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The effectiveness of stepwise discriminant analysis as a follow up procedure to a significant MANOVA using both the F-statistic and partial R-square criterion

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THE EFFECTIVENESS OF STEPWISE DISCRIMINANT ANALYSIS AS A FOLLOW UP PROCEDURE TO A SIGNIFICANT MANOVA USING BOTH THE F-STATISTIC AND PARTIAL R-SQUARE CRITERION

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ABSTRACT

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This study examined the effectiveness of stepwise discriminant analysis (SWDA) using the F-statistic and Partial R-square criterion as a follow up analysis to a significant MANOVA. Monte Carlo simulations were conducted, and 7,128 scenarios were examined using different combinations of levels of number of MANOVA dependent variables, sample size, population correlation matrices, effect sizes, alpha significance levels and Partial R-square correlations. The two group case of MANOVA was considered, and simulations were run under the assumptions of multivariate normality, homogeneity of variance-covariance matrices, and linearity among all pairs of predictors within each group.

This study has shown that SWDA is a viable option as a follow up analysis to a significant MANOVA if the correct conditions are met. It was found that SWDA performs well when the number of dependent variables with significantly differing means in each group is held low. Based on the results SWDA performs best when the number of significant dependent variables is three or less. Additionally, SWDA only works well when correlations between dependent variables are quite low.

If correlations between dependent variables are held low, then SWDA can be used in situations where there are three dependent variables or less. SWDA can be used in situations where there are more than three dependent variables, but the number of significant dependent variables must be below four in order for SWDA to perform well. Another procedure could be used to gauge what that may be, then SWDA could be employed if the correct conditions are met.

Because SWDA only works well when low correlations between dependent variables are present, it could be combined with another procedure, perhaps descriptive discriminant analysis to supplement situations when higher correlations are found. This dissertation has shown however, that using several univariate F-tests, also known as the "protected" F-test, should not be used after a significant MANOVA and SWDA should be used instead if the correct conditions are met.

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CHAPTER I

INTRODUCTION

Multivariate analyses in statistics are extremely important and are used in a variety of disciplines including the social and behavioral sciences as well as in educational research. Tatsuoka (1971, p. 273) stated, “There has been a sharp increase during the past decade in the use of multivariate analysis in research in the behavioral sciences and education.” More recently, Dimitrov and Rumrill (2005, p. 205) explained, “The complexity of relationships between variables in a variety of rehabilitation settings can be appropriately addressed by the use of multivariate methods of statistical analysis.” While multivariate techniques were once scarcely used due to the researchers lack of experience with them, or the cumbersome calculations that tend to come along with them (Tatsuoka), advances in statistical knowledge have remedied the prior while advances in computer technology have remedied the latter (Schneider, 2002). These advances in computer technology are not always beneficial as Heiny (2006, p. 1) states, “If there is a drawback to computer technology, it would be that researchers might blindly produce and accept easily-generated statistical results (Woldbeck, 1998).” One of the most popular and widely used statistical programs, SAS®, follows a MANOVA with several univariate ANOVA’s, as its default procedure. This analytical practice is known as the “protected F-test.” The protected portion of the name was supposed to refer to the protection against committing a Type I error (Hummel and Sligo, 1971). As it turns out, a more apt name might have been the "unprotected F-test," as more recent research has shown that in most circumstances, running this test will result in inflated Type I error rates (Kellow, 2000).

Often included in an introduction of MANOVA is the distinction between ANOVA and MANOVA; ANOVA being the univariate form of MANOVA. Bray and Maxwell (1985, pgs. 7-8) explain that "The major distinction is that in ANOVA one evaluates mean differences on a single dependent criterion variable, whereas in MANOVA one evaluates mean differences on two or more dependent criterion variables simultaneously." If significant differences are found between groups in a MANOVA several options are available to the researcher to find which dependent variables contribute to causing significant group differences.

Current Approaches

As stated before, the most commonly used follow-up procedure to a significant MANOVA is performing a separate ANOVA on each dependent variable. Each of these ANOVA's employs the use of an F-statistic in the analysis. This practice is known as the "protected F-test" (Hummel and Sligo, 1971). The rationale for conducting a separate ANOVA on each dependent variable in order to see which dependent variable or variables contributed to the significant group differences is intuitive, but fundamentally flawed. Researchers use, or should use a multivariate procedure because of the multivariate nature of the relationship between the variables across the groups being compared. That is, because each dependent variable is measured on the same sample of individuals in each group, these measurements are related multivariately. To follow up this multivariate test with several univariate tests completely disregards the relationship among the dependent variables that was presumably there and should not be ignored.

There are a few multivariate tests that are used by researchers currently as a follow-up procedure to a significant MANOVA. These include descriptive discriminant analysis, DDA, and stepwise discriminant analysis, SWDA. Research has been done on both of these post hoc tests with regards to their effectiveness. Schneider (2002) conducted a Monte Carlo simulation to investigate the effectiveness of DDA as a post hoc test to a significant MANOVA. DDA employs the use of Linear Discriminant Functions (LDFs), which maximizes group separation on the levels of a MANOVA independent variable (Schneider). When using DDA the researcher must also choose whether to use structure coefficients or standardized weights to assess variable importance, both of which will be described in further detail in Chapter II.

Schneider (2002) investigated 2, 5, and 8 dependent variables with 10, 50, 100 and 500 observations per group, and varied population correlation matrices and population mean vectors. Schneider also studied both structure coefficients and standardized weights, both of which yielded less than stellar results. Schneider concluded that, based on her results, she could not recommend using DDA as a follow-up procedure to a significant MANOVA. She went on to state specifically that she does not recommend the use of standardized weights when using DDA. Based on Schneider's findings, it would appear that the solution to the problem of analyzing a significant MANOVA lies elsewhere. This solution may be found in part, through the use of SWDA.

Heiny (2006) performed a Monte Carlo simulation to investigate whether SWDA was a feasible option as a follow-up to a significant MANOVA. He studied 2, 3, 4, 5, 6, 7 and 8 dependent variables with sample sizes of 50, 100, 200 and 500. Covariance matrices and effect sizes were also varied in his study. Finally, alpha levels of .01, .05 and .10 were used in conjunction with an F-statistic. Heiny found that SWDA performed well when the number of dependent variables was small (two or three) but did not perform well with more dependent variables in the MANOVA. As Heiny points out though, with either two or three dependent variables in his design there was only one dependent variable that had significantly different means between the groups. However, with 4, 5, 6, 7, or 8 dependent variables, there were two or more dependent variables that had significantly different means between the groups. It may be the case that the effectiveness of SWDA is related to the number of dependent variables that differ between the groups. This study will vary the number of variables that had significantly different means in each group to include from one to all variables being significant, with few combinations being left out. These conditions will be discussed further in Chapter III.

In SAS there is a choice between two statistics for use with the SWDA analysis. The choice is between an F-test criterion and a squared partial correlation criterion. The F-test criterion comes from an analysis of covariance, ANCOVA, and is also the default for the SAS STEPDISC procedure. Both the F-test and the squared partial correlation criterion typically select variables in the same order, but when the sample size increases, the F-test tends to select more variables (SAS/STAT User's Guide, Version 9.1, 1999). Heiny (2006) chose to use the F-test based on its merits and found that it did tend to become too aggressive as the sample size became large, which led to an increased probability of committing Type I errors.

Heiny (2006) also found that SWDA performed better when correlations between dependent variables were kept relatively low. Heiny concluded, "…when correlations among dependent variables are kept low, [SWDA] is probably a better alternative than DDA. However, when correlations among dependent variables are high, DDA using structure coefficients appears to be a more appropriate procedure." (p. 108) Heiny used correlations among what he described as "like" variables equal to .2, .4 and .6. He used correlations among "unlike" variables equal to .1 and .2. When considering the correlation between two MANOVA dependent variables whose means are the same in both groups, this is said to be the correlation between "like" variables. Additionally, two variables whose means are different in each group are also considered to be "like" variables. "Unlike" variables are when considering correlations between two MANOVA dependent variables, one variable has the same mean in both groups and the other has different means in both groups.

As stated before, Heiny (2006) used alpha levels of .01, .05 and .10. He found that researchers using SWDA as a follow-up procedure to a significant MANOVA should set alpha lower than the desired type I error rate, due to SWDA becoming too aggressive, especially when samples sizes were 250 or higher.

Justification For This Study

Simply the mention of a stepwise analysis in the statistical realm tends to spark much debate and controversy. There exist several arguments against the use of stepwise procedures in any capacity, not just SWDA. Thompson (1995) outlines three distinct arguments against the use of stepwise methods. The first revolves around the fact that the most commonly used statistical computer packages calculate the degrees of freedom for stepwise analyses incorrectly. Thompson points out that while the total degrees of freedom are calculated correctly, the degrees of freedom for the model are typically underestimated, while consequently the degrees of freedom for error are overestimated. This miscalculation can lead to a much higher probability of committing type I errors. Statistical software packages tend to calculate stepwise degrees of freedom as if the predicted variables were selected at random. With the procedure that stepwise methods use to select variables at each step, each variable cannot be considered to be selected at random. At each step, the next variable to be selected is chosen by considering the results from the in dependent variables not yet entered into the model (Thompson). These incorrect degrees of freedom apply to the F-statistic that can be used with SWDA. Also, using these conservative degrees of freedom would most likely result in the procedure becoming too conservative, and would lead to a decrease in power. SWDA is only useful if it selects the appropriate variables, so despite the fact that Thompson is correct, using his suggested degrees of freedom is useless if it leads to the procedure not selecting the correct variables.

The second criticism Thompson (1995) states is that stepwise methods do not select the best predictor set of a predetermined size. This criticism is valid for studies where the researcher is trying to select the best subset of variables to use in a particular study. This study uses stepwise methods to select variables after a significant MANOVA, not to select variables to be used initially, so this study will not suffer from this particular criticism.

The final criticism of Thompson (1995) against the use of stepwise methods is that stepwise analyses tend to yield unreplicable results. Thompson explains how this result is mainly due to the fact that stepwise methods tend to capitalize greatly on sampling error, which is the variability in sample data that is unique in that particular sample and consequently cannot be reproduced in ensuing samples. The difference between two contiguous variables may be extremely small or extremely large, but stepwise methods may select the "better" of the two, no matter the difference. This study looks at SWDA following a significant MANOVA, so there have already been established significant differences by the MANOVA procedure.

Purpose and Research Question

This study is an extension of Heiny's (2006) research, and will attempt to further explain the effectiveness of SWDA as a follow-up procedure to a significant MANOVA. Heiny used several different conditions some of which showed favorable results, and others that did not. This study will manipulate these conditions in order to find those which work well for SWDA. The following research question will be addressed:

> Q1 How does SWDA perform with consideration to different combinations of sample sizes, effect sizes, number of MANOVA dependent variables, alpha significance levels, correlations among dependent variables, and SWDA criterion chosen for this study?

Limitations

This study will only consider the case where the discriminant analysis assumptions of multivariate normality, homogeneity of variance-covariance matrices, and linearity among all pairs of predictors within each group are met. The results of this study therefore cannot be applied to experiments which do not meet these assumptions. This study will only consider the two group case, so results will not apply to studies that use three or more groups.

Conclusion

This chapter has shown the need for further research in the area of using SWDA as a post hoc test to a significant MANOVA. Heiny (2006) showed that SWDA may have significant upside when used as a follow-up test to a significant MANOVA. His research however, has left many questions unanswered with regards to the performance of SWDA. This study will investigate the conditions that did not yield satisfactory results in Heiny's study and alter them in order to find which conditions are optimal to use with SWDA. The specific conditions that will be altered are discussed in Chapter III.

Terminology

The following terminology will be used throughout this study:

Stepwise Discriminant Analysis (SWDA) selects variables using a stepwise selection criteria in discriminant analysis, and can be performed using PROC STEPDISC in SAS. There are two different criteria that can be used in SWDA; the *F-statistic* and *Partial R-square*. The F-statistic discriminates between groups based on the significance of Wilk's lambda. Partial R-square discriminates based on the squared partial correlation of the variable under consideration controlling for the effects of the variables already selected. *Effect Size* is the difference of means for a variable between the two groups, and is expressed in standard deviation units. *Power* is the probability of correctly selecting variables which have significantly different means between groups. *Significant variables* in this study will refer to dependent variables which have significantly differing means in each group, and *NV* will be used in all tables and appendices to refer to the number of significant variables.

CHAPTER II

REVIEW OF LITERATURE

As discussed earlier, this study extended the research of Heiny (2006), and further investigated if SWDA was a good follow-up procedure to a significant MANOVA, and under what circumstances that was true.

This chapter will be broken up into four sections as follows:

(1) A brief look at the history of MANOVA and the relationship between MANOVA and discriminant analysis are examined.

(2) The current analyses being used as a follow up procedure to a significant MANOVA are explored.

(3) Using discriminant analysis as a follow up procedure to a significant MANOVA are examined with most attention being focused on the study performed by Schnieder (2002).

(4) The study performed by Heiny (2006) using SWDA as a follow up procedure to a significant MANOVA will be examined, and the results as well as limitation are discussed.

A Brief Background on MANOVA and Discriminant Analysis

Multivariate analyses were largely developed in the 1930s; however MANOVA was developed a short time later and is most often attributed to a presentation given by Tukey (1949). In his little known presentation, Tukey discussed the generalization of ANOVA to the multivariate case; MANOVA. Early in the life of MANOVA, Wilk's criterion was the most widely used test of significance, but in a book written by Rao

(1952), he argues that Wilk's criterion simply did not provide an adequate test for the multigroup discriminant function since it gave equal weight to all dimensions of variation (Cramer & Bock 1966). Rao's argument was significant, and may have lead to the several alternatives to Wilk's criterion, some of which are still used today. These include advances by Roy (1957), Heck (1960), Pillai (1960), and Hotelling (1957) among others.

Discriminant analysis was developed by Fisher (1936) for the purpose of multivariate classification of individuals in groups. Mathematically, MANOVA and discriminant analysis are the same (Tabachnick & Fidell 1996). They are however, the opposite of each other in terms of the independent and the dependent variables. In MANOVA the independent variables determine group membership, while the dependent variables act as the predictor variables. In discriminant analysis, the independent variables act as the predictors while group membership is determined by the dependent variables. The fundamental difference between the two procedures may lie in the wording of the questions that each address. Discriminant analysis asks the question; can a linear combination of predictor variables predict group membership? As Tabachnick and Fidell explain MANOVA asks "whether group membership is associated with reliable mean differences on a combination of DV's" (p. 507).

Borgen and Seling (1978) explain that the statistical tools of MANOVA and discriminant analysis both have a fundamental base in the greater linear model. As such, both are methods of looking at multivariate differences among groups. They go on to explain that when groups are converted into dummy variables, MANOVA and discriminant analysis become special cases of canonical correlation, and subsequently the general linear model. This further solidifies the close mathematical relationship that

MANOVA and discriminant analysis share, and bolsters the argument for using discriminant analysis as a follow up procedure to a significant MANOVA.

Current Analyses Used

Several analyses are currently being used to analyze a significant MANOVA. The first, and by far the most used at the time this study was written, is performing a separate univariate ANOVA on each dependent variable. This practice is known as the "protected F-test". Kellow (2000) explains one of the pitfalls of the protected F-test. "Researchers who examine multiple outcome variables sometimes invoke a multivariate analysis of variance approach know as the "protected F test" to control for experimentwise Type I error rate. Unfortunately, this procedure affords protection against experimentwise Type I error only in rare instances" (p. 917). The use of the protected F-test with apparent reckless abandon appears to stem from a paper written by Hummel and Sligo (1971). Schneider (2002) found that at least 250 articles have cited Hummel and Sligo through the year 2001.

Hummel and Sligo (1971) performed a Monte Carlo simulation study to determine how to handle the analysis of multivariate normal data. Three approaches were examined in the study. The first approach was to simply perform a separate ANOVA on each dependent variable initially. The first approach does not employ the use of MANOVA at all, and instead ignores the multivariate relationship of the data. The second approach was to first perform a MANOVA, then use separate ANOVA's for each dependent variable to determine if they were significant. This second approach has come to be known as the protected F-test. The last approach involved first performing a

MANOVA, then following that with a simultaneous F-test. The third approach was used in order to test the recommendation of Morrison (1967).

They used three levels of sample size (10, 30 and 50), and three levels of amount of dependent variables (3, 6 and 9). Additionally, Hummel and Sligo (1971) used four levels of correlation (0.10, 0.30, 0.50 and 0.70), for a total of 36 different scenarios. Each scenario was run using 1,000 replications. Simulations were run using a computer program developed by Hummel.

The results found by Hummel and Sligo (1971) indicated that the second method, commonly referred to as the protected F-test, performed the best among the three methods. They found that the protected F-test showed relatively stable Type I error rates regardless of the amount of dependent variables used or correlation between variables. They also recommended this practice because of what they described as the method's conservatism not becoming too extreme.

Unfortunately the research done by Hummel and Sligo was misleading and ultimately flawed. Kellow (2000) outlined three main reasons why. First, Hummel and Sligo (1971) used correlation matrices in their simulation study, where all the mean vectors are zero. The case where the mean vectors for the two groups are exactly equal is a rare and unrealistic circumstance in real world data of any discipline. Strahan (1982) stated that the case Hummel and Sligo used was an unrealistic representation of psychological data. Hummel and Sligo actually only proved that the protected F test is only useful when the Null hypothesis is not rejected, i.e. there are no group differences. One would assume that the case where there are group differences and the Null hypothesis is rejected, is the case that nearly all researchers would be interested in. There isn't much use in research for a post hoc test where there are no group differences.

The second reason Kellow (2000) points out, is if one or more of the dependent variables are significant, then the protected F test does virtually nothing to indicate to the researcher which variable or variables are significantly different across the groups. It is the unfortunate fact that when using several univariate ANOVAs as a post hoc test to a significant MANOVA, the alpha level will become increasingly inflated as the number of dependent variables used rises. This would not be the case however if all of the post hoc ANOVA tests are completely dependent, which is a very unlikely scenario. Kellow gives a model for calculating the increase in Type I error: $\alpha_{ew}=1-(1-\alpha_{tw})^k$, where α_{ew} is the probability of committing a Type I error for the overall experiment, and α_{tw} is the probability of committing a Type I error in each test. Based on this formula it is apparent that the probability of committing a Type I error for the overall experiment can become quite large when using the protected F test. Moreover the probability will be larger than that of committing a Type I error in each test, in almost all circumstances. Bray and Maxwell (1985) point out that "Because the individual alpha levels are not adjusted despite performing multiple significance tests, the overall multivariate test does not provide 'protection' for each of the (p) univariate tests" (p. 343).

The use of a Bonferroni correction has been used in research to account for this potential inflation of the probability of committing a Type I error. The Bonferroni procedure simply involves using a new alpha calculated by dividing the desired alpha by the number of hypotheses. If, for example, a researcher wanted to use an alpha of 0.05, with four simultaneous ANOVA's, then the researcher would use a modified alpha of

0.05/4, or 0.0125. While using a Bonferroni correction may help protect against inflation of Type I error, it may also lead to decreased power or increased Type II error rates (Fish 1988). Perhaps more importantly, the Bonferroni correction in this context does nothing to reflect the multivariate nature of the data being used (Thompson, 1994).

Kellow's (2000) third reason against the use of the protected F test is that it is inappropriate to use several univariate tests as a follow up procedure to a multivariate test. Certainly this undermines the relationship that should exist between the dependent variables, as that is the precise reason for using a multivariate test to begin with. Some researchers would reason that if the dependent variables are completely or conceptually independent then using multiple ANOVAs following a significant MANOVA would be appropriate. This logic is not sound however. If the dependent variables were in fact independent of one another then a MANOVA would not be appropriate, rather several univariate ANOVAs run on each dependent variable would be appropriate.

Hummel and Sligo (1971) were not the only researchers to advocate the use of univariate F-tests as a post hoc analysis to a significant ANOVA. Spector (1977) recommended this practice in lieu of using discriminant analysis. Spector performed a Monte Carlo study comparing the protected F-test to discriminant analysis as a post hoc test to a significant MANOVA. He used two MANOVA's, each with three dependent variables. One of the MANOVA's had what he described as uncorrelated dependent variables, and the other correlated. The uncorrelated variables had correlations of 0.06, 0.05 and 0.03, and the correlated variables had 0.67, 0.69 and 0.54. The study was designed so that dependent variable "C" had the largest effect size then "B" then "A", with all three having significantly differing means in each group. Two samples were generated by randomly sampling 20 observations from a normal distribution with known means and equal variances. Analyses were run in Finn's (1972) *Multivariance* computer program.

Spector (1977) found that for the uncorrelated situation, the protected F-test performed the same as discriminant analysis. For the correlated case however, he found that the protected F-test correctly had the same results as the uncorrelated case, though discriminant analysis did not. While discriminant analysis reflected the order of magnitude of effect size, it did not identify variables "A" or B" as having significantly differing means in each group. Spector concluded from his results and his statistical knowledge that the protected F-test is superior to discriminant analysis as a post hoc test to a significant MANOVA. He went on to explain that discriminant analysis is most appropriate for prediction and classification, but is not effective as a follow up test to a significant MANOVA.

Borgen and Seling (1978) reviewed Spector's (1977) article, and performed their own Monte Carlo study to further compare the protected F-test and discriminant analysis methods. They agreed with Spector that discriminant function weights are not terribly interpretable when the dependent variables are correlated with one another. The discriminant function weights are similar to those used in multiple linear regression. Borgen and Selig explain that the weights are mathematically derived to best predict, in a least squares sense, the new discriminant variates. When fitting the weights with correlated dependent variables, while the prediction may be maximized, the meaning of the weights is often lost. Often, if there are two highly correlated variables that are both explaining the same information about a variable, one will be heavily weighted and the other will not, because of this redundancy. They point out that this phenomenon will occur whether the raw or standardized weights are used.

Borgen and Seling (1978) also admit that the protected F-test may be used, but add that repeated use of univariate tests will yield unrealistic probability estimates for hypothesis testing. This often happens because the dependent variables are correlated. If every outcome measure were orthogonal then using a univariate test on each dependent variable would not present any problems. In research that involves real world data, very rarely are every outcome measure orthogonal.

Borgen and Seling (1978) posit that the biggest limitation of Spector's (1977) article is that the theoretical model he used presumed that the groups were distinguished based on a single underlying dimension. MANOVA however, typically involves multiple underlying dimensions, being that the researcher decided to use a multivariate analysis over several univariate analyses. Therefore it would be much more appropriate to use a multivariate analysis as a follow-up procedure over several univariate ones. They suggest that discriminant analysis would be a prime candidate for this situation.

Another limitation of Spector's (1977) article is that he did not use all of the widely accepted interpretive tools available to him. Spector chided the use of discriminant analysis as a follow-up procedure to a significant MANOVA, largely based on the poor interpretability of the discriminant weights. However, the discriminant structure matrix has been proven to be interpretable, and was developed specifically to avoid the known limitations of discriminant weights. The discriminant structure matrix shows the correlations between the original dependent variables and derived discriminant function scores. It has the form of a factor matrix and directly shows the relationship of each dependent variable with the underlying discriminant dimensions.

