a. To what extent does the number of primary studies included in the meta-analysis impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

   b. To what extent does the mean sample size of groups (including balanced and unbalanced) in the primary studies included in the meta-analysis impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

c. To what extent do the group variances (homogeneous and heterogeneous) in the primary studies included in the meta-analysis impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

d. To what extent does the magnitude of the population effect size impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

e. To what extent does the variance of the population effect size impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

3. To what extent do power estimates vary across statistical methods for detecting publication bias in a random effects meta-analysis?

   a. To what extent does the number of primary studies included in the meta-analysis impact the extent that power estimates vary across statistical methods for detecting publication bias?

   b. To what extent does the mean sample size of groups (including balanced and unbalanced) in the primary studies included in the meta-analysis impact the extent that power estimates vary across statistical methods for detecting publication bias?

   c. To what extent do the group variances (homogeneous and heterogeneous) in the primary studies included in the meta-analysis impact the extent that power estimates vary across statistical methods for detecting publication bias?

d. To what extent does the magnitude of the population effect size impact the extent that power estimates vary across statistical methods for detecting publication bias?

e. To what extent does the variance of the population effect size impact the extent that power estimates vary across statistical methods for detecting publication bias?

Impact of Publication Bias

The number of studies included in each meta-analysis is pertinent to the interpretation of results. To simulate the influence of publication bias the proportion of studies available for the meta-analysis was manipulated by imposing a weight function (see Figure 7). The average proportion of studies available for the meta-analysis due to publication bias for each condition is presented in Table 6. The proportions of studies that were available for the meta-analyses verify the accuracy of the code used to simulate the study conditions. For example, if the function used to impose publication bias was written into the code accurately one would expect more studies to be available when the publication bias was moderate (73%), compared to strong publication bias (62%). Furthermore, when there was no publication bias imposed 100% of the studies were available for the meta-analyses. When moderate publication bias was imposed the minimum proportion available to the meta-analysis was 49%, compared to the maximum proportion available to the meta-analysis which was 97%. When the publication bias strength was greater (strong) the minimum proportion of studies available to the meta-analysis was 31% and the maximum was 95%. Thus a researcher conducting a meta-analysis under conditions similar to the simulated strong publication bias in the worst case scenario could be producing results based on only 31% of the studies conducted on the topic.

All of the proportions of studies available to the meta-analysis increase as the study condition values increase, except for the number of studies (k) condition. The average proportion of studies available for meta-analyses was the same (67%) across the number of studies included (k). The minimum proportion available, regardless of the number of studies included was 31% and the maximum was 97%.

The increasing proportion of studies available for the meta-analysis as the other study conditions (primary study sample size, primary study group variance, population effect size magnitude, and population effect size variance) values increase was expected because all of these conditions affect the power available to detect a significant result (p-value) which is what the publication bias function is based on for determining study inclusion. Thus, as the primary study sample size increased the proportion of studies included in the meta-analysis increased. The average proportion of studies available across sample sizes ranged from 57% (n1=4, n2=6) to 79% (n1=60, n2=40). The smallest minimum proportion of studies available across sample sizes was 31% (n1=40, n2=60) and the largest maximum proportion of studies available was 97% (n1=50, n2=50). The average proportion of studies available for the meta-analyses slightly increased as the primary study group variances increased (1:1, 67% to 1:8, 68%). The smallest minimum proportion of studies available across group variance was 31% (1:8) and the largest maximum proportion of studies available was 97% (1:8). Both the population effect size

Table 6. Proportion of studies available for meta-analyses by study conditions.

	N	Mean	Minimum	Maximum
Number of Studies (k)				
10	1440	0.6704	0.3123	0.9707
20	1440	0.6704	0.3120	0.9706
50	1440	0.6704	0.3128	0.9702
100	1440	0.6704	0.3124	0.9705
Primary Study Sample Size (n1, n2)				
4,6	640	0.5681	0.3258	0.7473
5,5	640	0.5863	0.3547	0.7558
6,4	640	0.6016	0.3549	0.7727
8,12	640	0.6253	0.3167	0.8005
10,10	640	0.6435	0.3554	0.8084
12,8	640	0.6562	0.3550	0.8208
40,60	640	0.7748	0.3120	0.9687
50,50	640	0.7860	0.3551	0.9707
60,40	640	0.7918	0.3540	0.9699
Primary Study Group Variance				
1:1	1440	0.6668	0.3540	0.9676
1:2	1440	0.6682	0.3339	0.9684
1:4	1440	0.6715	0.3206	0.9695
1:8	1440	0.6751	0.3120	0.9707
Population Effect Size Magnitude				
0.0	1440	0.6000	0.3120	0.8756
0.2	1440	0.6203	0.3435	0.8795
0.5	1440	0.6923	0.4302	0.8962
0.8	1440	0.7690	0.5574	0.9707
Population Effect Size Variance				
0.00	1152	0.6008	0.3120	0.9707
0.10	1152	0.6315	0.3666	0.9377
0.33	1152	0.6754	0.4370	0.9042
0.50	1152	0.6988	0.4761	0.9007
1.00	1152	0.7454	0.5536	0.9066
Magnitude of Publication Bias				
None	2880	1.0000	1.0000	1.0000
Moderate	2880	0.7257	0.4878	0.9707
Strong	2880	0.6151	0.3120	0.9539
Total	5760	0.6704	0.3120	0.9707

magnitude and variance produced increasing proportions of available studies as their values increased. The population effect size magnitude average proportion of studies available increased from 60% (Δ=0.0) to 77% (Δ=0.8). Similarly, the population effect size variance average proportion of studies available increased from 60% (τ^2 =0.0) to

75% (τ^2=1.0). The smallest minimum proportion of studies available across population effect sizes and population effect size variance was 31% (Δ=0.0 and τ^2=0.0) and the largest maximum proportion of studies available was 97% (Δ=0.8 and τ^2=0.0).

One indicator of the impact of publication bias on the results of a meta-analysis is the degree that the estimated mean effect size varies from the population effect size or effect size bias. Table 7 presents the average, minimum, and maximum effect size bias by study conditions. The effect size bias distribution shapes were investigated for normality. The distributions were skewed however the overall conclusions presented here would not be different if the medians were reported, rather than the means. The effect size bias was calculated by subtracting the population effect size from the estimated mean effect size. Thus the total average effect size bias value of 0.1071 indicates that on average (across all study conditions when publication bias was present) the estimated mean effect size was 0.1071 greater than the population effect size. In other words, when publication bias is present the estimated mean effect size was inflated by 0.1071.

The effect size bias when no publication bias was imposed can be used as a baseline for comparison to the other study conditions. When there is no publication bias one would expect to have minimal effect size bias. The results reflect this assumption because when no publication bias was imposed the average effect size bias was -0.0120 with a minimum value of -0.1125 and maximum value of 0.0997. In contrast, the average effect size bias increased to 0.0792 when moderate publication bias was imposed, with a minimum value of -0.0327 and maximum value of 0.3030. The average effect size bias increased even more when the imposed publication bias was strong, 0.1350 (minimum= -0.0295 and maximum=0.4491). According to these results when a researcher is conducting a meta-analysis with strong publication bias they could be producing an average effect size with as much as 0.45 error.

Table 7. Estimated bias in mean effect size by study conditions.

		Average Effect Size Bias		
	N	Mean	Minimum	Maximum
Number of Studies (k)				
10	1440	0.1088	-0.0271	0.4491
20	1440	0.1073	-0.0303	0.4417
50	1440	0.1064	-0.0320	0.4414
100	1440	0.1060	-0.0327	0.4392
Primary Study Sample Size (n1, n2)				
4,6	640	0.1275	-0.0059	0.3100
5,5	640	0.1421	-0.0088	0.3649
6,4	640	0.1621	-0.0111	0.4491
8,12	640	0.1024	-0.0048	0.2445
10,10	640	0.1164	-0.0081	0.2863
12,8	640	0.1377	-0.0098	0.3754
40,60	640	0.0437	-0.0327	0.1254
50,50	640	0.0569	-0.0058	0.1632
60,40	640	0.0754	-0.0070	0.2299
Primary Study Group Variance				
1:1	1440	0.0965	-0.0076	0.3100
1:2	1440	0.1001	-0.0202	0.3400
1:4	1440	0.1097	-0.0303	0.3905
1:8	1440	0.1222	-0.0327	0.4491
Population Effect Size Magnitude				
0.0	1440	0.0001	-0.0111	0.0085
0.2	1440	0.0959	0.0195	0.2245
0.5	1440	0.1659	-0.0009	0.4104
0.8	1440	0.1666	-0.0327	0.4491
Population Effect Size Variance				
0.00	1152	0.1021	-0.0327	0.4280
0.10	1152	0.1124	-0.0081	0.4419
0.33	1152	0.1145	-0.0074	0.4491
0.50	1152	0.1106	-0.0098	0.4449
1.00	1152	0.0961	-0.0111	0.4099
Magnitude of Publication Bias				
None	2880	-0.0120	-0.1125	0.0997
Moderate	2880	0.0792	-0.0327	0.3030
Strong	2880	0.1350	-0.0295	0.4491
Total	5760	0.1071	-0.0327	0.4491

Another indicator of the influence of publication bias on the results of a meta-analysis is the degree that the estimated effect size variance varies from the population effect size variance. The effect size variance bias by study conditions are presented in Table 8. The effect size variance bias distribution shapes were investigated for normality. The distributions were skewed however the overall conclusions presented here would not be different if the medians were reported, rather than the means. The effect size variance bias was calculated by subtracting the population effect size variance from the estimated effect size variance. Thus the total average effect size variance bias value of 0.1576 indicates that on average (across all study conditions when publication bias is present) the estimated effect size variance was 0.1576 greater than the population effect size variance. In other words when publication bias was present the estimated effect size variance was inflated by 0.1576.

The effect size variance bias when no publication bias was imposed can be used as a baseline for comparison to the other study conditions. When there is no publication bias one would expect to have minimal effect size variance bias. The results reflect this assumption because when no publication bias was imposed the average effect size variance bias was -0.0343 with a minimum value of -0.3806 and maximum value of 0.2756. In contrast, the average effect size variance bias increased to 0.1101 when moderate publication bias was imposed, with a minimum value of -0.1593 and maximum value of 0.7757. The average effect size variance bias increased even more when the imposed publication bias was strong, 0.2052 (minimum=-0.1413 and maximum=1.1622).

According to these results when researchers are conducting a meta-analysis with strong publication bias they could be producing an average effect size variance estimate with as much as 1.16 error.

Table 8. Estimated bias in effect size variance by study conditions.

		Average Variance Bias		
	N	Mean	Minimum	Maximum
Number of Studies (k)				
10	1440	0.1788	-0.1377	1.1622
20	1440	0.1589	-0.1479	1.0971
50	1440	0.1482	-0.1592	1.0661
100	1440	0.1447	-0.1593	1.0508
Primary Study Sample Size (n1, n2)				
4,6	640	0.1786	-0.1478	0.5639
5,5	640	0.2692	-0.1000	0.7987
6,4	640	0.3937	-0.0951	1.1622
8,12	640	0.0890	-0.1432	0.3506
10,10	640	0.1518	-0.0918	0.5232
12,8	640	0.2426	-0.0888	0.8256
40,60	640	-0.0039	-0.1593	0.1116
50,50	640	0.0271	-0.1082	0.1633
60,40	640	0.0706	-0.1055	0.3430
Primary Study Group Variance				
1:1	1440	0.1003	-0.1082	0.5274
1:2	1440	0.1194	-0.1478	0.6769
1:4	1440	0.1709	-0.1593	0.9142
1:8	1440	0.2399	-0.1570	1.1622
Population Effect Size Magnitude				
0.0	1440	0.2643	-0.0880	1.1622
0.2	1440	0.2286	-0.0957	1.1534
0.5	1440	0.1165	-0.1208	0.9752
0.8	1440	0.0211	-0.1593	0.7101
Population Effect Size Variance				
0.00	1152	0.1333	0.0002	0.9100
0.10	1152	0.1413	-0.0792	0.9615
0.33	1152	0.1693	-0.1062	1.0531
0.50	1152	0.1810	-0.0965	1.1092
1.00	1152	0.1633	-0.1593	1.1622
Magnitude of Publication Bias				
None	2880	-0.0343	-0.3806	0.2756
Moderate	2880	0.1101	-0.1593	0.7757
Strong	2880	0.2052	-0.1413	1.1622
Total	5760	0.1576	-0.1593	1.1622

The following section presents results in relation to the influence of moderators on the impact of publication bias when estimating the effect size magnitude and variance. The term moderator is used in the sense of describing the influence of a particular indicator on the results of a meta-analysis (effect size magnitude and effect size variance bias) when publication bias is present. Thus, a study condition is considered a moderator if for different values of the study condition the results of a meta-analysis (effect size magnitude and effect size variance bias) are larger/smaller when publication bias is present (both moderate and strong). Alternatively, one could examine a moderator by determining whether the results of a meta-analysis (effect size magnitude and effect size variance bias) are different across values of the study condition and across each value of publication bias (none, moderate, and strong) For this type of moderator investigation one would calculate the mean for each study condition value and each publication bias value. Please see Appendix B for the means, minimum, and maximum calculations associated with this method.

Number of Primary Studies Moderator

The degree to which the number of primary studies moderates the impact of publication bias on the estimation of the effect size magnitude and variance was minimal. The average effect size bias decreased slightly ranging from 0.1088 with 10 studies to 0.1060 with 100 studies (see Table 9). The average effect size variance bias decreased slightly as the number of studies included in the meta-analysis increased, from 0.1788 with 10 studies in the meta-analysis to 0.1447 with 100 studies in the meta-analysis. The minimal moderating effect of the number of primary studies on the impact of publication bias should be couched with the knowledge that the proportion of studies available (see Table 6) for the meta-analyses was similar across this condition (k=10, 20, 50, 100).

Sample Size Moderator

The average primary study sample size does moderate the impact of publication bias on the estimation of the effect size magnitude and variance. Under conditions where the average primary study sample size was 5 the average effect size bias ranged from 0.1275 (n1=4, n2=6) to 0.1621 (n1=6, n2=4). In contrast, conditions where the average primary study sample size was 50 the average effect size bias was smaller, ranging from 0.0437 (n1=40, n2=60) to 0.0754 (n1=60, n2=40). The average effect size variance bias exhibited a similar pattern to the average effect size magnitude bias. Under conditions where the average primary study sample size was 5 the average effect size variance bias ranged from 0.1786 (n1=4, n2=6) to 0.3937 (n1=6, n2=4). In contrast, conditions where the average primary study sample size was 50 the average effect size variance bias was smaller, ranging from -0.0039 (n1=40, n2=60) to 0.0706 (n1=60, n2=40).

Group Variance Moderator

The moderating influence of the primary study group variances on the impact of publication bias was that as the group variances increased, the bias of the effect size magnitude and variance increased (became less accurate). Specifically, the average effect size bias increased from 0.0965 (1:1) to 0.1222 (1:8) as the group variance increased. Similarly, the average effect size variance bias increased from 0.1003 (1:1) to 0.2399 (1:8) as the group variance increased.

Magnitude of Population Effect Size Moderator

The magnitude of the population effect size influenced the two indicators of the impact of publication bias (average effect size bias and effect size variance) differently. As the value of the population effect size increased the average effect size bias increased. Specifically, the average effect size bias increased from 0.0001 (Δ=0.0) to 0.1666 (Δ=0.8). In contrast, as the value of the population effect size increased the average effect size variance bias decreased. Specifically, the average effect size variance bias decreased from 0.2643 (Δ=0.0) to 0.0211 (Δ=0.8).

Variance of Population Effect Size Moderator

The degree that the variance of the population effect size moderates the impact of publication bias on the estimation of the effect size magnitude and variance was minimal. Specifically, the average effect size bias ranged from 0.0961 with population effect size variance of 1.00 to 0.1145 with population effect size variance of 0.33. The average effect size variance bias ranged from 0.1333 with population effect size variance of 0.00 to 0.1810 with population variance of 0.50.

Summary

Two of the study conditions minimally moderated indicators of the impact of publication bias, number of primary studies and population effect size variance. In addition, these two factors minimally impacted the percentage of studies available to the meta-analyst. The average primary study sample size increased the accuracy of the effect size magnitude and variance estimates by decreasing bias when publication bias was imposed. In contrast, the primary study group variances decreased the accuracy of the effect size magnitude and variance estimates by increasing bias when publication bias was imposed. Finally, the population effect size magnitude decreased the accuracy of the effect size magnitude estimate yet increased the accuracy of the effect size variance estimate.

Type I Error Rates of Methods to Detect Publication Bias

One indicator of the performance of statistical methods for detecting publication bias investigated was the Type I error rates. Two approaches to describing the Type I error rates are presented in this research. The first approach presented is the average Type I error rates for each study condition and across all conditions (see Table 9). The average Type I error rate for Begg Rank Correlation (N) method exhibited the best performance with an average close to the nominal value of 0.05 (M=0.0556). The Funnel Plot Regression and Trim and Fill methods' average Type I error rates were smaller than the nominal 0.05 value; M=0.0338 and M=0.0267. The two statistical methods with poor average Type I error rates, greater than the nominal 0.05 value, were Egger Regression (M=0.2199) and Begg Rank Correlation (V) (M=0.1841).

Table 9. Average Type I error rates for methods to detect publication bias by study conditions.

		Publication Bias Detection Method				
	N	Begg Rank Correlation (V) (Begg V)	Begg Rank Correlation (N) (Begg N)	Egger's Regression (Egger)	Funnel Plot Regression (Funnel)	Trim and Fill (Trim)
Number of Studies (k)						
10	720	0.0969	0.0649	0.0696	0.0115	0.0000
20	720	0.1192	0.0540	0.1633	0.0313	0.0029
50	720	0.2063	0.0513	0.2772	0.0436	0.0341
100	720	0.3141	0.0521	0.3693	0.0489	0.0698
Primary Study Sample Size (n1, n2)						
4,6	320	0.2450	0.0564	0.3138	0.0254	0.0386
5,5	320	0.2544	0.0560	0.3299	0.0280	0.0386
6,4	320	0.2753	0.0578	0.3568	0.0322	0.0375
8,12	320	0.1507	0.0553	0.1887	0.0305	0.0255
10,10	320	0.1658	0.0537	0.2084	0.0313	0.0259
12,8	320	0.1795	0.0549	0.2284	0.0334	0.0252
40,60	320	0.1180	0.0575	0.1099	0.0430	0.0160
50,50	320	0.1304	0.0538	0.1186	0.0401	0.0166
60,40	320	0.1380	0.0546	0.1243	0.0404	0.0165
Primary Study Group Variance						
1:1	720	0.1720	0.0541	0.1749	0.0318	0.0204
1:2	720	0.1767	0.0547	0.1894	0.0325	0.0225
1:4	720	0.1880	0.0560	0.2299	0.0342	0.0281
1:8	720	0.1998	0.0575	0.2854	0.0368	0.0357
Population Effect Size Magnitude						
0.0	720	0.0598	0.0541	0.1088	0.0325	0.0079
0.2	720	0.0857	0.0543	0.1378	0.0327	0.0137
0.5	720	0.2152	0.0558	0.2545	0.0340	0.0295
0.8	720	0.3758	0.0581	0.3784	0.0361	0.0556
Population Effect Size Variance						
0.00	576	0.1376	0.0563	0.1553	0.0232	0.0385
0.10	576	0.1571	0.0554	0.1842	0.0305	0.0319
0.33	576	0.1902	0.0553	0.2238	0.0348	0.0244
0.50	576	0.2059	0.0552	0.2451	0.0372	0.0215
1.00	576	0.2298	0.0556	0.2909	0.0433	0.0171
Total	2880	0.1841	0.0556	0.2199	0.0338	0.0267

The second approach to describing the Type I error rates was the proportion of conditions with adequate Type I error control. Specifically, Type I error control was based on Bradley's (1978) liberal robustness criterion which states that Type I error rates at the nominal 0.05 level should have half of α added to and subtracted from 0.05 thus a range of 0.025 to 0.075 is considered adequate. The proportions of conditions with adequate Type I error control for the methods to detect publication bias by study conditions are presented in Table 10. Consistent with the average Type I error rate performance, the Begg Rank Correlation (N) method had the greatest proportion of conditions with adequate Type I error control with 99% meeting the criterion. The Funnel Plot Regression method exhibited the second best proportion of adequate Type I error rates with 67% of the conditions performing well. Although the Trim and Fill method exhibited average Type I error rates below the 0.05 value, the Type I error rates are too small to be considered adequate, thus only 17% of the conditions met the criteria. In contrast, the Begg Rank Correlation (V) and Egger Regression methods exhibited poor proportions of Type I error control with 38% and 24% meeting criteria. However, this is consistent with high average Type I error rates which were well above the 0.05 level.

Since there may be researchers who would like to look up Type I error rates for specific conditions, the Type I error rates for every condition are presented in Appendix C.

Table 10. Proportion of conditions with adequate Type I error for methods to detect publication bias by study conditions.

		Publication Bias Detection Method				
	N	Begg Rank Correlation (V) (Begg V)	Begg Rank Correlation (N) (Begg N)	Egger's Regression (Egger)	Funnel Plot Regression (Funnel)	Trim and Fill (Trim)
Number of Studies (k)						
10	720	0.3903	0.9944	0.5139	0.0444	0.0000
20	720	0.4625	0.9986	0.2444	0.7306	0.0000
50	720	0.3639	0.9944	0.1208	0.9472	0.2944
100	720	0.2986	0.9764	0.0861	0.9403	0.3819
Primary Study Sample Size (n1, n2)						
4,6	320	0.1875	0.9938	0.1344	0.5469	0.1469
5,5	320	0.1938	1.0000	0.1125	0.6219	0.1500
6,4	320	0.1969	0.9813	0.0969	0.6469	0.1469
8,12	320	0.4344	1.0000	0.2875	0.6500	0.2094
10,10	320	0.4063	1.0000	0.2406	0.6844	0.1969
12,8	320	0.3781	0.9969	0.2281	0.7031	0.2000
40,60	320	0.5719	0.9656	0.4000	0.6875	0.1531
50,50	320	0.5344	1.0000	0.3438	0.7219	0.1625
60,40	320	0.5063	0.9813	0.3281	0.7281	0.1563
Primary Study Group Variance						
1:1	720	0.4097	1.0000	0.3806	0.6694	0.1625
1:2	720	0.3986	0.9972	0.3264	0.6681	0.1792
1:4	720	0.3722	0.9875	0.1861	0.6667	0.1792
1:8	720	0.3347	0.9792	0.0722	0.6583	0.1556
Population Effect Size Magnitude						
0.0	720	0.9153	1.0000	0.3444	0.6583	0.0083
0.2	720	0.4569	1.0000	0.3000	0.6681	0.2361
0.5	720	0.1069	0.9931	0.1986	0.6694	0.2667
0.8	720	0.0361	0.9708	0.1222	0.6667	0.1653
Population Effect Size Variance						
0.00	576	0.5122	0.9722	0.3559	0.4358	0.1979
0.10	576	0.4167	0.9879	0.2969	0.6458	0.1736
0.33	576	0.3490	0.9983	0.2535	0.7344	0.1563
0.50	576	0.3247	1.0000	0.2066	0.7569	0.1545
1.00	576	0.2917	0.9965	0.0938	0.7552	0.1632
Total	2880	0.3788	0.9910	0.2413	0.6656	0.1691

Number of Primary Studies Impact

The number of primary studies included in the meta-analysis did not impact the Type I error rates of the Begg Rank Correlation (N), which ranged from 0.0649 to 0.0513. The Funnel Plot Regression and Trim and Fill methods exhibited small increases in average Type I error rates. The Funnel Plot Regression average Type I error rates increased from 0.0115 to 0.0489 and the Trim and Fill average Type I error rates increased from 0.000 to 0.0698. The Begg Rank Correlation (V) and Egger Regression methods average Type I error rates also increased as the number of primary studies included in the meta-analysis increased however the increase is greater. The Begg Rank Correlation (V) method average Type I error rates increased from 0.0969 (k=10) to 0.3141 (k=100). Similarly, the Egger Regression method average Type I error rates increased from 0.0696 (k=10) to 0.3693 (k=100). These Type I error rates are presented in Table 9 and Figure 8.

When examining the proportion of conditions with adequate Type I error control (see Table 10 and Figure 9), the Begg Rank Correlation method performed well across all of the values of the number of studies included in the meta-analysis condition (97% to 100%). The Funnel Plot Regression performed poorly when the number of studies included in the meta-analysis was small (k=10, 4%) but improved as the number of studies increased (k=20, 73%; k=50, 95%; and k=100, 94%). The other three methods (Begg Rank Correlation (V), Egger Regression, and Trim and Fill) exhibited proportions of adequate Type I error control around 50% or less across the values for the number of studies condition. The Trim and Fill method increased from 0% to 38% as the number of

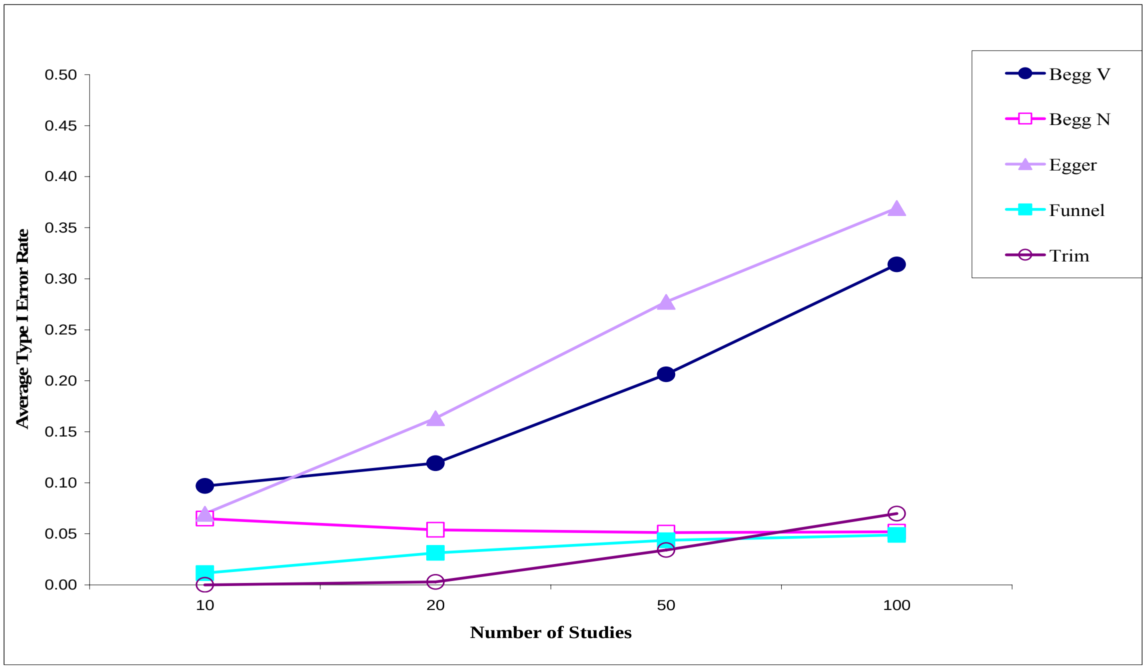

Figure 8. Average Type I error rates for each method to detect publication bias by number of studies.

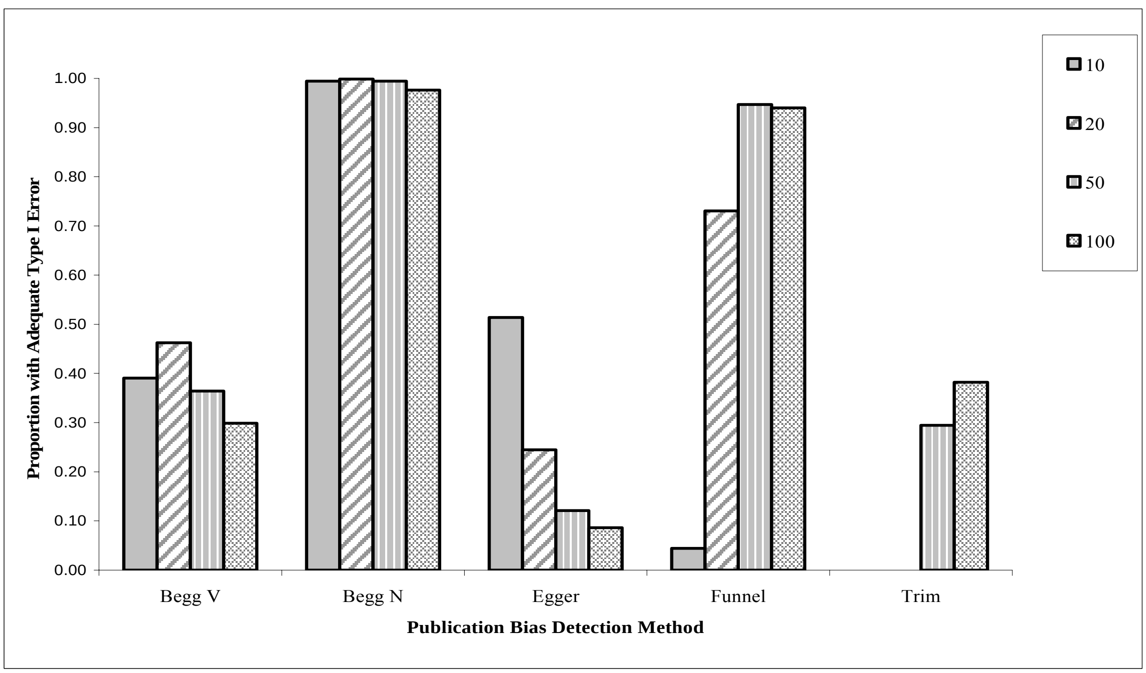

Figure 9. Proportion of conditions with adequate Type I error for each method to detect publication bias by number of studies.

studies included in the meta-analysis increased. In contrast, the Begg Rank Correlation (V) and Egger Regression methods exhibit declining proportions of adequate Type I error control as the number of studies included in the meta-analysis increases.

Sample Size Impact

The sample size of the primary studies included in the meta-analysis did not impact the Type I error rates of the Begg Rank Correlation (N) which ranged from 0.0537 (n1=10, n2=10) to 0.0578 (n1=6, n2=4). The average Type I error rates remained under the nominal 0.05 lever for both the Trim and Fill and the Funnel Plot Regression methods. The Trim and Fill method average Type I error rates decreased slightly as the sample size of the primary studies included in the meta-analysis increased, M=0.0386 (n1=4, n2=6) to M=0.0165 (n1=60, n2=40). In contrast, the Funnel Plot Regression average Type I error rates increased slightly as the sample size of the primary studies included in the meta-analysis increased, M=0.0254 (n1=4, n2=6) to M=0.0404 (n1=60, n2=40). The Begg Rank Correlation (V) and Egger Regression method average Type I error rates were above the nominal 0.05 value. Furthermore, the average Type I error rates for the Begg Rank Correlation (V) and the Egger Regression method decreased as the average sample size increased. For example, the Egger Regression method average Type I error rate decreased from M=0.3138 with a small primary study sample size (n1=4, n2=6) to M=0.1243 with a larger primary study sample size (n1=60, n2=40). The Type I error rates for the methods to detect publication bias are presented in Table 9 and Figure 10 by primary study sample size.

The proportion of conditions with adequate Type I error control was consistently high across values of primary study sample sizes for the Begg Rank Correlation (N)

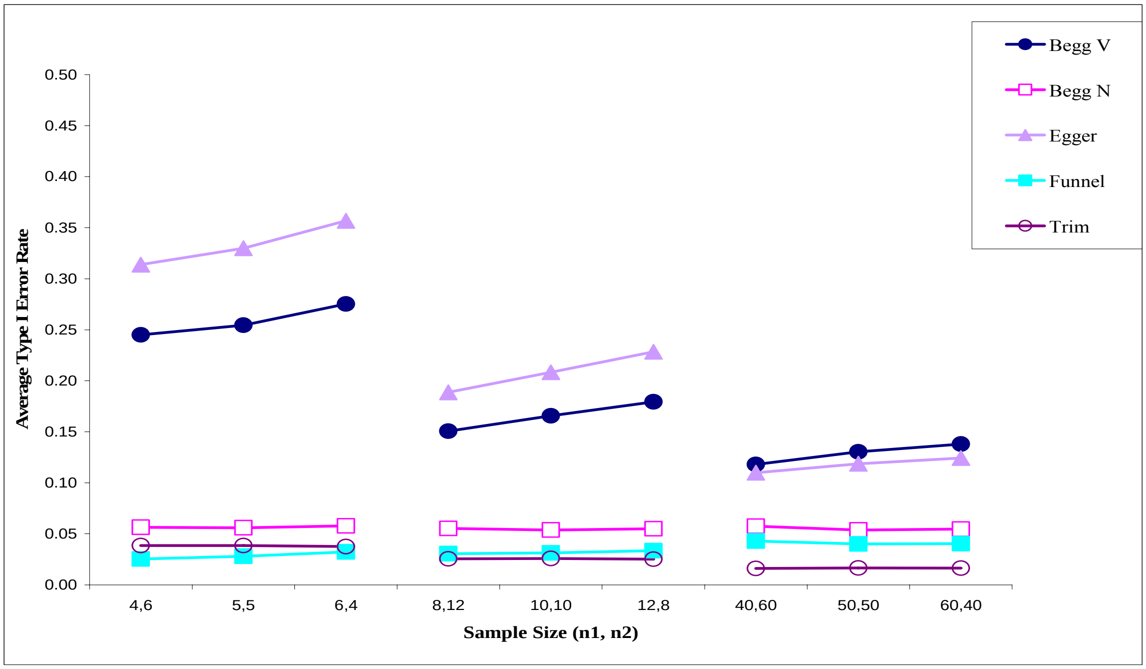

Figure 10. Average Type I error rates for each method to detect publication bias by sample size.

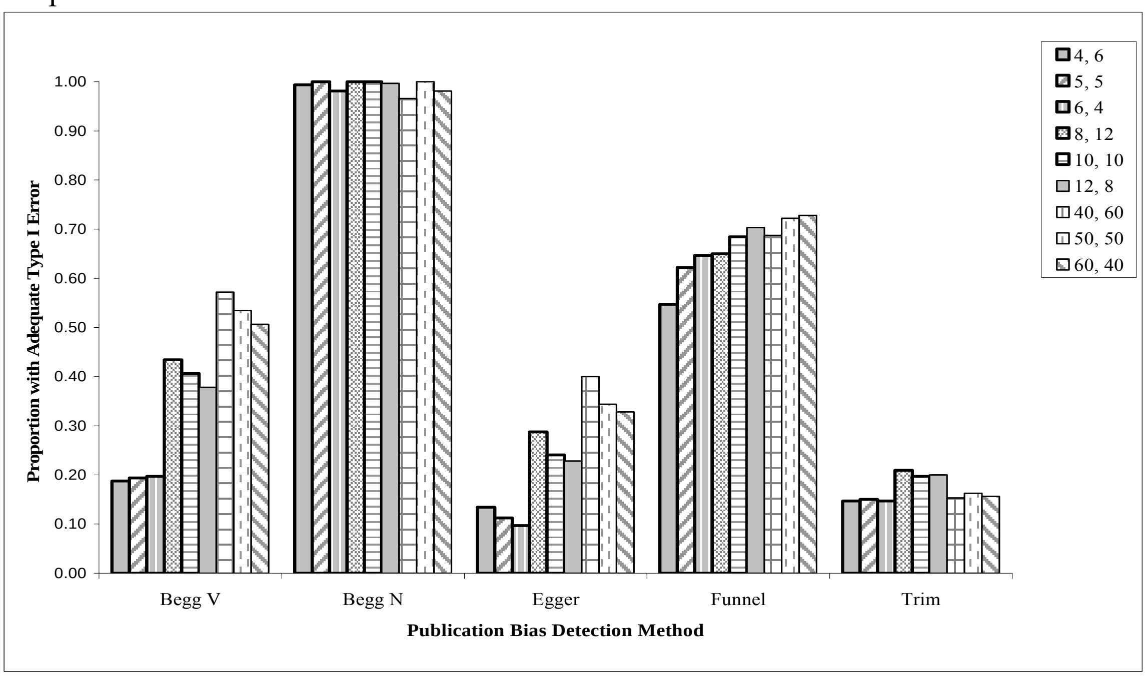

Figure 11. Proportion of conditions with adequate Type I error for each method to detect publication bias by sample size.

method (97% when n1=40 and n2=60 to 100% under multiple values of sample size). In contrast, the Trim and Fill method exhibited consistently low proportions of conditions with adequate Type I error rates across primary study sample sizes (14% when n1=4 and n2=6 to 21% when n1=8 and n2=12). The Begg Rank Correlation (V), Egger Regression, and Funnel Plot Regression methods had increasing proportions of conditions with adequate Type I error control across values of sample size, however the proportions were low. Specifically, the Begg Rank Correlation (V) proportions with adequate Type I error control ranged from 19% (n1=4 and n2=6) to 57% (n1=40 and n2=60) and the proportions with adequate Type I error control for the Egger Regression method ranged from 10% (n1=6 and n2=4) to 40% (n1=40 and n2=60). The proportions of conditions with adequate Type I error control by primary study sample size are presented in Table 10 and Figure 11.

Group Variance Impact

All of the average Type I error rates for the methods to detect publication bias increased as the primary study group variances become more heterogeneous. Although the Begg Rank Correlation (N) average Type I error rates increased slightly as the group variance increased, the values stayed close to 0.05 (ranging from 0.0541 with 1:1 variance to 0.0575 with 1:8 variance). The Funnel Plot Regression and the Trim and Fill average Type I error rates remained below the 0.05 nominal level across values of primary study group variance (0.0357 for 1:8 and 0.0204 for 1:1). In contrast, the Begg Rank Correlation (V) and Egger Regression methods average Type I error rates were well above the nominal 0.05 value (0.1720 to 0.2854). The pattern of average Type I error

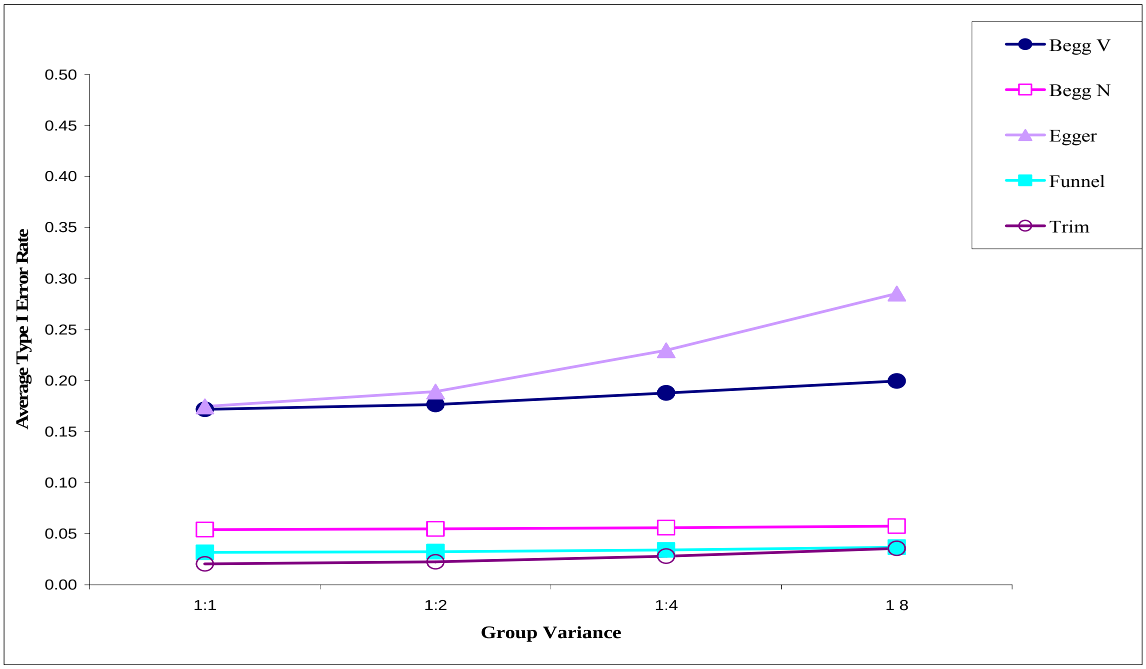

Figure 12. Average Type I error rates for each method to detect publication bias by primary study group variance.

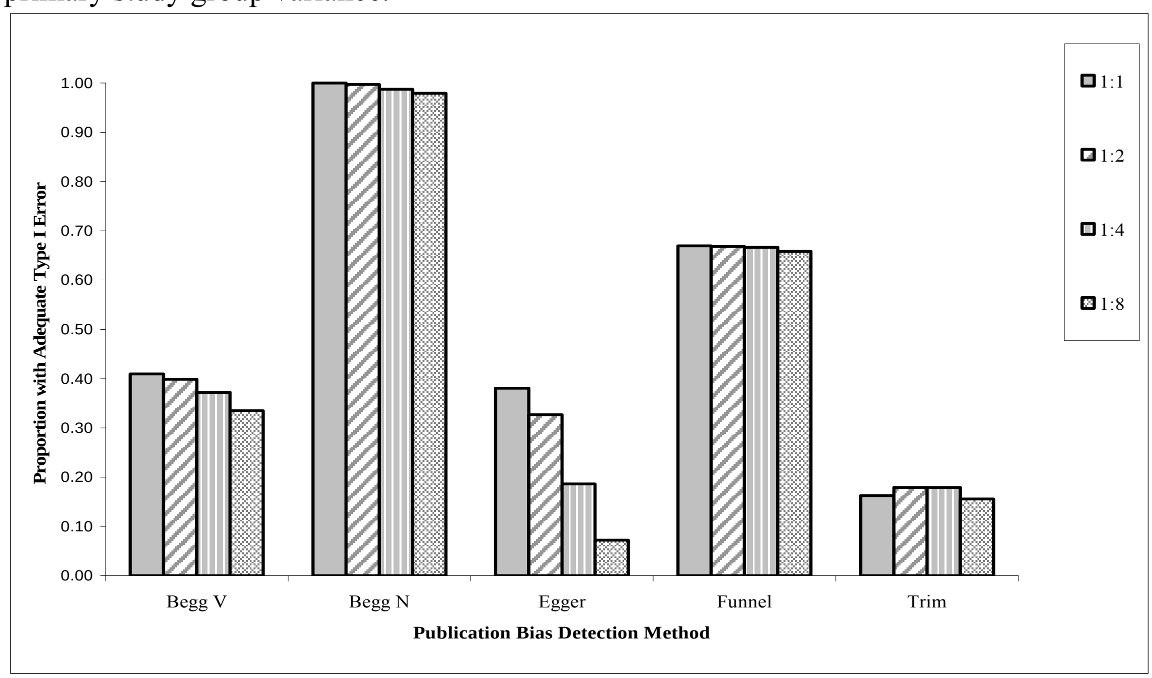

Figure 13. Proportion of conditions with adequate Type I error for each method to detect publication bias by primary study group variance.

rates for the publication bias detection methods across primary group variances are presented in Table 9 and Figure 12.

All of the methods to detect publication bias had declining proportions of conditions with adequate Type I error control when the primary study group variances increased in heterogeneity, except the Trim and Fill and Funnel Plot Regression methods which were stable across values of heterogeneity. The method with the best performance in regards to proportions of conditions with adequate Type I error control was the Begg Rank Correlation (N) method which ranged from 98% (Variance 1:8) to 100% (Variance 1:1). The method with the next best Type I error control performance across primary study group variance values was the Funnel Plot Regression with proportions ranging from 66% (Variance 1:8) to 67% (1:1). The proportion of studies with adequate Type I error control across values of primary study group variance did not exceed 50% for the Begg Rank Correlation (V), Egger Regression, and Trim and Fill methods. The proportions of conditions with adequate Type I error control across values of primary study group variance are presented in Table 10 and Figure 13.

Magnitude of Population Effect Size Impact

All of the average Type I error rates for the methods to detect publication bias increased as the population effect size magnitude increased. The Type I error rate upward trend was very small for the Begg Rank Correlation (N) and Funnel Plot Regression methods. The Begg Rank Correlation (N) average Type I error rates increased from 0.0541 (Δ=0.0) to 0.0581 (Δ=0.8). Similarly, the Funnel Plot Regression average Type I error rates increased from 0.0325 (Δ=0.0) to 0.0361 (Δ=0.8). The Trim and Fill

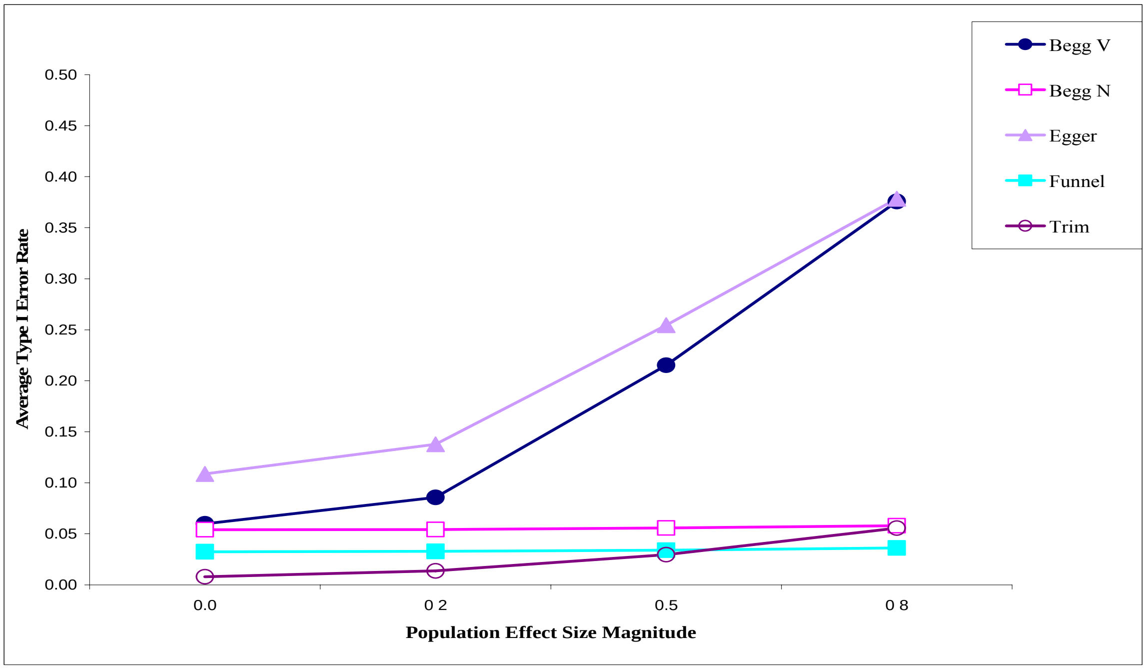

Figure 14. Average Type I error rates for each method to detect publication bias by population effect size magnitude.

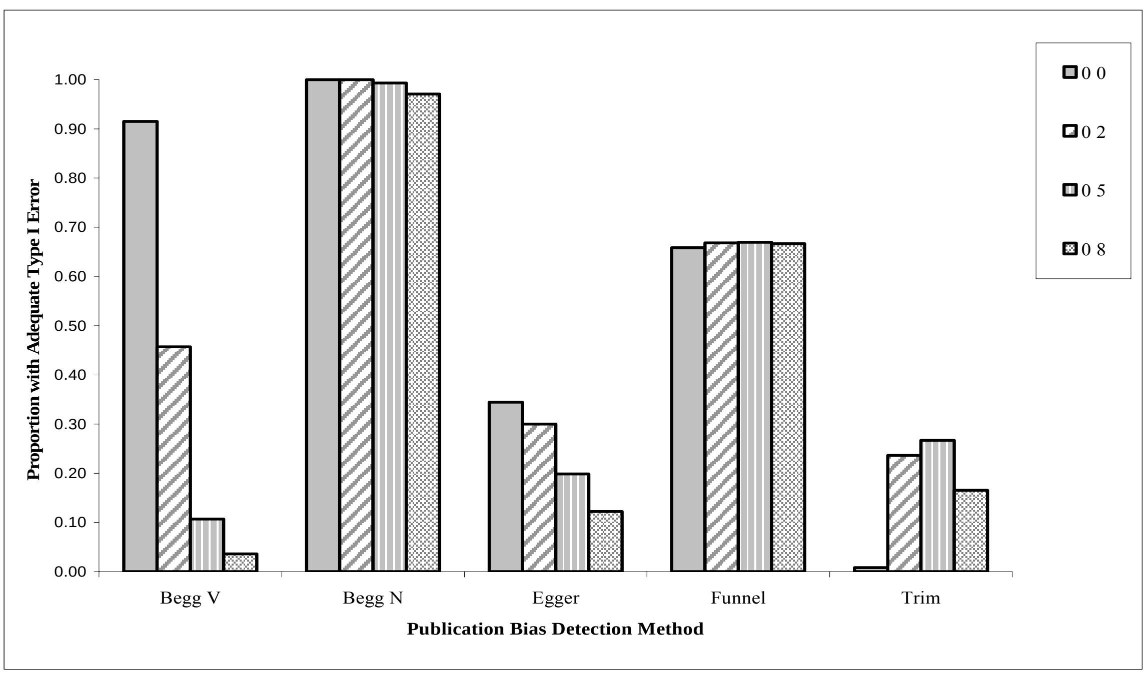

Figure 15. Proportion of conditions with adequate Type I error for each method to detect publication bias by population effect size magnitude.

method Type I error rate average was well below the nominal 0.05 value when the population effect size was 0.0 (M=0.0079) and increased to the nominal 0.05 value with a large effect size (M=0.0556, Δ=0.8). Both the Begg Rank Correlation (V) and the Egger Regression methods had sharp increases in average Type I error rates as the population effect size increased, with values as high as 0.3758 and 0.3784 when the effect size was large (Δ=0.8). Table 9 and Figure 14 present the average Type I error rates for the methods to detect publication bias by population effect size.

The proportion of conditions with adequate Type I error control decreased as the population effect size increased with the Begg Rank Correlation (V), Begg Rank Correlation (N), and Egger Regression methods. However, the Begg Rank Correlation (N) method was still exhibiting a consistently high proportion of conditions with adequate Type I error control (97%, Δ=0.8 to 100%, Δ=0.0). The Trim and Fill method had varying proportions of conditions with adequate Type I error control across values of population effect size, although they were all low (0%, Δ=0.0 to 27% Δ=0.5). Lastly, the Funnel Plot Regression method had consistent proportions of conditions with adequate Type I error control across values of the population effect size (66%, Δ=0.0 to 67%, Δ=0.2). Table 10 and Figure 15 present the proportion of studies with adequate Type I error control for the methods to detect publication bias by population effect size.

Variance of Population Effect Size Impact

The average Type I error rates of the Begg Rank Correlation (N) method, which were close to the nominal 0.05 value, were not impacted by the population effect size variance. Three of the methods had increasing average Type I error rates as the population effect size variance increased: Begg Rank Correlation (V), Egger Regression,

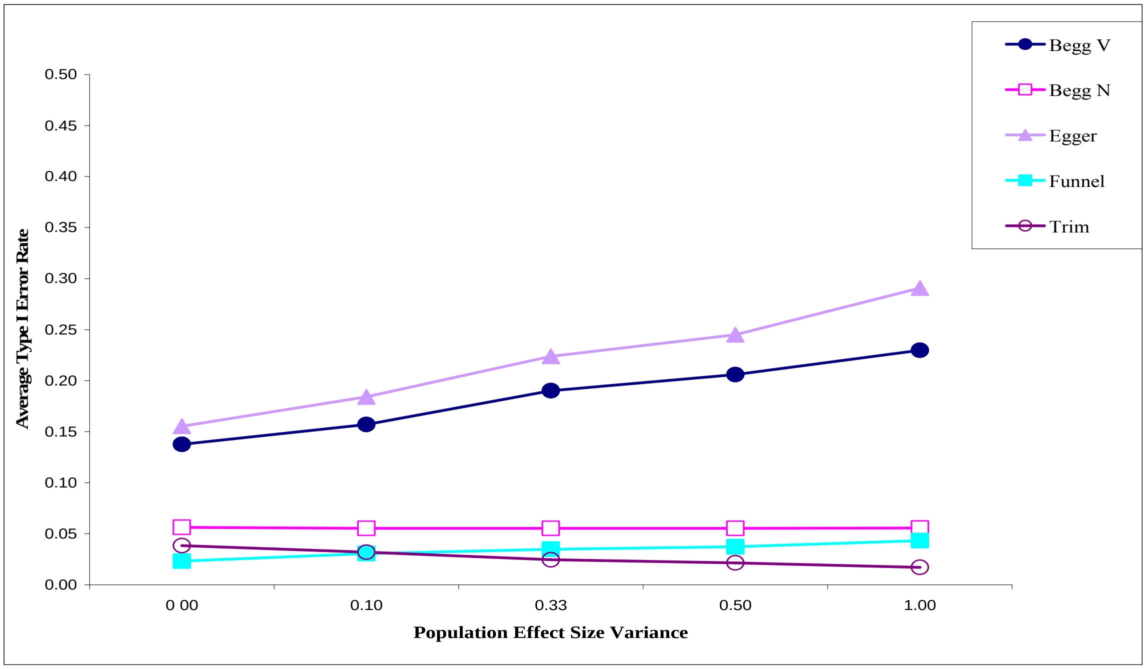

Figure 16. Average Type I error rates for each method to detect publication bias by population effect size variance.

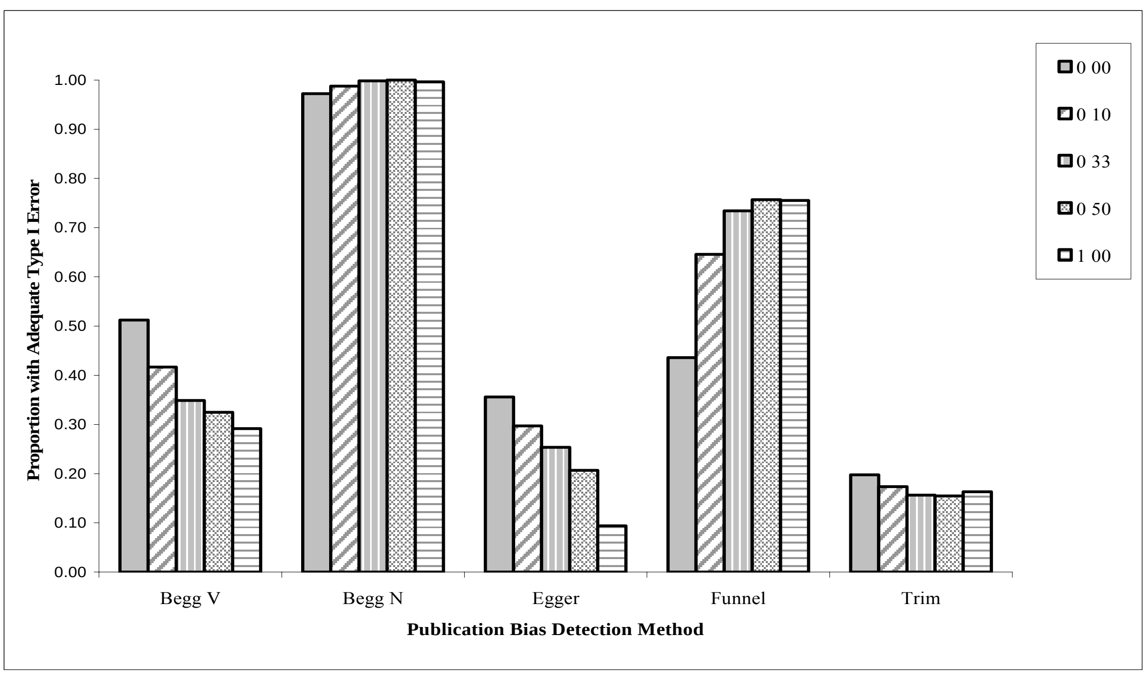

Figure 17.Proportion of conditions with adequate Type I error for each method to detect publication bias by population effect size variance.

and Funnel Plot Regression. However, the average Type I error rates of the Begg Rank Correlation (V) and Egger Regression methods were well above 0.05 for all of the population effect size variance values (0.1376 to 0.2909). In contrast the Funnel Plot Regression method average Type I error rates were below the value of 0.05 for all values of the population effect size variance (0.0232 to 0.0433). The only method with a declining average Type I error rate as the population effect size variance increased was the Trim and Fill method. The average Type I error rates decreased from 0.0385 (τ^2 = 0.00) to 0.0171 (τ^2 = 1.00). The average Type I error rate trends across population effect size variance values for each of the detection methods are presented in Table 9 and Figure 16.

The two better performing methods, Begg Rank Correlation (N) and Funnel Plot Regression, had increasing proportions of adequate Type I error control as the population effect size variance increased. The proportion of conditions with adequate Type I error control for the Begg Rank Correlation (N) were all greater than or equal to 97%. The Funnel Plot Regression method had proportions of conditions with adequate Type I error control ranging from 44% (τ^2 = 0.0) to 76% (τ^2 = 0.50). There was a declining trend in the proportion of conditions with adequate Type I error rates as the population effect size variance increased for the Begg Rank Correlation (V) and the Egger Regression methods. In addition, the proportion of conditions meeting the Type I error rate criteria was equal to or less than 51% for the Begg Rank Correlation (V) and the Egger Regression methods. The Trim and Fill method proportions of adequate Type I error control decreased as the population effect size variance increased until the population effect size variance reached 1.00, where a slight increase occurred. Regardless of the population effect size the proportions for the Trim and Fill method stayed below 20% across population effect size variance. The proportions of adequate Type I error control across population effect size variance conditions are presented in Table 10 and Figure 17.

Summary

Across the study conditions, it is evident that the Begg Rank Correlation (N) method had the best performance in regards to Type I error control. When the average Type I error rates were investigated the Begg Rank Correlation (N) method was consistently around the 0.05 level, ranging from 0.0649 (k=10) to 0.0513 (k=50) and an overall total average of 0.0556. The proportion of conditions with adequate Type I error rates was very high across all the study conditions for the Begg Rank Correlation (N) as well, ranging from 97% (n1=12 and n2=8) to 100% (multiple conditions) and an overall total of 99%.

The number of studies included in the meta-analysis, primary study sample size, and population effect size variance did not seem to have a consistent affect on the Type I error performance of the methods. In other words, some of the methods exhibited increases in average Type I error rates (or proportion with adequate Type I error) as the condition value increased, while others exhibited decreases in average Type I error rates (or proportion with adequate Type I error) as the condition value increased. The primary study group variance appears to impact the Type I error of the methods, as the primary group variance increased the average Type I error rates increased (conversely the proportion of conditions with adequate Type I error rates decreased). Similarly, the population effect size magnitude appears to impact the Type I error of the methods, as the primary group variance increased the average Type I error rates increased (conversely the proportion of conditions with adequate Type I error rates decreased).

Power Estimates of Methods to Detect Publication Bias

The other gauge for performance of the methods to detect publication bias investigated was the estimated power available or the proportion of times the method accurately indicated that there was publication bias. Since power estimates for conditions with inadequate Type I error rates can be misleading, the power estimates presented in this research are for conditions with adequate Type I error control according to the criterion for liberal robustness presented by Bradley (1978). Since there may be researchers who would like to look up power estimates for specific conditions a complete reporting of all of the power estimates for each condition is presented in Appendix D. A sample has been excerpted here (see Table 11 to Table 15) for discussing the power estimates where the primary study sample size was equal (n1=n2=50) and the group variance was 1:1 and 1:4. Each table represents a different value of the population effect size variance. As was discussed in the section on Type I error rates there were few conditions where the Type I error rates were adequate for the Trim and Fill and Begg Rank Correlation (V) methods which is reflected in the lack of power estimates for these methods (see Table 11 to Table 15).

There are several trends that are apparent across the sample of power estimates presented in Table 11 to Table 15. First, the power estimates increased as the number of studies included in the meta-analysis increased. For example, in Table 11 when the population effect size variance was 0.0, population effect size was 0.50, and publication bias was strong the power estimates for the Begg Rank Correlation (N) method increased with larger numbers of studies (k=10, 0.0781 to k=100, 0.3289). Another pattern was that as the population effect size variance increased the power estimates decreased. For example, the power estimates for the Begg Rank Correlation (N) under homogeneous group variance, number of studies included in the meta-analysis of 100, strong publication bias, and small population effect size conditions decreased across population effect size variance values from 0.3447 (0.0) to 0.0573 (1.00) (see Table 11 to Table 15). Overall the Begg Rank Correlation (V) method had greater power than the Begg Rank Correlation (N) method. For example, when the population effect size variance was 0.50 (Table 14), the primary study group variance was homogeneous (1:4), and the population effect size was 0.0, across all the values of number of primary studies included and strength of publication bias the Begg Rank Correlation (V) method had greater power estimates compared to the Begg Rank Correlation (N) method.

Table 11. Power estimates when primary study sample size is equal (50) and population effect size variance is 0.00.

Homogeneous Group Variances (1:1)

		Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
k	Pub Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
10	Mod	0.0635	0.0652	----	----	----	0.0811	0.0733	----	----	----	0.0801	0.0703	----	----	----	0.0691	0.0594	----	----	----
	Str	0.0731	0.0714	----	----	----	0.1173	0.1060	----	----	----	0.1003	0.0781	----	----	----	0.0740	0.0620	----	----	----
20	Mod	0.0566	0.0567	0.0595	----	----	0.0812	0.0649	0.0520	----	----	0.1022	0.0658	0.0552	----	----	0.0791	0.0521	0.0447	----	----
	Str	0.0650	0.0626	0.0784	----	----	0.1473	0.1120	0.0820	----	----	0.1541	0 1007	0.0837	----	----	0.0937	0.0546	0.0491	----	----
50	Mod	0.0585	0.0544	0.0807	0.0428	----	0.1167	0.0843	0.0895	0.0442	----	0.1941	0.0970	0.1560	0.0533	0.1231	----	0.0492	0.1136	0.0322	0.0826
	Str	0.0617	0.0560	0.1137	0.0431	----	0.2743	0.2024	0.1536	0.0728	----	0.3403	0.1838	0.2697	0.0920	0.2432	----	0.0616	0.1716	0.0380	0.1225
100	Mod	0.0545	0.0517	0.0820	0.0432	----	0.1805	0.1205	0.1197	0.0603	0.0100	0.3587	0.1592	0.3020	0.0906	0.1657	----	0.0618	----	0.0412	0.1825
	Str	0.0609	0.0606	0.1137	0.0479	----	0.4775	0.3447	0.2321	0.1211	0.0044	0.6157	0.3289	0.5313	0.1786	0.3660	----	0.0924	----	0.0536	0.3064

Heterogeneous Group Variances (1:4)

		Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
k	Pub Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
10	Mod	0.0667	0.0671	0.0769	----	----	0.0833	0.0748	0.0666	----	----	0.0902	0.0674	0.0669	----	----	0.0780	0.0615	0.0633	----	----
	Str	0.0798	0.0732	0.1019	----	----	0.1196	0.1012	0.0996	----	----	0.1140	0.0855	0.0768	----	----	0.0885	0.0650	0.0694	----	----
20	Mod	0.0646	0.0592	0.1399	----	----	0.0933	0.0761	----	----	----	0.1164	0.0726	----	----	----	0.0950	0.0574	----	----	----
	Str	0.0690	0.0596	0.1924	----	----	0.1546	0.1213	----	----	----	0.1675	0 1030	----	----	----	0.1202	0.0620	----	----	----
50	Mod	0.0598	0.0576	----	0.0426	----	0.1278	0.0929	----	0.0476	0.0096	0.2223	0.1113	----	0.0687	0.1692	----	0.0580	----	0.0393	----
	Str	0.0649	0.0639	----	0.0554	----	0.2819	0.2062	----	0.0802	0.0118	0.3628	0.1903	----	0.1058	0.2880	----	0.0802	----	0.0490	----
100	Mod	0.0583	0.0555	----	0.0454	0.0253	0.2009	0.1278	----	0.0605	0.0240	----	0 1714	----	0 1135	----	----	0.0827	----	0.0565	----
	Str	0.0612	0.0565	----	0.0490	0.0285	0.4764	0.3435	----	0.1288	0.0183	----	0.3458	----	0.2158	----	----	0.1196	----	0.0756	----

Note. Cells with dashes (----) indicate that the condition did not have adequate Type I error control for reporting power.

Table 12. Power estimates when primary study sample size is equal (50) and population effect size variance is 0.10.

Homogeneous Group Variances (1:1)

		Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
k	Pub Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
10	Mod	0.0627	0.0671	----	----	----	0.0711	0.0638	----	----	----	0.0874	0.0662	----	----	----	0.0877	0.0593	----	----	----
	Str	0.0685	0.0691	----	----	----	0.0790	0.0699	----	----	----	0.1019	0.0726	----	----	----	0.0939	0.0587	----	----	----
20	Mod	0.0573	0.0571	0.0609	0.0373	----	0.0731	0.0595	0.0600	0.0403	----	0.1121	0.0612	0.0662	0.0396	----	----	0.0521	0.0699	0.0315	----
	Str	0.0585	0.0561	0.0691	0.0374	----	0.0893	0.0667	0.0674	0.0402	----	0.1483	0.0726	0.0876	0.0437	----	----	0.0599	0.0911	0.0337	----
50	Mod	0.0532	0.0506	0.0780	0.0471	----	0.0888	0.0584	0.0846	0.0500	----	----	0.0775	0.1347	0.0592	----	----	0.0538	----	0.0468	----
	Str	0.0553	0.0539	0.0979	0.0508	----	0.1332	0.0784	0.1167	0.0587	----	----	0 1138	0.2104	0.0758	----	----	0.0866	----	0.0666	----
100	Mod	0.0520	0.0463	0.0846	0.0478	----	0.1236	0.0606	0.1012	0.0524	----	----	0.0955	----	0.0716	0.0045	----	0.0779	----	0.0643	0.1257
	Str	0.0518	0.0508	0.1055	0.0534	----	0.2250	0.1047	0.1470	0.0694	----	----	0.1796	----	0.1096	0.0088	----	0.1240	----	0.0897	0.2637

Heterogeneous Group Variances (1:4)

		Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
k	Pub Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
10	Mod	0.0659	0.0651	0.0653	----	----	0.0730	0.0632	0.0678	----	----	0.0869	0.0639	0.0712	----	----	----	0.0617	0.0780	----	----
	Str	0.0678	0.0677	0.0720	----	----	0.0845	0.0731	0.0788	----	----	0.1125	0.0745	0.0830	----	----	----	0.0621	0.0858	----	----
20	Mod	0.0546	0.0537	----	0.0411	----	0.0718	0.0582	----	0.0395	----	0.1213	0.0658	----	0.0439	----	----	0.0588	----	0.0381	----
	Str	0.0634	0.0592	----	0.0493	----	0.0952	0.0703	----	0.0515	----	0.1565	0.0760	----	0.0508	----	----	0.0654	----	0.0429	----
50	Mod	0.0553	0.0499	----	0.0539	----	0.0916	0.0568	----	0.0527	----	----	0.0771	----	0.0623	0.0212	----	0.0769	----	0.0652	0.1145
	Str	0.0553	0.0548	----	0.0588	----	0.1425	0.0823	----	0.0663	----	----	0 1216	----	0.0868	0.0426	----	0.0946	----	0.0785	0.1990
100	Mod	0.0534	0.0490	----	0.0564	----	0.1356	0.0639	----	0.0606	0.0135	----	0.1063	----	0.0838	0.0251	----	0.0926	----	0.0793	----
	Str	0.0558	0.0512	----	0.0638	----	0.2360	0.1066	----	0.0788	0.0054	----	0.1870	----	0.1310	0.0237	----	0.1389	----	0.1168	----

Note. Cells with dashes (----) indicate that the condition did not have adequate Type I error control for reporting power.

Table 13. Power estimates when primary study sample size is equal (50) and population effect size variance is 0.33.

Homogeneous Group Variances (1:1)

		Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
k	Pub Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
10	Mod	0.0631	0.0696	----	----	----	0.0676	0.0648	0.0281	----	----	0.0902	0.0655	0.0299	----	----	----	0.0668	0.0386	----	----
	Str	0.0647	0.0639	----	----	----	0.0706	0.0655	0.0298	----	----	0.1051	0.0694	0.0341	----	----	----	0.0649	0.0435	----	----
20	Mod	0.0539	0.0523	0.0582	0.0410	----	0.0684	0.0572	0.0616	0.0415	----	----	0.0561	0.0735	0.0362	----	----	0.0572	0.0859	0.0363	----
	Str	0.0596	0.0625	0.0703	0.0482	----	0.0777	0.0578	0.0699	0.0417	----	----	0.0641	0.0844	0.0420	----	----	0.0613	0.1134	0.0396	----
50	Mod	0.0525	0.0542	0.0749	0.0586	----	0.0941	0.0543	0.0884	0.0550	----	----	0.0589	----	0.0523	----	----	0.0567	----	0.0523	----
	Str	0.0506	0.0485	0.0967	0.0541	----	0.1153	0.0616	0.1153	0.0603	----	----	0.0722	----	0.0616	----	----	0.0748	----	0.0612	----
100	Mod	0.0569	0.0548	0.0873	0.0593	----	----	0.0582	0.1051	0.0622	----	----	0.0719	----	0.0634	----	----	0.0670	----	0.0595	0.0060
	Str	0.0538	0.0514	0.1087	0.0599	----	----	0.0681	0.1367	0.0637	----	----	0.1033	----	0.0780	----	----	0.0995	----	0.0776	0.0045

Heterogeneous Group Variances (1:4)

		Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
k	Pub Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
10	Mod	0.0646	0.0659	0.0594	----	----	0.0736	0.0637	0.0670	----	----	----	0.0649	0.0687	----	----	----	0.0633	0.0894	----	----
	Str	0.0672	0.0653	0.0641	----	----	0.0809	0.0692	0.0661	----	----	----	0.0685	0.0802	----	----	----	0.0702	0.1022	----	----
20	Mod	0.0550	0.0548	----	0.0491	----	0.0705	0.0566	----	0.0470	----	----	0.0553	----	0.0449	----	----	0.0587	----	0.0430	----
	Str	0.0608	0.0556	----	0.0459	----	0.0819	0.0590	----	0.0518	----	----	0.0649	----	0.0480	----	----	0.0669	----	0.0495	----
50	Mod	0.0511	0.0491	----	0.0539	----	0.0995	0.0557	----	0.0605	----	----	0.0616	----	0.0684	----	----	0.0655	----	0.0644	0.0166
	Str	0.0537	0.0523	----	0.0626	----	0.1176	0.0563	----	0.0623	----	----	0.0832	----	0.0772	----	----	0.0832	----	0.0792	0.0256
100	Mod	0.0530	0.0523	----	0.0625	----	----	0.0599	----	0.0696	0.0134	----	0.0752	----	0.0742	0.0118	----	0.0805	----	0.0839	0.0220
	Str	0.0503	0.0512	----	0.0673	----	----	0.0661	----	0.0748	0.0107	----	0.1096	----	0.0983	0.0054	----	0.1091	----	0.1003	0.0165

Note. Cells with dashes (----) indicate that the condition did not have adequate Type I error control for reporting power.

Table 14. Power estimates when primary study sample size is equal (50) and population effect size variance is 0.50.

Homogeneous Group Variances (1:1)

		Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
k	Pub Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
10	Mod	0.0620	0.0635	0.0328	----	----	0.0646	0.0652	0.0326	----	----	----	0.0625	0.0381	----	----	----	0.0646	0.0444	----	----
	Str	0.0666	0.0673	0.0300	----	----	0.0705	0.0612	0.0318	----	----	----	0.0659	0.0408	----	----	----	0.0641	0.0525	----	----
20	Mod	0.0535	0.0498	0.0619	0.0411	----	0.0674	0.0540	0.0656	0.0419	----	----	0.0572	0.0792	0.0414	----	----	0.0557	----	0.0396	----
	Str	0.0558	0.0564	0.0725	0.0495	----	0.0793	0.0586	0.0765	0.0472	----	----	0.0616	0.0939	0.0466	----	----	0.0576	----	0.0395	----
50	Mod	0.0525	0.0490	0.0830	0.0545	----	0.0948	0.0563	0.0947	0.0583	----	----	0.0530	----	0.0537	----	----	0.0538	----	0.0510	----
	Str	0.0525	0.0502	0.0999	0.0579	----	0.1115	0.0570	0.1151	0.0618	----	----	0.0662	----	0.0613	----	----	0.0699	----	0.0598	----
100	Mod	0.0512	0.0495	0.0920	0.0552	----	----	0.0510	0.1116	0.0597	----	----	0.0586	----	0.0607	----	----	0.0632	----	0.0595	0.0042
	Str	0.0504	0.0485	0.1066	0.0588	----	----	0.0536	0.1355	0.0643	----	----	0.0790	----	0.0712	----	----	0.0895	----	0.0748	0.0015

Heterogeneous Group Variances (1:4)

		Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
k	Pub Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
10	Mod	0.0651	0.0630	0.0665	----	----	0.0709	0.0615	0.0716	----	----	----	0.0653	0.0750	----	----	----	0.0653	----	----	----
	Str	0.0689	0.0657	0.0719	----	----	0.0774	0.0684	0.0757	----	----	----	0.0676	0.0780	----	----	----	0.0717	----	----	----
20	Mod	0.0581	0.0545	----	0.0490	----	0.0737	0.0569	----	0.0483	----	----	0.0543	----	0.0488	----	----	0.0567	----	0.0479	----
	Str	0.0589	0.0555	----	0.0505	----	0.0845	0.0602	----	0.0506	----	----	0.0564	----	0.0472	----	----	0.0632	----	0.0489	----
50	Mod	0.0573	0.0541	----	0.0662	----	0.0987	0.0549	----	0.0655	----	----	0.0628	----	0.0704	----	----	0.0602	----	0.0632	----
	Str	0.0527	0.0513	----	0.0634	----	0.1203	0.0601	----	0.0741	----	----	0.0715	----	0.0750	----	----	0.0769	----	0.0776	----
100	Mod	0.0484	0.0480	----	0.0658	----	----	0.0547	----	0.0708	----	----	0.0647	----	0.0713	0.0113	----	0.0711	----	0.0807	0.0182
	Str	0.0556	0.0513	----	0.0726	----	----	0.0590	----	0.0747	----	----	0.0882	----	0.0878	0.0088	----	0.1024	----	0.0982	0.0085

Note. Cells with dashes (----) indicate that the condition did not have adequate Type I error control for reporting power.