Borgen and Seling (1978) performed a Monte Carlo study comparing discriminant analysis and the protected F-test as follow-up analyses to a significant MANOVA. Their study was conducted mainly to improve upon the study of Spector (1977) by using a more complexly designed data structure. Their study included nine groups with six dependent variables and a sample size of 50. For half of the theoretical correlation scenarios 0.60 was used with 0.25 being used for the other half. Analyses were run in SPSS, with the discriminant structure matrix being calculated in an ad hoc Fortran program, as the matrix was not available in SPSS.

Not surprisingly, Borgen and Seling (1978) found the discriminant weights not very useful and instead used the discriminant structure matrix for interpretation. They concluded that discriminant analysis not only provided correct results, but that it provided more useful information about the multivariate data by examining the discriminant structure matrix. They surmised that when the data are truly multivariate, it is necessary to use a multivariate follow-up procedure to handle the complexity of the data. Specifically they found that discriminant analysis accurately identified the underlying dimensions of the data, by showing the contribution of individual variables to the underlying dimensions. They ultimately concluded that discriminant analysis was the most comprehensive method available for analyzing a significant MANOVA.

One major cause for concern for the articles by Spector (1977) and Borgen and Seling (1978) is their sweeping conclusions based on decidedly narrow Monte Carlo simulation studies. Much of the discussions in both articles were based on the statistical knowledge of the respective authors, which is acceptable, and moreover commendable. The sweeping conclusions by both authors however, based on the rather limiting situations that were used, are somewhat unsettling. While both articles used more than one level of correlation (three for Spector, and two for Borgen and Seling), only one level of sample size and amount of dependent variables were used. As stated before the conclusions from both articles are taken quite seriously, albeit with a grain of salt, but mainly due to the author's statistical knowledge, not based as much on the Monte Carlo studies performed. It should be noted though that both articles were written in the 1970's, and therefore the computer technology was rather limiting compared to current computer technology.

This study will manipulate several independent variables in addition to the choice of test statistic in SWDA, in order to give a more comprehensive analysis of the performance of SWDA as a follow-up analysis to a significant MANOVA. Both of the aforementioned articles did not use SWDA, opting instead to use discriminant analysis. Both articles used discriminant weights, though Borgen and Seling (1978) also used the discriminant structure matrix, for interpretation. Schnieder (2002) performed a Monte Carlo simulation study on a much larger scale to further examine the effectiveness of using Descriptive Discriminant Analysis (DDA) with structure coefficients and standardized weights as a follow-up procedure to a significant MANOVA.

Discriminant Analysis as a Follow Up Analysis to a Significant MANOVA

Tatsuoka (1969) once described the application of discriminant analysis as a follow-up to a significant MANOVA as, "…probably one of the most significant developments in multivariate analysis during the past ten years" (p. 742). Given the mathematical equivalence of MANOVA and discriminant analysis, its multivariate structure, as well as the promise shown in research thus far, his early backing of discriminant analysis in this context should prove to be somewhat foreboding. There are many options available to use within discriminant analysis however, which further complicates the blanket statement of simply using discriminant analysis in general in this context. The relevant options are discussed in this chapter.

Discriminant analysis has two main counterparts, descriptive discriminant analysis (DDA) or predictive discriminant analysis (PDA), each of which may be used depending on the research question being asked. PDA is used if the scores on the continuous variables are used to predict group membership, while DDA is used when group membership is being used to predict scores on the continuous variable (Buras, 1996). Based on these descriptions, it is apparent why DDA would be the appropriate analysis to use as a follow up analysis to a significant MANOVA.

Descriptive discriminant analysis (DDA) produces functions that are linear combinations of the dependent variables, which are called linear discriminant functions (LDFs). The LDF's are computed by maximizing between group separation, while minimizing within group variance (Klecka, 1980). This same method of maximizing between group separation, while minimizing within group variance is also employed in ANOVA, multiple linear regression, as well as in T-tests (Buras, 1996). The maximum number of discriminant functions is the smaller of either the number of predictors, or the degrees of freedom for groups. Typically, only the first one or two LDFs actually discriminate among the groups, with the remaining functions provide no additional information about group membership (Tabachnick & Fidell, 1996). In two group discriminant analysis, as is the case for this study, only one LDF is calculated.

Interpretation of the results of discriminant analysis, and of the LDFs specifically can be at times, quite difficult (Kellow, 2000). Several options have been discovered in order to dispel this problem. One of the options available is the use of standardized coefficients in the LDFs. As stated before, an LDF is a linear combination of the dependent variables, so the variables with the largest coefficients would be expected to contribute the most to explaining group differences. A problem arises however, if the dependent variables are measured on different scales, which is almost always the case. Using standardized coefficients instead of the typical coefficients remedies this problem.

Standardized coefficients are not without their flaws though. A problem tends to arise when some or all of the dependent variables are highly correlated with one another. When two dependent variables are highly correlated and are explaining much of the same information, then often times one of the variables will be given a much higher standardized coefficient than the other (Tanguma, 2000). This tends to occur in situations where both of the variables are providing the same amount of discriminatory information, and should therefore have similar standardized coefficients. This problem arises because standardized coefficients consider the simultaneous contributions of all other variables (Klecka, 1980).

Klecka (1980) supports the use of structure coefficients over standardized coefficients when trying to determine variable importance of explaining group differences. Structure coefficients for a dependent variable are the correlations between the dependent variable and the LDF (Huberty & Morris, 1989). Structure coefficients hold a decided advantage over standardized coefficients when the dependent variables are highly correlated. When comparing structure to standardized coefficients, Tanguma (2000) explains, "The structure coefficients (bivariate correlations), on the other hand, are not affected by relationships with other variables" (p. 6). Structure coefficients are not without their limitations, as Huberty (1972) showed that variable ordering as provided by structure coefficients will be identical to the order provided by performing p univariate F-values.

Another drawback to using structure coefficients relates to deciding the cutoff value for significance. In his multiple regression book; Pedhazur (1997) recommends 0.30 as a meaningful structure coefficient, but refers to this as a "rule of thumb." Dagleish (1994) tested this "rule of thumb" by using bootstrap and jackknife analysis on an example data set. By observing Type I error rates and confidence interval coverage he found that the standard "rule of thumb" was simply not adequate. Dagleish admitted that his finding do not apply to all possible combinations of sample size, number of groups, number of discriminant functions and violation of assumptions among others, though his findings do show the shortcomings of using the "rule of thumb."

More recently several other methods to interpret DDA results have been developed to compensate for the shortcomings of both standardized and structure coefficients; the most widely used methods of interpretation. The F-to-remove statistic developed by Huberty and Wisenbaker (1992) measures the change in Wilk's lamba when a response variable is removed from the analysis. Thomas and Zumbo (1996) introduced the parallel and total discriminant ratio coefficients. Both of which were designed to measure the relative contribution to group differences for an LDF. Each of these more recently developed methods has not yet been proven as being superior to the more conventional methods discussed earlier.

This study used SWDA which does not use structure or standardized coefficients. As will be discussed in Chapter III, SWDA with the use of the F-statistic instead uses the significance from the reduction in Wilk's lambda in order to interpret significance. The other criteria used in this study; partial r-square, also does not use either structure or standardized coefficients. The apparent advantage is due to the F-statistic and partial r-square in SWDA not suffering from the same drawbacks of structure and standardized coefficients discussed earlier. They come with their own drawbacks however, which will be discussed later.

Schneider (2002) performed a large scale simulation study to examine the effectiveness of using discriminant analysis as a follow-up analysis to a significant MANOVA. In her study, Schneider examined both structure and standardized coefficients in discriminant analysis. She used three levels of number of dependent variables, which were 3, 5 and 8. Four levels of sample size were used in the study, of 10, 50, 100 and 500. Additionally, two different population correlation matrices were used, and three levels of population mean vectors. The combination of all these independent variables led to 240 different scenarios examined in the study, with each being simulated 5,000 times.

The population correlation matrices in Schneider's (2002) study were developed with correlations for the two groups between dependent variables. There were five scenarios which were calculated by randomly generating numbers between 0.00 and 1.00, by intervals of 0.20. For scenario 1, numbers were randomly generated between 0.00 and 0.20, for scenario two between 0.21 and 0.40 and so on to scenario 5 which used correlations between 0.81 and 1.00. This approach is interesting, but it was reasoned that the range for each scenario was simply too large. Certainly the difference between 0.01 and 0.19 for example is quite large when dealing with correlations, specifically in MANOVA. Additionally, scenario 5 is simply not a realistic situation for MANOVA, as the correlations are too large. In fact, a more appropriate approach would have been to use higher correlations for "like" variables, and smaller correlations for "unlike" variables, as Heiny (2006) did. The approach taken by Heiny will be used in this study.

The population mean vectors contained the different levels effect size, which were 0.00, 0.50 and 1.00. The situations were somewhat arbitrary, and were selected based on what Schneider (2002) felt were realistic research situations in the social sciences. These situations were fairly strange, though this study will not use these situations, and therefore will not examine the situations developed by Schneider at great depth. Table 1 contains the population mean vectors.

Table 1

*Effect Sizes, **d**, for the Population Mean Vectors (Schneider, 2002)*

p = 2

d: $\begin{bmatrix} 0 \\ .5 \end{bmatrix} \begin{bmatrix} .5 \\ 1.0 \end{bmatrix} \begin{bmatrix} 1.0 \\ 1.0 \end{bmatrix}$

p = 5

d: $\begin{bmatrix} 0 \\ 0 \\ .5 \\ .5 \\ .5 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ .5 \\ .5 \\ 1.0 \end{bmatrix} \begin{bmatrix} .5 \\ .5 \\ 1.0 \\ 1.0 \\ 1.0 \end{bmatrix}$

p = 8

d: $\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ .5 \\ .5 \\ .5 \\ .5 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ .5 \\ .5 \\ .5 \\ 1.0 \end{bmatrix} \begin{bmatrix} .5 \\ .5 \\ .5 \\ .5 \\ 1.0 \\ 1.0 \\ 1.0 \\ 1.0 \end{bmatrix}$

In general, Schneider (2002) found poor results with standardized coefficients. She found the results from standardized coefficients to be uninterpretable, and found that the standardized weights returned values as high as 15. Multivariate normal distributions were used in the study, so any weights above three would be considered an outlier. The values of 15 that were found are extremely improbable, and would lead any reasonable researcher to discard them as incorrect in this situation (Bluman, 2000). Schneider found that "…standardized weights have provided virtually no useful information for LDF interpretation in the current study…" (p. 122). She also found that structure coefficients were much more reliable than standardized weights when interpreting discriminant functions.

While Scheider (2002) found structure coefficients to be more interpretable than standardized weights, she did not go as far as to recommend their use in general. She found the results regarding structure coefficients to be quite confusing. The results showed that as effect size was increased, power actually decreased in some cases. These results are certainly the opposite of what one would expect. For large effect sizes, the values of structure coefficients are smaller than they should be for moderately to highly influential dependent variables. Modified criteria for structure coefficients could then be used in those cases; which is precisely what Schneider did. The criteria in detail can be found on pages 103 and 104 of Schneider's unpublished dissertation. More research will need to be performed in order to find out if this modified criteria truly works, and under what conditions.

Schneider (2002) found that using DDA as a post hoc analysis to a significant MANOVA did show some promise, but her results overall did not warrant a blanket endorsement. As stated before, she found the use of standardized coefficients nearly useless, though found some promise in structure coefficients. Her results using structure coefficients showed that it worked in certain scenarios, based on power and Type I error. These circumstances however, were somewhat scattered without any major underlying pattern in their ability to work, though smaller patterns were recognized. Schneider herself admitted that her results were somewhat confusing. The scenarios for which using DDA with structure coefficients as a post hoc analysis to a significant MANOVA can be found in Schneider's dissertation.

SWDA as Follow Up Analysis to a Significant MANOVA

While Schneider's (2002) research showed a small amount of promise using DDA, perhaps much more promise was shown by Heiny (2006) using SWDA. This study is an extension of Heiny's research, though will change certain key independent variables, as well as considering an additional criterion in SWDA. While Heiny showed that SWDA has considerable upside, his results were not completely satisfactory and more research was needed in order to discover its full effectiveness.

Heiny (2006) used the number of dependent variables, p, equal to 2, 3, 4, 5, 6, 7 and 8. The range of number dependent variables used in Heiny's study represents reasonable conditions in the social sciences. Interestingly though, he chose the number of dependent variables with differing means in each group to be as close to half as possible. For situations where using exactly half was not possible, the extra variable did not have significantly differing means in each group. So, for p = 2, 3, 4, 5, 6, 7 and 8, the number of variables with significantly differing means in each group were respectively, 1, 1, 2, 2, 3, 3 and 4.

This practice may not be overtly detrimental, but due to Heiny's (2006) findings, more combinations of significantly differing means in each group needs to be performed. Had his results shown SWDA to work across all his conditions, then his choice of this may have been sufficient. He instead found that SWDA worked quite well for $p = 2$ and 3; the only situations where there was only one significantly different mean in each group. These results were somewhat ambiguous and certainly need to be explored further.

For levels of sample size, n, Heiny (2006) chose to use $n = 50$, 100, 250 and 500. The sample sizes chosen need to reflect reasonable sample sizes used in MANOVA, and his seem to fit that criteria. As discussed earlier, Schneider used sample sizes of 10, 50, 100 and 500, but decided that 10 was simply too small a sample size to give enough power to reject a significant MANOVA.

Young (2006) performed a Monte Carlo simulation study to find the minimum sample size required for MANOVA under different scenarios. Young considered several levels of alpha, correlations and effect sizes, and reported results based on power and Type I error. Not surprisingly Young found that as effect size increases or as the number of dependent variables decrease, the minimum sample size needed decreases. For the two group MANOVA case, he found that the minimum sample size per independent variable ranged from a low of about 130 ($p = 2$, power = 0.70, alpha = 0.01, effect size = 0.10, moderate correlation), to more than 500 ($p = 5$, alpha = 0.01, effect size = 0.10, small or very small correlations).

Heiny (2006) initially used three different population correlation matrices for each level of p. He set correlations between "like" variables (see *Terminology*, Chapter I) equal to 0.20 for correlation structures one, two and three. The correlations for "unlike" variables were set to 0.20, 0.40 and 0.60 for structures one, two and three respectively. Based on results obtained from using correlation structures one, two and three, Heiny decided to create three additional correlation matrices with lower correlations among "unlike" variables. The correlations for "unlike" variables were lowered from 0.20 to 0.10, with correlations between "like" variables remaining the same. Correlation structures four, five and six were run only using a sample size of 500. An example of correlation matrices one through six with p = 5 is shown in Table 2.

Table 2

Population Correlation Matrices (p = 5)

Correlation Structure One:

$$\boldsymbol{\rho} = \begin{bmatrix} 1.00 & 0.20 & 0.20 & 0.20 & 0.20 \\ 0.20 & 1.00 & 0.20 & 0.20 & 0.20 \\ 0.20 & 0.20 & 1.00 & 0.20 & 0.20 \\ 0.20 & 0.20 & 0.20 & 1.00 & 0.20 \\ 0.20 & 0.20 & 0.20 & 0.20 & 1.00 \end{bmatrix}$$

Correlation Structure Two:

$$\boldsymbol{\rho} = \begin{bmatrix} 1.00 & 0.40 & 0.40 & 0.20 & 0.20 \\ 0.40 & 1.00 & 0.40 & 0.20 & 0.20 \\ 0.40 & 0.40 & 1.00 & 0.20 & 0.20 \\ 0.20 & 0.20 & 0.20 & 1.00 & 0.40 \\ 0.20 & 0.20 & 0.20 & 0.40 & 1.00 \end{bmatrix}$$

Table 2 (*continued*)

Population Correlation Matrices (p = 5)

Correlation Structure Four:

$$\boldsymbol{\rho} = \begin{bmatrix} 1.00 & 0.20 & 0.20 & 0.10 & 0.10 \\ 0.20 & 1.00 & 0.20 & 0.10 & 0.10 \\ 0.20 & 0.20 & 1.00 & 0.10 & 0.10 \\ 0.10 & 0.10 & 0.10 & 1.00 & 0.20 \\ 0.10 & 0.10 & 0.10 & 0.20 & 1.00 \end{bmatrix}$$

Correlation Structure Five:

$$\boldsymbol{\rho} = \begin{bmatrix} 1.00 & 0.40 & 0.40 & 0.10 & 0.10 \\ 0.40 & 1.00 & 0.40 & 0.10 & 0.10 \\ 0.40 & 0.40 & 1.00 & 0.10 & 0.10 \\ 0.10 & 0.10 & 0.10 & 1.00 & 0.40 \\ 0.10 & 0.10 & 0.10 & 0.40 & 1.00 \end{bmatrix}$$

Correlation Structure Six:

$$\boldsymbol{\rho} = \begin{bmatrix} 1.00 & 0.60 & 0.60 & 0.10 & 0.10 \\ 0.60 & 1.00 & 0.60 & 0.10 & 0.10 \\ 0.60 & 0.60 & 1.00 & 0.10 & 0.10 \\ 0.10 & 0.10 & 0.10 & 1.00 & 0.60 \\ 0.10 & 0.10 & 0.10 & 0.60 & 1.00 \end{bmatrix}$$

Three levels of effect size; small, medium and large, were used in Heiny's (2006) study. The effect sizes used were 0.20, 0.50 and 0.80. Heiny distinguished between dependent variables which had significantly differing means in each group by assigning small, medium or large effect sizes to the variables that were significant, and zero to those which were not. The number of variables that were considered to be significant or not significant was discussed earlier.

Within SWDA in SAS, there are two options for variable selection. These are the F-test and the Partial R-square criterion. Heiny (2006) chose to use the F-test, which is also the default in SAS. An important criterion to consider then is the alpha level associated with the F-test. The default in SAS is 0.15, though this is more suitable for those using SWDA to reduce the number of variables used in an analysis, or for classification of individuals or items. Heiny used alphas of 0.01, 0.05 and 0.10 in his study due to the way SWDA was being used; as a follow up analysis to a significant MANOVA. Using all these different combinations of independent variables yielded 945 different scenarios, each run using 5,000 replications.

While Heiny's (2006) results did not lead him to recommend SWDA as a follow up analysis to MANOVA in all circumstances, he did find much promise in this practice. Success was based upon finding both power above 0.80 and Type I error being below 0.10. Using the criteria, Heiny found several situations where SWDA was successful.

In Heiny's (2006) study, there were numerous situations where SWDA was successful using correlation structures one, two and three. Most of these situations were within $p = 2$ and 3, and not for $p = 3, 4, 5, 6, 7$ or 8. For $p = 2$ and 3 Heiny found that SWDA worked well for the smallest sample size; 50 with large effect size. Interestingly though, he found that as sample size increased, SWDA was only effective as effect size decreased. For the largest sample size; 500, success was found using a small effect size. Heiny concluded that this was due to the "aggressive" nature of SWDA, which selected too many variables as the sample size and effect size increased, thus over inflating Type I error. This may also be due to the selection criterion used, which was the F-statistic. The F-statistic will be discussed further in Chapter III.

The situations where p = 2 and 3 were also the only two situations where there is only one variable with significantly differing means in each group. It's not certain why SWDA was only successful for p = 2 and 3, though it may be that SWDA only works when there is only one significantly differing mean in each group. Situations where there is only one significantly differing mean in each group for larger numbers of dependent variables would need to be examined in order find out.

For correlation structures 4, 5 and 6, where correlations between "unlike" variables were reduced from 0.20 to 0.10, SWDA was again successful for many situation within p = 2 and 3. For these three correlation structures, recall that Heiny (2006) only used a sample size of 500. Similarly to the first three correlation structures, good results were found using small correlations, though good results were also found using a small alpha value (0.01) with medium and large effect sizes. Correlation structures 3, 4 and 5 were also successful for a few situation within p = 4 and 5. Those situations were where alpha was small (0.01) with a medium effect size (0.50). Heiny's findings can be found in full in his unpublished dissertation from the University of Northern Colorado.

Heiny (2006) found several patterns regarding the independent variables he manipulated based on his examining his results. One pattern he found is that SWDA appeared to become less effective as the number of dependent variables increased, with power decreasing and Type I error increasing. It seems reasonable for this to happen, though a researcher would expect an increase in sample size to remedy this problem. Heiny's results however did not show in increase in sample size to help the problem. He found that as the sample size increased, SWDA using the F-statistic tended to select too many variables resulting in inflated Type I error rates. More favorable results may be obtained using SWDA with the F-statistic by using smaller values of alpha, which would lower the observed Type I error rate.

Not surprisingly Heiny (2006) observed was that as effect size increased so did power. More interestingly though, he found that Type I error rates also increased as effect size did. It would be reasonable to assume that SWDA would perform better with regards to both power and Type I error as effect size increased, though this was not the case for Type I error. In some extreme cases where sample size, number of dependent variables, and effect size were all large, Type I error rose as high as 0.90. As with an increase in dependent variables as discussed above, this problem may be remedied in part by simply lowering alpha to a much smaller value in those circumstances where it is warranted.

Heiny (2006) surmised that his unexpected results regarding effect size may some relationship with the correlation between "unlike" variables. To further examine this relationship he ran additional simulations lowering the correlation between "unlike" variables to 0.10. He ran these simulations using a sample size of 500. Based on his results, Heiny concluded that when using SWDA with the F-statistic, "The likelihood of incorrectly selecting the variable whose means are the same in both groups, increases as the correlations between the two variables increases, as well as when the effect size for the variable whose means are different in each group increases" (p. 62).

With regards to correlations, Heiny (2006) found that as correlations among "like" variables increased, power and Type I error decreased. The pattern became more apparent as the number of dependent variables increased. Conversely, as correlations among "unlike" variables increased so did the likelihood of committing a Type I error. One more observation about correlations was found due to a programming error where Heiny accidentally produced correlations matrices which were identity matrices. The error led to an interesting observation regarding the effectiveness of SWDA, as it performed quite well under those circumstances.

This study extended Heiny's (2006) study which used SWDA as a follow up procedure to a significant MANOVA for several reasons. First, and perhaps foremost, the most frequently employed follow up analysis to a significant MANOVA, multiple ANOVA's, is simply not the correct procedure to use, as shown in this chapter. Among the other methods reviewed in this chapter SWDA has been shown to have the most promise. Heiny's study showed the promise of SWDA, but also left many unanswered questions. He found that SWDA became too aggressive as sample size increased, leading to inflation in Type I error rates. This phenomenon might only apply when using F-statistic in SWDA, however. Additionally, Heiny chose to examine situations where about half of the dependent variables had significantly differing means in each group, and had results that were unclear based on this choice, as discussed earlier. Also, his results showed that SWDA may be more effective when correlations among “unlike” variables are lower than used in his study. This study will address all of these questions, and will further explore the effectiveness of SWDA as a follow up analysis to a significant MANOVA.

CHAPTER III

METHODOLOGY

Research Question

> Q1 How does SWDA perform with consideration to different combinations of sample sizes, effect sizes, number of MANOVA dependent variables, alpha significance levels, correlations among dependent variables, and SWDA criterion chosen for this study?

As discussed in Chapter II, this study extended the research of Heiny (2006), and further investigated if SWDA was a good follow-up procedure to a significant MANOVA, and under what circumstances that was true. Five independent variables will be manipulated in this study. They are the number of dependent variables, sample size, population correlation matrices, effect sizes for population mean vectors, and alpha significance levels.

In addition to these five independent variables, another important consideration is the type of test statistic that is used in SWDA. There are two test statistics that are used often in conjunction with SWDA, and that are available to be used in SAS. These are the F-test and the partial R-square criterion. There is a fundamental difference between the two however. The SAS Users Manual (1999) states "The significance level and the squared partial correlation criteria select variables in the same order, although they may select different numbers of variables. Increasing the sample size tends to increase the number of variables selected when using significance levels, but it has little effect on the number selected using squared partial correlations" (p. 3156).

Heiny (2006) chose to use the F-test in his study. The F-test comes from an analysis of covariance, ANCOVA, where the variables already chosen in the Stepwise procedure act as covariates, and the current variable under consideration acts as the dependent variable. ANCOVA is computed largely using regression techniques, and as such multicollinearity among the covariates will produce unreliable results. It is because of this simple fact that Heiny chose not to use correlations between dependent variables any higher than 0.60. Correlations higher than 0.60 represent a very unlikely scenario, so correlations above 0.60 will also not be used in this study. Heiny found that in using the F-test as opposed to using the partial R-square criterion, the Type I error became drastically inflated as sample size and effect size increased. This seems to echo the warning given in the SAS Manual (1999) regarding the F-statistic. It is because of this warning in conjunction with the results experienced by Heiny, this study used the partial R-square criterion with SWDA as well as further exploring effectiveness of the F-statistic.

In SAS, the partial R-square criterion is used for predicting the variable under consideration in SWDA, from the CLASS variable while controlling for the effects of the variables already selected for the discriminant function (SAS/STAT User's Guide, Version 9.1, 1999). The discriminatory power of a dependent variable when using the F-statistic is found using an F-test that measures the significance of the reduction in Wilks lambda, if the variable under consideration were added to the discriminant function. The F-statistic as used in SWDA is derived from an analysis of covariance (ANCOVA), where the variables already chosen act as covariates, and the variable under consideration is the dependent variable (SAS/STAT User's Guide, Version 9.1, 1999).

Heiny (2006) goes on to further explain how ANCOVA is used in SWDA using the F-statistic as a post hoc test to a MANOVA. One regression line is computed for all groups in an ANCOVA using the dependent variable from a MANOVA as the dependent variable in the ANCOVA, and using the independent variables from a MANOVA as covariates in the ANCOVA. Regression lines are then computed separately for each group in the ANCOVA, using the same dependent variable and covariates, though typically with the assumption of equal slopes for all groups. Residual sum-of-squares are then computed for the two cases previously mentioned; when there is one regression line computed for both groups and also for the case when there are separate regression lines computed for each group. For the regression lines that are computed for each group, as the residual sum-of-squares decreases, the F-statistic in the ANCOVA increases. If the F-statistic passes a certain threshold, the groups have been determined to differ significantly on that dependent variable after adjusting for the covariates. In SWDA if the F-statistic is significant, then that dependent variable is added to the list of variables that have significantly different means between groups.

Independent Variables

1. *The Number of MANOVA Dependent Variables,* ***p***

Schneider (2002) informally looked at MANOVA studies in the social sciences. She found that p = 2, 5 and 8 represented a reasonable number of small medium and large dependent variables, respectively. Heiny (2006) used p = 2, 3, 4, 5, 6, 7 and 8, in part based on the research of Schneider. Heiny found that SWDA did not work well when there were four or more dependent variables. He conceded however that this may have more to do with the number of variables whose means were different in each group, than with the number of dependent variables. For dependent variables equal to two or three, he had one variable that had means that were different in each group. For four or more however, he used the number of variables whose means were different in each group equal to half of the number of dependent variables, or the next lowest number for odd numbers of MANOVA dependent variables. While Heiny's results may have shown that SWDA works well only when dependent variables are kept less than four, due to the discrepancy created by the number of variables whose means were different in each group, this study looked at p = 2, 3, 4, 5, 6, 7 and 8.

This study will examine varying levels of variables whose means are different in each group in an attempt to find out if SWDA truly does not work well when there are four or more dependent variables, or if it is dependent on the number of variables with significantly different means in each group. A reasonable number of variables whose means are different in each group (significant variables) were chosen for each level of the number of dependent variables, and these are listed in Table 3. In all of the tables and appendices, NV will refer to the number of dependent variables with significantly differing means in each group. It would be ideal to look at all possible combinations of significant variables, though it is simply not reasonable for this study given the amount of time it would take to analyze all different combinations using SAS. The number of significant variables chosen include the minimum (1) and maximum values (8), as well as certain variables picked in between. All minimum values of the number of significant variables were chosen in part to examine if SWDA does in fact only work well for the number of significant variables equal to 1; a pattern that Heiny (2006) found. The rest of the the number of significant variables were chosen to further explore the effectiveness of

SWDA as a follow up analysis to a significant MANOVA, and were chosen so that patterns based on the number of significant variables could be detected.

Table 3
Number of Variables with Differing Means in Each Group (NV)

p	2	3	4	5	6	7	8
	1	1	1	1	1	1	1
	2	2	-	-	-	-	-
		3	3	3	3	3	-
NV:			4	-	-	-	4
				5	-	5	-
					6	-	6
						7	-
							8

2. *Sample Size, **n***

Meredith (1978) performed a DDA simulation study and used sample sizes of 5, 10 and 50. Based on this research Schneider (2002) used sample sizes of 10, 50, 100 and 500. Schneider recommended, based on her results, that future researchers use sample sizes varying between 100 and 500 when doing research of this type. This suggestion seems like a reasonable recommendation given the fact that MANOVA typically requires a larger sample size for significance to be reached in the model.

Heiny (2006) used sample sizes of 50, 100, 200 and 500. He found that SWDA became too aggressive as the sample size became large resulting in an inflation of the probability of committing a Type I error. As discussed earlier however, this characteristic found by Heiny may be due to the nature of the F-test statistic that he used in his study. This study used the partial R-square criterion in the hopes that it would not become overaggressive like the F-statistic did, while further exploring the effectiveness of the F-statistic. This study did not exclude larger sample sizes based on this optimism. Heiny found that very few scenarios were successful when using a sample size as small as 50, with most of the successful scenarios being from p = 2 or 3 with large effect sizes. As discussed in Chapter II, Young (2006) recommended minimum sample sizes between130 and 500 depending on factors such as number of dependent variables and effect size. Given the recommendations of both Young and Schnieder (2002), and the results of Heiny, this study used n = 100, 250 and 500.

3. *Population Correlation Matrix, **ρ***

It would seem intuitive for the dependent variables in MANOVA to be correlated with one another based on the inherent relationship they have to one another. Cole, Maxwell, Arvey and Salas (1994), suggest when performing a MANOVA, when the variables represent multiple measures of a single underlying construct, the researcher would hope for high correlations among the dependent variables. However, this is not always the case as Tabachnick and Fidell (1996) explain, “The best choice is a set of dependent variables that are uncorrelated with each other because they each measure a separate aspect of the influence of the independent variables" (p. 377). When correlations among the dependent variables are too high, at least one of the dependent variables is a near linear combination of one or more of the others rendering it or those redundant. Tabachnick and Fidell suggest that if correlations approach 0.90 for some dependent variable, then that dependent variable is considered redundant. This study will not use correlations nearly as high as 0.90, as it would be unrealistic to find correlations that high in a significant MANOVA, not to mention the problems that would arise from multicollinearity. It is important in this study to use a wide range of correlations across the dependent variables, while further exploring the effectiveness of SWDA.

Heiny (2006) found that high correlations among the dependent variables led to poor results and concluded that when correlations among the dependent variables are low, SWDA is a more appropriate procedure than DDA. This study will use smaller correlations among dependent variables than Heiny used in order to further explore whether SWDA works better under those circumstances. Heiny declined to use large correlations among dependent variables, reasoning that with the ANCOVA based F-statistic he employed in SWDA, multicollinearity among the covariates would lead to poor results. Heiny initially started with three correlation matrices, and varied the correlations among "like" variables while keeping the correlations of "unlike" variables at 0.20 for all three structures. Heiny used correlations of 0.20, 0.40 and 0.60 for "like" variables for correlation structures one, two and three respectively. Heiny later found that higher correlations among "unlike" variables led to larger Type I errors as the effect size increased. Because of this, he created three additional correlation structures using a sample size of 500. Correlation structures four, five and six were the same as structures one, two and three respectively, with correlations among "unlike" variables lowered from 0.20 to 0.10.

This study used correlations among "like" variables of 0.20, 0.40 and 0.60. These correlations reflect reasonable real world correlations for "like" variables. For correlations among "unlike" variables, 0.03 and 0.07 were used. These correlations were chosen based on Heiny's (2006) findings that SWDA performs better with lower correlations among "unlike" variables. These correlations are quite small in the context of

MANOVA, however as stated by Tabachnick and Fidell (1996), the best choice of dependent variables may be ones which are uncorrelated with each other. An example of the correlation structures used for the situation where there are five dependent variables (p = 5), is shown in Table 4.

Table 4

Population Correlation Matrices (p = 5, NV = 3)

Correlation Structure One:

$$\boldsymbol{\rho} = \begin{bmatrix} 1.00 & 0.20 & 0.20 & 0.07 & 0.07 \\ 0.20 & 1.00 & 0.20 & 0.07 & 0.07 \\ 0.20 & 0.20 & 1.00 & 0.07 & 0.07 \\ 0.07 & 0.07 & 0.07 & 1.00 & 0.20 \\ 0.07 & 0.07 & 0.07 & 0.20 & 1.00 \end{bmatrix}$$

Correlation Structure Two:

$$\boldsymbol{\rho} = \begin{bmatrix} 1.00 & 0.40 & 0.40 & 0.07 & 0.07 \\ 0.40 & 1.00 & 0.40 & 0.07 & 0.07 \\ 0.40 & 0.40 & 1.00 & 0.07 & 0.07 \\ 0.07 & 0.07 & 0.07 & 1.00 & 0.40 \\ 0.07 & 0.07 & 0.07 & 0.40 & 1.00 \end{bmatrix}$$

Correlation Structure Three:

$$\boldsymbol{\rho} = \begin{bmatrix} 1.00 & 0.60 & 0.60 & 0.07 & 0.07 \\ 0.60 & 1.00 & 0.60 & 0.07 & 0.07 \\ 0.60 & 0.60 & 1.00 & 0.07 & 0.07 \\ 0.07 & 0.07 & 0.07 & 1.00 & 0.60 \\ 0.07 & 0.07 & 0.07 & 0.60 & 1.00 \end{bmatrix}$$

Table 4 (*continued*)

Population Correlation Matrices (p = 5, NV = 3)

Correlation Structure Four:

$$\rho = \begin{bmatrix} 1.00 & 0.20 & 0.20 & 0.03 & 0.03 \\ 0.20 & 1.00 & 0.20 & 0.03 & 0.03 \\ 0.20 & 0.20 & 1.00 & 0.03 & 0.03 \\ 0.03 & 0.03 & 0.03 & 1.00 & 0.20 \\ 0.03 & 0.03 & 0.03 & 0.20 & 1.00 \end{bmatrix}$$

Correlation Structure Five:

$$\boldsymbol{\rho} = \begin{bmatrix} 1.00 & 0.40 & 0.40 & 0.03 & 0.03 \\ 0.40 & 1.00 & 0.40 & 0.03 & 0.03 \\ 0.40 & 0.40 & 1.00 & 0.03 & 0.03 \\ 0.03 & 0.03 & 0.03 & 1.00 & 0.40 \\ 0.03 & 0.03 & 0.03 & 0.40 & 1.00 \end{bmatrix}$$

Correlation Structure Six:

$$\boldsymbol{\rho} = \begin{bmatrix} 1.00 & 0.60 & 0.60 & 0.03 & 0.03 \\ 0.60 & 1.00 & 0.60 & 0.03 & 0.03 \\ 0.60 & 0.60 & 1.00 & 0.03 & 0.03 \\ 0.03 & 0.03 & 0.03 & 1.00 & 0.60 \\ 0.03 & 0.03 & 0.03 & 0.60 & 1.00 \end{bmatrix}$$

4. *Effect Sizes for Population Mean Vectors,* ***d***

The dissertation considered a significant MANOVA, meaning one or more of the dependent variables had differing means between the two groups. This mean difference, or effect size (ES), while statistically significant can be considered “small,” “large” or something in between. It is reasonable to assume that larger effect sizes are easier to detect than smaller ones. It is therefore important in this study to have varying levels of effect size to evaluate SWDA’s performance with regards to effect size.

Effect size is simply the absolute value of the difference of the group means for a dependent variable divided by the standard deviation of that dependent variable. Effect size is a unitless quantity, and can it be difficult to define “small,” “medium” and “large” effect sizes. Cohen (1988) provides guidance on how to define these three levels of effect sizes. Cohen suggests effect sizes of 0.20, 0.50, and 0.80 for “small,” “medium,” and “large” effect sizes respectively. He explains that while arbitrary, these effect sizes are typical of the research found in the behavioral sciences. He warns however, “The terms “small,” “medium,” and “large” are relative, not only to each other, but to the area of behavioral science or even more particularly to the specific content and research method being employed in any given investigation” (Cohen, 1988, p. 25). His warning is not overlooked however, with the wide range of effect sizes used in this study, ranging from 0.20 to 0.80, the external validity of the results do not appear to be negatively affected. This study will use the effect sizes suggested by Cohen, which are 0.20, 0.50 and 0.80.

Heiny (2006) chose, somewhat arbitrarily to make half of the dependent variables have significantly different means in each group. With odd numbers of dependent variables, the extra variable did not have significantly different means in each group. His results showed that SWDA worked well for p = 2 and 3; the situations where there was one variable with means that differ in each group. He did not experience good overall results for p larger than three, though that may be due in part to the number of significant variables rather than the number of dependent variables. In order to further investigate, this study will examine varying numbers of significantly different variables for each level of p, where possible. The population mean vectors are shown in Table 5.

Table 5

*Effect Sizes, **d**, for the Population Mean Vectors*

p = 2

$$\mathbf{d}: \quad \begin{bmatrix} 0 \\ 0.20 \end{bmatrix} \begin{bmatrix} 0.20 \\ 0.20 \end{bmatrix} \qquad \begin{bmatrix} 0 \\ 0.50 \end{bmatrix} \begin{bmatrix} 0.50 \\ 0.50 \end{bmatrix} \qquad \begin{bmatrix} 0 \\ 0.80 \end{bmatrix} \begin{bmatrix} 0.80 \\ 0.80 \end{bmatrix}$$

p = 3

$$\mathbf{d}: \quad \begin{bmatrix} 0 \\ 0 \\ 0.20 \end{bmatrix} \begin{bmatrix} 0 \\ 0.20 \\ 0.20 \end{bmatrix} \begin{bmatrix} 0.20 \\ 0.20 \\ 0.20 \end{bmatrix} \qquad \begin{bmatrix} 0 \\ 0 \\ 0.50 \end{bmatrix} \begin{bmatrix} 0 \\ 0.50 \\ 0.50 \end{bmatrix} \begin{bmatrix} 0.50 \\ 0.50 \\ 0.50 \end{bmatrix} \qquad \begin{bmatrix} 0 \\ 0 \\ 0.80 \end{bmatrix} \begin{bmatrix} 0 \\ 0.80 \\ 0.80 \end{bmatrix} \begin{bmatrix} 0.80 \\ 0.80 \\ 0.80 \end{bmatrix}$$

p = 4

$$\mathbf{d}: \quad \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0.20 \end{bmatrix} \begin{bmatrix} 0 \\ 0.20 \\ 0.20 \\ 0.20 \end{bmatrix} \begin{bmatrix} 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \end{bmatrix} \qquad \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0.50 \end{bmatrix} \begin{bmatrix} 0 \\ 0.50 \\ 0.50 \\ 0.50 \end{bmatrix} \begin{bmatrix} 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \end{bmatrix} \qquad \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0.80 \end{bmatrix} \begin{bmatrix} 0 \\ 0.80 \\ 0.80 \\ 0.80 \end{bmatrix} \begin{bmatrix} 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \end{bmatrix}$$

p = 5

$$\mathbf{d}: \quad \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0.20 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0.20 \\ 0.20 \\ 0.20 \end{bmatrix} \begin{bmatrix} 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \end{bmatrix} \qquad \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0.50 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0.50 \\ 0.50 \\ 0.50 \end{bmatrix} \begin{bmatrix} 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \end{bmatrix} \qquad \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0.80 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0.80 \\ 0.80 \\ 0.80 \end{bmatrix} \begin{bmatrix} 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \end{bmatrix}$$

Table 5 (*continued*)

*Effect Sizes, **d**, for the Population Mean Vectors*

p = 6

$$\mathbf{d}: \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0.20 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0.20 \\ 0.20 \\ 0.20 \end{bmatrix} \begin{bmatrix} 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \end{bmatrix} \quad \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0.50 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0.50 \\ 0.50 \\ 0.50 \end{bmatrix} \begin{bmatrix} 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \end{bmatrix} \quad \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0.80 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0.80 \\ 0.80 \\ 0.80 \end{bmatrix} \begin{bmatrix} 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \end{bmatrix}$$

p = 7

$$\mathbf{d}: \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0.20 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0.20 \\ 0.20 \\ 0.20 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \end{bmatrix} \begin{bmatrix} 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \end{bmatrix} \quad \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0.50 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0.50 \\ 0.50 \\ 0.50 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \end{bmatrix} \begin{bmatrix} 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \end{bmatrix}$$

$$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0.80 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0.80 \\ 0.80 \\ 0.80 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \end{bmatrix} \begin{bmatrix} 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \end{bmatrix}$$

p = 8

$$\mathbf{d}: \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0.20 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \end{bmatrix} \begin{bmatrix} 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \\ 0.20 \end{bmatrix} \quad \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0.50 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \end{bmatrix} \begin{bmatrix} 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \\ 0.50 \end{bmatrix}$$

Table 5 (*continued*)

Effect Sizes, ***d****, for the Population Mean Vectors*

p = 8 (*continued*)

$$\mathbf{d}: \quad \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0.80 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \end{bmatrix} \begin{bmatrix} 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \\ 0.80 \end{bmatrix}$$

5. *Significance Levels,* $\boldsymbol{\alpha}$

The most common application of SWDA is for use in paring down a large set of variables to keep the best subset of variables. In this context Costanza and Afifi (1979) have recommended using α between 0.10 and 0.25, when using the F-test criterion. Based on this research SAS has made the same recommendation for α, and has set the default α in SWDA to 0.15. As discussed earlier, this study used SWDA after a significant MANOVA, and therefore the liberal values of α recommended by Costanza and Afifi would not apply to this study.

Heiny (2006) used α equal to 0.01, 0.05 and 0.10 in his dissertation using the F-test criterion. He found that even using these seemingly conservative values of α, Type I error tended to increase well above the set value. This was observed as the sample size was increased or as effect size increased, or both. It would appear from Heiny's results that smaller values of α will lead to better results using SWDA. In ANOVA, an adjustment to alpha is typically used when performing a follow up test. As Tabachnick and Fidell (1996) explain, "It is common practice to use a Bonferroni-type adjustment where slightly more stringent α levels are used with each test to keep α across all tests as reasonable levels" (p. 51). Given Heiny's results it appears that this may also apply to the practice of using SWDA as a follow up test to a significant MANOVA. This study will use α values of 0.001, 0.005 and 0.01 with the F-test criterion in SWDA as a result.

6. *Partial R-square Correlations*, **PR^2**

This study examined both the F-test and partial R-square criterions available in SAS with SWDA. While the F-test uses α levels for determining the significance level of a variable to enter into or exit the discriminant function, the partial R-square criterion uses a PR^2 which is specified by the user. Research has not yet been performed to determine the optimal PR^2 values to be used in SWDA. Given the lack of research, PR^2 values were chosen based on reasonable "small", "medium" and "large" values. When deciding these values, the same consideration of a Bonferonni-type adustment was taken into account just as it was for deciding values for α. The values of PR^2 chosen for "small", "medium" and "large" correlations were 0.005, 0.01 and 0.05 respectively.

Scenarios and Determination of Success in SWDA

For the F-test criterion used with SWDA, twenty two significantly differing means scenarios, three levels of sample size, six levels of correlation structures, three levels of effect size, and three levels of significance led to 3564 different scenarios that were examined. The partial R-square criterion used with SWDA had twenty two significantly differing means scenarios, three levels of sample size, six levels of correlation structures, three levels of effect size, and three levels of significance. This led to 3564 different scenarios for use with the partial R-square criterion in SWDA. Combined there are 7128 different scenarios.

Success of SWDA as a post hoc analysis to a significant MANOVA in determining which variables were significant was determined by examining both Type I error and power. All results are summarized in Chapter IV, though cutoff points for each of these criteria must be chosen for the sake of discussion of the results. Depending on the type of research being performed using MANOVA, researchers will be looking for varying levels of Type I error and power. Heiny (2006) used considered values less than 0.10 for Type I error, and values more than 0.80 for power, to be successful. These were determined after examining results of his Monte Carlo simulation. It was reasoned that 0.10 is a somewhat large Type I error rate for applied research, so a more conservative 0.05 was used for to determine a successful scenario. Power of 0.80 is quite reasonable, and a scenario which met this power stipulation and also had a Type I error rate below 0.05 was determined to be successful. Additionally, scenarios that were deemed to show promise were also marked on the tables and were scenarios that did not meet the requirements of being successful, but that had power above 0.70 and Type I error below 0.07. Power was calculated in SAS IML by finding the percentage of dependent variables that had differing means in both groups and were correctly selected using SWDA. Type I error was also calculated in SAS, and was the percentage of dependent variables whose means were the same in each of the two groups, but were incorrectly selected by SWDA.

Number of Replications

In an unpublished dissertation, Ussawarujikulchai (2004) re-analyzed five published journal articles in order to determine an appropriate number of replications in multiple comparison procedures. The articles studied were generally recent, with the oldest being published in 1983. She found that between 3,750 and 4,000 replications were generally sufficient in order to obtain stable results when exploring power. Her recommended number of replications was ultimately 4,000, when researching power. In order to obtain stable Type I error rates, she found that 5,000 replications were sufficient.

Supawan (2004) performed a similar study, but instead examined the number of replications required for regression simulation studies. Six published articles were examined in order to find the number of replications required to obtain stable results by increasing replications. Additionally, replications were decreased until original results were no longer obtainable. As with Ussawarujikulchai (2004), it was found that fewer replications were required for sufficient power results, and more for Type I error. Recommendations were 4,500 replications for sufficient and stable Type I error results, and 1,300 for power.

Based on these two studies, this study used the highest recommended number of replications, which was 5,000. Given that this study examined both Type I error and power, it would be reasonable to use the higher recommendations. Using 5,000 replications should provide stable Type I error and power rates.

Procedures

A Monte Carlo simulation was performed using SAS IML (Interactive Matrix Language), and SAS STEPDISC (Stepwise Discriminant Analysis). For each scenario, two p-dimensional multivariate normal populations with mean vectors, μ_1 and μ_2, were created. The difference between μ_1 and μ_2, was set to the predetermined levels of effect size, d, which were discussed earlier. The population correlation matrix, $\boldsymbol{\rho}$ was the same for both populations within each scenario, with each of the six population correlation matrices being constructed in SAS IML.