Table 15. Power estimates when primary study sample size is equal (50) and population effect size variance is 1.00.

Homogeneous Group Variances (1:1)

		Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
k	Pub Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
10	Mod	0.0677	0.0638	0.0458	----	----	0.0687	0.0626	0.0441	----	----	----	0.0630	0.0547	----	----	----	0.0601	0.0709	----	----
	Str	0.0672	0.0651	0.0472	----	----	0.0734	0.0666	0.0471	----	----	----	0.0594	0.0520	----	----	----	0.0688	0.0727	----	----
20	Mod	0.0498	0.0564	0.0779	0.0514	----	0.0745	0.0568	0.0821	0.0528	----	----	0.0542	----	0.0447	----	----	0.0541	----	0.0463	----
	Str	0.0577	0.0582	0.0802	0.0556	----	0.0783	0.0567	0.0892	0.0532	----	----	0.0591	----	0.0468	----	----	0.0592	----	0.0461	----
50	Mod	0.0486	0.0507	0.0951	0.0592	----	----	0.0529	----	0.0634	----	----	0.0561	----	0.0631	----	----	0.0519	----	0.0572	----
	Str	0.0492	0.0490	0.1081	0.0630	----	----	0.0524	----	0.0636	----	----	0.0658	----	0.0685	----	----	0.0626	----	0.0618	----
100	Mod	0.0541	0.0494	----	0.0638	----	----	0.0518	----	0.0679	----	----	0.0597	----	0.0692	----	----	0.0580	----	0.0691	----
	Str	0.0586	0.0528	----	0.0735	----	----	0.0573	----	0.0731	----	----	0.0610	----	0.0692	----	----	0.0720	----	0.0723	----

Heterogeneous Group Variances (1:4)

		Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
k	Pub Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
10	Mod	0.0645	0.0636	----	0.0285	----	0.0704	0.0652	0.0741	----	----	----	0.0674	----	----	----	----	0.0621	----	0.0269	----
	Str	0.0668	0.0684	----	0.0286	----	0.0717	0.0610	0.0836	----	----	----	0.0630	----	----	----	----	0.0613	----	0.0267	----
20	Mod	0.0578	0.0541	----	0.0558	----	0.0722	0.0552	----	0.0556	----	----	0.0597	----	0.0563	----	----	0.0538	----	0.0535	----
	Str	0.0597	0.0576	----	0.0585	----	0.0771	0.0595	----	0.0611	----	----	0.0550	----	0.0555	----	----	0.0608	----	0.0590	----
50	Mod	0.0553	0.0521	----	0.0721	----	----	0.0521	----	0.0699	----	----	0.0505	----	0.0666	----	----	0.0566	----	0.0733	----
	Str	0.0546	0.0550	----	0.0764	----	----	0.0498	----	0.0672	----	----	0.0582	----	0.0721	----	----	0.0640	----	0.0764	----
100	Mod	0.0496	0.0492	----	0.0759	----	----	0.0514	----	0.0780	----	----	0.0577	----	0.0790	0.0147	----	0.0663	----	0.0812	0.0173
	Str	0.0500	0.0540	----	0.0781	----	----	0.0536	----	0.0809	----	----	0.0662	----	0.0876	0.0093	----	0.0740	----	0.0936	0.0112

Note. Cells with dashes (----) indicate that the condition did not have adequate Type I error control for reporting power.

Given that some power estimates are not reported for certain conditions because of inadequate Type I error control it is not appropriate to average across conditions. Thus, to examine the impact of each of the study conditions, the maximum power estimates for the methods to detect publication bias are presented for each of the study conditions in Table 16. The maximum power estimates are only reported for those conditions where adequate Type I error control was exhibited. The criterion used to determine the adequacy of the Type I error was Bradley's (1978) liberal robustness for the nominal value of 0.05 (0.025 to 0.075 was considered adequate). The maximum power estimates of the methods for detecting publication bias increased as the degree of publication bias increased (see Figure 18). The Begg Rank Correlation (V) and Begg Rank Correlation (N) had the largest maximum power estimates for the two values of publication bias; followed by Egger Regression, Funnel Plot Regression, and Trim and Fill.

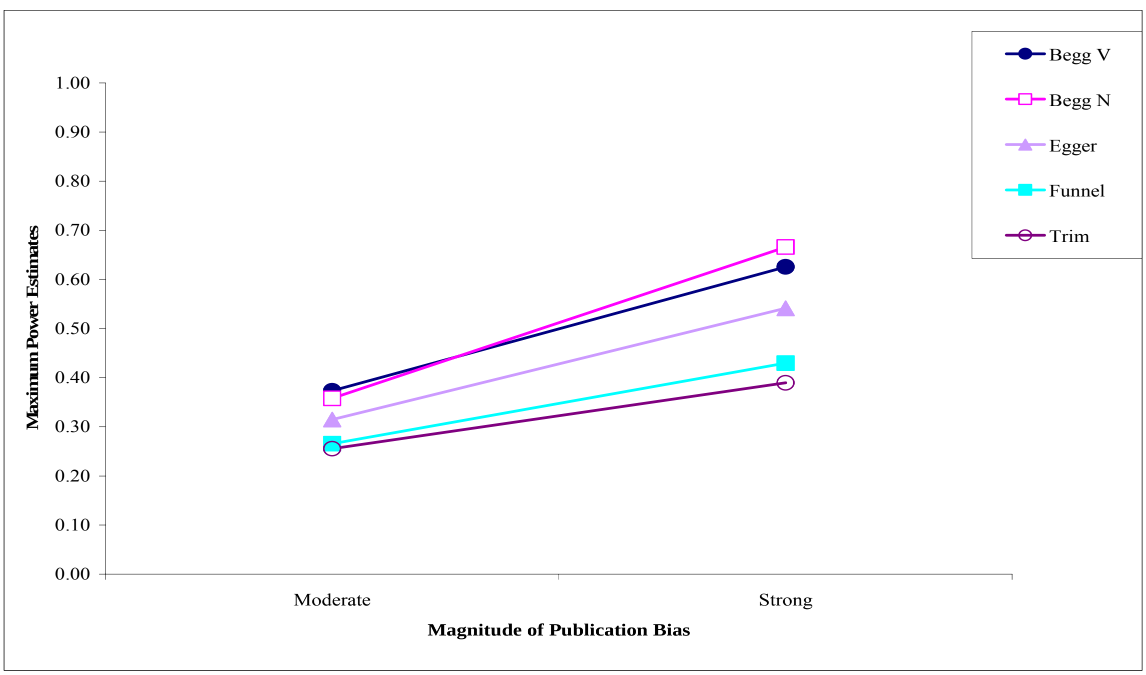

Figure 18. Maximum power estimates for methods to detect publication bias by magnitude of publication bias.

Table 16. Maximum power estimates for methods to detect publication bias by study conditions.

		Publication Bias Detection Method				
	N	Begg Rank Correlation (V) (Begg V)	Begg Rank Correlation (N) (Begg N)	Egger's Regression (Egger)	Funnel Plot Regression (Funnel)	Trim and Fill (Trim)
Number of Studies (k)						
10	1440	0.1634	0.1276	0.1867	0.0422	.
20	1440	0.2626	0.1808	0.1924	0.0792	.
50	1440	0.3664	0.3849	0.3221	0.2133	0.3196
100	1440	0.6256	0.6661	0.5414	0.4295	0.3894
Primary Study Sample Size (n1, n2)						
4,6	640	0.1164	0.4575	0.1422	0.1127	0.0314
5,5	640	0.1156	0.2093	0.1400	0.0735	0.0306
6,4	640	0.1187	0.1630	0.1460	0.0647	0.0287
8,12	640	0.2709	0.6661	0.1792	0.3732	0.2736
10,10	640	0.2692	0.4346	0.1844	0.2381	0.2651
12,8	640	0.2664	0.3358	0.1758	0.1461	0.2376
40,60	640	0.6196	0.5097	0.5414	0.4295	0.3865
50,50	640	0.6256	0.3716	0.5313	0.2463	0.3763
60,40	640	0.6237	0.3190	0.5315	0.1746	0.3894
Primary Study Group Variance						
1:1	1440	0.6237	0.3656	0.5414	0.1786	0.3660
1:2	1440	0.6256	0.4735	0.5364	0.2446	0.3894
1:4	1440	0.6011	0.5892	0.2232	0.3429	0.2897
1:8	1440	0.4795	0.6661	0.1867	0.4295	0.3196
Population Effect Size Magnitude						
0.0	1440	0.0881	0.0822	0.2232	0.0859	0.0285
0.2	1440	0.4855	0.5097	0.2667	0.2119	0.0366
0.5	1440	0.6256	0.5594	0.5414	0.4295	0.3854
0.8	1440	0.1920	0.6661	0.3666	0.3732	0.3894
Population Effect Size Variance						
0.00	1152	0.6256	0.6661	0.5414	0.4295	0.3894
0.10	1152	0.2371	0.4834	0.3819	0.2696	0.3003
0.33	1152	0.1415	0.2782	0.1721	0.1616	0.0312
0.50	1152	0.1203	0.2100	0.1398	0.1449	0.0283
1.00	1152	0.1045	0.1396	0.1081	0.0936	0.0322
Magnitude of Publication Bias						
Moderate	2880	0.3732	0.3579	0.3146	0.2654	0.2554
Strong	2880	0.6256	0.6661	0.5414	0.4295	0.3894

Note. Cells with a period (.) indicate that the condition did not have adequate Type I error control for reporting power.

Number of Primary Studies Impact

All of the maximum power estimates for the methods to detect publication bias increased as the number of studies included in the meta-analysis increased (see Figure 19). The maximum power estimates increased the most when k increased from 20 to 50 and then even more when k increased from 50 to 100. For example, the Begg Rank Correlation (N) had a small maximum power increase from k=10 to k=20 (0.05 increase), then a larger increase from k=20 to k=50 (0.20 increase), then an even larger increase from k=50 to k=100 (0.28 increase). Another example is the power estimates for the Egger Regression method, where there was little increase when k increased from 10 to 20 (0.1867 to 0.1924), then the increase in maximum power was greater when k increased from 20 to 50 (0.1924 to 0.3221), and even more increase in maximum power when k

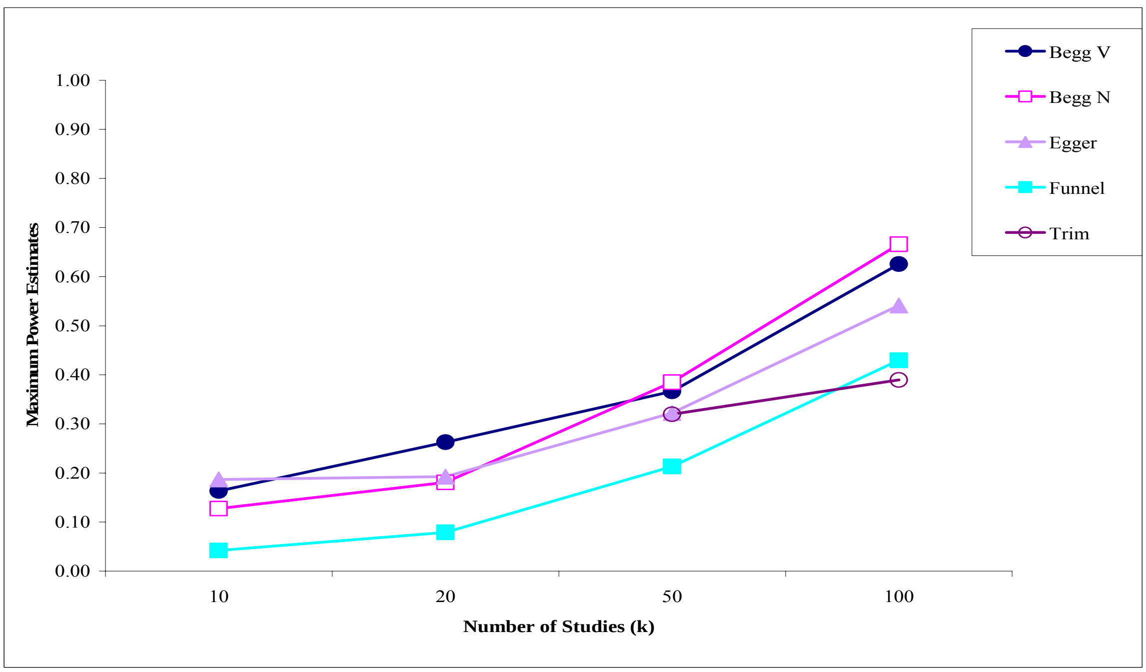

Figure 19. Maximum power estimates for methods to detect publication bias by number of studies.
Note. The Trim and Fill method did not have adequate Type I error control for the conditions when k=10 and when k=20.

increased from 50 to 100 (0.3221 to 0.5414). This indicates that for meta-analyses with 10 to 20 studies the maximum power is not impacted as much as when there are 50 to 100 studies in the meta-analysis.

Sample Size Impact

Overall as the primary study sample size increased the maximum power estimates of the methods to detect publication bias increased (see Figure 20). A good example is the Begg Rank Correlation (V) method with maximum power estimates which ranged from 0.1156 to 0.1187 when the average primary study sample size was 5, then they increased to range from 0.2664 to 0.2709 when the average primary study sample size was 10, and then increased again to range from 0.6256 to 0.6196 when the average primary study sample size was 50. The only method that did not have this pattern was the

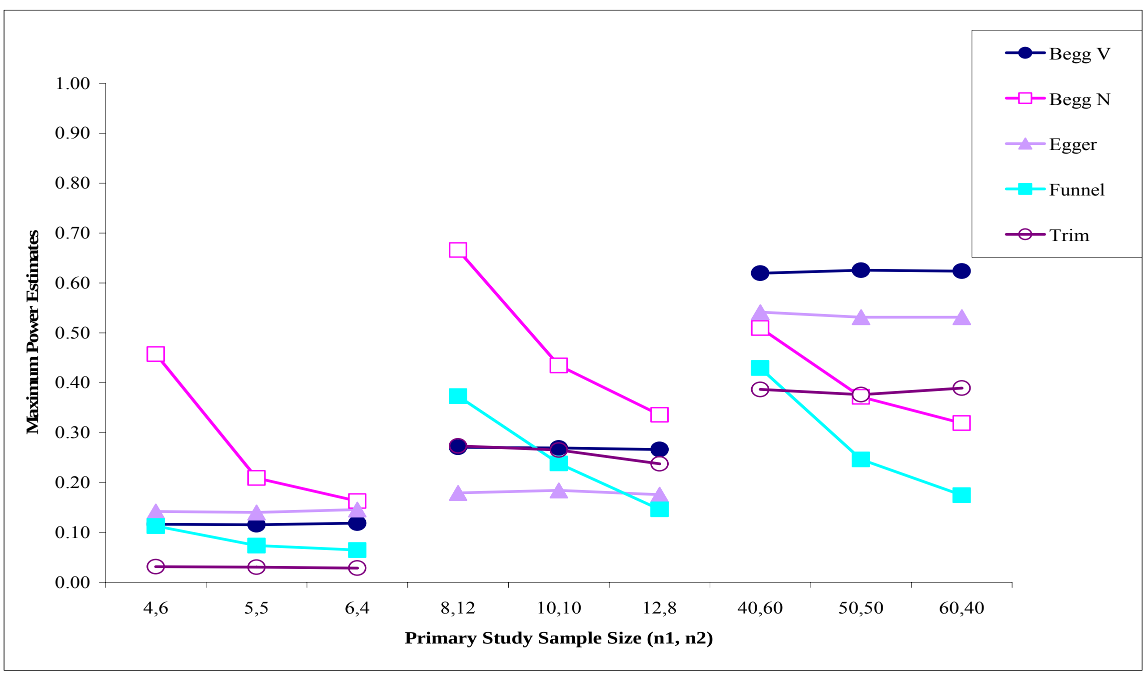

Figure 20. Maximum power estimates for methods to detect publication bias by primary study sample size.

Begg Rank Correlation (N) method which had the highest maximum estimates when the average sample size was 10 (0.3358 to 0.6661), rather than when the average sample size was 50 (0.3190 to 0.5097).

Group Variance Impact

The impact of primary study group variance on maximum power estimates differed across the methods to detect publication bias (see Figure 21). Two of the methods, Begg Rank Correlation (N) and Funnel Plot Regression, had increasing maximum power estimates as the primary study group variance became more heterogeneous. The Begg Rank Correlation (N) maximum power estimates increased from 0.3656 (1:1) to 0.6661 (1:8) and the Funnel Plot Regression maximum power estimates increased from 0.1786 (1:1) to 0.4295 (1:8). In contrast, two methods, Begg

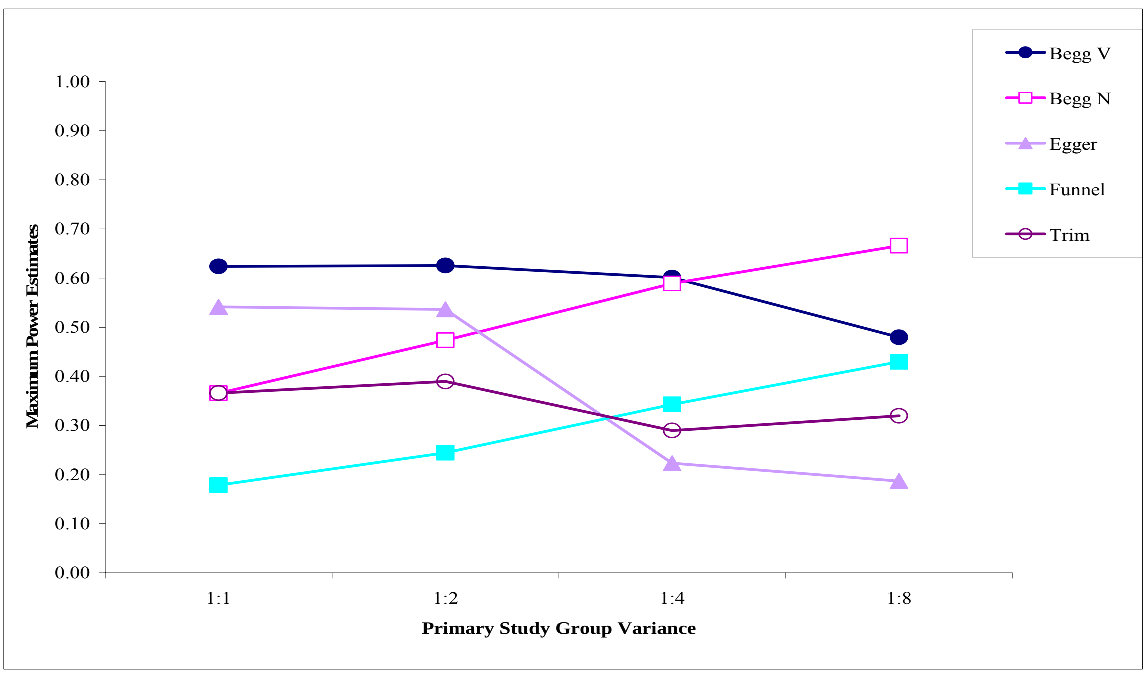

Figure 21. Maximum power estimates for methods to detect publication bias by primary study group variance.

Rank Correlation (V) and Egger Regression, had decreasing maximum power estimates as the primary study group variances became more heterogeneous. The Begg Rank Correlation (V) maximum power estimates decreased from 0.6237 (1:1) to 0.4795 (1:8) and the Egger Regression maximum power estimates decreased from 0.5414 (1:1) to 0.1867 (1:8). The Trim and Fill maximum power estimates were consistent across primary study group variances with a slight dip when the group variance was 1:4. (ranging from 0.2897 to 0.3894).

Magnitude of Population Effect Size Impact

As the magnitude of the population effect size increased from 0.0 to 0.5 the maximum power estimates of all of the methods increased (see Figure 22). However, some of the maximum power estimates for the methods decreased as the population effect size increased from 0.5 to 0.8. Specifically, the Begg Rank Correlation (V), Egger

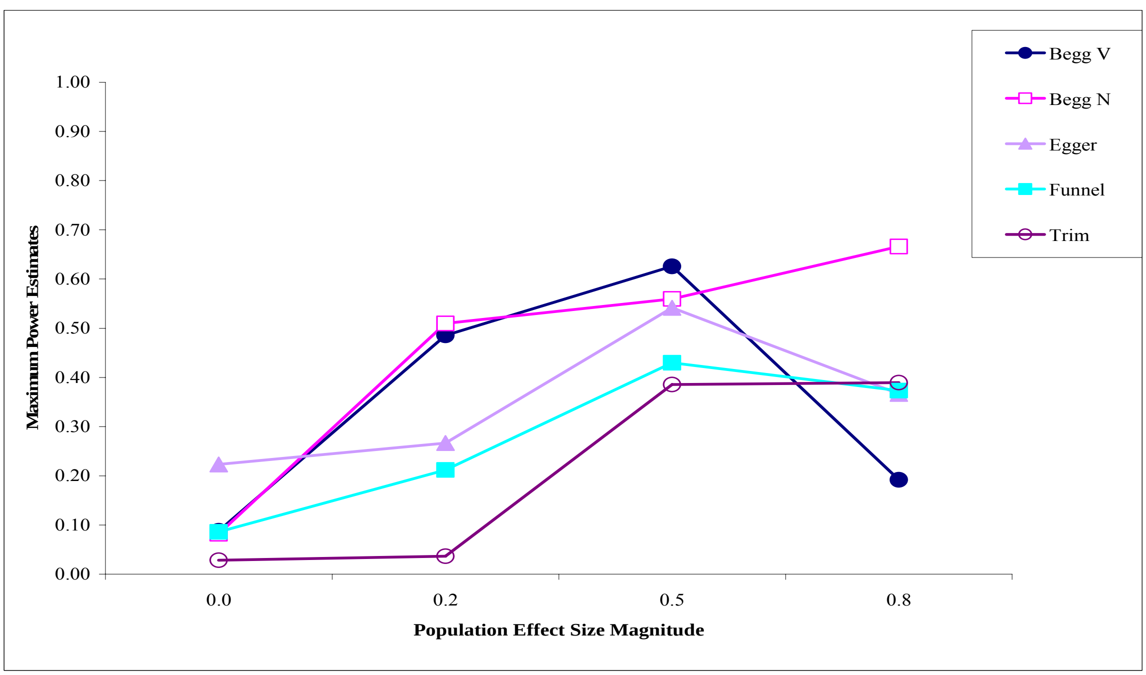

Figure 22. Maximum power estimates for methods to detect publication bias by population effect size magnitude.

Regression, and Funnel Plot Regression maximum power estimates decreased when the population effect size increased from 0.5 to 0.8. In contrast, the Begg Rank Correlation (N) and Trim and Fill maximum power estimates continued to increase when the population effect size increased from 0.5 to 0.8. The method with the overall highest maximum power estimates across values of the population effect size was the Begg Rank Correlation (N) with values ranging from 0.0822 (Δ=0.0) to 0.6661 (Δ=0.8).

Variance of Population Effect Size Impact

The maximum power estimates for all of the methods to detect publication bias decreased as the population effect size variance increased (see Figure 23). The Begg Rank Correlation (N) method had the largest maximum power estimates ranging from 0.6661 (τ^2 = 0.00) to 0.1396 (τ^2 = 1.00). The Trim and Fill method had the smallest maximum power estimates ranging from 0.3894 (τ^2 =0.00) to 0.0322 (τ^2 =1.00).

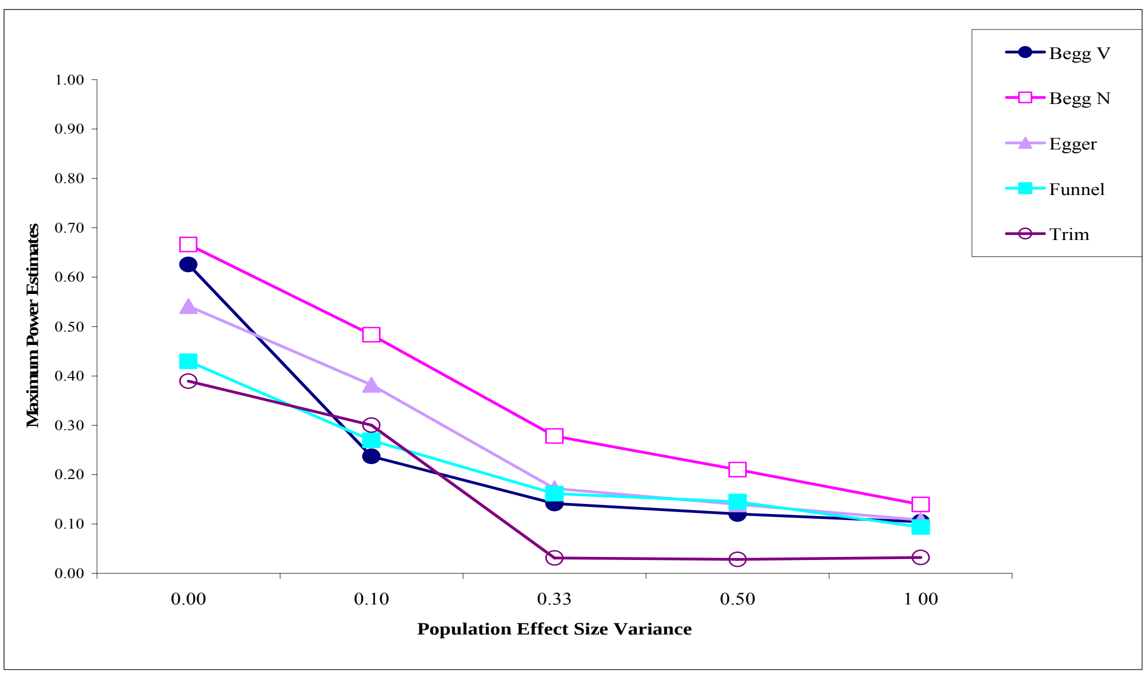

Figure 23. Maximum power estimates for methods to detect publication bias by population effect size variance

Summary

Several study conditions consistently impacted the maximum power estimates for the methods to detect publication bias. Specifically, the number of studies, primary study sample size, population effect size magnitude, and the publication bias magnitude produced increasing maximum power estimates as their values increased. One study condition, population effect size variance, produced decreasing maximum power estimates as its values increased. Lastly, the primary study group variance impacted the maximum power estimates differently depending on the method to detect publication bias. Regardless of the study conditions none of the statistical methods exhibited satisfactory power estimates.

CHAPTER FIVE: CONCLUSIONS

Summary of the Study

The phenomenon discussed by Rosenthal (1979) as the "file drawer problem", publication bias, occurs when researchers have studies that are sitting in their filing cabinets because they decided not to publish or were rejected by journals. Reasons for researchers to not submit studies or for journals to reject studies typically revolve around whether the results indicated significant findings, which are influenced by sample size, or large effects. In addition, published research can inadvertently contribute to publication bias when researchers exclude non-significant findings from results or report data poorly. Thus, there is a pattern in the published literature of a greater number of studies with significant findings and large effects.

Researchers conducting meta-analytic studies go to great lengths (or at least they should) to gather both published and unpublished studies on the content of their meta-analysis. This step in the meta-analysis design is time consuming but critical. When meta-analysts do not include unpublished studies, the results of the meta-analysis may be biased. Specifically, the meta-analysis results may indicate an inflated effect because the published studies are more likely to have significant results and large effects (Sharpe, 1997). Thus, publication bias is considered to be a threat to the validity of meta-analyses.

One method for detecting publication bias is the visual interpretation of a funnel plot (a scatterplot of effect sizes and sample sizes). However, the visual examination of the funnel plot is limited because the interpretation is subjective and the plot can be difficult to interpret when there are a small number of studies included in the meta-analysis (Greenhouse & Iyengar, 1994; Thornton & Lee, 2000). Consequently, some researchers have developed statistical methods for detecting publication bias that are not subjective. The following statistical methods for detecting publication bias have been introduced and applied in the literature: (1) Begg Rank Correlation, (2) Egger Regression, (3) Funnel Plot Regression, and (4) Trim and Fill.

Three issues drove the pursuit of this research: (1) publication bias is a problem which is underreported in meta-analyses, (2) both the impact of publication bias and the comparison of statistical methods for detecting publication bias are lacking in the literature, (3) publication bias issues have not been explored in random effects meta-analysis models. A wealth of literature documents the phenomenon of publication bias and the statistical bias that it presents to meta-analysts (Begg, 1994; Greenhouse & Iyengar, 1994; Rosenthal & Rubin, 1979; Sharpe, 1997; Smith, 1980; Sterling, 1959; Sutton, Abrams, Jones, Sheldon, & Song, 2000). This problem is compounded by the infrequent acknowledgement and application of methods for detecting (or adjusting for) publication bias. The second issue may be the reason why publication bias detection methods are inconsistently being implemented, there are few empirical investigations of the degree to which publication bias impacts meta-analysis results or the comparison of statistical methods to detect publication bias (Begg & Mazumdar, 1994; Bradley & Gupta, 1997; Duval & Tweedie, 2000a; Duval & Tweedie, 2000b; Macaskill, Walter, & Irwig, 2001; Rendina-Gobioff & Kromrey, 2004; Schwarzer, Antes, & Schumacher, 2002; Sterne, Gavaghan, & Egger, 2000). Lastly, there is a need in the literature to examine the impact of publication bias and the performance of publication bias detection methods within the random effects meta-analysis model.

There were two primary goals overarching this research endeavor: (1) examine the degree to which publication bias impacts the results of a random effects meta-analysis and (2) investigate the performance of five statistical methods for detecting publication bias in random effects meta-analysis. First, the impact on the meta-analysis results was estimated by examining the difference between the population effect size and the estimated meta-analysis effect size. Similarly, the impact on the meta-analysis results was estimated by examining the difference between the population effect size variance and the estimated meta-analysis effect size variance. Second, the performance of the five statistical methods (Begg Rank Correlation (V), Begg Rank Correlation (N), Egger Regression, Funnel Plot Regression, and Trim and Fill) was estimated with Type I error rates and statistical power.

This research simulated meta-analyses using a Monte Carlo design. The use of simulation methods allowed for the control and manipulation of research design factors and the incorporation of sampling error into the analyses. The first and second steps in the simulation were to generate observations in primary studies under known population conditions and to compute the effect size. The next step in the simulation was to impose the publication bias using the obtained p-values from the primary studies. The following two steps included computing the meta-analysis mean effect size and the statistical tests for publication bias. The final step in the research was to compute the analyses for determining the performance of the statistical tests for publication bias, Type I error rate and power estimates. In addition, the impact of imposing publication bias on the meta-analysis estimated mean effect size and variance was calculated.

The simulation was modeled after that reported by Macaskill, Walter and Irwig (2001) and Rendina-Gobioff and Kromrey (2004), but extends to random effects meta-analyses. For each primary study, the Hedges's g effect size (Hedges & Olkin, 1985) was calculated based on the simulated data. The Monte Carlo study included six factors in the design. These factors were (a) the number of primary studies in each meta-analysis (10, 20, 50, and 100), (b) the sample sizes of the two groups in each primary study (with mean total sample sizes ranging from 10 to 100 as well as balanced and unbalanced conditions), (c) group variances in the primary studies (variance ratios of 1:2, 1:4, and 1:8, as well as a homogeneous variance condition), (d) the magnitude of the population effect size (Δ = 0.00, 0.20, 0.50, 0.80), (e) the variance of the population effect size (τ^2 = 0, .10, .33, .50, and 1.00), and (f) the magnitude of the publication bias (no bias, moderate bias, and strong bias).

The proportions of studies available for each meta-analysis are presented as confirmation of the methods used to impose publication bias. The impact that publication bias had on the outcomes of meta-analyses was evaluated by examining the estimated mean effect size and estimated effect size variance compared to the population effect size magnitude and variance values. The performance of the statistical methods to detect publication bias was evaluated in regards to Type I error rates and estimated power. Type I error is reported for each study condition two ways, average rate and proportion with adequate rates. Lastly, maximum power estimates are reported for each study condition.

Research Questions

1. To what extent will publication bias impact the estimated mean effect size and estimated variance in a random effects meta-analysis?
    a. To what extent does the number of primary studies included in the meta-analysis moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?
    b. To what extent does the mean sample size of groups (including balanced and unbalanced) in the primary studies included in the meta-analysis moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?
    c. To what extent do the group variances (homogeneous and heterogeneous) in the primary studies included in the meta-analysis moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?
    d. To what extent does the magnitude of the population effect size moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?
    e. To what extent does the variance of the population effect size moderate the impact of publication bias on the estimated mean effect size and variance calculated for the meta-analysis?
2. To what extent do Type I error rates vary across statistical methods for detecting publication bias in a random effects meta-analysis?

a. To what extent does the number of primary studies included in the meta-analysis impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

b. To what extent does the mean sample size of groups (including balanced and unbalanced) in the primary studies included in the meta-analysis impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

c. To what extent do the group variances (homogeneous and heterogeneous) in the primary studies included in the meta-analysis impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

d. To what extent does the magnitude of the population effect size impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

e. To what extent does the variance of the population effect size impact the extent that Type I error rates vary across statistical methods for detecting publication bias?

3. To what extent do power estimates vary across statistical methods for detecting publication bias in a random effects meta-analysis?

   a. To what extent does the number of primary studies included in the meta-analysis impact the extent that power estimates vary across statistical methods for detecting publication bias?

b. To what extent does the mean sample size of groups (including balanced and unbalanced) in the primary studies included in the meta-analysis impact the extent that power estimates vary across statistical methods for detecting publication bias?
c. To what extent do the group variances (homogeneous and heterogeneous) in the primary studies included in the meta-analysis impact the extent that power estimates vary across statistical methods for detecting publication bias?
d. To what extent does the magnitude of the population effect size impact the extent that power estimates vary across statistical methods for detecting publication bias?
e. To what extent does the variance of the population effect size impact the extent that power estimates vary across statistical methods for detecting publication bias?

Summary of Study Results

The proportion of studies available for the meta analyses increased as the primary study sample size, primary study group variance, population effect size and population effect size variance increased. In contrast, the proportion of studies available for the meta-analyses decreased as the magnitude of publication bias increased. These proportions are consistent with publication bias theory regarding the types of studies available to the meta-analyst. Specifically, studies with large sample sizes and large effect sizes are expected to be available to the meta-analyst (Begg, 1994; Lipsey & Wilson, 1993; Sharpe, 1997; Smith, 1980; Sterling, 1959; Sutton et al., 2000). The studies with large primary study group variance and population effect size variance would be published under conditions where the population effect size is large (Begg, 1994; Sutton et al., 2000). Begg (1994) indicated that sample size of the primary study has the greatest influence on publication bias. In this study the simulation of publication bias resulted in the largest range of proportions of studies available to the meta-analyst under the primary study sample size condition.

Impact of Publication Bias

The impact of publication bias was evaluated by the average amount that the estimated mean effect size varied from the population effect size and the average amount that the estimated effect size variance varied from the population effect size variance. A substantial amount of effect size bias was evidenced with both moderate and strong publication bias, compared to no publication bias. Similarly, effect size variance bias was evident for moderate and strong publication bias, compared to no publication bias. The inflated effect size magnitude and inflated effect size variance are consistent with the literature regarding the influence of publication bias on the results of meta-analyses. Several researchers have alluded to or empirically investigated the phenomenon that the results of a meta-analysis with publication bias will have inflated estimates of the mean effect size (Begg, 1994; Bradley & Gupta, 1997; Lipsey & Wilson, 1993; Sharpe, 1997; Smith, 1980; Sutton et al., 2000)

Several of the study conditions impacted the effect size magnitude and variance estimates in the same way. One moderator, primary study sample size, was found to have a positive impact on effect size magnitude and variance bias, increasing accuracy. The increasing accuracy found with increasing sample size was expected because the distribution of studies approaches normality, as sample size increases, which would increase the accuracy of the mean and variance estimates. One moderator, primary study group variance, was found to have a negative impact on effect size magnitude and variance bias, decreasing accuracy. The primary study group variance has the opposite effect on the distribution of studies, when compared to the influence of primary study sample size, as group variance increases the distribution deviates from normality and thus decreases accuracy of the mean and variance estimates. Two moderators had a very slight impact on the effect size magnitude and variance bias; number of primary studies and population effect size variance. The number of primary studies would be expected to increase the accuracy of the mean and variance estimates as the value increased because the distribution of studies would approach normality. This effect was found to be very small. The population effect size variance would be expected to distort the distribution of studies from normality and thus would be expected to decrease the accuracy of estimates. This pattern was found to be very small as well. These findings of increased bias in Hedges's g effect size under conditions of smaller sample sizes, increased group variance and increased non-normality are consistent with results found by Hess, Kromrey, Ferron, Hogarty, and Hines (2005).

One study condition impacted the estimates of the population effect size magnitude and variance differently. Specifically, the population effect size magnitude had a negative impact on the effect size magnitude bias and a positive impact on the effect size variance bias. Thus as the population effect size increased the effect size magnitude estimate became less accurate and the effect size variance estimate became more accurate. One explanation for this impact is that when the population effect size is zero publication bias theory would project that studies in the upper and lower tails of the distribution would be published. Under these conditions, the estimate for the effect size magnitude would be balanced by the publications on both ends of the distribution resulting in an estimate close to the population value. The effect size variance estimate under these conditions would be inflated by the publications in the tails of the distribution. In contrast publication bias theory would expect that when the effect size is large the studies published would include all of the distribution except those studies in the smaller tail. Under these conditions the effect size magnitude estimate would be inflated because of the suppression of just the lower tail, smaller effect size, studies. The effect size variance estimate would approach the population effect size variance because the range of effect sizes published is wider (compared to the small effect size condition explained earlier).

Type I Error Rates of Methods to Detect Publication Bias

The performance of five methods to detect publication bias were evaluated by examining average Type I error rates and the proportion of meta-analyses with adequate Type I error control. The Begg Rank Correlation (N) method exhibited the best Type I error control in regards to both average and proportion with adequate control. Across study conditions, the Begg Rank Correlation (V) and Egger Regression methods exhibited large average Type I error rates and small proportions of studies with adequate Type I error control. The Funnel Plot Regression method exhibited small average Type I error rates and moderate proportions with adequate Type I error control across study conditions. Although the Trim and Fill method exhibited small average Type I error rates across study conditions, the error rates were too small to be considered adequate as evidenced by the small proportion of conditions with adequate Type I error control.

In theory the Type I error rates should be robust to the study conditions; number of studies, primary study sample size, and population effect size magnitude (Glass & Hopkins, 1996). The Begg Rank Correlation (N), Funnel Plot Regression, and Trim and Fill methods approached the nominal 0.05 value as the number of studies increased. In contrast, both the Begg Rank Correlation (V) and Egger Regression methods increased beyond the nominal 0.05 value as the number of studies increased. Consistent with robustness theory, as the primary study sample size condition values increased Type I error rates approached 0.05 with the Begg Rank Correlation (V), Begg Rank Correlation (N), Egger Regression, and Funnel Plot Regression methods. In contrast, the Trim and Fill method Type I error rates decreased well below the nominal 0.05 value as the primary study sample size increased. The Begg Rank Correlation (N), Funnel Plot Regression, and Trim and Fill methods exhibited Type I error rates approaching 0.05 as the population effect size increased. In contrast, the Begg Rank Correlation (V) and Egger Regression method Type I error rates increased beyond the nominal 0.05 value as the population effect size increased. To summarize, the Begg Rank Correlation (N), Funnel Plot Regression, and Trim and Fill methods are exhibiting Type I error rate performance that is consistent with theory regarding the robustness of statistical methods (Glass & Hopkins, 1996).

Type I error rates should deviate from the nominal 0.05 value when study conditions have greater heterogeneity and larger population effect size variance (Glass & Hopkins, 1996). The Begg Rank Correlation (V), Begg Rank Correlation (N), and Egger Regression methods to detect publication bias exhibited increasing Type I error rates as the primary study group variance increased, deviating from the nominal 0.05 value.

However the Begg Rank Correlation (N) method was still close to the 0.05 value across all values of primary study group variance. The Funnel Plot Regression and Trim and Fill methods also had increasing Type I error rates as the primary study group variance increased but they approached the nominal 0.05 value. The Type I error rates for the Begg Rank Correlation (V), Egger Regression, and Trim and Fill methods deviated from 0.05 as the population effect size variance increased. In contrast, the Funnel Plot Regression method Type I error rates approached the nominal 0.05 value. The Begg Rank Correlation (N) stayed around 0.05 value as the population effect size variance values increased. In summary, even under conditions that statistical methods should not be robust the Begg Rank Correlation (N) method exhibited robust Type I error rates.

Power Estimates of Methods to Detect Publication Bias

The performance of the statistical methods to detect publication bias was also evaluated by investigating the maximum power estimates across all study conditions and separately for each study condition. The power estimates were only reported for those conditions where Type I error control was adequate according to Bradley's (1978) liberal criteria. The maximum power estimates for all methods were greater when the strength of publication bias was large compared to when publication bias was small. The larger power estimates for the greater degree of publication bias is consistent with the well documented factors that influence statistical power, variance of the responses (study effect sizes) and effect size magnitude (Glass & Hopkins, 1996). In theory when publication bias is larger the variance of the study effect sizes would decrease and the effect sizes would be larger. When the publication bias imposed was moderate the maximum power estimates were small across all methods, with the greatest estimate being 0.3732 (Begg Rank Correlation V). The maximum power increased when publication bias was strong but was still low, with the greatest estimate being 0.6661 (Begg Rank Correlation N).

Three factors that in theory should increase statistical power are number of studies included, primary study sample size, and population effect size magnitude (Glass & Hopkins, 1996). The number of studies and the primary study sample size conditions consistently increased power estimates as their values increased across all methods. With the highest number of studies (k=100) the Begg Rank Correlation (V) and the Begg Rank Correlation (N) methods exhibited the highest maximum power estimates. However, when the number of studies included in the meta-analysis was small (k=10) the maximum power estimates for all methods were atrocious. The Begg Rank Correlation (N) method exhibited the best, although still low, maximum power estimates when the average sample size was small and medium. When the average sample size was large the Begg Rank Correlation (V) method had the highest maximum power estimates. All methods exhibited an increase in maximum power estimates as the population effect size magnitude increased to the moderate value of 0.50. However, some methods, Begg Rank Correlation (V), Egger Regression, and Funnel Plot Regression, had a small to large dip in the maximum power estimates when the population effect size was large (Δ=0.8).The highest maximum power estimate across methods for the population effect size magnitude condition was the Begg Rank Correlation (N).

Two study conditions that were expected to negatively impact power estimates were the primary study group variance and the population effect size variance. Both of these conditions would increase variation in the response variable, effect sizes, and thus decrease power estimates. Across all methods the population effect size variance condition did exhibit decreasing maximum power estimates as the variance increased. The highest maximum power estimates were for the Begg Rank Correlation (V) and Begg Rank Correlation (N) methods when there was no population effect size variance. The maximum power estimates were very low when the population effect size variance was large (1.00) across all methods. The maximum power estimates were impacted differently across the methods by the primary study group variance. Consistent with the expected impact of primary study group variance on power estimates, the power estimates decreased as group variance increased for the Begg Rank Correlation (V), Egger Regression, and Trim and Fill methods. In contrast the Begg Rank Correlation (N) and Funnel Plot Regression methods exhibited increasing maximum power estimates as group variance increased.

Regardless of the study condition or the detection method employed the maximum power estimates were low. The highest estimate was 0.6661 which was much lower than the desired 0.80 power estimate. In addition, for many conditions the maximum power estimates were below 0.30.

Discussion

The inflated effect size estimates revealed in this research are consistent with previous research regarding the impact of publication bias (Begg, 1994; Bradley & Gupta, 1997; Lipsey & Wilson, 1993; Sharpe, 1997; Smith, 1980; Sutton et al., 2000). Therefore, the results of a meta-analysis conducted that has publication bias are likely to falsely indicate that there is a larger effect than reality. This inflation is especially problematic because the results of a meta-analysis often are more influential than primary studies because they are the synthesis of multiple studies with perceived additional precision (Begg, 1994). These findings suggest that meta-analysts should be concerned about the effect of publication bias on their results. In addition, the findings validate the perception that publication bias is a threat to the validity of meta-analysis. According to Begg (1994), "Publication bias presents possibly the greatest methodological threat to validity of meta-analysis." (p.407). Furthermore, this impact on the results emphasizes the need to have and implement methods to detect publication bias.

The impact of publication bias on the estimation of effect size variance is less documented in the literature. This study found that there was an increased effect size variance bias when publication bias was imposed. Thus the estimated variance was larger than the population effect size variance. This inflation of the variance could lead to inaccurate investigations of moderators or random effects when the researcher should be looking into publication bias. As part of the meta-analysis procedures researchers estimate the homogeneity of the primary study effect sizes. When heterogeneity is indicated the effect sizes are not estimating a common population mean. In other words there may be study characteristics or moderators that are causing variability among the effect sizes. Four options for the meta-analyst when heterogeneity is indicated are: (1) only interpret the results descriptively, (2) include moderators in the analyses, (3) use regression techniques that account for the variance, or (4) incorporate the variance into the model by using random effects methods (Shadish & Haddock, 1994). These four options should be influenced by the investigation of publication bias. In other words, before the researcher chooses one of these options they should employ methods to detect publication bias. If detected then another option would be to return to the search for studies to include in the meta-analysis.

There are several conditions that alleviate the impact of publication bias on the effect size magnitude and variance estimation that meta-analysts should consider. Researchers with large primary study sample sizes and a large number of primary studies will have greater accuracy with these estimates. In contrast researchers with large heterogeneity in the primary study and large population effect size variance should be more concerned about the impact of publication bias on the estimates of effect size magnitude and variance. The population effect size magnitude influenced the accuracy of the effect size magnitude and variance estimates differently. Thus researchers should consider that with a large population effect size they will have more accuracy in the effect size variance estimate than the effect size magnitude estimate.

Regarding the performance of the statistical methods for detecting publication bias, the Begg Rank Correlation (N) method exhibited the best Type I error performance (consistently around the nominal 0.05 value) and in comparison to the other methods superior power estimates (greatest estimate 0.6661). The Begg Rank Correlation (V) and Egger Regression methods had astronomically high Type I error rates. The power estimates for the Begg Rank Correlation (V) method were, at times, comparable or greater than the Begg Rank Correlation (N) method, however, this was with the cost of greater Type I error rates. The Egger Regression method power estimates were low and did not exceed 0.5414. The Funnel Plot Regression and Trim and Fill methods typically had small Type I error rates (smaller than the 0.05 value) and low power estimates. These findings indicate that among the methods investigated the method with the best Type I error and power performance was the Begg Rank Correlation (N). These findings are consistent with the similarly designed research investigating the performance of these methods to detect publication bias within a fixed effects meta-analysis context (Kromrey & Rendina-Gobioff, 2004; Macaskill, Walter, & Irwig, 2001).

According to theory on robustness and factors influencing power several conditions were expected to influence Type I error rates and power. For most of the methods, Type I error rates approached the nominal 0.05 value when the number of studies, primary study sample size, and population effect size magnitude increased in value. In contrast, conditions that resulted in deviating Type I error rates were larger primary study group variance and larger population effect size variance. The factors expected to and found to increase power were number of studies, primary study sample size, and population effect size magnitude. Decreases in power estimates were expected and found for conditions where the primary study group variance and population effect size variance were greater. In general, across the five methods investigated, the Type I error rates and power estimates for most conditions performed consistent with theory on these statistical indicators of performance.

Although the Begg Rank Correlation (N) method has good Type I error control it does not have adequate power. Regardless of the study condition or the detection method employed the maximum power estimates were low. This is concerning to the meta-analyst who wants to detect publication bias statistically. The adequate Type I error control by the Begg Rank Correlation (N) indicates that the researcher is likely to accurately detect when publication bias is not present. However, the low power estimates for all methods indicates that a researcher is less likely to accurately detect when publication bias is present. Just examining the power estimates for the Begg Rank Correlation (N) method the best conditions for accurately detecting the presence of publication bias are with a large number of studies (k=100), medium unbalanced sample size (n1=8, n2=12), large primary study group variance (1:8), large population effect size magnitude (Δ=0.8), and small population effect size variance (τ^2=0.0).

As evidenced in this study, although the methods are similar the Begg Rank Correlation (N) method out performs (better Type I error) the Begg Rank Correlation (V) method. These results are similar to those found by Kromrey and Rendina-Gobioff (2004) who comment on the difference in performance among these two methods. Essentially, the Begg Rank Correlation (V) method correlates the standardized effect size with the variance of the effect sizes. The variance of Hedges's g effect size is estimated with the following:

$$\hat{\sigma}_{\hat{g}}^2 = \frac{n_1 + n_2}{n_1 n_2} + \frac{(g_i)^2}{2(n_1 + n_2)}$$

Where g_i is the estimated effect size for study *i*

n_1 is the sample size for group 1

n_2 is the sample size for group 2

This formula is a function of both the effect size (g_i) and the sample size (n_i). If we consider the situation where there is no publication bias, for the Begg Rank Correlation (V) method the correlation of the effect size and the variance of the effect sizes would be expected to be non-zero because both the effect size and the sample size are included in the variance formula. Therefore, it is not surprising that the Begg Rank Correlation (V) method had difficulty detecting when there was no publication bias present. In contrast, the Begg Rank Correlation (N) method correlates the standardized effect size with the sample size. If we consider the situation where there is no publication bias, the Begg Rank Correlation (N) method the correlation of the effect size with the sample size would be expected to be zero.

Limitations

There are generalizability limitations to consider in relation to this research study. The simulation method implemented in this study provides control of factors to investigate performance in specific situations. This benefit of simulation studies also limits the generalizability of the study findings. Thus, the controlled factors (number of studies, sample size, group variances, size of population effect size, and a random effects model) dictate the types of meta-analyses the results can be generalized to. Another restriction on generalizability is that only the Hedge's g effect size was investigated. The impact of publication bias and the performance of detection methods may vary across other effect size statistics. Another generalization limitation is that this study calculated meta-analysis summary statistics based on the methods developed by Hedges and Olkin (1985), and the results cannot be generalized to other meta-analysis methods such as Hunter and Schmidt (1990). The final consideration of limited generalizability is the investigation of moderators. Although moderators are commonly explored in meta-analyses this simulation does not generalize to these analyses.

Another limitation to consider relates to the methods used to impose publication bias. Although there are many factors influencing the publication of studies (effect size, methodology, journal type, funding source, etc.), the function utilized to determine the selection of primary studies for the simulation of meta-analyses solely relies on the p-values. The benefit of the function utilized is that it does not have a sharp cut off ($p < 0.05$) to determine the inclusion of primary studies. Therefore the function is in effect taking into consideration factors external to the p-value. However, the accuracy of the function to represent the reality of external factors is unknown. This method is consistent with other studies that have been done.

Implications

Importance of Study

The degree of publication bias impact on the results of meta-analyses is extremely important. Publication bias theory states that the mean effect size estimates that result from a meta-analysis will be inflated. There have been few studies documenting the extent that this inflation has on the results of a meta-analysis. In addition, the conclusions and decisions made from the results of meta-analyses hold additional weight because they are perceived to have additional precision. Therefore, it is pertinent that meta-analysts are aware of the potential degree that publication bias can impact their results and reflect that in their conclusions.

The detection of publication bias in the context of meta-analysis is important because the validity of a meta-analysis is partially determined by the selection of studies included in the synthesis. Examination of the performance of statistical methods for detecting publication bias provides information about the research conditions for which they are appropriate to apply. In addition, an increased use of statistical methods for detecting publication bias may result, rather than visually inspecting the funnel plot or not addressing publication bias at all. The reporting of publication bias detection will result in more accurate conclusions being drawn from meta-analysis results. Lastly, regular reporting of publication bias in meta-analysis designs may result in a more favorable perception of meta-analysis methodology.

Researchers in General

The large impact of publication bias on the results of meta-analyses indicates that researchers need to consider the need to decrease publication bias. Several methods to decrease publication bias could be considered. In the medical field many studies are registered before they are conducted. In the field of psychology and education the implementation of a resource for registering studies would bring awareness to the degree of publication bias and increase the ability of meta-analysts to track studies. The registration of studies would allow for researchers to determine how many studies are conducted compared to how many studies are published or made available to the meta-analyst. In addition to being able to calculate proportions of studies available to the meta-analyst, registration of studies would improve the study retrieval process of a meta-analysis. Another method to decrease publication bias is to standardize the reporting of studies. Often the results of a study are unavailable to the meta-analyst because the results are reported in a variety of formats that sometimes do not provide the necessary information to be included in the meta-analysis. The registration of studies could provide a standardization of study results. The publication process could facilitate a decline in the degree that publication bias exists by encouraging editors and reviewers to consider submissions that do not have statistically significant or large effect results.

Researchers Conducting Meta-Analyses

The large impact of publication bias on the results of meta-analyses indicates that meta-analysts need to investigate the potential of publication bias within their study and report the findings. Due to the subjectivity and difficulty interpreting, the visual inspection of a funnel plot is not the ideal method on its own (Greenhouse & Iyengar, 1994; Tang & Liu, 2000; Thornton & Lee, 2000). Although the statistical methods investigated in this study have their limitations, they provide additional information regarding the potential of publication bias. The review of *Psychological Bulletin* and *Review of Educational Research* conducted for this study revealed that very few meta-analysts are conducting and reporting publication bias detection methods. As more meta-analysts conduct and report publication bias detection in their meta-analyses the awareness and implementation will increase. In addition, meta-analysts should utilize meta-analysis procedures that decrease the potential for publication bias. For example, the incorporation of unpublished research studies within a meta-analysis will decrease publication bias. Some researchers have the perspective that unpublished studies are characterized by poorer quality. This perspective needs to be overcome.

Researchers of Statistical Methods for Detecting Publication Bias

The large impact of publication bias on the results of a meta-analysis is a reflection of the need to detect publication bias. The performance of the statistical methods to detect publication bias were found to be lacking. Although the Begg Rank Correlation (N) method had adequate Type I error control the available power was low. Therefore, there is a need for new methods to be developed to detect publication bias.

Suggestions for Future Research

One suggestion for future studies is to conduct additional studies on the impact of publication bias. This study uses one way of simulating publication bias which may or may not reflect the reality of what is occurring in the literature. Therefore, studies using a different algorithm for imposing publication bias would be beneficial. Similarly, studies investigating the accuracy of the theory of publication bias and its influences would be beneficial. For example, one could survey researchers regarding the factors that contribute to their decisions to publish and present research, as well as factors that influence their decision to recommend research for publication as a reviewer or editor.

Another suggestion for future research is to analyze the results for this study in a way that the fixed effects can be compared to random effects. In other words the impact and performance of the methods to detect publication bias can be compared when the population effect size variance is zero to when the population effect size variance is greater than zero. Although the performance of the statistical methods is expected to be similar across fixed and random effects since the results of this study (random effects) are similar to the results of Kromrey and Rendina-Gobioff (2004) (fixed effects). However, the impact of publication bias on the results of the meta-analysis (estimated effect size and variance) could vary.

In addition, it would be interesting to investigate the impact of publication bias when a fixed effect meta-analysis design is applied to population conditions that are random effects. The literature indicates that the variance estimates will be underestimated, implying greater precision, when fixed effects methods are applied to truly random effects data (Hedgers & Vevea, 1998). However, this phenomenon has not been investigated when publication bias is evidenced.

Lastly, this study calculated meta-analysis summary statistics based on the methods developed by Hedges and Olkin (1985), however another commonly used meta-analysis method is Hunter and Schmidt (1990). It would be of interest to conduct research to investigate the impact of publication bias when Hunter and Schmidt (1990) meta-analysis techniques are applied. In addition, the performance of the methods to detect publication bias would probably be different when Hunter and Schmidt (1990) techniques are applied for the meta-analysis simulations, compared to Hedges and Olkin (1985).

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APPENDICES

Appendix A: Code for Monte Carlo simulation and calculating publication bias detection methods.

```
* +-------------------------------------------------------+
   PUB_BIAS.SAS
   Investigation of methods to detect publication bias
   Random Effects Meta-Analysis
  +-------------------------------------------------------+;
*proc printto print='C:\PUB_BIAS.LST';
options ls = 132;
proc iml;


* +---------------------------------------------------------------+
   These are user specifications:
* +---------------------------------------------------------------+;

   replicat=10000;  * N of meta-analyses to simulate ;
                              ******CHANGE TO 10,000 ONCE CODE IS COMPLETE;

*     tau = 0;          *TAU0;      *Population variance;
*     tau = 0.10;       *TAU1;
      tau = 0.33;       *TAU2;
*     tau = 0.50;       *TAU3;
*     tau = 1.00;       *TAU4;

      KK=10;            *K1;  * N of studies in each meta-analysis;
*   KK=20;              *K2;
*   KK=50;              *K3;
*   KK=100;             *K4;

*     DELTA = 0.0;      *D1;  * Population effect size;
*   DELTA = 0.2;  *D2;
   DELTA = 0.5;   *D3;
*   DELTA = 0.8;  *D4;

*     Select_bias = 0;        *SB0; * Selection bias = none;
```

Appendix A (continued): Code for Monte Carlo simulation and calculating publication bias detection methods.

```
      Select_bias = 1;        *SB1; * Selection bias = mild;
*     Select_bias = 2;        *SB2; * Selection bias = moderate;

* +----------------------------------------------+
   Subroutine to generate a random sample.
   User specifies the population mean and
   standard deviation. For population shapes,
   Fleishman constants are used.

   Inputs to the subroutine are
     NN - desired sample size
     mu - population mean
     variance - population variance
     bb,cc,dd - Fleishman constants

   Outputs are
     Rawdata - column vector of NN observations
               from the specified population
  +----------------------------------------------+;
start gendata(NN,variance,bb,cc,dd,mu,rawdata);
  seed1=round(1000000*ranuni(0));
  rawdata=rannor(repeat(seed1,nn,1));
  rawdata = (-1*cc) + (bb*rawdata) + (cc*rawdata##2) + (dd*rawdata##3);
  rawdata = (rawdata * SQRT(variance)) + mu;
finish;

* +----------------------------------------------------------+
   Subroutine to calculate RANDOM EFFECTS weighted mean effect size,
   standard error, and confidence interval for mean.
   Inputs to the subroutine are
     di_vec - column vector of effect sizes (d)
     var_di - column vector of estimation errors (FIXED EFFECTS variance)
     tau2 - scalar estimate of RANDOM EFFECTS variance
```

Appendix A (continued): Code for Monte Carlo simulation and calculating publication bias detection methods.

```
   Outputs are
     d_mean = weighted mean d value  *****RANDOM EFFECTS Mean ES
       resum_wt = scalar, sum of the RANDOM EFFECTS weights
       vi star = column vector of RANDOM EFFECTS total variance for each study
     d_SE = standard error of d
     upper90, lower90 = endpoints of 90% CI
     upper95, lower95 = endpoints of 95% CI
     upper99, lower99 = endpoints of 99% CI
  +----------------------------------------------------------+;
start
mean_d(di_vec,var_di,tau2,d_mean,resum_wt,vi_star,d_SE,upper90,lower90,upper95,lower95,upper99,lower99);

* calculate RANDOM EFFECTS weighted mean effect size;
  k = nrow(di_vec);
  d mean = 0;
  resum_wt = 0;
  vi star = J(k,1,0);
  do i = 1 to k;
    d_mean = d_mean + di_vec[i,1]/(var_di[i,1]+tau2);
    resum_wt = resum_wt + (var_di[i,1]+tau2)##-1; *******resum_wt is scalar of the sum of random effect
weights;
      vi_star[i,1] = var_di[i,1]+tau2;    ****vi_star is the vector of RANDOM EFFECTS total variance;
  end;
  d mean = d mean/resum wt; *****Random Effects Mean ES;
  d_SE = SQRT(resum_wt##-1);
  upper90 = d mean + 1.65#d SE;
  lower90 = d mean - 1.65#d SE;
  upper95 = d_mean + 1.96#d_SE;
  lower95 = d mean - 1.96#d SE;
  upper99 = d mean + 2.576#d SE;
  lower99 = d_mean - 2.576#d_SE;
finish;

* +----------------------------------------------------------+
```

```
   Subroutine to calculate the Q test
   of homogeneity.
   Inputs to the subroutine are
     di vec - column vector of effect sizes (d)
     n_vec  - matrix (k X 2) of sample sizes
              corresponding to each effect size

   Outputs are
     QQ = the obtained value of Q
     d plus = weighted mean d value (FIXED EFFECTS MEAN EFFECT SIZE)
     prob_qq1 = chi-square probability associated with QQ
       fesum_wt = scalar, sum of the FIXED EFFECTS weights
     var di = column vector of variances of effect sizes (fixed effects variance)
  +-----------------------------------------------------------+;
start calcq(di_vec,n_vec,qq,d_plus,prob_qq1,fesum_wt,var_di);

* calculate FIXED EFFECTS variance for each effect size;

  k = nrow(di vec);
  var di=J(k,1,0);
  do i = 1 to k;
    var_di[i,1] = ((n_vec[i,1]+n_vec[i,2])/(n_vec[i,1]#n_vec[i,2])) +
((di_vec[i,1]##2)/(2#(n_vec[i,1]+n_vec[i,2])));
  end;

* calculate FIXED EFFECTS weighted mean effect size;

  d_plus = 0;
  fesum wt = 0;
  do i = 1 to k;
    d_plus = d_plus + di_vec[i,1]/var_di[i,1];
    fesum_wt = fesum_wt + var_di[i,1]##-1;      ****sum of the FIXED EFFECTS weights (1/var);
  end;
  d_plus = d_plus/fesum_wt;  ****FIXED EFFECTS Mean ES;
```

```
* calculate Q;

  QQ = 0;
  do i = 1 to k;
    QQ = QQ + ((di_vec[i,1] - d_plus)##2/var_di[i,1]);
  end;

  prob_qq1 = 1 - PROBCHI(QQ,k-1);
      * print di_vec var_di;
      * print d_plus qq prob_qq1;
finish;

*+------------------------------------------------------------+
   Subroutine to calculate OLS and WLS tests of models.
   Inputs to the subroutine are
     di vec - column vector of effect sizes (d)
     n_vec  - matrix (k X 2) of sample sizes
              corresponding to each effect size
     X Matrix - Matrix of potential moderator variables
                For tests of publication bias, vi are predictors
       vi - reciprocals of variances

   Outputs are
     B_wls - regression weights for WLS
     SE B  - Standard errors of the WLS weights
     B_ols - regression weights for OLS
     SE_B_ols  - Standard errors of the OLS weights
  +------------------------------------------------------------+;
start calcreg(di_vec,n_vec,X_Matrix,vi,B_wls,SE_B,B_ols,SE_B_ols);

  *+-----------------------------------------+
     Weighted least squares estimation using Vi
     as weights
   +-----------------------------------------+;
```

Appendix A (continued): Code for Monte Carlo simulation and calculating publication bias detection methods.

```
  k = nrow(di vec);
  X = J(k,1,1)||X_Matrix;
  B_wls = INV(X`*DIAG(vi)*X)*X`*DIAG(vi)*di_vec;
  cov b = INV(X`*DIAG(vi)*X);
  SE_B = SQRT(vecdiag(cov_b));
 * RSS_wls = (di_vec - X*B_wls)`*DIAG(vi)*(di_vec-X*B_wls);
 * Resid MS = RSS wls/(SUM(vi)-2);
 * SE_B = SE_B * (1/SQRT(Resid_MS));
  *+--------------------------------------------+
     Ordinary least squares estimation
   +--------------------------------------------+;

  B ols =INV(X`*X)*X`*di_vec;
  cov_b = INV(X`*X);
  SE_B_ols = SQRT(vecdiag(cov_b));
finish;

* +---------------------------------------------------------------+
   Subroutine Kendall
   Computes the Kendall Tau for Norman Cliff ordinal level analyses.
   Arguements to the subroutines are:
    A B = vectors of observed data for the two variables
            (A will be the observed tx effects
             B will be the variance of the tx effects)
    N = sample size

   Returned are:
    T_AB = Kendall Tau Coefficient Y and X1
    UNTIE_A = proportion of scores that are not tied on A
    UNTIE_B = proportion of scores that are not tied on B
    VART AB = VARIANCE of Y AND X1
  +---------------------------------------------------------------+;
START KENDALL(A,B,N,T_AB,untie_A,untie_B,VART_AB,Z_TEST);
*       print A B N;
```

Appendix A (continued): Code for Monte Carlo simulation and calculating publication bias detection methods.

```
* +---------------------------------------------------------------------+
          A = Y the criterion variable
          the A matrix is the criterion matrix dihy

       ####For pub bias study the A=observed tx effects
  +---------------------------------------------------------------------+;

 DOM_MTXA = J(N,N,0);
*       print 'Beginning:' DOM_MTXA;

 ties A   = 0;
 counts A = 0;
 do i = 1 to N;
    do j = 1 to N;
      if A[i,1] > A[j,1] then do;
           DOM_MTXA[i,j] =  1;
      end;
      if A[i,1] < A[j,1] then do;
           DOM_MTXA[i,j] = -1;
      end;
      if A[i,1] = A[j,1] then do;
           ties_A = ties_A + 1;
      end;
      counts_A = counts_A + 1;
    end;
 end;
 untie_A = 1 - (ties_A - N)/(counts_A - N);
*       print 'End of Loop:' DOM_MTXA;

* +---------------------------------------------------------------------+
          B = Predictor X1
          the B matrix is the predictor matrix dih1

       ####For pub bias study the B=variance of the tx effects
```

Appendix A (continued): Code for Monte Carlo simulation and calculating publication bias detection methods.

```
  +--------------------------------------------------------------------+;

 DOM_MTXB = J(N,N,0);
*       print 'Beginning:' DOM_MTXB;

 ties B   = 0;
 counts_B = 0;
 do i = 1 to N;
    do j = 1 to N;
      if B[i,1] > B[j,1] then do;
           DOM_MTXB[i,j] =  1;
      end;
      if B[i,1] < B[j,1] then do;
           DOM_MTXB[i,j] = -1;
      end;
      if B[i,1] = B[j,1] then do;
           ties_B = ties_B + 1;
      end;
      counts_B = counts_B + 1;
    end;
 end;
 untie_B = 1 - (ties_B - N)/(counts_B - N);
*       print 'End of Loop:' DOM_MTXB;

* +--------------------------------------------------------------------+
         D = (the Y criterion matrix) (the X1 predictor matrix)
         D = (dihy) (dih1) = tih1y
    Produces T_AB (tau for criterion Y and predictor X1)
  +--------------------------------------------------------------------+;


 DOM_MTXD = J(N,N,0);
*       print 'Beginning:' DOM_MTXD;
```

```
 do i = 1 to N;
    do j = 1 to N;
      DOM_MTXD[i,j] = DOM_MTXA[i,j]#DOM_MTXB[i,j];
    end;
 end;
*       print 'End of Loop:' DOM_MTXD;

 MTXD_sum = DOM_MTXD[,+];
*       print 'MTXD Sums:' MTXD_sum;

 T_AB = MTXD_sum[+,] #(1/(n#(n-1)));
*       print T_AB untie_A untie_B;

* +--------------------------VART_AB-----------------------------------+;
MTX F = J(N,1,0);
do i = 1 to N;
    *do j = 1 to N;
     MTX_F[i,1] = (MTXD_sum [i,1]/(n-1));
    *end;
 end;
*    print MTX_F;
 ****creates [1 .75 .50 .25 1];

MTX G = J(N,1,0);
 do i = 1 to N;
    *do j = 1 to N;
     MTX_G[i,1] = (MTX_F[i,1] - T_AB)##2;
    *end;
 end;
*    print MTX_G;
****creates [(1-.7)2 (.75-.7)2 etc.];


 MTXG_sum = 1/(n-1)#(MTX_G[+,]);
```

```
*     print MTXG_sum;
 ****sums MTX_G and divides by n-1 S2ti1y=.1063;

MTX_H = J(N,N,0);
 do i = 1 to N;
    do j = 1 to N;
       MTX_H[i,j] = DOM_MTXD[i,j]#DOM_MTXD[i,j];
    end;
 end;
*    print MTX H;
 ****squares MTXD;


 MTXH_sum = MTX_H[+,+];
*    print MTXH_sum;
 ****Sums MTX_H=18;


 NUMER_AB = MTXH_sum - ((n) # (n-1) # (T_AB#T_AB));
 DENOM_AB = n#(n-1) -1;

 VART AB = NUMER AB/DENOM_AB;
*   print VART_AB;
 ****Final Equation B6=.4316;

 vart_ab = ((4#(n-2)#(MTXG_sum))+(2#VART_AB)) / (n#(n-1));
*   print vart_ab;
 ******Final equation B3=.1069;

IF vart_ab > 0 THEN DO ;
 Z TEST = (T_AB /SQRT(vart_ab));
end;

if vart_ab =0 then do;
```

```
 Z_TEST = 5.00;
END;
* print Z_TEST;

FINISH;

* +--------------------------------------+
   Main program
   Generates samples, calls subroutines,
   computes rejection rates.
  +--------------------------------------+;
*********************************************************************************************************
*********************************************************************************************************;
do sample size = 1 to 9;      *CHANGE TO 1 TO 9 ONCE CODE COMPLETE;
  if sample size = 1 then  njs={ 5, 5};
  if sample_size = 2 then  njs={10,10};
  if sample size = 3 then  njs={50,50};
  if sample size = 4 then  njs={4,6};
  if sample_size = 5 then  njs={8,12};
  if sample size = 6 then  njs={40,60};
  if sample size = 7 then  njs={6,4};
  if sample_size = 8 then  njs={12,8};
  if sample_size = 9 then  njs={60,40};

do set_variances = 1 to 4;    *CHANGE TO 1 TO 4 ONCE CODE COMPLETE;
  if set variances = 1 then sds={1.0,1.0};
  if set variances = 2 then sds={1.0,2.0};
  if set_variances = 3 then sds={1.0,4.0};
  if set_variances = 4 then sds={1.0,8.0};

   POOLED_VAR=(0.5)#SUM(sds);
   POOLED_SD=SQRT(POOLED_VAR);
* print pooled_sd;
```

Appendix A (continued): Code for Monte Carlo simulation and calculating publication bias detection methods.

```
do set_shape = 1 to 1;
* +--------------------------------+
    Fleishman Transformations
    to nonnormality
  +--------------------------------+;

 if set_shape = 1 then do;
           * The following give sk= 0, kr= 0;
  b=1;
  c=0;
  d=0;
 end;
 if set_shape = 2 then do;
           * The following give sk= 1.00, kr= 3.00;
  b= .83221632289426;
  c= .12839670935047;
  d= .04803205907079;
 end;
 if set_shape = 3 then do;
           * The following give sk= 2.00, kr= 6.00;
  b= 0.82632385761082;
  c= 0.31374908500462;
  d= 0.02270660525731;
 end;


* +--------------------+
    Initialize counters
  +--------------------+;

  REJ_EGGWLS = J(3,1,0);
```

```
  REJ EGGOLS = J(3,1,0);
  REJ BEGV = J(3,1,0);
  REJ_BEGN = J(3,1,0);
  REJ FUNWLS = J(3,1,0);
  REJ FUNOLS = J(3,1,0);
  REJ_TRIM = J(3,1,0);
  AVEesBia = 0;
  AVEvaBia = 0;
  n_generated = 0;
  nsamples=0;

  esbias = 0;
  varbias = 0;
  SE = J(1,1,0);
  RMSE = J(1,1,0);
  INBAND = J(1,3,0);
  WIDEBAND = J(1,3,0);

do rep=1 to replicat;                      * This starts the big do loop, number of MA = 10000;

  k=kk;                                                        *number of studies, condition that
varies (see beginning of code);

  n_vec=J(K,2,0);
  study = 0;
  do until (study = k);                       * Inner loop for primary studies;

   MEANDELTA=DELTA#POOLED_SD;       *ALPHA_K IN OLD PUB BIAS CODE;
   VARDELTA=TAU#POOLED_VAR;

   mu1={0.0,0.0};    * Pop means for group 1;

* randomly generate a population mean for each study - consistent with the random effects model;
```

Appendix A (continued): Code for Monte Carlo simulation and calculating publication bias detection methods.

```
     ALPHA_K=RANNOR(0)#SQRT(VARDELTA)+MEANDELTA;
     Mean_exp=mu1[1,1]+alpha_k;                 ***MU2;

* randomly generate a sample size for each study;
     n1=(0.5#njs[1,1]#rannor(0))+ njs[1,1];           *IN TAU2WEIGHTS.SAS CODE THE VALUE IS 0.2 INSTEAD OF 
0.5;
     n1=round(n1);
     if n1<3 then n1=3;

     n2=(0.5#njs[2,1]#rannor(0))+njs[2,1];            *IN TAU2WEIGHTS.SAS CODE THE VALUE IS 0.2 INSTEAD OF 
0.5;
     n2=round(n2);
     if n2<3 then n2=3;

 *print meandelta vardelta alpha K Mean exp n1 n2;
     run gendata(n1,sds[1,1],b,c,d,mu1[1,1],z1);
     run gendata(n2,sds[2,1],b,c,d,mean_exp,z2);

 * calculate sample means, SS, di and cd for primary studies;

        xbar1 = (J(1,n1,1)*z1)/n1;
        xbar2 = (J(1,n2,1)*z2)/n2;
        ss1 = (J(1,n1,1)*(z1##2)) - ((J(1,n1,1)*z1)##2/n1);
        ss2 = (J(1,n2,1)*(z2##2)) - ((J(1,n2,1)*z2)##2/n2);
            njstemp = n1//n2;
        di = ((xbar2 - xbar1)/sqrt((ss1 + ss2)/(J(1,2,1)*njstemp - 2 )))#(1 - (3/(4#(J(1,2,1)*njstemp)-
9)));

            sw = SQRT((ss1 + ss2)/(n1 + n2 - 2));
            t value = (xbar1-xbar2)/(sw#(sqrt(1/n1 + 1/n2)));
            df = n1 + n2 - 2;
            t_pvalue =2#(1-probt(abs(t_value),df));
*    print xbar1 xbar2 ss1 ss2 n1 n2 njstemp sw t_value df t_pvalue;
```

Appendix A (continued): Code for Monte Carlo simulation and calculating publication bias detection methods.

```
 * Use Select bias to determine if study is included in meta-analysis;
      if Select bias = 1 then do;
            beta = 2;
            alpha = 1.5;
      end;
      if Select bias = 2 then do;
            beta = 4;
            alpha = 1.5;
      end;
      if Select_bias ^= 0 then do;
            prob select = exp(-1*beta*t pvalue**alpha);
            if ranuni(0) < prob_select then keepme = 1;
            else keepme = 0;
      end;
      if Select bias = 0 then do;
            keepme = 1;
            prob_select = 1;
      end;
      n_generated = n_generated + 1;
      if keepme = 1 then do; * Study is included in meta-analysis;
            study = study + 1; * increment the 'study' variable;
        if study = 1 then di_vec = di;
        if study > 1 then di_vec = di_vec//di;
        n vec[study,1]=n1;
      n_vec[study,2]=n2;
      end;
*print Select_bias t_pvalue prob_select di study;


  end;                                  * End inner loop for primary studies;
      * print n_vec di_Vec;

*****************************************************************************************************************************
****************************************************************************************************************************;
```

Appendix A (continued): Code for Monte Carlo simulation and calculating publication bias detection methods.

```
 * calculate Q test of homogeneity;

       run calcq(di_vec,n_vec,qq,d_plus,prob_qq1,fesum_wt,var_di);

 * Compute estimates of Tau-squared;

      * Estimator #2:  Q based REVC Estimate;

       CC = (J(1,K,1)*var_di##-1) - ((J(1,K,1)*var_di##-2) /
                                    (J(1,K,1)*var_di##-1));
         Tau2 = (QQ - (K - 1)) / cc;  *****REVC;
            if tau2 < 0 then tau2 = 0;


 * compute mean d and CIs using estimator 2;

   run
mean_d(di_vec,var_di,tau2,d_mean,resum_wt,vi_star,d_SE,upper90,lower90,upper95,lower95,upper99,lower99);

   esbias = d_mean - delta;               *supplement d_plus for FIXED EFFECTS;
   AVEesBia = AVEesbia + esbias;
   varbias = tau2 - tau;                  *not applicable for FIXED EFFECTS;
   AVEvaBia = AVEvabia + varbias;
   SE[1,1] = SE[1,1] + d_SE;
   RMSE[1,1] = RMSE[1,1] + (d mean - delta)##2;       *supplement d plus for FIXED EFFECTS;
   if (delta < upper99 & delta > lower99) then INBAND[1,1] = INBAND[1,1] + 1;
   if (delta < upper95 & delta > lower95) then INBAND[1,2] = INBAND[1,2] + 1;
   if (delta < upper90 & delta > lower90) then INBAND[1,3] = INBAND[1,3] + 1;
   WIDEBAND[1,1] = WIDEBAND[1,1] + (upper99 - lower99);
   WIDEBAND[1,2] = WIDEBAND[1,2] + (upper95 - lower95);
   WIDEBAND[1,3] = WIDEBAND[1,3] + (upper90 - lower90);
   *free d_mean d_SE upper90 lower90 upper95 lower95 upper99 lower99;
```

Appendix A (continued): Code for Monte Carlo simulation and calculating publication bias detection methods.

```
 *  print n_vec di_vec var_di fesum_wt d_plus qq cc vi_star resum_wt d_mean delta esbias AVEesBia tau2 tau
varbias AVEvaBia;


* +-----------------------------------------------------+
   Standardize the treatment effects for bias analysis
  +-----------------------------------------------------+;
  vi = J(k,1,0);
  vi inv = j(k,1,0);
  mean = 0;
  weight = 0;
  t star = J(k,1,0);
  Vi_stand = J(k,1,0);
  dev di = J(k,1,0);
  Root Vi=J(k,1,0);
  Egger_z = J(k,1,0);

  do i = 1 to k;
    vi[i,1] = vi_star[i,1];                     ****supplement var_di for FIXED EFFECTS MODEL;
      vi_inv[i,1] = vi[i,1]##-1;                      **inverse of variance(vi);
      mean = d_mean;                                  ****supplement d_plus for FIXED EFFECTS MODEL;
      weight = resum_wt;                                    ****supplement fesum_wt for FIXED EFFECTS
MODEL;
    dev di[i,1] = ABS(di vec[i,1] - mean);      ***For Trim and Fill;
    Vi_stand[i,1] = vi[i,1] - (weight##-1); ***For Begg;
    t star[i,1] = (di vec[i,1] - mean)/SQRT(Vi stand[i,1]);  ***For Begg;
      Root_Vi[i,1] = vi[i,1]##-0.5;                   *reciprocal of the standard deviation of di (For
Egger);
      Egger_z[i,1] = di_vec[i,1]#Root_Vi[i,1];**For Egger;

  end;

*  print vi vi_inv mean weight dev_di vi_stand t_star root_vi egger_z;
```

Appendix A (continued): Code for Monte Carlo simulation and calculating publication bias detection methods.

```
* +--------------------------------------------------+
   Egger Regression using precision as predictor
  +--------------------------------------------------+;
run calcreg(Egger_z,n_vec,Root_Vi,vi_inv,B_wls,SE_B,B_ols,SE_B_ols);

* +-------------------------------+
   WLS test of regression intercept
  +-------------------------------+;
  t WLS = B wls[1,1]/SE B[1,1];
  PROB_t=2#(1-probt(abs(t_WLS),k-2));
  if prob t < .10 then REJ EGGWLS[1,1] = REJ EGGWLS[1,1] + 1;
  if prob t < .05 then REJ EGGWLS[2,1] = REJ EGGWLS[2,1] + 1;
  if prob_t < .01 then REJ_EGGWLS[3,1] = REJ_EGGWLS[3,1] + 1;

* print b_wls se_b t_wls prob_t rej_EGGwls;

* +-------------------------------+
   OLS test of regression intercept
  +-------------------------------+;
  t ols = B ols[1,1]/SE B ols[1,1];
  prob t =2#(1-probt(abs(t ols),k-2));
  if prob_t < .10 then REJ_EGGOLS[1,1] = REJ_EGGOLS[1,1] + 1;
  if prob t < .05 then REJ EGGOLS[2,1] = REJ EGGOLS[2,1] + 1;
  if prob_t < .01 then REJ_EGGOLS[3,1] = REJ_EGGOLS[3,1] + 1;

* print b_ols se_b_ols t_ols prob_t  rej_EGGols;

* +--------------------------------------------------+
   Kendall Tau using variance of d as predictor
  +--------------------------------------------------+;

  run KENDALL(t star,vi,k,T X1Y,UT A,UT_B,VART_X1Y,Z_TEST);
  prob z =2#(1-probnorm(abs(Z test)));
  if prob_z < .10 then REJ_BEGV[1,1] = REJ_BEGV[1,1] + 1;
```

```
  if prob_z < .05 then REJ_BEGV[2,1] = REJ_BEGV[2,1] + 1;
  if prob_z < .01 then REJ_BEGV[3,1] = REJ_BEGV[3,1] + 1;

*print T_X1Y UT_A UT_B VART_X1Y Z_TEST rej_BEGv;

* +-----------------------------------------------------+
   Kendall Tau using total n as predictor
  +-----------------------------------------------------+;
  total n = n vec * J(2,1,1);
  run KENDALL(t_star,total_n,k,T_X1Y,UT_A,UT_B,VART_X1Y,Z_TEST);
  prob z =2#(1-probnorm(abs(Z test)));
  if prob z < .10 then REJ BEGN[1,1] = REJ BEGN[1,1] + 1;
  if prob_z < .05 then REJ_BEGN[2,1] = REJ_BEGN[2,1] + 1;
  if prob_z < .01 then REJ_BEGN[3,1] = REJ_BEGN[3,1] + 1;

*print T_X1Y UT_A UT_B VART_X1Y Z_TEST rej_BEGn;

* +-----------------------------------------------------+
   Funnel Plot
  +-----------------------------------------------------+;
  run calcreg(di_vec,n_vec,total_n,vi_inv,B_wls,SE_B,B_ols,SE_B_ols);

* +---------------------------------+
   WLS test of regression slope
  +---------------------------------+;
  t WLS = B wls[2,1]/SE B[2,1];
  PROB t=2#(1-probt(abs(t WLS),k-2));
  if prob_t < .10 then REJ_FUNWLS[1,1] = REJ_FUNWLS[1,1] + 1;
  if prob t < .05 then REJ FUNWLS[2,1] = REJ FUNWLS[2,1] + 1;
  if prob_t < .01 then REJ_FUNWLS[3,1] = REJ_FUNWLS[3,1] + 1;

*print B_wls SE_B t_wls prob_t rej_funwls;

* +---------------------------------+
```

Appendix A (continued): Code for Monte Carlo simulation and calculating publication bias detection methods.

```
   OLS test of regression slope
  +--------------------------------+;
  t ols = B ols[2,1]/SE B ols[2,1];
  prob_t =2#(1-probt(abs(t_ols),k-2));
  if prob t < .10 then REJ FUNOLS[1,1] = REJ FUNOLS[1,1] + 1;
  if prob t < .05 then REJ FUNOLS[2,1] = REJ FUNOLS[2,1] + 1;
  if prob_t < .01 then REJ_FUNOLS[3,1] = REJ_FUNOLS[3,1] + 1;

*print B_ols SE_B_ols t_ols prob_t rej_funols;

  * +--------------------------------+
      Trim and Fill
    +--------------------------------+;
  dev rank = rank(dev_di);
  do i = 1 to k;
      if di_vec[i,1] < mean then dev_rank[i,1] = -1#dev_rank[i,1];
  end;

      * +------------------+
            Left tail check
        +------------------+;
  r=-1#MIN(dev_rank);
  gamma=k-r;
  ro=gamma-1;
      * +------------------+
            Right tail check
        +------------------+;
  r2=MAX(dev_rank);
  gamma2=k-r2;
  ro2=gamma2-1;
  if ro > 3 then REJ_TRIM[1,1] = REJ_TRIM[1,1] +1;
  if ro2 > 3 then REJ_TRIM[2,1] = REJ_TRIM[2,1] +1;
      * +------------------------------------------+
            Either tail (note: alpha is .10 for this
```

```
      +----------------------------------------+;
  if (ro > 3 | ro2 > 3) then REJ_TRIM[3,1] = REJ_TRIM[3,1] +1;

*print dev_di di_vec mean dev_rank r gamma ro rej_trim;

  nsamples=nsamples+1;

end;                                                        *end the big loop;
* +-------------------------------------------------------+
   Convert counts of rejected hypotheses into proportions
  +-------------------------------------------------------+;
  do row = 1 to 3;
    REJ_EGGWLS[row,1] = REJ_EGGWLS[row,1]/nsamples;
    REJ EGGOLS[row,1] = REJ EGGOLS[row,1]/nsamples;
    REJ BEGV[row,1] = REJ BEGV[row,1]/nsamples;
    REJ_BEGN[row,1] = REJ_BEGN[row,1]/nsamples;
      REJ FUNOLS[row,1] = REJ FUNOLS[row,1]/nsamples;
      REJ FUNWLS[row,1] = REJ FUNWLS[row,1]/nsamples;
      REJ_TRIM[row,1] = REJ_TRIM[row,1]/nsamples;
  end;

  AVEesBia = AVEesBia/nsamples;
  AVEvaBia = AVEvaBia/nsamples;

  N in drawer = (n generated - (kk#nsamples))/nsamples;
  print 'Tests for Publication Bias Impact and Detection of Publication Bias';

 PRINT select_bias delta tau kk njs sds nsamples N_in_drawer AVEesBia AVEvaBia REJ_EGGWLS REJ_EGGOLS
REJ_BEGV REJ_BEGN REJ_FUNWLS REJ_FUNOLS REJ_TRIM;
end; * end the shape loop;
end; * end the variances loop;
end; * end the sample size loop;
quit;
```

Appendix B: Mean effect size and effect size variance bias estimates

Table 17. Estimated bias in mean effect size by study condition and magnitude of publication bias.

		Magnitude of Publication Bias								
		None			Moderate			Strong		
	N	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum
Number of Studies (k)										
10	720	-0.0098	-0.1119	0.0997	0.0810	-0.0271	0.3030	0.1366	-0.0239	0.4491
20	720	-0.0118	-0.1103	0.0959	0.0794	-0.0303	0.2924	0.1352	-0.0262	0.4417
50	720	-0.0129	-0.1125	0.0959	0.0784	-0.0320	0.2874	0.1344	-0.0292	0.4414
100	720	-0.0133	-0.1113	0.0943	0.0781	-0.0327	0.2895	0.1340	-0.0295	0.4392
Primary Study Sample Size (n1, n2)										
4,6	320	-0.0431	-0.1125	0.0074	0.0848	-0.0046	0.1623	0.1702	-0.0059	0.3100
5,5	320	-0.0291	-0.0943	0.0061	0.1000	-0.0088	0.2208	0.1843	-0.0080	0.3649
6,4	320	-0.0124	-0.0939	0.0498	0.1195	-0.0089	0.3030	0.2046	-0.0111	0.4491
8,12	320	-0.0265	-0.0721	0.0029	0.0723	-0.0037	0.1415	0.1325	-0.0048	0.2445
10,10	320	-0.0116	-0.0485	0.0096	0.0868	-0.0081	0.1871	0.1460	-0.0058	0.2863
12,8	320	0.0058	-0.0492	0.0851	0.1075	-0.0060	0.2723	0.1679	-0.0098	0.3754
40,60	320	-0.0121	-0.0378	0.0055	0.0324	-0.0327	0.0831	0.0551	-0.0295	0.1254
50,50	320	0.0024	-0.0116	0.0279	0.0457	-0.0058	0.1208	0.0680	-0.0031	0.1632
60,40	320	0.0189	-0.0113	0.0997	0.0639	-0.0066	0.1882	0.0868	-0.0070	0.2299
Primary Study Group Variance										
1:1	720	-0.0204	-0.0949	0.0049	0.0690	-0.0060	0.1647	0.1239	-0.0076	0.3100
1:2	720	-0.0175	-0.1122	0.0226	0.0725	-0.0202	0.1912	0.1277	-0.0175	0.3400
1:4	720	-0.0098	-0.1125	0.0611	0.0817	-0.0303	0.2458	0.1377	-0.0273	0.3905
1:8	720	-0.0002	-0.1097	0.0997	0.0936	-0.0327	0.3030	0.1508	-0.0295	0.4491
Population Effect Size Magnitude										
0.0	720	0.0001	-0.0080	0.0102	0.0002	-0.0089	0.0085	0.0001	-0.0111	0.0084
0.2	720	-0.0064	-0.0295	0.0249	0.0696	0.0195	0.1299	0.1222	0.0362	0.2245
0.5	720	-0.0160	-0.0701	0.0623	0.1227	-0.0009	0.2582	0.2090	0.0121	0.4104
0.8	720	-0.0255	-0.1125	0.0997	0.1243	-0.0327	0.3030	0.2090	-0.0295	0.4491
Population Effect Size Variance										
0.00	576	-0.0094	-0.0914	0.0918	0.0744	-0.0327	0.2866	0.1297	-0.0295	0.4280
0.10	576	-0.0109	-0.0989	0.0948	0.0830	-0.0081	0.3030	0.1418	-0.0058	0.4419
0.33	576	-0.0122	-0.1048	0.0954	0.0850	-0.0063	0.2981	0.1441	-0.0074	0.4491
0.50	576	-0.0128	-0.1089	0.0980	0.0822	-0.0089	0.2972	0.1389	-0.0098	0.4449
1.00	576	-0.0144	-0.1125	0.0997	0.0714	-0.0088	0.2735	0.1207	-0.0111	0.4099

Appendix B: Mean effect size and effect size variance bias estimates

Table 18. Estimated bias in effect size variance by study condition and magnitude of publication bias

		Magnitude of Publication Bias								
		None			Moderate			Strong		
	N	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum
Number of Studies (k)										
10	720	-0.0147	-0.3267	0.2756	0.1299	-0.1377	0.7757	0.2277	-0.1113	1.1622
20	720	-0.0328	-0.3648	0.2368	0.1114	-0.1479	0.6985	0.2063	-0.1302	1.0971
50	720	-0.0432	-0.3775	0.2167	0.1012	-0.1592	0.6714	0.1951	-0.1399	1.0661
100	720	-0.0467	-0.3806	0.2154	0.0978	-0.1593	0.6601	0.1915	-0.1413	1.0508
Primary Study Sample Size (n1, n2)										
4,6	320	-0.1233	-0.3806	0.0761	0.0974	-0.1478	0.2639	0.2598	-0.0840	0.5639
5,5	320	-0.0575	-0.3257	0.1536	0.1842	-0.1000	0.4577	0.3543	-0.0532	0.7987
6,4	320	0.0291	-0.3243	0.2756	0.3015	-0.0951	0.7757	0.4858	-0.0527	1.1622
8,12	320	-0.0867	-0.2862	0.0510	0.0462	-0.1432	0.1794	0.1319	-0.1062	0.3506
10,10	320	-0.0336	-0.2326	0.1007	0.1078	-0.0918	0.3166	0.1958	-0.0825	0.5232
12,8	320	0.0362	-0.2304	0.2215	0.1943	-0.0888	0.5872	0.2909	-0.0779	0.8256
40,60	320	-0.0573	-0.2173	0.0211	-0.0150	-0.1593	0.0628	0.0071	-0.1413	0.1116
50,50	320	-0.0276	-0.1651	0.0353	0.0158	-0.1082	0.1063	0.0383	-0.0907	0.1633
60,40	320	0.0117	-0.1620	0.1276	0.0587	-0.1055	0.2467	0.0825	-0.0863	0.3430
Primary Study Group Variance										
1:1	720	-0.0722	-0.3268	0.0723	0.0576	-0.1082	0.2596	0.1430	-0.0907	0.5274
1:2	720	-0.0595	-0.3752	0.1139	0.0752	-0.1478	0.3593	0.1635	-0.1262	0.6769
1:4	720	-0.0255	-0.3806	0.1782	0.1223	-0.1593	0.5446	0.2196	-0.1399	0.9142
1:8	720	0.0199	-0.3637	0.2756	0.1853	-0.1570	0.7757	0.2945	-0.1413	1.1622
Population Effect Size Magnitude										
0.0	720	-0.0380	-0.3788	0.2399	0.1824	-0.0880	0.7757	0.3461	-0.0240	1.1622
0.2	720	-0.0373	-0.3806	0.2512	0.1598	-0.0957	0.7620	0.2975	-0.0350	1.1534
0.5	720	-0.0341	-0.3770	0.2530	0.0841	-0.1208	0.6554	0.1490	-0.0792	0.9752
0.8	720	-0.0280	-0.3685	0.2756	0.0142	-0.1593	0.5305	0.0280	-0.1413	0.7101
Population Effect Size Variance										
0.00	576	0.0414	0.0012	0.2756	0.1039	0.0004	0.5948	0.1627	0.0002	0.9100
0.10	576	0.0175	-0.0675	0.2708	0.1075	-0.0643	0.6322	0.1751	-0.0792	0.9615
0.33	576	-0.0181	-0.1482	0.2580	0.1238	-0.0864	0.7076	0.2148	-0.1062	1.0531
0.50	576	-0.0479	-0.2011	0.2535	0.1270	-0.0936	0.7272	0.2350	-0.0965	1.1092
1.00	576	-0.1645	-0.3806	0.1917	0.0883	-0.1593	0.7757	0.2382	-0.1413	1.1622

Appendix C: Type I error rate estimates

Table 19. Type I error rate estimates for conditions when the population effect size variance is 0.00.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	10	4	6	0.078	0.064	0.022	0.003	0.000	0.081	0.066	0.025	0.003	0.000	0.110	0.066	0.037	0.004	0.000	0.154	0.067	0.062	0.005	0.000
1:1	10	5	5	0.076	0.071	0.022	0.003	0.000	0.081	0.064	0.024	0.004	0.000	0.108	0.065	0.038	0.003	0.000	0.155	0.071	0.059	0.004	0.000
1:1	10	6	4	0.074	0.067	0.022	0.004	0.000	0.079	0.063	0.024	0.004	0.000	0.105	0.069	0.040	0.002	0.000	0.161	0.071	0.061	0.005	0.000
1:1	10	8	12	0.061	0.062	0.009	0.004	0.000	0.063	0.060	0.010	0.004	0.000	0.071	0.068	0.014	0.004	0.000	0.083	0.064	0.019	0.004	0.000
1:1	10	10	10	0.062	0.061	0.011	0.003	0.000	0.065	0.067	0.010	0.004	0.000	0.077	0.065	0.015	0.004	0.000	0.085	0.067	0.019	0.004	0.000
1:1	10	12	8	0.064	0.065	0.009	0.004	0.000	0.068	0.068	0.011	0.006	0.000	0.075	0.066	0.014	0.004	0.000	0.080	0.066	0.019	0.004	0.000
1:1	10	40	60	0.057	0.058	0.010	0.005	0.000	0.058	0.062	0.012	0.005	0.000	0.064	0.067	0.012	0.006	0.000	0.061	0.055	0.011	0.005	0.000
1:1	10	50	50	0.062	0.060	0.011	0.006	0.000	0.060	0.061	0.011	0.005	0.000	0.058	0.060	0.012	0.005	0.000	0.070	0.061	0.013	0.006	0.000
1:1	10	60	40	0.057	0.061	0.010	0.006	0.000	0.063	0.055	0.011	0.006	0.000	0.060	0.060	0.010	0.005	0.000	0.062	0.060	0.013	0.005	0.000
1:1	20	4	6	0.058	0.049	0.055	0.013	0.001	0.076	0.049	0.063	0.014	0.002	0.133	0.052	0.126	0.016	0.005	0.251	0.056	0.234	0.016	0.009
1:1	20	5	5	0.066	0.059	0.053	0.015	0.001	0.073	0.051	0.063	0.016	0.002	0.141	0.057	0.120	0.016	0.005	0.237	0.054	0.220	0.014	0.012
1:1	20	6	4	0.061	0.050	0.053	0.013	0.001	0.074	0.055	0.066	0.014	0.002	0.145	0.054	0.127	0.014	0.006	0.257	0.055	0.236	0.016	0.010
1:1	20	8	12	0.059	0.052	0.029	0.016	0.002	0.059	0.053	0.031	0.016	0.003	0.071	0.048	0.045	0.016	0.006	0.103	0.054	0.074	0.019	0.008
1:1	20	10	10	0.051	0.049	0.027	0.015	0.002	0.057	0.052	0.034	0.017	0.004	0.075	0.054	0.048	0.020	0.006	0.105	0.057	0.075	0.021	0.007
1:1	20	12	8	0.053	0.050	0.028	0.015	0.002	0.057	0.048	0.035	0.018	0.003	0.071	0.053	0.048	0.018	0.005	0.099	0.050	0.074	0.020	0.008
1:1	20	40	60	0.052	0.052	0.027	0.021	0.003	0.053	0.050	0.028	0.019	0.007	0.054	0.051	0.031	0.022	0.006	0.057	0.052	0.030	0.020	0.006
1:1	20	50	50	0.051	0.050	0.027	0.022	0.005	0.050	0.052	0.028	0.022	0.005	0.051	0.046	0.027	0.018	0.008	0.062	0.049	0.035	0.023	0.007
1:1	20	60	40	0.047	0.049	0.026	0.018	0.004	0.053	0.052	0.031	0.023	0.005	0.055	0.051	0.031	0.021	0.006	0.056	0.048	0.031	0.022	0.006
1:1	50	4	6	0.059	0.048	0.082	0.026	0.013	0.088	0.048	0.113	0.022	0.024	0.269	0.052	0.311	0.026	0.052	0.534	0.055	0.583	0.031	0.108
1:1	50	5	5	0.057	0.045	0.074	0.021	0.012	0.086	0.049	0.111	0.025	0.023	0.252	0.052	0.295	0.025	0.051	0.511	0.054	0.558	0.026	0.110
1:1	50	6	4	0.055	0.047	0.072	0.023	0.011	0.091	0.047	0.119	0.025	0.025	0.272	0.052	0.318	0.026	0.055	0.538	0.058	0.585	0.031	0.108
1:1	50	8	12	0.054	0.049	0.044	0.029	0.015	0.057	0.047	0.053	0.029	0.021	0.101	0.051	0.100	0.029	0.036	0.192	0.052	0.199	0.029	0.062
1:1	50	10	10	0.053	0.049	0.044	0.028	0.015	0.064	0.048	0.056	0.028	0.023	0.113	0.050	0.109	0.030	0.036	0.183	0.048	0.188	0.034	0.064
1:1	50	12	8	0.051	0.047	0.043	0.028	0.016	0.057	0.046	0.049	0.028	0.021	0.101	0.050	0.102	0.032	0.036	0.189	0.050	0.201	0.034	0.059
1:1	50	40	60	0.045	0.048	0.039	0.035	0.019	0.047	0.045	0.041	0.035	0.021	0.055	0.045	0.044	0.031	0.024	0.069	0.048	0.057	0.035	0.032
1:1	50	50	50	0.048	0.044	0.039	0.031	0.020	0.047	0.043	0.039	0.033	0.021	0.058	0.049	0.049	0.035	0.030	0.075	0.047	0.057	0.032	0.034
1:1	50	60	40	0.050	0.048	0.041	0.034	0.018	0.046	0.043	0.039	0.033	0.024	0.051	0.042	0.045	0.030	0.028	0.068	0.049	0.054	0.036	0.033
1:1	100	4	6	0.056	0.049	0.084	0.026	0.021	0.126	0.048	0.168	0.028	0.043	0.484	0.050	0.553	0.032	0.119	0.834	0.061	0.872	0.039	0.250
1:1	100	5	5	0.054	0.047	0.079	0.025	0.022	0.121	0.048	0.160	0.027	0.045	0.456	0.053	0.518	0.032	0.125	0.823	0.062	0.862	0.039	0.246
1:1	100	6	4	0.058	0.048	0.085	0.025	0.021	0.122	0.046	0.167	0.024	0.044	0.486	0.054	0.554	0.035	0.117	0.841	0.057	0.874	0.035	0.248
1:1	100	8	12	0.055	0.047	0.053	0.034	0.022	0.070	0.047	0.071	0.032	0.035	0.165	0.048	0.183	0.034	0.070	0.340	0.049	0.382	0.040	0.123
1:1	100	10	10	0.048	0.045	0.048	0.029	0.021	0.068	0.046	0.068	0.030	0.036	0.162	0.044	0.176	0.033	0.078	0.342	0.046	0.381	0.037	0.126
1:1	100	12	8	0.050	0.048	0.053	0.029	0.020	0.068	0.047	0.071	0.033	0.034	0.166	0.050	0.180	0.036	0.070	0.340	0.047	0.381	0.036	0.120
1:1	100	40	60	0.047	0.048	0.044	0.036	0.024	0.046	0.048	0.047	0.037	0.031	0.063	0.046	0.054	0.037	0.037	0.090	0.045	0.071	0.041	0.045

Appendix C (continued): Type I error rate estimates

Table 19 (continued). Type I error rate estimates for conditions when the population effect size variance is 0.00.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	100	50	50	0.045	0.042	0.043	0.034	0.025	0.050	0.048	0.048	0.040	0.029	0.065	0.046	0.058	0.040	0.036	0.097	0.051	0.082	0.042	0.044
1:1	100	60	40	0.043	0.044	0.043	0.037	0.024	0.044	0.044	0.042	0.039	0.030	0.070	0.048	0.060	0.040	0.039	0.094	0.046	0.077	0.040	0.043
1:2	10	4	6	0.081	0.071	0.024	0.003	0.000	0.079	0.064	0.029	0.002	0.000	0.111	0.068	0.038	0.002	0.000	0.158	0.069	0.061	0.003	0.000
1:2	10	5	5	0.075	0.067	0.025	0.003	0.000	0.086	0.069	0.029	0.004	0.000	0.109	0.065	0.040	0.004	0.000	0.159	0.069	0.071	0.005	0.000
1:2	10	6	4	0.073	0.065	0.027	0.004	0.000	0.080	0.068	0.027	0.004	0.000	0.115	0.068	0.048	0.004	0.000	0.174	0.066	0.077	0.004	0.000
1:2	10	8	12	0.065	0.063	0.011	0.004	0.000	0.067	0.066	0.013	0.004	0.000	0.074	0.065	0.015	0.005	0.000	0.090	0.066	0.021	0.004	0.000
1:2	10	10	10	0.065	0.066	0.014	0.004	0.000	0.065	0.062	0.014	0.005	0.000	0.072	0.062	0.016	0.004	0.000	0.086	0.065	0.023	0.004	0.000
1:2	10	12	8	0.065	0.062	0.016	0.005	0.000	0.065	0.063	0.014	0.005	0.000	0.073	0.060	0.020	0.005	0.000	0.096	0.065	0.028	0.006	0.000
1:2	10	40	60	0.057	0.062	0.014	0.004	0.000	0.059	0.061	0.015	0.005	0.000	0.060	0.063	0.018	0.006	0.000	0.064	0.062	0.018	0.004	0.000
1:2	10	50	50	0.064	0.062	0.020	0.006	0.000	0.059	0.061	0.018	0.005	0.000	0.061	0.062	0.019	0.006	0.000	0.063	0.060	0.018	0.005	0.000
1:2	10	60	40	0.060	0.060	0.025	0.007	0.000	0.061	0.058	0.023	0.005	0.000	0.061	0.058	0.023	0.006	0.000	0.064	0.063	0.022	0.006	0.000
1:2	20	4	6	0.065	0.054	0.054	0.012	0.002	0.076	0.055	0.065	0.010	0.002	0.135	0.057	0.126	0.013	0.005	0.244	0.057	0.223	0.014	0.010
1:2	20	5	5	0.068	0.056	0.061	0.015	0.001	0.079	0.055	0.077	0.017	0.003	0.138	0.051	0.134	0.014	0.007	0.248	0.054	0.244	0.015	0.010
1:2	20	6	4	0.065	0.052	0.066	0.017	0.001	0.077	0.052	0.082	0.017	0.002	0.155	0.058	0.164	0.018	0.004	0.286	0.056	0.290	0.018	0.009
1:2	20	8	12	0.054	0.054	0.030	0.016	0.002	0.057	0.054	0.032	0.016	0.002	0.073	0.056	0.046	0.016	0.004	0.098	0.052	0.070	0.015	0.007
1:2	20	10	10	0.057	0.053	0.036	0.020	0.002	0.061	0.049	0.041	0.016	0.003	0.070	0.049	0.052	0.018	0.005	0.116	0.058	0.090	0.019	0.009
1:2	20	12	8	0.055	0.047	0.039	0.020	0.002	0.063	0.049	0.044	0.020	0.003	0.084	0.054	0.065	0.019	0.005	0.121	0.054	0.106	0.021	0.011
1:2	20	40	60	0.050	0.051	0.031	0.018	0.004	0.048	0.050	0.032	0.018	0.004	0.050	0.052	0.034	0.018	0.007	0.057	0.054	0.041	0.021	0.007
1:2	20	50	50	0.051	0.050	0.039	0.022	0.005	0.051	0.051	0.042	0.021	0.004	0.055	0.049	0.042	0.020	0.007	0.060	0.048	0.046	0.020	0.008
1:2	20	60	40	0.056	0.048	0.043	0.022	0.005	0.052	0.051	0.044	0.022	0.004	0.054	0.052	0.050	0.025	0.006	0.066	0.053	0.056	0.026	0.008
1:2	50	4	6	0.062	0.054	0.081	0.022	0.011	0.091	0.050	0.112	0.019	0.022	0.257	0.054	0.294	0.021	0.060	0.512	0.053	0.561	0.022	0.118
1:2	50	5	5	0.059	0.046	0.079	0.024	0.012	0.089	0.053	0.121	0.027	0.024	0.277	0.049	0.332	0.024	0.063	0.538	0.055	0.599	0.027	0.128
1:2	50	6	4	0.061	0.049	0.097	0.032	0.013	0.101	0.051	0.148	0.031	0.023	0.308	0.055	0.377	0.033	0.060	0.608	0.059	0.683	0.037	0.118
1:2	50	8	12	0.047	0.045	0.044	0.024	0.013	0.059	0.050	0.055	0.024	0.024	0.103	0.051	0.105	0.026	0.043	0.182	0.052	0.193	0.029	0.071
1:2	50	10	10	0.051	0.047	0.052	0.029	0.014	0.063	0.050	0.063	0.030	0.022	0.113	0.053	0.123	0.032	0.044	0.199	0.046	0.229	0.030	0.075
1:2	50	12	8	0.052	0.047	0.056	0.032	0.014	0.062	0.047	0.070	0.030	0.021	0.124	0.051	0.141	0.033	0.043	0.228	0.055	0.269	0.040	0.076
1:2	50	40	60	0.043	0.044	0.042	0.027	0.018	0.048	0.051	0.043	0.030	0.024	0.058	0.052	0.053	0.032	0.034	0.072	0.058	0.070	0.037	0.043
1:2	50	50	50	0.049	0.049	0.052	0.033	0.018	0.048	0.048	0.052	0.033	0.025	0.060	0.050	0.060	0.035	0.037	0.078	0.048	0.079	0.035	0.040
1:2	50	60	40	0.052	0.046	0.061	0.033	0.021	0.051	0.045	0.060	0.036	0.025	0.064	0.051	0.076	0.042	0.033	0.091	0.052	0.094	0.044	0.044
1:2	100	4	6	0.060	0.054	0.085	0.024	0.020	0.126	0.049	0.166	0.024	0.046	0.460	0.051	0.522	0.023	0.132	0.815	0.049	0.856	0.025	0.267
1:2	100	5	5	0.055	0.045	0.092	0.024	0.022	0.124	0.048	0.175	0.029	0.047	0.476	0.052	0.556	0.034	0.128	0.845	0.057	0.886	0.038	0.269
1:2	100	6	4	0.058	0.048	0.109	0.034	0.022	0.140	0.048	0.210	0.033	0.044	0.541	0.056	0.642	0.040	0.124	0.893	0.074	0.928	0.055	0.264
1:2	100	8	12	0.050	0.046	0.048	0.026	0.019	0.066	0.051	0.069	0.029	0.039	0.155	0.046	0.170	0.030	0.086	0.318	0.048	0.365	0.032	0.153
1:2	100	10	10	0.050	0.047	0.054	0.032	0.019	0.073	0.051	0.082	0.036	0.040	0.183	0.049	0.210	0.035	0.084	0.367	0.054	0.431	0.043	0.155

Appendix C (continued): Type I error rate estimates

Table 19 (continued). Type I error rate estimates for conditions when the population effect size variance is 0.00.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:2	100	12	8	0.053	0.048	0.065	0.039	0.025	0.071	0.045	0.092	0.034	0.036	0.201	0.052	0.250	0.041	0.081	0.413	0.067	0.495	0.055	0.146
1:2	100	40	60	0.044	0.049	0.044	0.031	0.028	0.049	0.050	0.050	0.039	0.033	0.066	0.055	0.067	0.036	0.052	0.095	0.059	0.097	0.043	0.071
1:2	100	50	50	0.048	0.043	0.056	0.037	0.028	0.054	0.048	0.061	0.040	0.034	0.069	0.043	0.078	0.037	0.051	0.119	0.051	0.127	0.044	0.075
1:2	100	60	40	0.050	0.050	0.066	0.041	0.022	0.053	0.046	0.066	0.041	0.033	0.078	0.055	0.089	0.048	0.048	0.129	0.068	0.132	0.063	0.068
1:4	10	4	6	0.083	0.073	0.030	0.003	0.000	0.087	0.073	0.034	0.003	0.000	0.115	0.070	0.051	0.003	0.000	0.166	0.069	0.083	0.003	0.000
1:4	10	5	5	0.084	0.068	0.038	0.003	0.000	0.089	0.070	0.037	0.005	0.000	0.121	0.070	0.056	0.004	0.000	0.177	0.071	0.095	0.004	0.000
1:4	10	6	4	0.075	0.063	0.039	0.006	0.000	0.085	0.065	0.043	0.005	0.000	0.128	0.064	0.078	0.005	0.000	0.201	0.070	0.123	0.007	0.000
1:4	10	8	12	0.068	0.069	0.016	0.004	0.000	0.067	0.065	0.018	0.004	0.000	0.078	0.072	0.025	0.006	0.000	0.086	0.069	0.032	0.005	0.000
1:4	10	10	10	0.068	0.063	0.023	0.004	0.000	0.067	0.063	0.021	0.004	0.000	0.075	0.065	0.026	0.005	0.000	0.097	0.064	0.043	0.005	0.000
1:4	10	12	8	0.068	0.060	0.026	0.006	0.000	0.070	0.064	0.028	0.007	0.000	0.088	0.063	0.037	0.007	0.000	0.107	0.068	0.052	0.005	0.000
1:4	10	40	60	0.056	0.063	0.032	0.004	0.000	0.063	0.065	0.035	0.006	0.000	0.063	0.066	0.035	0.007	0.000	0.064	0.070	0.046	0.006	0.000
1:4	10	50	50	0.066	0.066	0.043	0.007	0.000	0.061	0.063	0.041	0.007	0.000	0.067	0.060	0.045	0.008	0.000	0.069	0.062	0.052	0.007	0.000
1:4	10	60	40	0.065	0.058	0.048	0.006	0.000	0.063	0.054	0.050	0.006	0.000	0.072	0.064	0.056	0.007	0.000	0.075	0.061	0.062	0.010	0.000
1:4	20	4	6	0.071	0.059	0.063	0.010	0.001	0.079	0.053	0.080	0.011	0.001	0.144	0.058	0.140	0.011	0.005	0.260	0.058	0.268	0.012	0.014
1:4	20	5	5	0.068	0.053	0.078	0.016	0.001	0.082	0.058	0.099	0.016	0.003	0.156	0.056	0.178	0.015	0.005	0.291	0.055	0.315	0.014	0.016
1:4	20	6	4	0.059	0.051	0.094	0.019	0.001	0.084	0.053	0.117	0.019	0.002	0.181	0.056	0.231	0.022	0.005	0.346	0.064	0.401	0.022	0.013
1:4	20	8	12	0.057	0.058	0.042	0.014	0.002	0.063	0.057	0.048	0.015	0.003	0.077	0.055	0.066	0.015	0.005	0.106	0.060	0.099	0.016	0.010
1:4	20	10	10	0.056	0.051	0.051	0.018	0.002	0.061	0.056	0.057	0.021	0.003	0.084	0.051	0.083	0.018	0.007	0.131	0.053	0.142	0.018	0.010
1:4	20	12	8	0.056	0.045	0.059	0.019	0.002	0.063	0.049	0.063	0.021	0.002	0.088	0.052	0.107	0.025	0.005	0.146	0.055	0.170	0.025	0.010
1:4	20	40	60	0.047	0.054	0.055	0.017	0.005	0.051	0.056	0.058	0.020	0.005	0.054	0.061	0.068	0.022	0.005	0.067	0.067	0.086	0.029	0.008
1:4	20	50	50	0.052	0.054	0.069	0.022	0.003	0.052	0.051	0.076	0.022	0.004	0.059	0.052	0.080	0.020	0.007	0.070	0.051	0.103	0.022	0.007
1:4	20	60	40	0.054	0.050	0.085	0.025	0.003	0.060	0.047	0.088	0.023	0.003	0.062	0.050	0.092	0.024	0.006	0.082	0.061	0.117	0.031	0.007
1:4	50	4	6	0.065	0.057	0.096	0.019	0.013	0.095	0.055	0.135	0.019	0.028	0.265	0.050	0.334	0.019	0.069	0.532	0.050	0.602	0.018	0.160
1:4	50	5	5	0.059	0.048	0.108	0.023	0.012	0.100	0.050	0.159	0.026	0.030	0.300	0.048	0.396	0.025	0.073	0.594	0.057	0.698	0.029	0.159
1:4	50	6	4	0.059	0.048	0.123	0.030	0.013	0.112	0.048	0.198	0.030	0.026	0.368	0.056	0.498	0.039	0.071	0.701	0.062	0.803	0.043	0.156
1:4	50	8	12	0.050	0.052	0.051	0.023	0.013	0.060	0.049	0.066	0.022	0.026	0.110	0.056	0.131	0.025	0.055	0.187	0.054	0.241	0.023	0.103
1:4	50	10	10	0.054	0.049	0.077	0.029	0.013	0.066	0.047	0.089	0.030	0.026	0.132	0.050	0.176	0.029	0.058	0.243	0.052	0.320	0.034	0.115
1:4	50	12	8	0.056	0.049	0.079	0.031	0.014	0.073	0.049	0.105	0.032	0.027	0.157	0.055	0.224	0.039	0.054	0.305	0.064	0.402	0.048	0.105
1:4	50	40	60	0.045	0.049	0.066	0.026	0.018	0.055	0.059	0.076	0.034	0.030	0.060	0.062	0.092	0.038	0.047	0.083	0.079	0.132	0.053	0.079
1:4	50	50	50	0.047	0.050	0.088	0.035	0.017	0.056	0.050	0.090	0.034	0.032	0.073	0.051	0.122	0.037	0.054	0.103	0.051	0.175	0.037	0.085
1:4	50	60	40	0.053	0.046	0.102	0.032	0.016	0.058	0.052	0.111	0.038	0.030	0.080	0.057	0.134	0.042	0.048	0.118	0.075	0.187	0.051	0.086
1:4	100	4	6	0.054	0.051	0.102	0.019	0.022	0.129	0.057	0.188	0.020	0.052	0.458	0.051	0.561	0.019	0.149	0.827	0.052	0.883	0.022	0.317
1:4	100	5	5	0.059	0.052	0.115	0.030	0.022	0.133	0.047	0.223	0.028	0.048	0.512	0.053	0.638	0.034	0.151	0.877	0.056	0.927	0.039	0.318
1:4	100	6	4	0.059	0.047	0.140	0.033	0.021	0.164	0.049	0.286	0.036	0.047	0.630	0.064	0.757	0.051	0.148	0.942	0.087	0.972	0.073	0.303

Appendix C (continued): Type I error rate estimates

Table 19 (continued). Type I error rate estimates for conditions when the population effect size variance is 0.00.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:4	100	8	12	0.050	0.047	0.060	0.024	0.024	0.069	0.052	0.084	0.028	0.043	0.165	0.051	0.219	0.027	0.116	0.340	0.058	0.443	0.029	0.221
1:4	100	10	10	0.055	0.049	0.078	0.037	0.021	0.080	0.048	0.118	0.034	0.046	0.214	0.045	0.297	0.032	0.112	0.439	0.048	0.571	0.035	0.223
1:4	100	12	8	0.058	0.047	0.093	0.035	0.018	0.089	0.050	0.140	0.038	0.043	0.272	0.056	0.367	0.043	0.103	0.545	0.074	0.674	0.060	0.214
1:4	100	40	60	0.048	0.051	0.072	0.030	0.024	0.051	0.054	0.084	0.035	0.046	0.072	0.075	0.125	0.049	0.097	0.116	0.104	0.205	0.083	0.165
1:4	100	50	50	0.050	0.047	0.099	0.038	0.028	0.058	0.049	0.110	0.038	0.049	0.088	0.049	0.153	0.038	0.099	0.152	0.048	0.254	0.037	0.172
1:4	100	60	40	0.049	0.042	0.106	0.034	0.026	0.062	0.053	0.121	0.042	0.046	0.113	0.075	0.182	0.057	0.094	0.200	0.100	0.276	0.078	0.163
1:8	10	4	6	0.084	0.072	0.046	0.002	0.000	0.091	0.071	0.046	0.003	0.000	0.121	0.071	0.068	0.003	0.000	0.172	0.072	0.104	0.005	0.000
1:8	10	5	5	0.087	0.069	0.050	0.005	0.000	0.087	0.068	0.059	0.004	0.000	0.124	0.065	0.082	0.004	0.000	0.197	0.068	0.145	0.005	0.000
1:8	10	6	4	0.083	0.065	0.058	0.007	0.000	0.089	0.064	0.072	0.007	0.000	0.140	0.068	0.112	0.006	0.000	0.225	0.069	0.185	0.008	0.000
1:8	10	8	12	0.064	0.070	0.026	0.003	0.000	0.071	0.074	0.031	0.004	0.000	0.077	0.070	0.039	0.004	0.000	0.092	0.067	0.051	0.004	0.000
1:8	10	10	10	0.074	0.067	0.038	0.005	0.000	0.067	0.060	0.040	0.004	0.000	0.087	0.064	0.056	0.006	0.000	0.106	0.066	0.075	0.007	0.000
1:8	10	12	8	0.072	0.057	0.045	0.006	0.000	0.073	0.060	0.051	0.007	0.000	0.092	0.063	0.067	0.007	0.000	0.125	0.064	0.099	0.008	0.000
1:8	10	40	60	0.065	0.072	0.057	0.007	0.000	0.059	0.065	0.065	0.007	0.000	0.067	0.071	0.073	0.010	0.000	0.069	0.077	0.083	0.011	0.000
1:8	10	50	50	0.062	0.060	0.073	0.008	0.000	0.062	0.062	0.070	0.008	0.000	0.068	0.061	0.087	0.010	0.000	0.079	0.062	0.104	0.011	0.000
1:8	10	60	40	0.067	0.061	0.086	0.009	0.000	0.068	0.058	0.081	0.008	0.000	0.076	0.065	0.100	0.011	0.000	0.076	0.064	0.115	0.012	0.000
1:8	20	4	6	0.069	0.060	0.092	0.011	0.002	0.079	0.056	0.102	0.010	0.003	0.142	0.058	0.177	0.010	0.006	0.263	0.059	0.308	0.011	0.016
1:8	20	5	5	0.069	0.058	0.110	0.016	0.001	0.087	0.055	0.131	0.017	0.003	0.165	0.058	0.227	0.017	0.007	0.315	0.054	0.402	0.016	0.017
1:8	20	6	4	0.065	0.048	0.135	0.019	0.002	0.089	0.053	0.158	0.022	0.003	0.210	0.056	0.308	0.025	0.007	0.400	0.061	0.507	0.023	0.016
1:8	20	8	12	0.060	0.060	0.058	0.014	0.002	0.058	0.057	0.063	0.017	0.003	0.081	0.057	0.095	0.016	0.006	0.115	0.057	0.145	0.013	0.013
1:8	20	10	10	0.058	0.053	0.078	0.019	0.002	0.061	0.051	0.087	0.019	0.003	0.094	0.052	0.129	0.019	0.006	0.148	0.057	0.201	0.020	0.012
1:8	20	12	8	0.060	0.052	0.098	0.020	0.001	0.068	0.049	0.106	0.020	0.002	0.107	0.052	0.166	0.025	0.004	0.184	0.060	0.270	0.027	0.011
1:8	20	40	60	0.054	0.060	0.092	0.021	0.003	0.055	0.060	0.097	0.023	0.004	0.060	0.064	0.119	0.028	0.006	0.072	0.077	0.149	0.038	0.009
1:8	20	50	50	0.056	0.055	0.119	0.023	0.002	0.056	0.050	0.127	0.020	0.004	0.061	0.049	0.142	0.025	0.006	0.080	0.057	0.178	0.027	0.007
1:8	20	60	40	0.060	0.051	0.140	0.027	0.003	0.059	0.053	0.144	0.027	0.003	0.070	0.053	0.162	0.030	0.005	0.101	0.064	0.210	0.034	0.007
1:8	50	4	6	0.062	0.050	0.120	0.016	0.012	0.091	0.054	0.162	0.017	0.030	0.269	0.052	0.375	0.017	0.085	0.541	0.054	0.662	0.018	0.193
1:8	50	5	5	0.062	0.047	0.140	0.022	0.012	0.105	0.049	0.202	0.021	0.030	0.321	0.056	0.477	0.027	0.091	0.646	0.058	0.782	0.032	0.206
1:8	50	6	4	0.061	0.044	0.174	0.031	0.012	0.122	0.050	0.254	0.031	0.028	0.426	0.062	0.605	0.040	0.082	0.782	0.071	0.885	0.052	0.203
1:8	50	8	12	0.054	0.054	0.077	0.022	0.015	0.063	0.054	0.089	0.021	0.026	0.111	0.054	0.177	0.024	0.070	0.215	0.059	0.327	0.026	0.141
1:8	50	10	10	0.057	0.048	0.100	0.030	0.014	0.072	0.051	0.135	0.029	0.028	0.146	0.051	0.255	0.035	0.077	0.297	0.048	0.453	0.027	0.160
1:8	50	12	8	0.057	0.050	0.124	0.031	0.011	0.085	0.049	0.161	0.030	0.030	0.198	0.053	0.332	0.037	0.075	0.395	0.064	0.575	0.043	0.151
1:8	50	40	60	0.050	0.053	0.120	0.027	0.017	0.051	0.060	0.121	0.030	0.031	0.064	0.070	0.170	0.048	0.074	0.095	0.100	0.243	0.079	0.132
1:8	50	50	50	0.053	0.049	0.144	0.033	0.016	0.056	0.049	0.159	0.034	0.031	0.083	0.052	0.213	0.036	0.077	0.126	0.051	0.302	0.037	0.146
1:8	50	60	40	0.058	0.049	0.172	0.036	0.016	0.060	0.048	0.182	0.036	0.035	0.102	0.062	0.245	0.045	0.083	0.160	0.086	0.327	0.057	0.146
1:8	100	4	6	0.060	0.052	0.125	0.021	0.020	0.127	0.051	0.221	0.019	0.055	0.483	0.051	0.625	0.018	0.177	0.840	0.054	0.914	0.019	0.375

Appendix C (continued): Type I error rate estimates

Table 19 (continued). Type I error rate estimates for conditions when the population effect size variance is 0.00.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:8	100	5	5	0.057	0.046	0.147	0.029	0.023	0.146	0.046	0.282	0.031	0.056	0.572	0.054	0.735	0.033	0.179	0.910	0.054	0.964	0.037	0.378
1:8	100	6	4	0.057	0.047	0.186	0.032	0.021	0.185	0.048	0.368	0.037	0.057	0.706	0.074	0.840	0.055	0.171	0.968	0.106	0.990	0.082	0.369
1:8	100	8	12	0.051	0.049	0.080	0.026	0.022	0.074	0.054	0.122	0.028	0.054	0.185	0.062	0.292	0.028	0.139	0.385	0.064	0.560	0.032	0.292
1:8	100	10	10	0.054	0.048	0.117	0.033	0.021	0.087	0.050	0.165	0.034	0.054	0.255	0.046	0.420	0.032	0.148	0.524	0.051	0.712	0.033	0.313
1:8	100	12	8	0.058	0.046	0.136	0.033	0.021	0.103	0.045	0.208	0.030	0.048	0.344	0.065	0.524	0.046	0.138	0.670	0.080	0.832	0.064	0.290
1:8	100	40	60	0.049	0.054	0.119	0.033	0.023	0.054	0.060	0.140	0.041	0.056	0.084	0.098	0.222	0.075	0.153	0.136	0.153	0.356	0.140	0.287
1:8	100	50	50	0.053	0.050	0.152	0.036	0.026	0.060	0.044	0.182	0.035	0.057	0.115	0.054	0.287	0.041	0.161	0.200	0.054	0.434	0.044	0.297
1:8	100	60	40	0.052	0.045	0.183	0.033	0.026	0.072	0.055	0.206	0.039	0.059	0.149	0.078	0.323	0.051	0.158	0.292	0.122	0.489	0.079	0.301

Appendix C (continued): Type I error rate estimates

Table 20. Type I error rate estimates for conditions when the population effect size variance is 0.10.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	10	4	6	0.074	0.067	0.028	0.005	0.000	0.085	0.067	0.034	0.005	0.000	0.118	0.072	0.053	0.006	0.000	0.170	0.066	0.083	0.004	0.000
1:1	10	5	5	0.078	0.064	0.027	0.005	0.000	0.090	0.073	0.033	0.006	0.000	0.116	0.069	0.047	0.005	0.000	0.172	0.069	0.081	0.006	0.000
1:1	10	6	4	0.075	0.062	0.032	0.005	0.000	0.092	0.072	0.034	0.006	0.000	0.116	0.070	0.051	0.005	0.000	0.171	0.067	0.083	0.006	0.000
1:1	10	8	12	0.065	0.067	0.017	0.007	0.000	0.064	0.057	0.014	0.006	0.000	0.073	0.059	0.021	0.007	0.000	0.092	0.062	0.027	0.007	0.000
1:1	10	10	10	0.060	0.059	0.013	0.007	0.000	0.064	0.063	0.016	0.007	0.000	0.076	0.061	0.020	0.006	0.000	0.089	0.060	0.028	0.007	0.000
1:1	10	12	8	0.065	0.066	0.015	0.007	0.000	0.064	0.063	0.016	0.007	0.000	0.074	0.063	0.021	0.007	0.000	0.091	0.066	0.028	0.007	0.000
1:1	10	40	60	0.058	0.059	0.018	0.011	0.000	0.060	0.064	0.017	0.012	0.000	0.065	0.063	0.018	0.010	0.000	0.067	0.061	0.018	0.009	0.000
1:1	10	50	50	0.060	0.060	0.018	0.011	0.000	0.059	0.058	0.018	0.010	0.000	0.065	0.061	0.017	0.011	0.000	0.071	0.059	0.021	0.010	0.000
1:1	10	60	40	0.056	0.061	0.018	0.010	0.000	0.058	0.059	0.016	0.010	0.000	0.063	0.058	0.019	0.010	0.000	0.075	0.063	0.020	0.010	0.000
1:1	20	4	6	0.064	0.051	0.073	0.022	0.002	0.075	0.052	0.090	0.020	0.002	0.153	0.056	0.166	0.020	0.005	0.277	0.058	0.295	0.019	0.009
1:1	20	5	5	0.062	0.049	0.073	0.019	0.001	0.085	0.056	0.093	0.023	0.002	0.151	0.058	0.167	0.021	0.003	0.266	0.059	0.288	0.023	0.011
1:1	20	6	4	0.070	0.057	0.079	0.022	0.001	0.081	0.053	0.091	0.020	0.002	0.153	0.056	0.168	0.019	0.005	0.273	0.062	0.296	0.023	0.009
1:1	20	8	12	0.058	0.051	0.042	0.026	0.002	0.058	0.050	0.045	0.025	0.002	0.078	0.050	0.067	0.026	0.004	0.124	0.053	0.115	0.025	0.006
1:1	20	10	10	0.055	0.050	0.043	0.025	0.002	0.060	0.049	0.052	0.024	0.003	0.078	0.048	0.067	0.025	0.004	0.122	0.051	0.108	0.026	0.007
1:1	20	12	8	0.053	0.049	0.044	0.027	0.002	0.057	0.055	0.048	0.027	0.002	0.079	0.052	0.071	0.025	0.003	0.123	0.051	0.112	0.027	0.006
1:1	20	40	60	0.048	0.051	0.035	0.029	0.002	0.055	0.051	0.037	0.030	0.002	0.063	0.049	0.039	0.031	0.003	0.080	0.054	0.045	0.031	0.003
1:1	20	50	50	0.052	0.054	0.039	0.032	0.002	0.053	0.054	0.036	0.032	0.002	0.064	0.051	0.039	0.030	0.002	0.083	0.052	0.045	0.032	0.002
1:1	20	60	40	0.050	0.052	0.037	0.033	0.001	0.053	0.048	0.033	0.028	0.003	0.064	0.055	0.039	0.033	0.003	0.079	0.048	0.044	0.029	0.002
1:1	50	4	6	0.057	0.046	0.100	0.030	0.011	0.101	0.053	0.157	0.032	0.024	0.294	0.051	0.386	0.036	0.051	0.597	0.057	0.684	0.041	0.101
1:1	50	5	5	0.058	0.048	0.099	0.032	0.011	0.091	0.050	0.144	0.033	0.023	0.291	0.053	0.370	0.035	0.050	0.576	0.051	0.665	0.037	0.108
1:1	50	6	4	0.059	0.048	0.105	0.032	0.013	0.096	0.049	0.154	0.033	0.022	0.298	0.045	0.394	0.032	0.048	0.595	0.052	0.681	0.036	0.108
1:1	50	8	12	0.051	0.045	0.059	0.038	0.012	0.065	0.049	0.075	0.040	0.017	0.129	0.049	0.155	0.040	0.034	0.243	0.046	0.292	0.039	0.050
1:1	50	10	10	0.053	0.049	0.060	0.040	0.011	0.071	0.046	0.079	0.038	0.017	0.132	0.043	0.157	0.038	0.034	0.253	0.050	0.297	0.041	0.054
1:1	50	12	8	0.052	0.049	0.060	0.039	0.014	0.065	0.047	0.079	0.038	0.018	0.126	0.046	0.150	0.039	0.032	0.247	0.050	0.294	0.041	0.054
1:1	50	40	60	0.049	0.048	0.046	0.041	0.011	0.051	0.049	0.046	0.042	0.017	0.089	0.048	0.062	0.044	0.015	0.136	0.049	0.077	0.045	0.019
1:1	50	50	50	0.047	0.046	0.044	0.043	0.012	0.055	0.047	0.048	0.042	0.015	0.084	0.048	0.058	0.043	0.016	0.144	0.052	0.077	0.047	0.020
1:1	50	60	40	0.054	0.051	0.046	0.045	0.012	0.054	0.043	0.048	0.040	0.013	0.086	0.051	0.056	0.044	0.014	0.138	0.047	0.072	0.043	0.022
1:1	100	4	6	0.061	0.047	0.108	0.036	0.020	0.141	0.053	0.223	0.039	0.044	0.516	0.051	0.631	0.040	0.115	0.878	0.059	0.926	0.048	0.219
1:1	100	5	5	0.055	0.046	0.108	0.037	0.020	0.128	0.048	0.210	0.039	0.044	0.506	0.050	0.621	0.038	0.109	0.858	0.055	0.907	0.047	0.227
1:1	100	6	4	0.059	0.050	0.117	0.038	0.017	0.137	0.047	0.222	0.038	0.039	0.524	0.051	0.632	0.039	0.107	0.877	0.057	0.924	0.048	0.219
1:1	100	8	12	0.052	0.048	0.064	0.041	0.022	0.078	0.048	0.098	0.042	0.035	0.216	0.052	0.262	0.047	0.066	0.460	0.048	0.533	0.045	0.117
1:1	100	10	10	0.054	0.050	0.066	0.043	0.022	0.077	0.047	0.093	0.044	0.034	0.223	0.051	0.262	0.047	0.067	0.460	0.050	0.529	0.046	0.110
1:1	100	12	8	0.050	0.043	0.067	0.038	0.021	0.080	0.046	0.098	0.044	0.034	0.213	0.054	0.259	0.051	0.065	0.453	0.054	0.527	0.051	0.115
1:1	100	40	60	0.050	0.049	0.052	0.045	0.019	0.063	0.051	0.055	0.047	0.022	0.131	0.051	0.072	0.051	0.029	0.232	0.050	0.112	0.048	0.036

Appendix C (continued): Type I error rate estimates

Table 20 (continued). Type I error rate estimates for conditions when the population effect size variance is 0.10.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	100	50	50	0.052	0.049	0.052	0.049	0.021	0.062	0.051	0.054	0.051	0.024	0.129	0.048	0.078	0.049	0.033	0.243	0.052	0.107	0.053	0.037
1:1	100	60	40	0.049	0.052	0.049	0.047	0.020	0.059	0.049	0.053	0.048	0.022	0.124	0.048	0.072	0.048	0.030	0.234	0.048	0.111	0.050	0.037
1:2	10	4	6	0.080	0.070	0.034	0.006	0.000	0.084	0.065	0.032	0.004	0.000	0.119	0.075	0.053	0.004	0.000	0.174	0.066	0.083	0.004	0.000
1:2	10	5	5	0.081	0.071	0.034	0.005	0.000	0.080	0.063	0.034	0.005	0.000	0.117	0.067	0.053	0.005	0.000	0.175	0.071	0.086	0.006	0.000
1:2	10	6	4	0.076	0.064	0.031	0.006	0.000	0.080	0.068	0.037	0.006	0.000	0.125	0.066	0.063	0.005	0.000	0.184	0.069	0.103	0.006	0.000
1:2	10	8	12	0.062	0.064	0.016	0.006	0.000	0.066	0.065	0.018	0.007	0.000	0.073	0.062	0.022	0.007	0.000	0.089	0.063	0.028	0.005	0.000
1:2	10	10	10	0.062	0.060	0.016	0.008	0.000	0.062	0.062	0.019	0.007	0.000	0.080	0.063	0.024	0.007	0.000	0.095	0.065	0.037	0.008	0.000
1:2	10	12	8	0.061	0.058	0.021	0.007	0.000	0.067	0.064	0.022	0.008	0.000	0.079	0.059	0.027	0.007	0.000	0.102	0.066	0.038	0.008	0.000
1:2	10	40	60	0.056	0.064	0.024	0.012	0.000	0.055	0.061	0.023	0.010	0.000	0.065	0.060	0.028	0.012	0.000	0.070	0.060	0.026	0.010	0.000
1:2	10	50	50	0.059	0.064	0.023	0.013	0.000	0.061	0.060	0.025	0.010	0.000	0.064	0.060	0.027	0.012	0.000	0.078	0.058	0.030	0.011	0.000
1:2	10	60	40	0.061	0.058	0.028	0.010	0.000	0.063	0.058	0.027	0.011	0.000	0.066	0.058	0.027	0.011	0.000	0.080	0.061	0.035	0.011	0.000
1:2	20	4	6	0.063	0.051	0.076	0.016	0.001	0.082	0.053	0.091	0.020	0.002	0.148	0.055	0.161	0.016	0.004	0.272	0.052	0.289	0.018	0.010
1:2	20	5	5	0.065	0.054	0.078	0.020	0.001	0.075	0.054	0.092	0.020	0.002	0.151	0.056	0.177	0.023	0.006	0.284	0.056	0.314	0.022	0.011
1:2	20	6	4	0.070	0.053	0.086	0.023	0.001	0.087	0.057	0.106	0.023	0.002	0.167	0.052	0.200	0.024	0.005	0.317	0.055	0.360	0.025	0.011
1:2	20	8	12	0.052	0.052	0.044	0.026	0.002	0.060	0.054	0.052	0.027	0.003	0.082	0.054	0.070	0.025	0.004	0.114	0.054	0.114	0.027	0.007
1:2	20	10	10	0.055	0.052	0.048	0.028	0.002	0.061	0.051	0.056	0.027	0.002	0.084	0.052	0.079	0.029	0.003	0.123	0.054	0.119	0.028	0.007
1:2	20	12	8	0.061	0.052	0.055	0.028	0.002	0.061	0.048	0.057	0.028	0.002	0.088	0.052	0.088	0.028	0.003	0.142	0.055	0.141	0.030	0.007
1:2	20	40	60	0.050	0.053	0.045	0.034	0.001	0.054	0.053	0.042	0.033	0.001	0.058	0.053	0.050	0.032	0.002	0.079	0.052	0.063	0.040	0.003
1:2	20	50	50	0.051	0.052	0.046	0.031	0.001	0.053	0.052	0.044	0.031	0.002	0.065	0.052	0.052	0.033	0.002	0.091	0.050	0.065	0.030	0.003
1:2	20	60	40	0.053	0.053	0.048	0.032	0.001	0.055	0.047	0.052	0.032	0.002	0.073	0.053	0.058	0.031	0.002	0.091	0.053	0.067	0.033	0.002
1:2	50	4	6	0.060	0.050	0.105	0.027	0.012	0.093	0.051	0.155	0.030	0.023	0.282	0.056	0.370	0.034	0.059	0.569	0.051	0.657	0.030	0.123
1:2	50	5	5	0.059	0.050	0.110	0.033	0.011	0.097	0.049	0.161	0.031	0.024	0.302	0.047	0.403	0.032	0.057	0.594	0.056	0.690	0.037	0.117
1:2	50	6	4	0.061	0.049	0.120	0.033	0.010	0.103	0.049	0.175	0.035	0.022	0.337	0.059	0.451	0.039	0.052	0.660	0.057	0.754	0.043	0.115
1:2	50	8	12	0.052	0.048	0.063	0.036	0.015	0.060	0.050	0.075	0.039	0.018	0.121	0.044	0.155	0.034	0.039	0.237	0.046	0.304	0.037	0.067
1:2	50	10	10	0.049	0.046	0.062	0.037	0.011	0.068	0.050	0.083	0.041	0.016	0.130	0.046	0.170	0.038	0.038	0.273	0.048	0.323	0.041	0.060
1:2	50	12	8	0.049	0.047	0.066	0.038	0.010	0.065	0.045	0.086	0.038	0.017	0.153	0.049	0.190	0.044	0.035	0.292	0.053	0.357	0.042	0.062
1:2	50	40	60	0.051	0.051	0.053	0.044	0.012	0.053	0.050	0.058	0.046	0.015	0.083	0.052	0.073	0.047	0.021	0.141	0.054	0.101	0.044	0.027
1:2	50	50	50	0.052	0.050	0.060	0.045	0.011	0.055	0.048	0.065	0.044	0.015	0.093	0.050	0.082	0.045	0.020	0.152	0.053	0.107	0.049	0.028
1:2	50	60	40	0.051	0.048	0.065	0.040	0.013	0.062	0.049	0.066	0.044	0.013	0.093	0.049	0.084	0.044	0.018	0.162	0.056	0.108	0.048	0.025
1:2	100	4	6	0.054	0.050	0.109	0.036	0.022	0.135	0.049	0.213	0.034	0.043	0.494	0.049	0.619	0.034	0.116	0.861	0.048	0.920	0.033	0.234
1:2	100	5	5	0.051	0.047	0.112	0.037	0.020	0.137	0.048	0.234	0.036	0.046	0.524	0.052	0.647	0.040	0.123	0.882	0.057	0.933	0.046	0.244
1:2	100	6	4	0.061	0.049	0.130	0.040	0.021	0.146	0.048	0.252	0.042	0.042	0.578	0.054	0.707	0.047	0.116	0.923	0.071	0.953	0.061	0.235
1:2	100	8	12	0.048	0.043	0.068	0.039	0.022	0.081	0.050	0.103	0.043	0.037	0.204	0.047	0.272	0.042	0.075	0.428	0.045	0.533	0.042	0.135
1:2	100	10	10	0.047	0.045	0.066	0.039	0.021	0.077	0.043	0.104	0.039	0.036	0.234	0.047	0.294	0.044	0.076	0.489	0.051	0.575	0.047	0.135

Appendix C (continued): Type I error rate estimates

Table 20 (continued). Type I error rate estimates for conditions when the population effect size variance is 0.10.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:2	100	12	8	0.056	0.049	0.076	0.041	0.021	0.086	0.047	0.115	0.039	0.034	0.263	0.055	0.328	0.046	0.073	0.536	0.063	0.630	0.059	0.134
1:2	100	40	60	0.051	0.049	0.060	0.045	0.020	0.060	0.048	0.067	0.048	0.026	0.121	0.049	0.093	0.049	0.036	0.226	0.059	0.141	0.054	0.058
1:2	100	50	50	0.051	0.049	0.061	0.048	0.020	0.065	0.048	0.072	0.046	0.030	0.139	0.047	0.099	0.049	0.039	0.266	0.049	0.161	0.046	0.056
1:2	100	60	40	0.047	0.044	0.067	0.042	0.022	0.068	0.049	0.075	0.048	0.025	0.152	0.054	0.102	0.052	0.037	0.284	0.058	0.157	0.055	0.051
1:4	10	4	6	0.083	0.069	0.041	0.004	0.000	0.082	0.065	0.042	0.005	0.000	0.122	0.073	0.059	0.005	0.000	0.176	0.071	0.104	0.004	0.000
1:4	10	5	5	0.081	0.068	0.044	0.006	0.000	0.086	0.068	0.045	0.005	0.000	0.127	0.070	0.077	0.006	0.000	0.185	0.068	0.119	0.005	0.000
1:4	10	6	4	0.081	0.064	0.052	0.007	0.000	0.088	0.062	0.052	0.006	0.000	0.139	0.069	0.087	0.008	0.000	0.209	0.066	0.144	0.007	0.000
1:4	10	8	12	0.067	0.072	0.024	0.007	0.000	0.063	0.064	0.027	0.007	0.000	0.071	0.064	0.029	0.007	0.000	0.099	0.067	0.049	0.005	0.000
1:4	10	10	10	0.069	0.064	0.029	0.007	0.000	0.065	0.059	0.030	0.008	0.000	0.078	0.061	0.038	0.008	0.000	0.105	0.067	0.054	0.007	0.000
1:4	10	12	8	0.070	0.066	0.033	0.009	0.000	0.072	0.063	0.038	0.008	0.000	0.087	0.062	0.047	0.007	0.000	0.118	0.065	0.067	0.010	0.000
1:4	10	40	60	0.059	0.062	0.041	0.014	0.000	0.062	0.067	0.045	0.014	0.000	0.064	0.065	0.045	0.013	0.000	0.071	0.065	0.057	0.015	0.000
1:4	10	50	50	0.060	0.061	0.046	0.014	0.000	0.064	0.062	0.048	0.015	0.000	0.067	0.060	0.054	0.013	0.000	0.085	0.065	0.063	0.015	0.000
1:4	10	60	40	0.059	0.057	0.053	0.010	0.000	0.062	0.059	0.050	0.012	0.000	0.073	0.062	0.054	0.015	0.000	0.087	0.061	0.070	0.014	0.000
1:4	20	4	6	0.075	0.059	0.098	0.019	0.002	0.080	0.056	0.110	0.018	0.002	0.150	0.054	0.188	0.018	0.005	0.274	0.054	0.316	0.015	0.012
1:4	20	5	5	0.064	0.049	0.097	0.018	0.002	0.082	0.054	0.117	0.021	0.002	0.163	0.057	0.222	0.024	0.006	0.300	0.052	0.374	0.020	0.011
1:4	20	6	4	0.065	0.053	0.114	0.023	0.001	0.089	0.058	0.139	0.028	0.002	0.186	0.054	0.261	0.028	0.004	0.366	0.059	0.450	0.027	0.011
1:4	20	8	12	0.057	0.054	0.056	0.024	0.001	0.058	0.054	0.061	0.026	0.002	0.088	0.056	0.092	0.027	0.004	0.130	0.054	0.138	0.026	0.009
1:4	20	10	10	0.061	0.054	0.069	0.026	0.001	0.062	0.050	0.070	0.025	0.002	0.097	0.049	0.110	0.026	0.005	0.151	0.051	0.175	0.025	0.007
1:4	20	12	8	0.059	0.056	0.076	0.027	0.001	0.066	0.049	0.084	0.025	0.002	0.105	0.054	0.141	0.028	0.003	0.173	0.053	0.207	0.028	0.006
1:4	20	40	60	0.053	0.054	0.075	0.039	0.001	0.055	0.054	0.074	0.038	0.002	0.066	0.056	0.085	0.039	0.002	0.080	0.055	0.105	0.039	0.003
1:4	20	50	50	0.051	0.050	0.081	0.037	0.002	0.058	0.051	0.082	0.033	0.002	0.074	0.054	0.093	0.036	0.002	0.102	0.055	0.120	0.035	0.002
1:4	20	60	40	0.055	0.051	0.085	0.035	0.002	0.064	0.056	0.092	0.037	0.001	0.074	0.052	0.098	0.034	0.002	0.106	0.054	0.124	0.037	0.003
1:4	50	4	6	0.059	0.049	0.123	0.027	0.012	0.099	0.051	0.171	0.028	0.028	0.291	0.052	0.408	0.027	0.067	0.581	0.054	0.691	0.025	0.145
1:4	50	5	5	0.060	0.048	0.134	0.031	0.013	0.104	0.047	0.199	0.031	0.026	0.325	0.054	0.462	0.035	0.067	0.653	0.052	0.769	0.033	0.148
1:4	50	6	4	0.057	0.048	0.148	0.032	0.011	0.110	0.048	0.222	0.034	0.024	0.396	0.054	0.552	0.041	0.063	0.734	0.062	0.842	0.046	0.141
1:4	50	8	12	0.053	0.051	0.078	0.036	0.012	0.065	0.050	0.098	0.036	0.023	0.129	0.051	0.189	0.037	0.045	0.243	0.055	0.346	0.040	0.084
1:4	50	10	10	0.052	0.051	0.086	0.038	0.013	0.072	0.048	0.111	0.035	0.023	0.155	0.052	0.225	0.037	0.050	0.313	0.053	0.416	0.039	0.089
1:4	50	12	8	0.055	0.050	0.097	0.038	0.011	0.077	0.047	0.126	0.035	0.021	0.193	0.050	0.272	0.038	0.048	0.378	0.056	0.490	0.045	0.088
1:4	50	40	60	0.049	0.049	0.091	0.049	0.013	0.060	0.059	0.095	0.050	0.015	0.085	0.054	0.119	0.052	0.026	0.150	0.062	0.176	0.060	0.043
1:4	50	50	50	0.051	0.050	0.095	0.047	0.009	0.066	0.053	0.110	0.050	0.015	0.105	0.048	0.138	0.045	0.027	0.171	0.047	0.184	0.044	0.044
1:4	50	60	40	0.057	0.051	0.110	0.048	0.010	0.069	0.052	0.117	0.049	0.017	0.109	0.052	0.146	0.047	0.028	0.206	0.059	0.199	0.056	0.042
1:4	100	4	6	0.056	0.051	0.133	0.034	0.018	0.127	0.045	0.240	0.028	0.050	0.501	0.048	0.639	0.029	0.125	0.867	0.050	0.928	0.031	0.289
1:4	100	5	5	0.058	0.048	0.143	0.034	0.018	0.142	0.047	0.265	0.038	0.048	0.556	0.048	0.713	0.038	0.134	0.907	0.057	0.953	0.044	0.287
1:4	100	6	4	0.059	0.047	0.164	0.039	0.020	0.169	0.054	0.317	0.043	0.047	0.664	0.062	0.789	0.052	0.129	0.958	0.078	0.982	0.066	0.273