For each of the 5,000 replications, a random sample of size **n** was taken from each of the two populations which created the p-dimensional sample vectors, X_{1i} and X_{2i}, (i=1 to n). These sample data were read into PROC STEPDISC in SAS, and run using both the F-test and partial R-square criterion at the appropriate level of $\boldsymbol{\alpha}$. SWDA then identified which variables it deemed to have significantly differing means in each group. The power and Type I error were calculated as discussed earlier, and each scenario was calculated based on an average of 5,000 replications.

Stepwise Procedures

The three most common variable selection methods, and the three available in PROC STEPDISC, are forward, backward and stepwise selection. Stepwise selection incorporates both forward and backward elimination, and is the most widely used of the methods. SWDA starts initially with no variables in the discriminant function. Each variable that is available for selection is examined, and the variable that contributes the most to the discrimination between the two groups, in the presence of the variables already selected, is included. The variable is included if either meets the requirements for entry based on its F-statistic, or based on the partial R-square, depending on which method is being examined. The threshold for variable entry for the F-statistic is based on a prespecified **α,** and the threshold for partial R-square is based on a prespecified PR^2, both of which were discussed earlier. All the variables that have been selected for the discriminant function are then examined to see which variables now contribute the least to discriminating between the two groups. The threshold for removal of a variable is based on the same F-statistic and partial R-square, using **α** and PR^2, respectively. This process of adding and removing variables is continued until no more variables meet the predetermined thresholds for entry and removal. The variables in the discriminant function are those that SWDA indentified as having significantly differing means in each group.

The two criteria for discrimination available in PROC STEPDISC in SAS are the F-test and partial R-square criterions. Heiny (2006) used the F-test criterion in order to see if SWDA was effective. He found that in many cases SWDA selected too many variables as the sample size was increased, or when the effect size was large. This result was forewarned in the SAS User's Guide, which stated that while the F-test and partial R-square criterions would select variables in the same order, increasing the sample size when using the F-test also increases the number of variables selected (SAS/STAT User's Guide, Version 9.1). This problem may be fixed by adjusting the level of **α** to a smaller level than the desired Type I error rate. It is for that reason, this study will further explore the F-statistic, and use smaller levels of **α.**

While the F-statistic suffers from the problem of becoming too aggressive as the sample size increases, the partial R-square criterion does not. The partial R-square will also be examined to see if it performs well in SWDA as a post hoc test to a significant MANOVA. Research has not yet been performed using the partial R-square criterion in this context, so the results may be very informative. One drawback to this lack of research is that the values of PR^2 are based on informal test runs and common sense rather than recommendations from literature.

The following option were used in STEPDISC for the F-test criterion:

1. The stepwise selection method was used.
2. The F-test criterion was used.
3. The significance levels for **α** were set at 0.001, 0.005, 0.01 and 0.05.

The following options were used in STEPDISC for the Partial R-Square criterion:

1. The stepwise selection method was used.
2. The partial R-square criterion was used.
3. The PR^2 values were set at 0.001, 0.005, 0.01 and 0.05, using the "PR2ENTRY =", option in PROC STEPDISC.

CHAPTER IV

RESULTS AND DISCUSSION

Research Question

Q1 How does SWDA perform with consideration to different combinations of sample sizes, effect sizes, number of MANOVA dependent variables, alpha significance levels, correlations among dependent variables, and SWDA criterion chosen for this study?

All of the results discussed in this chapter will be in reference to the situation where the correlation between "unlike" variables is 0.03. The difference in power and Type I error between "unlike" correlations of 0.03 and 0.07, when examining the same scenarios, were extremely small. Given this information, and the large amount of tables that would need to be examined; 100 in all, it was determined that reporting only on "unlike" variables equal to 0.03 would be sufficient. All tables for "unlike" variables equal to 0.07 are contained in appendix A. Successful scenarios were defined in Chapter III as having power above 0.80 and Type I error below 0.05, and scenarios that show promise are defined as not meeting the requirements of a successful scenario but still having power above 0.70 and Type I error below 0.07. It should also be noted that Type I error cannot be directly examined for scenarios where the number of significant variables is equal to p. In those situations all observed Type I error rates are zero, due to the simple fact that if all variables are significant, then it is not possible to commit a Type I error.

Successful Scenarios Using SWDA with the F-statistic

SWDA performed well when the number of significant variables was small, and became decreasingly effective as the number of significant variables rose. Results were very similar for any value of the number of significant variables regardless of p, and therefore the results sections in this study will be organized by the number of significant variables. The most favorable results were found when the number of significant variables was equal to one. For tables with the number of significant variables = 1 (Tables 7, 9, 12, 15, 18, 21, 25), every scenario with large effect sizes was successful. As "like" correlations rose, so did Type I error, albeit very slightly, and power either stayed the same or dropped very slightly. With n = 500 or 250, large effect sizes and the number of significant variables = 1, power was equal to one with the smallest Type I error being obtained with $\alpha = 0.001$. For n = 100, large effect sizes and the number of significant variables =1, power stayed above 0.9852 for all p, and Type I error stayed below 0.0114. Lowest Type I error was found using $\alpha = 0.001$, and the highest power was found using $\alpha = 0.01$.

For n = 500, medium effect sizes and the number of significant variables = 1, power was 1.0 with all scenarios being successful and the lowest Type I error being obtained with $\alpha = 0.001$. With n = 250, and the same conditions otherwise, medium effect sizes again had all successful scenarios but with highest power (1.0) achieved using $\alpha = 0.01$, and lowest Type I error was found using $\alpha = 0.001$. For n = 100 and the same conditions, medium effect sizes were only successful when using $\alpha = 0.01$, with power above 0.80 and Type I error around 0.01.

Small effect sizes did not provide any successful scenarios, though with n = 500 and α = 0.001 power was above 0.70 with Type I error hovering around 0.01, regardless of "like" correlations. For n = 100 or 250, Type I error was relatively low typically staying around or below 0.01, though power was also low, staying below 0.40. A larger alpha could potentially lead to successful results with n = 250, though it appears unlikely that scenarios with n = 100 and small effect sizes would lead to successful results.

For the number of significant variables = 2 (Tables 8 and 10) the pattern of SWDA performing more poorly as "like" correlations rise, starts to emerge. While Type I error was relatively stable as "like" correlations rose, power dropped in every scenario, with the drop being larger for n = 100 and 250 than for n = 500. For the number of significant variables = 2 and p = 3 the drops in power were 0.1628, 0.1764 and 0.0913 for n = 100, 250 and 500 respectively. For the number of significant variables = 2, n = 250 or 500 and large effect sizes, SWDA was successful with power above 0.90 in all but one scenario (α = 0.001, "like" corr. = 0.60) where power was still above 0.80. Type I error ranged from 0.001 to 0.224, with most scenarios around 0.01. For n = 100 and large effect sizes, SWDA was successful for each scenario where "like" correlations were small (0.20). It was also successful where α = 0.001 and "like" correlations were 0.40 (power = 0.8016, Type I error = 0.0108). Type I error held below 0.0122 for n = 100 and "like" correlation = 0.60, but power was not large enough with power below 0.60. An increase in alpha as "like" correlations rise may help bring power to an acceptable value.

For medium effect sizes with the number of significant variables = 2, SWDA with the F-statistic was successful for all but one scenario (α = 0.001, "like" correlations. = 0.60) when n was equal to 500, though power for that scenario was still above 0.70. For n = 250, successful scenarios were found using “like” correlations of 0.20, and one scenario where “like” correlations were equal to 0.40 and α = 0.01. The scenario with n = 250, α = 0.005 and “like” correlations = 0.40 showed promise however (power = .7792, Type I error = 0.0064 for p = 3). For medium effect sizes there were no successful scenarios with n = 100. Type I error stayed low, though power was simply too low. There were no successful scenarios for small effect sizes with the number of significant variables = 2, as power was too low.

With the number of significant variables = 3 (Tables 11, 16, 19, 22) the pattern of SWDA progressively becoming less effective with respect to power, continues. For large effect sizes and n = 500, SWDA with the F-statistic performed well when “like” correlations were 0.20 and 0.40, with power staying above 0.98 and Type I error below 0.03. There were two successful scenarios for “unlike” correlations = 0.60 and n = 500 (α = 0.005 and 0.01), with the last scenario (α = 0.001) showing promise with power around 0.75 and Type I error around 0.002. As the number of significant variables rises SWDA becomes increasingly less effective as “like” correlations also rise. For large effect sizes there were no successful scenarios for n = 250. The rest of the scenarios were successful however, for n = 250 with the exception of α = 0.001 and “like” correlations = 0.40, though power was above 0.70 and Type I error well below 0.01. For n = 100 the only successful scenario was α = 0.01 and “like” correlations = 0.20 with α = 0.005 and “like” correlations = 0.20 showing promise.

When using medium effect sizes there were no successful scenarios for “unlike” correlations = 0.60. For n = 500, medium effect sizes had success for “like” correlations = 0.20 and 0.40, with the scenario of α = 0.001 and “like” correlations = 0.40 showing promise. For n = 250, even less effectiveness was observed for larger “unlike” correlations with no successful scenarios for “like” correlations = 0.40 or 0.60. There were two successful scenarios for “like” correlations = 0.20 (α = 0.005 and 0.01), with α = 0.001 showing promise. When n = 100 for medium effect sizes there was generally not enough power for success, with only one successful scenario (α = 0.001, “like” correlations = 0.20), and one scenario that showed promise (α = 0.005, “like” correlations = 0.20). There were no successful scenarios for small effect sizes, with power for respective scenarios dropping as the number of significant variables rises.

The pattern as the number of significant variables rises to this point has been well established, so the number of significant variables = 5 and 8 will be the only scenarios discussed here. There were very few scenarios that were successful with the number of significant variables = 5 (Tables 17 and 23) with most of those scenarios coming from large effect sizes and higher values for n. With large effect sizes and n = 500 scenarios where “like” correlations were equal to 0.20 or 0.40 were successful with the exception of one scenario, (α = 0.001, “like” correlations = 0.40) which showed promise. For large effect sizes with n = 250, SWDA with the F-statistic was only successful for scenarios where “like” correlations were kept low, at 0.20. There were no successful scenarios for n = 100, where power was too low.

For the number of significant variables = 5 with medium effect sizes and n = 500, two successful scenarios were observed (α = 0.005 and 0.01, “like” correlations = 0.20) and one scenario showed promise (α = 0.001, “like” correlations = 0.20). There were no successful scenarios for medium effect sizes and when n was equal to 100 or 250. There were no successful scenarios for small effect sizes, and small effect sizes fared worse than it did for the number of significant variables less than 5.

The final results that will be discussed for the F-statistic are for the number of significant variables = 8, (Table 28) which is the highest the number of significant variables examined in this study. There is only one table for the number of significant variables = 8, which happens to be the circumstance where the number of significant variables is equal to p, and as discussed earlier in this chapter Type I error cannot be discussed as it is zero in every scenario. The only three successful scenarios were for large effect sizes, n = 500 and "like" correlations = 0.20, with highest power being obtained with α = 0.01 (power = .9289). There were also two scenarios which showed promise. One was with medium effect sizes, n = 500, "like" correlations = 0.20 and α = 0.01, and the other was with large effect sizes, n = 250, "like" correlations = 0.20 and α = 0.01. Both successful scenarios had power just above 0.91. There were no successful scenarios for n = 100 or 250, and there were also no successful scenarios for "like" correlations of 0.40 or 0.60.

Successful Scenarios Using SWDA with the Partial R-square Criterion

Results using the Partial R-square criterion were similar to the F-statistic with the exception of inflated Type I error rates as n rises as observed with the F-statistic. This section will also be organized by the number of significant variables, based on findings that show similar results with the same value for the number of significant variables. For the number of significant variables = 1 (Tables 29, 31, 34, 37, 40, 43 and 47) with large effect sizes, just as with the F-statistic there were many successful scenarios. For n = 500, power was 1.0000 for every large effect size scenario, with Type I error being zero for $PR^2 = 0.05$. Just as with the F-statistic, power and Type I error are stable across "like" correlations for the number of significant variables = 1. For n = 250, large effect sizes were successful for $PR^2 = 0.01$ and 0.05, with best performance being obtained with $PR^2 = 0.05$ (power = 1.0, Type I error = 0.0). With n = 100 and large effect sizes, successful results were found using $PR^2 = 0.05$, with power above 0.99 and Type I error generally below 0.002.

For n = 500, medium effect sizes were successful for $PR^2 = 0.005$ and 0.01, and showed promise for $PR^2 = 0.05$. Best results were found using $PR^2 = 0.01$, with power = 1.0 and Type I error generally below 0.003. For n = 250, medium effect sizes were successful for $PR^2 = 0.01$. There were no successful results using n = 100 for medium effect sizes, with power too low using $PR^2 = 0.05$, and Type I error too high using $PR^2 = 0.01$. A value for PR^2 in between 0.01 and 0.05 may provide successful results. The only successful results for small effect sizes were found using n = 500 with $PR^2 = 0.005$, where power was around 0.82 and Type I error below 0.03.

For the number of significant variables = 2, (Tables 30 and 32) SWDA became less effective as "like" correlations rose, and this pattern becomes increasingly apparent as the number of significant variables rises, just as it did using the F-statistic. Using n = 500, large effect sizes were successful for $PR^2 = 0.005$ and 0.01 with one other successful scenario ($PR^2 = 0.05$, "like" correlations = 0.02). Best results for n = 500 were found using $PR^2 = 0.01$. For n = 250, large effect sizes were successful using $PR^2 = 0.01$, and was also successful for the scenario where $PR^2 = 0.05$ and "like" correlations = 0.20. Large effect sizes had only one successful scenario for n = 100, which was with $PR^2 = 0.05$ and unsurprisingly the lowest value for "like" correlations; 0.20.

Scenarios using n = 500, the number of significant variables = 2 and medium effect sizes were successful using PR^2 = 0.01, and also for PR^2 = 0.005 with “like” correlations of 0.20. Medium effect sizes using PR^2 = 0.005 provided successful results for “like” correlations = 0.20 and 0.40, power dropped just below 0.70 using “like” correlations of 0.60. There were no successful medium effect sizes scenarios for n = 100. Using a PR^2 between 0.01 and 0.05 could potentially provide for a successful scenario however. There were no successful scenarios using small effect sizes, with the closest successful scenario coming from using n = 500, PR^2 = 0.005 and “like” correlations of 0.20, with power = 0.6521 and Type I error = 0.0262 for p = 3.

As expected, the performance of SWDA with the Partial R-square criterion continued to drop as the number of significant variables increased, though another pattern emerged with the number of significant variables = 3 (Tables 33, 35, 38, 41 and 44). When using the Partial R-square criterion with the number of significant variables greater than 3, Type I error decreased along with power as “like” correlations increased, within the same PR^2. For n = 500, large effect sizes were successful for all three scenarios where PR^2 = 0.01, and for PR^2 = 0.005 with “like” correlations = 0.40 and 0.60. Power was high (1.0) for PR^2 = 0.005 and “like” correlations = 0.20, but Type I error was also relatively high around 0.06. The scenario of PR^2 = 0.05, “like” correlations = 0.20 and large effect sizes, also showed promise. When using n = 250, large effect sizes provided successful results for PR^2 = 0.01 and “like” correlations of 0.20 and 0.40, with the scenario for 0.60 showing promise, but power was too low for success. The scenario with PR^2 = 0.05, “like” correlations = 0.20 and n = 250 also showed promise. There were no successful scenarios for n = 100 and large effect sizes, though using a PR^2 between 0.01 and 0.05 may provide for a promising scenario.

Medium effect sizes with the number of significant variables = 3 performed best with "like" correlations of 0.20. For n = 500, success was found using PR^2 = 0.005 with "like" correlations of 0.20 and 0.40, with 0.60 showing promise. With n = 500 and PR^2 = 0.01, medium effect sizes also were successful for "like" correlations of 0.20, with 0.40 showing promise. There was only one successful scenario for medium effect sizes and n = 250 (PR^2 = 0.01, "like" correlations = 0.20) and one scenario which showed promise (PR^2 = 0.01, "like" correlations = 0.20). There were no successful scenarios for medium effect sizes with n = 100. As with small effect sizes for the number of significant variables = 2, there were no successful or promising scenarios.

As with the F-statistic results section, only the number of significant variables = 5 and 8 will be discussed for the rest of this section. There were very few successful scenarios for the number of significant variables = 5, (Tables 39 and 45) and even fewer than there were using the F-statistic. Using large effects sizes and n = 500 provided only one successful scenario (PR^2 = 0.01, "like" correlations = 0.20). There were however, two scenarios which showed promise, both of which had "like" correlations of 0.40, one with PR^2 = 0.005 and the other with 0.01. Using n = 250 with large effect sizes also only provided one successful scenario (PR^2 = 0.01, "like" correlations = 0.20) and one scenario that showed promise (PR^2 = 0.01, "like" correlations = 0.40). There were no successful scenarios for n = 100 and large effect sizes.

For medium effect sizes with n = 500 and the number of significant variables = 5, there was one successful scenario (PR^2 = 0.01, "like" correlations = 0.20) and one scenario that showed promise (PR^2 = 0.005, "like" correlations = 0.20). There were no successful scenarios for n = 250 with medium effect sizes, though there was one scenario that showed promise, which was for PR^2 = 0.01 and "like" correlations = 0.20. There were no successful or promising scenarios for n = 100 with medium effect sizes. There also were no successful or promising scenarios using small effect sizes at all for NV = 5.

Type I error cannot be discussed in this last section due to the number of significant variables being equal to p, though the results will still be discussed. For the number of significant variables = 8, (Table 50) there were four successful scenarios and one promising scenario, all with "like" correlations = 0.20. Using n = 500 both PR^2 = 0.005 and 0.01 were successful, though if for example p were equal to 9, or at least larger than 8, with the number of significant variables = 8, then most likely the scenario where PR^2 = 0.005 would have Type I error too high. This hypothesis is based on the pattern of SWDA becoming progressively worse as the number of significant variables rises, with close attention being paid to Table 49 (p = 8, number of significant variables = 6). The same could be said of the last two scenarios, which used PR^2 = 0.005 one with n = 100 and the other 250. The scenario which showed promise (n = 250, PR^2 = 0.01) might also not keep Type I error below 0.07 in the hypothetical situation described above, though it is less clear cut as the other scenarios discussed.

There were no successful scenarios using the Partial R-square criterion with the number of significant variables = 8 and medium effect sizes, though there were two scenarios which showed promise. One with n = 500, PR^2 = 0.005 and "like" correlations = 0.20, and the other with n = 250, PR^2 = 0.005 and "like" correlations = 0.20. Again, if p were greater than 8 with the number of significant variables = 8, the scenario with n =

250 would almost certainly have Type I error too large, and the other with n = 500 may also have overly inflated Type I error, though it is not as clear cut. There were no successful scenarios with small effect sizes.

Correlations Between Dependent Variables

In general, SWDA performs better, (higher power and lower Type I error) when correlations between "unlike" variables are smaller. Heiny (2006) used "unlike" correlations of 0.20 initially, and later also used 0.10. He found better results using a lower value for correlation. This study used even smaller "unlike" correlations, 0.03 and 0.07, and the same pattern was observed. Slightly higher power and lower Type I error was generally observed for an "unlike" correlation of 0.03, when compared to using 0.07. For scenarios using the F-statistic, corresponding scenarios comparing "unlike" correlations of 0.03 to 0.07 showed an average difference of 0.0059 for power and 0.0024 for Type I error. The difference found for the Partial R-square criterion was 0.0030 for power, and 0.0094 for Type I error.

Number of Dependent Variables

When comparing the performance of SWDA across dependent variables, it was found that performance was very similar so long as the same the number of significant variables was examined. This same pattern holds true for both the F-statistic and Partial R-square criterion. Results for each value of the number of significant variables were looked at for every dependent variable, from p = 2 through p = 8, and an examination of corresponding scenarios shows that power and Type I error are very similar. It iss not possible to compare Type I error for scenarios where the number of significant variables is equal to its respective number of dependent variables, which is the situation where the number of significant variables is at its maximum. For that particular situation all variables are significant and therefore it is not possible to commit a Type I error, and consequently all observed Type I errors are equal to zero.

Heiny (2006) found that SWDA performed more poorly as the number of dependent variables increased. He also added however that his observation may have instead been due to the the number of significant variables that he chose, which were equal to half of the number of dependent variables or half minus one for odd number of dependent variables. This study has shown that his latter hypothesis is in fact the correct one.

Number of Variables with Differing Means in Each Group

For both the F-statistic and Partial R-square criterion, it was found that the performance of SWDA, with respect to power, declined as the number of significant variables rose and for the Partial R-square criterion Type I error also rose. Additionally, as the number of significant variables rose, higher correlations between "like" variables increasingly affected power. For NV = 1, moving from "like" correlations of 0.20, to 0.40 and on to 0.60 tended to affect very little, if at all. For example, when examining p = 2 and the number of significant variables = 1 for the F-statistic, moving from 0.20 to 0.60 for "like" correlations produced an average decrease in power of 0.0005, and an average increase in Type I error of 0.0005. Certainly finding the same number for the differences is a strange coincidence, though these differences being opposite direction also has little bearing given how small the differences were. Similar results could be shown for every level of dependent variable where the number of significant variables = 1, for both the F-statistic and Partial R-square criterion.

As the number of significant variables increased, raising "like" correlations led to lower power and somewhat stable Type I error rates for both the F-statistic and Partial R-square criterion, with the pattern starting to emerge using the number of significant variables = 2. For example, the average difference in power when moving from "like" correlations of 0.20 to 0.60 for p = 8 and number of significant variables = 6 in the F-statistic was 0.2533, with the average difference for Type I error being 0.0044. For the Partial R-square criterion using the same conditions showed an average difference of 0.2490 for power and 0.0146 for Type I error. These differences themselves are somewhat arbitrary, but they do show just how large the difference for power can be on average as the number of significant variables becomes larger.

In general, there were fewer successful scenarios as the number of significant variables increased, especially with consideration to higher "like" correlations. For example, when examining p = 8 and the number of significant variables equal to 6 or 8, using either the F-statistic or Partial R-square criterion, there were no successful scenarios for "like" correlations of 0.60, and nearly none for 0.40. For those situations, power was simply too low. Conversely there were many successful scenarios using either the F-statistic or Partial R-square criterion with the number of significant variables = 1.

One of Klemmer's (2000) arguments against the use of SWDA is that it does not identify the best predictor set. His argument revolves around the fact that SWDA when using the F-statistic will first select the variable that is the single best discriminator in the study, with the variable that minimizes Wilk's Lambda the most in the presence of the first variable selected, being selected second. The third variable would be selected if it minimizes Wilk's Lambda the most in the presence of all the variables already selected for the model. The process would continue until there is no variable that is deemed to be significant based on this criterion. He argues that this method does not in fact select the best subset of variables, and some variables could share a certain amount of discriminatory information which could lead to certain variables being incorrectly left out which were deemed redundant (Klecka, 1980). This may very well be one of the driving reasons that SWDA performed more poorly as the number of significant variables rose.