Appendix C (continued): Type I error rate estimates

Table 20 (continued). Type I error rate estimates for conditions when the population effect size variance is 0.10.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:4	100	8	12	0.054	0.052	0.093	0.043	0.021	0.075	0.051	0.127	0.043	0.041	0.217	0.046	0.317	0.041	0.098	0.450	0.053	0.597	0.042	0.191
1:4	100	10	10	0.053	0.048	0.097	0.038	0.020	0.089	0.049	0.146	0.040	0.044	0.272	0.048	0.383	0.041	0.102	0.554	0.052	0.688	0.043	0.192
1:4	100	12	8	0.055	0.047	0.104	0.038	0.022	0.102	0.048	0.172	0.038	0.038	0.330	0.057	0.445	0.047	0.095	0.650	0.072	0.763	0.061	0.185
1:4	100	40	60	0.049	0.049	0.098	0.051	0.021	0.065	0.056	0.106	0.057	0.032	0.130	0.061	0.164	0.065	0.061	0.256	0.076	0.268	0.081	0.111
1:4	100	50	50	0.049	0.050	0.110	0.043	0.019	0.070	0.046	0.119	0.048	0.030	0.162	0.054	0.177	0.052	0.066	0.310	0.056	0.279	0.054	0.114
1:4	100	60	40	0.051	0.052	0.115	0.048	0.019	0.077	0.053	0.127	0.052	0.033	0.194	0.060	0.191	0.058	0.065	0.372	0.069	0.294	0.066	0.114
1:8	10	4	6	0.085	0.070	0.055	0.006	0.000	0.095	0.074	0.061	0.005	0.000	0.126	0.072	0.083	0.004	0.000	0.179	0.069	0.126	0.004	0.000
1:8	10	5	5	0.083	0.063	0.062	0.005	0.000	0.090	0.063	0.072	0.007	0.000	0.133	0.069	0.103	0.007	0.000	0.202	0.066	0.163	0.005	0.000
1:8	10	6	4	0.087	0.072	0.079	0.007	0.000	0.093	0.061	0.084	0.007	0.000	0.151	0.067	0.126	0.008	0.000	0.246	0.072	0.210	0.009	0.000
1:8	10	8	12	0.064	0.065	0.037	0.007	0.000	0.065	0.068	0.038	0.007	0.000	0.079	0.066	0.048	0.006	0.000	0.101	0.069	0.069	0.007	0.000
1:8	10	10	10	0.063	0.063	0.045	0.008	0.000	0.068	0.062	0.050	0.008	0.000	0.086	0.066	0.067	0.008	0.000	0.113	0.063	0.092	0.008	0.000
1:8	10	12	8	0.068	0.060	0.056	0.011	0.000	0.080	0.063	0.063	0.011	0.000	0.097	0.069	0.080	0.011	0.000	0.136	0.066	0.114	0.010	0.000
1:8	10	40	60	0.056	0.060	0.068	0.017	0.000	0.058	0.060	0.068	0.015	0.000	0.065	0.061	0.074	0.017	0.000	0.079	0.069	0.094	0.021	0.000
1:8	10	50	50	0.064	0.066	0.081	0.018	0.000	0.063	0.059	0.081	0.015	0.000	0.070	0.060	0.086	0.016	0.000	0.084	0.063	0.102	0.017	0.000
1:8	10	60	40	0.063	0.056	0.086	0.014	0.000	0.066	0.060	0.084	0.015	0.000	0.077	0.060	0.101	0.015	0.000	0.097	0.065	0.120	0.020	0.000
1:8	20	4	6	0.076	0.058	0.115	0.018	0.002	0.078	0.050	0.130	0.015	0.002	0.157	0.059	0.223	0.019	0.006	0.287	0.059	0.367	0.018	0.015
1:8	20	5	5	0.069	0.056	0.140	0.022	0.001	0.083	0.054	0.159	0.021	0.003	0.193	0.056	0.282	0.024	0.006	0.337	0.059	0.457	0.025	0.014
1:8	20	6	4	0.072	0.052	0.161	0.024	0.001	0.095	0.054	0.193	0.026	0.002	0.216	0.058	0.349	0.029	0.004	0.417	0.061	0.555	0.030	0.013
1:8	20	8	12	0.057	0.055	0.079	0.023	0.002	0.064	0.055	0.084	0.025	0.002	0.087	0.056	0.120	0.024	0.004	0.136	0.058	0.194	0.026	0.008
1:8	20	10	10	0.061	0.053	0.095	0.025	0.001	0.068	0.052	0.111	0.027	0.003	0.104	0.051	0.167	0.025	0.004	0.166	0.058	0.240	0.026	0.006
1:8	20	12	8	0.059	0.047	0.110	0.025	0.001	0.075	0.052	0.130	0.028	0.002	0.121	0.053	0.200	0.028	0.004	0.214	0.057	0.315	0.030	0.008
1:8	20	40	60	0.052	0.054	0.114	0.039	0.001	0.051	0.055	0.119	0.042	0.001	0.068	0.060	0.132	0.044	0.002	0.093	0.067	0.168	0.051	0.003
1:8	20	50	50	0.057	0.055	0.129	0.041	0.001	0.055	0.051	0.134	0.036	0.001	0.080	0.056	0.148	0.038	0.002	0.110	0.055	0.192	0.040	0.003
1:8	20	60	40	0.057	0.052	0.142	0.038	0.001	0.059	0.051	0.145	0.033	0.001	0.084	0.054	0.166	0.036	0.001	0.129	0.057	0.212	0.039	0.003
1:8	50	4	6	0.056	0.050	0.148	0.025	0.013	0.099	0.055	0.213	0.025	0.028	0.298	0.055	0.456	0.028	0.080	0.597	0.055	0.741	0.026	0.177
1:8	50	5	5	0.062	0.050	0.172	0.031	0.011	0.109	0.052	0.243	0.033	0.027	0.358	0.048	0.547	0.029	0.079	0.681	0.050	0.825	0.035	0.185
1:8	50	6	4	0.065	0.054	0.206	0.039	0.012	0.123	0.051	0.297	0.034	0.027	0.439	0.057	0.643	0.043	0.078	0.806	0.071	0.901	0.055	0.178
1:8	50	8	12	0.055	0.057	0.106	0.037	0.013	0.066	0.050	0.126	0.038	0.026	0.139	0.053	0.247	0.037	0.054	0.269	0.057	0.427	0.037	0.120
1:8	50	10	10	0.052	0.050	0.123	0.036	0.012	0.075	0.052	0.152	0.039	0.027	0.179	0.050	0.312	0.037	0.060	0.354	0.048	0.527	0.036	0.127
1:8	50	12	8	0.057	0.052	0.150	0.036	0.013	0.083	0.051	0.193	0.039	0.023	0.222	0.056	0.382	0.040	0.060	0.464	0.062	0.640	0.045	0.121
1:8	50	40	60	0.048	0.050	0.151	0.049	0.012	0.059	0.055	0.161	0.061	0.018	0.098	0.063	0.209	0.067	0.040	0.155	0.077	0.276	0.081	0.062
1:8	50	50	50	0.053	0.049	0.170	0.047	0.011	0.065	0.052	0.181	0.053	0.018	0.119	0.051	0.231	0.052	0.041	0.210	0.053	0.309	0.052	0.076
1:8	50	60	40	0.050	0.051	0.172	0.048	0.009	0.068	0.051	0.197	0.046	0.020	0.141	0.052	0.251	0.052	0.043	0.268	0.063	0.337	0.055	0.075
1:8	100	4	6	0.055	0.048	0.162	0.029	0.022	0.134	0.051	0.271	0.029	0.053	0.526	0.052	0.697	0.032	0.154	0.884	0.054	0.947	0.030	0.341

Appendix C (continued): Type I error rate estimates

Table 20 (continued). Type I error rate estimates for conditions when the population effect size variance is 0.10.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:8	100	5	5	0.060	0.050	0.187	0.034	0.020	0.156	0.047	0.334	0.037	0.050	0.602	0.057	0.776	0.037	0.161	0.933	0.051	0.973	0.039	0.350
1:8	100	6	4	0.060	0.051	0.228	0.041	0.021	0.193	0.051	0.399	0.039	0.052	0.735	0.068	0.862	0.056	0.152	0.978	0.090	0.991	0.079	0.333
1:8	100	8	12	0.052	0.047	0.110	0.038	0.022	0.083	0.049	0.166	0.039	0.051	0.241	0.054	0.403	0.040	0.133	0.481	0.061	0.680	0.045	0.259
1:8	100	10	10	0.056	0.049	0.135	0.039	0.020	0.100	0.047	0.209	0.040	0.050	0.312	0.048	0.488	0.039	0.129	0.623	0.051	0.789	0.041	0.263
1:8	100	12	8	0.058	0.048	0.163	0.039	0.019	0.118	0.048	0.254	0.037	0.045	0.413	0.062	0.592	0.050	0.128	0.760	0.073	0.879	0.063	0.260
1:8	100	40	60	0.050	0.052	0.160	0.055	0.020	0.068	0.054	0.185	0.059	0.043	0.144	0.070	0.266	0.080	0.092	0.279	0.098	0.401	0.115	0.193
1:8	100	50	50	0.052	0.053	0.177	0.054	0.020	0.076	0.051	0.205	0.053	0.042	0.189	0.052	0.304	0.059	0.101	0.387	0.052	0.458	0.058	0.206
1:8	100	60	40	0.053	0.048	0.198	0.052	0.019	0.082	0.049	0.221	0.050	0.038	0.236	0.058	0.324	0.057	0.110	0.470	0.076	0.483	0.070	0.214

Appendix C (continued): Type I error rate estimates

Table 21. Type I error rate estimates for conditions when the population effect size variance is 0.33.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	10	4	6	0.082	0.066	0.047	0.008	0.000	0.089	0.068	0.053	0.007	0.000	0.130	0.066	0.074	0.007	0.000	0.196	0.068	0.114	0.010	0.000
1:1	10	5	5	0.080	0.068	0.048	0.007	0.000	0.087	0.067	0.052	0.008	0.000	0.122	0.067	0.073	0.008	0.000	0.186	0.065	0.118	0.007	0.000
1:1	10	6	4	0.085	0.068	0.048	0.008	0.000	0.086	0.065	0.052	0.008	0.000	0.132	0.067	0.075	0.008	0.000	0.199	0.066	0.118	0.007	0.000
1:1	10	8	12	0.062	0.066	0.024	0.009	0.000	0.067	0.066	0.023	0.009	0.000	0.079	0.062	0.031	0.008	0.000	0.116	0.070	0.046	0.009	0.000
1:1	10	10	10	0.062	0.062	0.023	0.010	0.000	0.069	0.066	0.026	0.010	0.000	0.083	0.062	0.034	0.008	0.000	0.103	0.061	0.044	0.010	0.000
1:1	10	12	8	0.062	0.061	0.025	0.009	0.000	0.067	0.066	0.026	0.010	0.000	0.081	0.064	0.033	0.010	0.000	0.113	0.064	0.049	0.009	0.000
1:1	10	40	60	0.064	0.065	0.026	0.015	0.000	0.057	0.059	0.026	0.014	0.000	0.077	0.064	0.025	0.014	0.000	0.088	0.061	0.034	0.014	0.000
1:1	10	50	50	0.057	0.060	0.024	0.016	0.000	0.059	0.061	0.027	0.013	0.000	0.075	0.064	0.029	0.014	0.000	0.093	0.060	0.032	0.013	0.000
1:1	10	60	40	0.061	0.069	0.023	0.016	0.000	0.059	0.061	0.027	0.014	0.000	0.071	0.062	0.023	0.013	0.000	0.093	0.061	0.030	0.014	0.000
1:1	20	4	6	0.064	0.051	0.113	0.027	0.001	0.086	0.053	0.130	0.028	0.002	0.170	0.050	0.236	0.026	0.004	0.331	0.052	0.399	0.027	0.007
1:1	20	5	5	0.067	0.050	0.108	0.026	0.002	0.083	0.056	0.125	0.029	0.002	0.171	0.055	0.229	0.027	0.004	0.321	0.057	0.392	0.027	0.008
1:1	20	6	4	0.066	0.054	0.107	0.028	0.001	0.079	0.053	0.125	0.024	0.002	0.170	0.057	0.234	0.029	0.004	0.327	0.054	0.403	0.027	0.009
1:1	20	8	12	0.059	0.053	0.062	0.031	0.002	0.059	0.050	0.063	0.028	0.002	0.099	0.046	0.103	0.028	0.003	0.167	0.051	0.169	0.031	0.004
1:1	20	10	10	0.057	0.056	0.059	0.030	0.001	0.064	0.052	0.067	0.030	0.001	0.101	0.053	0.100	0.033	0.002	0.170	0.051	0.166	0.029	0.003
1:1	20	12	8	0.057	0.054	0.061	0.032	0.001	0.063	0.054	0.070	0.032	0.002	0.098	0.051	0.102	0.031	0.003	0.169	0.056	0.170	0.034	0.004
1:1	20	40	60	0.054	0.054	0.044	0.036	0.000	0.056	0.053	0.044	0.035	0.001	0.083	0.051	0.052	0.035	0.001	0.122	0.051	0.064	0.036	0.002
1:1	20	50	50	0.054	0.055	0.047	0.038	0.000	0.054	0.050	0.044	0.035	0.001	0.088	0.054	0.054	0.038	0.001	0.127	0.056	0.060	0.035	0.001
1:1	20	60	40	0.046	0.050	0.042	0.035	0.001	0.059	0.053	0.044	0.037	0.001	0.082	0.054	0.050	0.037	0.001	0.124	0.055	0.066	0.036	0.001
1:1	50	4	6	0.058	0.049	0.147	0.037	0.010	0.108	0.051	0.214	0.040	0.021	0.346	0.047	0.494	0.038	0.043	0.673	0.054	0.785	0.044	0.082
1:1	50	5	5	0.058	0.047	0.140	0.037	0.011	0.108	0.051	0.210	0.037	0.021	0.334	0.053	0.473	0.039	0.041	0.648	0.052	0.762	0.041	0.085
1:1	50	6	4	0.060	0.050	0.149	0.037	0.012	0.104	0.049	0.215	0.036	0.020	0.344	0.051	0.490	0.040	0.043	0.678	0.053	0.786	0.043	0.080
1:1	50	8	12	0.052	0.050	0.080	0.042	0.011	0.072	0.049	0.102	0.040	0.013	0.182	0.050	0.225	0.041	0.024	0.366	0.050	0.423	0.044	0.041
1:1	50	10	10	0.055	0.047	0.077	0.041	0.012	0.075	0.053	0.105	0.045	0.015	0.177	0.050	0.224	0.043	0.023	0.376	0.050	0.429	0.044	0.042
1:1	50	12	8	0.056	0.047	0.081	0.041	0.010	0.070	0.049	0.104	0.040	0.015	0.176	0.050	0.229	0.041	0.024	0.372	0.048	0.428	0.040	0.040
1:1	50	40	60	0.050	0.051	0.052	0.050	0.009	0.067	0.047	0.056	0.045	0.009	0.137	0.050	0.074	0.046	0.009	0.262	0.052	0.102	0.050	0.014
1:1	50	50	50	0.052	0.051	0.055	0.049	0.011	0.065	0.051	0.058	0.050	0.010	0.146	0.049	0.076	0.044	0.013	0.282	0.048	0.106	0.044	0.016
1:1	50	60	40	0.050	0.050	0.054	0.047	0.009	0.064	0.051	0.049	0.048	0.011	0.147	0.054	0.075	0.050	0.010	0.257	0.053	0.102	0.046	0.012
1:1	100	4	6	0.054	0.044	0.157	0.041	0.021	0.155	0.047	0.293	0.041	0.039	0.595	0.048	0.731	0.043	0.096	0.926	0.054	0.959	0.052	0.177
1:1	100	5	5	0.056	0.051	0.153	0.044	0.020	0.149	0.050	0.285	0.043	0.040	0.577	0.052	0.720	0.046	0.097	0.920	0.052	0.958	0.047	0.176
1:1	100	6	4	0.055	0.050	0.165	0.042	0.020	0.146	0.049	0.287	0.044	0.037	0.589	0.052	0.727	0.044	0.094	0.929	0.055	0.962	0.052	0.179
1:1	100	8	12	0.051	0.047	0.087	0.047	0.016	0.094	0.048	0.143	0.046	0.028	0.328	0.051	0.400	0.049	0.057	0.631	0.050	0.700	0.049	0.086
1:1	100	10	10	0.053	0.053	0.087	0.047	0.018	0.101	0.045	0.142	0.042	0.031	0.329	0.048	0.384	0.049	0.050	0.653	0.051	0.703	0.047	0.085
1:1	100	12	8	0.050	0.047	0.088	0.043	0.017	0.098	0.049	0.145	0.046	0.030	0.322	0.050	0.396	0.044	0.051	0.641	0.051	0.707	0.050	0.088
1:1	100	40	60	0.053	0.054	0.059	0.055	0.017	0.080	0.047	0.061	0.047	0.019	0.241	0.053	0.099	0.054	0.023	0.472	0.052	0.152	0.050	0.027

Appendix C (continued): Type I error rate estimates

Table 21 (continued). Type I error rate estimates for conditions when the population effect size variance is 0.33.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	100	50	50	0.053	0.050	0.055	0.054	0.017	0.082	0.048	0.062	0.051	0.018	0.241	0.048	0.092	0.049	0.022	0.501	0.046	0.152	0.048	0.027
1:1	100	60	40	0.050	0.051	0.058	0.051	0.015	0.082	0.048	0.063	0.049	0.016	0.237	0.052	0.095	0.052	0.022	0.486	0.055	0.155	0.055	0.027
1:2	10	4	6	0.079	0.068	0.046	0.006	0.000	0.092	0.067	0.053	0.006	0.000	0.136	0.070	0.075	0.007	0.000	0.195	0.064	0.121	0.007	0.000
1:2	10	5	5	0.078	0.068	0.052	0.007	0.000	0.091	0.066	0.057	0.008	0.000	0.128	0.070	0.085	0.009	0.000	0.197	0.069	0.129	0.007	0.000
1:2	10	6	4	0.084	0.066	0.052	0.009	0.000	0.088	0.069	0.060	0.009	0.000	0.139	0.065	0.090	0.007	0.000	0.217	0.066	0.147	0.009	0.000
1:2	10	8	12	0.064	0.065	0.026	0.009	0.000	0.062	0.063	0.028	0.010	0.000	0.082	0.066	0.041	0.010	0.000	0.113	0.067	0.051	0.009	0.000
1:2	10	10	10	0.064	0.062	0.029	0.011	0.000	0.067	0.063	0.031	0.009	0.000	0.085	0.062	0.041	0.008	0.000	0.112	0.062	0.052	0.010	0.000
1:2	10	12	8	0.061	0.057	0.030	0.009	0.000	0.070	0.063	0.031	0.010	0.000	0.085	0.060	0.044	0.010	0.000	0.121	0.065	0.057	0.011	0.000
1:2	10	40	60	0.058	0.064	0.029	0.015	0.000	0.062	0.066	0.031	0.015	0.000	0.072	0.064	0.031	0.017	0.000	0.088	0.062	0.041	0.015	0.000
1:2	10	50	50	0.057	0.063	0.030	0.014	0.000	0.062	0.064	0.033	0.015	0.000	0.075	0.061	0.037	0.014	0.000	0.097	0.059	0.044	0.013	0.000
1:2	10	60	40	0.058	0.058	0.030	0.014	0.000	0.066	0.063	0.034	0.015	0.000	0.075	0.068	0.038	0.017	0.000	0.102	0.061	0.042	0.013	0.000
1:2	20	4	6	0.071	0.056	0.116	0.027	0.000	0.082	0.056	0.138	0.028	0.002	0.176	0.056	0.236	0.026	0.004	0.314	0.056	0.393	0.027	0.009
1:2	20	5	5	0.065	0.054	0.113	0.026	0.001	0.084	0.054	0.137	0.026	0.002	0.178	0.055	0.247	0.029	0.004	0.329	0.051	0.408	0.026	0.010
1:2	20	6	4	0.068	0.053	0.122	0.026	0.001	0.086	0.055	0.149	0.026	0.002	0.198	0.059	0.272	0.031	0.004	0.365	0.057	0.454	0.031	0.006
1:2	20	8	12	0.061	0.052	0.065	0.031	0.001	0.060	0.052	0.073	0.031	0.001	0.106	0.053	0.110	0.033	0.003	0.172	0.054	0.183	0.032	0.004
1:2	20	10	10	0.057	0.053	0.065	0.029	0.001	0.063	0.052	0.075	0.030	0.001	0.107	0.054	0.116	0.033	0.003	0.167	0.053	0.186	0.031	0.003
1:2	20	12	8	0.056	0.049	0.071	0.029	0.001	0.064	0.052	0.077	0.028	0.001	0.110	0.052	0.122	0.032	0.002	0.186	0.054	0.203	0.031	0.004
1:2	20	40	60	0.050	0.052	0.053	0.037	0.000	0.056	0.058	0.053	0.036	0.000	0.079	0.053	0.063	0.036	0.001	0.126	0.055	0.079	0.036	0.001
1:2	20	50	50	0.048	0.047	0.050	0.033	0.000	0.055	0.053	0.056	0.035	0.001	0.091	0.055	0.072	0.038	0.001	0.131	0.055	0.086	0.035	0.001
1:2	20	60	40	0.055	0.054	0.055	0.038	0.000	0.058	0.051	0.060	0.034	0.001	0.089	0.056	0.062	0.037	0.001	0.137	0.057	0.082	0.040	0.001
1:2	50	4	6	0.059	0.051	0.154	0.036	0.012	0.101	0.052	0.213	0.038	0.022	0.338	0.048	0.487	0.038	0.051	0.647	0.052	0.774	0.037	0.097
1:2	50	5	5	0.063	0.050	0.156	0.041	0.011	0.111	0.053	0.225	0.040	0.020	0.341	0.050	0.497	0.039	0.046	0.665	0.053	0.782	0.043	0.097
1:2	50	6	4	0.061	0.050	0.162	0.040	0.009	0.113	0.048	0.242	0.037	0.019	0.386	0.055	0.549	0.044	0.049	0.723	0.055	0.830	0.045	0.087
1:2	50	8	12	0.050	0.048	0.087	0.044	0.010	0.074	0.048	0.109	0.040	0.017	0.171	0.051	0.227	0.041	0.030	0.352	0.051	0.426	0.041	0.047
1:2	50	10	10	0.055	0.051	0.088	0.044	0.009	0.072	0.046	0.117	0.042	0.016	0.189	0.049	0.247	0.042	0.028	0.382	0.052	0.458	0.044	0.047
1:2	50	12	8	0.053	0.050	0.089	0.043	0.010	0.082	0.046	0.128	0.039	0.016	0.206	0.053	0.272	0.045	0.028	0.412	0.056	0.487	0.049	0.047
1:2	50	40	60	0.050	0.046	0.064	0.047	0.010	0.064	0.051	0.070	0.051	0.011	0.129	0.050	0.094	0.049	0.012	0.250	0.054	0.126	0.052	0.016
1:2	50	50	50	0.053	0.052	0.067	0.051	0.008	0.067	0.052	0.071	0.052	0.011	0.142	0.048	0.095	0.046	0.013	0.284	0.053	0.131	0.047	0.015
1:2	50	60	40	0.051	0.050	0.066	0.051	0.010	0.065	0.048	0.073	0.048	0.010	0.151	0.048	0.093	0.048	0.014	0.298	0.053	0.132	0.054	0.016
1:2	100	4	6	0.058	0.049	0.163	0.042	0.019	0.144	0.047	0.285	0.042	0.042	0.569	0.048	0.720	0.039	0.097	0.918	0.048	0.959	0.040	0.207
1:2	100	5	5	0.060	0.049	0.169	0.041	0.019	0.155	0.052	0.300	0.044	0.039	0.594	0.050	0.738	0.042	0.097	0.925	0.056	0.964	0.049	0.192
1:2	100	6	4	0.059	0.050	0.185	0.043	0.022	0.170	0.049	0.332	0.041	0.039	0.652	0.052	0.777	0.049	0.097	0.950	0.068	0.976	0.061	0.187
1:2	100	8	12	0.055	0.049	0.094	0.047	0.019	0.093	0.054	0.144	0.048	0.029	0.304	0.050	0.386	0.048	0.061	0.614	0.047	0.700	0.046	0.103
1:2	100	10	10	0.057	0.047	0.099	0.048	0.019	0.099	0.048	0.152	0.044	0.032	0.348	0.049	0.420	0.043	0.056	0.672	0.050	0.737	0.050	0.096

Appendix C (continued): Type I error rate estimates

Table 21 (continued). Type I error rate estimates for conditions when the population effect size variance is 0.33.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:2	100	12	8	0.055	0.046	0.108	0.044	0.018	0.102	0.044	0.163	0.043	0.031	0.373	0.048	0.456	0.046	0.063	0.709	0.059	0.771	0.058	0.101
1:2	100	40	60	0.049	0.048	0.073	0.049	0.018	0.084	0.058	0.086	0.058	0.019	0.231	0.047	0.122	0.050	0.028	0.467	0.053	0.195	0.051	0.037
1:2	100	50	50	0.050	0.050	0.073	0.054	0.019	0.086	0.051	0.083	0.052	0.020	0.256	0.051	0.121	0.055	0.028	0.534	0.048	0.201	0.050	0.035
1:2	100	60	40	0.053	0.050	0.072	0.053	0.016	0.085	0.047	0.085	0.055	0.019	0.279	0.052	0.129	0.053	0.027	0.542	0.057	0.206	0.056	0.036
1:4	10	4	6	0.084	0.069	0.060	0.008	0.000	0.094	0.068	0.068	0.005	0.000	0.130	0.070	0.094	0.006	0.000	0.200	0.067	0.139	0.006	0.000
1:4	10	5	5	0.082	0.067	0.061	0.009	0.000	0.089	0.064	0.068	0.008	0.000	0.133	0.063	0.105	0.008	0.000	0.213	0.067	0.163	0.010	0.000
1:4	10	6	4	0.079	0.062	0.070	0.008	0.000	0.094	0.072	0.082	0.009	0.000	0.148	0.063	0.120	0.009	0.000	0.239	0.068	0.193	0.010	0.000
1:4	10	8	12	0.066	0.066	0.038	0.010	0.000	0.069	0.067	0.038	0.010	0.000	0.089	0.066	0.049	0.010	0.000	0.114	0.067	0.065	0.012	0.000
1:4	10	10	10	0.068	0.064	0.037	0.011	0.000	0.071	0.065	0.043	0.011	0.000	0.088	0.063	0.053	0.009	0.000	0.119	0.061	0.075	0.009	0.000
1:4	10	12	8	0.067	0.062	0.048	0.010	0.000	0.071	0.063	0.049	0.011	0.000	0.094	0.061	0.066	0.010	0.000	0.139	0.064	0.092	0.010	0.000
1:4	10	40	60	0.065	0.065	0.046	0.022	0.000	0.061	0.062	0.047	0.019	0.000	0.072	0.065	0.053	0.020	0.000	0.095	0.072	0.067	0.022	0.000
1:4	10	50	50	0.060	0.063	0.054	0.019	0.000	0.064	0.061	0.053	0.019	0.000	0.083	0.067	0.059	0.019	0.000	0.104	0.065	0.074	0.021	0.000
1:4	10	60	40	0.061	0.059	0.057	0.016	0.000	0.067	0.061	0.056	0.018	0.000	0.086	0.067	0.062	0.019	0.000	0.108	0.064	0.078	0.017	0.000
1:4	20	4	6	0.068	0.057	0.131	0.025	0.001	0.082	0.058	0.151	0.024	0.002	0.163	0.055	0.253	0.025	0.005	0.321	0.054	0.418	0.024	0.009
1:4	20	5	5	0.070	0.054	0.136	0.027	0.001	0.083	0.054	0.163	0.025	0.001	0.190	0.060	0.291	0.030	0.005	0.354	0.054	0.465	0.028	0.009
1:4	20	6	4	0.064	0.049	0.156	0.028	0.000	0.086	0.053	0.186	0.030	0.001	0.218	0.060	0.337	0.029	0.004	0.417	0.060	0.545	0.033	0.009
1:4	20	8	12	0.053	0.054	0.078	0.029	0.002	0.063	0.053	0.090	0.031	0.002	0.102	0.054	0.132	0.030	0.003	0.170	0.058	0.210	0.031	0.005
1:4	20	10	10	0.057	0.049	0.087	0.029	0.001	0.064	0.054	0.101	0.032	0.002	0.121	0.055	0.160	0.031	0.003	0.194	0.052	0.247	0.031	0.004
1:4	20	12	8	0.063	0.053	0.097	0.032	0.001	0.072	0.051	0.115	0.030	0.001	0.125	0.056	0.175	0.033	0.003	0.225	0.053	0.280	0.035	0.005
1:4	20	40	60	0.054	0.054	0.083	0.043	0.001	0.057	0.052	0.086	0.040	0.000	0.079	0.055	0.097	0.043	0.002	0.127	0.054	0.123	0.043	0.001
1:4	20	50	50	0.054	0.054	0.093	0.041	0.000	0.059	0.051	0.092	0.038	0.000	0.092	0.054	0.109	0.041	0.001	0.147	0.053	0.132	0.041	0.001
1:4	20	60	40	0.054	0.051	0.092	0.038	0.000	0.057	0.050	0.091	0.038	0.001	0.097	0.050	0.116	0.037	0.001	0.163	0.057	0.142	0.040	0.001
1:4	50	4	6	0.059	0.052	0.170	0.036	0.012	0.098	0.050	0.234	0.036	0.022	0.326	0.049	0.499	0.035	0.057	0.647	0.052	0.783	0.036	0.115
1:4	50	5	5	0.060	0.048	0.181	0.037	0.010	0.107	0.050	0.257	0.035	0.023	0.372	0.050	0.557	0.035	0.053	0.695	0.050	0.823	0.040	0.115
1:4	50	6	4	0.061	0.053	0.202	0.041	0.011	0.118	0.053	0.289	0.043	0.022	0.432	0.052	0.617	0.043	0.053	0.779	0.060	0.880	0.051	0.103
1:4	50	8	12	0.050	0.048	0.108	0.037	0.011	0.075	0.047	0.133	0.038	0.020	0.176	0.052	0.265	0.041	0.033	0.363	0.050	0.480	0.042	0.064
1:4	50	10	10	0.052	0.050	0.120	0.040	0.010	0.080	0.051	0.152	0.039	0.019	0.215	0.047	0.310	0.039	0.035	0.423	0.052	0.543	0.042	0.066
1:4	50	12	8	0.055	0.051	0.126	0.039	0.010	0.085	0.050	0.168	0.044	0.017	0.245	0.049	0.361	0.044	0.031	0.495	0.053	0.611	0.046	0.059
1:4	50	40	60	0.053	0.051	0.106	0.053	0.009	0.066	0.055	0.110	0.056	0.011	0.138	0.052	0.145	0.055	0.018	0.254	0.055	0.198	0.060	0.022
1:4	50	50	50	0.050	0.050	0.112	0.053	0.007	0.067	0.052	0.117	0.050	0.011	0.165	0.050	0.151	0.053	0.017	0.313	0.055	0.219	0.058	0.025
1:4	50	60	40	0.051	0.047	0.112	0.049	0.009	0.073	0.050	0.119	0.051	0.011	0.178	0.048	0.159	0.052	0.017	0.358	0.054	0.221	0.053	0.024
1:4	100	4	6	0.057	0.048	0.182	0.038	0.021	0.148	0.048	0.321	0.037	0.047	0.579	0.051	0.745	0.040	0.117	0.918	0.053	0.962	0.039	0.239
1:4	100	5	5	0.057	0.048	0.194	0.041	0.020	0.160	0.049	0.336	0.038	0.046	0.613	0.051	0.775	0.043	0.111	0.941	0.050	0.970	0.046	0.223
1:4	100	6	4	0.059	0.048	0.222	0.043	0.019	0.180	0.050	0.384	0.046	0.044	0.700	0.057	0.834	0.052	0.110	0.974	0.072	0.986	0.067	0.227

Table 21 (continued). Type I error rate estimates for conditions when the population effect size variance is 0.33.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:4	100	8	12	0.053	0.050	0.118	0.046	0.018	0.092	0.048	0.176	0.046	0.035	0.315	0.048	0.439	0.045	0.072	0.640	0.055	0.759	0.047	0.144
1:4	100	10	10	0.055	0.048	0.131	0.045	0.018	0.108	0.049	0.194	0.046	0.034	0.378	0.048	0.507	0.043	0.074	0.712	0.051	0.804	0.047	0.139
1:4	100	12	8	0.058	0.049	0.145	0.045	0.019	0.113	0.050	0.223	0.048	0.032	0.437	0.058	0.563	0.053	0.071	0.796	0.061	0.868	0.058	0.136
1:4	100	40	60	0.050	0.050	0.112	0.060	0.017	0.082	0.049	0.127	0.057	0.021	0.234	0.056	0.192	0.065	0.040	0.471	0.063	0.297	0.073	0.065
1:4	100	50	50	0.051	0.051	0.116	0.056	0.015	0.089	0.050	0.138	0.058	0.025	0.283	0.053	0.210	0.056	0.040	0.570	0.049	0.323	0.056	0.069
1:4	100	60	40	0.052	0.046	0.124	0.051	0.016	0.098	0.050	0.141	0.056	0.025	0.323	0.054	0.210	0.057	0.041	0.627	0.060	0.331	0.065	0.065
1:8	10	4	6	0.086	0.067	0.075	0.006	0.000	0.096	0.071	0.084	0.008	0.000	0.132	0.071	0.115	0.009	0.000	0.200	0.066	0.169	0.007	0.000
1:8	10	5	5	0.090	0.068	0.088	0.009	0.000	0.093	0.066	0.095	0.008	0.000	0.144	0.070	0.136	0.008	0.000	0.228	0.070	0.205	0.008	0.000
1:8	10	6	4	0.086	0.070	0.106	0.012	0.000	0.102	0.066	0.110	0.010	0.000	0.166	0.066	0.175	0.009	0.000	0.276	0.068	0.261	0.010	0.000
1:8	10	8	12	0.067	0.067	0.052	0.010	0.000	0.064	0.066	0.054	0.011	0.000	0.084	0.066	0.068	0.011	0.000	0.121	0.067	0.096	0.009	0.000
1:8	10	10	10	0.066	0.063	0.062	0.011	0.000	0.075	0.062	0.067	0.012	0.000	0.096	0.063	0.087	0.011	0.000	0.137	0.066	0.122	0.011	0.000
1:8	10	12	8	0.072	0.061	0.074	0.013	0.000	0.079	0.064	0.079	0.010	0.000	0.105	0.068	0.102	0.013	0.000	0.155	0.063	0.147	0.011	0.000
1:8	10	40	60	0.059	0.063	0.074	0.019	0.000	0.063	0.066	0.078	0.025	0.000	0.084	0.072	0.089	0.028	0.000	0.098	0.072	0.101	0.030	0.000
1:8	10	50	50	0.066	0.064	0.086	0.024	0.000	0.067	0.063	0.087	0.022	0.000	0.083	0.066	0.099	0.024	0.000	0.113	0.064	0.119	0.025	0.000
1:8	10	60	40	0.067	0.061	0.088	0.021	0.000	0.064	0.061	0.088	0.020	0.000	0.086	0.064	0.094	0.022	0.000	0.123	0.061	0.125	0.021	0.000
1:8	20	4	6	0.067	0.051	0.163	0.022	0.001	0.082	0.056	0.183	0.023	0.002	0.173	0.055	0.288	0.025	0.005	0.331	0.057	0.462	0.023	0.011
1:8	20	5	5	0.072	0.058	0.181	0.030	0.001	0.092	0.054	0.205	0.028	0.002	0.196	0.056	0.335	0.028	0.005	0.369	0.052	0.530	0.026	0.012
1:8	20	6	4	0.069	0.055	0.204	0.030	0.001	0.103	0.056	0.252	0.030	0.002	0.237	0.057	0.402	0.033	0.004	0.455	0.060	0.620	0.036	0.011
1:8	20	8	12	0.058	0.053	0.112	0.031	0.001	0.069	0.059	0.119	0.033	0.002	0.104	0.054	0.172	0.032	0.004	0.179	0.054	0.268	0.034	0.004
1:8	20	10	10	0.066	0.055	0.124	0.032	0.001	0.073	0.055	0.137	0.031	0.001	0.126	0.057	0.204	0.033	0.003	0.217	0.052	0.311	0.030	0.005
1:8	20	12	8	0.061	0.053	0.144	0.031	0.001	0.074	0.053	0.165	0.033	0.001	0.143	0.052	0.250	0.032	0.002	0.251	0.056	0.375	0.034	0.003
1:8	20	40	60	0.050	0.054	0.129	0.047	0.001	0.058	0.055	0.132	0.047	0.001	0.089	0.061	0.149	0.053	0.002	0.132	0.061	0.186	0.057	0.002
1:8	20	50	50	0.055	0.051	0.136	0.043	0.001	0.063	0.052	0.142	0.048	0.001	0.100	0.055	0.172	0.049	0.001	0.157	0.051	0.202	0.046	0.001
1:8	20	60	40	0.058	0.055	0.145	0.044	0.000	0.063	0.051	0.148	0.044	0.001	0.115	0.054	0.177	0.044	0.001	0.191	0.056	0.227	0.047	0.001
1:8	50	4	6	0.061	0.051	0.210	0.033	0.012	0.112	0.055	0.270	0.035	0.025	0.335	0.057	0.543	0.037	0.065	0.670	0.057	0.814	0.035	0.144
1:8	50	5	5	0.064	0.054	0.234	0.041	0.013	0.116	0.048	0.306	0.038	0.025	0.384	0.052	0.607	0.037	0.068	0.739	0.053	0.871	0.037	0.137
1:8	50	6	4	0.061	0.048	0.261	0.040	0.010	0.133	0.052	0.355	0.045	0.025	0.465	0.053	0.683	0.045	0.066	0.832	0.062	0.919	0.054	0.136
1:8	50	8	12	0.049	0.051	0.137	0.040	0.008	0.078	0.050	0.179	0.041	0.018	0.182	0.052	0.325	0.040	0.045	0.370	0.053	0.546	0.042	0.079
1:8	50	10	10	0.056	0.053	0.169	0.040	0.012	0.084	0.051	0.204	0.040	0.019	0.240	0.051	0.409	0.041	0.044	0.475	0.046	0.632	0.040	0.086
1:8	50	12	8	0.058	0.046	0.185	0.042	0.010	0.096	0.055	0.237	0.046	0.015	0.277	0.051	0.454	0.044	0.046	0.563	0.062	0.715	0.053	0.091
1:8	50	40	60	0.052	0.051	0.169	0.060	0.008	0.066	0.053	0.186	0.061	0.013	0.143	0.061	0.223	0.072	0.021	0.285	0.063	0.314	0.076	0.034
1:8	50	50	50	0.050	0.048	0.169	0.055	0.007	0.072	0.051	0.190	0.058	0.014	0.185	0.051	0.250	0.061	0.021	0.343	0.056	0.335	0.068	0.035
1:8	50	60	40	0.051	0.052	0.188	0.057	0.007	0.081	0.049	0.198	0.059	0.013	0.207	0.051	0.255	0.058	0.021	0.407	0.053	0.348	0.061	0.038
1:8	100	4	6	0.060	0.051	0.219	0.039	0.020	0.150	0.053	0.358	0.038	0.048	0.578	0.049	0.766	0.039	0.128	0.924	0.050	0.966	0.035	0.272

Appendix C (continued): Type I error rate estimates

Table 21 (continued). Type I error rate estimates for conditions when the population effect size variance is 0.33.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:8	100	5	5	0.058	0.049	0.247	0.035	0.021	0.166	0.047	0.399	0.035	0.047	0.644	0.051	0.812	0.038	0.129	0.954	0.049	0.977	0.041	0.265
1:8	100	6	4	0.060	0.049	0.277	0.044	0.023	0.202	0.050	0.459	0.042	0.048	0.757	0.058	0.873	0.053	0.123	0.983	0.081	0.990	0.077	0.266
1:8	100	8	12	0.053	0.047	0.154	0.043	0.020	0.097	0.051	0.223	0.047	0.039	0.320	0.056	0.498	0.045	0.093	0.654	0.058	0.805	0.047	0.190
1:8	100	10	10	0.055	0.050	0.186	0.044	0.021	0.117	0.046	0.268	0.043	0.042	0.401	0.046	0.587	0.044	0.092	0.764	0.050	0.874	0.044	0.191
1:8	100	12	8	0.054	0.049	0.209	0.043	0.018	0.131	0.049	0.313	0.046	0.037	0.500	0.055	0.677	0.051	0.095	0.857	0.066	0.928	0.063	0.199
1:8	100	40	60	0.051	0.055	0.186	0.070	0.017	0.081	0.051	0.203	0.069	0.030	0.252	0.062	0.311	0.082	0.052	0.507	0.074	0.458	0.103	0.102
1:8	100	50	50	0.052	0.052	0.200	0.064	0.018	0.094	0.051	0.224	0.062	0.032	0.307	0.052	0.324	0.066	0.065	0.615	0.051	0.477	0.069	0.111
1:8	100	60	40	0.053	0.051	0.208	0.060	0.017	0.114	0.051	0.231	0.060	0.030	0.380	0.050	0.338	0.057	0.060	0.703	0.062	0.504	0.069	0.116

Appendix C (continued): Type I error rate estimates

Table 22. Type I error rate estimates for conditions when the population effect size variance is 0.50.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	10	4	6	0.084	0.067	0.057	0.008	0.000	0.091	0.067	0.063	0.008	0.000	0.133	0.066	0.094	0.009	0.000	0.205	0.066	0.143	0.009	0.000
1:1	10	5	5	0.083	0.070	0.054	0.010	0.000	0.093	0.066	0.061	0.009	0.000	0.129	0.066	0.086	0.009	0.000	0.212	0.067	0.147	0.009	0.000
1:1	10	6	4	0.083	0.067	0.060	0.011	0.000	0.090	0.067	0.065	0.008	0.000	0.141	0.066	0.092	0.010	0.000	0.212	0.070	0.142	0.009	0.000
1:1	10	8	12	0.070	0.061	0.031	0.011	0.000	0.065	0.060	0.032	0.012	0.000	0.089	0.070	0.041	0.011	0.000	0.118	0.064	0.055	0.009	0.000
1:1	10	10	10	0.065	0.063	0.030	0.013	0.000	0.066	0.060	0.029	0.009	0.000	0.086	0.060	0.039	0.012	0.000	0.120	0.067	0.055	0.012	0.000
1:1	10	12	8	0.061	0.065	0.032	0.011	0.000	0.067	0.061	0.032	0.010	0.000	0.090	0.060	0.045	0.012	0.000	0.127	0.060	0.058	0.011	0.000
1:1	10	40	60	0.058	0.064	0.029	0.018	0.000	0.061	0.061	0.031	0.017	0.000	0.070	0.060	0.033	0.014	0.000	0.106	0.063	0.039	0.018	0.000
1:1	10	50	50	0.056	0.060	0.028	0.016	0.000	0.062	0.065	0.029	0.015	0.000	0.077	0.065	0.033	0.015	0.000	0.106	0.063	0.038	0.017	0.000
1:1	10	60	40	0.057	0.062	0.029	0.017	0.000	0.061	0.064	0.027	0.015	0.000	0.077	0.065	0.035	0.016	0.000	0.100	0.059	0.038	0.015	0.000
1:1	20	4	6	0.072	0.056	0.138	0.027	0.001	0.086	0.056	0.157	0.030	0.003	0.184	0.050	0.271	0.026	0.003	0.353	0.057	0.445	0.031	0.006
1:1	20	5	5	0.065	0.055	0.128	0.032	0.001	0.089	0.055	0.150	0.029	0.002	0.177	0.057	0.263	0.032	0.004	0.345	0.049	0.441	0.028	0.006
1:1	20	6	4	0.065	0.052	0.134	0.029	0.001	0.085	0.052	0.150	0.029	0.001	0.192	0.060	0.277	0.031	0.004	0.351	0.052	0.446	0.031	0.006
1:1	20	8	12	0.057	0.051	0.073	0.029	0.001	0.066	0.053	0.082	0.032	0.001	0.112	0.049	0.125	0.031	0.002	0.191	0.054	0.203	0.030	0.003
1:1	20	10	10	0.059	0.051	0.067	0.031	0.001	0.066	0.052	0.083	0.032	0.001	0.110	0.054	0.123	0.031	0.001	0.200	0.054	0.211	0.033	0.003
1:1	20	12	8	0.057	0.055	0.074	0.033	0.001	0.067	0.054	0.082	0.034	0.002	0.109	0.055	0.128	0.036	0.002	0.193	0.056	0.207	0.033	0.004
1:1	20	40	60	0.048	0.051	0.048	0.034	0.000	0.059	0.056	0.054	0.039	0.001	0.095	0.054	0.062	0.039	0.001	0.151	0.052	0.076	0.035	0.000
1:1	20	50	50	0.052	0.050	0.045	0.036	0.001	0.057	0.054	0.049	0.037	0.001	0.100	0.056	0.067	0.039	0.001	0.158	0.053	0.077	0.037	0.000
1:1	20	60	40	0.053	0.053	0.049	0.036	0.001	0.061	0.056	0.054	0.039	0.001	0.095	0.050	0.064	0.039	0.000	0.153	0.055	0.080	0.040	0.000
1:1	50	4	6	0.059	0.050	0.177	0.040	0.013	0.110	0.047	0.248	0.038	0.022	0.371	0.051	0.531	0.040	0.040	0.702	0.052	0.816	0.043	0.072
1:1	50	5	5	0.062	0.052	0.173	0.042	0.012	0.109	0.049	0.250	0.040	0.019	0.347	0.049	0.512	0.040	0.040	0.685	0.053	0.798	0.046	0.071
1:1	50	6	4	0.062	0.044	0.180	0.039	0.012	0.113	0.052	0.242	0.044	0.018	0.360	0.049	0.531	0.040	0.040	0.707	0.051	0.819	0.046	0.074
1:1	50	8	12	0.052	0.050	0.099	0.047	0.010	0.077	0.052	0.124	0.042	0.013	0.212	0.052	0.274	0.045	0.022	0.419	0.054	0.489	0.049	0.033
1:1	50	10	10	0.052	0.050	0.099	0.043	0.008	0.081	0.048	0.125	0.043	0.014	0.213	0.051	0.271	0.046	0.022	0.444	0.048	0.502	0.041	0.035
1:1	50	12	8	0.052	0.053	0.099	0.044	0.010	0.080	0.049	0.124	0.041	0.014	0.206	0.048	0.270	0.042	0.023	0.429	0.052	0.499	0.048	0.037
1:1	50	40	60	0.046	0.045	0.056	0.047	0.007	0.069	0.051	0.063	0.052	0.008	0.171	0.054	0.086	0.052	0.011	0.333	0.051	0.123	0.052	0.011
1:1	50	50	50	0.054	0.051	0.063	0.052	0.009	0.071	0.051	0.063	0.054	0.009	0.177	0.049	0.088	0.048	0.009	0.350	0.048	0.120	0.050	0.013
1:1	50	60	40	0.053	0.052	0.058	0.052	0.009	0.072	0.050	0.067	0.052	0.010	0.172	0.055	0.085	0.051	0.010	0.327	0.052	0.118	0.049	0.013
1:1	100	4	6	0.056	0.046	0.194	0.044	0.018	0.161	0.049	0.330	0.046	0.036	0.617	0.049	0.762	0.044	0.086	0.941	0.052	0.966	0.050	0.163
1:1	100	5	5	0.056	0.048	0.182	0.045	0.018	0.154	0.048	0.320	0.043	0.037	0.609	0.048	0.752	0.047	0.079	0.937	0.056	0.967	0.054	0.159
1:1	100	6	4	0.056	0.049	0.192	0.044	0.022	0.158	0.052	0.325	0.047	0.034	0.626	0.051	0.761	0.048	0.083	0.942	0.055	0.968	0.052	0.149
1:1	100	8	12	0.052	0.049	0.107	0.050	0.019	0.104	0.049	0.170	0.045	0.027	0.373	0.048	0.453	0.048	0.047	0.725	0.052	0.779	0.051	0.074
1:1	100	10	10	0.051	0.046	0.106	0.045	0.020	0.109	0.047	0.173	0.047	0.026	0.382	0.046	0.452	0.046	0.048	0.734	0.050	0.779	0.050	0.082
1:1	100	12	8	0.054	0.051	0.107	0.046	0.020	0.106	0.050	0.176	0.048	0.028	0.382	0.053	0.458	0.052	0.045	0.730	0.052	0.785	0.051	0.079
1:1	100	40	60	0.049	0.048	0.059	0.054	0.019	0.089	0.051	0.068	0.054	0.017	0.294	0.050	0.116	0.056	0.021	0.596	0.048	0.186	0.051	0.026

Appendix C (continued): Type I error rate estimates

Table 22 (continued). Type I error rate estimates for conditions when the population effect size variance is 0.50.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	100	50	50	0.050	0.051	0.064	0.054	0.018	0.093	0.051	0.068	0.055	0.017	0.319	0.053	0.118	0.058	0.024	0.623	0.051	0.185	0.054	0.027
1:1	100	60	40	0.048	0.050	0.063	0.051	0.018	0.091	0.051	0.068	0.058	0.018	0.303	0.048	0.108	0.054	0.020	0.602	0.048	0.193	0.053	0.026
1:2	10	4	6	0.086	0.071	0.059	0.010	0.000	0.089	0.064	0.069	0.009	0.000	0.135	0.066	0.094	0.008	0.000	0.209	0.070	0.142	0.010	0.000
1:2	10	5	5	0.084	0.068	0.061	0.009	0.000	0.096	0.068	0.069	0.010	0.000	0.137	0.069	0.099	0.010	0.000	0.214	0.068	0.153	0.008	0.000
1:2	10	6	4	0.082	0.065	0.066	0.009	0.000	0.094	0.068	0.074	0.010	0.000	0.147	0.069	0.106	0.009	0.000	0.232	0.065	0.173	0.012	0.000
1:2	10	8	12	0.061	0.060	0.028	0.010	0.000	0.066	0.063	0.032	0.011	0.000	0.087	0.064	0.043	0.011	0.000	0.121	0.066	0.064	0.010	0.000
1:2	10	10	10	0.065	0.066	0.036	0.013	0.000	0.066	0.062	0.035	0.013	0.000	0.090	0.061	0.051	0.011	0.000	0.130	0.065	0.069	0.010	0.000
1:2	10	12	8	0.065	0.060	0.036	0.012	0.000	0.069	0.065	0.039	0.012	0.000	0.092	0.062	0.052	0.009	0.000	0.140	0.063	0.071	0.011	0.000
1:2	10	40	60	0.060	0.062	0.034	0.017	0.000	0.061	0.064	0.035	0.016	0.000	0.078	0.063	0.042	0.020	0.000	0.100	0.059	0.045	0.017	0.000
1:2	10	50	50	0.056	0.064	0.033	0.015	0.000	0.062	0.066	0.037	0.016	0.000	0.080	0.062	0.046	0.018	0.000	0.104	0.060	0.049	0.016	0.000
1:2	10	60	40	0.063	0.066	0.035	0.018	0.000	0.060	0.059	0.039	0.017	0.000	0.080	0.061	0.045	0.017	0.000	0.107	0.062	0.050	0.016	0.000
1:2	20	4	6	0.066	0.051	0.137	0.026	0.001	0.086	0.056	0.160	0.032	0.002	0.182	0.054	0.268	0.028	0.004	0.334	0.053	0.436	0.028	0.006
1:2	20	5	5	0.067	0.053	0.134	0.029	0.001	0.085	0.057	0.164	0.029	0.001	0.189	0.056	0.289	0.029	0.004	0.356	0.053	0.461	0.030	0.006
1:2	20	6	4	0.066	0.051	0.149	0.030	0.001	0.093	0.056	0.177	0.030	0.002	0.199	0.054	0.305	0.029	0.004	0.386	0.061	0.492	0.036	0.007
1:2	20	8	12	0.057	0.054	0.076	0.032	0.001	0.067	0.053	0.091	0.034	0.001	0.114	0.054	0.135	0.033	0.002	0.186	0.055	0.213	0.035	0.004
1:2	20	10	10	0.058	0.055	0.081	0.031	0.001	0.069	0.052	0.085	0.033	0.001	0.114	0.047	0.133	0.030	0.002	0.205	0.050	0.227	0.030	0.003
1:2	20	12	8	0.057	0.051	0.085	0.031	0.001	0.068	0.050	0.092	0.029	0.001	0.124	0.055	0.151	0.034	0.002	0.211	0.049	0.250	0.031	0.004
1:2	20	40	60	0.048	0.053	0.059	0.041	0.000	0.062	0.056	0.055	0.042	0.000	0.088	0.054	0.072	0.042	0.001	0.144	0.058	0.091	0.042	0.001
1:2	20	50	50	0.049	0.052	0.058	0.040	0.001	0.060	0.055	0.066	0.040	0.001	0.097	0.056	0.074	0.042	0.001	0.163	0.051	0.097	0.040	0.001
1:2	20	60	40	0.055	0.056	0.059	0.039	0.001	0.058	0.053	0.064	0.040	0.000	0.100	0.053	0.073	0.038	0.001	0.162	0.053	0.102	0.040	0.001
1:2	50	4	6	0.062	0.050	0.178	0.040	0.011	0.110	0.050	0.250	0.040	0.019	0.348	0.047	0.521	0.037	0.042	0.681	0.050	0.801	0.038	0.079
1:2	50	5	5	0.056	0.052	0.180	0.041	0.011	0.111	0.050	0.256	0.040	0.022	0.368	0.052	0.539	0.040	0.043	0.696	0.051	0.813	0.043	0.077
1:2	50	6	4	0.061	0.049	0.199	0.039	0.010	0.116	0.048	0.271	0.038	0.020	0.401	0.048	0.576	0.042	0.044	0.746	0.056	0.848	0.048	0.077
1:2	50	8	12	0.054	0.051	0.099	0.043	0.010	0.077	0.049	0.137	0.043	0.013	0.200	0.047	0.282	0.041	0.024	0.408	0.050	0.490	0.044	0.042
1:2	50	10	10	0.058	0.048	0.111	0.046	0.009	0.088	0.052	0.143	0.044	0.017	0.219	0.049	0.293	0.045	0.025	0.452	0.051	0.526	0.045	0.042
1:2	50	12	8	0.056	0.050	0.118	0.043	0.009	0.084	0.050	0.143	0.044	0.014	0.239	0.055	0.323	0.049	0.025	0.469	0.050	0.563	0.044	0.039
1:2	50	40	60	0.052	0.050	0.071	0.052	0.008	0.070	0.051	0.078	0.052	0.009	0.155	0.052	0.099	0.050	0.013	0.315	0.050	0.143	0.052	0.014
1:2	50	50	50	0.049	0.049	0.075	0.053	0.009	0.074	0.051	0.072	0.051	0.010	0.181	0.048	0.105	0.049	0.012	0.353	0.053	0.155	0.055	0.014
1:2	50	60	40	0.050	0.049	0.074	0.047	0.009	0.071	0.050	0.076	0.050	0.008	0.192	0.050	0.103	0.051	0.012	0.369	0.053	0.153	0.053	0.013
1:2	100	4	6	0.055	0.047	0.188	0.041	0.021	0.157	0.050	0.323	0.043	0.038	0.596	0.052	0.745	0.044	0.086	0.934	0.051	0.964	0.044	0.178
1:2	100	5	5	0.057	0.051	0.200	0.047	0.022	0.157	0.050	0.337	0.044	0.041	0.622	0.052	0.763	0.048	0.085	0.941	0.054	0.972	0.051	0.166
1:2	100	6	4	0.061	0.050	0.218	0.046	0.019	0.170	0.049	0.366	0.047	0.036	0.665	0.052	0.794	0.049	0.081	0.963	0.061	0.977	0.056	0.168
1:2	100	8	12	0.056	0.051	0.116	0.046	0.020	0.106	0.048	0.176	0.049	0.024	0.352	0.049	0.452	0.049	0.053	0.698	0.051	0.764	0.047	0.092
1:2	100	10	10	0.058	0.048	0.121	0.047	0.019	0.114	0.050	0.192	0.050	0.028	0.396	0.051	0.476	0.048	0.053	0.746	0.054	0.802	0.054	0.090

Appendix C (continued): Type I error rate estimates

Table 22 (continued). Type I error rate estimates for conditions when the population effect size variance is 0.50.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:2	100	12	8	0.053	0.048	0.115	0.048	0.019	0.115	0.051	0.198	0.049	0.028	0.421	0.055	0.518	0.052	0.048	0.777	0.054	0.829	0.052	0.090
1:2	100	40	60	0.054	0.056	0.084	0.060	0.016	0.089	0.047	0.090	0.057	0.020	0.294	0.054	0.135	0.060	0.024	0.586	0.059	0.232	0.062	0.031
1:2	100	50	50	0.048	0.049	0.078	0.054	0.018	0.096	0.051	0.094	0.058	0.020	0.326	0.047	0.133	0.056	0.026	0.636	0.052	0.237	0.058	0.032
1:2	100	60	40	0.049	0.049	0.079	0.052	0.019	0.092	0.047	0.082	0.054	0.018	0.339	0.051	0.141	0.054	0.026	0.657	0.049	0.237	0.055	0.028
1:4	10	4	6	0.081	0.069	0.070	0.009	0.000	0.091	0.073	0.080	0.009	0.000	0.134	0.069	0.111	0.008	0.000	0.214	0.068	0.173	0.008	0.000
1:4	10	5	5	0.086	0.068	0.079	0.009	0.000	0.095	0.068	0.088	0.009	0.000	0.139	0.067	0.122	0.010	0.000	0.229	0.069	0.192	0.011	0.000
1:4	10	6	4	0.085	0.068	0.082	0.012	0.000	0.102	0.065	0.096	0.011	0.000	0.152	0.066	0.144	0.011	0.000	0.253	0.065	0.224	0.011	0.000
1:4	10	8	12	0.066	0.066	0.044	0.011	0.000	0.067	0.068	0.045	0.012	0.000	0.093	0.065	0.061	0.012	0.000	0.123	0.067	0.084	0.012	0.000
1:4	10	10	10	0.066	0.067	0.054	0.012	0.000	0.068	0.062	0.052	0.013	0.000	0.100	0.066	0.072	0.012	0.000	0.137	0.062	0.097	0.012	0.000
1:4	10	12	8	0.071	0.060	0.055	0.012	0.000	0.076	0.065	0.056	0.012	0.000	0.098	0.062	0.073	0.013	0.000	0.148	0.067	0.105	0.012	0.000
1:4	10	40	60	0.062	0.070	0.053	0.023	0.000	0.062	0.066	0.054	0.022	0.000	0.077	0.064	0.058	0.022	0.000	0.101	0.062	0.072	0.022	0.000
1:4	10	50	50	0.061	0.064	0.058	0.020	0.000	0.066	0.063	0.062	0.022	0.000	0.086	0.065	0.067	0.021	0.000	0.116	0.064	0.080	0.024	0.000
1:4	10	60	40	0.057	0.058	0.061	0.020	0.000	0.064	0.057	0.061	0.019	0.000	0.087	0.062	0.065	0.019	0.000	0.125	0.061	0.084	0.019	0.000
1:4	20	4	6	0.069	0.052	0.155	0.027	0.001	0.086	0.055	0.184	0.028	0.002	0.182	0.056	0.295	0.029	0.004	0.326	0.053	0.460	0.024	0.009
1:4	20	5	5	0.072	0.055	0.169	0.030	0.001	0.089	0.056	0.191	0.029	0.002	0.192	0.056	0.320	0.031	0.004	0.366	0.054	0.500	0.028	0.009
1:4	20	6	4	0.074	0.054	0.185	0.033	0.001	0.093	0.050	0.210	0.030	0.002	0.224	0.056	0.367	0.033	0.004	0.431	0.060	0.577	0.035	0.007
1:4	20	8	12	0.057	0.057	0.096	0.034	0.001	0.068	0.055	0.106	0.033	0.001	0.112	0.052	0.157	0.030	0.002	0.192	0.058	0.252	0.034	0.003
1:4	20	10	10	0.062	0.058	0.108	0.036	0.001	0.072	0.053	0.115	0.033	0.001	0.126	0.053	0.178	0.034	0.001	0.218	0.054	0.286	0.034	0.003
1:4	20	12	8	0.065	0.054	0.117	0.031	0.001	0.071	0.051	0.129	0.031	0.001	0.139	0.053	0.207	0.035	0.003	0.244	0.055	0.327	0.037	0.002
1:4	20	40	60	0.055	0.057	0.090	0.049	0.001	0.063	0.055	0.091	0.043	0.001	0.092	0.057	0.108	0.047	0.001	0.149	0.057	0.133	0.049	0.001
1:4	20	50	50	0.053	0.052	0.091	0.043	0.001	0.064	0.052	0.097	0.046	0.000	0.101	0.052	0.114	0.042	0.001	0.174	0.057	0.147	0.045	0.001
1:4	20	60	40	0.054	0.050	0.094	0.040	0.000	0.062	0.050	0.098	0.039	0.000	0.114	0.049	0.122	0.042	0.001	0.195	0.055	0.157	0.040	0.001
1:4	50	4	6	0.066	0.055	0.205	0.041	0.013	0.105	0.051	0.265	0.037	0.020	0.353	0.049	0.546	0.035	0.052	0.681	0.048	0.818	0.038	0.096
1:4	50	5	5	0.065	0.050	0.219	0.040	0.012	0.112	0.049	0.286	0.038	0.020	0.385	0.053	0.584	0.040	0.050	0.734	0.049	0.848	0.041	0.103
1:4	50	6	4	0.062	0.049	0.240	0.042	0.012	0.127	0.051	0.322	0.042	0.021	0.445	0.055	0.645	0.047	0.048	0.794	0.058	0.893	0.055	0.092
1:4	50	8	12	0.053	0.049	0.131	0.045	0.009	0.078	0.049	0.165	0.044	0.014	0.203	0.050	0.319	0.047	0.028	0.410	0.050	0.541	0.043	0.050
1:4	50	10	10	0.055	0.046	0.142	0.042	0.011	0.087	0.048	0.180	0.042	0.016	0.239	0.049	0.363	0.044	0.029	0.479	0.047	0.603	0.045	0.052
1:4	50	12	8	0.058	0.051	0.154	0.048	0.009	0.091	0.047	0.201	0.041	0.015	0.271	0.049	0.407	0.045	0.029	0.555	0.058	0.670	0.051	0.049
1:4	50	40	60	0.053	0.053	0.114	0.060	0.010	0.072	0.056	0.128	0.061	0.009	0.167	0.052	0.164	0.059	0.014	0.327	0.055	0.228	0.066	0.019
1:4	50	50	50	0.050	0.051	0.124	0.057	0.010	0.073	0.052	0.124	0.054	0.009	0.195	0.049	0.173	0.055	0.014	0.395	0.051	0.233	0.056	0.020
1:4	50	60	40	0.052	0.050	0.119	0.058	0.007	0.077	0.048	0.130	0.057	0.010	0.210	0.050	0.169	0.056	0.014	0.427	0.052	0.244	0.056	0.020
1:4	100	4	6	0.057	0.049	0.215	0.042	0.021	0.159	0.050	0.348	0.042	0.041	0.603	0.049	0.767	0.040	0.097	0.935	0.048	0.967	0.038	0.199
1:4	100	5	5	0.058	0.052	0.229	0.044	0.021	0.162	0.049	0.374	0.045	0.042	0.638	0.047	0.800	0.042	0.094	0.952	0.052	0.973	0.048	0.203
1:4	100	6	4	0.059	0.050	0.248	0.044	0.020	0.187	0.051	0.418	0.048	0.040	0.708	0.053	0.836	0.055	0.091	0.978	0.071	0.985	0.071	0.193

Appendix C (continued): Type I error rate estimates

Table 22 (continued). Type I error rate estimates for conditions when the population effect size variance is 0.50.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:4	100	8	12	0.055	0.047	0.143	0.047	0.017	0.107	0.052	0.212	0.049	0.034	0.361	0.051	0.501	0.047	0.067	0.700	0.052	0.793	0.048	0.123
1:4	100	10	10	0.052	0.044	0.157	0.044	0.018	0.116	0.045	0.233	0.047	0.033	0.431	0.049	0.554	0.050	0.069	0.789	0.049	0.859	0.045	0.124
1:4	100	12	8	0.055	0.047	0.163	0.047	0.017	0.125	0.049	0.255	0.048	0.032	0.477	0.053	0.611	0.054	0.061	0.843	0.058	0.897	0.064	0.112
1:4	100	40	60	0.047	0.045	0.129	0.058	0.016	0.092	0.050	0.141	0.063	0.022	0.291	0.051	0.214	0.068	0.035	0.580	0.058	0.337	0.071	0.049
1:4	100	50	50	0.053	0.051	0.132	0.062	0.014	0.098	0.046	0.139	0.058	0.020	0.344	0.051	0.219	0.060	0.033	0.673	0.051	0.352	0.062	0.055
1:4	100	60	40	0.054	0.049	0.129	0.058	0.015	0.110	0.046	0.143	0.056	0.024	0.398	0.051	0.233	0.062	0.036	0.723	0.054	0.362	0.062	0.057
1:8	10	4	6	0.085	0.071	0.094	0.008	0.000	0.097	0.067	0.099	0.008	0.000	0.136	0.066	0.128	0.008	0.000	0.217	0.068	0.195	0.008	0.000
1:8	10	5	5	0.089	0.071	0.105	0.010	0.000	0.099	0.068	0.117	0.009	0.000	0.143	0.067	0.155	0.009	0.000	0.237	0.069	0.233	0.010	0.000
1:8	10	6	4	0.089	0.061	0.120	0.011	0.000	0.112	0.069	0.141	0.013	0.000	0.174	0.069	0.196	0.013	0.000	0.276	0.065	0.285	0.012	0.000
1:8	10	8	12	0.062	0.063	0.058	0.013	0.000	0.071	0.065	0.066	0.013	0.000	0.088	0.069	0.079	0.012	0.000	0.125	0.065	0.105	0.011	0.000
1:8	10	10	10	0.067	0.063	0.070	0.012	0.000	0.075	0.065	0.081	0.012	0.000	0.102	0.068	0.103	0.013	0.000	0.147	0.067	0.140	0.015	0.000
1:8	10	12	8	0.069	0.061	0.080	0.013	0.000	0.077	0.060	0.089	0.012	0.000	0.113	0.067	0.118	0.013	0.000	0.170	0.067	0.161	0.014	0.000
1:8	10	40	60	0.062	0.069	0.078	0.027	0.000	0.062	0.068	0.080	0.026	0.000	0.079	0.068	0.092	0.030	0.000	0.107	0.067	0.110	0.030	0.000
1:8	10	50	50	0.064	0.062	0.089	0.026	0.000	0.064	0.064	0.082	0.024	0.000	0.083	0.065	0.097	0.025	0.000	0.122	0.067	0.122	0.026	0.000
1:8	10	60	40	0.067	0.062	0.087	0.024	0.000	0.066	0.063	0.095	0.026	0.000	0.090	0.063	0.104	0.024	0.000	0.130	0.061	0.135	0.025	0.000
1:8	20	4	6	0.070	0.055	0.189	0.025	0.001	0.081	0.055	0.206	0.027	0.001	0.183	0.058	0.323	0.029	0.004	0.349	0.060	0.502	0.028	0.008
1:8	20	5	5	0.074	0.056	0.204	0.029	0.001	0.096	0.056	0.234	0.031	0.001	0.202	0.054	0.374	0.027	0.005	0.391	0.054	0.567	0.030	0.007
1:8	20	6	4	0.074	0.053	0.240	0.030	0.001	0.096	0.055	0.272	0.031	0.002	0.231	0.055	0.431	0.031	0.004	0.451	0.064	0.637	0.040	0.008
1:8	20	8	12	0.057	0.054	0.128	0.033	0.001	0.071	0.058	0.135	0.036	0.001	0.112	0.051	0.195	0.033	0.003	0.200	0.055	0.297	0.033	0.003
1:8	20	10	10	0.062	0.052	0.148	0.032	0.000	0.070	0.055	0.158	0.035	0.001	0.132	0.056	0.241	0.036	0.002	0.238	0.054	0.349	0.032	0.003
1:8	20	12	8	0.066	0.054	0.165	0.034	0.000	0.077	0.052	0.184	0.036	0.001	0.153	0.051	0.276	0.035	0.001	0.278	0.055	0.414	0.034	0.004
1:8	20	40	60	0.055	0.056	0.135	0.053	0.001	0.063	0.053	0.139	0.052	0.001	0.097	0.054	0.161	0.054	0.001	0.159	0.060	0.198	0.057	0.001
1:8	20	50	50	0.054	0.057	0.147	0.050	0.000	0.064	0.054	0.146	0.051	0.001	0.111	0.055	0.174	0.049	0.001	0.184	0.053	0.218	0.049	0.000
1:8	20	60	40	0.059	0.054	0.149	0.050	0.000	0.063	0.052	0.156	0.047	0.000	0.122	0.053	0.184	0.048	0.001	0.213	0.058	0.221	0.048	0.001
1:8	50	4	6	0.059	0.050	0.230	0.035	0.012	0.108	0.051	0.305	0.037	0.025	0.353	0.052	0.570	0.039	0.057	0.684	0.050	0.836	0.035	0.117
1:8	50	5	5	0.064	0.052	0.265	0.039	0.010	0.115	0.051	0.329	0.038	0.024	0.393	0.050	0.635	0.043	0.056	0.749	0.054	0.875	0.043	0.120
1:8	50	6	4	0.062	0.049	0.293	0.043	0.010	0.133	0.047	0.378	0.043	0.024	0.474	0.052	0.701	0.047	0.059	0.829	0.063	0.915	0.057	0.116
1:8	50	8	12	0.057	0.052	0.167	0.045	0.010	0.075	0.055	0.205	0.047	0.017	0.208	0.052	0.376	0.044	0.036	0.427	0.059	0.595	0.049	0.065
1:8	50	10	10	0.056	0.051	0.195	0.049	0.011	0.083	0.052	0.237	0.049	0.016	0.253	0.048	0.438	0.046	0.032	0.517	0.054	0.678	0.046	0.069
1:8	50	12	8	0.058	0.049	0.218	0.044	0.011	0.102	0.050	0.274	0.043	0.017	0.303	0.051	0.502	0.050	0.037	0.606	0.057	0.748	0.058	0.071
1:8	50	40	60	0.055	0.053	0.178	0.068	0.007	0.068	0.050	0.189	0.064	0.012	0.176	0.056	0.244	0.074	0.018	0.338	0.065	0.328	0.087	0.028
1:8	50	50	50	0.055	0.055	0.190	0.068	0.007	0.077	0.051	0.202	0.064	0.011	0.205	0.050	0.260	0.062	0.020	0.412	0.051	0.339	0.066	0.028
1:8	50	60	40	0.051	0.050	0.186	0.061	0.008	0.081	0.051	0.204	0.061	0.010	0.237	0.050	0.265	0.063	0.019	0.481	0.054	0.374	0.066	0.031
1:8	100	4	6	0.062	0.050	0.260	0.040	0.022	0.161	0.052	0.395	0.037	0.048	0.600	0.050	0.776	0.037	0.114	0.940	0.052	0.971	0.041	0.236

Appendix C (continued): Type I error rate estimates

Table 22 (continued). Type I error rate estimates for conditions when the population effect size variance is 0.50.

					Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
TAU	s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
0.5	1:8	100	5	5	0.058	0.052	0.275	0.042	0.020	0.166	0.051	0.419	0.044	0.044	0.671	0.049	0.828	0.042	0.117	0.964	0.051	0.984	0.045	0.238
0.5	1:8	100	6	4	0.058	0.048	0.308	0.048	0.019	0.201	0.051	0.478	0.047	0.044	0.750	0.059	0.866	0.059	0.108	0.987	0.073	0.988	0.073	0.235
0.5	1:8	100	8	12	0.054	0.051	0.187	0.048	0.018	0.102	0.047	0.257	0.049	0.035	0.376	0.054	0.556	0.049	0.083	0.718	0.057	0.842	0.050	0.156
0.5	1:8	100	10	10	0.055	0.051	0.214	0.048	0.020	0.122	0.049	0.302	0.048	0.033	0.456	0.049	0.635	0.049	0.083	0.823	0.046	0.899	0.045	0.172
0.5	1:8	100	12	8	0.056	0.050	0.233	0.051	0.019	0.135	0.048	0.341	0.049	0.034	0.550	0.054	0.705	0.055	0.080	0.895	0.062	0.940	0.065	0.160
0.5	1:8	100	40	60	0.054	0.053	0.196	0.071	0.016	0.094	0.053	0.219	0.073	0.029	0.299	0.057	0.320	0.078	0.045	0.596	0.069	0.464	0.098	0.080
0.5	1:8	100	50	50	0.051	0.051	0.214	0.068	0.016	0.108	0.054	0.226	0.070	0.023	0.377	0.052	0.338	0.068	0.051	0.716	0.048	0.508	0.074	0.091
0.5	1:8	100	60	40	0.053	0.050	0.216	0.064	0.017	0.114	0.049	0.232	0.066	0.027	0.444	0.052	0.357	0.069	0.049	0.784	0.059	0.526	0.069	0.094

Appendix C (continued): Type I error rate estimates

Table 23. Type I error rate estimates for conditions when the population effect size variance is 1.00.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	10	4	6	0.089	0.069	0.090	0.012	0.000	0.096	0.066	0.093	0.011	0.000	0.151	0.067	0.139	0.013	0.000	0.235	0.066	0.195	0.011	0.000
1:1	10	5	5	0.089	0.067	0.087	0.012	0.000	0.095	0.070	0.098	0.013	0.000	0.147	0.073	0.136	0.012	0.000	0.232	0.072	0.202	0.013	0.000
1:1	10	6	4	0.086	0.062	0.085	0.012	0.000	0.096	0.064	0.091	0.010	0.000	0.145	0.065	0.138	0.011	0.000	0.238	0.066	0.201	0.011	0.000
1:1	10	8	12	0.067	0.066	0.049	0.014	0.000	0.075	0.068	0.051	0.015	0.000	0.098	0.063	0.068	0.015	0.000	0.147	0.065	0.092	0.016	0.000
1:1	10	10	10	0.065	0.066	0.049	0.014	0.000	0.074	0.065	0.051	0.014	0.000	0.094	0.063	0.067	0.013	0.000	0.143	0.063	0.093	0.014	0.000
1:1	10	12	8	0.072	0.065	0.050	0.015	0.000	0.072	0.068	0.051	0.013	0.000	0.105	0.071	0.063	0.015	0.000	0.148	0.065	0.094	0.013	0.000
1:1	10	40	60	0.057	0.066	0.042	0.025	0.000	0.062	0.060	0.042	0.021	0.000	0.088	0.063	0.048	0.021	0.000	0.118	0.061	0.060	0.021	0.000
1:1	10	50	50	0.059	0.063	0.042	0.020	0.000	0.064	0.062	0.043	0.022	0.000	0.083	0.063	0.050	0.023	0.000	0.122	0.064	0.059	0.020	0.000
1:1	10	60	40	0.056	0.061	0.042	0.023	0.000	0.059	0.061	0.040	0.020	0.000	0.089	0.062	0.052	0.021	0.000	0.127	0.068	0.062	0.024	0.000
1:1	20	4	6	0.071	0.055	0.185	0.031	0.001	0.094	0.057	0.221	0.037	0.001	0.198	0.057	0.341	0.034	0.003	0.384	0.055	0.525	0.033	0.004
1:1	20	5	5	0.071	0.056	0.191	0.033	0.001	0.092	0.057	0.214	0.035	0.002	0.191	0.057	0.328	0.036	0.002	0.370	0.055	0.511	0.034	0.006
1:1	20	6	4	0.073	0.058	0.193	0.034	0.001	0.091	0.059	0.221	0.037	0.001	0.198	0.054	0.344	0.034	0.002	0.378	0.059	0.519	0.034	0.005
1:1	20	8	12	0.059	0.051	0.110	0.037	0.001	0.069	0.052	0.121	0.037	0.001	0.131	0.051	0.186	0.034	0.001	0.242	0.055	0.296	0.039	0.002
1:1	20	10	10	0.054	0.051	0.103	0.037	0.001	0.067	0.052	0.120	0.036	0.001	0.131	0.053	0.184	0.037	0.001	0.247	0.053	0.293	0.033	0.002
1:1	20	12	8	0.060	0.054	0.107	0.038	0.001	0.075	0.052	0.128	0.039	0.001	0.134	0.050	0.183	0.035	0.002	0.237	0.053	0.294	0.036	0.002
1:1	20	40	60	0.053	0.053	0.065	0.048	0.000	0.059	0.051	0.069	0.043	0.000	0.114	0.050	0.080	0.043	0.001	0.198	0.059	0.106	0.046	0.001
1:1	20	50	50	0.052	0.051	0.067	0.046	0.000	0.060	0.053	0.068	0.049	0.001	0.111	0.055	0.083	0.047	0.001	0.208	0.052	0.117	0.046	0.000
1:1	20	60	40	0.053	0.049	0.063	0.044	0.001	0.065	0.054	0.069	0.047	0.000	0.117	0.052	0.090	0.041	0.000	0.193	0.050	0.113	0.044	0.001
1:1	50	4	6	0.060	0.048	0.245	0.044	0.011	0.113	0.052	0.310	0.046	0.016	0.381	0.050	0.583	0.047	0.032	0.734	0.055	0.840	0.051	0.057
1:1	50	5	5	0.061	0.050	0.238	0.048	0.014	0.109	0.049	0.305	0.044	0.018	0.369	0.051	0.573	0.045	0.031	0.722	0.052	0.838	0.050	0.058
1:1	50	6	4	0.060	0.050	0.238	0.046	0.012	0.111	0.052	0.311	0.047	0.018	0.386	0.050	0.587	0.047	0.032	0.734	0.050	0.841	0.046	0.056
1:1	50	8	12	0.059	0.051	0.153	0.052	0.008	0.090	0.051	0.190	0.048	0.013	0.265	0.052	0.377	0.053	0.020	0.528	0.048	0.618	0.050	0.027
1:1	50	10	10	0.057	0.051	0.153	0.051	0.009	0.090	0.050	0.190	0.052	0.012	0.271	0.050	0.377	0.048	0.017	0.538	0.050	0.619	0.052	0.026
1:1	50	12	8	0.055	0.050	0.147	0.051	0.009	0.091	0.049	0.190	0.051	0.014	0.259	0.049	0.373	0.047	0.021	0.534	0.050	0.624	0.049	0.026
1:1	50	40	60	0.054	0.054	0.076	0.059	0.008	0.079	0.053	0.085	0.062	0.007	0.225	0.049	0.112	0.056	0.008	0.461	0.046	0.175	0.053	0.011
1:1	50	50	50	0.049	0.050	0.074	0.060	0.009	0.079	0.052	0.080	0.058	0.008	0.239	0.049	0.119	0.059	0.009	0.464	0.051	0.172	0.058	0.011
1:1	50	60	40	0.049	0.050	0.080	0.057	0.008	0.082	0.052	0.085	0.060	0.011	0.220	0.051	0.118	0.056	0.011	0.453	0.050	0.171	0.057	0.011
1:1	100	4	6	0.057	0.049	0.267	0.048	0.021	0.161	0.048	0.388	0.049	0.033	0.643	0.053	0.782	0.052	0.067	0.956	0.055	0.970	0.055	0.125
1:1	100	5	5	0.060	0.052	0.253	0.051	0.019	0.161	0.048	0.389	0.049	0.034	0.621	0.053	0.776	0.058	0.066	0.945	0.054	0.966	0.055	0.121
1:1	100	6	4	0.058	0.050	0.270	0.048	0.022	0.161	0.050	0.389	0.051	0.033	0.646	0.052	0.778	0.051	0.064	0.958	0.050	0.970	0.050	0.118
1:1	100	8	12	0.056	0.050	0.164	0.052	0.016	0.121	0.051	0.244	0.052	0.028	0.475	0.050	0.574	0.055	0.040	0.825	0.053	0.859	0.059	0.060
1:1	100	10	10	0.054	0.050	0.162	0.052	0.017	0.127	0.051	0.248	0.055	0.020	0.480	0.054	0.573	0.059	0.040	0.843	0.050	0.864	0.055	0.060
1:1	100	12	8	0.056	0.048	0.164	0.055	0.019	0.125	0.050	0.243	0.053	0.023	0.476	0.050	0.582	0.054	0.039	0.837	0.049	0.869	0.052	0.057
1:1	100	40	60	0.053	0.051	0.083	0.062	0.017	0.110	0.050	0.097	0.061	0.017	0.417	0.051	0.161	0.059	0.019	0.765	0.050	0.272	0.061	0.023

Appendix C (continued): Type I error rate estimates

Table 23 (continued). Type I error rate estimates for conditions when the population effect size variance is 1.00.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	100	50	50	0.053	0.050	0.083	0.066	0.016	0.107	0.047	0.092	0.060	0.019	0.444	0.049	0.171	0.063	0.022	0.789	0.049	0.285	0.061	0.023
1:1	100	60	40	0.056	0.049	0.081	0.063	0.019	0.116	0.055	0.098	0.067	0.017	0.424	0.051	0.167	0.061	0.018	0.773	0.048	0.286	0.059	0.021
1:2	10	4	6	0.090	0.070	0.095	0.012	0.000	0.097	0.067	0.096	0.011	0.000	0.144	0.066	0.141	0.011	0.000	0.230	0.077	0.199	0.011	0.000
1:2	10	5	5	0.093	0.071	0.095	0.013	0.000	0.097	0.065	0.100	0.013	0.000	0.149	0.070	0.141	0.012	0.000	0.231	0.067	0.200	0.011	0.000
1:2	10	6	4	0.090	0.069	0.100	0.012	0.000	0.097	0.066	0.109	0.014	0.000	0.158	0.065	0.154	0.014	0.000	0.249	0.068	0.226	0.014	0.000
1:2	10	8	12	0.071	0.065	0.054	0.014	0.000	0.079	0.068	0.057	0.015	0.000	0.102	0.064	0.072	0.015	0.000	0.142	0.065	0.094	0.013	0.000
1:2	10	10	10	0.069	0.067	0.052	0.014	0.000	0.071	0.065	0.058	0.015	0.000	0.101	0.065	0.074	0.016	0.000	0.151	0.066	0.105	0.014	0.000
1:2	10	12	8	0.066	0.062	0.058	0.015	0.000	0.077	0.065	0.063	0.015	0.000	0.110	0.067	0.085	0.015	0.000	0.154	0.064	0.115	0.016	0.000
1:2	10	40	60	0.053	0.062	0.049	0.023	0.000	0.061	0.060	0.049	0.022	0.000	0.081	0.062	0.056	0.023	0.000	0.121	0.066	0.066	0.023	0.000
1:2	10	50	50	0.061	0.066	0.050	0.023	0.000	0.061	0.063	0.052	0.023	0.000	0.087	0.060	0.061	0.023	0.000	0.123	0.064	0.071	0.023	0.000
1:2	10	60	40	0.057	0.060	0.050	0.021	0.000	0.061	0.061	0.050	0.020	0.000	0.084	0.060	0.065	0.023	0.000	0.133	0.055	0.080	0.018	0.000
1:2	20	4	6	0.068	0.059	0.191	0.037	0.001	0.089	0.056	0.222	0.036	0.001	0.193	0.058	0.333	0.033	0.002	0.375	0.055	0.519	0.031	0.006
1:2	20	5	5	0.074	0.058	0.207	0.036	0.001	0.090	0.053	0.224	0.031	0.002	0.191	0.054	0.337	0.034	0.002	0.382	0.056	0.534	0.033	0.008
1:2	20	6	4	0.069	0.055	0.207	0.035	0.001	0.094	0.055	0.236	0.034	0.002	0.210	0.057	0.361	0.039	0.002	0.408	0.053	0.562	0.034	0.005
1:2	20	8	12	0.057	0.055	0.113	0.040	0.000	0.068	0.050	0.127	0.036	0.001	0.133	0.053	0.197	0.037	0.001	0.234	0.055	0.300	0.039	0.002
1:2	20	10	10	0.063	0.054	0.119	0.039	0.000	0.072	0.055	0.132	0.038	0.001	0.133	0.051	0.198	0.039	0.002	0.248	0.053	0.311	0.035	0.002
1:2	20	12	8	0.059	0.055	0.123	0.040	0.001	0.075	0.055	0.137	0.039	0.001	0.145	0.053	0.215	0.039	0.001	0.266	0.055	0.338	0.037	0.002
1:2	20	40	60	0.051	0.051	0.078	0.048	0.000	0.061	0.056	0.077	0.047	0.001	0.116	0.056	0.099	0.051	0.001	0.191	0.056	0.124	0.050	0.000
1:2	20	50	50	0.055	0.052	0.076	0.051	0.000	0.060	0.052	0.077	0.048	0.000	0.121	0.058	0.109	0.050	0.000	0.213	0.058	0.130	0.053	0.000
1:2	20	60	40	0.051	0.053	0.076	0.045	0.000	0.062	0.052	0.082	0.047	0.000	0.125	0.051	0.101	0.043	0.001	0.216	0.056	0.130	0.048	0.000
1:2	50	4	6	0.063	0.053	0.257	0.045	0.012	0.117	0.053	0.320	0.046	0.018	0.365	0.052	0.578	0.043	0.036	0.716	0.052	0.824	0.044	0.061
1:2	50	5	5	0.064	0.048	0.256	0.042	0.011	0.112	0.051	0.324	0.045	0.018	0.382	0.050	0.594	0.046	0.034	0.729	0.053	0.841	0.047	0.062
1:2	50	6	4	0.059	0.047	0.262	0.045	0.010	0.118	0.050	0.336	0.047	0.018	0.406	0.054	0.620	0.049	0.034	0.757	0.050	0.853	0.047	0.058
1:2	50	8	12	0.057	0.051	0.160	0.049	0.008	0.088	0.053	0.199	0.051	0.012	0.245	0.051	0.371	0.051	0.019	0.512	0.052	0.615	0.051	0.030
1:2	50	10	10	0.058	0.050	0.165	0.052	0.010	0.091	0.052	0.200	0.052	0.012	0.275	0.046	0.393	0.047	0.020	0.550	0.048	0.650	0.049	0.029
1:2	50	12	8	0.055	0.050	0.165	0.051	0.009	0.094	0.054	0.221	0.054	0.012	0.277	0.049	0.412	0.052	0.020	0.572	0.053	0.671	0.057	0.031
1:2	50	40	60	0.047	0.047	0.089	0.056	0.007	0.081	0.054	0.104	0.061	0.009	0.210	0.053	0.129	0.062	0.009	0.439	0.052	0.203	0.061	0.012
1:2	50	50	50	0.048	0.051	0.094	0.061	0.008	0.078	0.053	0.097	0.062	0.007	0.239	0.049	0.143	0.059	0.011	0.495	0.050	0.212	0.059	0.012
1:2	50	60	40	0.054	0.049	0.094	0.061	0.008	0.078	0.047	0.101	0.055	0.011	0.248	0.048	0.145	0.059	0.009	0.493	0.049	0.212	0.058	0.011
1:2	100	4	6	0.055	0.053	0.267	0.048	0.018	0.159	0.051	0.393	0.048	0.034	0.614	0.051	0.763	0.047	0.068	0.950	0.048	0.964	0.051	0.131
1:2	100	5	5	0.055	0.047	0.261	0.048	0.019	0.162	0.048	0.402	0.046	0.037	0.639	0.049	0.785	0.050	0.068	0.954	0.052	0.969	0.054	0.122
1:2	100	6	4	0.059	0.048	0.280	0.052	0.021	0.166	0.052	0.415	0.052	0.034	0.677	0.054	0.803	0.052	0.068	0.967	0.061	0.971	0.064	0.120
1:2	100	8	12	0.056	0.054	0.177	0.057	0.019	0.124	0.052	0.264	0.056	0.026	0.442	0.050	0.565	0.051	0.045	0.810	0.049	0.855	0.053	0.069
1:2	100	10	10	0.054	0.049	0.174	0.053	0.016	0.129	0.052	0.264	0.056	0.026	0.487	0.051	0.589	0.057	0.046	0.844	0.052	0.871	0.055	0.070

Appendix C (continued): Type I error rate estimates

Table 23 (continued). Type I error rate estimates for conditions when the population effect size variance is 1.00.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:2	100	12	8	0.054	0.050	0.184	0.056	0.017	0.126	0.049	0.272	0.055	0.023	0.506	0.051	0.621	0.057	0.041	0.863	0.054	0.890	0.062	0.067
1:2	100	40	60	0.052	0.051	0.103	0.066	0.018	0.107	0.050	0.117	0.062	0.019	0.394	0.055	0.187	0.069	0.022	0.742	0.049	0.317	0.064	0.028
1:2	100	50	50	0.050	0.045	0.097	0.060	0.018	0.118	0.049	0.114	0.061	0.017	0.442	0.051	0.190	0.063	0.021	0.799	0.054	0.321	0.067	0.026
1:2	100	60	40	0.054	0.054	0.099	0.069	0.014	0.118	0.053	0.120	0.065	0.017	0.453	0.049	0.201	0.063	0.024	0.807	0.052	0.329	0.068	0.023
1:4	10	4	6	0.092	0.072	0.110	0.012	0.000	0.102	0.068	0.113	0.011	0.000	0.152	0.071	0.162	0.014	0.000	0.231	0.069	0.220	0.009	0.000
1:4	10	5	5	0.094	0.067	0.120	0.014	0.000	0.097	0.065	0.125	0.013	0.000	0.151	0.067	0.166	0.013	0.000	0.247	0.069	0.242	0.012	0.000
1:4	10	6	4	0.095	0.074	0.136	0.015	0.000	0.107	0.066	0.145	0.014	0.000	0.169	0.066	0.196	0.016	0.000	0.274	0.075	0.275	0.017	0.000
1:4	10	8	12	0.066	0.058	0.064	0.015	0.000	0.075	0.069	0.071	0.018	0.000	0.098	0.065	0.086	0.015	0.000	0.146	0.066	0.118	0.016	0.000
1:4	10	10	10	0.070	0.067	0.074	0.015	0.000	0.074	0.068	0.080	0.017	0.000	0.109	0.063	0.098	0.016	0.000	0.159	0.065	0.137	0.016	0.000
1:4	10	12	8	0.074	0.066	0.085	0.018	0.000	0.081	0.065	0.090	0.017	0.000	0.113	0.065	0.114	0.016	0.000	0.174	0.065	0.156	0.016	0.000
1:4	10	40	60	0.057	0.066	0.063	0.026	0.000	0.067	0.067	0.071	0.030	0.000	0.082	0.057	0.077	0.026	0.000	0.121	0.065	0.092	0.028	0.000
1:4	10	50	50	0.062	0.063	0.076	0.025	0.000	0.066	0.062	0.073	0.025	0.000	0.089	0.061	0.082	0.024	0.000	0.135	0.059	0.104	0.025	0.000
1:4	10	60	40	0.061	0.061	0.073	0.024	0.000	0.065	0.062	0.075	0.026	0.000	0.086	0.059	0.085	0.023	0.000	0.148	0.061	0.106	0.025	0.000
1:4	20	4	6	0.074	0.059	0.215	0.034	0.001	0.093	0.053	0.243	0.032	0.002	0.191	0.051	0.359	0.032	0.004	0.364	0.055	0.533	0.032	0.006
1:4	20	5	5	0.073	0.059	0.229	0.035	0.001	0.093	0.053	0.253	0.033	0.001	0.202	0.058	0.384	0.037	0.002	0.389	0.052	0.566	0.034	0.006
1:4	20	6	4	0.075	0.054	0.245	0.036	0.001	0.092	0.052	0.275	0.039	0.001	0.222	0.052	0.416	0.038	0.003	0.440	0.058	0.620	0.043	0.006
1:4	20	8	12	0.060	0.058	0.142	0.041	0.001	0.074	0.057	0.152	0.041	0.001	0.129	0.056	0.222	0.039	0.001	0.234	0.052	0.323	0.036	0.002
1:4	20	10	10	0.062	0.056	0.156	0.040	0.001	0.071	0.049	0.168	0.038	0.000	0.140	0.053	0.242	0.038	0.001	0.275	0.052	0.376	0.037	0.003
1:4	20	12	8	0.061	0.052	0.165	0.038	0.000	0.080	0.056	0.182	0.041	0.001	0.156	0.057	0.269	0.043	0.001	0.299	0.057	0.418	0.043	0.003
1:4	20	40	60	0.053	0.054	0.109	0.055	0.000	0.061	0.051	0.109	0.052	0.000	0.112	0.057	0.135	0.059	0.000	0.188	0.055	0.165	0.052	0.001
1:4	20	50	50	0.054	0.054	0.112	0.053	0.000	0.062	0.056	0.121	0.053	0.000	0.117	0.055	0.142	0.054	0.001	0.222	0.055	0.182	0.047	0.001
1:4	20	60	40	0.053	0.054	0.115	0.053	0.001	0.064	0.051	0.119	0.050	0.001	0.134	0.056	0.155	0.053	0.001	0.247	0.055	0.186	0.048	0.000
1:4	50	4	6	0.063	0.050	0.273	0.042	0.011	0.109	0.050	0.334	0.043	0.019	0.360	0.049	0.588	0.041	0.042	0.713	0.051	0.834	0.042	0.076
1:4	50	5	5	0.061	0.052	0.288	0.046	0.011	0.119	0.053	0.357	0.046	0.018	0.389	0.049	0.623	0.045	0.040	0.748	0.053	0.867	0.048	0.072
1:4	50	6	4	0.064	0.051	0.309	0.050	0.009	0.123	0.050	0.384	0.048	0.020	0.424	0.054	0.647	0.051	0.038	0.797	0.056	0.884	0.057	0.073
1:4	50	8	12	0.058	0.051	0.195	0.050	0.009	0.083	0.048	0.224	0.048	0.014	0.252	0.051	0.406	0.049	0.023	0.505	0.053	0.633	0.052	0.036
1:4	50	10	10	0.058	0.049	0.200	0.055	0.009	0.093	0.057	0.253	0.057	0.013	0.283	0.055	0.446	0.054	0.022	0.579	0.053	0.691	0.053	0.038
1:4	50	12	8	0.060	0.051	0.220	0.056	0.011	0.096	0.048	0.268	0.049	0.014	0.313	0.051	0.488	0.056	0.022	0.630	0.050	0.742	0.055	0.037
1:4	50	40	60	0.051	0.051	0.144	0.067	0.007	0.076	0.054	0.151	0.068	0.010	0.210	0.052	0.201	0.066	0.011	0.442	0.053	0.268	0.067	0.013
1:4	50	50	50	0.054	0.053	0.143	0.069	0.008	0.086	0.048	0.151	0.064	0.010	0.237	0.055	0.196	0.070	0.011	0.509	0.051	0.288	0.066	0.015
1:4	50	60	40	0.050	0.049	0.137	0.065	0.008	0.084	0.051	0.152	0.065	0.009	0.276	0.050	0.211	0.063	0.013	0.548	0.054	0.302	0.068	0.013
1:4	100	4	6	0.059	0.053	0.292	0.047	0.019	0.161	0.050	0.409	0.044	0.037	0.619	0.049	0.777	0.046	0.083	0.944	0.054	0.960	0.048	0.150
1:4	100	5	5	0.058	0.048	0.298	0.047	0.017	0.160	0.049	0.426	0.049	0.035	0.650	0.052	0.800	0.054	0.078	0.961	0.048	0.971	0.050	0.150
1:4	100	6	4	0.065	0.046	0.325	0.052	0.019	0.183	0.049	0.452	0.055	0.034	0.714	0.055	0.828	0.061	0.079	0.977	0.066	0.980	0.071	0.141

Appendix C (continued): Type I error rate estimates

Table 23 (continued). Type I error rate estimates for conditions when the population effect size variance is 1.00.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:4	100	8	12	0.058	0.051	0.212	0.053	0.018	0.127	0.050	0.285	0.054	0.027	0.440	0.051	0.586	0.056	0.051	0.813	0.053	0.868	0.053	0.085
1:4	100	10	10	0.056	0.050	0.228	0.055	0.017	0.131	0.050	0.314	0.055	0.027	0.507	0.051	0.644	0.058	0.052	0.869	0.047	0.899	0.054	0.089
1:4	100	12	8	0.058	0.046	0.247	0.058	0.016	0.142	0.049	0.333	0.057	0.029	0.556	0.051	0.693	0.058	0.051	0.906	0.055	0.929	0.065	0.086
1:4	100	40	60	0.049	0.052	0.164	0.068	0.014	0.106	0.053	0.169	0.072	0.022	0.392	0.054	0.267	0.078	0.030	0.743	0.053	0.405	0.075	0.038
1:4	100	50	50	0.054	0.051	0.157	0.068	0.015	0.121	0.051	0.177	0.073	0.022	0.453	0.050	0.273	0.065	0.026	0.813	0.046	0.423	0.066	0.038
1:4	100	60	40	0.051	0.051	0.153	0.071	0.013	0.127	0.050	0.178	0.067	0.020	0.495	0.053	0.278	0.069	0.029	0.850	0.050	0.452	0.070	0.040
1:8	10	4	6	0.090	0.071	0.137	0.012	0.000	0.107	0.069	0.139	0.011	0.000	0.151	0.067	0.184	0.010	0.000	0.238	0.069	0.255	0.011	0.000
1:8	10	5	5	0.098	0.068	0.152	0.014	0.000	0.106	0.068	0.162	0.012	0.000	0.164	0.063	0.213	0.013	0.000	0.260	0.066	0.294	0.012	0.000
1:8	10	6	4	0.100	0.073	0.176	0.019	0.000	0.108	0.067	0.187	0.016	0.000	0.187	0.072	0.245	0.017	0.000	0.295	0.066	0.342	0.018	0.000
1:8	10	8	12	0.074	0.072	0.092	0.019	0.000	0.075	0.067	0.092	0.017	0.000	0.103	0.067	0.112	0.017	0.000	0.148	0.067	0.149	0.015	0.000
1:8	10	10	10	0.076	0.065	0.101	0.017	0.000	0.078	0.061	0.106	0.015	0.000	0.112	0.065	0.137	0.018	0.000	0.168	0.068	0.186	0.017	0.000
1:8	10	12	8	0.077	0.066	0.121	0.018	0.000	0.077	0.064	0.131	0.019	0.000	0.124	0.069	0.159	0.017	0.000	0.194	0.066	0.213	0.021	0.000
1:8	10	40	60	0.063	0.066	0.099	0.032	0.000	0.060	0.068	0.096	0.032	0.000	0.091	0.067	0.109	0.037	0.000	0.131	0.072	0.134	0.038	0.000
1:8	10	50	50	0.063	0.071	0.105	0.033	0.000	0.072	0.066	0.112	0.037	0.000	0.099	0.068	0.122	0.035	0.000	0.131	0.062	0.141	0.031	0.000
1:8	10	60	40	0.063	0.061	0.106	0.030	0.000	0.071	0.063	0.112	0.032	0.000	0.102	0.063	0.128	0.028	0.000	0.157	0.063	0.157	0.027	0.000
1:8	20	4	6	0.076	0.057	0.261	0.034	0.001	0.098	0.057	0.282	0.036	0.002	0.191	0.056	0.387	0.030	0.003	0.374	0.060	0.572	0.033	0.006
1:8	20	5	5	0.072	0.054	0.260	0.036	0.001	0.096	0.058	0.296	0.035	0.001	0.206	0.054	0.432	0.036	0.004	0.408	0.059	0.604	0.036	0.008
1:8	20	6	4	0.073	0.056	0.308	0.039	0.001	0.102	0.054	0.333	0.038	0.001	0.235	0.056	0.484	0.039	0.004	0.471	0.057	0.662	0.042	0.006
1:8	20	8	12	0.063	0.053	0.180	0.040	0.001	0.077	0.060	0.195	0.045	0.001	0.131	0.059	0.251	0.040	0.002	0.237	0.057	0.373	0.039	0.003
1:8	20	10	10	0.062	0.052	0.195	0.039	0.001	0.078	0.057	0.216	0.043	0.001	0.147	0.058	0.296	0.039	0.002	0.279	0.053	0.432	0.042	0.003
1:8	20	12	8	0.064	0.049	0.227	0.040	0.001	0.072	0.053	0.238	0.043	0.001	0.167	0.049	0.338	0.040	0.001	0.320	0.057	0.487	0.043	0.003
1:8	20	40	60	0.053	0.062	0.159	0.064	0.000	0.064	0.052	0.165	0.056	0.001	0.115	0.061	0.189	0.064	0.000	0.197	0.059	0.231	0.067	0.001
1:8	20	50	50	0.058	0.055	0.168	0.062	0.000	0.068	0.049	0.172	0.058	0.000	0.124	0.054	0.198	0.061	0.000	0.240	0.054	0.251	0.058	0.001
1:8	20	60	40	0.056	0.052	0.172	0.056	0.000	0.073	0.048	0.183	0.055	0.000	0.136	0.051	0.211	0.057	0.001	0.259	0.055	0.266	0.060	0.000
1:8	50	4	6	0.061	0.052	0.309	0.044	0.012	0.113	0.054	0.374	0.043	0.021	0.370	0.053	0.619	0.043	0.047	0.717	0.053	0.842	0.043	0.088
1:8	50	5	5	0.062	0.050	0.329	0.044	0.010	0.116	0.050	0.397	0.047	0.021	0.405	0.049	0.652	0.044	0.043	0.760	0.052	0.872	0.046	0.091
1:8	50	6	4	0.064	0.054	0.348	0.056	0.010	0.130	0.048	0.433	0.052	0.022	0.450	0.053	0.695	0.056	0.048	0.819	0.058	0.894	0.063	0.086
1:8	50	8	12	0.058	0.054	0.239	0.054	0.010	0.090	0.057	0.282	0.056	0.015	0.254	0.057	0.460	0.055	0.029	0.518	0.054	0.687	0.052	0.046
1:8	50	10	10	0.058	0.054	0.273	0.054	0.009	0.091	0.050	0.307	0.051	0.015	0.292	0.050	0.506	0.054	0.029	0.608	0.047	0.747	0.047	0.045
1:8	50	12	8	0.056	0.051	0.284	0.054	0.009	0.106	0.050	0.345	0.056	0.015	0.346	0.053	0.563	0.057	0.026	0.678	0.054	0.795	0.065	0.053
1:8	50	40	60	0.050	0.050	0.213	0.074	0.007	0.082	0.053	0.230	0.075	0.008	0.215	0.052	0.274	0.077	0.014	0.445	0.061	0.371	0.086	0.018
1:8	50	50	50	0.052	0.052	0.210	0.075	0.007	0.091	0.054	0.234	0.075	0.010	0.267	0.052	0.293	0.071	0.015	0.530	0.053	0.393	0.077	0.021
1:8	50	60	40	0.053	0.052	0.216	0.071	0.005	0.094	0.050	0.235	0.072	0.010	0.287	0.055	0.298	0.071	0.014	0.580	0.051	0.419	0.072	0.019
1:8	100	4	6	0.058	0.048	0.327	0.044	0.021	0.156	0.049	0.434	0.042	0.037	0.608	0.052	0.780	0.043	0.089	0.940	0.050	0.962	0.043	0.173

Appendix C (continued): Type I error rate estimates

Table 23 (continued). Type I error rate estimates for conditions when the population effect size variance is 1.00.

				Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:8	100	5	5	0.055	0.049	0.345	0.046	0.022	0.170	0.053	0.463	0.052	0.038	0.657	0.050	0.819	0.050	0.095	0.964	0.048	0.972	0.049	0.174
1:8	100	6	4	0.058	0.048	0.374	0.052	0.020	0.187	0.054	0.496	0.059	0.037	0.734	0.060	0.841	0.064	0.087	0.981	0.068	0.980	0.078	0.168
1:8	100	8	12	0.057	0.051	0.264	0.054	0.018	0.124	0.052	0.343	0.056	0.032	0.449	0.053	0.636	0.053	0.064	0.812	0.056	0.879	0.061	0.110
1:8	100	10	10	0.060	0.054	0.290	0.060	0.018	0.136	0.049	0.379	0.053	0.028	0.522	0.051	0.691	0.059	0.064	0.876	0.052	0.910	0.058	0.113
1:8	100	12	8	0.061	0.049	0.312	0.059	0.016	0.150	0.047	0.419	0.058	0.031	0.587	0.053	0.737	0.063	0.061	0.927	0.059	0.942	0.072	0.118
1:8	100	40	60	0.054	0.050	0.241	0.079	0.015	0.109	0.050	0.269	0.079	0.021	0.404	0.058	0.371	0.093	0.034	0.742	0.069	0.517	0.106	0.053
1:8	100	50	50	0.052	0.052	0.258	0.082	0.017	0.115	0.049	0.273	0.073	0.021	0.477	0.051	0.381	0.079	0.032	0.837	0.050	0.555	0.079	0.053
1:8	100	60	40	0.054	0.050	0.241	0.075	0.016	0.136	0.051	0.271	0.077	0.021	0.540	0.049	0.405	0.076	0.041	0.885	0.051	0.595	0.075	0.063

Appendix D: Power estimates for conditions with adequate Type I error rates

Table 24. Power estimates for conditions when the population effect size variance is 0.00.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	10	4	6	Mod	----	0.066	----	----	----	----	0.066	0.035	----	----	----	0.071	0.055	----	----	----	0.073	0.077	----	----
1:1	10	4	6	Str	----	0.068	----	----	----	----	0.072	0.044	----	----	----	0.072	0.050	----	----	----	0.081	0.076	----	----
1:1	10	5	5	Mod	----	0.067	----	----	----	----	0.073	----	----	----	----	0.069	0.049	----	----	----	0.074	0.074	----	----
1:1	10	5	5	Str	----	0.069	----	----	----	----	0.066	----	----	----	----	0.082	0.054	----	----	----	0.076	0.079	----	----
1:1	10	6	4	Mod	0.085	0.071	----	----	----	----	0.066	----	----	----	----	0.069	0.049	----	----	----	0.071	0.073	----	----
1:1	10	6	4	Str	0.081	0.068	----	----	----	----	0.073	----	----	----	----	0.077	0.050	----	----	----	0.079	0.080	----	----
1:1	10	8	12	Mod	0.070	0.066	----	----	----	0.076	0.067	----	----	----	0.109	0.071	----	----	----	----	0.070	----	----	----
1:1	10	8	12	Str	0.075	0.071	----	----	----	0.085	0.071	----	----	----	0.153	0.086	----	----	----	----	0.088	----	----	----
1:1	10	10	10	Mod	0.070	0.064	----	----	----	0.073	0.068	----	----	----	----	0.072	----	----	----	----	0.073	----	----	----
1:1	10	10	10	Str	0.071	0.067	----	----	----	0.087	0.073	----	----	----	----	0.091	----	----	----	----	0.088	----	----	----
1:1	10	12	8	Mod	0.072	0.069	----	----	----	0.075	0.070	----	----	----	----	0.076	----	----	----	----	0.073	----	----	----
1:1	10	12	8	Str	0.073	0.070	----	----	----	0.086	0.072	----	----	----	----	0.088	----	----	----	----	0.080	----	----	----
1:1	10	40	60	Mod	0.065	0.066	----	----	----	0.084	0.077	----	----	----	0.080	0.067	----	----	----	0.076	0.060	----	----	----
1:1	10	40	60	Str	0.074	0.071	----	----	----	0.118	0.096	----	----	----	0.104	0.076	----	----	----	0.073	0.058	----	----	----
1:1	10	50	50	Mod	0.064	0.065	----	----	----	0.081	0.073	----	----	----	0.080	0.070	----	----	----	0.069	0.059	----	----	----
1:1	10	50	50	Str	0.073	0.071	----	----	----	0.117	0.106	----	----	----	0.100	0.078	----	----	----	0.074	0.062	----	----	----
1:1	10	60	40	Mod	0.067	0.065	----	----	----	0.076	0.070	----	----	----	0.083	0.069	----	----	----	0.071	0.060	----	----	----
1:1	10	60	40	Str	0.076	0.076	----	----	----	0.116	0.093	----	----	----	0.102	0.081	----	----	----	0.075	0.063	----	----	----
1:1	20	4	6	Mod	0.066	0.054	0.091	----	----	----	0.057	0.115	----	----	----	0.056	----	----	----	----	0.057	----	----	----
1:1	20	4	6	Str	0.066	0.057	0.107	----	----	----	0.057	0.126	----	----	----	0.066	----	----	----	----	0.075	----	----	----
1:1	20	5	5	Mod	0.065	0.050	0.083	----	----	0.095	0.057	0.104	----	----	----	0.062	----	----	----	----	0.058	----	----	----
1:1	20	5	5	Str	0.065	0.054	0.103	----	----	0.114	0.061	0.123	----	----	----	0.067	----	----	----	----	0.081	----	----	----
1:1	20	6	4	Mod	0.066	0.059	0.091	----	----	0.093	0.054	0.112	----	----	----	0.057	----	----	----	----	0.063	----	----	----
1:1	20	6	4	Str	0.070	0.061	0.108	----	----	0.119	0.059	0.124	----	----	----	0.067	----	----	----	----	0.075	----	----	----
1:1	20	8	12	Mod	0.062	0.057	0.056	----	----	0.073	0.054	0.058	----	----	0.152	0.065	0.083	----	----	----	0.063	0.135	----	----
1:1	20	8	12	Str	0.063	0.055	0.067	----	----	0.097	0.061	0.072	----	----	0.241	0.098	0.111	----	----	----	0.096	0.179	----	----
1:1	20	10	10	Mod	0.059	0.054	0.056	----	----	0.071	0.054	0.056	----	----	----	0.068	0.087	----	----	----	0.068	0.130	----	----
1:1	20	10	10	Str	0.065	0.061	0.071	----	----	0.098	0.067	0.071	----	----	----	0.105	0.113	----	----	----	0.109	0.184	----	----
1:1	20	12	8	Mod	0.059	0.056	0.056	----	----	0.072	0.055	0.057	----	----	0.149	0.066	0.082	----	----	----	0.066	0.133	----	----
1:1	20	12	8	Str	0.062	0.058	0.065	----	----	0.099	0.066	0.070	----	----	0.245	0.100	0.116	----	----	----	0.100	0.176	----	----
1:1	20	40	60	Mod	0.058	0.056	0.059	----	----	0.083	0.072	0.055	----	----	0.103	0.070	0.055	----	----	0.078	0.052	0.048	----	----
1:1	20	40	60	Str	0.062	0.062	0.082	----	----	0.144	0.115	0.078	----	----	0.153	0.095	0.081	----	----	0.102	0.056	0.057	----	----
1:1	20	50	50	Mod	0.057	0.057	0.060	----	----	0.081	0.065	0.052	----	----	0.102	0.066	0.055	----	----	0.079	0.052	0.045	----	----
1:1	20	50	50	Str	0.065	0.063	0.078	----	----	0.147	0.112	0.082	----	----	0.154	0.101	0.084	----	----	0.094	0.055	0.049	----	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 24 (continued). Power estimates for conditions when the population effect size variance is 0.00.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	20	60	40	Mod	0.059	0.053	0.061	----	----	0.083	0.069	0.054	----	----	0.109	0.066	0.059	----	----	0.079	0.051	0.047	----	----
1:1	20	60	40	Str	0.061	0.058	0.079	----	----	0.143	0.109	0.078	----	----	0.159	0.096	0.081	----	----	0.098	0.058	0.059	----	----
1:1	50	4	6	Mod	0.060	0.052	----	0.035	----	----	0.053	----	----	----	----	0.052	----	0.028	0.007	----	0.057	----	0.021	----
1:1	50	4	6	Str	0.061	0.051	----	0.036	----	----	0.059	----	----	----	----	0.073	----	0.031	0.002	----	0.098	----	0.029	----
1:1	50	5	5	Mod	0.063	0.051	0.120	----	----	----	0.047	----	0.031	----	----	0.051	----	0.030	0.007	----	0.059	----	0.023	----
1:1	50	5	5	Str	0.060	0.052	0.140	----	----	----	0.055	----	0.036	----	----	0.083	----	0.035	0.002	----	0.110	----	0.030	----
1:1	50	6	4	Mod	0.056	0.048	0.115	----	----	----	0.053	----	----	----	----	0.055	----	0.028	0.006	----	0.057	----	0.026	----
1:1	50	6	4	Str	0.064	0.058	0.146	----	----	----	0.060	----	----	----	----	0.079	----	0.032	0.002	----	0.105	----	0.029	----
1:1	50	8	12	Mod	0.056	0.053	0.071	0.039	----	0.094	0.055	0.091	0.038	----	----	0.074	----	0.037	0.008	----	0.087	----	0.034	0.112
1:1	50	8	12	Str	0.061	0.055	0.093	0.041	----	0.157	0.070	0.115	0.042	----	----	0.161	----	0.053	0.021	----	0.186	----	0.071	0.239
1:1	50	10	10	Mod	0.056	0.051	0.074	0.036	----	0.087	0.054	0.086	0.038	----	----	0.077	----	0.033	0.008	----	0.084	----	0.035	0.123
1:1	50	10	10	Str	0.056	0.053	0.090	0.040	----	0.155	0.070	0.108	0.040	----	----	0.180	----	0.059	0.024	----	0.202	----	0.074	0.258
1:1	50	12	8	Mod	0.053	0.050	0.070	0.036	----	0.090	0.054	0.088	0.039	----	----	0.070	----	0.033	0.009	----	0.087	----	0.036	0.113
1:1	50	12	8	Str	0.058	0.056	0.089	0.039	----	0.148	0.067	0.109	0.039	----	----	0.163	----	0.054	0.021	----	0.182	----	0.069	0.238
1:1	50	40	60	Mod	0.057	0.054	0.082	0.043	----	0.114	0.077	0.088	0.040	----	0.195	0.096	0.152	0.051	----	0.132	0.053	0.118	0.032	0.087
1:1	50	40	60	Str	0.061	0.060	0.106	0.046	----	0.264	0.181	0.151	0.067	----	0.345	0.172	0.267	0.087	----	0.188	0.069	0.173	0.037	0.131
1:1	50	50	50	Mod	0.059	0.054	0.081	0.043	----	0.117	0.084	0.090	0.044	----	0.194	0.097	0.156	0.053	0.123	----	0.049	0.114	0.032	0.083
1:1	50	50	50	Str	0.062	0.056	0.114	0.043	----	0.274	0.202	0.154	0.073	----	0.340	0.184	0.270	0.092	0.243	----	0.062	0.172	0.038	0.123
1:1	50	60	40	Mod	0.055	0.055	0.078	0.041	----	0.115	0.084	0.089	0.042	----	0.200	0.100	0.155	0.053	0.122	0.136	0.052	0.118	0.031	0.084
1:1	50	60	40	Str	0.066	0.061	0.108	0.049	----	0.264	0.180	0.148	0.069	----	0.346	0.176	0.273	0.086	0.252	0.192	0.068	0.178	0.038	0.133
1:1	100	4	6	Mod	0.057	0.050	----	0.036	----	----	0.049	----	0.035	0.015	----	0.051	----	0.033	----	----	0.061	----	0.025	----
1:1	100	4	6	Str	0.061	0.055	----	0.043	----	----	0.054	----	0.040	0.005	----	0.097	----	0.039	----	----	0.150	----	0.045	----
1:1	100	5	5	Mod	0.064	0.053	----	----	----	----	0.049	----	0.036	0.015	----	0.052	----	0.032	----	----	0.073	----	0.028	----
1:1	100	5	5	Str	0.061	0.053	----	----	----	----	0.058	----	0.038	0.006	----	0.111	----	0.041	----	----	0.182	----	0.053	----
1:1	100	6	4	Mod	0.055	0.046	----	0.037	----	----	0.053	----	----	0.014	----	0.054	----	0.034	----	----	0.063	----	0.028	----
1:1	100	6	4	Str	0.058	0.051	----	0.040	----	----	0.061	----	----	0.004	----	0.092	----	0.037	----	----	0.163	----	0.052	----
1:1	100	8	12	Mod	0.054	0.052	0.080	0.041	----	0.124	0.052	0.112	0.038	0.006	----	0.094	----	0.048	0.010	----	0.128	----	0.062	----
1:1	100	8	12	Str	0.060	0.054	0.094	0.047	----	0.253	0.091	0.144	0.042	0.001	----	0.274	----	0.096	0.004	----	0.329	----	0.139	----
1:1	100	10	10	Mod	0.057	0.051	0.077	0.040	----	0.131	0.058	0.123	0.042	0.006	----	0.099	----	0.045	----	----	0.144	----	0.061	----
1:1	100	10	10	Str	0.061	0.055	0.102	0.043	----	0.257	0.095	0.147	0.043	0.002	----	0.322	----	0.109	----	----	0.366	----	0.164	----
1:1	100	12	8	Mod	0.056	0.052	0.081	0.041	----	0.123	0.050	0.112	0.036	0.007	----	0.095	----	0.047	0.010	----	0.131	----	0.059	----
1:1	100	12	8	Str	0.061	0.055	0.096	0.045	----	0.250	0.082	0.140	0.041	0.001	----	0.275	----	0.093	0.004	----	0.336	----	0.146	----
1:1	100	40	60	Mod	0.054	0.053	0.086	0.043	----	0.178	0.110	0.124	0.059	0.009	0.365	0.146	0.305	0.085	0.164	----	0.066	0.235	0.044	0.182
1:1	100	40	60	Str	0.056	0.056	0.109	0.046	----	0.476	0.318	0.232	0.113	0.005	0.620	0.319	0.541	0.170	0.358	----	0.087	0.367	0.056	0.305