The same pattern of drop in performance as the number of significant variables rose was also experienced when using the Partial R-square criterion. The same logic also applies to why this is the case. As discussed in Chapter III, the partial R-square criterion is used for predicting the variable under consideration in SWDA while controlling for the effects of the variables already selected for the discriminant function (SAS/STAT User's Guide, Version 9.1, 1999).

Sample Size

As expected, as n increased power did as well, with Type I error typically decreasing, when comparing corresponding scenarios within the same sample size. When examining the F-statistic it appeared that the optimal power and Type I error combination was often obtained by decreasing alpha as n increased. Heiny (2006) concluded that SWDA with the F-statistic tended to become too aggressive as n increased, leading to inflated Type I error rates. This study found the same results regarding the aggressiveness of SWDA using the F-statistic.

It should also be noted that this pattern was not observed for the Partial R-square criterion. Instead, the optimal power and Type I error combination was most often found using the same PR^2 for a particular table, depending on effect size but regardless of n. The Partial R-square criterion not being dependent on sample size is not unexpected given the statement in the SAS manual (1999) that, "The significance level and the squared partial correlation criteria select variables in the same order, although they may select different numbers of variables. Increasing the sample size tends to increase the number of variables selected when using significance levels, but it has little effect on the number selected using squared partial correlations" (p. 3156).

Effect Size

As effect size was increased, power increased and Type I error tended to decrease. This pattern was observed regardless of criterion being used. Effect size also affected the optimal alpha or PR^2 to be used. When using the F-statistic with the number of significant variables = 1 for example , good results could be found using an alpha of 0.001 for n = 500 and large or medium effect sizes, while a larger alpha of 0.01 should be used for small effect sizes. Power was too low for small effect sizes when using an alpha of 0.001 or 0.005 under those circumstances.

There were very few circumstances where small effects size provided successful results, and those circumstances were limited to scenarios where the number of significant variables was equal to one and n was equal to 500. For the F-statistic a more liberal or larger value of alpha was required for success for small effect sizes, with the number of significant variables = 1 and n = 500. Likewise, a more liberal value was also required for the Partial R-square criterion, though that meant a smaller value for PR^2. It may be possible to obtain successful results for larger values of the number of significant variables, though a more liberal value for alpha or PR^2 would need to be used.

Alpha and PR^2 Levels

Based on Heiny's (2006) study, smaller values of alpha were chosen for this study (α = 0.001, 0.005, 0.01). More conservative values for PR^2 were chosen for the same reason. Heiny experienced extremely large values for Type I error when n was large (n = 500), with Type I error going over 0.80 in some extreme cases. The results from this study showed that using a more conservative alpha remedied this problem. Extremely large Type I error rates were not found in this study when using the F-statistic, with Type I error rarely even going above 0.05. There were however, large values of Type I error observed using the Partial R-square criterion (Tables 29 – 50). So when using the F-statistic in SWDA, a downward adjustment to alpha is often necessary as n increases in many cases in order for a particular scenario to be successful. As discussed earlier the Partial R-square criterion did not generally require an adjustment to PR^2 based on the value of n.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Perhaps the most significant observation made from this study is the performance of SWDA in relation to the number of significant variables. Whether using the F-statistic or the Partial R-square criterion, the performance of SWDA with respect to power and Type I error, was nearly identical when comparing corresponding scenarios for a particular value of the number of significant variables. SWDA performed well when the number of significant variables was equal to one, with the exception of small effect sizes. Small effect sizes were successful for n = 500 using the Partial R-square criterion, while successful results may be found with the F-statistic, though a larger value for alpha than was employed in this study would need to be used. SWDA also performed well for number of significant variables = 2, again with the exception of small effect sizes and additionally, successful results were found so long as n was 250 or larger. Performance for number of significant variables = 3 was still relatively good, though larger "like" correlations started to negatively affect power, and only large effect sizes with n = 500 returned successful results when "like" correlations were as high as 0.60. With the number of significant variables = 4 or above, the performance of SWDA begins to deteriorate, and becomes almost useless unless ideal circumstances are met. These circumstances would be a large n, large effect sizes, and low "like" and "unlike" correlations. SWDA using either the F-statistic or Partial R-square criterion can be considered a good follow up procedure to use after a significant MANOVA for p = 2 or 3. This simply comes from the fact that SWDA performed well (number of significant variables = 1) or acceptably (number of significant variables = 3) for values of the number of significant variables below 4.

If using SWDA as a follow up procedure to MANOVA, it is important to check the variance covariance matrix for dependent variables, to make sure that correlations are relatively low. This study used "unlike" correlations of 0.03 and 0.07, and there are clear indications that if even lower correlations are used then SWDA will perform even better. Likewise, if lower correlations are found between "like" variables, better performance can be expected. This certainly is a large limitation of SWDA as a follow up analysis to a significant MANOVA, though as Tabachnick and Fidell (1996) explain, often times the best choice of dependent variables in MANOVA are a set which are uncorrelated with each other. The reasoning is that each dependent variable would measure a separate aspect of the influence of the independent variables. Additionally if correlations between dependent variables are too high, then at least one of the variables may be a linear combination of the others, and therefore redundant. It should be pointed out that SWDA is more negatively affected by larger correlations between "unlike" variables than for "like" variables, hence the extremely small values used for "unlike" correlations.

Despite the fact that SWDA performs better in general with lower correlations between dependent variables, when using SWDA with the partial R-square criterion, there are circumstances where higher correlations can benefit the procedure. In over half of the scenarios involving the Partial R-square criterion, Type I error actually decreased when comparing "like" correlations of 0.20 to the two higher "like" correlations of 0.40 and 0.60. Type I error rates using the Partial R-square criterion were relatively unstable however, and the only real detectable pattern regarding the relationship of "like" correlations to Type I error is that the drop in Type I error as "like" correlations increased became larger as the number of significant variables increased.

SWDA performed better as effect size was increased regardless of criteria being used. Additionally it was found that there were very few scenarios where small effect sizes led to successful results, with those being limited to number of significant variables = 1 and n = 500. This study used n as high as 500, though it may be possible to find successful results for the number of significant variables higher than one for small effect sizes if a higher n were used. It should be pointed out that when a study has small effect sizes there is a good chance that even the MANOVA performed will not be significant. If the MANOVA is significant, then obviously it is a moot point as to how well SWDA performs as a post hoc analysis. A similar argument could be made when considering smaller values for n, especially when combined with smaller effect sizes. Heiny (2006) found that SWDA using the F-statistic became too aggressive as effect sizes increased, leading to inflated Type I error rates, and recommended using smaller levels of alpha.

This study did use smaller levels of alpha ($\alpha = 0.001, 0.005, 0.01$), with the exception of $\alpha = 0.01$ which Heiny used, and the smaller values led to acceptable levels of Type I error in nearly every scenario. In fact, when examining the scenarios where SWDA was unsuccessful, the vast majority were a result of insufficient power. This observation was even more pronounced when considering the unsuccessful scenarios using the F-statistic, where as stated above, nearly every scenario had acceptable Type I error rates.

Effect size also affects what level of alpha or PR^2 should be used, though it didn't appear that larger effect sizes led to inflated Type I error rates. For the Partial R-square criterion and many of the scenarios for the F-statistic, when going from large to medium effect sizes, power dropped and in many circumstances a more liberal PR^2 or alpha would need to be used in order to obtain an acceptable level. For the Partial R-square criterion there were any circumstances where Type I error would rise to an unacceptable level when using a more liberal PR^2 often leading to a situation where a successful scenario cannot be found regardless of PR^2, due to either power that is too low or Type I error that is too high. A researcher can examine the tables in this study and determine what level of alpha or PR^2 to use in order to obtain successful results, if it is possible at all to do so.

This study has shown that both the Partial R-square criterion and the F-statistic perform quite similarly, and that there is no clear cut "winner" between the two. As pointed out earlier however, the optimum level of alpha to be used depends on n, as Type I error tends to increase as n rises. Both criteria are negatively affected by larger correlations between dependent variables, and perform similarly using the same levels of correlation.

Recommendations

The reliance of SWDA on the number of significant variables leads to the necessity to measure the number of significant variables prior to running SWDA. If the number of significant variables was known, then it could be determined how well SWDA would perform as a follow up analysis to a significant MANOVA, and a decision on whether or not to use it could be made. For example if p was four or larger, then a researcher may not want to employ SWDA unless the number of significant variables were three or less. Another method such as the traditional "protected" F-test could be used only for guidance on what the number of significant variables may be, and not used for actually determining which variables are significant unless the number of significant variables is determined by the researcher to be too high.

Based on the results of this study a sweeping recommendation cannot be made for the use of SWDA with the F-statistic or Partial R-square criterion as a follow up analysis to a significant MANOVA. This study has shown under what conditions SWDA can be safely used, and has shown in many circumstances what level of alpha or PR^2 should be used. Additionally this study has shown that both the F-statistic and Partial R-square criterion perform similarly and therefore one cannot be recommended over the other in general.

This study has shown to a major extent, what conditions are optimal for SWDA to be used as a follow up analysis to a significant MANOVA, and has shown the limitations of it as well. While this study has shown what levels of alpha or PR^2 could be used for certain scenarios, future researchers may want to find the exact or near exact levels of alpha or PR^2 to use, to be derived mathematically or through Monte Carlo simulations. It may be possible for a researcher to write a computer program in SAS or another statistical software package that would maximize power while minimizing Type I error. At this time due to computing power limitations it would simply take too much time to feasibly run such a program.

The true extent of SWDA as an effective follow up analysis to a significant MANOVA has been shown here, and as stated before it is only useful under certain conditions, opening the door for researchers to look elsewhere for a universally most powerful follow up analysis to a significant MANOVA. Schneider's (2002) study showed that DDA performed poorly in general when used as a follow up analysis to a significant MANOVA. She found extremely poor results using standardized weights with DDA, recommending against their use entirely. Using structure coefficients also returned poor results for Schneider, though she found that power increased as correlations between dependent variables did as well. While more research may need to be performed to see the full extent of the performance of DDA under larger correlation situations, a combination of both SWDA and DDA could potentially be used. SWDA could be used when small correlations are found, and DDA with structure coefficients could be used when large correlations are found.

This study has shown that SWDA can be used as a follow up analysis to a significant MANOVA under certain circumstances. SWDA should only be employed if correlations between dependent variables are held quite low. It also performs well for large effect sizes, and does not perform well for small effect sizes in most scenarios examined. It was also found that SWDA does not directly rely on the number of dependent variables in the study, but rather relies on the number of significant variables. It was also found that the performance of SWDA deteriorates as the number of significant variables rises, with best results found for the number of significant variables less than four. As discussed in Chapter II, the “protected” F-test which is currently the most commonly used method as a follow up analysis to a significant MANOVA, is not the correct procedure to use and if the correct conditions are met, it is highly recommended to use SWDA instead of the “protected” F-test.

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Table 6

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.03, p=2 and NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0310 *(0.0012)*	0.0298 *(0.0008)*	0.0270 *(0.0002)*
		0.50	0.5884 *(0.0012)*	0.5748 *(0.0006)*	0.5798 *(0.0010)*
		0.80	0.9890 *(0.0020)**	0.9904 *(0.0014)**	0.9898 *(0.0014)**
	0.005	0.20	0.0830 *(0.0054)*	0.0758 *(0.0060)*	0.0786 *(0.0032)*
		0.50	0.7478 *(0.0066)***	0.7488 *(0.0050)***	0.7582 *(0.0058)***
		0.80	0.9980 *(0.0062)**	0.9968 *(0.0058)**	0.9978 *(0.0068)**
	0.01	0.20	0.1216 *(0.0122)*	0.1250 *(0.0098)*	0.1174 *(0.0094)*
		0.50	0.8342 *(0.0094)**	0.8170 *(0.0098)**	0.8320 *(0.0104)**
		0.80	0.9994 *(0.0112)**	0.9992 *(0.0114)**	0.9992 *(0.0096)**
250	0.001	0.20	0.1404 *(0.0012)*	0.1428 *(0.0010)*	0.1418 *(0.0010)*
		0.50	0.9900 *(0.0014)**	0.9854 *(0.0014)**	0.9912 *(0.0016)**
		0.80	1.0000 *(0.0014)**	1.0000 *(0.0014)**	1.0000 *(0.0018)**
	0.005	0.20	0.2850 *(0.0088)*	0.2802 *(0.0056)*	0.2868 *(0.0052)*
		0.50	0.9964 *(0.0058)**	0.9966 *(0.0068)**	0.9982 *(0.0054)**
		0.80	1.0000 *(0.0064)**	1.0000 *(0.0066)**	1.0000 *(0.0046)**
	0.01	0.20	0.3618 *(0.0076)*	0.3590 *(0.0094)*	0.3730 *(0.0104)*
		0.50	0.9988 *(0.0118)**	0.9986 *(0.0118)**	0.9982 *(0.0108)**
		0.80	1.0000 *(0.0136)**	1.0000 *(0.0134)**	1.0000 *(0.0126)**
500	0.001	0.20	0.4420 *(0.0014)*	0.4414 *(0.0008)*	0.4518 *(0.0012)*
		0.50	1.0000 *(0.0014)**	1.0000 *(0.0012)**	1.0000 *(0.0006)**
		0.80	1.0000 *(0.0020)**	1.0000 *(0.0014)**	1.0000 *(0.0018)**
	0.005	0.20	0.6332 *(0.0036)*	0.6416 *(0.0050)*	0.6276 *(0.0048)*
		0.50	1.0000 *(0.0062)**	1.0000 *(0.0058)**	1.0000 *(0.0070)**
		0.80	1.0000 *(0.0084)**	1.0000 *(0.0048)**	1.0000 *(0.0060)**
	0.01	0.20	0.7208 *(0.0108)***	0.7142 *(0.0108)***	0.7256 *(0.0112)***
		0.50	1.0000 *(0.0122)**	0.9998 *(0.0114)**	1.0000 *(0.0140)**
		0.80	1.0000 *(0.0140)**	1.0000 *(0.0146)**	1.0000 *(0.0118)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 7

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.03, p=2 and NV=2

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0304 *(0.0000)*	0.0260 *(0.0000)*	0.0257 *(0.0000)*
		0.50	0.4198 *(0.0000)*	0.3865 *(0.0000)*	0.3643 *(0.0000)*
		0.80	0.8209 *(0.0000)**	0.6036 *(0.0000)*	0.5047 *(0.0000)*
	0.005	0.20	0.0737 *(0.0000)*	0.0723 *(0.0000)*	0.0681 *(0.0000)*
		0.50	0.5611 *(0.0000)*	0.4647 *(0.0000)*	0.4326 *(0.0000)*
		0.80	0.9212 *(0.0000)**	0.7401 *(0.0000)***	0.5357 *(0.0000)*
	0.01	0.20	0.1129 *(0.0000)*	0.1029 *(0.0000)*	0.0940 *(0.0000)*
		0.50	0.6267 *(0.0000)*	0.5076 *(0.0000)*	0.4578 *(0.0000)*
		0.80	0.9532 *(0.0000)**	0.8009 *(0.0000)**	0.5705 *(0.0000)*
250	0.001	0.20	0.1320 *(0.0000)*	0.1207 *(0.0000)*	0.1098 *(0.0000)*
		0.50	0.8773 *(0.0000)**	0.6378 *(0.0000)*	0.5067 *(0.0000)*
		0.80	0.9998 *(0.0000)**	0.9828 *(0.0000)**	0.7966 *(0.0000)***
	0.005	0.20	0.2317 *(0.0000)*	0.2021 *(0.0000)*	0.2021 *(0.0000)*
		0.50	0.9463 *(0.0000)**	0.5535 *(0.0000)*	0.5535 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9079 *(0.0000)**	0.9079 *(0.0000)**
	0.01	0.20	0.3050 *(0.0000)*	0.2788 *(0.0000)*	0.2560 *(0.0000)*
		0.50	0.9639 *(0.0000)**	0.8362 *(0.0000)**	0.6002 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9979 *(0.0000)**	0.9414 *(0.0000)**
500	0.001	0.20	0.3486 *(0.0000)*	0.3157 *(0.0000)*	0.2939 *(0.0000)*
		0.50	0.9987 *(0.0000)**	0.9554 *(0.0000)**	0.7126 *(0.0000)***
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	0.9937 *(0.0000)**
	0.005	0.20	0.4900 *(0.0000)*	0.4129 *(0.0000)*	0.3841 *(0.0000)*
		0.50	0.9999 *(0.0000)**	0.9867 *(0.0000)**	0.8470 *(0.0000)**
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	0.9990 *(0.0000)**
	0.01	0.20	0.5542 *(0.0000)*	0.4590 *(0.0000)*	0.4198 *(0.0000)*
		0.50	1.0000 *(0.0000)**	0.9923 *(0.0000)**	0.8953 *(0.0000)**
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	0.9994 *(0.0000)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 8

Power and (*Type I error*) for: F-statistic, “unlike” correlation=0.03, p=3 and NV=1

“Like” correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0276 *(0.0009)*	0.0286 *(0.0011)*	0.0278 *(0.0016)*
		0.50	0.5806 *(0.0011)*	0.5812 *(0.0008)*	0.5796 *(0.0008)*
		0.80	0.9892 *(0.0015)**	0.9888 *(0.0005)**	0.9886 *(0.0010)**
	0.005	0.20	0.0758 *(0.0042)*	0.0768 *(0.0044)*	0.0814 *(0.0057)*
		0.50	0.7554 *(0.0054)***	0.7608 *(0.0044)***	0.7528 *(0.0044)***
		0.80	0.9970 *(0.0052)**	0.9970 *(0.0046)**	0.9968 *(0.0061)**
	0.01	0.20	0.1218 *(0.0103)*	0.1202 *(0.0116)*	0.1280 *(0.0080)*
		0.50	0.8292 *(0.0115)**	0.8268 *(0.0096)**	0.8204 *(0.0109)**
		0.80	0.9988 *(0.0117)**	0.9996 *(0.0106)**	0.9980 *(0.0094)**
250	0.001	0.20	0.1320 *(0.0006)*	0.1446 *(0.0009)*	0.1408 *(0.0012)*
		0.50	0.9864 *(0.0011)**	0.9888 *(0.0015)**	0.9892 *(0.0015)**
		0.80	1.0000 *(0.0017)**	1.0000 *(0.0011)**	1.0000 *(0.0010)**
	0.005	0.20	0.2840 *(0.0045)*	0.2768 *(0.0055)*	0.2810 *(0.0063)*
		0.50	0.9984 *(0.0055)**	0.9960 *(0.0062)**	0.9974 *(0.0048)**
		0.80	1.0000 *(0.0058)**	1.0000 *(0.0061)**	1.0000 *(0.0066)**
	0.01	0.20	0.3610 *(0.0109)*	0.3648 *(0.0098)*	0.3592 *(0.0102)*
		0.50	0.9992 *(0.0096)**	0.9992 *(0.0092)**	0.9992 *(0.0095)**
		0.80	1.0000 *(0.0129)**	1.0000 *(0.0115)**	1.0000 *(0.0120)**
500	0.001	0.20	0.4460 *(0.0010)*	0.4354 *(0.0005)*	0.4482 *(0.0010)*
		0.50	1.0000 *(0.0011)**	1.0000 *(0.0013)**	1.0000 *(0.0012)**
		0.80	1.0000 *(0.0017)**	1.0000 *(0.0010)**	1.0000 *(0.0010)**
	0.005	0.20	0.6388 *(0.0051)*	0.6332 *(0.0051)*	0.6254 *(0.0070)*
		0.50	1.0000 *(0.0067)**	1.0000 *(0.0070)**	1.0000 *(0.0053)**
		0.80	1.0000 *(0.0066)**	1.0000 *(0.0073)**	1.0000 *(0.0078)**
	0.01	0.20	0.7174 *(0.0109)***	0.7164 *(0.0117)***	0.7194 *(0.0096)***
		0.50	1.0000 *(0.0115)**	1.0000 *(0.0118)**	1.0000 *(0.0093)**
		0.80	1.0000 *(0.0179)**	1.0000 *(0.0128)**	1.0000 *(0.0135)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 9

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.03, p=3 and NV=2

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0283 *(0.0010)*	0.0245 *(0.0012)*	0.0260 *(0.0008)*
		0.50	0.4264 *(0.0020)*	0.3870 *(0.0012)*	0.3576 *(0.0006)*
		0.80	0.8225 *(0.0018)**	0.6033 *(0.0014)*	0.5049 *(0.0016)*
	0.005	0.20	0.0756 *(0.0068)*	0.0700 *(0.0050)*	0.0618 *(0.0058)*
		0.50	0.5604 *(0.0046)*	0.4665 *(0.0062)*	0.4348 *(0.0046)*
		0.80	0.9212 *(0.0064)**	0.7377 *(0.0056)***	0.5376 *(0.0080)*
	0.01	0.20	0.1096 *(0.0114)*	0.1060 *(0.0118)*	0.0958 *(0.0090)*
		0.50	0.6266 *(0.0114)*	0.5092 *(0.0126)*	0.4635 *(0.0098)*
		0.80	0.9523 *(0.0110)**	0.8016 *(0.0108)**	0.5759 *(0.0122)*
250	0.001	0.20	0.1258 *(0.0014)*	0.1181 *(0.0006)*	0.1095 *(0.0014)*
		0.50	0.8703 *(0.0006)**	0.6536 *(0.0006)*	0.5058 *(0.0018)*
		0.80	0.9994 *(0.0010)**	0.9808 *(0.0016)**	0.8016 *(0.0022)**
	0.005	0.20	0.2358 *(0.0048)*	0.2139 *(0.0062)*	0.1992 *(0.0074)*
		0.50	0.9479 *(0.0062)**	0.7792 *(0.0064)***	0.5527 *(0.0062)*
		0.80	1.0000 *(0.0078)**	0.9961 *(0.0068)**	0.9076 *(0.0070)**
	0.01	0.20	0.3016 *(0.0086)*	0.2778 *(0.0112)*	0.2503 *(0.0078)*
		0.50	0.9689 *(0.0110)**	0.8343 *(0.0132)**	0.5976 *(0.0092)*
		0.80	1.0000 *(0.0132)**	0.9975 *(0.0134)**	0.9381 *(0.0138)**
500	0.001	0.20	0.3486 *(0.0010)*	0.3190 *(0.0018)*	0.2973 *(0.0018)*
		0.50	0.9987 *(0.0022)**	0.9571 *(0.0014)**	0.7151 *(0.0016)***
		0.80	1.0000 *(0.0022)**	1.0000 *(0.0020)**	0.9952 *(0.0006)**
	0.005	0.20	0.4858 *(0.0052)*	0.4152 *(0.0034)*	0.3880 *(0.0062)*
		0.50	0.9992 *(0.0074)**	0.9835 *(0.0058)**	0.8493 *(0.0078)**
		0.80	1.0000 *(0.0152)**	1.0000 *(0.0098)**	0.9981 *(0.0084)**
	0.01	0.20	0.5567 *(0.0110)*	0.4552 *(0.0084)*	0.4248 *(0.0108)*
		0.50	0.9996 *(0.0152)**	0.9928 *(0.0136)**	0.8996 *(0.0098)**
		0.80	1.0000 *(0.0224)**	1.0000 *(0.0188)**	0.9997 *(0.0156)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 10

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.03, p=3 and NV=3

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0254 *(0.0000)*	0.0277 *(0.0000)*	0.0223 *(0.0000)*
		0.50	0.3429 *(0.0000)*	0.2855 *(0.0000)*	0.2633 *(0.0000)*
		0.80	0.6579 *(0.0000)*	0.4589 *(0.0000)*	0.3409 *(0.0000)*
	0.005	0.20	0.0704 *(0.0000)*	0.0639 *(0.0000)*	0.0553 *(0.0000)*
		0.50	0.4512 *(0.0000)*	0.3374 *(0.0000)*	0.3031 *(0.0000)*
		0.80	0.7651 *(0.0000)***	0.5655 *(0.0000)*	0.3783 *(0.0000)*
	0.01	0.20	0.1000 *(0.0000)*	0.0939 *(0.0000)*	0.0827 *(0.0000)*
		0.50	0.5156 *(0.0000)*	0.3729 *(0.0000)*	0.3205 *(0.0000)*
		0.80	0.8212 *(0.0000)**	0.6085 *(0.0000)*	0.4192 *(0.0000)*
250	0.001	0.20	0.1139 *(0.0000)*	0.1072 *(0.0000)*	0.0931 *(0.0000)*
		0.50	0.7093 *(0.0000)***	0.4922 *(0.0000)*	0.3452 *(0.0000)*
		0.80	0.9859 *(0.0000)**	0.7709 *(0.0000)***	0.5921 *(0.0000)*
	0.005	0.20	0.2087 *(0.0000)*	0.1780 *(0.0000)*	0.1633 *(0.0000)*
		0.50	0.8202 *(0.0000)**	0.5963 *(0.0000)*	0.3968 *(0.0000)*
		0.80	0.9966 *(0.0000)**	0.8699 *(0.0000)**	0.6517 *(0.0000)*
	0.01	0.20	0.2561 *(0.0000)*	0.2163 *(0.0000)*	0.1956 *(0.0000)*
		0.50	0.8689 *(0.0000)**	0.6434 *(0.0000)*	0.4403 *(0.0000)*
		0.80	0.9981 *(0.0000)**	0.9113 *(0.0000)**	0.6771 *(0.0000)*
500	0.001	0.20	0.2935 *(0.0000)*	0.2465 *(0.0000)*	0.2239 *(0.0000)*
		0.50	0.9726 *(0.0000)**	0.7257 *(0.0000)***	0.5363 *(0.0000)*
		0.80	0.9999 *(0.0000)**	0.9885 *(0.0000)**	0.7559 *(0.0000)***
	0.005	0.20	0.3991 *(0.0000)*	0.3089 *(0.0000)*	0.2807 *(0.0000)*
		0.50	0.9911 *(0.0000)**	0.8251 *(0.0000)**	0.6223 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9967 *(0.0000)**	0.8617 *(0.0000)**
	0.01	0.20	0.4625 *(0.0000)*	0.3392 *(0.0000)*	0.2969 *(0.0000)*
		0.50	0.9955 *(0.0000)**	0.8724 *(0.0000)**	0.6492 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9989 *(0.0000)**	0.9074 *(0.0000)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 11

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.03, p=4 and NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.0314 *(0.0007)*	0.0288 *(0.0015)*	0.0284 *(0.0007)*
	0.001	0.50	0.5870 *(0.0009)*	0.5654 *(0.0010)*	0.5810 *(0.0010)*
		0.80	0.9878 *(0.0011)**	0.9902 *(0.0012)**	0.9898 *(0.0016)**
		0.20	0.0756 *(0.0046)*	0.0862 *(0.0048)*	0.0780 *(0.0046)*
100	0.005	0.50	0.7460 *(0.0054)***	0.7454 *(0.0063)***	0.7552 *(0.0051)***
		0.80	0.9974 *(0.0057)**	0.9980 *(0.0052)**	0.9980 *(0.0051)**
		0.20	0.1182 *(0.0107)*	0.1264 *(0.0090)*	0.1186 *(0.0092)*
	0.01	0.50	0.8228 *(0.0111)**	0.8230 *(0.0088)**	0.8136 *(0.0086)**
		0.80	0.9988 *(0.0102)**	0.9992 *(0.0101)**	0.9988 *(0.0086)**
		0.20	0.1426 *(0.0007)*	0.1386 *(0.0012)*	0.1494 *(0.0009)*
	0.001	0.50	0.9890 *(0.0017)**	0.9884 *(0.0009)**	0.9894 *(0.0013)**
		0.80	1.0000 *(0.0013)**	1.0000 *(0.0015)**	1.0000 *(0.0011)**
		0.20	0.2828 *(0.0058)*	0.2856 *(0.0050)*	0.2824 *(0.0037)*
250	0.005	0.50	0.9976 *(0.0071)**	0.9966 *(0.0050)**	0.9970 *(0.0043)**
		0.80	1.0000 *(0.0064)**	1.0000 *(0.0065)**	1.0000 *(0.0046)**
		0.20	0.3692 *(0.0097)*	0.3668 *(0.0102)*	0.3638 *(0.0081)*
	0.01	0.50	0.9988 *(0.0128)**	0.9984 *(0.0105)**	0.9984 *(0.0099)**
		0.80	1.0000 *(0.0119)**	1.0000 *(0.0133)**	1.0000 *(0.0111)**
		0.20	0.4490 *(0.0007)*	0.4474 *(0.0009)*	0.4468 *(0.0013)*
	0.001	0.50	1.0000 *(0.0011)**	1.0000 *(0.0014)**	1.0000 *(0.0010)**
		0.80	1.0000 *(0.0021)**	1.0000 *(0.0021)**	1.0000 *(0.0017)**
		0.20	0.6342 *(0.0056)*	0.6360 *(0.0051)*	0.6408 *(0.0046)*
500	0.005	0.50	1.0000 *(0.0073)**	1.0000 *(0.0052)**	1.0000 *(0.0053)**
		0.80	1.0000 *(0.0079)**	1.0000 *(0.0064)**	1.0000 *(0.0082)**
		0.20	0.7250 *(0.0111)***	0.7138 *(0.0087)***	0.7200 *(0.0093)***
	0.01	0.50	1.0000 *(0.0112)**	1.0000 *(0.0113)**	1.0000 *(0.0121)**
		0.80	1.0000 *(0.0132)**	1.0000 *(0.0125)**	1.0000 *(0.0122)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 12

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.03, p=4 and NV=3

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0272 *(0.0020)*	0.0256 *(0.0008)*	0.0225 *(0.0012)*
		0.50	0.3437 *(0.0004)*	0.2820 *(0.0010)*	0.2680 *(0.0010)*
		0.80	0.6585 *(0.0006)*	0.4580 *(0.0014)*	0.3397 *(0.0008)*
	0.005	0.20	0.0705 *(0.0040)*	0.0613 *(0.0052)*	0.0561 *(0.0048)*
		0.50	0.4509 *(0.0046)*	0.3407 *(0.0048)*	0.3035 *(0.0084)*
		0.80	0.7653 *(0.0072)***	0.5649 *(0.0052)*	0.3788 *(0.0068)*
	0.01	0.20	0.1008 *(0.0100)*	0.0901 *(0.0100)*	0.0787 *(0.0094)*
		0.50	0.5099 *(0.0094)*	0.3733 *(0.0096)*	0.3181 *(0.0074)*
		0.80	0.8188 *(0.0126)**	0.6060 *(0.0090)*	0.4187 *(0.0094)*
250	0.001	0.20	0.1162 *(0.0008)*	0.1050 *(0.0002)*	0.0919 *(0.0006)*
		0.50	0.7097 *(0.0016)***	0.4910 *(0.0018)*	0.3448 *(0.0024)*
		0.80	0.9847 *(0.0034)**	0.7677 *(0.0012)***	0.5955 *(0.0012)*
	0.005	0.20	0.2081 *(0.0052)*	0.1747 *(0.0048)*	0.1608 *(0.0046)*
		0.50	0.8197 *(0.0072)**	0.5930 *(0.0062)*	0.3967 *(0.0038)*
		0.80	0.9955 *(0.0122)**	0.8727 *(0.0092)**	0.6523 *(0.0078)*
	0.01	0.20	0.2506 *(0.0094)*	0.2183 *(0.0078)*	0.1919 *(0.0090)*
		0.50	0.8690 *(0.0148)**	0.6380 *(0.0126)*	0.4395 *(0.0126)*
		0.80	0.9976 *(0.0216)**	0.9104 *(0.0214)**	0.6777 *(0.0148)*
500	0.001	0.20	0.2865 *(0.0012)*	0.2426 *(0.0010)*	0.2211 *(0.0008)*
		0.50	0.9717 *(0.0030)**	0.7288 *(0.0016)***	0.5345 *(0.0018)*
		0.80	1.0000 *(0.0046)**	0.9895 *(0.0018)**	0.7551 *(0.0012)***
	0.005	0.20	0.3977 *(0.0038)*	0.3084 *(0.0038)*	0.2811 *(0.0046)*
		0.50	0.9901 *(0.0088)**	0.8247 *(0.0080)**	0.6212 *(0.0068)*
		0.80	1.0000 *(0.0152)**	0.9967 *(0.0114)**	0.8625 *(0.0120)**
	0.01	0.20	0.4603 *(0.0120)*	0.3405 *(0.0108)*	0.3006 *(0.0090)*
		0.50	0.9945 *(0.0186)**	0.8756 *(0.0130)**	0.6469 *(0.0132)*
		0.80	1.0000 *(0.0348)**	0.9989 *(0.0216)**	0.9090 *(0.0178)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 13

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.03, p=4 and NV=4

"Like" correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.0254 *(0.0000)*	0.0229 *(0.0000)*	0.0200 *(0.0000)*
	0.001	0.50	0.2869 *(0.0000)*	0.2292 *(0.0000)*	0.2092 *(0.0000)*
		0.80	0.5455 *(0.0000)*	0.3714 *(0.0000)*	0.2577 *(0.0000)*
		0.20	0.0660 *(0.0000)*	0.0594 *(0.0000)*	0.0512 *(0.0000)*
100	0.005	0.50	0.3846 *(0.0000)*	0.2689 *(0.0000)*	0.2353 *(0.0000)*
		0.80	0.6521 *(0.0000)*	0.4569 *(0.0000)*	0.2974 *(0.0000)*
		0.20	0.0965 *(0.0000)*	0.0771 *(0.0000)*	0.0717 *(0.0000)*
	0.01	0.50	0.4359 *(0.0000)*	0.2994 *(0.0000)*	0.2431 *(0.0000)*
		0.80	0.7018 *(0.0000)***	0.4884 *(0.0000)*	0.3333 *(0.0000)*
		0.20	0.1048 *(0.0000)*	0.0928 *(0.0000)*	0.0814 *(0.0000)*
	0.001	0.50	0.5971 *(0.0000)*	0.4000 *(0.0000)*	0.2637 *(0.0000)*
		0.80	0.9087 *(0.0000)**	0.6320 *(0.0000)*	0.4637 *(0.0000)*
		0.20	0.1857 *(0.0000)*	0.1493 *(0.0000)*	0.1332 *(0.0000)*
250	0.005	0.50	0.7067 *(0.0000)***	0.4779 *(0.0000)*	0.3116 *(0.0000)*
		0.80	0.9610 *(0.0000)**	0.7181 *(0.0000)***	0.5024 *(0.0000)*
		0.20	0.2230 *(0.0000)*	0.1800 *(0.0000)*	0.1597 *(0.0000)*
	0.01	0.50	0.7574 *(0.0000)***	0.5127 *(0.0000)*	0.3525 *(0.0000)*
		0.80	0.9748 *(0.0000)**	0.7606 *(0.0000)***	0.5303 *(0.0000)*
		0.20	0.2487 *(0.0000)*	0.1992 *(0.0000)*	0.1827 *(0.0000)*
	0.001	0.50	0.8818 *(0.0000)**	0.5884 *(0.0000)*	0.4266 *(0.0000)*
		0.80	0.9991 *(0.0000)**	0.8713 *(0.0000)**	0.6145 *(0.0000)*
		0.20	0.3434 *(0.0000)*	0.2481 *(0.0000)*	0.2167 *(0.0000)*
500	0.005	0.50	0.9477 *(0.0000)**	0.6815 *(0.0000)*	0.4825 *(0.0000)*
		0.80	0.9999 *(0.0000)**	0.9404 *(0.0000)**	0.7008 *(0.0000)***
		0.20	0.3952 *(0.0000)*	0.2759 *(0.0000)*	0.2307 *(0.0000)*
	0.01	0.50	0.9701 *(0.0000)**	0.7307 *(0.0000)***	0.5078 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9619 *(0.0000)**	0.7341 *(0.0000)***

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 14

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.03, p=5 and NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0262 *(0.0008)*	0.0244 *(0.0011)*	0.0330 *(0.0009)*
		0.50	0.5734 *(0.0011)*	0.5808 *(0.0011)*	0.5876 *(0.0009)*
		0.80	0.9900 *(0.0007)**	0.9904 *(0.0012)**	0.9912 *(0.0010)**
	0.005	0.20	0.0798 *(0.0046)*	0.0756 *(0.0046)*	0.0742 *(0.0043)*
		0.50	0.7514 *(0.0052)***	0.7496 *(0.0045)***	0.7444 *(0.0049)***
		0.80	0.9984 *(0.0060)**	0.9968 *(0.0053)**	0.9970 *(0.0048)**
	0.01	0.20	0.1182 *(0.0106)*	0.1186 *(0.0094)*	0.1234 *(0.0083)*
		0.50	0.8266 *(0.0105)**	0.8278 *(0.0109)**	0.8332 *(0.0089)**
		0.80	0.9994 *(0.0108)**	0.9984 *(0.0107)**	0.9988 *(0.0087)**
250	0.001	0.20	0.1410 *(0.0008)*	0.1438 *(0.0008)*	0.1436 *(0.0008)*
		0.50	0.9886 *(0.0010)**	0.9882 *(0.0010)**	0.9862 *(0.0010)**
		0.80	1.0000 *(0.0016)**	1.0000 *(0.0015)**	1.0000 *(0.0011)**
	0.005	0.20	0.2796 *(0.0050)*	0.2822 *(0.0045)*	0.2872 *(0.0038)*
		0.50	0.9950 *(0.0057)**	0.9964 *(0.0052)**	0.9970 *(0.0040)**
		0.80	1.0000 *(0.0062)**	1.0000 *(0.0066)**	1.0000 *(0.0046)**
	0.01	0.20	0.3668 *(0.0096)*	0.3626 *(0.0094)*	0.3770 *(0.0087)*
		0.50	0.9980 *(0.0091)**	0.9988 *(0.0094)**	0.9984 *(0.0095)**
		0.80	1.0000 *(0.0119)**	1.0000 *(0.0123)**	1.0000 *(0.0103)**
500	0.001	0.20	0.4460 *(0.0009)*	0.4444 *(0.0012)*	0.4504 *(0.0009)*
		0.50	1.0000 *(0.0015)**	1.0000 *(0.0015)**	1.0000 *(0.0010)**
		0.80	1.0000 *(0.0015)**	1.0000 *(0.0012)**	1.0000 *(0.0017)**
	0.005	0.20	0.6364 *(0.0047)*	0.6354 *(0.0052)*	0.6444 *(0.0037)*
		0.50	1.0000 *(0.0060)**	1.0000 *(0.0062)**	1.0000 *(0.0056)**
		0.80	1.0000 *(0.0079)**	1.0000 *(0.0068)**	1.0000 *(0.0059)**
	0.01	0.20	0.7178 *(0.0106)***	0.7130 *(0.0099)***	0.7206 *(0.0076)***
		0.50	1.0000 *(0.0114)**	1.0000 *(0.0104)**	1.0000 *(0.0098)**
		0.80	1.0000 *(0.0144)**	1.0000 *(0.0126)**	1.0000 *(0.0098)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 15

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.03, p=5 and NV=3

"Like" correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.0278 *(0.0007)*	0.0251 *(0.0008)*	0.0230 *(0.0008)*
	0.001	0.50	0.3406 *(0.0017)*	0.2879 *(0.0017)*	0.2610 *(0.0012)*
		0.80	0.6627 *(0.0010)*	0.4607 *(0.0009)*	0.3407 *(0.0008)*
		0.20	0.0679 *(0.0053)*	0.0621 *(0.0053)*	0.0569 *(0.0058)*
100	0.005	0.50	0.4532 *(0.0046)*	0.3402 *(0.0048)*	0.3048 *(0.0054)*
		0.80	0.7683 *(0.0065)***	0.5638 *(0.0058)*	0.3785 *(0.0063)*
		0.20	0.1033 *(0.0100)*	0.0882 *(0.0090)*	0.0809 *(0.0088)*
	0.01	0.50	0.5077 *(0.0092)*	0.3737 *(0.0128)*	0.3167 *(0.0090)*
		0.80	0.8183 *(0.0119)**	0.6111 *(0.0116)*	0.4197 *(0.0095)*
		0.20	0.1153 *(0.0009)*	0.1056 *(0.0009)*	0.0941 *(0.0013)*
	0.001	0.50	0.7087 *(0.0017)***	0.4933 *(0.0008)*	0.3462 *(0.0018)*
		0.80	0.9865 *(0.0024)**	0.7717 *(0.0022)***	0.5921 *(0.0015)*
		0.20	0.2079 *(0.0058)*	0.1778 *(0.0058)*	0.1594 *(0.0046)*
250	0.005	0.50	0.8192 *(0.0066)**	0.5895 *(0.0047)*	0.3959 *(0.0065)*
		0.80	0.9951 *(0.0089)**	0.8745 *(0.0086)**	0.6476 *(0.0055)*
		0.20	0.2579 *(0.0104)*	0.2136 *(0.0111)*	0.1931 *(0.0097)*
	0.01	0.50	0.8693 *(0.0147)**	0.6413 *(0.0114)*	0.4425 *(0.0113)*
		0.80	0.9982 *(0.0192)**	0.9101 *(0.0132)**	0.6755 *(0.0121)*
		0.20	0.2900 *(0.0010)*	0.2403 *(0.0011)*	0.2263 *(0.0012)*
	0.001	0.50	0.9703 *(0.0014)**	0.7221 *(0.0020)***	0.5361 *(0.0010)*
		0.80	1.0000 *(0.0041)**	0.9887 *(0.0021)**	0.7585 *(0.0022)***
		0.20	0.4007 *(0.0054)*	0.3100 *(0.0059)*	0.2807 *(0.0048)*
500	0.005	0.50	0.9915 *(0.0081)**	0.8279 *(0.0066)**	0.6197 *(0.0065)*
		0.80	1.0000 *(0.0174)**	0.9981 *(0.0112)**	0.8645 *(0.0084)**
		0.20	0.4634 *(0.0119)*	0.3405 *(0.0086)*	0.2971 *(0.0104)*
	0.01	0.50	0.9959 *(0.0192)**	0.8704 *(0.0141)**	0.6478 *(0.0127)*
		0.80	1.0000 *(0.0295)**	0.9986 *(0.0219)**	0.9046 *(0.0138)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 16

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.03, p=5 and NV=5

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0250 *(0.0000)*	0.0206 *(0.0000)*	0.0187 *(0.0000)*
		0.50	0.2505 *(0.0000)*	0.1890 *(0.0000)*	0.1718 *(0.0000)*
		0.80	0.4712 *(0.0000)*	0.3143 *(0.0000)*	0.2079 *(0.0000)*
	0.005	0.20	0.0631 *(0.0000)*	0.0524 *(0.0000)*	0.0468 *(0.0000)*
		0.50	0.3349 *(0.0000)*	0.2260 *(0.0000)*	0.1919 *(0.0000)*
		0.80	0.5645 *(0.0000)*	0.3814 *(0.0000)*	0.2446 *(0.0000)*
	0.01	0.20	0.0892 *(0.0000)*	0.0720 *(0.0000)*	0.0596 *(0.0000)*
		0.50	0.3772 *(0.0000)*	0.2524 *(0.0000)*	0.1974 *(0.0000)*
		0.80	0.6118 *(0.0000)*	0.4067 *(0.0000)*	0.2792 *(0.0000)*
250	0.001	0.20	0.0952 *(0.0000)*	0.0818 *(0.0000)*	0.0736 *(0.0000)*
		0.50	0.5169 *(0.0000)*	0.3376 *(0.0000)*	0.2116 *(0.0000)*
		0.80	0.8025 *(0.0000)**	0.5326 *(0.0000)*	0.3786 *(0.0000)*
	0.005	0.20	0.1652 *(0.0000)*	0.1319 *(0.0000)*	0.1133 *(0.0000)*
		0.50	0.6190 *(0.0000)*	0.3966 *(0.0000)*	0.2626 *(0.0000)*
		0.80	0.8873 *(0.0000)**	0.6093 *(0.0000)*	0.4118 *(0.0000)*
	0.01	0.20	0.2017 *(0.0000)*	0.1559 *(0.0000)*	0.1343 *(0.0000)*
		0.50	0.6706 *(0.0000)*	0.4310 *(0.0000)*	0.2960 *(0.0000)*
		0.80	0.9214 *(0.0000)**	0.6486 *(0.0000)*	0.4386 *(0.0000)*
500	0.001	0.20	0.2174 *(0.0000)*	0.1690 *(0.0000)*	0.1516 *(0.0000)*
		0.50	0.7839 *(0.0000)***	0.4954 *(0.0000)*	0.3530 *(0.0000)*
		0.80	0.9904 *(0.0000)**	0.7495 *(0.0000)***	0.5136 *(0.0000)*
	0.005	0.20	0.2991 *(0.0000)*	0.2086 *(0.0000)*	0.1779 *(0.0000)*
		0.50	0.8745 *(0.0000)**	0.5778 *(0.0000)*	0.3941 *(0.0000)*
		0.80	0.9969 *(0.0000)**	0.8278 *(0.0000)**	0.5814 *(0.0000)*
	0.01	0.20	0.3476 *(0.0000)*	0.2284 *(0.0000)*	0.1885 *(0.0000)*
		0.50	0.9090 *(0.0000)**	0.6170 *(0.0000)*	0.4121 *(0.0000)*
		0.80	0.9983 *(0.0000)**	0.8651 *(0.0000)**	0.6123 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 17