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 24 (continued). Power estimates for conditions when the population effect size variance is 0.00.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	100	50	50	Mod	0.055	0.052	0.082	0.043	----	0.181	0.121	0.120	0.060	0.010	0.359	0.159	0.302	0.091	0.166	----	0.062	----	0.041	0.183
1:1	100	50	50	Str	0.061	0.061	0.114	0.048	----	0.478	0.345	0.232	0.121	0.004	0.616	0.329	0.531	0.179	0.366	----	0.092	----	0.054	0.306
1:1	100	60	40	Mod	0.051	0.052	0.078	0.044	----	0.182	0.108	0.121	0.056	0.010	0.365	0.156	0.306	0.088	0.165	----	0.063	----	0.043	0.191
1:1	100	60	40	Str	0.056	0.052	0.110	0.047	----	0.476	0.319	0.227	0.116	0.005	0.624	0.316	0.532	0.175	0.349	----	0.091	----	0.051	0.314
1:2	10	4	6	Mod	----	0.075	----	----	----	----	0.072	0.046	----	----	----	0.073	0.054	----	----	----	0.072	0.074	----	----
1:2	10	4	6	Str	----	0.073	----	----	----	----	0.075	0.046	----	----	----	0.084	0.064	----	----	----	0.089	0.083	----	----
1:2	10	5	5	Mod	----	0.070	----	----	----	----	0.069	0.041	----	----	----	0.074	0.057	----	----	----	0.071	0.080	----	----
1:2	10	5	5	Str	----	0.067	----	----	----	----	0.071	0.044	----	----	----	0.073	0.060	----	----	----	0.080	0.095	----	----
1:2	10	6	4	Mod	0.080	0.067	0.038	----	----	----	0.067	0.043	----	----	----	0.066	0.055	----	----	----	0.067	----	----	----
1:2	10	6	4	Str	0.088	0.070	0.046	----	----	----	0.070	0.047	----	----	----	0.070	0.067	----	----	----	0.071	----	----	----
1:2	10	8	12	Mod	0.070	0.068	----	----	----	0.076	0.069	----	----	----	0.113	0.086	----	----	----	----	0.078	----	----	----
1:2	10	8	12	Str	0.079	0.075	----	----	----	0.094	0.079	----	----	----	0.161	0.106	----	----	----	----	0.099	----	----	----
1:2	10	10	10	Mod	0.065	0.066	----	----	----	0.077	0.069	----	----	----	0.118	0.075	----	----	----	----	0.072	----	----	----
1:2	10	10	10	Str	0.074	0.070	----	----	----	0.091	0.073	----	----	----	0.163	0.093	----	----	----	----	0.087	----	----	----
1:2	10	12	8	Mod	0.067	0.067	----	----	----	0.075	0.064	----	----	----	0.112	0.069	----	----	----	----	0.061	0.042	----	----
1:2	10	12	8	Str	0.074	0.067	----	----	----	0.094	0.071	----	----	----	0.160	0.076	----	----	----	----	0.075	0.055	----	----
1:2	10	40	60	Mod	0.070	0.070	----	----	----	0.085	0.082	----	----	----	0.085	0.073	----	----	----	0.068	0.065	----	----	----
1:2	10	40	60	Str	0.078	0.077	----	----	----	0.120	0.112	----	----	----	0.105	0.095	----	----	----	0.078	0.070	----	----	----
1:2	10	50	50	Mod	0.068	0.069	----	----	----	0.080	0.070	----	----	----	0.083	0.067	----	----	----	0.074	0.063	----	----	----
1:2	10	50	50	Str	0.073	0.066	----	----	----	0.113	0.092	----	----	----	0.102	0.082	----	----	----	0.081	0.064	----	----	----
1:2	10	60	40	Mod	0.070	0.061	----	----	----	0.079	0.068	----	----	----	0.086	0.064	----	----	----	0.076	0.063	----	----	----
1:2	10	60	40	Str	0.079	0.070	----	----	----	0.122	0.086	----	----	----	0.108	0.067	----	----	----	0.081	0.059	----	----	----
1:2	20	4	6	Mod	0.070	0.057	0.097	----	----	----	0.057	0.115	----	----	----	0.060	----	----	----	----	0.067	----	----	----
1:2	20	4	6	Str	0.071	0.056	0.119	----	----	----	0.064	0.137	----	----	----	0.081	----	----	----	----	0.093	----	----	----
1:2	20	5	5	Mod	0.065	0.053	0.097	----	----	----	0.055	----	----	----	----	0.054	----	----	----	----	0.065	----	----	----
1:2	20	5	5	Str	0.072	0.056	0.117	----	----	----	0.060	----	----	----	----	0.070	----	----	----	----	0.076	----	----	----
1:2	20	6	4	Mod	0.067	0.055	0.096	----	----	----	0.054	----	----	----	----	0.057	----	----	----	----	0.057	----	----	----
1:2	20	6	4	Str	0.074	0.061	0.117	----	----	----	0.059	----	----	----	----	0.054	----	----	----	----	0.065	----	----	----
1:2	20	8	12	Mod	0.061	0.063	0.067	----	----	0.072	0.061	0.063	----	----	0.150	0.073	0.084	----	----	----	0.082	0.131	----	----
1:2	20	8	12	Str	0.064	0.058	0.076	----	----	0.096	0.069	0.074	----	----	0.253	0.120	0.122	----	----	----	0.125	0.175	----	----
1:2	20	10	10	Mod	0.065	0.056	0.070	----	----	0.069	0.053	0.061	----	----	0.153	0.066	0.095	----	----	----	0.067	----	----	----
1:2	20	10	10	Str	0.063	0.056	0.079	----	----	0.100	0.064	0.083	----	----	0.263	0.105	0.140	----	----	----	0.107	----	----	----
1:2	20	12	8	Mod	0.061	0.051	0.062	----	----	0.072	0.054	0.066	----	----	----	0.057	0.102	----	----	----	0.059	----	----	----
1:2	20	12	8	Str	0.062	0.056	0.075	----	----	0.107	0.059	0.082	----	----	----	0.088	0.153	----	----	----	0.082	----	----	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 24 (continued). Power estimates for conditions when the population effect size variance is 0.00.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:2	20	40	60	Mod	0.059	0.057	0.077	----	----	0.081	0.080	0.062	----	----	0.102	0.084	0.068	----	----	0.079	0.064	0.059	----	----
1:2	20	40	60	Str	0.068	0.069	0.112	----	----	0.153	0.132	0.100	----	----	0.148	0.117	0.095	----	----	0.096	0.071	0.070	----	----
1:2	20	50	50	Mod	0.060	0.061	0.079	----	----	0.083	0.070	0.073	----	----	0.109	0.071	0.079	----	----	0.085	0.052	0.067	----	----
1:2	20	50	50	Str	0.062	0.059	0.110	----	----	0.147	0.113	0.108	----	----	0.158	0.095	0.116	----	----	0.097	0.056	0.084	----	----
1:2	20	60	40	Mod	0.065	0.058	0.091	----	----	0.081	0.059	0.078	----	----	0.111	0.058	0.090	0.026	----	0.095	0.052	0.083	0.022	----
1:2	20	60	40	Str	0.061	0.060	0.114	----	----	0.146	0.093	0.112	----	----	0.172	0.074	0.128	0.027	----	0.111	0.048	0.104	0.022	----
1:2	50	4	6	Mod	0.064	0.054	----	----	----	----	0.053	----	----	----	----	0.062	----	----	0.010	----	0.078	----	----	----
1:2	50	4	6	Str	0.064	0.051	----	----	----	----	0.057	----	----	----	----	0.101	----	----	0.003	----	0.149	----	----	----
1:2	50	5	5	Mod	0.056	0.045	----	----	----	----	0.053	----	0.034	----	----	0.052	----	----	0.009	----	0.059	----	0.024	----
1:2	50	5	5	Str	0.064	0.054	----	----	----	----	0.054	----	0.034	----	----	0.076	----	----	0.002	----	0.120	----	0.034	----
1:2	50	6	4	Mod	0.057	0.052	----	0.037	----	----	0.053	----	0.033	----	----	0.053	----	0.032	0.008	----	0.050	----	0.027	----
1:2	50	6	4	Str	0.065	0.054	----	0.041	----	----	0.054	----	0.040	----	----	0.058	----	0.032	0.002	----	0.068	----	0.029	----
1:2	50	8	12	Mod	0.054	0.053	0.079	----	----	0.090	0.057	0.096	----	----	----	0.097	----	0.037	0.012	----	0.129	----	0.046	0.143
1:2	50	8	12	Str	0.061	0.056	0.097	----	----	0.149	0.080	0.125	----	----	----	0.219	----	0.065	0.028	----	0.254	----	0.089	0.274
1:2	50	10	10	Mod	0.060	0.050	0.086	0.038	----	0.094	0.057	0.105	0.037	----	----	0.083	----	0.039	0.013	----	0.095	----	0.043	0.136
1:2	50	10	10	Str	0.057	0.053	0.095	0.038	----	0.159	0.077	0.124	0.042	----	----	0.186	----	0.060	0.023	----	0.202	----	0.083	0.265
1:2	50	12	8	Mod	0.057	0.050	0.088	0.038	----	0.099	0.048	0.108	0.034	----	----	0.061	----	0.034	0.008	----	0.067	----	0.035	----
1:2	50	12	8	Str	0.061	0.054	0.103	0.042	----	0.159	0.062	0.130	0.039	----	----	0.127	----	0.047	0.015	----	0.132	----	0.060	----
1:2	50	40	60	Mod	0.054	0.054	0.092	0.041	----	0.114	0.102	0.101	0.047	----	0.195	0.135	0.164	0.068	0.144	0.143	0.086	0.146	0.050	0.112
1:2	50	40	60	Str	0.058	0.061	0.133	0.048	----	0.277	0.232	0.175	0.077	----	0.334	0.239	0.279	0.115	0.254	0.192	0.107	0.200	0.057	0.157
1:2	50	50	50	Mod	0.055	0.051	0.102	0.041	----	0.117	0.085	0.112	0.042	0.009	0.198	0.100	0.189	0.057	0.140	----	0.055	----	0.035	0.110
1:2	50	50	50	Str	0.060	0.057	0.139	0.046	----	0.271	0.200	0.188	0.077	0.009	0.354	0.186	0.322	0.102	0.273	----	0.074	----	0.042	0.158
1:2	50	60	40	Mod	0.053	0.051	0.107	0.039	----	0.114	0.069	0.118	0.043	----	0.220	0.069	----	0.044	0.137	----	0.045	----	0.034	0.114
1:2	50	60	40	Str	0.063	0.058	0.149	0.050	----	0.272	0.147	0.193	0.057	----	0.366	0.114	----	0.068	0.263	----	0.051	----	0.036	0.165
1:2	100	4	6	Mod	0.060	0.055	----	----	----	----	0.049	----	----	0.017	----	0.069	----	----	----	----	0.097	----	0.029	----
1:2	100	4	6	Str	0.066	0.056	----	----	----	----	0.064	----	----	0.005	----	0.146	----	----	----	----	0.254	----	0.072	----
1:2	100	5	5	Mod	0.060	0.051	----	----	----	----	0.051	----	0.038	0.017	----	0.059	----	0.033	----	----	0.071	----	0.030	----
1:2	100	5	5	Str	0.063	0.055	----	----	----	----	0.057	----	0.036	0.005	----	0.112	----	0.038	----	----	0.183	----	0.061	----
1:2	100	6	4	Mod	0.062	0.049	----	0.039	----	----	0.048	----	0.035	0.015	----	0.051	----	0.038	----	----	0.050	----	0.030	----
1:2	100	6	4	Str	0.061	0.054	----	0.044	----	----	0.052	----	0.039	0.006	----	0.067	----	0.035	----	----	0.092	----	0.039	----
1:2	100	8	12	Mod	0.054	0.051	0.088	0.039	----	0.119	0.061	0.123	0.041	0.007	----	0.141	----	0.054	----	----	0.202	----	0.083	----
1:2	100	8	12	Str	0.059	0.054	0.106	0.044	----	0.247	0.100	0.160	0.040	0.002	----	0.402	----	0.130	----	----	0.474	----	0.209	----
1:2	100	10	10	Mod	0.058	0.055	0.090	0.042	----	0.139	0.059	----	0.045	0.008	----	0.109	----	0.047	----	----	0.143	----	0.070	----
1:2	100	10	10	Str	0.064	0.056	0.111	0.045	----	0.269	0.096	----	0.045	0.002	----	0.325	----	0.115	----	----	0.383	----	0.187	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 24 (continued). Power estimates for conditions when the population effect size variance is 0.00.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:2	100	12	8	Mod	0.055	0.049	0.090	0.040	----	0.136	0.051	----	0.037	0.005	----	0.066	----	0.039	----	----	0.083	----	0.047	----
1:2	100	12	8	Str	0.059	0.053	0.108	0.044	----	0.266	0.073	----	0.042	0.002	----	0.192	----	0.075	----	----	0.224	----	0.111	----
1:2	100	40	60	Mod	0.054	0.058	0.101	0.047	0.027	0.180	0.156	0.142	0.072	0.013	0.357	0.239	0.315	0.136	0.195	----	0.126	----	0.074	0.255
1:2	100	40	60	Str	0.059	0.058	0.142	0.051	0.028	0.477	0.407	0.254	0.154	0.009	0.617	0.451	0.536	0.245	0.385	----	0.179	----	0.102	0.387
1:2	100	50	50	Mod	0.054	0.056	0.103	0.046	0.026	0.203	0.132	0.157	0.067	0.012	0.373	0.158	----	0.098	0.187	----	0.072	----	0.047	----
1:2	100	50	50	Str	0.060	0.055	0.144	0.048	0.027	0.477	0.351	0.267	0.124	0.007	0.626	0.341	----	0.192	0.376	----	0.096	----	0.059	----
1:2	100	60	40	Mod	0.059	0.054	0.116	0.046	----	0.191	0.087	0.149	0.052	0.011	----	0.094	----	0.064	0.166	----	0.044	----	0.041	0.245
1:2	100	60	40	Str	0.061	0.059	0.153	0.052	----	0.474	0.239	0.254	0.088	0.006	----	0.208	----	0.124	0.343	----	0.052	----	0.041	0.389
1:4	10	4	6	Mod	----	0.074	0.054	----	----	----	0.073	0.054	----	----	----	0.074	0.068	----	----	----	0.082	----	----	----
1:4	10	4	6	Str	----	0.077	0.067	----	----	----	0.075	0.066	----	----	----	0.091	0.082	----	----	----	0.095	----	----	----
1:4	10	5	5	Mod	----	0.067	0.055	----	----	----	0.072	0.055	----	----	----	0.070	0.076	----	----	----	0.076	----	----	----
1:4	10	5	5	Str	----	0.073	0.059	----	----	----	0.072	0.061	----	----	----	0.072	0.084	----	----	----	0.083	----	----	----
1:4	10	6	4	Mod	----	0.065	0.053	----	----	----	0.064	0.061	----	----	----	0.067	----	----	----	----	0.072	----	----	----
1:4	10	6	4	Str	----	0.065	0.054	----	----	----	0.068	0.061	----	----	----	0.069	----	----	----	----	0.066	----	----	----
1:4	10	8	12	Mod	0.071	0.071	----	----	----	0.081	0.078	----	----	----	----	0.082	0.034	----	----	----	0.087	0.048	----	----
1:4	10	8	12	Str	0.079	0.072	----	----	----	0.097	0.085	----	----	----	----	0.117	0.050	----	----	----	0.115	0.060	----	----
1:4	10	10	10	Mod	0.069	0.066	----	----	----	0.082	0.070	----	----	----	----	0.070	0.042	----	----	----	0.073	0.061	----	----
1:4	10	10	10	Str	0.076	0.075	----	----	----	0.099	0.072	----	----	----	----	0.092	0.060	----	----	----	0.088	0.085	----	----
1:4	10	12	8	Mod	0.077	0.067	0.040	----	----	0.087	0.065	0.044	----	----	----	0.069	0.055	----	----	----	0.062	0.076	----	----
1:4	10	12	8	Str	0.082	0.068	0.049	----	----	0.096	0.065	0.049	----	----	----	0.073	0.071	----	----	----	0.069	0.100	----	----
1:4	10	40	60	Mod	0.066	0.070	0.068	----	----	0.084	0.088	0.059	----	----	0.084	0.088	0.051	----	----	0.073	0.075	0.055	----	----
1:4	10	40	60	Str	0.081	0.081	0.102	----	----	0.121	0.117	0.086	----	----	0.102	0.102	0.064	----	----	0.083	0.082	0.057	----	----
1:4	10	50	50	Mod	0.067	0.067	0.077	----	----	0.083	0.075	0.067	----	----	0.090	0.067	0.067	----	----	0.078	0.062	0.063	----	----
1:4	10	50	50	Str	0.080	0.073	0.102	----	----	0.120	0.101	0.100	----	----	0.114	0.086	0.077	----	----	0.089	0.065	0.069	----	----
1:4	10	60	40	Mod	0.070	0.065	0.081	----	----	0.087	0.061	0.082	----	----	0.093	0.056	0.074	----	----	0.091	0.058	0.073	----	----
1:4	10	60	40	Str	0.077	0.067	0.109	----	----	0.117	0.079	0.108	----	----	0.119	0.066	0.090	----	----	0.099	0.060	0.082	----	----
1:4	20	4	6	Mod	0.073	0.058	0.115	----	----	----	0.055	----	----	----	----	0.066	----	----	----	----	0.078	----	----	----
1:4	20	4	6	Str	0.075	0.063	0.142	----	----	----	0.063	----	----	----	----	0.092	----	----	----	----	0.113	----	----	----
1:4	20	5	5	Mod	0.070	0.059	----	----	----	----	0.059	----	----	----	----	0.059	----	----	----	----	0.065	----	----	----
1:4	20	5	5	Str	0.072	0.054	----	----	----	----	0.061	----	----	----	----	0.071	----	----	----	----	0.081	----	----	----
1:4	20	6	4	Mod	0.066	0.049	----	----	----	----	0.054	----	----	----	----	0.056	----	----	----	----	0.051	----	----	----
1:4	20	6	4	Str	0.073	0.058	----	----	----	----	0.056	----	----	----	----	0.059	----	----	----	----	0.058	----	----	----
1:4	20	8	12	Mod	0.061	0.060	0.081	----	----	0.080	0.066	0.087	----	----	----	0.089	0.116	----	----	----	0.094	----	----	----
1:4	20	8	12	Str	0.071	0.063	0.103	----	----	0.107	0.071	0.112	----	----	----	0.154	0.168	----	----	----	0.152	----	----	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 24 (continued). Power estimates for conditions when the population effect size variance is 0.00.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:4	20	10	10	Mod	0.060	0.054	0.088	----	----	0.080	0.060	0.092	----	----	----	0.069	----	----	----	----	0.072	----	----	----
1:4	20	10	10	Str	0.068	0.060	0.102	----	----	0.115	0.072	0.124	----	----	----	0.103	----	----	----	----	0.112	----	----	----
1:4	20	12	8	Mod	0.066	0.052	0.092	----	----	0.086	0.057	0.101	----	----	----	0.054	----	0.022	----	----	0.054	----	0.021	----
1:4	20	12	8	Str	0.070	0.058	0.103	----	----	0.112	0.061	0.117	----	----	----	0.074	----	0.025	----	----	0.071	----	0.024	----
1:4	20	40	60	Mod	0.061	0.064	0.125	----	----	0.085	0.088	0.113	----	----	0.103	0.101	0.113	----	----	0.082	0.081	----	0.030	----
1:4	20	40	60	Str	0.068	0.067	0.177	----	----	0.154	0.150	0.169	----	----	0.155	0.141	0.153	----	----	0.104	0.097	----	0.039	----
1:4	20	50	50	Mod	0.065	0.059	0.140	----	----	0.093	0.076	----	----	----	0.116	0.073	----	----	----	0.095	0.057	----	----	----
1:4	20	50	50	Str	0.069	0.060	0.192	----	----	0.155	0.121	----	----	----	0.168	0.103	----	----	----	0.120	0.062	----	----	----
1:4	20	60	40	Mod	0.066	0.057	----	----	----	0.094	0.059	----	----	----	0.124	0.058	----	----	----	----	0.050	----	0.023	----
1:4	20	60	40	Str	0.070	0.059	----	----	----	0.147	0.079	----	----	----	0.184	0.066	----	----	----	----	0.049	----	0.024	----
1:4	50	4	6	Mod	0.058	0.052	----	----	----	----	0.052	----	----	0.010	----	0.073	----	----	0.016	----	0.104	----	----	----
1:4	50	4	6	Str	0.062	0.055	----	----	----	----	0.068	----	----	0.003	----	0.133	----	----	0.008	----	0.212	----	----	----
1:4	50	5	5	Mod	0.062	0.054	----	----	----	----	0.051	----	0.032	0.008	----	0.057	----	----	0.013	----	0.065	----	0.024	----
1:4	50	5	5	Str	0.063	0.055	----	----	----	----	0.056	----	0.035	0.003	----	0.087	----	----	0.006	----	0.119	----	0.040	----
1:4	50	6	4	Mod	0.061	0.054	----	0.038	----	----	0.051	----	0.038	0.009	----	0.049	----	0.033	0.011	----	0.052	----	0.030	----
1:4	50	6	4	Str	0.065	0.053	----	0.037	----	----	0.049	----	0.036	0.004	----	0.057	----	0.034	0.003	----	0.057	----	0.030	----
1:4	50	8	12	Mod	0.058	0.055	0.106	----	----	0.096	0.063	0.128	----	0.006	----	0.124	----	----	0.024	----	0.164	----	----	----
1:4	50	8	12	Str	0.068	0.063	0.137	----	----	0.157	0.088	0.163	----	0.002	----	0.279	----	----	0.039	----	0.328	----	----	----
1:4	50	10	10	Mod	0.060	0.053	----	0.038	----	0.106	0.060	----	0.036	0.006	----	0.091	----	0.042	0.020	----	0.104	----	0.053	----
1:4	50	10	10	Str	0.065	0.058	----	0.043	----	0.172	0.074	----	0.039	0.001	----	0.197	----	0.072	0.024	----	0.212	----	0.096	----
1:4	50	12	8	Mod	0.057	0.051	----	0.039	----	0.105	0.049	----	0.034	0.005	----	0.057	----	0.033	0.014	----	0.058	----	0.035	----
1:4	50	12	8	Str	0.059	0.052	----	0.038	----	0.178	0.060	----	0.040	0.002	----	0.103	----	0.046	0.014	----	0.101	----	0.053	----
1:4	50	40	60	Mod	0.058	0.061	0.154	0.046	----	0.122	0.123	----	0.060	0.013	0.202	0.187	----	0.099	0.165	----	----	----	0.078	----
1:4	50	40	60	Str	0.062	0.059	0.216	0.052	----	0.279	0.274	----	0.100	0.018	0.339	0.301	----	0.161	0.290	----	----	----	0.098	----
1:4	50	50	50	Mod	0.060	0.058	----	0.043	----	0.128	0.093	----	0.048	0.010	0.222	0.111	----	0.069	0.169	----	0.058	----	0.039	----
1:4	50	50	50	Str	0.065	0.064	----	0.055	----	0.282	0.206	----	0.080	0.012	0.363	0.190	----	0.106	0.288	----	0.080	----	0.049	----
1:4	50	60	40	Mod	0.061	0.054	----	0.043	----	0.134	0.063	----	0.036	0.010	----	0.058	----	0.037	0.169	----	0.052	----	0.038	----
1:4	50	60	40	Str	0.062	0.055	----	0.049	----	0.276	0.120	----	0.050	0.007	----	0.096	----	0.059	0.290	----	0.047	----	0.035	----
1:4	100	4	6	Mod	0.058	0.054	----	----	----	----	0.055	----	----	0.021	----	0.087	----	----	----	----	0.162	----	----	----
1:4	100	4	6	Str	0.061	0.056	----	----	----	----	0.068	----	----	0.009	----	0.206	----	----	----	----	0.369	----	----	----
1:4	100	5	5	Mod	0.056	0.051	----	0.034	----	----	0.055	----	0.037	0.021	----	0.058	----	0.030	----	----	0.084	----	0.036	----
1:4	100	5	5	Str	0.060	0.053	----	0.041	----	----	0.058	----	0.038	0.008	----	0.114	----	0.038	----	----	0.196	----	0.068	----
1:4	100	6	4	Mod	0.058	0.049	----	0.038	----	----	0.049	----	0.039	0.019	----	0.053	----	0.040	----	----	----	----	0.037	----
1:4	100	6	4	Str	0.054	0.052	----	0.044	----	----	0.048	----	0.040	0.009	----	0.057	----	0.034	----	----	----	----	0.038	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 24 (continued). Power estimates for conditions when the population effect size variance is 0.00.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:4	100	8	12	Mod	0.058	0.055	0.116	----	----	0.125	0.067	----	0.041	0.016	----	0.199	----	0.070	----	----	0.288	----	0.126	----
1:4	100	8	12	Str	0.062	0.056	0.141	----	----	0.266	0.130	----	0.047	0.004	----	0.491	----	0.173	----	----	0.589	----	0.288	----
1:4	100	10	10	Mod	0.058	0.053	----	0.042	----	----	0.057	----	0.035	0.017	----	0.121	----	0.053	----	----	0.163	----	0.084	----
1:4	100	10	10	Str	0.063	0.055	----	0.043	----	----	0.094	----	0.042	0.004	----	0.344	----	0.119	----	----	0.396	----	0.209	----
1:4	100	12	8	Mod	0.058	0.054	----	0.042	----	----	0.051	----	0.040	0.015	----	0.061	----	0.034	----	----	0.067	----	0.042	----
1:4	100	12	8	Str	0.063	0.054	----	0.047	----	----	0.067	----	0.042	0.004	----	0.159	----	0.061	----	----	0.170	----	0.091	----
1:4	100	40	60	Mod	0.055	0.055	0.161	0.046	----	0.185	0.189	----	0.083	0.025	0.360	----	----	0.200	----	----	----	----	----	----
1:4	100	40	60	Str	0.061	0.060	0.223	0.054	----	0.486	0.477	----	0.189	0.021	0.601	----	----	0.343	----	----	----	----	----	----
1:4	100	50	50	Mod	0.058	0.056	----	0.045	0.025	0.201	0.128	----	0.061	0.024	----	0.171	----	0.114	----	----	0.083	----	0.057	----
1:4	100	50	50	Str	0.061	0.057	----	0.049	0.029	0.476	0.344	----	0.129	0.018	----	0.346	----	0.216	----	----	0.120	----	0.076	----
1:4	100	60	40	Mod	0.060	0.051	----	0.043	0.027	0.211	0.079	----	0.048	0.022	----	----	----	0.052	----	----	----	----	----	----
1:4	100	60	40	Str	0.058	0.054	----	0.051	0.025	0.468	0.195	----	0.070	0.012	----	----	----	0.086	----	----	----	----	----	----
1:8	10	4	6	Mod	----	0.071	0.073	----	----	----	0.073	0.074	----	----	----	0.080	0.094	----	----	----	0.084	----	----	----
1:8	10	4	6	Str	----	0.070	0.078	----	----	----	0.077	0.086	----	----	----	0.089	0.115	----	----	----	0.107	----	----	----
1:8	10	5	5	Mod	----	0.065	0.073	----	----	----	0.072	0.080	----	----	----	0.072	----	----	----	----	0.072	----	----	----
1:8	10	5	5	Str	----	0.072	0.082	----	----	----	0.075	0.090	----	----	----	0.077	----	----	----	----	0.082	----	----	----
1:8	10	6	4	Mod	----	0.068	0.080	----	----	----	0.069	0.090	----	----	----	0.064	----	----	----	----	0.065	----	----	----
1:8	10	6	4	Str	----	0.071	0.083	----	----	----	0.069	0.094	----	----	----	0.066	----	----	----	----	0.066	----	----	----
1:8	10	8	12	Mod	0.074	0.074	0.059	----	----	0.084	0.079	0.059	----	----	----	0.087	0.062	----	----	----	0.096	0.081	----	----
1:8	10	8	12	Str	0.088	0.082	0.077	----	----	0.106	0.089	0.071	----	----	----	0.124	0.085	----	----	----	0.123	0.103	----	----
1:8	10	10	10	Mod	0.073	0.064	0.065	----	----	0.088	0.073	0.068	----	----	----	0.074	0.077	----	----	----	0.083	0.104	----	----
1:8	10	10	10	Str	0.087	0.070	0.081	----	----	0.109	0.079	0.080	----	----	----	0.095	0.104	----	----	----	0.092	0.134	----	----
1:8	10	12	8	Mod	0.076	0.061	0.066	----	----	0.087	0.065	0.067	----	----	----	0.066	0.097	----	----	----	0.067	----	----	----
1:8	10	12	8	Str	0.082	0.068	0.075	----	----	0.102	0.064	0.073	----	----	----	0.077	0.116	----	----	----	0.072	----	----	----
1:8	10	40	60	Mod	0.072	0.075	0.118	----	----	0.088	0.090	0.107	----	----	0.093	0.099	0.100	----	----	0.074	----	----	----	----
1:8	10	40	60	Str	0.087	0.082	0.172	----	----	0.126	0.128	0.148	----	----	0.112	0.112	0.112	----	----	0.079	----	----	----	----
1:8	10	50	50	Mod	0.079	0.072	0.136	----	----	0.091	0.080	0.120	----	----	0.096	0.072	----	----	----	----	0.065	----	----	----
1:8	10	50	50	Str	0.086	0.074	0.187	----	----	0.127	0.102	0.167	----	----	0.119	0.088	----	----	----	----	0.064	----	----	----
1:8	10	60	40	Mod	0.080	0.066	----	----	----	0.089	0.064	----	----	----	----	0.060	----	----	----	----	0.061	----	----	----
1:8	10	60	40	Str	0.087	0.070	----	----	----	0.128	0.078	----	----	----	----	0.061	----	----	----	----	0.060	----	----	----
1:8	20	4	6	Mod	0.074	0.061	----	----	----	----	0.064	----	----	----	----	0.074	----	----	----	----	0.089	----	----	----
1:8	20	4	6	Str	0.074	0.057	----	----	----	----	0.066	----	----	----	----	0.097	----	----	----	----	0.138	----	----	----
1:8	20	5	5	Mod	0.076	0.055	----	----	----	----	0.054	----	----	----	----	0.062	----	----	----	----	0.061	----	----	----
1:8	20	5	5	Str	0.071	0.058	----	----	----	----	0.057	----	----	----	----	0.072	----	----	----	----	0.079	----	----	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 24 (continued). Power estimates for conditions when the population effect size variance is 0.00.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:8	20	6	4	Mod	0.073	0.057	----	----	----	----	0.055	----	----	----	----	0.054	----	0.022	----	----	0.054	----	----	----
1:8	20	6	4	Str	0.071	0.055	----	----	----	----	0.055	----	----	----	----	0.053	----	0.025	----	----	0.052	----	----	----
1:8	20	8	12	Mod	0.063	0.060	0.119	----	----	0.077	0.064	0.112	----	----	----	0.095	----	----	----	----	0.108	----	----	----
1:8	20	8	12	Str	0.067	0.064	0.139	----	----	0.113	0.084	0.160	----	----	----	0.170	----	----	----	----	0.181	----	----	----
1:8	20	10	10	Mod	0.068	0.059	----	----	----	0.084	0.059	----	----	----	----	0.073	----	----	----	----	0.076	----	----	----
1:8	20	10	10	Str	0.068	0.058	----	----	----	0.116	0.070	----	----	----	----	0.107	----	----	----	----	0.119	----	----	----
1:8	20	12	8	Mod	0.065	0.052	----	----	----	0.089	0.054	----	----	----	----	0.058	----	----	----	----	0.056	----	0.023	----
1:8	20	12	8	Str	0.072	0.054	----	----	----	0.121	0.059	----	----	----	----	0.065	----	----	----	----	0.067	----	0.027	----
1:8	20	40	60	Mod	0.065	0.064	----	----	----	0.087	0.096	----	----	----	0.112	0.118	----	0.048	----	0.093	----	----	0.046	----
1:8	20	40	60	Str	0.075	0.071	----	----	----	0.159	0.164	----	----	----	0.158	0.166	----	0.069	----	0.111	----	----	0.055	----
1:8	20	50	50	Mod	0.069	0.062	----	----	----	0.094	0.080	----	----	----	0.128	0.076	----	----	----	----	0.059	----	0.030	----
1:8	20	50	50	Str	0.069	0.065	----	----	----	0.145	0.113	----	----	----	0.172	0.105	----	----	----	----	0.063	----	0.030	----
1:8	20	60	40	Mod	0.067	0.054	----	0.039	----	0.103	0.064	----	0.034	----	0.144	0.051	----	0.026	----	----	0.056	----	0.030	----
1:8	20	60	40	Str	0.071	0.059	----	0.048	----	0.153	0.082	----	0.039	----	0.208	0.065	----	0.033	----	----	0.053	----	0.028	----
1:8	50	4	6	Mod	0.063	0.054	----	----	----	----	0.054	----	----	0.012	----	0.085	----	----	----	----	0.137	----	----	----
1:8	50	4	6	Str	0.064	0.056	----	----	----	----	0.070	----	----	0.008	----	0.157	----	----	----	----	0.256	----	----	----
1:8	50	5	5	Mod	0.065	0.051	----	----	----	----	0.056	----	----	0.013	----	0.056	----	0.024	----	----	0.075	----	0.028	----
1:8	50	5	5	Str	0.063	0.049	----	----	----	----	0.059	----	----	0.006	----	0.088	----	0.031	----	----	0.130	----	0.041	----
1:8	50	6	4	Mod	0.061	0.050	----	0.037	----	----	0.052	----	0.040	0.009	----	0.054	----	0.035	----	----	0.055	----	0.034	----
1:8	50	6	4	Str	0.061	0.047	----	0.040	----	----	0.050	----	0.037	0.006	----	0.056	----	0.035	----	----	0.053	----	0.027	----
1:8	50	8	12	Mod	0.064	0.061	----	----	----	0.097	0.068	----	----	0.011	----	0.156	----	----	0.034	----	0.203	----	0.079	----
1:8	50	8	12	Str	0.063	0.056	----	----	----	0.170	0.103	----	----	0.003	----	0.326	----	----	0.049	----	0.385	----	0.166	----
1:8	50	10	10	Mod	0.059	0.055	----	0.038	----	0.112	0.060	----	0.036	0.009	----	0.091	----	0.040	----	----	0.117	----	0.056	----
1:8	50	10	10	Str	0.064	0.055	----	0.039	----	0.182	0.080	----	0.040	0.004	----	0.200	----	0.076	----	----	0.229	----	0.113	----
1:8	50	12	8	Mod	0.062	0.053	----	0.041	----	----	0.054	----	0.039	0.008	----	0.054	----	0.036	0.020	----	0.052	----	0.033	----
1:8	50	12	8	Str	0.063	0.055	----	0.044	----	----	0.058	----	0.041	0.004	----	0.099	----	0.046	0.017	----	0.098	----	0.049	----
1:8	50	40	60	Mod	0.063	0.062	----	0.053	----	0.126	0.140	----	0.062	0.020	0.203	0.212	----	0.131	0.200	----	----	----	----	----
1:8	50	40	60	Str	0.065	0.064	----	0.064	----	0.275	0.301	----	0.119	0.023	0.341	0.349	----	0.213	0.320	----	----	----	----	----
1:8	50	50	50	Mod	0.060	0.054	----	0.045	----	0.134	0.094	----	0.050	0.016	----	0.116	----	0.076	----	----	0.070	----	0.047	----
1:8	50	50	50	Str	0.069	0.063	----	0.063	----	0.288	0.206	----	0.087	0.019	----	0.198	----	0.120	----	----	0.085	----	0.060	----
1:8	50	60	40	Mod	0.061	0.055	----	0.048	----	0.142	0.065	----	0.042	0.013	----	0.056	----	0.036	----	----	----	----	0.042	----
1:8	50	60	40	Str	0.062	0.055	----	0.058	----	0.262	0.110	----	0.057	0.010	----	0.086	----	0.051	----	----	----	----	0.035	----
1:8	100	4	6	Mod	0.066	0.058	----	----	----	----	0.059	----	----	0.031	----	0.115	----	----	----	----	0.211	----	----	----
1:8	100	4	6	Str	0.061	0.053	----	----	----	----	0.081	----	----	0.015	----	0.263	----	----	----	----	0.458	----	----	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 24 (continued). Power estimates for conditions when the population effect size variance is 0.00.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:8	100	5	5	Mod	0.059	0.051	----	0.038	----	----	0.048	----	0.030	0.029	----	0.067	----	0.031	----	----	0.086	----	0.033	----
1:8	100	5	5	Str	0.060	0.051	----	0.035	----	----	0.058	----	0.034	0.014	----	0.126	----	0.038	----	----	0.209	----	0.074	----
1:8	100	6	4	Mod	0.061	0.051	----	0.040	----	----	0.048	----	0.040	0.026	----	0.054	----	0.041	----	----	----	----	----	----
1:8	100	6	4	Str	0.059	0.052	----	0.042	----	----	0.049	----	0.041	0.014	----	0.054	----	0.037	----	----	----	----	----	----
1:8	100	8	12	Mod	0.060	0.059	----	0.044	----	0.138	0.081	----	0.046	0.021	----	0.253	----	0.096	----	----	0.358	----	0.172	----
1:8	100	8	12	Str	0.062	0.056	----	0.047	----	0.271	0.148	----	0.049	0.010	----	0.559	----	0.222	----	----	0.666	----	0.373	----
1:8	100	10	10	Mod	0.058	0.053	----	0.039	----	----	0.061	----	0.036	0.022	----	0.136	----	0.058	----	----	0.176	----	0.087	----
1:8	100	10	10	Str	0.064	0.060	----	0.049	----	----	0.103	----	0.043	0.009	----	0.357	----	0.129	----	----	0.435	----	0.238	----
1:8	100	12	8	Mod	0.060	0.051	----	0.038	----	----	0.052	----	0.039	0.018	----	0.061	----	0.034	----	----	----	----	0.037	----
1:8	100	12	8	Str	0.060	0.053	----	0.049	----	----	0.063	----	0.045	0.008	----	0.142	----	0.054	----	----	----	----	0.072	----
1:8	100	40	60	Mod	0.059	0.061	----	0.051	----	0.192	0.222	----	0.106	0.037	----	----	----	0.265	----	----	----	----	----	----
1:8	100	40	60	Str	0.063	0.061	----	0.067	----	0.477	0.510	----	0.212	0.034	----	----	----	0.430	----	----	----	----	----	----
1:8	100	50	50	Mod	0.060	0.054	----	0.047	0.026	0.222	0.139	----	0.070	0.034	----	0.189	----	0.128	----	----	0.094	----	0.069	----
1:8	100	50	50	Str	0.060	0.059	----	0.064	0.027	0.480	0.347	----	0.133	0.030	----	0.372	----	0.246	----	----	0.128	----	0.099	----
1:8	100	60	40	Mod	0.060	0.052	----	0.049	0.023	0.227	0.068	----	0.044	0.030	----	----	----	0.043	----	----	----	----	----	----
1:8	100	60	40	Str	0.062	0.052	----	0.057	0.029	0.467	0.167	----	0.066	0.027	----	----	----	0.084	----	----	----	----	----	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 25. Power estimates for conditions when the population effect size variance is 0.10.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	10	4	6	Mod	0.081	0.068	0.039	----	----	----	0.065	0.044	----	----	----	0.068	0.060	----	----	----	0.069	----	----	----
1:1	10	4	6	Str	0.085	0.069	0.044	----	----	----	0.071	0.052	----	----	----	0.074	0.064	----	----	----	0.077	----	----	----
1:1	10	5	5	Mod	----	0.070	0.043	----	----	----	0.063	0.045	----	----	----	0.071	0.063	----	----	----	0.071	----	----	----
1:1	10	5	5	Str	----	0.068	0.044	----	----	----	0.071	0.047	----	----	----	0.073	0.065	----	----	----	0.077	----	----	----
1:1	10	6	4	Mod	----	0.064	0.043	----	----	----	0.065	0.045	----	----	----	0.069	0.064	----	----	----	0.068	----	----	----
1:1	10	6	4	Str	----	0.066	0.044	----	----	----	0.071	0.049	----	----	----	0.074	0.067	----	----	----	0.073	----	----	----
1:1	10	8	12	Mod	0.067	0.064	----	----	----	0.071	0.063	----	----	----	0.103	0.071	----	----	----	----	0.067	0.036	----	----
1:1	10	8	12	Str	0.070	0.070	----	----	----	0.083	0.068	----	----	----	0.140	0.079	----	----	----	----	0.076	0.043	----	----
1:1	10	10	10	Mod	0.065	0.063	----	----	----	0.073	0.066	----	----	----	----	0.066	----	----	----	----	0.067	0.040	----	----
1:1	10	10	10	Str	0.071	0.068	----	----	----	0.081	0.068	----	----	----	----	0.074	----	----	----	----	0.078	0.050	----	----
1:1	10	12	8	Mod	0.068	0.071	----	----	----	0.074	0.065	----	----	----	0.105	0.067	----	----	----	----	0.067	0.037	----	----
1:1	10	12	8	Str	0.073	0.071	----	----	----	0.084	0.071	----	----	----	0.138	0.077	----	----	----	----	0.076	0.048	----	----
1:1	10	40	60	Mod	0.064	0.065	----	----	----	0.070	0.065	----	----	----	0.082	0.063	----	----	----	0.081	0.055	----	----	----
1:1	10	40	60	Str	0.071	0.065	----	----	----	0.079	0.069	----	----	----	0.098	0.068	----	----	----	0.102	0.063	----	----	----
1:1	10	50	50	Mod	0.063	0.067	----	----	----	0.071	0.064	----	----	----	0.087	0.066	----	----	----	0.088	0.059	----	----	----
1:1	10	50	50	Str	0.069	0.069	----	----	----	0.079	0.070	----	----	----	0.102	0.073	----	----	----	0.094	0.059	----	----	----
1:1	10	60	40	Mod	0.058	0.062	----	----	----	0.071	0.065	----	----	----	0.081	0.067	----	----	----	----	0.059	----	----	----
1:1	10	60	40	Str	0.070	0.068	----	----	----	0.079	0.068	----	----	----	0.102	0.074	----	----	----	----	0.060	----	----	----
1:1	20	4	6	Mod	0.063	0.050	0.105	----	----	0.095	0.057	----	----	----	----	0.055	----	----	----	----	0.056	----	----	----
1:1	20	4	6	Str	0.071	0.058	0.114	----	----	0.116	0.055	----	----	----	----	0.063	----	----	----	----	0.067	----	----	----
1:1	20	5	5	Mod	0.066	0.058	0.103	----	----	----	0.054	----	----	----	----	0.057	----	----	----	----	0.058	----	----	----
1:1	20	5	5	Str	0.066	0.056	0.109	----	----	----	0.060	----	----	----	----	0.060	----	----	----	----	0.070	----	----	----
1:1	20	6	4	Mod	0.069	0.057	----	----	----	----	0.061	----	----	----	----	0.059	----	----	----	----	0.057	----	----	----
1:1	20	6	4	Str	0.073	0.059	----	----	----	----	0.055	----	----	----	----	0.061	----	----	----	----	0.070	----	----	----
1:1	20	8	12	Mod	0.061	0.053	0.061	0.031	----	0.070	0.053	0.064	0.030	----	----	0.059	0.106	0.026	----	----	0.059	----	----	----
1:1	20	8	12	Str	0.058	0.054	0.069	0.032	----	0.089	0.058	0.078	0.033	----	----	0.078	0.132	0.031	----	----	0.079	----	----	----
1:1	20	10	10	Mod	0.056	0.054	0.060	0.032	----	0.073	0.059	0.070	----	----	----	0.055	0.103	----	----	----	0.064	----	0.028	----
1:1	20	10	10	Str	0.068	0.061	0.074	0.033	----	0.084	0.058	0.070	----	----	----	0.076	0.137	----	----	----	0.081	----	0.034	----
1:1	20	12	8	Mod	0.057	0.058	0.060	0.033	----	0.066	0.053	0.065	0.028	----	----	0.058	0.104	0.027	----	----	0.059	----	0.025	----
1:1	20	12	8	Str	0.063	0.056	0.072	0.032	----	0.091	0.058	0.077	0.034	----	----	0.075	0.128	0.030	----	----	0.082	----	0.029	----
1:1	20	40	60	Mod	0.056	0.057	0.057	0.037	----	0.068	0.058	0.054	0.035	----	0.109	0.062	0.066	0.037	----	----	0.058	0.074	0.035	----
1:1	20	40	60	Str	0.060	0.057	0.067	0.036	----	0.081	0.064	0.065	0.038	----	0.146	0.073	0.087	0.043	----	----	0.060	0.095	0.035	----
1:1	20	50	50	Mod	0.057	0.057	0.061	0.037	----	0.073	0.060	0.060	0.040	----	0.112	0.061	0.066	0.040	----	----	0.052	0.070	0.032	----
1:1	20	50	50	Str	0.059	0.056	0.069	0.037	----	0.089	0.067	0.067	0.040	----	0.148	0.073	0.088	0.044	----	----	0.060	0.091	0.034	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 25 (continued). Power estimates for conditions when the population effect size variance is 0.10.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	20	60	40	Mod	0.054	0.052	0.053	0.036	----	0.070	0.057	0.056	0.032	----	0.103	0.059	0.066	0.034	----	----	0.056	0.064	0.035	----
1:1	20	60	40	Str	0.059	0.055	0.068	0.040	----	0.088	0.064	0.070	0.038	----	0.145	0.070	0.087	0.043	----	----	0.059	0.091	0.037	----
1:1	50	4	6	Mod	0.059	0.051	----	0.039	----	----	0.050	----	0.038	----	----	0.056	----	0.038	0.008	----	0.057	----	0.029	----
1:1	50	4	6	Str	0.058	0.049	----	0.038	----	----	0.054	----	0.037	----	----	0.066	----	0.037	0.001	----	0.087	----	0.037	----
1:1	50	5	5	Mod	0.058	0.054	----	0.038	----	----	0.054	----	0.039	----	----	0.051	----	0.034	0.006	----	0.055	----	0.033	----
1:1	50	5	5	Str	0.059	0.053	----	0.040	----	----	0.056	----	0.038	----	----	0.068	----	0.036	0.002	----	0.089	----	0.042	----
1:1	50	6	4	Mod	0.061	0.050	----	0.037	----	----	0.051	----	0.037	----	----	0.051	----	0.032	0.006	----	0.053	----	0.030	----
1:1	50	6	4	Str	0.060	0.051	----	0.038	----	----	0.056	----	0.042	----	----	0.065	----	0.037	0.001	----	0.082	----	0.036	----
1:1	50	8	12	Mod	0.057	0.053	0.088	0.044	----	0.095	0.051	0.109	0.042	----	----	0.056	----	0.043	0.003	----	0.067	----	0.044	0.049
1:1	50	8	12	Str	0.058	0.059	0.094	0.047	----	0.146	0.065	0.128	0.045	----	----	0.095	----	0.049	0.003	----	0.130	----	0.069	0.122
1:1	50	10	10	Mod	0.053	0.049	0.078	0.041	----	0.097	0.056	----	0.042	----	----	0.060	----	0.042	0.003	----	0.073	----	0.049	0.056
1:1	50	10	10	Str	0.060	0.054	0.098	0.043	----	0.137	0.060	----	0.042	----	----	0.112	----	0.060	0.002	----	0.138	----	0.082	0.132
1:1	50	12	8	Mod	0.049	0.050	0.079	0.041	----	0.092	0.052	----	0.040	----	----	0.060	----	0.041	0.003	----	0.067	----	0.044	0.045
1:1	50	12	8	Str	0.060	0.052	0.100	0.047	----	0.144	0.061	----	0.045	----	----	0.103	----	0.054	0.003	----	0.129	----	0.074	0.119
1:1	50	40	60	Mod	0.051	0.051	0.076	0.046	----	0.086	0.060	0.084	0.049	----	----	0.069	0.130	0.053	----	----	0.059	----	0.047	----
1:1	50	40	60	Str	0.053	0.053	0.097	0.052	----	0.130	0.071	0.114	0.055	----	----	0.102	0.215	0.070	----	----	0.078	----	0.060	----
1:1	50	50	50	Mod	0.053	0.051	0.078	0.047	----	0.089	0.058	0.085	0.050	----	----	0.078	0.135	0.059	----	----	0.054	----	0.047	----
1:1	50	50	50	Str	0.055	0.054	0.098	0.051	----	0.133	0.078	0.117	0.059	----	----	0.114	0.210	0.076	----	----	0.087	----	0.067	----
1:1	50	60	40	Mod	0.056	0.055	0.082	0.052	----	0.084	0.057	0.083	0.049	----	----	0.069	0.131	0.051	----	----	0.061	0.171	0.051	----
1:1	50	60	40	Str	0.054	0.054	0.102	0.053	----	0.133	0.075	0.116	0.058	----	----	0.105	0.205	0.072	----	----	0.084	0.254	0.063	----
1:1	100	4	6	Mod	0.058	0.050	----	0.038	----	----	0.051	----	0.039	0.015	----	0.054	----	0.041	----	----	0.053	----	0.034	----
1:1	100	4	6	Str	0.057	0.048	----	0.040	----	----	0.055	----	0.041	0.008	----	0.077	----	0.042	----	----	0.105	----	0.046	----
1:1	100	5	5	Mod	0.060	0.050	----	0.040	----	----	0.051	----	0.041	0.016	----	0.049	----	0.038	----	----	0.059	----	0.037	----
1:1	100	5	5	Str	0.058	0.051	----	0.044	----	----	0.054	----	0.038	0.006	----	0.084	----	0.041	----	----	0.116	----	0.052	----
1:1	100	6	4	Mod	0.060	0.054	----	0.044	----	----	0.050	----	0.042	0.015	----	0.057	----	0.037	----	----	0.056	----	0.037	----
1:1	100	6	4	Str	0.060	0.052	----	0.042	----	----	0.053	----	0.041	0.006	----	0.076	----	0.042	----	----	0.110	----	0.049	----
1:1	100	8	12	Mod	0.057	0.049	0.093	0.044	----	----	0.053	----	0.041	0.006	----	0.068	----	0.049	0.005	----	0.088	----	0.059	----
1:1	100	8	12	Str	0.055	0.053	0.101	0.047	----	----	0.065	----	0.046	0.002	----	0.156	----	0.074	0.001	----	0.214	----	0.126	----
1:1	100	10	10	Mod	0.052	0.050	0.087	0.044	----	----	0.055	----	0.046	0.007	----	0.073	----	0.051	0.006	----	0.098	----	0.068	----
1:1	100	10	10	Str	0.058	0.055	0.103	0.049	----	----	0.073	----	0.046	0.003	----	0.173	----	0.080	0.001	----	0.234	----	0.139	----
1:1	100	12	8	Mod	0.051	0.048	0.089	0.041	----	----	0.052	----	0.044	0.007	----	0.067	----	0.046	0.006	----	0.091	----	0.063	----
1:1	100	12	8	Str	0.059	0.053	0.105	0.046	----	----	0.066	----	0.047	0.002	----	0.154	----	0.073	0.001	----	0.208	----	0.124	----
1:1	100	40	60	Mod	0.053	0.052	0.083	0.050	----	0.118	0.061	0.103	0.055	----	----	0.093	0.224	0.071	0.006	----	0.076	----	0.061	0.123
1:1	100	40	60	Str	0.055	0.054	0.110	0.057	----	0.213	0.094	0.141	0.063	----	----	0.162	0.380	0.104	0.007	----	0.115	----	0.088	0.258

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 25 (continued). Power estimates for conditions when the population effect size variance is 0.10.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	100	50	50	Mod	0.052	0.046	0.085	0.048	----	0.124	0.061	0.101	0.052	----	----	0.096	----	0.072	0.005	----	0.078	----	0.064	0.126
1:1	100	50	50	Str	0.052	0.051	0.106	0.053	----	0.225	0.105	0.147	0.069	----	----	0.180	----	0.110	0.009	----	0.124	----	0.090	0.264
1:1	100	60	40	Mod	0.060	0.054	0.092	0.055	----	0.124	0.069	0.105	0.058	----	----	0.097	0.228	0.070	0.007	----	0.079	----	0.062	0.118
1:1	100	60	40	Str	0.054	0.053	0.112	0.057	----	0.220	0.098	0.148	0.066	----	----	0.169	0.382	0.109	0.007	----	0.114	----	0.087	0.254
1:2	10	4	6	Mod	----	0.073	0.049	----	----	----	0.066	0.044	----	----	----	----	0.069	----	----	----	0.066	----	----	----
1:2	10	4	6	Str	----	0.073	0.051	----	----	----	0.069	0.052	----	----	----	----	0.071	----	----	----	0.078	----	----	----
1:2	10	5	5	Mod	----	0.070	0.044	----	----	----	0.068	0.048	----	----	----	0.066	0.067	----	----	----	0.069	----	----	----
1:2	10	5	5	Str	----	0.067	0.051	----	----	----	0.070	0.054	----	----	----	0.072	0.074	----	----	----	0.076	----	----	----
1:2	10	6	4	Mod	----	0.066	0.048	----	----	----	0.067	0.050	----	----	----	0.067	0.073	----	----	----	0.067	----	----	----
1:2	10	6	4	Str	----	0.069	0.044	----	----	----	0.072	0.054	----	----	----	0.073	0.079	----	----	----	0.065	----	----	----
1:2	10	8	12	Mod	0.068	0.069	----	----	----	0.077	0.072	----	----	----	0.101	0.072	----	----	----	----	0.069	0.043	----	----
1:2	10	8	12	Str	0.078	0.073	----	----	----	0.088	0.071	----	----	----	0.138	0.084	----	----	----	----	0.087	0.048	----	----
1:2	10	10	10	Mod	0.064	0.067	----	----	----	0.076	0.064	----	----	----	----	0.066	----	----	----	----	0.067	0.047	----	----
1:2	10	10	10	Str	0.074	0.070	----	----	----	0.090	0.074	----	----	----	----	0.078	----	----	----	----	0.081	0.060	----	----
1:2	10	12	8	Mod	0.067	0.070	----	----	----	0.072	0.062	----	----	----	----	0.066	0.034	----	----	----	0.066	0.055	----	----
1:2	10	12	8	Str	0.076	0.066	----	----	----	0.088	0.069	----	----	----	----	0.077	0.043	----	----	----	0.073	0.064	----	----
1:2	10	40	60	Mod	0.066	0.064	----	----	----	0.069	0.071	----	----	----	0.085	0.069	0.036	----	----	0.085	0.063	0.035	----	----
1:2	10	40	60	Str	0.071	0.072	----	----	----	0.083	0.076	----	----	----	0.102	0.078	0.043	----	----	0.097	0.066	0.040	----	----
1:2	10	50	50	Mod	0.064	0.063	----	----	----	0.071	0.067	0.034	----	----	0.083	0.061	0.037	----	----	----	0.059	0.036	----	----
1:2	10	50	50	Str	0.070	0.065	----	----	----	0.084	0.073	0.040	----	----	0.103	0.072	0.045	----	----	----	0.065	0.044	----	----
1:2	10	60	40	Mod	0.066	0.066	0.035	----	----	0.070	0.060	0.037	----	----	0.092	0.066	0.041	----	----	----	0.058	0.042	----	----
1:2	10	60	40	Str	0.070	0.069	0.042	----	----	0.082	0.067	0.042	----	----	0.106	0.068	0.050	----	----	----	0.063	0.044	----	----
1:2	20	4	6	Mod	0.073	0.062	----	----	----	----	0.056	----	----	----	----	0.058	----	----	----	----	0.062	----	----	----
1:2	20	4	6	Str	0.077	0.056	----	----	----	----	0.056	----	----	----	----	0.064	----	----	----	----	0.075	----	----	----
1:2	20	5	5	Mod	0.069	0.055	----	----	----	0.100	0.051	----	----	----	----	0.054	----	----	----	----	0.061	----	----	----
1:2	20	5	5	Str	0.071	0.057	----	----	----	0.116	0.058	----	----	----	----	0.062	----	----	----	----	0.069	----	----	----
1:2	20	6	4	Mod	0.070	0.054	----	----	----	----	0.056	----	----	----	----	0.056	----	----	----	----	0.050	----	----	----
1:2	20	6	4	Str	0.074	0.054	----	----	----	----	0.055	----	----	----	----	0.060	----	----	----	----	0.059	----	----	----
1:2	20	8	12	Mod	0.058	0.054	0.067	0.032	----	0.068	0.054	0.074	0.032	----	----	0.061	0.113	----	----	----	0.068	----	0.028	----
1:2	20	8	12	Str	0.062	0.058	0.079	0.035	----	0.093	0.065	0.086	0.033	----	----	0.089	0.146	----	----	----	0.100	----	0.036	----
1:2	20	10	10	Mod	0.058	0.051	0.069	0.031	----	0.075	0.055	0.080	0.031	----	----	0.057	----	0.027	----	----	0.063	----	0.029	----
1:2	20	10	10	Str	0.062	0.055	0.076	0.032	----	0.097	0.067	0.091	0.035	----	----	0.077	----	0.033	----	----	0.089	----	0.034	----
1:2	20	12	8	Mod	0.057	0.050	0.070	0.030	----	0.077	0.057	0.079	0.032	----	----	0.053	----	0.025	----	----	0.053	----	0.025	----
1:2	20	12	8	Str	0.065	0.052	0.086	0.032	----	0.094	0.055	0.090	0.033	----	----	0.062	----	0.028	----	----	0.069	----	0.029	----

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Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 25 (continued). Power estimates for conditions when the population effect size variance is 0.10.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:2	20	40	60	Mod	0.058	0.054	0.068	0.041	----	0.067	0.064	0.070	0.041	----	0.105	0.063	0.081	0.039	----	----	0.062	0.093	0.042	----
1:2	20	40	60	Str	0.061	0.061	0.087	0.045	----	0.087	0.068	0.087	0.043	----	0.148	0.082	0.110	0.048	----	----	0.073	0.117	0.045	----
1:2	20	50	50	Mod	0.060	0.059	0.070	0.037	----	0.067	0.056	0.076	0.037	----	0.109	0.059	0.089	0.039	----	----	0.059	0.097	0.036	----
1:2	20	50	50	Str	0.062	0.059	0.096	0.044	----	0.091	0.070	0.096	0.041	----	0.151	0.074	0.119	0.044	----	----	0.058	0.114	0.038	----
1:2	20	60	40	Mod	0.056	0.057	0.075	0.038	----	0.069	0.057	0.078	0.036	----	0.116	0.056	0.090	0.036	----	----	0.050	0.101	0.033	----
1:2	20	60	40	Str	0.059	0.057	0.096	0.043	----	0.092	0.063	0.099	0.037	----	0.154	0.064	0.114	0.038	----	----	0.051	0.132	0.030	----
1:2	50	4	6	Mod	0.063	0.052	----	0.038	----	----	0.056	----	0.040	----	----	0.058	----	0.034	0.007	----	0.064	----	0.034	----
1:2	50	4	6	Str	0.062	0.056	----	0.040	----	----	0.060	----	0.039	----	----	0.075	----	0.037	0.001	----	0.114	----	0.042	----
1:2	50	5	5	Mod	0.064	0.051	----	0.037	----	----	0.050	----	0.035	----	----	0.054	----	0.034	0.007	----	0.058	----	0.033	----
1:2	50	5	5	Str	0.069	0.055	----	0.041	----	----	0.053	----	0.040	----	----	0.066	----	0.040	0.002	----	0.086	----	0.038	----
1:2	50	6	4	Mod	0.057	0.051	----	0.040	----	----	0.054	----	0.039	----	----	0.055	----	0.035	0.007	----	0.052	----	0.034	----
1:2	50	6	4	Str	0.060	0.052	----	0.042	----	----	0.052	----	0.042	----	----	0.061	----	0.042	0.001	----	0.062	----	0.032	----
1:2	50	8	12	Mod	0.054	0.051	0.091	0.039	----	0.096	0.057	0.117	0.044	----	----	0.065	----	0.041	0.003	----	0.090	----	0.053	0.067
1:2	50	8	12	Str	0.061	0.055	0.105	0.047	----	0.141	0.064	0.139	0.048	----	----	0.127	----	0.055	0.003	----	0.170	----	0.090	0.135
1:2	50	10	10	Mod	0.055	0.048	0.088	0.040	----	0.091	0.049	----	0.038	----	----	0.064	----	0.039	0.004	----	0.066	----	0.044	0.062
1:2	50	10	10	Str	0.056	0.053	0.106	0.044	----	0.137	0.063	----	0.042	----	----	0.110	----	0.055	0.004	----	0.139	----	0.076	0.138
1:2	50	12	8	Mod	0.059	0.054	0.096	0.046	----	0.105	0.052	----	0.041	----	----	0.057	----	0.040	0.004	----	0.056	----	0.039	0.052
1:2	50	12	8	Str	0.057	0.050	0.104	0.040	----	0.148	0.056	----	0.042	----	----	0.081	----	0.045	0.002	----	0.096	----	0.059	0.113
1:2	50	40	60	Mod	0.051	0.051	0.090	0.050	----	0.089	0.062	0.101	0.053	----	----	0.090	0.157	0.070	----	----	0.083	----	0.070	0.082
1:2	50	40	60	Str	0.054	0.055	0.121	0.054	----	0.129	0.084	0.141	0.064	----	----	0.136	0.251	0.094	----	----	0.113	----	0.093	0.154
1:2	50	50	50	Mod	0.052	0.052	0.102	0.052	----	0.086	0.055	0.105	0.049	----	----	0.071	----	0.056	----	----	0.067	----	0.055	0.083
1:2	50	50	50	Str	0.057	0.054	0.130	0.054	----	0.137	0.081	0.146	0.059	----	----	0.116	----	0.078	----	----	0.085	----	0.067	0.151
1:2	50	60	40	Mod	0.053	0.051	0.101	0.049	----	0.089	0.056	0.110	0.050	----	----	0.055	----	0.047	----	----	0.050	----	0.042	0.081
1:2	50	60	40	Str	0.055	0.050	0.131	0.051	----	0.139	0.065	0.154	0.051	----	----	0.092	----	0.067	----	----	0.060	----	0.048	0.140
1:2	100	4	6	Mod	0.061	0.048	----	0.037	----	----	0.050	----	0.042	0.019	----	0.057	----	0.035	----	----	0.072	----	0.033	----
1:2	100	4	6	Str	0.058	0.052	----	0.041	----	----	0.057	----	0.037	0.009	----	0.107	----	0.046	----	----	0.175	----	0.063	----
1:2	100	5	5	Mod	0.061	0.050	----	0.039	----	----	0.054	----	0.042	0.016	----	0.054	----	0.040	----	----	0.066	----	0.037	----
1:2	100	5	5	Str	0.059	0.051	----	0.042	----	----	0.056	----	0.039	0.006	----	0.092	----	0.044	----	----	0.134	----	0.058	----
1:2	100	6	4	Mod	0.059	0.051	----	0.043	----	----	0.052	----	0.043	0.017	----	0.053	----	0.045	----	----	0.052	----	0.041	----
1:2	100	6	4	Str	0.060	0.049	----	0.043	----	----	0.049	----	0.040	0.007	----	0.065	----	0.045	----	----	0.068	----	0.040	----
1:2	100	8	12	Mod	0.055	0.055	0.099	0.046	----	----	0.052	----	0.044	0.008	----	0.090	----	0.056	0.010	----	0.131	----	0.080	----
1:2	100	8	12	Str	0.060	0.057	0.121	0.052	----	----	0.081	----	0.051	0.002	----	0.211	----	0.091	0.003	----	0.303	----	0.164	----
1:2	100	10	10	Mod	0.053	0.049	0.100	0.045	----	----	0.053	----	0.042	0.007	----	0.072	----	0.047	----	----	0.100	----	0.067	----
1:2	100	10	10	Str	0.059	0.053	0.118	0.046	----	----	0.072	----	0.050	0.003	----	0.170	----	0.074	----	----	0.238	----	0.138	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 25 (continued). Power estimates for conditions when the population effect size variance is 0.10.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:2	100	12	8	Mod	0.058	0.050	----	0.044	----	----	0.057	----	0.048	0.007	----	0.058	----	0.045	0.009	----	0.066	----	0.045	----
1:2	100	12	8	Str	0.058	0.053	----	0.049	----	----	0.061	----	0.046	0.003	----	0.118	----	0.057	0.001	----	0.142	----	0.085	----
1:2	100	40	60	Mod	0.054	0.054	0.100	0.054	----	0.125	0.071	0.125	0.059	0.005	----	0.128	----	0.091	0.010	----	0.121	----	0.097	0.149
1:2	100	40	60	Str	0.053	0.051	0.135	0.055	----	0.219	0.116	0.180	0.076	0.002	----	0.230	----	0.149	0.010	----	0.183	----	0.138	0.300
1:2	100	50	50	Mod	0.054	0.051	0.112	0.053	----	0.131	0.064	0.128	0.054	0.005	----	0.098	----	0.074	0.012	----	0.083	----	0.068	0.153
1:2	100	50	50	Str	0.056	0.055	0.138	0.058	----	0.229	0.102	0.182	0.071	0.002	----	0.188	----	0.120	0.010	----	0.131	----	0.104	0.287
1:2	100	60	40	Mod	0.054	0.051	0.112	0.051	----	0.131	0.056	----	0.054	0.007	----	0.071	----	0.055	0.009	----	0.058	----	0.049	0.130
1:2	100	60	40	Str	0.056	0.052	0.140	0.059	----	0.237	0.091	----	0.066	0.002	----	0.120	----	0.075	0.009	----	0.073	----	0.056	0.271
1:4	10	4	6	Mod	----	0.066	0.058	----	----	----	0.071	0.066	----	----	----	0.073	0.086	----	----	----	0.080	----	----	----
1:4	10	4	6	Str	----	0.068	0.063	----	----	----	0.075	0.066	----	----	----	0.077	0.091	----	----	----	0.086	----	----	----
1:4	10	5	5	Mod	----	0.073	0.060	----	----	----	0.068	0.065	----	----	----	0.067	----	----	----	----	0.071	----	----	----
1:4	10	5	5	Str	----	0.069	0.063	----	----	----	0.071	0.070	----	----	----	0.071	----	----	----	----	0.079	----	----	----
1:4	10	6	4	Mod	----	0.065	0.060	----	----	----	0.067	0.067	----	----	----	0.069	----	----	----	----	0.062	----	----	----
1:4	10	6	4	Str	----	0.068	0.064	----	----	----	0.067	0.071	----	----	----	0.068	----	----	----	----	0.065	----	----	----
1:4	10	8	12	Mod	0.073	0.072	----	----	----	0.078	0.069	0.039	----	----	0.108	0.076	0.047	----	----	----	0.076	0.059	----	----
1:4	10	8	12	Str	0.069	0.067	----	----	----	0.089	0.074	0.045	----	----	0.143	0.090	0.051	----	----	----	0.100	0.077	----	----
1:4	10	10	10	Mod	0.072	0.069	0.043	----	----	0.079	0.069	0.044	----	----	----	0.066	0.048	----	----	----	0.070	0.075	----	----
1:4	10	10	10	Str	0.074	0.070	0.051	----	----	0.091	0.072	0.047	----	----	----	0.079	0.062	----	----	----	0.079	0.093	----	----
1:4	10	12	8	Mod	0.072	0.066	0.044	----	----	0.079	0.062	0.044	----	----	----	0.061	0.058	----	----	----	0.061	0.087	----	----
1:4	10	12	8	Str	0.076	0.065	0.046	----	----	0.093	0.070	0.051	----	----	----	0.069	0.072	----	----	----	0.065	0.112	----	----
1:4	10	40	60	Mod	0.062	0.067	0.061	----	----	0.071	0.068	0.061	----	----	0.084	0.070	0.067	----	----	0.090	0.071	0.069	----	----
1:4	10	40	60	Str	0.071	0.073	0.069	----	----	0.080	0.079	0.074	----	----	0.105	0.082	0.075	----	----	0.105	0.074	0.081	----	----
1:4	10	50	50	Mod	0.066	0.065	0.065	----	----	0.073	0.063	0.068	----	----	0.087	0.064	0.071	----	----	----	0.062	0.078	----	----
1:4	10	50	50	Str	0.068	0.068	0.072	----	----	0.085	0.073	0.079	----	----	0.112	0.074	0.083	----	----	----	0.062	0.086	----	----
1:4	10	60	40	Mod	0.071	0.064	0.069	----	----	0.074	0.064	0.068	----	----	0.099	0.066	0.075	----	----	----	0.063	0.081	----	----
1:4	10	60	40	Str	0.077	0.071	0.073	----	----	0.091	0.069	0.083	----	----	0.117	0.062	0.093	----	----	----	0.062	0.088	----	----
1:4	20	4	6	Mod	0.067	0.056	----	----	----	----	0.057	----	----	----	----	0.063	----	----	----	----	0.067	----	----	----
1:4	20	4	6	Str	0.074	0.061	----	----	----	----	0.063	----	----	----	----	0.075	----	----	----	----	0.093	----	----	----
1:4	20	5	5	Mod	0.071	0.057	----	----	----	----	0.052	----	----	----	----	0.057	----	----	----	----	0.061	----	----	----
1:4	20	5	5	Str	0.074	0.060	----	----	----	----	0.056	----	----	----	----	0.068	----	----	----	----	0.071	----	----	----
1:4	20	6	4	Mod	0.069	0.052	----	----	----	----	0.056	----	0.031	----	----	0.054	----	0.024	----	----	0.051	----	0.024	----
1:4	20	6	4	Str	0.072	0.055	----	----	----	----	0.058	----	0.033	----	----	0.060	----	0.027	----	----	0.059	----	0.023	----
1:4	20	8	12	Mod	0.060	0.056	0.090	----	----	0.073	0.060	0.100	0.032	----	----	0.073	----	0.032	----	----	0.080	----	0.034	----
1:4	20	8	12	Str	0.067	0.060	0.110	----	----	0.099	0.068	0.117	0.034	----	----	0.099	----	0.039	----	----	0.126	----	0.045	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 25 (continued). Power estimates for conditions when the population effect size variance is 0.10.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:4	20	10	10	Mod	0.064	0.059	0.100	0.032	----	0.075	0.054	0.099	0.030	----	----	0.060	----	0.028	----	----	0.072	----	----	----
1:4	20	10	10	Str	0.065	0.058	0.109	0.035	----	0.106	0.060	0.122	0.034	----	----	0.080	----	0.031	----	----	0.096	----	----	----
1:4	20	12	8	Mod	0.061	0.051	----	0.031	----	0.083	0.054	----	----	----	----	0.052	----	0.027	----	----	0.054	----	0.025	----
1:4	20	12	8	Str	0.060	0.055	----	0.034	----	0.103	0.061	----	----	----	----	0.060	----	0.031	----	----	0.064	----	0.033	----
1:4	20	40	60	Mod	0.060	0.062	0.116	0.047	----	0.071	0.062	0.115	0.044	----	0.107	0.073	----	0.049	----	----	0.071	----	0.052	----
1:4	20	40	60	Str	0.058	0.058	0.146	0.046	----	0.090	0.073	0.150	0.052	----	0.157	0.104	----	0.065	----	----	0.090	----	0.063	----
1:4	20	50	50	Mod	0.055	0.054	----	0.041	----	0.072	0.058	----	0.040	----	0.121	0.066	----	0.044	----	----	0.059	----	0.038	----
1:4	20	50	50	Str	0.063	0.059	----	0.049	----	0.095	0.070	----	0.052	----	0.157	0.076	----	0.051	----	----	0.065	----	0.043	----
1:4	20	60	40	Mod	0.057	0.052	----	0.040	----	0.079	0.056	----	0.038	----	0.126	0.053	----	0.037	----	----	0.052	----	0.032	----
1:4	20	60	40	Str	0.065	0.053	----	0.040	----	0.092	0.059	----	0.042	----	0.174	0.062	----	0.038	----	----	0.049	----	0.029	----
1:4	50	4	6	Mod	0.062	0.052	----	0.037	----	----	0.053	----	0.033	0.010	----	0.065	----	0.032	0.011	----	0.083	----	0.035	----
1:4	50	4	6	Str	0.060	0.055	----	0.040	----	----	0.061	----	0.037	0.004	----	0.097	----	0.039	0.004	----	0.155	----	0.053	----
1:4	50	5	5	Mod	0.064	0.057	----	0.037	----	----	0.052	----	0.035	0.009	----	0.057	----	0.033	0.013	----	0.053	----	0.029	----
1:4	50	5	5	Str	0.064	0.055	----	0.037	----	----	0.055	----	0.038	0.005	----	0.073	----	0.036	0.002	----	0.094	----	0.041	----
1:4	50	6	4	Mod	0.061	0.055	----	0.041	----	----	0.048	----	0.038	----	----	0.049	----	0.034	0.011	----	0.050	----	0.034	----
1:4	50	6	4	Str	0.060	0.049	----	0.041	----	----	0.051	----	0.043	----	----	0.053	----	0.036	0.003	----	0.058	----	0.036	----
1:4	50	8	12	Mod	0.060	0.057	----	0.041	----	0.089	0.055	----	0.044	----	----	0.089	----	0.051	0.007	----	0.123	----	0.066	----
1:4	50	8	12	Str	0.059	0.058	----	0.049	----	0.148	0.076	----	0.047	----	----	0.162	----	0.073	0.006	----	0.232	----	0.119	----
1:4	50	10	10	Mod	0.056	0.052	----	0.040	----	0.107	0.055	----	0.040	----	----	0.069	----	0.044	0.008	----	0.079	----	0.049	----
1:4	50	10	10	Str	0.063	0.058	----	0.049	----	0.152	0.063	----	0.043	----	----	0.118	----	0.059	0.004	----	0.158	----	0.084	----
1:4	50	12	8	Mod	0.060	0.048	----	0.042	----	----	0.048	----	0.038	----	----	0.050	----	0.037	0.006	----	0.053	----	0.037	----
1:4	50	12	8	Str	0.062	0.056	----	0.047	----	----	0.050	----	0.040	----	----	0.075	----	0.041	0.003	----	0.082	----	0.050	----
1:4	50	40	60	Mod	0.055	0.057	----	0.056	----	0.088	0.064	----	0.058	----	----	0.105	----	0.088	0.023	----	0.105	----	0.093	0.116
1:4	50	40	60	Str	0.059	0.056	----	0.065	----	0.137	0.093	----	0.072	----	----	0.167	----	0.123	0.051	----	0.150	----	0.130	0.199
1:4	50	50	50	Mod	0.055	0.050	----	0.054	----	0.092	0.057	----	0.053	----	----	0.077	----	0.062	0.021	----	0.077	----	0.065	0.115
1:4	50	50	50	Str	0.055	0.055	----	0.059	----	0.143	0.082	----	0.066	----	----	0.122	----	0.087	0.043	----	0.095	----	0.079	0.199
1:4	50	60	40	Mod	0.053	0.051	----	0.052	----	0.096	0.053	----	0.051	----	----	0.058	----	0.051	0.019	----	0.051	----	0.049	0.114
1:4	50	60	40	Str	0.056	0.051	----	0.057	----	0.138	0.065	----	0.054	----	----	0.071	----	0.058	0.034	----	0.053	----	0.050	0.187
1:4	100	4	6	Mod	0.059	0.053	----	0.038	----	----	0.057	----	0.039	0.021	----	0.069	----	0.034	----	----	0.112	----	0.043	----
1:4	100	4	6	Str	0.063	0.056	----	0.042	----	----	0.069	----	0.041	0.009	----	0.145	----	0.048	----	----	0.266	----	0.088	----
1:4	100	5	5	Mod	0.062	0.057	----	0.044	----	----	0.050	----	0.037	0.021	----	0.057	----	0.037	----	----	0.064	----	0.038	----
1:4	100	5	5	Str	0.060	0.049	----	0.040	----	----	0.061	----	0.041	0.009	----	0.085	----	0.041	----	----	0.136	----	0.059	----
1:4	100	6	4	Mod	0.058	0.048	----	0.037	----	----	0.052	----	0.045	0.022	----	0.056	----	0.046	----	----	----	----	0.043	----
1:4	100	6	4	Str	0.062	0.053	----	0.046	----	----	0.050	----	0.044	0.009	----	0.051	----	0.037	----	----	----	----	0.037	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 25 (continued). Power estimates for conditions when the population effect size variance is 0.10.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:4	100	8	12	Mod	0.061	0.058	----	0.049	----	----	0.060	----	0.047	0.016	----	0.126	----	0.069	----	----	0.192	----	0.107	----
1:4	100	8	12	Str	0.062	0.055	----	0.050	----	----	0.093	----	0.052	0.005	----	0.279	----	0.110	----	----	0.411	----	0.224	----
1:4	100	10	10	Mod	0.056	0.053	----	0.043	----	----	0.055	----	0.045	0.015	----	0.081	----	0.050	----	----	0.110	----	0.066	----
1:4	100	10	10	Str	0.063	0.054	----	0.051	----	----	0.078	----	0.047	0.006	----	0.196	----	0.074	----	----	0.263	----	0.138	----
1:4	100	12	8	Mod	0.060	0.051	----	0.044	----	----	0.047	----	0.041	0.013	----	0.054	----	0.038	----	----	0.058	----	0.041	----
1:4	100	12	8	Str	0.063	0.053	----	0.049	----	----	0.063	----	0.048	0.008	----	0.098	----	0.049	----	----	0.121	----	0.065	----
1:4	100	40	60	Mod	0.053	0.055	----	0.061	----	0.122	0.077	----	0.066	0.010	----	0.166	----	0.130	0.028	----	----	----	----	----
1:4	100	40	60	Str	0.055	0.053	----	0.065	----	0.214	0.122	----	0.086	0.005	----	0.287	----	0.198	0.024	----	----	----	----	----
1:4	100	50	50	Mod	0.053	0.049	----	0.056	----	0.136	0.064	----	0.061	0.014	----	0.106	----	0.084	0.025	----	0.093	----	0.079	----
1:4	100	50	50	Str	0.056	0.051	----	0.064	----	0.236	0.107	----	0.079	0.005	----	0.187	----	0.131	0.024	----	0.139	----	0.117	----
1:4	100	60	40	Mod	0.052	0.048	----	0.055	----	----	0.055	----	0.057	0.012	----	0.059	----	0.052	0.023	----	0.049	----	0.048	----
1:4	100	60	40	Str	0.055	0.055	----	0.062	----	----	0.082	----	0.069	0.005	----	0.099	----	0.068	0.020	----	0.057	----	0.048	----
1:8	10	4	6	Mod	----	0.077	0.077	----	----	----	0.073	0.083	----	----	----	0.077	----	----	----	----	0.082	----	----	----
1:8	10	4	6	Str	----	0.073	0.089	----	----	----	0.080	0.092	----	----	----	0.086	----	----	----	----	0.095	----	----	----
1:8	10	5	5	Mod	----	0.069	0.083	----	----	----	0.070	0.096	----	----	----	0.070	----	----	----	----	0.070	----	----	----
1:8	10	5	5	Str	----	0.069	0.085	----	----	----	0.071	0.094	----	----	----	0.074	----	----	----	----	0.078	----	----	----
1:8	10	6	4	Mod	----	0.069	----	----	----	----	0.067	----	----	----	----	0.068	----	----	----	----	0.065	----	----	----
1:8	10	6	4	Str	----	0.072	----	----	----	----	0.065	----	----	----	----	0.066	----	----	----	----	0.070	----	----	----
1:8	10	8	12	Mod	0.076	0.069	0.062	----	----	0.080	0.070	0.059	----	----	----	0.080	0.068	----	----	----	0.082	0.093	----	----
1:8	10	8	12	Str	0.077	0.074	0.069	----	----	0.097	0.080	0.073	----	----	----	0.099	0.089	----	----	----	0.106	0.117	----	----
1:8	10	10	10	Mod	0.071	0.065	0.062	----	----	0.082	0.066	0.073	----	----	----	0.071	0.087	----	----	----	0.076	----	----	----
1:8	10	10	10	Str	0.081	0.070	0.077	----	----	0.100	0.071	0.079	----	----	----	0.079	0.106	----	----	----	0.087	----	----	----
1:8	10	12	8	Mod	0.074	0.062	0.069	----	----	----	0.063	0.074	----	----	----	0.067	----	----	----	----	0.065	----	----	----
1:8	10	12	8	Str	0.081	0.068	0.077	----	----	----	0.068	0.083	----	----	----	0.069	----	----	----	----	0.069	----	----	----
1:8	10	40	60	Mod	0.069	0.069	0.105	----	----	0.074	0.074	0.096	----	----	0.087	0.076	0.108	----	----	----	0.079	----	----	----
1:8	10	40	60	Str	0.072	0.073	0.122	----	----	0.085	0.080	0.121	----	----	0.108	0.087	0.123	----	----	----	0.084	----	----	----
1:8	10	50	50	Mod	0.068	0.061	----	----	----	0.076	0.066	----	----	----	0.099	0.072	----	----	----	----	0.067	----	----	----
1:8	10	50	50	Str	0.073	0.071	----	----	----	0.091	0.077	----	----	----	0.119	0.076	----	----	----	----	0.069	----	----	----
1:8	10	60	40	Mod	0.071	0.067	----	----	----	0.077	0.063	----	----	----	----	0.063	----	----	----	----	0.064	----	----	----
1:8	10	60	40	Str	0.080	0.067	----	----	----	0.091	0.066	----	----	----	----	0.065	----	----	----	----	0.062	----	----	----
1:8	20	4	6	Mod	----	0.058	----	----	----	----	0.058	----	----	----	----	0.064	----	----	----	----	0.079	----	----	----
1:8	20	4	6	Str	----	0.059	----	----	----	----	0.062	----	----	----	----	0.085	----	----	----	----	0.101	----	----	----
1:8	20	5	5	Mod	0.070	0.054	----	----	----	----	0.056	----	----	----	----	0.058	----	----	----	----	0.058	----	----	----
1:8	20	5	5	Str	0.075	0.058	----	----	----	----	0.054	----	----	----	----	0.066	----	----	----	----	0.073	----	----	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 25 (continued). Power estimates for conditions when the population effect size variance is 0.10.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:8	20	6	4	Mod	0.070	0.052	----	----	----	----	0.055	----	0.031	----	----	0.055	----	0.028	----	----	0.052	----	0.026	----
1:8	20	6	4	Str	0.073	0.056	----	----	----	----	0.055	----	0.033	----	----	0.058	----	0.032	----	----	0.053	----	0.023	----
1:8	20	8	12	Mod	0.065	0.060	----	----	----	0.076	0.058	----	----	----	----	0.075	----	----	----	----	0.091	----	0.034	----
1:8	20	8	12	Str	0.072	0.063	----	----	----	0.102	0.071	----	----	----	----	0.109	----	----	----	----	0.135	----	0.049	----
1:8	20	10	10	Mod	0.063	0.056	----	----	----	0.087	0.055	----	0.030	----	----	0.062	----	----	----	----	0.063	----	0.025	----
1:8	20	10	10	Str	0.069	0.057	----	----	----	0.109	0.064	----	0.037	----	----	0.080	----	----	----	----	0.100	----	0.039	----
1:8	20	12	8	Mod	0.064	0.052	----	----	----	0.094	0.056	----	0.031	----	----	0.050	----	0.029	----	----	0.053	----	0.028	----
1:8	20	12	8	Str	0.072	0.057	----	----	----	0.112	0.059	----	0.038	----	----	0.064	----	0.029	----	----	0.063	----	0.028	----
1:8	20	40	60	Mod	0.057	0.059	----	0.053	----	0.071	0.063	----	0.050	----	0.114	0.081	----	0.061	----	----	0.080	----	0.066	----
1:8	20	40	60	Str	0.060	0.061	----	0.056	----	0.086	0.074	----	0.062	----	0.161	0.105	----	0.075	----	----	0.097	----	0.079	----
1:8	20	50	50	Mod	0.064	0.058	----	0.049	----	0.078	0.061	----	0.050	----	----	0.067	----	0.051	----	----	0.063	----	0.047	----
1:8	20	50	50	Str	0.061	0.057	----	0.053	----	0.096	0.068	----	0.058	----	----	0.084	----	0.063	----	----	0.070	----	0.054	----
1:8	20	60	40	Mod	0.062	0.057	----	0.046	----	0.080	0.056	----	0.044	----	----	0.052	----	0.038	----	----	0.050	----	0.038	----
1:8	20	60	40	Str	0.062	0.052	----	0.052	----	0.098	0.059	----	0.049	----	----	0.060	----	0.047	----	----	0.054	----	0.040	----
1:8	50	4	6	Mod	0.063	0.052	----	0.034	----	----	0.055	----	0.033	0.012	----	0.073	----	0.033	----	----	0.108	----	0.039	----
1:8	50	4	6	Str	0.063	0.054	----	0.033	----	----	0.066	----	0.039	0.005	----	0.117	----	0.041	----	----	0.192	----	0.060	----
1:8	50	5	5	Mod	0.063	0.048	----	0.032	----	----	0.052	----	0.037	0.012	----	0.054	----	0.029	----	----	0.058	----	0.029	----
1:8	50	5	5	Str	0.061	0.055	----	0.039	----	----	0.056	----	0.038	0.006	----	0.073	----	0.035	----	----	0.100	----	0.041	----
1:8	50	6	4	Mod	0.061	0.051	----	0.041	----	----	0.054	----	0.042	0.012	----	0.050	----	0.039	----	----	0.053	----	0.037	----
1:8	50	6	4	Str	0.066	0.053	----	0.043	----	----	0.050	----	0.043	0.005	----	0.051	----	0.038	----	----	0.051	----	0.035	----
1:8	50	8	12	Mod	0.054	0.052	----	0.043	----	0.100	0.059	----	0.044	0.006	----	0.094	----	0.052	0.015	----	0.144	----	0.074	----
1:8	50	8	12	Str	0.062	0.061	----	0.052	----	0.155	0.081	----	0.051	0.003	----	0.195	----	0.081	0.011	----	0.275	----	0.140	----
1:8	50	10	10	Mod	0.059	0.050	----	0.040	----	----	0.055	----	0.040	0.009	----	0.073	----	0.044	0.016	----	0.088	----	0.053	----
1:8	50	10	10	Str	0.061	0.055	----	0.046	----	----	0.064	----	0.045	0.004	----	0.134	----	0.060	0.009	----	0.163	----	0.087	----
1:8	50	12	8	Mod	0.062	0.049	----	0.039	----	----	0.050	----	0.040	----	----	0.054	----	0.042	0.012	----	0.054	----	0.035	----
1:8	50	12	8	Str	0.061	0.054	----	0.048	----	----	0.059	----	0.047	----	----	0.074	----	0.042	0.005	----	0.076	----	0.043	----
1:8	50	40	60	Mod	0.054	0.054	----	0.062	----	0.099	0.077	----	0.078	----	----	0.123	----	0.111	0.030	----	----	----	----	0.153
1:8	50	40	60	Str	0.058	0.054	----	0.073	----	0.141	0.100	----	0.087	----	----	0.191	----	0.152	0.055	----	----	----	----	0.231
1:8	50	50	50	Mod	0.057	0.053	----	0.060	----	0.101	0.064	----	0.064	----	----	0.083	----	0.079	0.026	----	0.075	----	0.075	----
1:8	50	50	50	Str	0.057	0.055	----	0.068	----	0.147	0.087	----	0.080	----	----	0.126	----	0.099	0.048	----	0.101	----	0.097	----
1:8	50	60	40	Mod	0.052	0.048	----	0.052	----	0.108	0.051	----	0.058	----	----	0.055	----	0.054	0.025	----	0.050	----	0.047	----
1:8	50	60	40	Str	0.058	0.051	----	0.066	----	0.159	0.064	----	0.066	----	----	0.071	----	0.065	0.035	----	0.048	----	0.050	----
1:8	100	4	6	Mod	0.058	0.052	----	0.037	----	----	0.057	----	0.037	0.025	----	0.093	----	0.040	----	----	0.155	----	0.055	----
1:8	100	4	6	Str	0.059	0.053	----	0.039	----	----	0.070	----	0.037	0.016	----	0.178	----	0.048	----	----	0.337	----	0.113	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 25 (continued). Power estimates for conditions when the population effect size variance is 0.10.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:8	100	5	5	Mod	0.059	0.052	----	0.039	----	----	0.053	----	0.038	0.029	----	0.057	----	0.034	----	----	0.069	----	0.036	----
1:8	100	5	5	Str	0.055	0.048	----	0.040	----	----	0.060	----	0.041	0.015	----	0.098	----	0.042	----	----	0.142	----	0.059	----
1:8	100	6	4	Mod	0.057	0.049	----	0.043	----	----	0.051	----	0.041	0.025	----	0.054	----	0.043	----	----	----	----	----	----
1:8	100	6	4	Str	0.058	0.049	----	0.043	----	----	0.050	----	0.047	0.015	----	0.050	----	0.040	----	----	----	----	----	----
1:8	100	8	12	Mod	0.057	0.053	----	0.046	----	----	0.065	----	0.046	0.018	----	0.147	----	0.074	----	----	0.253	----	0.137	----
1:8	100	8	12	Str	0.055	0.054	----	0.050	----	----	0.109	----	0.057	0.010	----	0.336	----	0.123	----	----	0.483	----	0.270	----
1:8	100	10	10	Mod	0.057	0.051	----	0.044	----	----	0.056	----	0.044	0.020	----	0.091	----	0.050	----	----	0.123	----	0.068	----
1:8	100	10	10	Str	0.058	0.054	----	0.051	----	----	0.080	----	0.050	0.012	----	0.214	----	0.084	----	----	0.302	----	0.150	----
1:8	100	12	8	Mod	0.055	0.051	----	0.046	----	----	0.049	----	0.042	0.018	----	0.055	----	0.041	----	----	0.055	----	0.040	----
1:8	100	12	8	Str	0.057	0.048	----	0.046	----	----	0.063	----	0.052	0.012	----	0.092	----	0.050	----	----	0.101	----	0.054	----
1:8	100	40	60	Mod	0.057	0.053	----	0.070	----	0.123	0.083	----	0.084	0.017	----	0.199	----	----	----	----	----	----	----	----
1:8	100	40	60	Str	0.054	0.051	----	0.072	----	0.227	0.146	----	0.114	0.015	----	0.338	----	----	----	----	----	----	----	----
1:8	100	50	50	Mod	0.055	0.054	----	0.067	----	----	0.068	----	0.073	0.021	----	0.118	----	0.106	----	----	0.102	----	0.110	----
1:8	100	50	50	Str	0.058	0.054	----	0.074	----	----	0.108	----	0.091	0.016	----	0.211	----	0.163	----	----	0.154	----	0.150	----
1:8	100	60	40	Mod	0.053	0.049	----	0.059	----	----	0.057	----	0.066	0.024	----	0.058	----	0.059	----	----	----	----	0.053	----
1:8	100	60	40	Str	0.054	0.051	----	0.069	----	----	0.074	----	0.073	0.012	----	0.094	----	0.078	----	----	----	----	0.060	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 26. Power estimates for conditions when the population effect size variance is 0.33.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	10	4	6	Mod	----	0.068	0.054	----	----	----	0.070	0.061	----	----	----	0.071	0.088	----	----	----	0.068	----	----	----
1:1	10	4	6	Str	----	0.065	0.055	----	----	----	0.070	0.058	----	----	----	0.070	0.082	----	----	----	0.069	----	----	----
1:1	10	5	5	Mod	----	0.066	0.052	----	----	----	0.067	0.061	----	----	----	0.074	0.085	----	----	----	0.068	----	----	----
1:1	10	5	5	Str	----	0.067	0.053	----	----	----	0.068	0.064	----	----	----	0.072	0.082	----	----	----	0.071	----	----	----
1:1	10	6	4	Mod	----	0.067	0.052	----	----	----	0.068	0.059	----	----	----	0.068	0.084	----	----	----	0.072	----	----	----
1:1	10	6	4	Str	----	0.067	0.054	----	----	----	0.071	0.061	----	----	----	0.073	0.087	----	----	----	0.070	----	----	----
1:1	10	8	12	Mod	0.069	0.066	----	----	----	0.071	0.067	----	----	----	----	0.065	0.036	----	----	----	0.062	0.056	----	----
1:1	10	8	12	Str	0.067	0.069	----	----	----	0.081	0.069	----	----	----	----	0.070	0.041	----	----	----	0.073	0.063	----	----
1:1	10	10	10	Mod	0.067	0.064	----	----	----	0.073	0.063	0.028	----	----	----	0.069	0.038	----	----	----	0.075	0.059	----	----
1:1	10	10	10	Str	0.071	0.069	----	----	----	0.084	0.069	0.035	----	----	----	0.070	0.041	----	----	----	0.073	0.064	----	----
1:1	10	12	8	Mod	0.065	0.062	0.029	----	----	0.072	0.066	0.029	----	----	----	0.066	0.038	----	----	----	0.066	0.056	----	----
1:1	10	12	8	Str	0.071	0.068	0.033	----	----	0.084	0.068	0.029	----	----	----	0.071	0.043	----	----	----	0.073	0.061	----	----
1:1	10	40	60	Mod	0.060	0.061	0.028	----	----	0.063	0.061	0.028	----	----	----	0.064	0.032	----	----	----	0.063	0.039	----	----
1:1	10	40	60	Str	0.071	0.072	0.032	----	----	0.077	0.069	0.033	----	----	----	0.067	0.034	----	----	----	0.065	0.039	----	----
1:1	10	50	50	Mod	0.063	0.070	----	----	----	0.068	0.065	0.028	----	----	0.090	0.066	0.030	----	----	----	0.067	0.039	----	----
1:1	10	50	50	Str	0.065	0.064	----	----	----	0.071	0.066	0.030	----	----	0.105	0.069	0.034	----	----	----	0.065	0.044	----	----
1:1	10	60	40	Mod	0.059	0.062	----	----	----	0.067	0.064	0.028	----	----	0.091	0.064	----	----	----	----	0.062	0.038	----	----
1:1	10	60	40	Str	0.066	0.066	----	----	----	0.071	0.064	0.030	----	----	0.103	0.069	----	----	----	----	0.059	0.042	----	----
1:1	20	4	6	Mod	0.069	0.055	----	0.031	----	----	0.053	----	0.027	----	----	0.056	----	0.032	----	----	0.056	----	0.027	----
1:1	20	4	6	Str	0.069	0.059	----	0.033	----	----	0.056	----	0.027	----	----	0.059	----	0.029	----	----	0.065	----	0.026	----
1:1	20	5	5	Mod	0.070	0.056	----	0.028	----	----	0.055	----	0.029	----	----	0.060	----	0.031	----	----	0.058	----	0.028	----
1:1	20	5	5	Str	0.070	0.056	----	0.031	----	----	0.059	----	0.030	----	----	0.059	----	0.028	----	----	0.059	----	0.026	----
1:1	20	6	4	Mod	0.068	0.058	----	0.029	----	----	0.051	----	----	----	----	0.058	----	0.031	----	----	0.056	----	0.024	----
1:1	20	6	4	Str	0.070	0.057	----	0.032	----	----	0.058	----	----	----	----	0.056	----	0.029	----	----	0.059	----	0.025	----
1:1	20	8	12	Mod	0.057	0.054	0.076	0.034	----	0.075	0.056	0.085	0.034	----	----	0.059	----	0.032	----	----	0.056	----	0.031	----
1:1	20	8	12	Str	0.061	0.058	0.081	0.040	----	0.087	0.057	0.091	0.035	----	----	0.064	----	0.035	----	----	0.066	----	0.032	----
1:1	20	10	10	Mod	0.055	0.053	0.074	0.033	----	0.076	0.053	0.080	0.030	----	----	0.058	----	0.033	----	----	0.054	----	0.027	----
1:1	20	10	10	Str	0.061	0.057	0.084	0.037	----	0.094	0.061	0.095	0.038	----	----	0.062	----	0.036	----	----	0.066	----	0.034	----
1:1	20	12	8	Mod	0.061	0.057	0.076	0.034	----	0.078	0.061	0.083	0.038	----	----	0.057	----	0.032	----	----	0.058	----	0.031	----
1:1	20	12	8	Str	0.057	0.053	0.078	0.036	----	0.086	0.053	0.091	0.036	----	----	0.064	----	0.035	----	----	0.066	----	0.031	----
1:1	20	40	60	Mod	0.055	0.059	0.056	0.042	----	0.069	0.058	0.059	0.040	----	----	0.055	0.070	0.040	----	----	0.055	0.086	0.034	----
1:1	20	40	60	Str	0.053	0.053	0.064	0.043	----	0.077	0.060	0.072	0.042	----	----	0.059	0.082	0.041	----	----	0.059	0.110	0.042	----
1:1	20	50	50	Mod	0.054	0.052	0.058	0.041	----	0.068	0.057	0.062	0.042	----	----	0.056	0.074	0.036	----	----	0.057	0.086	0.036	----
1:1	20	50	50	Str	0.060	0.063	0.070	0.048	----	0.078	0.058	0.070	0.042	----	----	0.064	0.084	0.042	----	----	0.061	0.113	0.040	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 26 (continued). Power estimates for conditions when the population effect size variance is 0.33.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	20	60	40	Mod	0.054	0.057	0.058	0.042	----	0.069	0.058	0.059	0.041	----	----	0.058	0.069	0.041	----	----	0.053	0.088	0.034	----
1:1	20	60	40	Str	0.058	0.054	0.065	0.043	----	0.076	0.058	0.069	0.043	----	----	0.061	0.087	0.042	----	----	0.063	0.108	0.041	----
1:1	50	4	6	Mod	0.060	0.051	----	0.040	----	----	0.049	----	0.040	----	----	0.052	----	0.039	0.006	----	0.051	----	0.040	----
1:1	50	4	6	Str	0.064	0.050	----	0.044	----	----	0.054	----	0.044	----	----	0.058	----	0.041	0.001	----	0.065	----	0.044	----
1:1	50	5	5	Mod	0.060	0.053	----	0.044	----	----	0.050	----	0.039	----	----	0.052	----	0.039	0.005	----	0.053	----	0.042	----
1:1	50	5	5	Str	0.066	0.054	----	0.046	----	----	0.058	----	0.046	----	----	0.058	----	0.039	0.001	----	0.066	----	0.042	----
1:1	50	6	4	Mod	0.064	0.050	----	0.041	----	----	0.051	----	0.041	----	----	0.051	----	0.039	0.007	----	0.054	----	0.038	----
1:1	50	6	4	Str	0.062	0.051	----	0.042	----	----	0.052	----	0.043	----	----	0.057	----	0.042	0.001	----	0.063	----	0.042	----
1:1	50	8	12	Mod	0.057	0.048	----	0.042	----	0.100	0.052	----	0.046	----	----	0.053	----	0.044	----	----	0.060	----	0.050	0.008
1:1	50	8	12	Str	0.056	0.053	----	0.050	----	0.131	0.055	----	0.047	----	----	0.075	----	0.050	----	----	0.087	----	0.059	0.015
1:1	50	10	10	Mod	0.061	0.056	----	0.049	----	0.099	0.051	----	0.042	----	----	0.057	----	0.045	----	----	0.057	----	0.044	0.010
1:1	50	10	10	Str	0.059	0.054	----	0.050	----	0.136	0.058	----	0.049	----	----	0.082	----	0.055	----	----	0.093	----	0.061	0.016
1:1	50	12	8	Mod	0.051	0.048	----	0.042	----	0.102	0.053	----	0.049	----	----	0.054	----	0.045	----	----	0.055	----	0.044	0.007
1:1	50	12	8	Str	0.057	0.051	----	0.047	----	0.132	0.060	----	0.051	----	----	0.068	----	0.049	----	----	0.086	----	0.055	0.015
1:1	50	40	60	Mod	0.055	0.052	0.078	0.050	----	0.092	0.051	0.086	0.050	----	----	0.058	0.121	0.052	----	----	0.057	----	0.051	----
1:1	50	40	60	Str	0.057	0.055	0.098	0.057	----	0.118	0.061	0.115	0.059	----	----	0.075	0.172	0.061	----	----	0.073	----	0.059	----
1:1	50	50	50	Mod	0.053	0.054	0.075	0.059	----	0.094	0.054	0.088	0.055	----	----	0.059	----	0.052	----	----	0.057	----	0.052	----
1:1	50	50	50	Str	0.051	0.049	0.097	0.054	----	0.115	0.062	0.115	0.060	----	----	0.072	----	0.062	----	----	0.075	----	0.061	----
1:1	50	60	40	Mod	0.053	0.053	0.081	0.053	----	0.098	0.056	0.086	0.054	----	----	0.056	0.126	0.052	----	----	0.053	----	0.051	----
1:1	50	60	40	Str	0.050	0.052	0.093	0.060	----	0.110	0.057	0.112	0.056	----	----	0.072	0.159	0.059	----	----	0.078	----	0.063	----
1:1	100	4	6	Mod	0.059	0.053	----	0.045	----	----	0.053	----	0.044	0.016	----	0.052	----	0.045	----	----	0.050	----	0.041	----
1:1	100	4	6	Str	0.059	0.052	----	0.046	----	----	0.048	----	0.045	0.011	----	0.062	----	0.045	----	----	0.075	----	0.045	----
1:1	100	5	5	Mod	0.060	0.051	----	0.044	----	----	0.051	----	0.047	0.017	----	0.053	----	0.045	----	----	0.053	----	0.039	----
1:1	100	5	5	Str	0.058	0.046	----	0.043	----	----	0.053	----	0.047	0.010	----	0.066	----	0.048	----	----	0.084	----	0.049	----
1:1	100	6	4	Mod	0.059	0.050	----	0.045	----	----	0.051	----	0.046	0.016	----	0.052	----	0.046	----	----	0.049	----	0.042	----
1:1	100	6	4	Str	0.058	0.048	----	0.043	----	----	0.056	----	0.048	0.010	----	0.062	----	0.046	----	----	0.077	----	0.049	----
1:1	100	8	12	Mod	0.055	0.051	----	0.049	----	----	0.049	----	0.048	0.010	----	0.058	----	0.048	0.006	----	0.064	----	0.049	----
1:1	100	8	12	Str	0.054	0.048	----	0.046	----	----	0.061	----	0.051	0.005	----	0.097	----	0.062	0.001	----	0.120	----	0.070	----
1:1	100	10	10	Mod	0.057	0.051	----	0.050	----	----	0.050	----	0.047	0.011	----	0.062	----	0.049	0.006	----	0.072	----	0.055	----
1:1	100	10	10	Str	0.054	0.052	----	0.053	----	----	0.056	----	0.048	0.004	----	0.098	----	0.058	0.001	----	0.131	----	0.081	----
1:1	100	12	8	Mod	0.057	0.052	----	0.052	----	----	0.051	----	0.048	0.010	----	0.056	----	0.048	0.007	----	0.067	----	0.050	----
1:1	100	12	8	Str	0.058	0.053	----	0.054	----	----	0.060	----	0.055	0.005	----	0.093	----	0.060	0.001	----	0.125	----	0.075	----
1:1	100	40	60	Mod	0.054	0.051	0.083	0.059	----	----	0.053	0.104	0.058	----	----	0.064	----	0.059	----	----	0.066	----	0.058	0.005
1:1	100	40	60	Str	0.052	0.048	0.112	0.056	----	----	0.063	0.138	0.065	----	----	0.095	----	0.075	----	----	0.097	----	0.074	0.004