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.03, p=6 and NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0332 *(0.0013)*	0.0304 *(0.0010)*	0.0284 *(0.0010)*
		0.50	0.5958 *(0.0015)*	0.5812 *(0.0012)*	0.5682 *(0.0007)*
		0.80	0.9892 *(0.0010)**	0.9884 *(0.0009)**	0.9914 *(0.0012)**
	0.005	0.20	0.0852 *(0.0049)*	0.0872 *(0.0037)*	0.0842 *(0.0044)*
		0.50	0.7526 *(0.0051)***	0.7550 *(0.0058)***	0.7536 *(0.0040)***
		0.80	0.9976 *(0.0066)**	0.9984 *(0.0046)**	0.9972 *(0.0036)**
	0.01	0.20	0.1204 *(0.0093)*	0.1278 *(0.0106)*	0.1120 *(0.0094)*
		0.50	0.8260 *(0.0098)**	0.8194 *(0.0105)**	0.8180 *(0.0070)**
		0.80	0.9984 *(0.0098)**	0.9986 *(0.0108)**	0.9986 *(0.0088)**
250	0.001	0.20	0.1394 *(0.0008)*	0.1416 *(0.0009)*	0.1394 *(0.0006)*
		0.50	0.9856 *(0.0015)**	0.9900 *(0.0012)**	0.9866 *(0.0012)**
		0.80	1.0000 *(0.0014)**	1.0000 *(0.0016)**	1.0000 *(0.0013)**
	0.005	0.20	0.2668 *(0.0056)*	0.2746 *(0.0048)*	0.2846 *(0.0048)*
		0.50	0.9970 *(0.0056)**	0.9972 *(0.0039)**	0.9972 *(0.0040)**
		0.80	1.0000 *(0.0059)**	1.0000 *(0.0056)**	1.0000 *(0.0054)**
	0.01	0.20	0.3688 *(0.0097)*	0.3616 *(0.0096)*	0.3602 *(0.0093)*
		0.50	0.9992 *(0.0103)**	0.9988 *(0.0096)**	0.9982 *(0.0087)**
		0.80	1.0000 *(0.0122)**	1.0000 *(0.0111)**	1.0000 *(0.0091)**
500	0.001	0.20	0.4314 *(0.0009)*	0.4478 *(0.0008)*	0.4422 *(0.0010)*
		0.50	1.0000 *(0.0010)**	1.0000 *(0.0008)**	1.0000 *(0.0015)**
		0.80	1.0000 *(0.0012)**	1.0000 *(0.0022)**	1.0000 *(0.0019)**
	0.005	0.20	0.6388 *(0.0054)*	0.6386 *(0.0049)*	0.6422 *(0.0046)*
		0.50	1.0000 *(0.0055)**	1.0000 *(0.0056)**	1.0000 *(0.0047)**
		0.80	1.0000 *(0.0077)**	1.0000 *(0.0078)**	1.0000 *(0.0064)**
	0.01	0.20	0.7134 *(0.0101)***	0.7162 *(0.0094)***	0.7240 *(0.0083)***
		0.50	1.0000 *(0.0116)**	1.0000 *(0.0098)**	1.0000 *(0.0089)**
		0.80	1.0000 *(0.0134)**	1.0000 *(0.0122)**	1.0000 *(0.0111)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 18

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.03, p=6 and NV=3

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0254 *(0.0009)*	0.0264 *(0.0009)*	0.0237 *(0.0007)*
		0.50	0.3433 *(0.0006)*	0.2849 *(0.0010)*	0.2630 *(0.0008)*
		0.80	0.6583 *(0.0010)*	0.4572 *(0.0009)*	0.3395 *(0.0011)*
	0.005	0.20	0.0683 *(0.0053)*	0.0641 *(0.0049)*	0.0513 *(0.0051)*
		0.50	0.4516 *(0.0055)*	0.3407 *(0.0040)*	0.3038 *(0.0050)*
		0.80	0.7643 *(0.0067)***	0.5615 *(0.0068)*	0.3793 *(0.0053)*
	0.01	0.20	0.1009 *(0.0112)*	0.0878 *(0.0105)*	0.0788 *(0.0097)*
		0.50	0.5091 *(0.0113)*	0.3707 *(0.0102)*	0.3193 *(0.0089)*
		0.80	0.8119 *(0.0130)**	0.6113 *(0.0120)*	0.4184 *(0.0109)*
250	0.001	0.20	0.1156 *(0.0007)*	0.1030 *(0.0007)*	0.0929 *(0.0008)*
		0.50	0.7091 *(0.0016)***	0.4915 *(0.0016)*	0.3435 *(0.0007)*
		0.80	0.9823 *(0.0030)**	0.7703 *(0.0022)***	0.5925 *(0.0020)*
	0.005	0.20	0.2079 *(0.0044)*	0.1795 *(0.0056)*	0.1597 *(0.0057)*
		0.50	0.8141 *(0.0071)**	0.5988 *(0.0069)*	0.3931 *(0.0051)*
		0.80	0.9958 *(0.0104)**	0.8723 *(0.0075)**	0.6489 *(0.0067)*
	0.01	0.20	0.2589 *(0.0098)*	0.2145 *(0.0087)*	0.1911 *(0.0090)*
		0.50	0.8644 *(0.0136)**	0.6354 *(0.0107)*	0.4389 *(0.0095)*
		0.80	0.9975 *(0.0180)**	0.9080 *(0.0134)**	0.6763 *(0.0132)*
500	0.001	0.20	0.2841 *(0.0015)*	0.2415 *(0.0010)*	0.2229 *(0.0009)*
		0.50	0.9708 *(0.0026)**	0.7259 *(0.0017)***	0.5317 *(0.0014)*
		0.80	1.0000 *(0.0055)**	0.9867 *(0.0032)**	0.7545 *(0.0023)***
	0.005	0.20	0.3989 *(0.0052)*	0.3104 *(0.0055)*	0.2800 *(0.0045)*
		0.50	0.9911 *(0.0108)**	0.8293 *(0.0076)**	0.6163 *(0.0073)*
		0.80	1.0000 *(0.0157)**	0.9970 *(0.0094)**	0.8627 *(0.0073)**
	0.01	0.20	0.4624 *(0.0101)*	0.3426 *(0.0093)*	0.2977 *(0.0084)*
		0.50	0.9955 *(0.0198)**	0.8699 *(0.0135)**	0.6497 *(0.0149)*
		0.80	1.0000 *(0.0271)**	0.9979 *(0.0218)**	0.9040 *(0.0138)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 19

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.03, p=6 and NV=6

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0240 *(0.0000)*	0.0219 *(0.0000)*	0.0174 *(0.0000)*
		0.50	0.2245 *(0.0000)*	0.1616 *(0.0000)*	0.1469 *(0.0000)*
		0.80	0.4105 *(0.0000)*	0.2729 *(0.0000)*	0.1755 *(0.0000)*
	0.005	0.20	0.0603 *(0.0000)*	0.0509 *(0.0000)*	0.0429 *(0.0000)*
		0.50	0.2966 *(0.0000)*	0.1948 *(0.0000)*	0.1602 *(0.0000)*
		0.80	0.4986 *(0.0000)*	0.3244 *(0.0000)*	0.2119 *(0.0000)*
	0.01	0.20	0.0829 *(0.0000)*	0.0684 *(0.0000)*	0.0560 *(0.0000)*
		0.50	0.3374 *(0.0000)*	0.2198 *(0.0000)*	0.1675 *(0.0000)*
		0.80	0.5415 *(0.0000)*	0.3546 *(0.0000)*	0.2423 *(0.0000)*
250	0.001	0.20	0.0899 *(0.0000)*	0.0751 *(0.0000)*	0.0628 *(0.0000)*
		0.50	0.4566 *(0.0000)*	0.2906 *(0.0000)*	0.1796 *(0.0000)*
		0.80	0.7160 *(0.0000)***	0.4600 *(0.0000)*	0.3202 *(0.0000)*
	0.005	0.20	0.1524 *(0.0000)*	0.1144 *(0.0000)*	0.0977 *(0.0000)*
		0.50	0.5496 *(0.0000)*	0.3425 *(0.0000)*	0.2257 *(0.0000)*
		0.80	0.8084 *(0.0000)**	0.5236 *(0.0000)*	0.3461 *(0.0000)*
	0.01	0.20	0.1826 *(0.0000)*	0.1360 *(0.0000)*	0.1144 *(0.0000)*
		0.50	0.5991 *(0.0000)*	0.3710 *(0.0000)*	0.2555 *(0.0000)*
		0.80	0.8447 *(0.0000)**	0.5634 *(0.0000)*	0.3750 *(0.0000)*
500	0.001	0.20	0.1938 *(0.0000)*	0.1445 *(0.0000)*	0.1289 *(0.0000)*
		0.50	0.7011 *(0.0000)***	0.4311 *(0.0000)*	0.3020 *(0.0000)*
		0.80	0.9519 *(0.0000)**	0.6518 *(0.0000)*	0.4436 *(0.0000)*
	0.005	0.20	0.2679 *(0.0000)*	0.1799 *(0.0000)*	0.1513 *(0.0000)*
		0.50	0.7955 *(0.0000)***	0.5010 *(0.0000)*	0.3322 *(0.0000)*
		0.80	0.9828 *(0.0000)**	0.7310 *(0.0000)***	0.4971 *(0.0000)*
	0.01	0.20	0.3079 *(0.0000)*	0.1994 *(0.0000)*	0.1598 *(0.0000)*
		0.50	0.8370 *(0.0000)**	0.5380 *(0.0000)*	0.3528 *(0.0000)*
		0.80	0.9913 *(0.0000)**	0.7721 *(0.0000)***	0.5266 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 20

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.03, p=7 and NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0278 *(0.0008)*	0.0316 *(0.0009)*	0.0314 *(0.0008)*
		0.50	0.5702 *(0.0007)*	0.5666 *(0.0010)*	0.5736 *(0.0009)*
		0.80	0.9894 *(0.0012)**	0.9852 *(0.0010)**	0.9870 *(0.0009)**
	0.005	0.20	0.0764 *(0.0046)*	0.0884 *(0.0052)*	0.0802 *(0.0040)*
		0.50	0.7616 *(0.0050)***	0.7518 *(0.0052)***	0.7564 *(0.0042)***
		0.80	0.9964 *(0.0044)**	0.9976 *(0.0052)**	0.9974 *(0.0037)**
	0.01	0.20	0.1210 *(0.0095)*	0.1170 *(0.0086)*	0.1206 *(0.0086)*
		0.50	0.8066 *(0.0098)**	0.8260 *(0.0093)**	0.8200 *(0.0074)**
		0.80	0.9992 *(0.0103)**	0.9982 *(0.0097)**	0.9988 *(0.0086)**
250	0.001	0.20	0.1466 *(0.0010)*	0.1396 *(0.0007)*	0.1406 *(0.0010)*
		0.50	0.9902 *(0.0009)**	0.9876 *(0.0009)**	0.9896 *(0.0009)**
		0.80	1.0000 *(0.0011)**	1.0000 *(0.0008)**	1.0000 *(0.0010)**
	0.005	0.20	0.2850 *(0.0050)*	0.2726 *(0.0045)*	0.2882 *(0.0042)*
		0.50	0.9966 *(0.0057)**	0.9966 *(0.0048)**	0.9968 *(0.0041)**
		0.80	1.0000 *(0.0058)**	1.0000 *(0.0057)**	1.0000 *(0.0046)**
	0.01	0.20	0.3688 *(0.0105)*	0.3604 *(0.0089)*	0.3682 *(0.0071)*
		0.50	0.9986 *(0.0103)**	0.9990 *(0.0106)**	0.9982 *(0.0079)**
		0.80	1.0000 *(0.0113)**	1.0000 *(0.0104)**	1.0000 *(0.0096)**
500	0.001	0.20	0.4512 *(0.0008)*	0.4432 *(0.0006)*	0.4546 *(0.0010)*
		0.50	1.0000 *(0.0014)**	1.0000 *(0.0013)**	1.0000 *(0.0011)**
		0.80	1.0000 *(0.0018)**	1.0000 *(0.0021)**	1.0000 *(0.0015)**
	0.005	0.20	0.6306 *(0.0048)*	0.6324 *(0.0047)*	0.6250 *(0.0043)*
		0.50	1.0000 *(0.0059)**	1.0000 *(0.0056)**	1.0000 *(0.0046)**
		0.80	1.0000 *(0.0079)**	1.0000 *(0.0064)**	1.0000 *(0.0055)**
	0.01	0.20	0.7218 *(0.0102)***	0.7164 *(0.0085)***	0.7044 *(0.0081)***
		0.50	1.0000 *(0.0114)**	1.0000 *(0.0110)**	1.0000 *(0.0079)**
		0.80	1.0000 *(0.0144)**	1.0000 *(0.0133)**	1.0000 *(0.0114)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 21

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.03, p=7 and NV=3

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0270 *(0.0012)*	0.0254 *(0.0014)*	0.0218 *(0.0009)*
		0.50	0.3455 *(0.0012)*	0.2831 *(0.0012)*	0.2628 *(0.0010)*
		0.80	0.6553 *(0.0020)*	0.4557 *(0.0012)*	0.3399 *(0.0011)*
	0.005	0.20	0.0707 *(0.0058)*	0.0654 *(0.0039)*	0.0583 *(0.0038)*
		0.50	0.4525 *(0.0052)*	0.3411 *(0.0058)*	0.3043 *(0.0047)*
		0.80	0.7665 *(0.0067)***	0.5650 *(0.0054)*	0.3796 *(0.0043)*
	0.01	0.20	0.1072 *(0.0118)*	0.0925 *(0.0099)*	0.0781 *(0.0088)*
		0.50	0.5143 *(0.0103)*	0.3727 *(0.0115)*	0.3193 *(0.0089)*
		0.80	0.8169 *(0.0142)**	0.6111 *(0.0108)*	0.4201 *(0.0095)*
250	0.001	0.20	0.1149 *(0.0009)*	0.1050 *(0.0006)*	0.0949 *(0.0009)*
		0.50	0.7055 *(0.0013)***	0.4947 *(0.0015)*	0.3427 *(0.0009)*
		0.80	0.9851 *(0.0026)**	0.7707 *(0.0023)***	0.5953 *(0.0014)*
	0.005	0.20	0.2087 *(0.0061)*	0.1831 *(0.0043)*	0.1628 *(0.0044)*
		0.50	0.8188 *(0.0068)**	0.5961 *(0.0059)*	0.3947 *(0.0049)*
		0.80	0.9958 *(0.0098)**	0.8700 *(0.0077)**	0.6515 *(0.0060)*
	0.01	0.20	0.2583 *(0.0084)*	0.2130 *(0.0082)*	0.1941 *(0.0078)*
		0.50	0.8699 *(0.0134)**	0.6394 *(0.0115)*	0.4441 *(0.0097)*
		0.80	0.9979 *(0.0198)**	0.9082 *(0.0139)**	0.6775 *(0.0116)*
500	0.001	0.20	0.2897 *(0.0015)*	0.2441 *(0.0012)*	0.2253 *(0.0007)*
		0.50	0.9703 *(0.0027)**	0.7245 *(0.0014)***	0.5387 *(0.0017)*
		0.80	1.0000 *(0.0046)**	0.9888 *(0.0035)**	0.7563 *(0.0020)***
	0.005	0.20	0.3997 *(0.0049)*	0.3095 *(0.0052)*	0.2781 *(0.0046)*
		0.50	0.9907 *(0.0102)**	0.8247 *(0.0071)**	0.6220 *(0.0060)*
		0.80	1.0000 *(0.0171)**	0.9969 *(0.0120)**	0.8627 *(0.0085)**
	0.01	0.20	0.4590 *(0.0110)*	0.3396 *(0.0100)*	0.2978 *(0.0085)*
		0.50	0.9957 *(0.0159)**	0.8719 *(0.0125)**	0.6473 *(0.0104)*
		0.80	1.0000 *(0.0288)**	0.9991 *(0.0202)**	0.9086 *(0.0135)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 22

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.03, p=7 and NV=5

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0265 *(0.0004)*	0.0219 *(0.0007)*	0.0184 *(0.0011)*
		0.50	0.2491 *(0.0015)*	0.1883 *(0.0009)*	0.1704 *(0.0015)*
		0.80	0.4673 *(0.0020)*	0.3142 *(0.0006)*	0.2085 *(0.0006)*
	0.005	0.20	0.0613 *(0.0045)*	0.0524 *(0.0056)*	0.0463 *(0.0043)*
		0.50	0.3365 *(0.0060)*	0.2264 *(0.0052)*	0.1914 *(0.0046)*
		0.80	0.5651 *(0.0068)*	0.3791 *(0.0047)*	0.2478 *(0.0046)*
	0.01	0.20	0.0880 *(0.0091)*	0.0734 *(0.0100)*	0.0644 *(0.0092)*
		0.50	0.3804 *(0.0117)*	0.2566 *(0.0103)*	0.1973 *(0.0096)*
		0.80	0.6112 *(0.0135)*	0.4106 *(0.0118)*	0.2787 *(0.0104)*
250	0.001	0.20	0.0990 *(0.0010)*	0.0812 *(0.0013)*	0.0679 *(0.0010)*
		0.50	0.5185 *(0.0011)*	0.3380 *(0.0012)*	0.2126 *(0.0004)*
		0.80	0.8033 *(0.0035)**	0.5324 *(0.0015)*	0.3799 *(0.0014)*
	0.005	0.20	0.1636 *(0.0058)*	0.1329 *(0.0043)*	0.1138 *(0.0052)*
		0.50	0.6180 *(0.0076)*	0.3983 *(0.0070)*	0.2618 *(0.0058)*
		0.80	0.8863 *(0.0133)**	0.6088 *(0.0095)*	0.4102 *(0.0083)*
	0.01	0.20	0.2014 *(0.0099)*	0.1554 *(0.0105)*	0.1342 *(0.0093)*
		0.50	0.6663 *(0.0167)*	0.4311 *(0.0135)*	0.2999 *(0.0100)*
		0.80	0.9210 *(0.0243)**	0.6508 *(0.0149)*	0.4383 *(0.0126)*
500	0.001	0.20	0.2144 *(0.0009)*	0.1707 *(0.0006)*	0.1481 *(0.0011)*
		0.50	0.7860 *(0.0031)***	0.4969 *(0.0019)*	0.3531 *(0.0017)*
		0.80	0.9904 *(0.0069)**	0.7510 *(0.0036)***	0.5136 *(0.0022)*
	0.005	0.20	0.3026 *(0.0056)*	0.2075 *(0.0059)*	0.1779 *(0.0048)*
		0.50	0.8737 *(0.0135)**	0.5794 *(0.0087)*	0.3914 *(0.0066)*
		0.80	0.9980 *(0.0260)**	0.8268 *(0.0146)**	0.5827 *(0.0098)*
	0.01	0.20	0.3450 *(0.0111)*	0.2319 *(0.0102)*	0.1880 *(0.0097)*
		0.50	0.9076 *(0.0241)**	0.6189 *(0.0156)*	0.4140 *(0.0100)*
		0.80	0.9991 *(0.0394)**	0.8656 *(0.0227)**	0.6136 *(0.0166)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 23

Power and (*Type I error*) for: F-statistic, “unlike” correlation=0.03, p=7 and NV=7

“Like” correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.0248 *(0.0000)*	0.0205 *(0.0000)*	0.0165 *(0.0000)*
	0.001	0.50	0.2034 *(0.0000)*	0.1412 *(0.0000)*	0.1263 *(0.0000)*
		0.80	0.3669 *(0.0000)*	0.2431 *(0.0000)*	0.1521 *(0.0000)*
		0.20	0.0558 *(0.0000)*	0.0460 *(0.0000)*	0.0367 *(0.0000)*
100	0.005	0.50	0.2690 *(0.0000)*	0.1755 *(0.0000)*	0.1385 *(0.0000)*
		0.80	0.4447 *(0.0000)*	0.2857 *(0.0000)*	0.1851 *(0.0000)*
		0.20	0.0796 *(0.0000)*	0.0656 *(0.0000)*	0.0515 *(0.0000)*
	0.01	0.50	0.3052 *(0.0000)*	0.1960 *(0.0000)*	0.1445 *(0.0000)*
		0.80	0.4868 *(0.0000)*	0.3093 *(0.0000)*	0.2133 *(0.0000)*
		0.20	0.0862 *(0.0000)*	0.0714 *(0.0000)*	0.0583 *(0.0000)*
	0.001	0.50	0.4112 *(0.0000)*	0.2565 *(0.0000)*	0.1560 *(0.0000)*
		0.80	0.6431 *(0.0000)*	0.4041 *(0.0000)*	0.2775 *(0.0000)*
		0.20	0.1377 *(0.0000)*	0.1051 *(0.0000)*	0.0884 *(0.0000)*
250	0.005	0.50	0.4936 *(0.0000)*	0.3005 *(0.0000)*	0.1985 *(0.0000)*
		0.80	0.7327 *(0.0000)***	0.4639 *(0.0000)*	0.3010 *(0.0000)*
		0.20	0.1691 *(0.0000)*	0.1209 *(0.0000)*	0.1012 *(0.0000)*
	0.01	0.50	0.5387 *(0.0000)*	0.3293 *(0.0000)*	0.2243 *(0.0000)*
		0.80	0.7778 *(0.0000)***	0.4985 *(0.0000)*	0.3283 *(0.0000)*
		0.20	0.1774 *(0.0000)*	0.1279 *(0.0000)*	0.1127 *(0.0000)*
	0.001	0.50	0.6321 *(0.0000)*	0.3804 *(0.0000)*	0.2608 *(0.0000)*
		0.80	0.8900 *(0.0000)**	0.5747 *(0.0000)*	0.3867 *(0.0000)*
		0.20	0.2426 *(0.0000)*	0.1587 *(0.0000)*	0.1315 *(0.0000)*
500	0.005	0.50	0.7259 *(0.0000)***	0.4406 *(0.0000)*	0.2883 *(0.0000)*
		0.80	0.9503 *(0.0000)**	0.6531 *(0.0000)*	0.4311 *(0.0000)*
		0.20	0.2817 *(0.0000)*	0.1795 *(0.0000)*	0.1384 *(0.0000)*
	0.01	0.50	0.7692 *(0.0000)***	0.4757 *(0.0000)*	0.3078 *(0.0000)*
		0.80	0.9680 *(0.0000)**	0.6930 *(0.0000)*	0.4606 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 24

Power and (*Type I error*) for: F-statistic, “unlike” correlation=0.03, p=8 and NV=1

“Like” correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0272 *(0.0013)*	0.0294 *(0.0010)*	0.0306 *(0.0008)*
		0.50	0.5822 *(0.0011)*	0.5876 *(0.0012)*	0.5964 *(0.0010)*
		0.80	0.9882 *(0.0013)**	0.9892 *(0.0010)**	0.9860 *(0.0010)**
	0.005	0.20	0.0784 *(0.0052)*	0.0790 *(0.0045)*	0.0736 *(0.0037)*
		0.50	0.7500 *(0.0051)***	0.7602 *(0.0050)***	0.7478 *(0.0040)***
		0.80	0.9978 *(0.0057)**	0.9984 *(0.0050)**	0.9972 *(0.0044)**
	0.01	0.20	0.1236 *(0.0099)*	0.1172 *(0.0096)*	0.1166 *(0.0070)*
		0.50	0.8146 *(0.0103)**	0.8120 *(0.0092)**	0.8190 *(0.0074)**
		0.80	0.9992 *(0.0103)**	0.9982 *(0.0094)**	0.9980 *(0.0088)**
250	0.001	0.20	0.1476 *(0.0008)*	0.1400 *(0.0011)*	0.1416 *(0.0006)*
		0.50	0.9874 *(0.0010)**	0.9894 *(0.0009)**	0.9876 *(0.0008)**
		0.80	1.0000 *(0.0016)**	1.0000 *(0.0017)**	1.0000 *(0.0010)**
	0.005	0.20	0.2748 *(0.0043)*	0.2826 *(0.0050)*	0.2744 *(0.0039)*
		0.50	0.9964 *(0.0054)**	0.9978 *(0.0043)**	0.9970 *(0.0042)**
		0.80	1.0000 *(0.0069)**	1.0000 *(0.0055)**	1.0000 *(0.0054)**
	0.01	0.20	0.3634 *(0.0100)*	0.3592 *(0.0086)*	0.3618 *(0.0075)*
		0.50	0.9988 *(0.0103)**	0.9992 *(0.0095)**	0.9990 *(0.0074)**
		0.80	1.0000 *(0.0114)**	1.0000 *(0.0102)**	1.0000 *(0.0087)**
500	0.001	0.20	0.4424 *(0.0011)*	0.4236 *(0.0009)*	0.4296 *(0.0011)*
		0.50	1.0000 *(0.0012)**	1.0000 *(0.0010)**	1.0000 *(0.0012)**
		0.80	1.0000 *(0.0013)**	1.0000 *(0.0017)**	1.0000 *(0.0012)**
	0.005	0.20	0.6396 *(0.0046)*	0.6280 *(0.0049)*	0.6362 *(0.0037)*
		0.50	1.0000 *(0.0053)**	1.0000 *(0.0057)**	1.0000 *(0.0047)**
		0.80	1.0000 *(0.0079)**	1.0000 *(0.0067)**	1.0000 *(0.0052)**
	0.01	0.20	0.7172 *(0.0104)***	0.7268 *(0.0092)***	0.7222 *(0.0075)***
		0.50	1.0000 *(0.0122)**	1.0000 *(0.0108)**	1.0000 *(0.0083)**
		0.80	1.0000 *(0.0135)**	1.0000 *(0.0118)**	1.0000 *(0.0097)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 25