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 26 (continued). Power estimates for conditions when the population effect size variance is 0.33.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	100	50	50	Mod	0.057	0.055	0.087	0.059	----	----	0.058	0.105	0.062	----	----	0.072	----	0.063	----	----	0.067	----	0.060	0.006
1:1	100	50	50	Str	0.054	0.051	0.109	0.060	----	----	0.068	0.137	0.064	----	----	0.103	----	0.078	----	----	0.100	----	0.078	0.005
1:1	100	60	40	Mod	0.052	0.052	0.088	0.055	----	----	0.059	0.108	0.057	----	----	0.068	----	0.064	----	----	0.068	----	0.062	0.006
1:1	100	60	40	Str	0.052	0.051	0.116	0.060	----	----	0.069	0.134	0.065	----	----	0.102	----	0.078	----	----	0.096	----	0.075	0.005
1:2	10	4	6	Mod	----	0.068	0.057	----	----	----	0.067	0.064	----	----	----	0.069	0.088	----	----	----	0.065	----	----	----
1:2	10	4	6	Str	----	0.071	0.058	----	----	----	0.076	0.064	----	----	----	0.074	0.090	----	----	----	0.079	----	----	----
1:2	10	5	5	Mod	----	0.066	0.057	----	----	----	0.066	0.063	----	----	----	0.069	----	----	----	----	0.072	----	----	----
1:2	10	5	5	Str	----	0.069	0.062	----	----	----	0.065	0.060	----	----	----	0.075	----	----	----	----	0.075	----	----	----
1:2	10	6	4	Mod	----	0.069	0.066	----	----	----	0.071	0.070	----	----	----	0.069	----	----	----	----	0.073	----	----	----
1:2	10	6	4	Str	----	0.072	0.064	----	----	----	0.065	0.064	----	----	----	0.067	----	----	----	----	0.069	----	----	----
1:2	10	8	12	Mod	0.067	0.068	0.032	----	----	0.076	0.072	0.034	----	----	----	0.067	0.042	----	----	----	0.071	0.058	----	----
1:2	10	8	12	Str	0.073	0.072	0.034	----	----	0.089	0.070	0.036	----	----	----	0.072	0.042	----	----	----	0.081	0.067	----	----
1:2	10	10	10	Mod	0.070	0.065	0.036	----	----	0.080	0.066	0.036	----	----	----	0.063	0.043	----	----	----	0.065	0.065	----	----
1:2	10	10	10	Str	0.073	0.073	0.040	----	----	0.086	0.076	0.038	----	----	----	0.071	0.051	----	----	----	0.079	0.081	----	----
1:2	10	12	8	Mod	0.066	0.061	0.033	----	----	0.080	0.065	0.038	----	----	----	0.064	0.045	----	----	----	0.063	0.070	----	----
1:2	10	12	8	Str	0.076	0.065	0.037	----	----	0.087	0.068	0.038	----	----	----	0.065	0.051	----	----	----	0.071	0.076	----	----
1:2	10	40	60	Mod	0.066	0.066	0.038	----	----	0.068	0.066	0.030	----	----	0.095	0.068	0.041	----	----	----	0.064	0.046	----	----
1:2	10	40	60	Str	0.066	0.065	0.038	----	----	0.076	0.070	0.038	----	----	0.106	0.065	0.047	----	----	----	0.068	0.053	----	----
1:2	10	50	50	Mod	0.066	0.066	0.035	----	----	0.069	0.066	0.037	----	----	0.098	0.066	0.046	----	----	----	0.064	0.049	----	----
1:2	10	50	50	Str	0.067	0.071	0.037	----	----	0.078	0.068	0.041	----	----	0.111	0.069	0.049	----	----	----	0.065	0.056	----	----
1:2	10	60	40	Mod	0.066	0.065	0.037	----	----	0.073	0.065	0.040	----	----	----	0.061	0.041	----	----	----	0.062	0.056	----	----
1:2	10	60	40	Str	0.066	0.067	0.039	----	----	0.075	0.065	0.046	----	----	----	0.061	0.049	----	----	----	0.062	0.058	----	----
1:2	20	4	6	Mod	0.066	0.057	----	0.030	----	----	0.055	----	0.027	----	----	0.059	----	0.030	----	----	0.057	----	0.028	----
1:2	20	4	6	Str	0.072	0.059	----	0.035	----	----	0.057	----	0.033	----	----	0.062	----	0.029	----	----	0.071	----	0.027	----
1:2	20	5	5	Mod	0.072	0.055	----	0.031	----	----	0.054	----	0.033	----	----	0.058	----	0.029	----	----	0.054	----	0.027	----
1:2	20	5	5	Str	0.067	0.054	----	0.034	----	----	0.059	----	0.031	----	----	0.061	----	0.029	----	----	0.062	----	0.027	----
1:2	20	6	4	Mod	0.069	0.057	----	0.032	----	----	0.053	----	0.031	----	----	0.057	----	0.030	----	----	0.055	----	0.028	----
1:2	20	6	4	Str	0.066	0.058	----	0.035	----	----	0.058	----	0.035	----	----	0.055	----	0.031	----	----	0.057	----	0.030	----
1:2	20	8	12	Mod	0.060	0.054	0.083	0.033	----	0.077	0.059	0.093	0.037	----	----	0.059	----	0.032	----	----	0.061	----	0.034	----
1:2	20	8	12	Str	0.057	0.056	0.091	0.038	----	0.086	0.054	0.095	0.036	----	----	0.071	----	0.040	----	----	0.078	----	0.039	----
1:2	20	10	10	Mod	0.059	0.052	0.087	0.034	----	0.075	0.055	----	0.034	----	----	0.056	----	0.030	----	----	0.060	----	0.033	----
1:2	20	10	10	Str	0.065	0.063	0.094	0.040	----	0.093	0.058	----	0.038	----	----	0.064	----	0.034	----	----	0.068	----	0.035	----
1:2	20	12	8	Mod	0.058	0.051	0.081	0.033	----	0.076	0.055	----	0.032	----	----	0.057	----	0.035	----	----	0.056	----	0.031	----
1:2	20	12	8	Str	0.063	0.055	0.089	0.037	----	0.091	0.054	----	0.037	----	----	0.059	----	0.032	----	----	0.062	----	0.035	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 26 (continued). Power estimates for conditions when the population effect size variance is 0.33.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:2	20	40	60	Mod	0.051	0.053	0.066	0.042	----	0.064	0.059	0.068	0.044	----	----	0.063	0.084	0.044	----	----	0.061	----	0.044	----
1:2	20	40	60	Str	0.056	0.052	0.082	0.044	----	0.077	0.058	0.082	0.044	----	----	0.069	0.100	0.047	----	----	0.068	----	0.046	----
1:2	20	50	50	Mod	0.058	0.052	0.070	0.041	----	0.069	0.056	0.074	0.041	----	----	0.060	0.089	0.041	----	----	0.057	----	0.039	----
1:2	20	50	50	Str	0.055	0.052	0.083	0.042	----	0.083	0.058	0.085	0.045	----	----	0.062	0.102	0.044	----	----	0.056	----	0.038	----
1:2	20	60	40	Mod	0.054	0.054	0.075	0.044	----	0.069	0.056	0.085	0.041	----	----	0.053	0.096	0.036	----	----	0.055	----	0.037	----
1:2	20	60	40	Str	0.060	0.057	0.087	0.044	----	0.082	0.060	0.089	0.044	----	----	0.060	0.116	0.040	----	----	0.054	----	0.034	----
1:2	50	4	6	Mod	0.061	0.050	----	0.039	----	----	0.050	----	0.040	----	----	0.052	----	0.038	0.007	----	0.057	----	0.039	----
1:2	50	4	6	Str	0.054	0.052	----	0.040	----	----	0.056	----	0.043	----	----	0.064	----	0.042	0.002	----	0.076	----	0.044	----
1:2	50	5	5	Mod	0.068	0.056	----	0.046	----	----	0.051	----	0.042	----	----	0.053	----	0.042	0.008	----	0.050	----	0.036	----
1:2	50	5	5	Str	0.059	0.054	----	0.043	----	----	0.054	----	0.042	----	----	0.058	----	0.040	0.002	----	0.063	----	0.041	----
1:2	50	6	4	Mod	0.062	0.051	----	0.043	----	----	0.049	----	0.042	----	----	0.051	----	0.039	0.007	----	0.048	----	0.038	----
1:2	50	6	4	Str	0.062	0.052	----	0.048	----	----	0.053	----	0.046	----	----	0.053	----	0.043	0.002	----	0.054	----	0.036	----
1:2	50	8	12	Mod	0.057	0.054	----	0.048	----	0.098	0.053	----	0.045	----	----	0.061	----	0.047	0.002	----	0.068	----	0.049	0.009
1:2	50	8	12	Str	0.058	0.055	----	0.050	----	0.133	0.058	----	0.048	----	----	0.086	----	0.055	0.001	----	0.108	----	0.064	0.017
1:2	50	10	10	Mod	0.054	0.047	----	0.045	----	0.104	0.053	----	0.045	----	----	0.054	----	0.043	0.003	----	0.059	----	0.046	0.011
1:2	50	10	10	Str	0.056	0.050	----	0.047	----	0.142	0.057	----	0.052	----	----	0.077	----	0.052	0.000	----	0.098	----	0.060	0.015
1:2	50	12	8	Mod	0.061	0.056	----	0.049	----	----	0.054	----	0.046	----	----	0.051	----	0.045	0.003	----	0.051	----	0.040	0.009
1:2	50	12	8	Str	0.055	0.050	----	0.049	----	----	0.055	----	0.049	----	----	0.068	----	0.049	0.000	----	0.070	----	0.050	0.013
1:2	50	40	60	Mod	0.049	0.051	0.101	0.054	----	0.089	0.054	0.104	0.056	----	----	0.061	----	0.058	----	----	0.068	----	0.060	----
1:2	50	40	60	Str	0.054	0.054	0.118	0.056	----	0.115	0.061	0.127	0.059	----	----	0.085	----	0.067	----	----	0.086	----	0.071	----
1:2	50	50	50	Mod	0.055	0.056	0.104	0.054	----	0.093	0.054	0.112	0.054	----	----	0.058	----	0.052	----	----	0.062	----	0.056	----
1:2	50	50	50	Str	0.054	0.053	0.118	0.055	----	0.115	0.059	0.136	0.057	----	----	0.076	----	0.067	----	----	0.077	----	0.067	----
1:2	50	60	40	Mod	0.051	0.052	0.102	0.051	----	0.097	0.054	0.112	0.057	----	----	0.056	----	0.050	----	----	0.051	----	0.049	----
1:2	50	60	40	Str	0.053	0.049	0.116	0.053	----	0.118	0.057	0.133	0.059	----	----	0.066	----	0.058	----	----	0.062	----	0.057	----
1:2	100	4	6	Mod	0.062	0.052	----	0.044	----	----	0.053	----	0.043	0.018	----	0.057	----	0.044	----	----	0.061	----	0.042	----
1:2	100	4	6	Str	0.061	0.049	----	0.044	----	----	0.056	----	0.046	0.010	----	0.075	----	0.046	----	----	0.108	----	0.054	----
1:2	100	5	5	Mod	0.056	0.052	----	0.043	----	----	0.051	----	0.042	0.021	----	0.050	----	0.044	----	----	0.052	----	0.043	----
1:2	100	5	5	Str	0.060	0.056	----	0.050	----	----	0.052	----	0.043	0.010	----	0.067	----	0.045	----	----	0.083	----	0.048	----
1:2	100	6	4	Mod	0.055	0.049	----	0.044	----	----	0.056	----	0.048	0.018	----	0.049	----	0.043	----	----	0.053	----	0.046	----
1:2	100	6	4	Str	0.061	0.052	----	0.050	----	----	0.053	----	0.048	0.011	----	0.055	----	0.045	----	----	0.054	----	0.040	----
1:2	100	8	12	Mod	0.060	0.051	----	0.050	----	----	0.054	----	0.048	0.010	----	0.065	----	0.053	0.009	----	0.089	----	0.059	----
1:2	100	8	12	Str	0.056	0.053	----	0.054	----	----	0.066	----	0.054	0.005	----	0.122	----	0.069	0.001	----	0.176	----	0.094	----
1:2	100	10	10	Mod	0.058	0.053	----	0.052	----	----	0.051	----	0.049	0.011	----	0.062	----	0.050	0.008	----	0.069	----	0.052	----
1:2	100	10	10	Str	0.054	0.051	----	0.051	----	----	0.060	----	0.054	0.006	----	0.108	----	0.062	0.002	----	0.137	----	0.078	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 26 (continued). Power estimates for conditions when the population effect size variance is 0.33.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:2	100	12	8	Mod	0.054	0.052	----	0.052	----	----	0.052	----	0.050	0.011	----	0.054	----	0.046	0.008	----	0.053	----	0.047	----
1:2	100	12	8	Str	0.056	0.049	----	0.047	----	----	0.056	----	0.054	0.006	----	0.079	----	0.053	0.002	----	0.090	----	0.056	----
1:2	100	40	60	Mod	0.056	0.056	0.107	0.059	----	----	0.060	----	0.064	----	----	0.079	----	0.073	0.004	----	0.093	----	0.078	0.009
1:2	100	40	60	Str	0.056	0.052	0.130	0.063	----	----	0.066	----	0.067	----	----	0.125	----	0.095	0.001	----	0.138	----	0.110	0.006
1:2	100	50	50	Mod	0.049	0.049	0.107	0.055	----	----	0.057	----	0.060	----	----	0.071	----	0.065	0.005	----	0.070	----	0.062	0.008
1:2	100	50	50	Str	0.056	0.050	0.135	0.060	----	----	0.066	----	0.067	----	----	0.104	----	0.081	0.002	----	0.108	----	0.088	0.006
1:2	100	60	40	Mod	0.054	0.048	0.104	0.057	----	----	0.057	----	0.061	----	----	0.058	----	0.056	0.005	----	0.057	----	0.057	0.009
1:2	100	60	40	Str	0.053	0.053	0.129	0.063	----	----	0.060	----	0.064	----	----	0.080	----	0.068	0.002	----	0.073	----	0.066	0.005
1:4	10	4	6	Mod	----	0.071	0.072	----	----	----	0.069	0.082	----	----	----	0.070	----	----	----	----	0.069	----	----	----
1:4	10	4	6	Str	----	0.069	0.072	----	----	----	0.068	0.079	----	----	----	0.073	----	----	----	----	0.080	----	----	----
1:4	10	5	5	Mod	----	0.067	0.074	----	----	----	0.065	0.084	----	----	----	0.069	----	----	----	----	0.068	----	----	----
1:4	10	5	5	Str	----	0.070	0.075	----	----	----	0.071	0.084	----	----	----	0.068	----	----	----	----	0.068	----	----	----
1:4	10	6	4	Mod	----	0.066	0.078	----	----	----	0.066	----	----	----	----	0.065	----	----	----	----	0.070	----	----	----
1:4	10	6	4	Str	----	0.072	0.078	----	----	----	0.068	----	----	----	----	0.070	----	----	----	----	0.066	----	----	----
1:4	10	8	12	Mod	0.067	0.064	0.047	----	----	0.078	0.069	0.047	----	----	----	0.069	0.061	----	----	----	0.073	0.081	----	----
1:4	10	8	12	Str	0.075	0.073	0.054	----	----	0.084	0.068	0.055	----	----	----	0.078	0.064	----	----	----	0.085	0.093	----	----
1:4	10	10	10	Mod	0.069	0.066	0.053	----	----	0.077	0.065	0.050	----	----	----	0.066	0.066	----	----	----	0.066	----	----	----
1:4	10	10	10	Str	0.072	0.068	0.050	----	----	0.086	0.068	0.055	----	----	----	0.075	0.077	----	----	----	0.075	----	----	----
1:4	10	12	8	Mod	0.071	0.065	0.055	----	----	0.083	0.061	0.056	----	----	----	0.064	0.071	----	----	----	0.064	----	----	----
1:4	10	12	8	Str	0.071	0.065	0.052	----	----	0.094	0.064	0.058	----	----	----	0.065	0.075	----	----	----	0.067	----	----	----
1:4	10	40	60	Mod	0.063	0.063	0.059	----	----	0.067	0.065	0.058	----	----	0.089	0.066	0.066	----	----	----	0.065	0.083	----	----
1:4	10	40	60	Str	0.071	0.072	0.069	----	----	0.075	0.070	0.068	----	----	0.105	0.076	0.072	----	----	----	0.074	0.092	----	----
1:4	10	50	50	Mod	0.065	0.066	0.059	----	----	0.074	0.064	0.067	----	----	----	0.065	0.069	----	----	----	0.063	0.089	----	----
1:4	10	50	50	Str	0.067	0.065	0.064	----	----	0.081	0.069	0.066	----	----	----	0.069	0.080	----	----	----	0.070	0.102	----	----
1:4	10	60	40	Mod	0.064	0.065	0.066	----	----	0.074	0.061	0.066	----	----	----	0.060	0.073	----	----	----	0.063	----	----	----
1:4	10	60	40	Str	0.064	0.065	0.069	----	----	0.083	0.069	0.070	----	----	----	0.064	0.081	----	----	----	0.062	----	----	----
1:4	20	4	6	Mod	0.070	0.061	----	0.031	----	----	0.058	----	----	----	----	0.060	----	----	----	----	0.062	----	----	----
1:4	20	4	6	Str	0.071	0.054	----	0.028	----	----	0.066	----	----	----	----	0.065	----	----	----	----	0.070	----	----	----
1:4	20	5	5	Mod	0.069	0.056	----	0.032	----	----	0.059	----	0.028	----	----	0.057	----	0.028	----	----	0.052	----	0.026	----
1:4	20	5	5	Str	0.069	0.053	----	0.031	----	----	0.057	----	0.034	----	----	0.059	----	0.028	----	----	0.065	----	0.027	----
1:4	20	6	4	Mod	0.076	0.056	----	0.034	----	----	0.059	----	0.036	----	----	0.055	----	0.029	----	----	0.054	----	0.029	----
1:4	20	6	4	Str	0.076	0.054	----	0.035	----	----	0.058	----	0.037	----	----	0.053	----	0.030	----	----	0.056	----	0.026	----
1:4	20	8	12	Mod	0.059	0.057	----	0.036	----	0.075	0.059	----	0.036	----	----	0.062	----	0.035	----	----	0.066	----	0.035	----
1:4	20	8	12	Str	0.061	0.057	----	0.037	----	0.094	0.064	----	0.041	----	----	0.074	----	0.041	----	----	0.087	----	0.042	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 26 (continued). Power estimates for conditions when the population effect size variance is 0.33.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:4	20	10	10	Mod	0.062	0.053	----	0.035	----	0.081	0.054	----	0.033	----	----	0.057	----	0.034	----	----	0.064	----	0.035	----
1:4	20	10	10	Str	0.065	0.059	----	0.042	----	0.098	0.061	----	0.036	----	----	0.064	----	0.037	----	----	0.073	----	0.036	----
1:4	20	12	8	Mod	0.059	0.051	----	0.036	----	0.085	0.055	----	0.038	----	----	0.051	----	0.031	----	----	0.052	----	0.030	----
1:4	20	12	8	Str	0.062	0.057	----	0.039	----	0.096	0.054	----	0.035	----	----	0.057	----	0.037	----	----	0.058	----	0.031	----
1:4	20	40	60	Mod	0.058	0.060	----	0.049	----	0.067	0.060	----	0.048	----	----	0.064	----	0.050	----	----	0.064	----	0.049	----
1:4	20	40	60	Str	0.056	0.058	----	0.051	----	0.078	0.057	----	0.051	----	----	0.069	----	0.055	----	----	0.077	----	0.057	----
1:4	20	50	50	Mod	0.055	0.055	----	0.049	----	0.071	0.057	----	0.047	----	----	0.055	----	0.045	----	----	0.059	----	0.043	----
1:4	20	50	50	Str	0.061	0.056	----	0.046	----	0.082	0.059	----	0.052	----	----	0.065	----	0.048	----	----	0.067	----	0.050	----
1:4	20	60	40	Mod	0.056	0.054	----	0.044	----	0.070	0.052	----	0.043	----	----	0.051	----	0.043	----	----	0.058	----	0.041	----
1:4	20	60	40	Str	0.060	0.054	----	0.049	----	0.084	0.055	----	0.049	----	----	0.053	----	0.040	----	----	0.051	----	0.037	----
1:4	50	4	6	Mod	0.062	0.051	----	0.038	----	----	0.047	----	0.036	----	----	0.056	----	0.036	0.011	----	0.071	----	0.039	----
1:4	50	4	6	Str	0.061	0.056	----	0.043	----	----	0.058	----	0.043	----	----	0.079	----	0.044	0.004	----	0.107	----	0.053	----
1:4	50	5	5	Mod	0.064	0.050	----	0.040	----	----	0.050	----	0.038	----	----	0.049	----	0.036	0.010	----	0.048	----	0.032	----
1:4	50	5	5	Str	0.064	0.050	----	0.044	----	----	0.052	----	0.042	----	----	0.059	----	0.040	0.003	----	0.073	----	0.041	----
1:4	50	6	4	Mod	0.064	0.049	----	0.044	----	----	0.053	----	0.046	----	----	0.051	----	0.041	0.010	----	0.051	----	0.041	----
1:4	50	6	4	Str	0.061	0.053	----	0.048	----	----	0.052	----	0.046	----	----	0.053	----	0.042	0.003	----	0.053	----	0.042	----
1:4	50	8	12	Mod	0.058	0.054	----	0.049	----	0.095	0.055	----	0.046	----	----	0.066	----	0.049	0.004	----	0.087	----	0.057	0.018
1:4	50	8	12	Str	0.058	0.055	----	0.052	----	0.139	0.064	----	0.053	----	----	0.103	----	0.060	0.001	----	0.138	----	0.083	0.023
1:4	50	10	10	Mod	0.059	0.053	----	0.049	----	----	0.050	----	0.045	----	----	0.056	----	0.043	0.005	----	0.061	----	0.046	0.018
1:4	50	10	10	Str	0.060	0.051	----	0.050	----	----	0.062	----	0.052	----	----	0.081	----	0.053	0.002	----	0.097	----	0.059	0.018
1:4	50	12	8	Mod	0.056	0.047	----	0.045	----	----	0.049	----	0.045	----	----	0.048	----	0.043	0.006	----	0.050	----	0.042	0.015
1:4	50	12	8	Str	0.059	0.049	----	0.049	----	----	0.050	----	0.046	----	----	0.058	----	0.048	0.001	----	0.066	----	0.050	0.014
1:4	50	40	60	Mod	0.051	0.055	----	0.066	----	0.091	0.057	----	0.065	----	----	0.067	----	0.069	----	----	0.086	----	0.086	----
1:4	50	40	60	Str	0.052	0.054	----	0.064	----	0.113	0.061	----	0.067	----	----	0.102	----	0.088	----	----	0.117	----	0.112	----
1:4	50	50	50	Mod	0.051	0.049	----	0.054	----	0.100	0.056	----	0.061	----	----	0.062	----	0.068	----	----	0.066	----	0.064	0.017
1:4	50	50	50	Str	0.054	0.052	----	0.063	----	0.118	0.056	----	0.062	----	----	0.083	----	0.077	----	----	0.083	----	0.079	0.026
1:4	50	60	40	Mod	0.053	0.050	----	0.059	----	0.101	0.053	----	0.058	----	----	0.055	----	0.053	----	----	0.051	----	0.056	----
1:4	50	60	40	Str	0.056	0.052	----	0.062	----	0.120	0.054	----	0.059	----	----	0.058	----	0.058	----	----	0.055	----	0.054	----
1:4	100	4	6	Mod	0.058	0.050	----	0.040	----	----	0.054	----	0.043	0.023	----	0.059	----	0.042	----	----	0.079	----	0.045	----
1:4	100	4	6	Str	0.057	0.051	----	0.045	----	----	0.058	----	0.043	0.011	----	0.091	----	0.042	----	----	0.153	----	0.062	----
1:4	100	5	5	Mod	0.056	0.051	----	0.044	----	----	0.053	----	0.044	0.021	----	0.054	----	0.040	----	----	0.060	----	0.041	----
1:4	100	5	5	Str	0.058	0.049	----	0.044	----	----	0.053	----	0.044	0.015	----	0.069	----	0.046	----	----	0.090	----	0.045	----
1:4	100	6	4	Mod	0.059	0.050	----	0.049	----	----	0.046	----	0.044	0.023	----	0.054	----	0.048	----	----	0.058	----	0.051	----
1:4	100	6	4	Str	0.056	0.054	----	0.051	----	----	0.048	----	0.045	0.012	----	0.050	----	0.042	----	----	0.047	----	0.037	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 26 (continued). Power estimates for conditions when the population effect size variance is 0.33.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:4	100	8	12	Mod	0.058	0.055	----	0.051	----	----	0.057	----	0.053	0.014	----	0.079	----	0.055	0.016	----	0.113	----	0.069	----
1:4	100	8	12	Str	0.059	0.057	----	0.057	----	----	0.070	----	0.055	0.006	----	0.143	----	0.073	0.004	----	0.229	----	0.117	----
1:4	100	10	10	Mod	0.060	0.052	----	0.050	----	----	0.055	----	0.051	0.015	----	0.061	----	0.050	0.019	----	0.075	----	0.050	----
1:4	100	10	10	Str	0.059	0.051	----	0.053	----	----	0.061	----	0.056	0.009	----	0.112	----	0.066	0.006	----	0.155	----	0.082	----
1:4	100	12	8	Mod	0.055	0.051	----	0.053	----	----	0.049	----	0.048	0.016	----	0.051	----	0.050	0.018	----	0.053	----	0.047	----
1:4	100	12	8	Str	0.058	0.052	----	0.055	----	----	0.055	----	0.050	0.009	----	0.067	----	0.050	0.006	----	0.082	----	0.057	----
1:4	100	40	60	Mod	0.051	0.048	----	0.063	----	----	0.059	----	0.070	----	----	0.093	----	0.087	0.010	----	0.121	----	0.121	0.024
1:4	100	40	60	Str	0.052	0.052	----	0.071	----	----	0.070	----	0.075	----	----	0.148	----	0.123	0.006	----	0.180	----	0.162	0.016
1:4	100	50	50	Mod	0.053	0.052	----	0.063	----	----	0.060	----	0.070	0.013	----	0.075	----	0.074	0.012	----	0.081	----	0.084	0.022
1:4	100	50	50	Str	0.050	0.051	----	0.067	----	----	0.066	----	0.075	0.011	----	0.110	----	0.098	0.005	----	0.109	----	0.100	0.017
1:4	100	60	40	Mod	0.053	0.052	----	0.061	----	----	0.050	----	0.061	0.011	----	0.054	----	0.061	0.012	----	0.051	----	0.058	0.028
1:4	100	60	40	Str	0.051	0.056	----	0.069	----	----	0.058	----	0.069	0.008	----	0.070	----	0.068	0.005	----	0.060	----	0.061	0.017
1:8	10	4	6	Mod	----	0.072	0.098	----	----	----	0.067	----	----	----	----	0.076	----	----	----	----	0.080	----	----	----
1:8	10	4	6	Str	----	0.073	0.093	----	----	----	0.076	----	----	----	----	0.075	----	----	----	----	0.079	----	----	----
1:8	10	5	5	Mod	----	0.070	----	----	----	----	0.068	----	----	----	----	0.072	----	----	----	----	0.072	----	----	----
1:8	10	5	5	Str	----	0.068	----	----	----	----	0.071	----	----	----	----	0.070	----	----	----	----	0.074	----	----	----
1:8	10	6	4	Mod	----	0.068	----	----	----	----	0.068	----	----	----	----	0.067	----	----	----	----	0.069	----	----	----
1:8	10	6	4	Str	----	0.068	----	----	----	----	0.070	----	----	----	----	0.065	----	----	----	----	0.062	----	----	----
1:8	10	8	12	Mod	0.074	0.072	0.064	----	----	0.079	0.068	0.067	----	----	----	0.074	0.085	----	----	----	0.076	----	----	----
1:8	10	8	12	Str	0.078	0.073	0.077	----	----	0.096	0.079	0.082	----	----	----	0.082	0.097	----	----	----	0.088	----	----	----
1:8	10	10	10	Mod	0.074	0.071	0.081	----	----	0.084	0.068	0.082	----	----	----	0.071	----	----	----	----	0.067	----	----	----
1:8	10	10	10	Str	0.084	0.071	0.085	----	----	0.095	0.072	0.086	----	----	----	0.073	----	----	----	----	0.080	----	----	----
1:8	10	12	8	Mod	0.075	0.064	0.085	----	----	----	0.066	----	----	----	----	0.068	----	----	----	----	0.067	----	----	----
1:8	10	12	8	Str	0.079	0.064	0.087	----	----	----	0.065	----	----	----	----	0.066	----	----	----	----	0.066	----	----	----
1:8	10	40	60	Mod	0.065	0.070	0.092	----	----	0.074	0.068	----	----	----	----	0.068	----	0.027	----	----	0.073	----	0.030	----
1:8	10	40	60	Str	0.070	0.071	0.101	----	----	0.079	0.073	----	----	----	----	0.076	----	0.032	----	----	0.074	----	0.035	----
1:8	10	50	50	Mod	0.069	0.068	----	----	----	0.077	0.070	----	----	----	----	0.068	----	----	----	----	0.068	----	0.028	----
1:8	10	50	50	Str	0.075	0.067	----	----	----	0.085	0.068	----	----	----	----	0.070	----	----	----	----	0.073	----	0.028	----
1:8	10	60	40	Mod	0.069	0.067	----	----	----	0.077	0.063	----	----	----	----	0.065	----	----	----	----	0.062	----	----	----
1:8	10	60	40	Str	0.073	0.068	----	----	----	0.082	0.067	----	----	----	----	0.066	----	----	----	----	0.066	----	----	----
1:8	20	4	6	Mod	0.068	0.058	----	----	----	----	0.058	----	----	----	----	0.062	----	----	----	----	0.068	----	----	----
1:8	20	4	6	Str	0.077	0.061	----	----	----	----	0.062	----	----	----	----	0.071	----	----	----	----	0.090	----	----	----
1:8	20	5	5	Mod	0.073	0.057	----	0.030	----	----	0.054	----	0.030	----	----	0.061	----	0.032	----	----	0.060	----	0.026	----
1:8	20	5	5	Str	0.077	0.058	----	0.035	----	----	0.056	----	0.034	----	----	0.059	----	0.030	----	----	0.064	----	0.030	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 26 (continued). Power estimates for conditions when the population effect size variance is 0.33.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:8	20	6	4	Mod	0.074	0.054	----	0.035	----	----	0.056	----	0.035	----	----	0.059	----	0.033	----	----	0.054	----	0.030	----
1:8	20	6	4	Str	0.075	0.053	----	0.036	----	----	0.058	----	0.040	----	----	0.054	----	0.031	----	----	0.054	----	0.027	----
1:8	20	8	12	Mod	0.061	0.058	----	0.038	----	0.077	0.059	----	0.035	----	----	0.063	----	0.036	----	----	0.079	----	0.041	----
1:8	20	8	12	Str	0.067	0.062	----	0.041	----	0.095	0.066	----	0.042	----	----	0.086	----	0.044	----	----	0.093	----	0.049	----
1:8	20	10	10	Mod	0.064	0.056	----	0.036	----	0.078	0.052	----	0.034	----	----	0.058	----	0.031	----	----	0.063	----	0.036	----
1:8	20	10	10	Str	0.068	0.057	----	0.041	----	0.103	0.058	----	0.036	----	----	0.068	----	0.039	----	----	0.074	----	0.039	----
1:8	20	12	8	Mod	0.065	0.055	----	0.037	----	0.093	0.056	----	0.038	----	----	0.055	----	0.037	----	----	0.053	----	0.032	----
1:8	20	12	8	Str	0.063	0.052	----	0.038	----	0.106	0.055	----	0.040	----	----	0.059	----	0.037	----	----	0.057	----	0.035	----
1:8	20	40	60	Mod	0.057	0.054	----	0.056	----	0.070	0.061	----	0.060	----	----	0.065	----	0.060	----	----	0.076	----	0.071	----
1:8	20	40	60	Str	0.060	0.062	----	0.063	----	0.082	0.065	----	0.065	----	----	0.083	----	0.075	----	----	0.086	----	0.075	----
1:8	20	50	50	Mod	0.062	0.058	----	0.053	----	0.078	0.062	----	0.056	----	----	0.058	----	0.056	----	----	0.061	----	0.055	----
1:8	20	50	50	Str	0.061	0.062	----	0.064	----	0.087	0.062	----	0.058	----	----	0.065	----	0.062	----	----	0.069	----	0.059	----
1:8	20	60	40	Mod	0.062	0.054	----	0.051	----	0.080	0.051	----	0.050	----	----	0.057	----	0.051	----	----	0.052	----	0.046	----
1:8	20	60	40	Str	0.059	0.055	----	0.055	----	0.090	0.059	----	0.053	----	----	0.061	----	0.055	----	----	0.055	----	0.046	----
1:8	50	4	6	Mod	0.065	0.051	----	0.037	----	----	0.053	----	0.037	----	----	0.063	----	0.038	0.013	----	0.076	----	0.039	----
1:8	50	4	6	Str	0.059	0.051	----	0.040	----	----	0.057	----	0.042	----	----	0.083	----	0.041	0.006	----	0.124	----	0.052	----
1:8	50	5	5	Mod	0.056	0.050	----	0.040	----	----	0.051	----	0.037	----	----	0.052	----	0.037	0.019	----	0.056	----	0.035	----
1:8	50	5	5	Str	0.067	0.052	----	0.043	----	----	0.053	----	0.040	----	----	0.065	----	0.041	0.007	----	0.080	----	0.040	----
1:8	50	6	4	Mod	0.066	0.050	----	0.045	----	----	0.051	----	0.045	----	----	0.051	----	0.042	0.019	----	0.058	----	0.048	----
1:8	50	6	4	Str	0.065	0.049	----	0.048	----	----	0.050	----	0.044	----	----	0.050	----	0.042	0.008	----	0.057	----	0.043	----
1:8	50	8	12	Mod	0.052	0.050	----	0.045	----	----	0.056	----	0.050	----	----	0.076	----	0.057	0.009	----	0.096	----	0.066	----
1:8	50	8	12	Str	0.057	0.054	----	0.053	----	----	0.062	----	0.053	----	----	0.119	----	0.067	0.004	----	0.166	----	0.090	----
1:8	50	10	10	Mod	0.058	0.055	----	0.048	----	----	0.059	----	0.049	----	----	0.059	----	0.045	0.010	----	0.070	----	0.048	----
1:8	50	10	10	Str	0.059	0.051	----	0.049	----	----	0.061	----	0.052	----	----	0.089	----	0.059	0.004	----	0.108	----	0.066	----
1:8	50	12	8	Mod	0.056	0.050	----	0.049	----	----	0.052	----	0.051	----	----	0.052	----	0.046	0.008	----	0.052	----	0.044	----
1:8	50	12	8	Str	0.060	0.054	----	0.052	----	----	0.051	----	0.047	----	----	0.056	----	0.050	0.003	----	0.066	----	0.049	----
1:8	50	40	60	Mod	0.056	0.051	----	0.068	----	0.092	0.059	----	0.075	----	----	0.084	----	0.096	----	----	0.103	----	----	0.020
1:8	50	40	60	Str	0.060	0.056	----	0.078	----	0.118	0.069	----	0.083	----	----	0.112	----	0.106	----	----	0.134	----	----	0.028
1:8	50	50	50	Mod	0.054	0.051	----	0.070	----	0.103	0.056	----	0.067	----	----	0.062	----	0.072	----	----	0.069	----	0.077	0.021
1:8	50	50	50	Str	0.055	0.052	----	0.075	----	0.126	0.061	----	0.076	----	----	0.083	----	0.084	----	----	0.086	----	0.095	0.031
1:8	50	60	40	Mod	0.057	0.054	----	0.068	----	----	0.052	----	0.066	----	----	0.055	----	0.067	----	----	0.052	----	0.061	0.023
1:8	50	60	40	Str	0.053	0.052	----	0.070	----	----	0.057	----	0.072	----	----	0.060	----	0.065	----	----	0.057	----	0.064	0.026
1:8	100	4	6	Mod	0.062	0.053	----	0.040	----	----	0.056	----	0.040	0.026	----	0.073	----	0.045	----	----	0.099	----	0.047	----
1:8	100	4	6	Str	0.057	0.052	----	0.042	----	----	0.063	----	0.043	0.017	----	0.114	----	0.046	----	----	0.203	----	0.076	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 26 (continued). Power estimates for conditions when the population effect size variance is 0.33.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:8	100	5	5	Mod	0.060	0.056	----	0.046	----	----	0.049	----	0.043	0.031	----	0.051	----	0.041	----	----	0.061	----	0.039	----
1:8	100	5	5	Str	0.060	0.053	----	0.045	----	----	0.056	----	0.047	0.019	----	0.069	----	0.041	----	----	0.101	----	0.048	----
1:8	100	6	4	Mod	0.057	0.052	----	0.050	----	----	0.051	----	0.046	0.027	----	0.054	----	0.048	----	----	----	----	----	----
1:8	100	6	4	Str	0.058	0.052	----	0.051	----	----	0.048	----	0.049	0.020	----	0.048	----	0.046	----	----	----	----	----	----
1:8	100	8	12	Mod	0.057	0.053	----	0.051	----	----	0.060	----	0.054	0.018	----	0.097	----	0.066	----	----	0.145	----	0.089	----
1:8	100	8	12	Str	0.061	0.054	----	0.058	----	----	0.080	----	0.064	0.012	----	0.173	----	0.085	----	----	0.278	----	0.149	----
1:8	100	10	10	Mod	0.051	0.048	----	0.046	----	----	0.054	----	0.048	0.023	----	0.071	----	0.058	----	----	0.083	----	0.057	----
1:8	100	10	10	Str	0.059	0.052	----	0.052	----	----	0.065	----	0.058	0.012	----	0.123	----	0.072	----	----	0.171	----	0.092	----
1:8	100	12	8	Mod	0.058	0.055	----	0.052	----	----	0.053	----	0.052	0.020	----	0.050	----	0.047	----	----	0.050	----	0.046	----
1:8	100	12	8	Str	0.055	0.048	----	0.052	----	----	0.054	----	0.053	0.013	----	0.066	----	0.054	----	----	0.072	----	0.050	----
1:8	100	40	60	Mod	0.054	0.049	----	0.072	----	----	0.067	----	0.084	0.015	----	0.112	----	----	0.022	----	0.152	----	----	----
1:8	100	40	60	Str	0.050	0.049	----	0.077	----	----	0.075	----	0.090	0.012	----	0.170	----	----	0.014	----	0.215	----	----	----
1:8	100	50	50	Mod	0.055	0.051	----	0.069	----	----	0.058	----	0.080	0.017	----	0.082	----	0.093	0.029	----	0.087	----	0.105	----
1:8	100	50	50	Str	0.053	0.051	----	0.079	----	----	0.068	----	0.084	0.012	----	0.121	----	0.120	0.019	----	0.130	----	0.137	----
1:8	100	60	40	Mod	0.053	0.050	----	0.068	----	----	0.055	----	0.070	0.019	----	0.055	----	0.064	0.028	----	0.049	----	0.061	----
1:8	100	60	40	Str	0.057	0.052	----	0.072	----	----	0.060	----	0.077	0.014	----	0.068	----	0.077	0.017	----	0.061	----	0.072	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 27. Power estimates for conditions when the population effect size variance is 0.50.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	10	4	6	Mod	----	0.071	0.064	----	----	----	0.067	0.071	----	----	----	0.070	----	----	----	----	0.066	----	----	----
1:1	10	4	6	Str	----	0.072	0.063	----	----	----	0.069	0.070	----	----	----	0.074	----	----	----	----	0.070	----	----	----
1:1	10	5	5	Mod	----	0.074	0.064	----	----	----	0.070	0.072	----	----	----	0.069	----	----	----	----	0.071	----	----	----
1:1	10	5	5	Str	----	0.069	0.063	----	----	----	0.069	0.061	----	----	----	0.069	----	----	----	----	0.070	----	----	----
1:1	10	6	4	Mod	----	0.065	0.064	----	----	----	0.069	0.069	----	----	----	0.067	----	----	----	----	0.065	----	----	----
1:1	10	6	4	Str	----	0.067	0.061	----	----	----	0.068	0.068	----	----	----	0.072	----	----	----	----	0.070	----	----	----
1:1	10	8	12	Mod	0.068	0.067	0.034	----	----	0.074	0.067	0.034	----	----	----	0.066	0.044	----	----	----	0.068	0.066	----	----
1:1	10	8	12	Str	0.067	0.063	0.035	----	----	0.083	0.073	0.038	----	----	----	0.071	0.048	----	----	----	0.073	0.070	----	----
1:1	10	10	10	Mod	0.070	0.069	0.032	----	----	0.074	0.063	0.036	----	----	----	0.071	0.044	----	----	----	0.067	0.065	----	----
1:1	10	10	10	Str	0.074	0.071	0.036	----	----	0.083	0.066	0.033	----	----	----	0.068	0.046	----	----	----	0.069	0.072	----	----
1:1	10	12	8	Mod	0.068	0.065	0.036	----	----	0.073	0.071	0.038	----	----	----	0.061	0.041	----	----	----	0.065	0.068	----	----
1:1	10	12	8	Str	0.072	0.071	0.039	----	----	0.086	0.069	0.039	----	----	----	0.071	0.043	----	----	----	0.071	0.071	----	----
1:1	10	40	60	Mod	0.060	0.062	0.032	----	----	0.069	0.067	0.032	----	----	0.095	0.064	0.039	----	----	----	0.066	0.046	----	----
1:1	10	40	60	Str	0.067	0.071	0.034	----	----	0.075	0.068	0.035	----	----	0.105	0.065	0.043	----	----	----	0.071	0.053	----	----
1:1	10	50	50	Mod	0.062	0.064	0.033	----	----	0.065	0.065	0.033	----	----	----	0.063	0.038	----	----	----	0.065	0.044	----	----
1:1	10	50	50	Str	0.067	0.067	0.030	----	----	0.071	0.061	0.032	----	----	----	0.066	0.041	----	----	----	0.064	0.053	----	----
1:1	10	60	40	Mod	0.060	0.063	0.032	----	----	0.068	0.066	0.033	----	----	----	0.067	0.037	----	----	----	0.063	0.048	----	----
1:1	10	60	40	Str	0.059	0.064	0.031	----	----	0.074	0.063	0.035	----	----	----	0.065	0.042	----	----	----	0.065	0.054	----	----
1:1	20	4	6	Mod	0.065	0.054	----	0.030	----	----	0.055	----	0.032	----	----	0.051	----	0.029	----	----	0.054	----	0.029	----
1:1	20	4	6	Str	0.073	0.058	----	0.035	----	----	0.057	----	0.032	----	----	0.058	----	0.033	----	----	0.059	----	0.030	----
1:1	20	5	5	Mod	0.068	0.056	----	0.032	----	----	0.056	----	0.033	----	----	0.055	----	0.029	----	----	0.056	----	0.028	----
1:1	20	5	5	Str	0.074	0.058	----	0.037	----	----	0.058	----	0.033	----	----	0.061	----	0.033	----	----	0.063	----	0.030	----
1:1	20	6	4	Mod	0.068	0.052	----	0.032	----	----	0.055	----	0.035	----	----	0.055	----	0.031	----	----	0.058	----	0.031	----
1:1	20	6	4	Str	0.072	0.056	----	0.034	----	----	0.049	----	0.030	----	----	0.057	----	0.030	----	----	0.058	----	0.031	----
1:1	20	8	12	Mod	0.057	0.054	0.085	0.036	----	0.079	0.054	----	0.038	----	----	0.060	----	0.035	----	----	0.053	----	0.031	----
1:1	20	8	12	Str	0.062	0.055	0.091	0.037	----	0.086	0.053	----	0.035	----	----	0.059	----	0.038	----	----	0.064	----	0.034	----
1:1	20	10	10	Mod	0.060	0.059	0.084	0.040	----	0.081	0.057	----	0.038	----	----	0.055	----	0.036	----	----	0.056	----	0.034	----
1:1	20	10	10	Str	0.058	0.056	0.082	0.037	----	0.087	0.055	----	0.036	----	----	0.063	----	0.037	----	----	0.067	----	0.035	----
1:1	20	12	8	Mod	0.057	0.053	0.082	0.035	----	0.077	0.055	----	0.036	----	----	0.053	----	0.032	----	----	0.056	----	0.032	----
1:1	20	12	8	Str	0.061	0.062	0.091	0.040	----	0.089	0.060	----	0.040	----	----	0.061	----	0.036	----	----	0.066	----	0.036	----
1:1	20	40	60	Mod	0.058	0.055	0.061	0.044	----	0.069	0.055	0.065	0.045	----	----	0.056	0.076	0.041	----	----	0.056	----	0.040	----
1:1	20	40	60	Str	0.054	0.054	0.068	0.040	----	0.080	0.059	0.074	0.043	----	----	0.063	0.089	0.046	----	----	0.061	----	0.043	----
1:1	20	50	50	Mod	0.054	0.050	0.062	0.041	----	0.067	0.054	0.066	0.042	----	----	0.057	0.079	0.041	----	----	0.056	----	0.040	----
1:1	20	50	50	Str	0.056	0.056	0.073	0.050	----	0.079	0.059	0.077	0.047	----	----	0.062	0.094	0.047	----	----	0.058	----	0.040	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 27 (continued). Power estimates for conditions when the population effect size variance is 0.50.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	20	60	40	Mod	0.050	0.053	0.063	0.041	----	0.069	0.057	0.067	0.043	----	----	0.057	0.082	0.043	----	----	0.052	----	0.036	----
1:1	20	60	40	Str	0.059	0.060	0.071	0.046	----	0.079	0.055	0.075	0.041	----	----	0.062	0.089	0.044	----	----	0.062	----	0.041	----
1:1	50	4	6	Mod	0.062	0.052	----	0.043	----	----	0.049	----	0.041	----	----	0.051	----	0.043	0.009	----	0.056	----	0.043	0.011
1:1	50	4	6	Str	0.062	0.049	----	0.044	----	----	0.053	----	0.043	----	----	0.057	----	0.043	0.002	----	0.063	----	0.044	0.002
1:1	50	5	5	Mod	0.057	0.048	----	0.043	----	----	0.051	----	0.046	----	----	0.055	----	0.043	0.006	----	0.049	----	0.040	0.013
1:1	50	5	5	Str	0.060	0.052	----	0.045	----	----	0.050	----	0.044	----	----	0.062	----	0.047	0.002	----	0.065	----	0.043	0.005
1:1	50	6	4	Mod	0.067	0.051	----	0.042	----	----	0.051	----	0.043	----	----	0.052	----	0.044	0.008	----	0.054	----	0.044	0.011
1:1	50	6	4	Str	0.063	0.056	----	0.050	----	----	0.055	----	0.047	----	----	0.057	----	0.046	0.001	----	0.057	----	0.042	0.003
1:1	50	8	12	Mod	0.056	0.052	----	0.047	----	----	0.055	----	0.051	----	----	0.054	----	0.047	----	----	0.056	----	0.046	0.004
1:1	50	8	12	Str	0.056	0.055	----	0.050	----	----	0.055	----	0.054	----	----	0.068	----	0.050	----	----	0.074	----	0.052	0.003
1:1	50	10	10	Mod	0.054	0.050	----	0.048	----	----	0.051	----	0.045	----	----	0.052	----	0.047	----	----	0.060	----	0.047	0.004
1:1	50	10	10	Str	0.053	0.051	----	0.048	----	----	0.057	----	0.051	----	----	0.067	----	0.054	----	----	0.080	----	0.053	0.003
1:1	50	12	8	Mod	0.053	0.054	----	0.050	----	----	0.053	----	0.048	----	----	0.054	----	0.046	----	----	0.058	----	0.047	0.004
1:1	50	12	8	Str	0.056	0.049	----	0.048	----	----	0.055	----	0.048	----	----	0.063	----	0.047	----	----	0.068	----	0.048	0.003
1:1	50	40	60	Mod	0.052	0.054	0.085	0.055	----	0.094	0.051	0.090	0.057	----	----	0.055	----	0.055	----	----	0.058	----	0.056	----
1:1	50	40	60	Str	0.052	0.049	0.100	0.057	----	0.107	0.057	0.110	0.058	----	----	0.063	----	0.057	----	----	0.066	----	0.057	----
1:1	50	50	50	Mod	0.053	0.049	0.083	0.055	----	0.095	0.056	0.095	0.058	----	----	0.053	----	0.054	----	----	0.054	----	0.051	----
1:1	50	50	50	Str	0.053	0.050	0.100	0.058	----	0.112	0.057	0.115	0.062	----	----	0.066	----	0.061	----	----	0.070	----	0.060	----
1:1	50	60	40	Mod	0.053	0.052	0.088	0.055	----	0.087	0.053	0.090	0.059	----	----	0.055	----	0.056	----	----	0.063	----	0.054	----
1:1	50	60	40	Str	0.054	0.049	0.103	0.054	----	0.108	0.056	0.113	0.058	----	----	0.063	----	0.059	----	----	0.068	----	0.059	----
1:1	100	4	6	Mod	0.058	0.049	----	0.047	----	----	0.051	----	0.045	0.021	----	0.049	----	0.047	----	----	0.050	----	0.042	----
1:1	100	4	6	Str	0.055	0.053	----	0.051	----	----	0.052	----	0.049	0.011	----	0.057	----	0.047	----	----	0.069	----	0.046	----
1:1	100	5	5	Mod	0.059	0.050	----	0.047	----	----	0.050	----	0.047	0.018	----	0.050	----	0.046	----	----	0.049	----	0.042	----
1:1	100	5	5	Str	0.054	0.050	----	0.045	----	----	0.052	----	0.047	0.011	----	0.059	----	0.046	----	----	0.073	----	0.050	----
1:1	100	6	4	Mod	0.055	0.048	----	0.047	----	----	0.049	----	0.046	0.018	----	0.050	----	0.047	----	----	0.048	----	0.040	----
1:1	100	6	4	Str	0.056	0.051	----	0.051	----	----	0.057	----	0.053	0.012	----	0.060	----	0.051	----	----	0.063	----	0.046	----
1:1	100	8	12	Mod	0.054	0.049	----	0.051	----	----	0.057	----	0.051	0.012	----	0.053	----	0.047	0.007	----	0.061	----	0.053	0.011
1:1	100	8	12	Str	0.055	0.052	----	0.051	----	----	0.057	----	0.054	0.007	----	0.076	----	0.056	0.002	----	0.098	----	0.064	0.003
1:1	100	10	10	Mod	0.055	0.050	----	0.049	----	----	0.051	----	0.049	0.015	----	0.055	----	0.048	0.007	----	0.063	----	0.054	----
1:1	100	10	10	Str	0.061	0.053	----	0.056	----	----	0.057	----	0.055	0.006	----	0.089	----	0.059	0.002	----	0.109	----	0.071	----
1:1	100	12	8	Mod	0.057	0.050	----	0.051	----	----	0.049	----	0.052	0.015	----	0.057	----	0.053	0.008	----	0.060	----	0.049	----
1:1	100	12	8	Str	0.056	0.053	----	0.054	----	----	0.061	----	0.058	0.007	----	0.082	----	0.061	0.002	----	0.100	----	0.063	----
1:1	100	40	60	Mod	0.054	0.050	0.094	0.056	----	----	0.051	0.109	0.056	----	----	0.055	----	0.055	----	----	0.059	----	0.057	0.003
1:1	100	40	60	Str	0.053	0.053	0.111	0.060	----	----	0.057	0.137	0.064	----	----	0.075	----	0.069	----	----	0.083	----	0.071	0.002

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 27 (continued). Power estimates for conditions when the population effect size variance is 0.50.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	100	50	50	Mod	0.051	0.050	0.092	0.055	----	----	0.051	0.112	0.060	----	----	0.059	----	0.061	----	----	0.063	----	0.060	0.004
1:1	100	50	50	Str	0.050	0.049	0.107	0.059	----	----	0.054	0.136	0.064	----	----	0.079	----	0.071	----	----	0.090	----	0.075	0.002
1:1	100	60	40	Mod	0.050	0.049	0.091	0.056	----	----	0.053	0.109	0.058	----	----	0.060	----	0.062	----	----	0.063	----	0.060	0.004
1:1	100	60	40	Str	0.047	0.048	0.106	0.060	----	----	0.063	0.140	0.065	----	----	0.082	----	0.071	----	----	0.082	----	0.069	0.001
1:2	10	4	6	Mod	----	0.068	0.071	----	----	----	0.068	0.076	----	----	----	0.072	----	----	----	----	0.070	----	----	----
1:2	10	4	6	Str	----	0.069	0.068	----	----	----	0.069	0.072	----	----	----	0.077	----	----	----	----	0.076	----	----	----
1:2	10	5	5	Mod	----	0.070	0.071	----	----	----	0.071	0.074	----	----	----	0.071	----	----	----	----	0.073	----	----	----
1:2	10	5	5	Str	----	0.072	0.067	----	----	----	0.071	0.079	----	----	----	0.070	----	----	----	----	0.074	----	----	----
1:2	10	6	4	Mod	----	0.068	0.075	----	----	----	0.067	0.075	----	----	----	0.066	----	----	----	----	0.066	----	----	----
1:2	10	6	4	Str	----	0.063	0.073	----	----	----	0.070	0.075	----	----	----	0.072	----	----	----	----	0.070	----	----	----
1:2	10	8	12	Mod	0.067	0.068	0.033	----	----	0.077	0.067	0.036	----	----	----	0.070	0.046	----	----	----	0.070	0.068	----	----
1:2	10	8	12	Str	0.071	0.072	0.040	----	----	0.083	0.068	0.041	----	----	----	0.075	0.056	----	----	----	0.074	0.077	----	----
1:2	10	10	10	Mod	0.066	0.065	0.039	----	----	0.077	0.065	0.041	----	----	----	0.068	0.052	----	----	----	0.063	0.074	----	----
1:2	10	10	10	Str	0.074	0.074	0.045	----	----	0.082	0.067	0.040	----	----	----	0.067	0.054	----	----	----	0.070	0.085	----	----
1:2	10	12	8	Mod	0.070	0.066	0.041	----	----	0.073	0.070	0.042	----	----	----	0.061	0.057	----	----	----	0.065	0.082	----	----
1:2	10	12	8	Str	0.073	0.068	0.042	----	----	0.088	0.065	0.044	----	----	----	0.068	0.056	----	----	----	0.069	0.087	----	----
1:2	10	40	60	Mod	0.060	0.063	0.036	----	----	0.068	0.064	0.040	----	----	----	0.067	0.047	----	----	----	0.069	0.051	----	----
1:2	10	40	60	Str	0.070	0.069	0.042	----	----	0.074	0.068	0.045	----	----	----	0.070	0.049	----	----	----	0.068	0.061	----	----
1:2	10	50	50	Mod	0.064	0.064	0.042	----	----	0.070	0.063	0.042	----	----	----	0.064	0.045	----	----	----	0.066	0.059	----	----
1:2	10	50	50	Str	0.067	0.062	0.042	----	----	0.071	0.063	0.040	----	----	----	0.076	0.054	----	----	----	0.063	0.064	----	----
1:2	10	60	40	Mod	0.065	0.070	0.043	----	----	0.071	0.063	0.042	----	----	----	0.063	0.049	----	----	----	0.058	0.058	----	----
1:2	10	60	40	Str	0.068	0.064	0.045	----	----	0.075	0.065	0.043	----	----	----	0.066	0.056	----	----	----	0.065	0.066	----	----
1:2	20	4	6	Mod	0.072	0.052	----	0.027	----	----	0.056	----	0.032	----	----	0.051	----	0.030	----	----	0.054	----	0.027	----
1:2	20	4	6	Str	0.071	0.058	----	0.036	----	----	0.055	----	0.031	----	----	0.062	----	0.029	----	----	0.065	----	0.028	----
1:2	20	5	5	Mod	0.068	0.053	----	0.030	----	----	0.058	----	0.035	----	----	0.057	----	0.029	----	----	0.056	----	0.027	----
1:2	20	5	5	Str	0.074	0.059	----	0.034	----	----	0.055	----	0.030	----	----	0.056	----	0.031	----	----	0.066	----	0.031	----
1:2	20	6	4	Mod	0.080	0.060	----	0.038	----	----	0.058	----	0.035	----	----	0.054	----	0.031	----	----	0.060	----	0.031	----
1:2	20	6	4	Str	0.074	0.054	----	0.034	----	----	0.055	----	0.036	----	----	0.053	----	0.030	----	----	0.056	----	0.029	----
1:2	20	8	12	Mod	0.056	0.055	----	0.038	----	0.075	0.059	----	0.039	----	----	0.055	----	0.034	----	----	0.058	----	0.033	----
1:2	20	8	12	Str	0.062	0.054	----	0.039	----	0.088	0.058	----	0.037	----	----	0.064	----	0.038	----	----	0.068	----	0.037	----
1:2	20	10	10	Mod	0.060	0.053	----	0.034	----	0.079	0.056	----	0.036	----	----	0.058	----	0.032	----	----	0.055	----	0.033	----
1:2	20	10	10	Str	0.065	0.058	----	0.038	----	0.091	0.055	----	0.037	----	----	0.063	----	0.037	----	----	0.064	----	0.037	----
1:2	20	12	8	Mod	0.058	0.049	----	0.032	----	0.083	0.055	----	0.034	----	----	0.056	----	0.036	----	----	0.056	----	0.034	----
1:2	20	12	8	Str	0.062	0.057	----	0.038	----	0.091	0.057	----	0.037	----	----	0.057	----	0.033	----	----	0.054	----	0.031	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 27 (continued). Power estimates for conditions when the population effect size variance is 0.50.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:2	20	40	60	Mod	0.055	0.053	0.076	0.043	----	0.071	0.059	0.079	0.044	----	----	0.059	0.094	0.044	----	----	0.057	----	0.044	----
1:2	20	40	60	Str	0.058	0.056	0.085	0.050	----	0.079	0.055	0.087	0.045	----	----	0.062	0.104	0.044	----	----	0.062	----	0.043	----
1:2	20	50	50	Mod	0.056	0.055	0.075	0.048	----	0.069	0.054	0.079	0.044	----	----	0.057	0.095	0.046	----	----	0.059	----	0.043	----
1:2	20	50	50	Str	0.055	0.058	0.087	0.051	----	0.081	0.058	0.092	0.046	----	----	0.060	0.112	0.045	----	----	0.056	----	0.041	----
1:2	20	60	40	Mod	0.056	0.054	0.079	0.042	----	0.067	0.052	0.077	0.039	----	----	0.057	0.101	0.042	----	----	0.050	----	0.040	----
1:2	20	60	40	Str	0.053	0.053	0.086	0.044	----	0.078	0.055	0.093	0.043	----	----	0.060	0.107	0.044	----	----	0.055	----	0.042	----
1:2	50	4	6	Mod	0.063	0.054	----	0.047	----	----	0.051	----	0.042	----	----	0.051	----	0.039	0.009	----	0.056	----	0.043	----
1:2	50	4	6	Str	0.063	0.054	----	0.047	----	----	0.056	----	0.049	----	----	0.062	----	0.046	0.003	----	0.071	----	0.043	----
1:2	50	5	5	Mod	0.063	0.052	----	0.046	----	----	0.050	----	0.045	----	----	0.052	----	0.041	0.009	----	0.051	----	0.037	----
1:2	50	5	5	Str	0.061	0.051	----	0.046	----	----	0.051	----	0.044	----	----	0.057	----	0.044	0.002	----	0.065	----	0.041	----
1:2	50	6	4	Mod	0.063	0.052	----	0.045	----	----	0.050	----	0.043	----	----	0.052	----	0.044	0.008	----	0.050	----	0.039	----
1:2	50	6	4	Str	0.060	0.056	----	0.050	----	----	0.050	----	0.047	----	----	0.056	----	0.046	0.002	----	0.056	----	0.042	----
1:2	50	8	12	Mod	0.054	0.051	----	0.047	----	----	0.051	----	0.046	----	----	0.059	----	0.049	----	----	0.063	----	0.047	0.004
1:2	50	8	12	Str	0.056	0.052	----	0.050	----	----	0.057	----	0.052	----	----	0.073	----	0.051	----	----	0.092	----	0.062	0.005
1:2	50	10	10	Mod	0.056	0.049	----	0.048	----	----	0.050	----	0.049	----	----	0.056	----	0.046	----	----	0.058	----	0.046	0.004
1:2	50	10	10	Str	0.058	0.055	----	0.052	----	----	0.055	----	0.050	----	----	0.067	----	0.054	----	----	0.080	----	0.055	0.005
1:2	50	12	8	Mod	0.062	0.054	----	0.050	----	----	0.049	----	0.044	----	----	0.048	----	0.046	0.003	----	0.053	----	0.048	0.004
1:2	50	12	8	Str	0.054	0.050	----	0.050	----	----	0.053	----	0.053	----	----	0.062	----	0.050	0.001	----	0.063	----	0.048	0.003
1:2	50	40	60	Mod	0.052	0.049	0.098	0.056	----	0.090	0.055	----	0.059	----	----	0.061	----	0.058	----	----	0.066	----	0.061	----
1:2	50	40	60	Str	0.055	0.053	0.124	0.058	----	0.107	0.058	----	0.066	----	----	0.072	----	0.066	----	----	0.083	----	0.073	----
1:2	50	50	50	Mod	0.050	0.052	----	0.056	----	0.094	0.052	0.112	0.058	----	----	0.059	----	0.056	----	----	0.061	----	0.056	----
1:2	50	50	50	Str	0.057	0.053	----	0.062	----	0.112	0.055	0.136	0.059	----	----	0.071	----	0.064	----	----	0.073	----	0.067	----
1:2	50	60	40	Mod	0.054	0.053	0.099	0.055	----	0.092	0.050	----	0.056	----	----	0.052	----	0.051	----	----	0.055	----	0.053	----
1:2	50	60	40	Str	0.052	0.054	0.121	0.059	----	0.111	0.054	----	0.059	----	----	0.059	----	0.059	----	----	0.058	----	0.053	----
1:2	100	4	6	Mod	0.059	0.053	----	0.047	----	----	0.049	----	0.045	0.017	----	0.052	----	0.045	----	----	0.060	----	0.047	----
1:2	100	4	6	Str	0.058	0.054	----	0.049	----	----	0.056	----	0.053	0.012	----	0.071	----	0.049	----	----	0.091	----	0.049	----
1:2	100	5	5	Mod	0.057	0.053	----	0.046	----	----	0.049	----	0.043	0.019	----	0.051	----	0.043	----	----	0.053	----	0.041	----
1:2	100	5	5	Str	0.060	0.048	----	0.048	----	----	0.052	----	0.047	0.013	----	0.066	----	0.047	----	----	0.068	----	0.046	----
1:2	100	6	4	Mod	0.060	0.056	----	0.051	----	----	0.053	----	0.049	0.020	----	0.049	----	0.045	----	----	0.049	----	0.048	----
1:2	100	6	4	Str	0.060	0.051	----	0.051	----	----	0.053	----	0.052	0.012	----	0.053	----	0.048	----	----	0.058	----	0.049	----
1:2	100	8	12	Mod	0.056	0.051	----	0.053	----	----	0.054	----	0.051	----	----	0.063	----	0.053	0.008	----	0.076	----	0.058	----
1:2	100	8	12	Str	0.058	0.053	----	0.056	----	----	0.061	----	0.059	----	----	0.096	----	0.065	0.002	----	0.134	----	0.077	----
1:2	100	10	10	Mod	0.055	0.052	----	0.053	----	----	0.050	----	0.047	0.014	----	0.054	----	0.049	0.010	----	0.066	----	0.054	----
1:2	100	10	10	Str	0.054	0.050	----	0.050	----	----	0.056	----	0.054	0.009	----	0.089	----	0.064	0.003	----	0.106	----	0.064	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 27 (continued). Power estimates for conditions when the population effect size variance is 0.50.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:2	100	12	8	Mod	0.058	0.050	----	0.052	----	----	0.051	----	0.052	0.014	----	0.053	----	0.051	0.010	----	0.050	----	0.047	----
1:2	100	12	8	Str	0.053	0.050	----	0.053	----	----	0.055	----	0.054	0.009	----	0.071	----	0.058	0.002	----	0.077	----	0.054	----
1:2	100	40	60	Mod	0.053	0.051	----	0.064	----	----	0.058	----	0.067	----	----	0.068	----	0.066	----	----	0.080	----	0.080	0.006
1:2	100	40	60	Str	0.053	0.048	----	0.063	----	----	0.057	----	0.067	----	----	0.093	----	0.081	----	----	0.116	----	0.100	0.002
1:2	100	50	50	Mod	0.054	0.051	----	0.063	----	----	0.051	----	0.061	----	----	0.065	----	0.062	0.006	----	0.065	----	0.066	0.007
1:2	100	50	50	Str	0.052	0.051	----	0.065	----	----	0.060	----	0.068	----	----	0.083	----	0.073	0.003	----	0.091	----	0.079	0.003
1:2	100	60	40	Mod	0.050	0.049	----	0.057	----	----	0.054	----	0.061	----	----	0.057	----	0.059	0.007	----	0.053	----	0.054	0.006
1:2	100	60	40	Str	0.054	0.050	----	0.063	----	----	0.057	----	0.065	----	----	0.073	----	0.068	0.003	----	0.071	----	0.065	0.003
1:4	10	4	6	Mod	----	0.072	0.081	----	----	----	0.069	----	----	----	----	0.072	----	----	----	----	0.067	----	----	----
1:4	10	4	6	Str	----	0.068	0.085	----	----	----	0.070	----	----	----	----	0.075	----	----	----	----	0.076	----	----	----
1:4	10	5	5	Mod	----	0.070	----	----	----	----	0.067	----	----	----	----	0.068	----	----	----	----	0.068	----	----	----
1:4	10	5	5	Str	----	0.071	----	----	----	----	0.068	----	----	----	----	0.069	----	----	----	----	0.070	----	----	----
1:4	10	6	4	Mod	----	0.068	----	----	----	----	0.064	----	----	----	----	0.068	----	----	----	----	0.068	----	----	----
1:4	10	6	4	Str	----	0.071	----	----	----	----	0.069	----	----	----	----	0.069	----	----	----	----	0.064	----	----	----
1:4	10	8	12	Mod	0.070	0.068	0.052	----	----	0.077	0.072	0.051	----	----	----	0.075	0.068	----	----	----	0.070	----	----	----
1:4	10	8	12	Str	0.074	0.068	0.055	----	----	0.085	0.067	0.056	----	----	----	0.072	0.072	----	----	----	0.076	----	----	----
1:4	10	10	10	Mod	0.069	0.066	0.056	----	----	0.076	0.064	0.058	----	----	----	0.065	0.074	----	----	----	0.069	----	----	----
1:4	10	10	10	Str	0.074	0.069	0.058	----	----	0.091	0.075	0.065	----	----	----	0.076	0.084	----	----	----	0.074	----	----	----
1:4	10	12	8	Mod	0.072	0.064	0.062	----	----	----	0.063	0.061	----	----	----	0.064	0.081	----	----	----	0.065	----	----	----
1:4	10	12	8	Str	0.076	0.068	0.061	----	----	----	0.065	0.064	----	----	----	0.061	0.090	----	----	----	0.065	----	----	----
1:4	10	40	60	Mod	0.067	0.066	0.059	----	----	0.073	0.072	0.062	----	----	----	0.066	0.068	----	----	----	0.069	0.083	----	----
1:4	10	40	60	Str	0.068	0.067	0.063	----	----	0.072	0.069	0.070	----	----	----	0.068	0.078	----	----	----	0.077	0.093	----	----
1:4	10	50	50	Mod	0.065	0.063	0.067	----	----	0.071	0.062	0.072	----	----	----	0.065	0.075	----	----	----	0.065	----	----	----
1:4	10	50	50	Str	0.069	0.066	0.072	----	----	0.077	0.068	0.076	----	----	----	0.068	0.078	----	----	----	0.072	----	----	----
1:4	10	60	40	Mod	0.069	0.064	0.068	----	----	0.073	0.064	0.070	----	----	----	0.062	0.081	----	----	----	0.060	----	----	----
1:4	10	60	40	Str	0.068	0.064	0.066	----	----	0.078	0.065	0.076	----	----	----	0.064	0.087	----	----	----	0.061	----	----	----
1:4	20	4	6	Mod	0.071	0.057	----	0.031	----	----	0.056	----	0.030	----	----	0.063	----	0.033	----	----	0.058	----	----	----
1:4	20	4	6	Str	0.076	0.059	----	0.032	----	----	0.054	----	0.030	----	----	0.065	----	0.034	----	----	0.072	----	----	----
1:4	20	5	5	Mod	0.071	0.054	----	0.033	----	----	0.058	----	0.034	----	----	0.057	----	0.030	----	----	0.059	----	0.027	----
1:4	20	5	5	Str	0.072	0.056	----	0.036	----	----	0.056	----	0.034	----	----	0.060	----	0.032	----	----	0.060	----	0.028	----
1:4	20	6	4	Mod	0.069	0.053	----	0.031	----	----	0.056	----	0.034	----	----	0.058	----	0.033	----	----	0.060	----	0.035	----
1:4	20	6	4	Str	0.070	0.053	----	0.035	----	----	0.055	----	0.035	----	----	0.054	----	0.032	----	----	0.052	----	0.031	----
1:4	20	8	12	Mod	0.063	0.058	----	0.040	----	0.079	0.057	----	0.040	----	----	0.062	----	0.036	----	----	0.069	----	0.040	----
1:4	20	8	12	Str	0.065	0.060	----	0.042	----	0.096	0.059	----	0.043	----	----	0.067	----	0.038	----	----	0.077	----	0.040	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 27 (continued). Power estimates for conditions when the population effect size variance is 0.50.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:4	20	10	10	Mod	0.060	0.056	----	0.040	----	0.078	0.052	----	0.035	----	----	0.057	----	0.036	----	----	0.056	----	0.034	----
1:4	20	10	10	Str	0.063	0.055	----	0.042	----	0.094	0.058	----	0.039	----	----	0.064	----	0.040	----	----	0.067	----	0.036	----
1:4	20	12	8	Mod	0.064	0.052	----	0.038	----	0.084	0.053	----	0.036	----	----	0.056	----	0.038	----	----	0.052	----	0.034	----
1:4	20	12	8	Str	0.064	0.051	----	0.037	----	0.097	0.060	----	0.044	----	----	0.054	----	0.036	----	----	0.056	----	0.032	----
1:4	20	40	60	Mod	0.053	0.056	----	0.050	----	0.071	0.057	----	0.051	----	----	0.062	----	0.049	----	----	0.068	----	0.054	----
1:4	20	40	60	Str	0.061	0.055	----	0.053	----	0.075	0.061	----	0.055	----	----	0.068	----	0.056	----	----	0.071	----	0.058	----
1:4	20	50	50	Mod	0.058	0.055	----	0.049	----	0.074	0.057	----	0.048	----	----	0.054	----	0.049	----	----	0.057	----	0.048	----
1:4	20	50	50	Str	0.059	0.056	----	0.051	----	0.085	0.060	----	0.051	----	----	0.056	----	0.047	----	----	0.063	----	0.049	----
1:4	20	60	40	Mod	0.053	0.057	----	0.049	----	0.074	0.052	----	0.047	----	----	0.050	----	0.045	----	----	0.053	----	0.043	----
1:4	20	60	40	Str	0.055	0.055	----	0.048	----	0.084	0.057	----	0.052	----	----	0.056	----	0.047	----	----	0.051	----	0.041	----
1:4	50	4	6	Mod	0.065	0.053	----	0.042	----	----	0.050	----	0.043	----	----	0.054	----	0.041	0.010	----	0.060	----	0.041	----
1:4	50	4	6	Str	0.061	0.048	----	0.040	----	----	0.056	----	0.045	----	----	0.068	----	0.042	0.003	----	0.091	----	0.049	----
1:4	50	5	5	Mod	0.060	0.050	----	0.043	----	----	0.052	----	0.044	----	----	0.053	----	0.040	0.011	----	0.052	----	0.041	----
1:4	50	5	5	Str	0.065	0.056	----	0.046	----	----	0.056	----	0.047	----	----	0.059	----	0.045	0.004	----	0.060	----	0.040	----
1:4	50	6	4	Mod	0.064	0.051	----	0.047	----	----	0.054	----	0.045	----	----	0.052	----	0.047	0.010	----	0.054	----	0.046	----
1:4	50	6	4	Str	0.065	0.051	----	0.049	----	----	0.051	----	0.050	----	----	0.051	----	0.048	0.004	----	0.051	----	0.044	----
1:4	50	8	12	Mod	0.058	0.054	----	0.051	----	----	0.054	----	0.050	----	----	0.062	----	0.050	0.004	----	0.077	----	0.056	0.008
1:4	50	8	12	Str	0.057	0.055	----	0.052	----	----	0.061	----	0.057	----	----	0.082	----	0.057	0.002	----	0.110	----	0.068	0.005
1:4	50	10	10	Mod	0.056	0.054	----	0.049	----	----	0.057	----	0.051	----	----	0.055	----	0.045	0.006	----	0.060	----	0.048	0.010
1:4	50	10	10	Str	0.059	0.054	----	0.052	----	----	0.054	----	0.054	----	----	0.068	----	0.054	0.002	----	0.086	----	0.057	0.005
1:4	50	12	8	Mod	0.058	0.051	----	0.048	----	----	0.051	----	0.050	----	----	0.050	----	0.047	0.006	----	0.053	----	0.047	0.008
1:4	50	12	8	Str	0.062	0.056	----	0.055	----	----	0.054	----	0.052	----	----	0.057	----	0.052	0.002	----	0.062	----	0.052	0.004
1:4	50	40	60	Mod	0.055	0.056	----	0.068	----	0.092	0.054	----	0.066	----	----	0.068	----	0.075	----	----	0.078	----	0.080	----
1:4	50	40	60	Str	0.049	0.043	----	0.058	----	0.109	0.059	----	0.072	----	----	0.084	----	0.082	----	----	0.097	----	0.098	----
1:4	50	50	50	Mod	0.057	0.054	----	0.066	----	0.099	0.055	----	0.066	----	----	0.063	----	0.070	----	----	0.060	----	0.063	----
1:4	50	50	50	Str	0.053	0.051	----	0.063	----	0.120	0.060	----	0.074	----	----	0.072	----	0.075	----	----	0.077	----	0.078	----
1:4	50	60	40	Mod	0.049	0.049	----	0.058	----	----	0.053	----	0.058	----	----	0.052	----	0.058	----	----	0.050	----	0.055	----
1:4	50	60	40	Str	0.055	0.050	----	0.064	----	----	0.055	----	0.066	----	----	0.058	----	0.064	----	----	0.057	----	0.060	----
1:4	100	4	6	Mod	0.053	0.048	----	0.041	----	----	0.051	----	0.044	0.022	----	0.058	----	0.042	----	----	0.069	----	0.046	----
1:4	100	4	6	Str	0.058	0.052	----	0.048	----	----	0.056	----	0.045	0.015	----	0.084	----	0.050	----	----	0.121	----	0.054	----
1:4	100	5	5	Mod	0.065	0.056	----	0.051	----	----	0.052	----	0.047	0.025	----	0.050	----	0.048	----	----	0.051	----	0.042	----
1:4	100	5	5	Str	0.062	0.054	----	0.049	----	----	0.053	----	0.047	0.016	----	0.068	----	0.047	----	----	0.080	----	0.051	----
1:4	100	6	4	Mod	0.053	0.049	----	0.048	----	----	0.046	----	0.043	0.021	----	0.051	----	0.050	----	----	0.055	----	0.052	----
1:4	100	6	4	Str	0.060	0.052	----	0.052	----	----	0.052	----	0.052	0.015	----	0.055	----	0.050	----	----	0.052	----	0.047	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 27 (continued). Power estimates for conditions when the population effect size variance is 0.50.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:4	100	8	12	Mod	0.054	0.052	----	0.055	----	----	0.052	----	0.049	0.016	----	0.068	----	0.054	0.016	----	0.098	----	0.065	----
1:4	100	8	12	Str	0.055	0.053	----	0.057	----	----	0.060	----	0.058	0.009	----	0.118	----	0.071	0.006	----	0.177	----	0.098	----
1:4	100	10	10	Mod	0.059	0.051	----	0.052	----	----	0.051	----	0.051	0.016	----	0.059	----	0.055	0.016	----	0.066	----	0.052	----
1:4	100	10	10	Str	0.059	0.053	----	0.055	----	----	0.063	----	0.059	0.011	----	0.090	----	0.063	0.006	----	0.121	----	0.076	----
1:4	100	12	8	Mod	0.057	0.050	----	0.051	----	----	0.052	----	0.054	0.016	----	0.051	----	0.051	0.017	----	0.047	----	0.047	----
1:4	100	12	8	Str	0.057	0.048	----	0.056	----	----	0.050	----	0.054	0.011	----	0.067	----	0.056	0.007	----	0.067	----	0.052	----
1:4	100	40	60	Mod	0.055	0.052	----	0.071	----	----	0.060	----	0.073	----	----	0.084	----	0.086	0.012	----	0.109	----	0.114	0.018
1:4	100	40	60	Str	0.054	0.052	----	0.070	----	----	0.065	----	0.076	----	----	0.116	----	0.107	0.006	----	0.158	----	0.145	0.009
1:4	100	50	50	Mod	0.048	0.048	----	0.066	----	----	0.055	----	0.071	----	----	0.065	----	0.071	0.011	----	0.071	----	0.081	0.018
1:4	100	50	50	Str	0.056	0.051	----	0.073	----	----	0.059	----	0.075	----	----	0.088	----	0.088	0.009	----	0.102	----	0.098	0.009
1:4	100	60	40	Mod	0.054	0.054	----	0.067	----	----	0.052	----	0.061	----	----	0.054	----	0.066	0.011	----	0.055	----	0.063	0.020
1:4	100	60	40	Str	0.051	0.048	----	0.067	----	----	0.055	----	0.069	----	----	0.063	----	0.067	0.006	----	0.064	----	0.070	0.011
1:8	10	4	6	Mod	----	0.071	----	----	----	----	0.071	----	----	----	----	0.072	----	----	----	----	0.072	----	----	----
1:8	10	4	6	Str	----	0.070	----	----	----	----	0.072	----	----	----	----	0.078	----	----	----	----	0.079	----	----	----
1:8	10	5	5	Mod	----	0.066	----	----	----	----	0.067	----	----	----	----	0.064	----	----	----	----	0.068	----	----	----
1:8	10	5	5	Str	----	0.068	----	----	----	----	0.072	----	----	----	----	0.069	----	----	----	----	0.073	----	----	----
1:8	10	6	4	Mod	----	0.065	----	----	----	----	0.066	----	----	----	----	0.069	----	----	----	----	0.065	----	----	----
1:8	10	6	4	Str	----	0.071	----	----	----	----	0.069	----	----	----	----	0.067	----	----	----	----	0.067	----	----	----
1:8	10	8	12	Mod	0.078	0.073	0.074	----	----	0.078	0.069	0.073	----	----	----	0.071	----	----	----	----	0.076	----	----	----
1:8	10	8	12	Str	0.077	0.067	0.079	----	----	0.087	0.069	0.083	----	----	----	0.081	----	----	----	----	0.082	----	----	----
1:8	10	10	10	Mod	0.072	0.070	0.083	----	----	0.083	0.067	----	----	----	----	0.074	----	----	----	----	0.068	----	----	----
1:8	10	10	10	Str	0.075	0.069	0.088	----	----	0.092	0.065	----	----	----	----	0.073	----	----	----	----	0.072	----	----	----
1:8	10	12	8	Mod	0.075	0.067	----	----	----	----	0.064	----	----	----	----	0.063	----	----	----	----	0.061	----	----	----
1:8	10	12	8	Str	0.081	0.068	----	----	----	----	0.063	----	----	----	----	0.064	----	----	----	----	0.067	----	----	----
1:8	10	40	60	Mod	0.070	0.067	----	0.032	----	0.069	0.066	----	0.030	----	----	0.067	----	0.031	----	----	0.071	----	0.033	----
1:8	10	40	60	Str	0.068	0.072	----	0.036	----	0.076	0.069	----	0.035	----	----	0.070	----	0.032	----	----	0.074	----	0.037	----
1:8	10	50	50	Mod	0.067	0.063	----	0.030	----	0.074	0.063	----	----	----	----	0.065	----	0.028	----	----	0.066	----	0.030	----
1:8	10	50	50	Str	0.067	0.065	----	0.032	----	0.088	0.067	----	----	----	----	0.068	----	0.029	----	----	0.072	----	0.029	----
1:8	10	60	40	Mod	0.068	0.064	----	----	----	0.077	0.065	----	0.028	----	----	0.063	----	----	----	----	0.062	----	0.026	----
1:8	10	60	40	Str	0.068	0.063	----	----	----	0.081	0.064	----	0.031	----	----	0.069	----	----	----	----	0.064	----	0.025	----
1:8	20	4	6	Mod	0.072	0.055	----	----	----	----	0.056	----	0.032	----	----	0.055	----	0.029	----	----	0.061	----	0.030	----
1:8	20	4	6	Str	0.072	0.058	----	----	----	----	0.062	----	0.033	----	----	0.063	----	0.032	----	----	0.074	----	0.031	----
1:8	20	5	5	Mod	0.073	0.055	----	0.032	----	----	0.059	----	0.035	----	----	0.056	----	0.028	----	----	0.056	----	0.029	----
1:8	20	5	5	Str	0.077	0.056	----	0.034	----	----	0.054	----	0.033	----	----	0.058	----	0.030	----	----	0.063	----	0.029	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 27 (continued). Power estimates for conditions when the population effect size variance is 0.50.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:8	20	6	4	Mod	0.072	0.053	----	0.035	----	----	0.056	----	0.038	----	----	0.055	----	0.035	----	----	0.053	----	0.030	----
1:8	20	6	4	Str	0.075	0.054	----	0.039	----	----	0.054	----	0.038	----	----	0.056	----	0.036	----	----	0.054	----	0.033	----
1:8	20	8	12	Mod	0.062	0.058	----	0.040	----	0.079	0.059	----	0.042	----	----	0.062	----	0.043	----	----	0.071	----	0.039	----
1:8	20	8	12	Str	0.071	0.061	----	0.045	----	0.098	0.063	----	0.044	----	----	0.076	----	0.044	----	----	0.087	----	0.048	----
1:8	20	10	10	Mod	0.061	0.056	----	0.036	----	0.087	0.056	----	0.040	----	----	0.057	----	0.035	----	----	0.059	----	0.036	----
1:8	20	10	10	Str	0.068	0.058	----	0.046	----	0.101	0.061	----	0.045	----	----	0.063	----	0.039	----	----	0.071	----	0.038	----
1:8	20	12	8	Mod	0.067	0.056	----	0.041	----	----	0.054	----	0.040	----	----	0.054	----	0.040	----	----	0.055	----	0.035	----
1:8	20	12	8	Str	0.070	0.056	----	0.045	----	----	0.052	----	0.042	----	----	0.054	----	0.041	----	----	0.055	----	0.034	----
1:8	20	40	60	Mod	0.059	0.057	----	0.058	----	0.070	0.058	----	0.060	----	----	0.065	----	0.068	----	----	0.072	----	0.074	----
1:8	20	40	60	Str	0.055	0.057	----	0.062	----	0.080	0.063	----	0.067	----	----	0.070	----	0.065	----	----	0.075	----	0.074	----
1:8	20	50	50	Mod	0.059	0.058	----	0.060	----	0.075	0.059	----	0.060	----	----	0.060	----	0.059	----	----	0.063	----	0.058	----
1:8	20	50	50	Str	0.060	0.057	----	0.060	----	0.086	0.056	----	0.061	----	----	0.063	----	0.061	----	----	0.063	----	0.061	----
1:8	20	60	40	Mod	0.058	0.050	----	0.053	----	0.082	0.054	----	0.053	----	----	0.054	----	0.053	----	----	0.052	----	0.047	----
1:8	20	60	40	Str	0.059	0.056	----	0.058	----	0.086	0.055	----	0.056	----	----	0.054	----	0.055	----	----	0.051	----	0.048	----
1:8	50	4	6	Mod	0.056	0.046	----	0.038	----	----	0.053	----	0.043	----	----	0.059	----	0.041	0.016	----	0.074	----	0.042	----
1:8	50	4	6	Str	0.066	0.052	----	0.043	----	----	0.058	----	0.044	----	----	0.075	----	0.042	0.006	----	0.104	----	0.052	----
1:8	50	5	5	Mod	0.062	0.052	----	0.044	----	----	0.050	----	0.040	----	----	0.054	----	0.040	0.017	----	0.053	----	0.040	----
1:8	50	5	5	Str	0.064	0.052	----	0.045	----	----	0.051	----	0.043	----	----	0.061	----	0.043	0.008	----	0.070	----	0.046	----
1:8	50	6	4	Mod	0.061	0.057	----	0.052	----	----	0.051	----	0.047	----	----	0.050	----	0.047	0.015	----	0.055	----	0.050	----
1:8	50	6	4	Str	0.060	0.049	----	0.047	----	----	0.049	----	0.048	----	----	0.050	----	0.044	0.006	----	0.052	----	0.043	----
1:8	50	8	12	Mod	0.055	0.053	----	0.053	----	----	0.051	----	0.049	----	----	0.068	----	0.056	0.008	----	0.083	----	0.061	0.017
1:8	50	8	12	Str	0.060	0.059	----	0.058	----	----	0.058	----	0.058	----	----	0.096	----	0.062	0.002	----	0.134	----	0.080	0.010
1:8	50	10	10	Mod	0.058	0.051	----	0.048	----	----	0.057	----	0.054	----	----	0.056	----	0.052	0.008	----	0.065	----	0.052	0.018
1:8	50	10	10	Str	0.063	0.055	----	0.057	----	----	0.056	----	0.057	----	----	0.074	----	0.058	0.003	----	0.091	----	0.058	0.011
1:8	50	12	8	Mod	0.059	0.050	----	0.049	----	----	0.050	----	0.052	----	----	0.047	----	0.048	0.009	----	0.053	----	0.047	0.019
1:8	50	12	8	Str	0.058	0.050	----	0.055	----	----	0.050	----	0.052	----	----	0.054	----	0.049	0.004	----	0.060	----	0.050	0.010
1:8	50	40	60	Mod	0.053	0.055	----	0.075	----	0.098	0.060	----	0.082	----	----	0.068	----	0.086	----	----	0.086	----	----	0.009
1:8	50	40	60	Str	0.049	0.050	----	0.074	----	0.116	0.063	----	0.089	----	----	0.092	----	0.104	----	----	0.110	----	----	0.007
1:8	50	50	50	Mod	0.056	0.052	----	0.072	----	----	0.053	----	0.074	----	----	0.063	----	0.078	----	----	0.068	----	0.081	0.012
1:8	50	50	50	Str	0.052	0.049	----	0.074	----	----	0.056	----	0.076	----	----	0.079	----	0.087	----	----	0.080	----	0.095	0.008
1:8	50	60	40	Mod	0.058	0.054	----	0.073	----	----	0.049	----	0.067	----	----	0.052	----	0.069	----	----	0.047	----	0.062	0.011
1:8	50	60	40	Str	0.056	0.052	----	0.071	----	----	0.048	----	0.069	----	----	0.062	----	0.071	----	----	0.056	----	0.066	0.008
1:8	100	4	6	Mod	0.061	0.051	----	0.044	----	----	0.054	----	0.046	0.028	----	0.065	----	0.046	----	----	0.090	----	0.050	----
1:8	100	4	6	Str	0.060	0.052	----	0.048	----	----	0.058	----	0.048	0.021	----	0.098	----	0.054	----	----	0.151	----	0.061	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 27 (continued). Power estimates for conditions when the population effect size variance is 0.50.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:8	100	5	5	Mod	0.058	0.048	----	0.042	----	----	0.054	----	0.051	0.028	----	0.057	----	0.048	----	----	0.053	----	0.040	----
1:8	100	5	5	Str	0.059	0.050	----	0.049	----	----	0.048	----	0.045	0.019	----	0.067	----	0.048	----	----	0.082	----	0.049	----
1:8	100	6	4	Mod	0.056	0.052	----	0.053	----	----	0.056	----	0.056	0.027	----	0.052	----	0.052	----	----	0.056	----	0.055	----
1:8	100	6	4	Str	0.058	0.050	----	0.052	----	----	0.052	----	0.053	0.020	----	0.049	----	0.048	----	----	0.050	----	0.048	----
1:8	100	8	12	Mod	0.056	0.052	----	0.056	----	----	0.055	----	0.056	0.020	----	0.083	----	0.063	----	----	0.123	----	0.084	----
1:8	100	8	12	Str	0.059	0.056	----	0.062	----	----	0.069	----	0.063	0.016	----	0.133	----	0.078	----	----	0.210	----	0.115	----
1:8	100	10	10	Mod	0.056	0.052	----	0.053	----	----	0.052	----	0.054	0.021	----	0.065	----	0.055	----	----	0.076	----	0.061	----
1:8	100	10	10	Str	0.061	0.053	----	0.059	----	----	0.059	----	0.056	0.016	----	0.098	----	0.067	----	----	0.142	----	0.090	----
1:8	100	12	8	Mod	0.054	0.049	----	0.054	----	----	0.047	----	0.052	0.021	----	0.054	----	0.055	----	----	0.055	----	0.053	----
1:8	100	12	8	Str	0.060	0.052	----	0.060	----	----	0.056	----	0.057	0.016	----	0.064	----	0.058	----	----	0.069	----	0.057	----
1:8	100	40	60	Mod	0.058	0.055	----	0.079	----	----	0.058	----	0.084	0.017	----	0.095	----	----	0.019	----	0.129	----	----	----
1:8	100	40	60	Str	0.054	0.052	----	0.082	----	----	0.071	----	0.096	0.012	----	0.130	----	----	0.013	----	0.186	----	----	----
1:8	100	50	50	Mod	0.053	0.053	----	0.076	----	----	0.056	----	0.079	----	----	0.069	----	0.092	0.024	----	0.085	----	0.104	----
1:8	100	50	50	Str	0.055	0.051	----	0.079	----	----	0.067	----	0.087	----	----	0.100	----	0.107	0.015	----	0.117	----	0.132	----
1:8	100	60	40	Mod	0.053	0.052	----	0.073	----	----	0.055	----	0.075	0.019	----	0.053	----	0.075	0.028	----	0.055	----	0.071	----
1:8	100	60	40	Str	0.052	0.050	----	0.076	----	----	0.058	----	0.082	0.013	----	0.061	----	0.078	0.016	----	0.061	----	0.079	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 28. Power estimates for conditions when the population effect size variance is 1.00.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	10	4	6	Mod	----	0.074	----	----	----	----	0.067	----	----	----	----	0.067	----	----	----	----	0.069	----	----	----
1:1	10	4	6	Str	----	0.067	----	----	----	----	0.068	----	----	----	----	0.069	----	----	----	----	0.069	----	----	----
1:1	10	5	5	Mod	----	0.068	----	----	----	----	0.069	----	----	----	----	0.069	----	----	----	----	0.072	----	----	----
1:1	10	5	5	Str	----	0.067	----	----	----	----	0.070	----	----	----	----	0.073	----	----	----	----	0.071	----	----	----
1:1	10	6	4	Mod	----	0.068	----	----	----	----	0.072	----	----	----	----	0.071	----	----	----	----	0.068	----	----	----
1:1	10	6	4	Str	----	0.067	----	----	----	----	0.070	----	----	----	----	0.068	----	----	----	----	0.069	----	----	----
1:1	10	8	12	Mod	0.068	0.071	0.054	----	----	----	0.066	0.053	----	----	----	0.063	0.065	----	----	----	0.063	----	----	----
1:1	10	8	12	Str	0.077	0.070	0.053	----	----	----	0.062	0.049	----	----	----	0.071	0.069	----	----	----	0.072	----	----	----
1:1	10	10	10	Mod	0.070	0.067	0.051	----	----	0.082	0.067	0.055	----	----	----	0.066	0.069	----	----	----	0.067	----	----	----
1:1	10	10	10	Str	0.071	0.067	0.051	----	----	0.085	0.067	0.051	----	----	----	0.067	0.068	----	----	----	0.070	----	----	----
1:1	10	12	8	Mod	0.071	0.067	0.049	----	----	0.080	0.067	0.055	----	----	----	0.068	0.066	----	----	----	0.065	----	----	----
1:1	10	12	8	Str	0.077	0.069	0.052	----	----	0.084	0.065	0.053	----	----	----	0.074	0.070	----	----	----	0.071	----	----	----
1:1	10	40	60	Mod	0.063	0.067	0.042	----	----	0.068	0.060	0.044	----	----	----	0.067	0.051	----	----	----	0.059	0.067	----	----
1:1	10	40	60	Str	0.064	0.067	0.044	----	----	0.072	0.064	0.043	----	----	----	0.066	0.054	----	----	----	0.068	0.070	----	----
1:1	10	50	50	Mod	0.068	0.064	0.046	----	----	0.069	0.063	0.044	----	----	----	0.063	0.055	----	----	----	0.060	0.071	----	----
1:1	10	50	50	Str	0.067	0.065	0.047	----	----	0.073	0.067	0.047	----	----	----	0.059	0.052	----	----	----	0.069	0.073	----	----
1:1	10	60	40	Mod	0.064	0.060	0.042	----	----	0.070	0.065	0.042	----	----	----	0.067	0.052	----	----	----	0.061	0.068	----	----
1:1	10	60	40	Str	0.067	0.062	0.043	----	----	0.070	0.062	0.039	----	----	----	0.067	0.057	----	----	----	0.063	0.065	----	----
1:1	20	4	6	Mod	0.072	0.055	----	0.038	----	----	0.058	----	0.032	----	----	0.059	----	0.036	----	----	0.055	----	0.035	----
1:1	20	4	6	Str	0.071	0.057	----	0.038	----	----	0.057	----	0.039	----	----	0.056	----	0.038	----	----	0.061	----	0.036	----
1:1	20	5	5	Mod	0.074	0.058	----	0.037	----	----	0.052	----	0.034	----	----	0.059	----	0.037	----	----	0.054	----	0.032	----
1:1	20	5	5	Str	0.074	0.057	----	0.034	----	----	0.056	----	0.037	----	----	0.053	----	0.037	----	----	0.057	----	0.035	----
1:1	20	6	4	Mod	0.068	0.055	----	0.037	----	----	0.059	----	0.040	----	----	0.057	----	0.036	----	----	0.058	----	0.035	----
1:1	20	6	4	Str	0.070	0.055	----	0.038	----	----	0.057	----	0.039	----	----	0.060	----	0.039	----	----	0.061	----	0.036	----
1:1	20	8	12	Mod	0.061	0.054	----	0.042	----	0.083	0.058	----	0.041	----	----	0.055	----	0.038	----	----	0.054	----	0.042	----
1:1	20	8	12	Str	0.060	0.060	----	0.046	----	0.087	0.058	----	0.040	----	----	0.055	----	0.041	----	----	0.060	----	0.041	----
1:1	20	10	10	Mod	0.064	0.051	----	0.038	----	0.083	0.062	----	0.044	----	----	0.052	----	0.038	----	----	0.059	----	0.038	----
1:1	20	10	10	Str	0.057	0.053	----	0.042	----	0.092	0.057	----	0.043	----	----	0.058	----	0.042	----	----	0.059	----	0.035	----
1:1	20	12	8	Mod	0.060	0.054	----	0.041	----	0.079	0.054	----	0.042	----	----	0.051	----	0.037	----	----	0.061	----	0.042	----
1:1	20	12	8	Str	0.056	0.053	----	0.041	----	0.090	0.054	----	0.043	----	----	0.057	----	0.037	----	----	0.059	----	0.040	----
1:1	20	40	60	Mod	0.053	0.053	0.076	0.048	----	0.072	0.052	0.083	0.049	----	----	0.054	----	0.048	----	----	0.059	----	0.046	----
1:1	20	40	60	Str	0.057	0.056	0.087	0.048	----	0.076	0.055	0.088	0.049	----	----	0.060	----	0.050	----	----	0.056	----	0.043	----
1:1	20	50	50	Mod	0.050	0.056	0.078	0.051	----	0.075	0.057	0.082	0.053	----	----	0.054	----	0.045	----	----	0.054	----	0.046	----
1:1	20	50	50	Str	0.058	0.058	0.080	0.056	----	0.078	0.057	0.089	0.053	----	----	0.059	----	0.047	----	----	0.059	----	0.046	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 28 (continued). Power estimates for conditions when the population effect size variance is 1.00.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	20	60	40	Mod	0.060	0.053	0.080	0.048	----	0.071	0.056	0.083	0.047	----	----	0.056	----	0.049	----	----	0.056	----	0.049	----
1:1	20	60	40	Str	0.051	0.056	0.081	0.050	----	0.078	0.054	0.088	0.051	----	----	0.054	----	0.047	----	----	0.054	----	0.045	----
1:1	50	4	6	Mod	0.061	0.050	----	0.048	----	----	0.052	----	0.052	----	----	0.051	----	0.047	0.009	----	0.049	----	0.045	0.009
1:1	50	4	6	Str	0.059	0.048	----	0.048	----	----	0.053	----	0.051	----	----	0.053	----	0.050	0.005	----	0.054	----	0.044	0.002
1:1	50	5	5	Mod	0.062	0.053	----	0.052	----	----	0.056	----	0.054	----	----	0.053	----	0.049	0.009	----	0.054	----	0.045	0.009
1:1	50	5	5	Str	0.063	0.054	----	0.053	----	----	0.054	----	0.052	----	----	0.057	----	0.050	0.004	----	0.054	----	0.045	0.003
1:1	50	6	4	Mod	0.063	0.051	----	0.046	----	----	0.055	----	0.053	----	----	0.053	----	0.047	0.010	----	0.053	----	0.048	0.010
1:1	50	6	4	Str	0.063	0.054	----	0.053	----	----	0.049	----	0.048	----	----	0.051	----	0.049	0.004	----	0.059	----	0.047	0.003
1:1	50	8	12	Mod	0.057	0.053	----	0.058	----	----	0.047	----	0.050	----	----	0.052	----	0.052	----	----	0.055	----	0.053	0.004
1:1	50	8	12	Str	0.056	0.051	----	0.059	----	----	0.056	----	0.056	----	----	0.057	----	0.053	----	----	0.061	----	0.053	0.001
1:1	50	10	10	Mod	0.057	0.050	----	0.052	----	----	0.058	----	0.062	----	----	0.056	----	0.054	----	----	0.055	----	0.051	0.003
1:1	50	10	10	Str	0.058	0.055	----	0.057	----	----	0.054	----	0.054	----	----	0.060	----	0.059	----	----	0.066	----	0.054	0.002
1:1	50	12	8	Mod	0.055	0.050	----	0.053	----	----	0.047	----	0.049	----	----	0.056	----	0.055	----	----	0.050	----	0.049	0.004
1:1	50	12	8	Str	0.058	0.051	----	0.055	----	----	0.053	----	0.054	----	----	0.058	----	0.056	----	----	0.061	----	0.053	0.002
1:1	50	40	60	Mod	0.053	0.052	----	0.059	----	----	0.053	----	0.060	----	----	0.053	----	0.061	----	----	0.049	----	0.056	----
1:1	50	40	60	Str	0.052	0.052	----	0.066	----	----	0.052	----	0.066	----	----	0.054	----	0.062	----	----	0.055	----	0.057	----
1:1	50	50	50	Mod	0.049	0.051	0.095	0.059	----	----	0.053	----	0.063	----	----	0.056	----	0.063	----	----	0.052	----	0.057	----
1:1	50	50	50	Str	0.049	0.049	0.108	0.063	----	----	0.052	----	0.064	----	----	0.066	----	0.069	----	----	0.063	----	0.062	----
1:1	50	60	40	Mod	0.052	0.050	----	0.064	----	----	0.050	----	0.063	----	----	0.053	----	0.063	----	----	0.053	----	0.057	----
1:1	50	60	40	Str	0.050	0.053	----	0.065	----	----	0.055	----	0.066	----	----	0.052	----	0.060	----	----	0.058	----	0.063	----
1:1	100	4	6	Mod	0.054	0.053	----	0.053	----	----	0.051	----	0.053	0.020	----	0.048	----	0.050	0.023	----	0.050	----	0.050	----
1:1	100	4	6	Str	0.060	0.052	----	0.054	----	----	0.054	----	0.056	0.015	----	0.056	----	0.053	0.010	----	0.055	----	0.050	----
1:1	100	5	5	Mod	0.063	0.050	----	0.054	----	----	0.051	----	0.051	0.022	----	0.054	----	0.052	0.023	----	0.050	----	0.048	----
1:1	100	5	5	Str	0.061	0.053	----	0.055	----	----	0.053	----	0.053	0.014	----	0.056	----	0.051	0.012	----	0.063	----	0.051	----
1:1	100	6	4	Mod	0.057	0.055	----	0.056	----	----	0.049	----	0.052	0.021	----	0.047	----	0.051	0.021	----	0.050	----	0.048	----
1:1	100	6	4	Str	0.059	0.050	----	0.051	----	----	0.053	----	0.056	0.015	----	0.053	----	0.052	0.012	----	0.059	----	0.049	----
1:1	100	8	12	Mod	0.055	0.053	----	0.056	----	----	0.056	----	0.061	0.014	----	0.050	----	0.054	0.012	----	0.053	----	0.055	0.011
1:1	100	8	12	Str	0.061	0.053	----	0.064	----	----	0.051	----	0.058	0.012	----	0.063	----	0.062	0.004	----	0.076	----	0.062	0.003
1:1	100	10	10	Mod	0.054	0.051	----	0.058	----	----	0.048	----	0.055	----	----	0.056	----	0.059	0.011	----	0.055	----	0.054	0.011
1:1	100	10	10	Str	0.061	0.052	----	0.060	----	----	0.052	----	0.058	----	----	0.062	----	0.060	0.005	----	0.079	----	0.062	0.003
1:1	100	12	8	Mod	0.055	0.047	----	0.055	----	----	0.053	----	0.059	----	----	0.051	----	0.053	0.010	----	0.056	----	0.057	0.012
1:1	100	12	8	Str	0.056	0.052	----	0.062	----	----	0.051	----	0.057	----	----	0.066	----	0.061	0.004	----	0.071	----	0.057	0.004
1:1	100	40	60	Mod	0.055	0.053	----	0.067	----	----	0.052	----	0.068	----	----	0.053	----	0.065	----	----	0.060	----	0.071	----
1:1	100	40	60	Str	0.052	0.049	----	0.066	----	----	0.057	----	0.071	----	----	0.064	----	0.075	----	----	0.071	----	0.069	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 28 (continued). Power estimates for conditions when the population effect size variance is 1.00.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:1	100	50	50	Mod	0.054	0.049	----	0.064	----	----	0.052	----	0.068	----	----	0.060	----	0.069	----	----	0.058	----	0.069	----
1:1	100	50	50	Str	0.059	0.053	----	0.074	----	----	0.057	----	0.073	----	----	0.061	----	0.069	----	----	0.072	----	0.072	----
1:1	100	60	40	Mod	0.052	0.052	----	0.068	----	----	0.051	----	0.065	----	----	0.057	----	0.069	----	----	0.060	----	0.069	----
1:1	100	60	40	Str	0.055	0.049	----	0.065	----	----	0.052	----	0.069	----	----	0.060	----	0.070	----	----	0.067	----	0.069	----
1:2	10	4	6	Mod	----	0.064	----	----	----	----	0.068	----	----	----	----	0.068	----	----	----	----	----	----	----	----
1:2	10	4	6	Str	----	0.069	----	----	----	----	0.070	----	----	----	----	0.069	----	----	----	----	----	----	----	----
1:2	10	5	5	Mod	----	0.066	----	----	----	----	0.074	----	----	----	----	0.066	----	----	----	----	0.070	----	----	----
1:2	10	5	5	Str	----	0.067	----	----	----	----	0.066	----	----	----	----	0.069	----	----	----	----	0.070	----	----	----
1:2	10	6	4	Mod	----	0.068	----	----	----	----	0.066	----	----	----	----	0.067	----	----	----	----	0.065	----	----	----
1:2	10	6	4	Str	----	0.068	----	----	----	----	0.069	----	----	----	----	0.068	----	----	----	----	0.072	----	----	----
1:2	10	8	12	Mod	0.070	0.066	0.050	----	----	----	0.067	0.054	----	----	----	0.067	0.072	----	----	----	0.068	----	----	----
1:2	10	8	12	Str	0.073	0.068	0.055	----	----	----	0.072	0.054	----	----	----	0.070	0.072	----	----	----	0.072	----	----	----
1:2	10	10	10	Mod	0.070	0.069	0.059	----	----	0.076	0.063	0.055	----	----	----	0.069	0.078	----	----	----	0.064	----	----	----
1:2	10	10	10	Str	0.074	0.069	0.054	----	----	0.087	0.072	0.061	----	----	----	0.071	0.081	----	----	----	0.068	----	----	----
1:2	10	12	8	Mod	0.075	0.065	0.060	----	----	----	0.066	0.064	----	----	----	0.062	----	----	----	----	0.065	----	----	----
1:2	10	12	8	Str	0.079	0.065	0.058	----	----	----	0.062	0.062	----	----	----	0.063	----	----	----	----	0.064	----	----	----
1:2	10	40	60	Mod	0.063	0.061	0.047	----	----	0.068	0.059	0.049	----	----	----	0.066	0.062	----	----	----	0.070	0.072	----	----
1:2	10	40	60	Str	0.062	0.064	0.049	----	----	0.073	0.066	0.054	----	----	----	0.067	0.061	----	----	----	0.067	0.077	----	----
1:2	10	50	50	Mod	0.063	0.070	0.055	----	----	0.071	0.062	0.055	----	----	----	0.065	0.063	----	----	----	0.063	0.077	----	----
1:2	10	50	50	Str	0.064	0.063	0.055	----	----	0.075	0.067	0.053	----	----	----	0.064	0.063	----	----	----	0.063	0.084	----	----
1:2	10	60	40	Mod	0.059	0.063	0.055	----	----	0.074	0.063	0.057	----	----	----	0.063	0.064	----	----	----	0.063	----	----	----
1:2	10	60	40	Str	0.066	0.067	0.055	----	----	0.073	0.063	0.054	----	----	----	0.068	0.070	----	----	----	0.066	----	----	----
1:2	20	4	6	Mod	0.068	0.057	----	0.034	----	----	0.056	----	0.034	----	----	0.057	----	0.039	----	----	0.055	----	0.031	----
1:2	20	4	6	Str	0.077	0.058	----	0.038	----	----	0.051	----	0.032	----	----	0.054	----	0.035	----	----	0.065	----	0.034	----
1:2	20	5	5	Mod	0.073	0.055	----	0.037	----	----	0.058	----	0.038	----	----	0.057	----	0.039	----	----	0.056	----	0.033	----
1:2	20	5	5	Str	0.075	0.059	----	0.041	----	----	0.056	----	0.037	----	----	0.054	----	0.036	----	----	0.056	----	0.033	----
1:2	20	6	4	Mod	0.068	0.058	----	0.039	----	----	0.052	----	0.040	----	----	0.059	----	0.040	----	----	0.057	----	0.036	----
1:2	20	6	4	Str	0.079	0.053	----	0.039	----	----	0.055	----	0.038	----	----	0.057	----	0.039	----	----	0.055	----	0.035	----
1:2	20	8	12	Mod	0.062	0.056	----	0.040	----	0.077	0.056	----	0.041	----	----	0.056	----	0.041	----	----	0.062	----	0.041	----
1:2	20	8	12	Str	0.063	0.056	----	0.043	----	0.090	0.056	----	0.043	----	----	0.058	----	0.041	----	----	0.064	----	0.040	----
1:2	20	10	10	Mod	0.063	0.055	----	0.042	----	0.084	0.052	----	0.040	----	----	0.055	----	0.037	----	----	0.057	----	0.039	----
1:2	20	10	10	Str	0.065	0.058	----	0.046	----	0.092	0.060	----	0.046	----	----	0.057	----	0.038	----	----	0.058	----	0.039	----
1:2	20	12	8	Mod	0.064	0.053	----	0.044	----	0.085	0.049	----	0.040	----	----	0.053	----	0.042	----	----	0.053	----	0.038	----
1:2	20	12	8	Str	0.066	0.055	----	0.044	----	0.092	0.058	----	0.044	----	----	0.059	----	0.044	----	----	0.055	----	0.038	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 28 (continued). Power estimates for conditions when the population effect size variance is 1.00.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:2	20	40	60	Mod	0.055	0.060	----	0.053	----	0.067	0.053	----	0.051	----	----	0.053	----	0.050	----	----	0.059	----	0.049	----
1:2	20	40	60	Str	0.058	0.059	----	0.054	----	0.070	0.054	----	0.049	----	----	0.062	----	0.055	----	----	0.065	----	0.051	----
1:2	20	50	50	Mod	0.053	0.054	----	0.054	----	0.075	0.055	----	0.053	----	----	0.051	----	0.050	----	----	0.056	----	0.048	----
1:2	20	50	50	Str	0.058	0.054	----	0.050	----	0.072	0.057	----	0.053	----	----	0.053	----	0.051	----	----	0.054	----	0.044	----
1:2	20	60	40	Mod	0.055	0.055	----	0.048	----	0.070	0.053	----	0.045	----	----	0.053	----	0.045	----	----	0.055	----	0.049	----
1:2	20	60	40	Str	0.057	0.061	----	0.056	----	0.078	0.055	----	0.053	----	----	0.058	----	0.050	----	----	0.054	----	0.047	----
1:2	50	4	6	Mod	0.066	0.051	----	0.047	----	----	0.053	----	0.050	----	----	0.050	----	0.046	0.010	----	0.053	----	0.045	0.013
1:2	50	4	6	Str	0.060	0.053	----	0.051	----	----	0.053	----	0.051	----	----	0.055	----	0.047	0.004	----	0.064	----	0.046	0.004
1:2	50	5	5	Mod	0.061	0.054	----	0.049	----	----	0.051	----	0.047	----	----	0.054	----	0.049	0.011	----	0.052	----	0.047	0.014
1:2	50	5	5	Str	0.060	0.054	----	0.051	----	----	0.052	----	0.047	----	----	0.051	----	0.046	0.005	----	0.057	----	0.049	0.003
1:2	50	6	4	Mod	0.068	0.056	----	0.055	----	----	0.052	----	0.051	----	----	0.052	----	0.048	0.011	----	0.056	----	0.051	0.012
1:2	50	6	4	Str	0.062	0.053	----	0.052	----	----	0.052	----	0.051	----	----	0.050	----	0.047	0.004	----	0.051	----	0.049	0.005
1:2	50	8	12	Mod	0.052	0.053	----	0.054	----	----	0.050	----	0.054	----	----	0.051	----	0.054	----	----	0.057	----	0.053	0.004
1:2	50	8	12	Str	0.057	0.051	----	0.058	----	----	0.059	----	0.059	----	----	0.061	----	0.055	----	----	0.065	----	0.056	0.002
1:2	50	10	10	Mod	0.060	0.055	----	0.055	----	----	0.048	----	0.052	----	----	0.053	----	0.051	----	----	0.054	----	0.049	0.005
1:2	50	10	10	Str	0.058	0.053	----	0.054	----	----	0.054	----	0.059	----	----	0.059	----	0.056	----	----	0.066	----	0.056	0.001
1:2	50	12	8	Mod	0.056	0.052	----	0.052	----	----	0.054	----	0.056	----	----	0.050	----	0.051	----	----	0.050	----	0.050	0.004
1:2	50	12	8	Str	0.055	0.055	----	0.059	----	----	0.053	----	0.056	----	----	0.055	----	0.054	----	----	0.057	----	0.054	0.002
1:2	50	40	60	Mod	0.052	0.051	----	0.064	----	----	0.051	----	0.065	----	----	0.057	----	0.065	----	----	0.062	----	0.066	----
1:2	50	40	60	Str	0.058	0.052	----	0.068	----	----	0.055	----	0.070	----	----	0.058	----	0.065	----	----	0.065	----	0.072	----
1:2	50	50	50	Mod	0.049	0.047	----	0.064	----	----	0.053	----	0.066	----	----	0.052	----	0.062	----	----	0.057	----	0.067	----
1:2	50	50	50	Str	0.055	0.054	----	0.068	----	----	0.050	----	0.065	----	----	0.055	----	0.066	----	----	0.062	----	0.070	----
1:2	50	60	40	Mod	0.053	0.054	----	0.063	----	----	0.047	----	0.061	----	----	0.052	----	0.064	----	----	0.053	----	0.063	----
1:2	50	60	40	Str	0.051	0.051	----	0.066	----	----	0.051	----	0.063	----	----	0.054	----	0.063	----	----	0.053	----	0.059	----
1:2	100	4	6	Mod	0.056	0.052	----	0.051	----	----	0.056	----	0.052	0.020	----	0.050	----	0.050	0.025	----	0.054	----	0.049	----
1:2	100	4	6	Str	0.060	0.048	----	0.050	----	----	0.052	----	0.053	0.018	----	0.055	----	0.050	0.015	----	0.066	----	0.048	----
1:2	100	5	5	Mod	0.061	0.049	----	0.051	----	----	0.048	----	0.052	0.020	----	0.048	----	0.050	0.027	----	0.052	----	0.053	----
1:2	100	5	5	Str	0.054	0.049	----	0.054	----	----	0.051	----	0.053	0.016	----	0.062	----	0.056	0.013	----	0.062	----	0.053	----
1:2	100	6	4	Mod	0.059	0.050	----	0.054	----	----	0.050	----	0.052	0.021	----	0.049	----	0.053	0.027	----	0.052	----	0.055	----
1:2	100	6	4	Str	0.058	0.048	----	0.055	----	----	0.052	----	0.056	0.015	----	0.053	----	0.055	0.014	----	0.055	----	0.053	----
1:2	100	8	12	Mod	0.054	0.053	----	0.058	----	----	0.051	----	0.057	0.016	----	0.058	----	0.061	0.012	----	0.062	----	0.055	0.012
1:2	100	8	12	Str	0.056	0.052	----	0.061	----	----	0.056	----	0.062	0.012	----	0.069	----	0.061	0.005	----	0.095	----	0.068	0.005
1:2	100	10	10	Mod	0.053	0.047	----	0.052	----	----	0.051	----	0.055	0.018	----	0.053	----	0.058	0.014	----	0.059	----	0.057	0.015
1:2	100	10	10	Str	0.056	0.050	----	0.061	----	----	0.053	----	0.058	0.013	----	0.066	----	0.061	0.007	----	0.081	----	0.064	0.005

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 28 (continued). Power estimates for conditions when the population effect size variance is 1.00.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:2	100	12	8	Mod	0.051	0.045	----	0.054	----	----	0.048	----	0.056	----	----	0.052	----	0.055	0.014	----	0.049	----	0.054	0.015
1:2	100	12	8	Str	0.053	0.053	----	0.062	----	----	0.050	----	0.060	----	----	0.053	----	0.056	0.006	----	0.062	----	0.055	0.005
1:2	100	40	60	Mod	0.049	0.049	----	0.066	----	----	0.054	----	0.073	----	----	0.061	----	0.074	----	----	0.067	----	0.078	0.008
1:2	100	40	60	Str	0.055	0.052	----	0.075	----	----	0.057	----	0.073	----	----	0.073	----	0.080	----	----	0.080	----	0.083	0.004
1:2	100	50	50	Mod	0.054	0.052	----	0.074	----	----	0.052	----	0.068	----	----	0.052	----	0.067	----	----	0.063	----	0.072	0.008
1:2	100	50	50	Str	0.051	0.049	----	0.068	----	----	0.053	----	0.069	----	----	0.064	----	0.077	----	----	0.073	----	0.077	0.005
1:2	100	60	40	Mod	0.051	0.052	----	0.071	----	----	0.056	----	0.072	----	----	0.052	----	0.064	----	----	0.054	----	0.066	----
1:2	100	60	40	Str	0.054	0.053	----	0.069	----	----	0.051	----	0.069	----	----	0.058	----	0.069	----	----	0.057	----	0.067	----
1:4	10	4	6	Mod	----	0.068	----	----	----	----	0.071	----	----	----	----	0.074	----	----	----	----	0.072	----	----	----
1:4	10	4	6	Str	----	0.070	----	----	----	----	0.071	----	----	----	----	0.069	----	----	----	----	0.070	----	----	----
1:4	10	5	5	Mod	----	0.073	----	----	----	----	0.063	----	----	----	----	0.067	----	----	----	----	0.072	----	----	----
1:4	10	5	5	Str	----	0.064	----	----	----	----	0.071	----	----	----	----	0.071	----	----	----	----	0.071	----	----	----
1:4	10	6	4	Mod	----	0.069	----	----	----	----	0.071	----	----	----	----	0.064	----	----	----	----	----	----	----	----
1:4	10	6	4	Str	----	0.066	----	----	----	----	0.070	----	----	----	----	0.065	----	----	----	----	----	----	----	----
1:4	10	8	12	Mod	0.071	0.068	0.071	----	----	0.081	0.071	0.076	----	----	----	0.074	----	----	----	----	0.072	----	----	----
1:4	10	8	12	Str	0.077	0.069	0.069	----	----	0.084	0.071	0.074	----	----	----	0.071	----	----	----	----	0.072	----	----	----
1:4	10	10	10	Mod	0.076	0.069	0.078	----	----	0.084	0.065	----	----	----	----	0.071	----	----	----	----	0.065	----	----	----
1:4	10	10	10	Str	0.076	0.065	0.076	----	----	0.088	0.070	----	----	----	----	0.070	----	----	----	----	0.066	----	----	----
1:4	10	12	8	Mod	0.076	0.068	----	----	----	----	0.069	----	----	----	----	0.066	----	----	----	----	0.059	----	----	----
1:4	10	12	8	Str	0.082	0.066	----	----	----	----	0.067	----	----	----	----	0.066	----	----	----	----	0.068	----	----	----
1:4	10	40	60	Mod	0.067	0.065	0.075	0.032	----	0.070	0.069	0.078	0.034	----	----	0.068	----	0.031	----	----	0.071	----	0.030	----
1:4	10	40	60	Str	0.070	0.071	0.074	0.033	----	0.081	0.073	0.077	0.033	----	----	0.068	----	0.030	----	----	0.070	----	0.030	----
1:4	10	50	50	Mod	0.065	0.064	----	0.029	----	0.070	0.065	0.074	----	----	----	0.067	----	----	----	----	0.062	----	0.027	----
1:4	10	50	50	Str	0.067	0.068	----	0.029	----	0.072	0.061	0.084	----	----	----	0.063	----	----	----	----	0.061	----	0.027	----
1:4	10	60	40	Mod	0.064	0.068	0.076	----	----	0.071	0.066	----	0.028	----	----	0.062	----	----	----	----	0.063	----	0.025	----
1:4	10	60	40	Str	0.071	0.068	0.082	----	----	0.075	0.063	----	0.028	----	----	0.063	----	----	----	----	0.066	----	0.028	----
1:4	20	4	6	Mod	0.073	0.059	----	0.037	----	----	0.057	----	0.037	----	----	0.060	----	0.036	----	----	0.058	----	0.034	----
1:4	20	4	6	Str	0.081	0.056	----	0.038	----	----	0.060	----	0.038	----	----	0.061	----	0.036	----	----	0.064	----	0.035	----
1:4	20	5	5	Mod	0.073	0.056	----	0.037	----	----	0.055	----	0.038	----	----	0.054	----	0.034	----	----	0.060	----	0.037	----
1:4	20	5	5	Str	0.073	0.053	----	0.040	----	----	0.057	----	0.041	----	----	0.057	----	0.037	----	----	0.055	----	0.032	----
1:4	20	6	4	Mod	0.073	0.062	----	0.040	----	----	0.057	----	0.042	----	----	0.057	----	0.040	----	----	0.058	----	0.040	----
1:4	20	6	4	Str	0.077	0.054	----	0.043	----	----	0.056	----	0.041	----	----	0.055	----	0.039	----	----	0.057	----	0.037	----
1:4	20	8	12	Mod	0.063	0.056	----	0.044	----	0.083	0.057	----	0.042	----	----	0.058	----	0.039	----	----	0.062	----	0.039	----
1:4	20	8	12	Str	0.064	0.059	----	0.043	----	0.088	0.059	----	0.044	----	----	0.061	----	0.043	----	----	0.069	----	0.044	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 28 (continued). Power estimates for conditions when the population effect size variance is 1.00.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:4	20	10	10	Mod	0.062	0.054	----	0.045	----	0.086	0.055	----	0.042	----	----	0.055	----	0.041	----	----	0.057	----	0.040	----
1:4	20	10	10	Str	0.065	0.057	----	0.047	----	0.090	0.055	----	0.046	----	----	0.060	----	0.044	----	----	0.062	----	0.045	----
1:4	20	12	8	Mod	0.061	0.055	----	0.044	----	----	0.053	----	0.041	----	----	0.058	----	0.043	----	----	0.054	----	0.042	----
1:4	20	12	8	Str	0.069	0.056	----	0.045	----	----	0.054	----	0.045	----	----	0.054	----	0.046	----	----	0.054	----	0.042	----
1:4	20	40	60	Mod	0.052	0.056	----	0.061	----	0.072	0.060	----	0.060	----	----	0.062	----	0.061	----	----	0.061	----	0.058	----
1:4	20	40	60	Str	0.056	0.055	----	0.063	----	0.072	0.059	----	0.064	----	----	0.061	----	0.061	----	----	0.065	----	0.060	----
1:4	20	50	50	Mod	0.058	0.054	----	0.056	----	0.072	0.055	----	0.056	----	----	0.060	----	0.056	----	----	0.054	----	0.054	----
1:4	20	50	50	Str	0.060	0.058	----	0.059	----	0.077	0.060	----	0.061	----	----	0.055	----	0.056	----	----	0.061	----	0.059	----
1:4	20	60	40	Mod	0.059	0.054	----	0.051	----	0.080	0.054	----	0.051	----	----	0.056	----	0.052	----	----	0.055	----	0.051	----
1:4	20	60	40	Str	0.061	0.053	----	0.057	----	0.080	0.055	----	0.053	----	----	0.054	----	0.055	----	----	0.052	----	0.048	----
1:4	50	4	6	Mod	0.059	0.048	----	0.041	----	----	0.053	----	0.047	----	----	0.054	----	0.047	0.013	----	0.059	----	0.047	----
1:4	50	4	6	Str	0.062	0.053	----	0.050	----	----	0.052	----	0.049	----	----	0.058	----	0.049	0.006	----	0.073	----	0.051	----
1:4	50	5	5	Mod	0.062	0.052	----	0.050	----	----	0.049	----	0.048	----	----	0.053	----	0.046	0.012	----	0.055	----	0.048	0.017
1:4	50	5	5	Str	0.063	0.049	----	0.048	----	----	0.052	----	0.051	----	----	0.053	----	0.048	0.006	----	0.056	----	0.046	0.007
1:4	50	6	4	Mod	0.061	0.051	----	0.053	----	----	0.055	----	0.054	----	----	0.052	----	0.051	0.014	----	0.050	----	0.048	0.017
1:4	50	6	4	Str	0.059	0.052	----	0.054	----	----	0.050	----	0.054	----	----	0.050	----	0.049	0.006	----	0.054	----	0.052	0.009
1:4	50	8	12	Mod	0.059	0.055	----	0.058	----	----	0.050	----	0.056	----	----	0.057	----	0.053	----	----	0.067	----	0.059	0.008
1:4	50	8	12	Str	0.063	0.053	----	0.059	----	----	0.059	----	0.061	----	----	0.067	----	0.063	----	----	0.086	----	0.064	0.003
1:4	50	10	10	Mod	0.057	0.054	----	0.054	----	----	0.055	----	0.061	----	----	0.054	----	0.056	----	----	0.054	----	0.051	0.009
1:4	50	10	10	Str	0.060	0.050	----	0.057	----	----	0.051	----	0.056	----	----	0.060	----	0.060	----	----	0.067	----	0.055	0.002
1:4	50	12	8	Mod	0.059	0.051	----	0.058	----	----	0.048	----	0.052	----	----	0.052	----	0.056	----	----	0.048	----	0.050	0.009
1:4	50	12	8	Str	0.057	0.051	----	0.059	----	----	0.051	----	0.057	----	----	0.052	----	0.056	----	----	0.054	----	0.052	0.003
1:4	50	40	60	Mod	0.055	0.052	----	0.073	----	----	0.055	----	0.071	----	----	0.059	----	0.078	----	----	0.067	----	0.081	----
1:4	50	40	60	Str	0.051	0.049	----	0.071	----	----	0.062	----	0.079	----	----	0.063	----	0.080	----	----	0.074	----	0.088	----
1:4	50	50	50	Mod	0.055	0.052	----	0.072	----	----	0.052	----	0.070	----	----	0.051	----	0.067	----	----	0.057	----	0.073	----
1:4	50	50	50	Str	0.055	0.055	----	0.076	----	----	0.050	----	0.067	----	----	0.058	----	0.072	----	----	0.064	----	0.076	----
1:4	50	60	40	Mod	0.051	0.050	----	0.068	----	----	0.049	----	0.067	----	----	0.051	----	0.068	----	----	0.047	----	0.062	----
1:4	50	60	40	Str	0.055	0.050	----	0.072	----	----	0.051	----	0.069	----	----	0.054	----	0.070	----	----	0.056	----	0.069	----
1:4	100	4	6	Mod	0.059	0.050	----	0.049	----	----	0.053	----	0.053	0.024	----	0.056	----	0.052	----	----	0.061	----	0.048	----
1:4	100	4	6	Str	0.060	0.054	----	0.052	----	----	0.056	----	0.052	0.018	----	0.071	----	0.055	----	----	0.087	----	0.056	----
1:4	100	5	5	Mod	0.060	0.050	----	0.054	----	----	0.051	----	0.051	0.024	----	0.051	----	0.050	----	----	0.053	----	0.050	----
1:4	100	5	5	Str	0.055	0.050	----	0.050	----	----	0.052	----	0.055	0.019	----	0.055	----	0.052	----	----	0.065	----	0.053	----
1:4	100	6	4	Mod	0.056	0.050	----	0.054	----	----	0.051	----	0.059	0.025	----	0.054	----	0.058	----	----	0.054	----	0.058	----
1:4	100	6	4	Str	0.058	0.051	----	0.056	----	----	0.054	----	0.061	0.019	----	0.051	----	0.055	----	----	0.052	----	0.052	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 28 (continued). Power estimates for conditions when the population effect size variance is 1.00.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:4	100	8	12	Mod	0.056	0.054	----	0.061	----	----	0.050	----	0.058	0.018	----	0.064	----	0.061	0.017	----	0.077	----	0.066	----
1:4	100	8	12	Str	0.056	0.053	----	0.062	----	----	0.054	----	0.059	0.009	----	0.082	----	0.069	0.007	----	0.110	----	0.078	----
1:4	100	10	10	Mod	0.055	0.051	----	0.059	----	----	0.058	----	0.065	0.018	----	0.052	----	0.058	0.020	----	0.065	----	0.060	----
1:4	100	10	10	Str	0.060	0.054	----	0.065	----	----	0.056	----	0.063	0.013	----	0.068	----	0.063	0.009	----	0.086	----	0.067	----
1:4	100	12	8	Mod	0.055	0.054	----	0.064	----	----	0.046	----	0.056	0.019	----	0.049	----	0.058	0.021	----	0.049	----	0.056	----
1:4	100	12	8	Str	0.055	0.049	----	0.059	----	----	0.049	----	0.062	0.015	----	0.055	----	0.060	0.011	----	0.063	----	0.061	----
1:4	100	40	60	Mod	0.052	0.052	----	0.077	----	----	0.052	----	0.078	----	----	0.064	----	----	0.013	----	0.080	----	----	0.015
1:4	100	40	60	Str	0.054	0.050	----	0.076	----	----	0.058	----	0.079	----	----	0.077	----	----	0.007	----	0.100	----	----	0.007
1:4	100	50	50	Mod	0.050	0.049	----	0.076	----	----	0.051	----	0.078	----	----	0.058	----	0.079	0.015	----	0.066	----	0.081	0.017
1:4	100	50	50	Str	0.050	0.054	----	0.078	----	----	0.054	----	0.081	----	----	0.066	----	0.088	0.009	----	0.074	----	0.094	0.011
1:4	100	60	40	Mod	0.053	0.050	----	0.071	----	----	0.052	----	0.075	----	----	0.052	----	0.068	0.015	----	0.053	----	0.068	0.016
1:4	100	60	40	Str	0.055	0.055	----	0.078	----	----	0.052	----	0.080	----	----	0.058	----	0.079	0.012	----	0.058	----	0.072	0.012
1:8	10	4	6	Mod	----	0.071	----	----	----	----	0.068	----	----	----	----	0.070	----	----	----	----	0.072	----	----	----
1:8	10	4	6	Str	----	0.072	----	----	----	----	0.067	----	----	----	----	0.071	----	----	----	----	0.080	----	----	----
1:8	10	5	5	Mod	----	0.068	----	----	----	----	0.069	----	----	----	----	0.068	----	----	----	----	0.065	----	----	----
1:8	10	5	5	Str	----	0.070	----	----	----	----	0.075	----	----	----	----	0.069	----	----	----	----	0.071	----	----	----
1:8	10	6	4	Mod	----	0.065	----	----	----	----	0.065	----	----	----	----	0.071	----	----	----	----	0.062	----	----	----
1:8	10	6	4	Str	----	0.068	----	----	----	----	0.063	----	----	----	----	0.064	----	----	----	----	0.068	----	----	----
1:8	10	8	12	Mod	0.073	0.071	----	----	----	0.085	0.072	----	----	----	----	0.070	----	----	----	----	0.072	----	----	----
1:8	10	8	12	Str	0.082	0.074	----	----	----	0.086	0.065	----	----	----	----	0.073	----	----	----	----	0.076	----	----	----
1:8	10	10	10	Mod	----	0.063	----	----	----	----	0.071	----	----	----	----	0.070	----	----	----	----	0.067	----	----	----
1:8	10	10	10	Str	----	0.071	----	----	----	----	0.068	----	----	----	----	0.068	----	----	----	----	0.069	----	----	----
1:8	10	12	8	Mod	----	0.066	----	----	----	----	0.066	----	----	----	----	0.065	----	----	----	----	0.066	----	----	----
1:8	10	12	8	Str	----	0.068	----	----	----	----	0.068	----	----	----	----	0.062	----	----	----	----	0.065	----	----	----
1:8	10	40	60	Mod	0.069	0.069	----	0.038	----	0.068	0.068	----	0.034	----	----	0.072	----	0.038	----	----	0.073	----	0.042	----
1:8	10	40	60	Str	0.068	0.069	----	0.038	----	0.078	0.065	----	0.038	----	----	0.073	----	0.039	----	----	0.071	----	0.041	----
1:8	10	50	50	Mod	0.067	0.063	----	0.033	----	0.069	0.060	----	0.034	----	----	0.067	----	0.035	----	----	0.066	----	0.037	----
1:8	10	50	50	Str	0.070	0.062	----	0.036	----	0.084	0.070	----	0.039	----	----	0.066	----	0.037	----	----	0.070	----	0.035	----
1:8	10	60	40	Mod	0.070	0.067	----	0.036	----	0.080	0.063	----	0.034	----	----	0.069	----	0.033	----	----	0.060	----	0.028	----
1:8	10	60	40	Str	0.069	0.064	----	0.032	----	0.082	0.065	----	0.035	----	----	0.057	----	0.032	----	----	0.062	----	0.031	----
1:8	20	4	6	Mod	----	0.057	----	0.037	----	----	0.061	----	0.039	----	----	0.058	----	0.034	----	----	0.060	----	0.033	----
1:8	20	4	6	Str	----	0.061	----	0.042	----	----	0.056	----	0.036	----	----	0.060	----	0.035	----	----	0.066	----	0.035	----
1:8	20	5	5	Mod	0.076	0.055	----	0.039	----	----	0.051	----	0.033	----	----	0.052	----	0.036	----	----	0.055	----	0.036	----
1:8	20	5	5	Str	0.074	0.056	----	0.038	----	----	0.053	----	0.036	----	----	0.059	----	0.039	----	----	0.059	----	0.038	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 28 (continued). Power estimates for conditions when the population effect size variance is 1.00.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:8	20	6	4	Mod	0.080	0.053	----	0.042	----	----	0.051	----	0.040	----	----	0.057	----	0.041	----	----	0.061	----	0.043	----
1:8	20	6	4	Str	0.080	0.054	----	0.042	----	----	0.052	----	0.043	----	----	0.056	----	0.042	----	----	0.057	----	0.042	----
1:8	20	8	12	Mod	0.063	0.057	----	0.045	----	----	0.055	----	0.046	----	----	0.061	----	0.047	----	----	0.065	----	0.045	----
1:8	20	8	12	Str	0.065	0.062	----	0.052	----	----	0.056	----	0.048	----	----	0.066	----	0.048	----	----	0.070	----	0.047	----
1:8	20	10	10	Mod	0.066	0.054	----	0.046	----	----	0.056	----	0.047	----	----	0.059	----	0.048	----	----	0.058	----	0.042	----
1:8	20	10	10	Str	0.065	0.055	----	0.047	----	----	0.057	----	0.049	----	----	0.060	----	0.048	----	----	0.062	----	0.048	----
1:8	20	12	8	Mod	0.066	0.051	----	0.046	----	0.090	0.054	----	0.047	----	----	0.051	----	0.040	----	----	0.057	----	0.047	----
1:8	20	12	8	Str	0.069	0.054	----	0.050	----	0.105	0.057	----	0.049	----	----	0.056	----	0.050	----	----	0.058	----	0.044	----
1:8	20	40	60	Mod	0.059	0.057	----	0.065	----	0.075	0.058	----	0.069	----	----	0.062	----	0.072	----	----	0.065	----	0.074	----
1:8	20	40	60	Str	0.060	0.057	----	0.069	----	0.076	0.057	----	0.068	----	----	0.061	----	0.074	----	----	0.068	----	0.076	----
1:8	20	50	50	Mod	0.058	0.055	----	0.064	----	0.078	0.060	----	0.066	----	----	0.054	----	0.065	----	----	0.060	----	0.064	----
1:8	20	50	50	Str	0.061	0.057	----	0.070	----	0.083	0.054	----	0.064	----	----	0.059	----	0.066	----	----	0.058	----	0.070	----
1:8	20	60	40	Mod	0.056	0.057	----	0.063	----	0.080	0.049	----	0.058	----	----	0.055	----	0.061	----	----	0.052	----	0.057	----
1:8	20	60	40	Str	0.059	0.052	----	0.063	----	0.086	0.058	----	0.066	----	----	0.055	----	0.064	----	----	0.053	----	0.057	----
1:8	50	4	6	Mod	0.063	0.055	----	0.049	----	----	0.053	----	0.047	----	----	0.058	----	0.046	0.015	----	0.065	----	0.047	----
1:8	50	4	6	Str	0.063	0.052	----	0.049	----	----	0.050	----	0.048	----	----	0.062	----	0.049	0.008	----	0.074	----	0.051	----
1:8	50	5	5	Mod	0.062	0.058	----	0.055	----	----	0.050	----	0.050	----	----	0.052	----	0.046	0.018	----	0.055	----	0.045	----
1:8	50	5	5	Str	0.067	0.052	----	0.049	----	----	0.054	----	0.052	----	----	0.055	----	0.050	0.012	----	0.059	----	0.047	----
1:8	50	6	4	Mod	0.065	0.047	----	0.053	----	----	0.053	----	0.058	----	----	0.052	----	0.055	0.022	----	0.052	----	0.056	----
1:8	50	6	4	Str	0.065	0.055	----	0.058	----	----	0.050	----	0.055	----	----	0.049	----	0.056	0.011	----	0.053	----	0.051	----
1:8	50	8	12	Mod	0.057	0.051	----	0.055	----	----	0.054	----	0.058	----	----	0.059	----	0.057	0.010	----	0.070	----	0.060	0.011
1:8	50	8	12	Str	0.060	0.052	----	0.063	----	----	0.060	----	0.064	----	----	0.071	----	0.064	0.004	----	0.088	----	0.066	0.004
1:8	50	10	10	Mod	0.065	0.056	----	0.060	----	----	0.053	----	0.060	----	----	0.052	----	0.055	0.010	----	0.056	----	0.054	0.014
1:8	50	10	10	Str	0.058	0.053	----	0.062	----	----	0.053	----	0.060	----	----	0.064	----	0.063	0.006	----	0.067	----	0.058	0.007
1:8	50	12	8	Mod	0.061	0.054	----	0.060	----	----	0.048	----	0.057	----	----	0.053	----	0.058	0.010	----	0.050	----	0.056	0.017
1:8	50	12	8	Str	0.059	0.049	----	0.060	----	----	0.051	----	0.065	----	----	0.053	----	0.057	0.007	----	0.053	----	0.055	0.009
1:8	50	40	60	Mod	0.055	0.050	----	0.085	----	----	0.053	----	0.087	----	----	0.062	----	----	----	----	0.074	----	----	----
1:8	50	40	60	Str	0.054	0.055	----	0.086	----	----	0.053	----	0.084	----	----	0.074	----	----	----	----	0.084	----	----	----
1:8	50	50	50	Mod	0.051	0.054	----	0.082	----	----	0.052	----	0.081	----	----	0.050	----	0.075	----	----	0.059	----	----	----
1:8	50	50	50	Str	0.055	0.053	----	0.083	----	----	0.049	----	0.081	----	----	0.064	----	0.091	----	----	0.066	----	----	----
1:8	50	60	40	Mod	0.054	0.051	----	0.078	----	----	0.051	----	0.073	----	----	0.046	----	0.073	----	----	0.051	----	0.073	----
1:8	50	60	40	Str	0.054	0.053	----	0.081	----	----	0.052	----	0.079	----	----	0.054	----	0.076	----	----	0.051	----	0.073	----
1:8	100	4	6	Mod	0.058	0.050	----	0.049	----	----	0.054	----	0.050	0.025	----	0.060	----	0.053	----	----	0.074	----	0.054	----
1:8	100	4	6	Str	0.058	0.054	----	0.055	----	----	0.054	----	0.051	0.019	----	0.069	----	0.055	----	----	0.102	----	0.058	----

Appendix D (continued): Power estimates for conditions with adequate Type I error rates

Table 28 (continued). Power estimates for conditions when the population effect size variance is 1.00.

				Pub	Population Effect Size 0.0					Population Effect Size 0.2					Population Effect Size 0.5					Population Effect Size 0.8				
s2	k	n1	n2	Bias	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim	Begg V	Begg N	Egger	Funnel	Trim
1:8	100	5	5	Mod	0.061	0.053	----	0.053	----	----	0.050	----	0.054	0.028	----	0.055	----	0.052	----	----	0.049	----	0.048	----
1:8	100	5	5	Str	0.057	0.052	----	0.052	----	----	0.051	----	0.054	0.022	----	0.055	----	0.049	----	----	0.067	----	0.054	----
1:8	100	6	4	Mod	0.056	0.050	----	0.061	----	----	0.050	----	0.062	0.029	----	0.055	----	0.065	----	----	0.060	----	----	----
1:8	100	6	4	Str	0.059	0.048	----	0.060	----	----	0.050	----	0.059	0.023	----	0.048	----	0.056	----	----	0.048	----	----	----
1:8	100	8	12	Mod	0.056	0.051	----	0.062	----	----	0.051	----	0.059	0.020	----	0.068	----	0.068	0.027	----	0.090	----	0.075	----
1:8	100	8	12	Str	0.058	0.054	----	0.065	----	----	0.056	----	0.061	0.017	----	0.092	----	0.077	0.015	----	0.140	----	0.094	----
1:8	100	10	10	Mod	0.054	0.049	----	0.061	----	----	0.053	----	0.061	0.022	----	0.057	----	0.059	0.028	----	0.064	----	0.061	----
1:8	100	10	10	Str	0.051	0.052	----	0.064	----	----	0.057	----	0.067	0.015	----	0.073	----	0.073	0.017	----	0.091	----	0.075	----
1:8	100	12	8	Mod	0.057	0.047	----	0.063	----	----	0.049	----	0.061	0.020	----	0.051	----	0.061	0.029	----	0.047	----	0.057	----
1:8	100	12	8	Str	0.060	0.055	----	0.070	----	----	0.052	----	0.065	0.019	----	0.051	----	0.062	0.021	----	0.057	----	0.066	----
1:8	100	40	60	Mod	0.053	0.051	----	----	----	----	0.055	----	----	----	----	0.072	----	----	0.022	----	0.096	----	----	0.025
1:8	100	40	60	Str	0.053	0.051	----	----	----	----	0.057	----	----	----	----	0.090	----	----	0.016	----	0.120	----	----	0.016
1:8	100	50	50	Mod	0.050	0.046	----	----	----	----	0.057	----	0.089	----	----	0.059	----	----	0.025	----	0.069	----	----	0.032
1:8	100	50	50	Str	0.053	0.054	----	----	----	----	0.059	----	0.093	----	----	0.072	----	----	0.019	----	0.087	----	----	0.022
1:8	100	60	40	Mod	0.053	0.050	----	----	----	----	0.052	----	----	----	----	0.052	----	----	0.024	----	0.051	----	----	0.032
1:8	100	60	40	Str	0.052	0.049	----	----	----	----	0.052	----	----	----	----	0.054	----	----	0.016	----	0.056	----	----	0.024

ABOUT THE AUTHOR

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