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.03, p=8 and NV=4

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0248 *(0.0013)*	0.0254 *(0.0006)*	0.0214 *(0.0010)*
		0.50	0.2885 *(0.0015)*	0.2283 *(0.0011)*	0.2081 *(0.0007)*
		0.80	0.5494 *(0.0014)*	0.3708 *(0.0008)*	0.2572 *(0.0014)*
	0.005	0.20	0.0654 *(0.0046)*	0.0579 *(0.0045)*	0.0495 *(0.0047)*
		0.50	0.3820 *(0.0049)*	0.2706 *(0.0054)*	0.2347 *(0.0045)*
		0.80	0.6501 *(0.0075)*	0.4531 *(0.0062)*	0.2970 *(0.0046)*
	0.01	0.20	0.0932 *(0.0096)*	0.0799 *(0.0102)*	0.0694 *(0.0085)*
		0.50	0.4325 *(0.0109)*	0.2998 *(0.0110)*	0.2445 *(0.0082)*
		0.80	0.7020 *(0.0137)***	0.4870 *(0.0122)*	0.3353 *(0.0088)*
250	0.001	0.20	0.1054 *(0.0012)*	0.0920 *(0.0009)*	0.0795 *(0.0008)*
		0.50	0.5989 *(0.0019)*	0.4006 *(0.0013)*	0.2623 *(0.0009)*
		0.80	0.9072 *(0.0032)**	0.6315 *(0.0017)*	0.4632 *(0.0016)*
	0.005	0.20	0.1780 *(0.0051)*	0.1514 *(0.0034)*	0.1346 *(0.0053)*
		0.50	0.7044 *(0.0077)***	0.4739 *(0.0058)*	0.3118 *(0.0051)*
		0.80	0.9622 *(0.0131)**	0.7206 *(0.0081)***	0.5020 *(0.0072)*
	0.01	0.20	0.2261 *(0.0108)*	0.1795 *(0.0093)*	0.1589 *(0.0084)*
		0.50	0.7599 *(0.0144)***	0.5137 *(0.0118)*	0.3535 *(0.0093)*
		0.80	0.9791 *(0.0204)**	0.7589 *(0.0149)***	0.5292 *(0.0117)*
500	0.001	0.20	0.2478 *(0.0008)*	0.1988 *(0.0010)*	0.1807 *(0.0011)*
		0.50	0.8845 *(0.0028)**	0.5914 *(0.0021)*	0.4248 *(0.0011)*
		0.80	0.9994 *(0.0071)**	0.8691 *(0.0033)**	0.6106 *(0.0019)*
	0.005	0.20	0.3432 *(0.0064)*	0.2470 *(0.0053)*	0.2167 *(0.0039)*
		0.50	0.9493 *(0.0106)**	0.6867 *(0.0082)*	0.4806 *(0.0047)*
		0.80	0.9998 *(0.0231)**	0.9407 *(0.0126)**	0.6999 *(0.0080)*
	0.01	0.20	0.3920 *(0.0104)*	0.2758 *(0.0103)*	0.2309 *(0.0080)*
		0.50	0.9680 *(0.0202)**	0.7264 *(0.0144)***	0.5042 *(0.0104)*
		0.80	1.0000 *(0.0359)**	0.9618 *(0.0212)**	0.7360 *(0.0141)***

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 26

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.03, p=8 and NV=6

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0266 *(0.0008)*	0.0208 *(0.0014)*	0.0188 *(0.0011)*
		0.50	0.2221 *(0.0014)*	0.1626 *(0.0017)*	0.1472 *(0.0008)*
		0.80	0.4119 *(0.0013)*	0.2751 *(0.0015)*	0.1740 *(0.0007)*
	0.005	0.20	0.0596 *(0.0054)*	0.0487 *(0.0049)*	0.0397 *(0.0044)*
		0.50	0.2968 *(0.0065)*	0.1931 *(0.0056)*	0.1609 *(0.0045)*
		0.80	0.4958 *(0.0090)*	0.3248 *(0.0050)*	0.2113 *(0.0048)*
	0.01	0.20	0.0830 *(0.0106)*	0.0677 *(0.0116)*	0.0546 *(0.0117)*
		0.50	0.3395 *(0.0122)*	0.2200 *(0.0099)*	0.1678 *(0.0117)*
		0.80	0.5411 *(0.0152)*	0.3514 *(0.0123)*	0.2398 *(0.0113)*
250	0.001	0.20	0.0928 *(0.0006)*	0.0731 *(0.0007)*	0.0642 *(0.0009)*
		0.50	0.4565 *(0.0019)*	0.2920 *(0.0010)*	0.1803 *(0.0012)*
		0.80	0.7167 *(0.0027)***	0.4602 *(0.0014)*	0.3201 *(0.0017)*
	0.005	0.20	0.1508 *(0.0051)*	0.1182 *(0.0059)*	0.0996 *(0.0049)*
		0.50	0.5519 *(0.0075)*	0.3425 *(0.0075)*	0.2235 *(0.0061)*
		0.80	0.8073 *(0.0146)**	0.5252 *(0.0102)*	0.3452 *(0.0071)*
	0.01	0.20	0.1833 *(0.0096)*	0.1363 *(0.0099)*	0.1171 *(0.0095)*
		0.50	0.5992 *(0.0150)*	0.3723 *(0.0120)*	0.2573 *(0.0122)*
		0.80	0.8508 *(0.0282)**	0.5648 *(0.0165)*	0.3734 *(0.0135)*
500	0.001	0.20	0.1944 *(0.0015)*	0.1456 *(0.0009)*	0.1290 *(0.0015)*
		0.50	0.6995 *(0.0024)*	0.4324 *(0.0018)*	0.3017 *(0.0022)*
		0.80	0.9530 *(0.0097)**	0.6542 *(0.0032)*	0.4415 *(0.0025)*
	0.005	0.20	0.2693 *(0.0041)*	0.1808 *(0.0057)*	0.1516 *(0.0046)*
		0.50	0.7968 *(0.0144)***	0.5026 *(0.0094)*	0.3320 *(0.0060)*
		0.80	0.9832 *(0.0308)**	0.7311 *(0.0134)***	0.4958 *(0.0088)*
	0.01	0.20	0.3087 *(0.0100)*	0.1994 *(0.0099)*	0.1583 *(0.0098)*
		0.50	0.8396 *(0.0248)**	0.5368 *(0.0167)*	0.3530 *(0.0113)*
		0.80	0.9904 *(0.0432)**	0.7739 *(0.0241)***	0.5234 *(0.0150)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 27

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.03, p=8 and NV=8

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0238 *(0.0000)*	0.0197 *(0.0000)*	0.0145 *(0.0000)*
		0.50	0.1857 *(0.0000)*	0.1262 *(0.0000)*	0.1133 *(0.0000)*
		0.80	0.3301 *(0.0000)*	0.2155 *(0.0000)*	0.1340 *(0.0000)*
	0.005	0.20	0.0537 *(0.0000)*	0.0448 *(0.0000)*	0.0358 *(0.0000)*
		0.50	0.2447 *(0.0000)*	0.1550 *(0.0000)*	0.1222 *(0.0000)*
		0.80	0.4026 *(0.0000)*	0.2549 *(0.0000)*	0.1665 *(0.0000)*
	0.01	0.20	0.0743 *(0.0000)*	0.0591 *(0.0000)*	0.0466 *(0.0000)*
		0.50	0.2811 *(0.0000)*	0.1759 *(0.0000)*	0.1274 *(0.0000)*
		0.80	0.4405 *(0.0000)*	0.2759 *(0.0000)*	0.1891 *(0.0000)*
250	0.001	0.20	0.0813 *(0.0000)*	0.0649 *(0.0000)*	0.0520 *(0.0000)*
		0.50	0.3695 *(0.0000)*	0.2294 *(0.0000)*	0.1378 *(0.0000)*
		0.80	0.5866 *(0.0000)*	0.3590 *(0.0000)*	0.2444 *(0.0000)*
	0.005	0.20	0.1277 *(0.0000)*	0.0949 *(0.0000)*	0.0795 *(0.0000)*
		0.50	0.4489 *(0.0000)*	0.2695 *(0.0000)*	0.1771 *(0.0000)*
		0.80	0.6719 *(0.0000)*	0.4135 *(0.0000)*	0.2666 *(0.0000)*
	0.01	0.20	0.1544 *(0.0000)*	0.1115 *(0.0000)*	0.0927 *(0.0000)*
		0.50	0.4917 *(0.0000)*	0.2937 *(0.0000)*	0.2006 *(0.0000)*
		0.80	0.7159 *(0.0000)***	0.4475 *(0.0000)*	0.2922 *(0.0000)*
500	0.001	0.20	0.1626 *(0.0000)*	0.1141 *(0.0000)*	0.1010 *(0.0000)*
		0.50	0.5755 *(0.0000)*	0.3391 *(0.0000)*	0.2325 *(0.0000)*
		0.80	0.8264 *(0.0000)**	0.5130 *(0.0000)*	0.3444 *(0.0000)*
	0.005	0.20	0.2236 *(0.0000)*	0.1419 *(0.0000)*	0.1162 *(0.0000)*
		0.50	0.6633 *(0.0000)*	0.3931 *(0.0000)*	0.2547 *(0.0000)*
		0.80	0.8988 *(0.0000)**	0.5867 *(0.0000)*	0.3818 *(0.0000)*
	0.01	0.20	0.2586 *(0.0000)*	0.1618 *(0.0000)*	0.1217 *(0.0000)*
		0.50	0.7109 *(0.0000)***	0.4264 *(0.0000)*	0.2723 *(0.0000)*
		0.80	0.9289 *(0.0000)**	0.6243 *(0.0000)*	0.4106 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 28

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=2, NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.6722 *(0.3278)*	0.6534 *(0.3246)*	0.6720 *(0.3184)*
	0.005	0.50	0.9924 *(0.3204)*	0.9948 *(0.3182)*	0.9944 *(0.3162)*
		0.80	1.0000 *(0.3320)*	1.0000 *(0.3310)*	1.0000 *(0.3210)*
		0.20	0.5060 *(0.1574)*	0.5044 *(0.1538)*	0.5036 *(0.1610)*
100	0.01	0.50	0.9812 *(0.1654)*	0.9822 *(0.1580)*	0.9830 *(0.1470)*
		0.80	1.0000 *(0.1670)*	1.0000 *(0.1646)*	1.0000 *(0.1630)*
		0.20	0.0360 *(0.0012)*	0.0366 *(0.0014)*	0.0380 *(0.0012)*
	0.05	0.50	0.6086 *(0.0010)*	0.6196 *(0.0014)*	0.6214 *(0.0010)*
		0.80	0.9926 *(0.0016)**	0.9922 *(0.0020)**	0.9918 *(0.0016)**
		0.20	0.7512 *(0.1044)*	0.7410 *(0.1154)*	0.7428 *(0.1136)*
	0.005	0.50	1.0000 *(0.1246)*	1.0000 *(0.1196)*	1.0000 *(0.1184)*
		0.80	1.0000 *(0.1262)*	1.0000 *(0.1236)*	1.0000 *(0.1236)*
		0.20	0.5132 *(0.0282)*	0.5020 *(0.0250)*	0.4982 *(0.0226)*
250	0.01	0.50	1.0000 *(0.0264)**	0.9992 *(0.0260)**	0.9996 *(0.0302)**
		0.80	1.0000 *(0.0308)**	1.0000 *(0.0300)**	1.0000 *(0.0262)**
		0.20	0.0016 *(0.0000)*	0.0018 *(0.0000)*	0.0026 *(0.0000)*
	0.05	0.50	0.6852 *(0.0000)*	0.6842 *(0.0000)*	0.6842 *(0.0000)*
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**
		0.20	0.8254 *(0.0298)**	0.8228 *(0.0268)**	0.8262 *(0.0244)**
	0.005	0.50	1.0000 *(0.0290)**	1.0000 *(0.0306)**	1.0000 *(0.0340)**
		0.80	1.0000 *(0.0314)**	1.0000 *(0.0342)**	1.0000 *(0.0318)**
		0.20	0.4918 *(0.0014)*	0.4908 *(0.0012)*	0.4808 *(0.0022)*
500	0.01	0.50	1.0000 *(0.0016)**	1.0000 *(0.0010)**	1.0000 *(0.0024)**
		0.80	1.0000 *(0.0030)**	1.0000 *(0.0022)**	1.0000 *(0.0016)**
		0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
	0.05	0.50	0.7382 *(0.0000)***	0.7394 *(0.0000)***	0.7488 *(0.0000)***
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 29

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=2, NV=2

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.5909 *(0.0000)*	0.5113 *(0.0000)*	0.4651 *(0.0000)*
		0.50	0.9679 *(0.0000)**	0.8939 *(0.0000)**	0.7668 *(0.0000)***
		0.80	0.9995 *(0.0000)**	0.9929 *(0.0000)**	0.9445 *(0.0000)**
	0.01	0.20	0.4338 *(0.0000)*	0.3735 *(0.0000)*	0.3373 *(0.0000)*
		0.50	0.9172 *(0.0000)**	0.8019 *(0.0000)**	0.6431 *(0.0000)*
		0.80	0.9979 *(0.0000)**	0.9759 *(0.0000)**	0.8847 *(0.0000)**
	0.05	0.20	0.0378 *(0.0000)*	0.0348 *(0.0000)*	0.0311 *(0.0000)*
		0.50	0.4519 *(0.0000)*	0.3991 *(0.0000)*	0.3849 *(0.0000)*
		0.80	0.8576 *(0.0000)**	0.6338 *(0.0000)*	0.5085 *(0.0000)*
250	0.005	0.20	0.6174 *(0.0000)*	0.5148 *(0.0000)*	0.4532 *(0.0000)*
		0.50	0.9974 *(0.0000)**	0.9756 *(0.0000)**	0.8713 *(0.0000)**
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	0.9954 *(0.0000)**
	0.01	0.20	0.4015 *(0.0000)*	0.3552 *(0.0000)*	0.3226 *(0.0000)*
		0.50	0.9847 *(0.0000)**	0.9065 *(0.0000)**	0.6969 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9999 *(0.0000)**	0.9691 *(0.0000)**
	0.05	0.20	0.0026 *(0.0000)*	0.0018 *(0.0000)*	0.0023 *(0.0000)*
		0.50	0.4561 *(0.0000)*	0.4228 *(0.0000)*	0.4074 *(0.0000)*
		0.80	0.9476 *(0.0000)**	0.6617 *(0.0000)*	0.5020 *(0.0000)*
500	0.005	0.20	0.6677 *(0.0000)*	0.5255 *(0.0000)*	0.4631 *(0.0000)*
		0.50	0.9999 *(0.0000)**	0.9968 *(0.0000)**	0.9482 *(0.0000)**
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	0.9999 *(0.0000)**
	0.01	0.20	0.3759 *(0.0000)*	0.3441 *(0.0000)*	0.3237 *(0.0000)*
		0.50	0.9991 *(0.0000)**	0.9680 *(0.0000)**	0.7488 *(0.0000)***
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	0.9962 *(0.0000)**
	0.05	0.20	0.0000 *(0.0000)*	0.0001 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.4661 *(0.0000)*	0.4411 *(0.0000)*	0.4305 *(0.0000)*
		0.80	0.9882 *(0.0000)**	0.6957 *(0.0000)*	0.5002 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 30

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=3, NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.6704 *(0.3200)*	0.6710 *(0.3216)*	0.6716 *(0.2939)*
		0.50	0.9940 *(0.3246)*	0.9940 *(0.3050)*	0.9954 *(0.2983)*
		0.80	1.0000 *(0.3220)*	1.0000 *(0.3138)*	1.0000 *(0.2937)*
	0.01	0.20	0.4958 *(0.1553)*	0.4966 *(0.1600)*	0.4954 *(0.1455)*
		0.50	0.9810 *(0.1553)*	0.9812 *(0.1548)*	0.9812 *(0.1470)*
		0.80	1.0000 *(0.1628)*	1.0000 *(0.1559)*	1.0000 *(0.1458)*
	0.05	0.20	0.0386 *(0.0010)*	0.0366 *(0.0013)*	0.0354 *(0.0022)*
		0.50	0.6180 *(0.0010)*	0.6196 *(0.0015)*	0.6192 *(0.0014)*
		0.80	0.9912 *(0.0017)**	0.9904 *(0.0012)**	0.9916 *(0.0009)**
250	0.005	0.20	0.7408 *(0.1138)*	0.7400 *(0.1091)*	0.7398 *(0.1001)*
		0.50	1.0000 *(0.1121)*	1.0000 *(0.1114)*	1.0000 *(0.1079)*
		0.80	1.0000 *(0.1285)*	1.0000 *(0.1193)*	1.0000 *(0.1115)*
	0.01	0.20	0.4946 *(0.0271)*	0.4968 *(0.0252)*	0.4972 *(0.0248)*
		0.50	0.9996 *(0.0274)**	1.0000 *(0.0259)**	0.9996 *(0.0271)**
		0.80	1.0000 *(0.0299)**	1.0000 *(0.0293)**	1.0000 *(0.0262)**
	0.05	0.20	0.0020 *(0.0000)*	0.0028 *(0.0000)*	0.0024 *(0.0000)*
		0.50	0.6790 *(0.0000)*	0.6880 *(0.0000)*	0.6758 *(0.0000)*
		0.80	0.9998 *(0.0000)**	0.9998 *(0.0000)**	1.0000 *(0.0000)**
500	0.005	0.20	0.8218 *(0.0240)**	0.8192 *(0.0252)**	0.8304 *(0.0241)**
		0.50	1.0000 *(0.0278)**	1.0000 *(0.0329)**	1.0000 *(0.0237)**
		0.80	1.0000 *(0.0339)**	1.0000 *(0.0338)**	1.0000 *(0.0342)**
	0.01	0.20	0.4966 *(0.0016)*	0.4946 *(0.0018)*	0.5002 *(0.0014)*
		0.50	1.0000 *(0.0026)**	1.0000 *(0.0017)**	1.0000 *(0.0009)**
		0.80	1.0000 *(0.0028)**	1.0000 *(0.0023)**	1.0000 *(0.0028)**
	0.05	0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.7448 *(0.0000)***	0.7500 *(0.0000)***	0.7478 *(0.0000)***
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 31

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=3, NV=2

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.5805 *(0.3198)*	0.5298 *(0.3272)*	0.4731 *(0.3224)*
		0.50	0.9635 *(0.3242)*	0.8911 *(0.3308)*	0.7648 *(0.3182)*
		0.80	0.9995 *(0.3384)*	0.9921 *(0.3296)*	0.9476 *(0.3414)*
	0.01	0.20	0.4210 *(0.1608)*	0.3727 *(0.1552)*	0.3411 *(0.1588)*
		0.50	0.9206 *(0.1604)*	0.8006 *(0.1656)*	0.6444 *(0.1608)*
		0.80	0.9973 *(0.1790)*	0.9766 *(0.1850)*	0.8835 *(0.1696)*
	0.05	0.20	0.0369 *(0.0014)*	0.0342 *(0.0018)*	0.0317 *(0.0018)*
		0.50	0.4616 *(0.0008)*	0.4000 *(0.0016)*	0.3776 *(0.0016)*
		0.80	0.8609 *(0.0014)**	0.6345 *(0.0022)*	0.5064 *(0.0020)*
250	0.005	0.20	0.6113 *(0.1178)*	0.5151 *(0.1176)*	0.4448 *(0.1138)*
		0.50	0.9982 *(0.1292)*	0.9756 *(0.1288)*	0.8724 *(0.1228)*
		0.80	1.0000 *(0.1400)*	1.0000 *(0.1444)*	0.9949 *(0.1348)*
	0.01	0.20	0.4069 *(0.0280)*	0.3449 *(0.0276)*	0.3188 *(0.0288)*
		0.50	0.9871 *(0.0282)**	0.9071 *(0.0336)**	0.6963 *(0.0288)*
		0.80	1.0000 *(0.0374)**	0.9990 *(0.0322)**	0.9706 *(0.0326)**
	0.05	0.20	0.0029 *(0.0000)*	0.0022 *(0.0000)*	0.0018 *(0.0000)*
		0.50	0.4602 *(0.0000)*	0.4239 *(0.0000)*	0.4077 *(0.0000)*
		0.80	0.9505 *(0.0000)**	0.6583 *(0.0000)*	0.5009 *(0.0000)*
500	0.005	0.20	0.6521 *(0.0262)*	0.5287 *(0.0248)*	0.4653 *(0.0258)*
		0.50	1.0000 *(0.0348)**	0.9974 *(0.0356)**	0.9448 *(0.0316)**
		0.80	1.0000 *(0.0490)**	1.0000 *(0.0466)**	0.9998 *(0.0388)**
	0.01	0.20	0.3822 *(0.0018)*	0.3473 *(0.0006)*	0.3211 *(0.0026)*
		0.50	0.9989 *(0.0036)**	0.9672 *(0.0024)**	0.7485 *(0.0026)***
		0.80	1.0000 *(0.0046)**	1.0000 *(0.0040)**	0.9967 *(0.0034)**
	0.05	0.20	0.0000 *(0.0000)*	0.0001 *(0.0000)*	0.0001 *(0.0000)*
		0.50	0.4616 *(0.0000)*	0.4389 *(0.0000)*	0.4325 *(0.0000)*
		0.80	0.9880 *(0.0000)**	0.6946 *(0.0000)*	0.5001 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 32

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=3, NV=3

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.5295 *(0.0000)*	0.4463 *(0.0000)*	0.3881 *(0.0000)*
		0.50	0.9117 *(0.0000)**	0.7594 *(0.0000)***	0.6104 *(0.0000)*
		0.80	0.9933 *(0.0000)**	0.9352 *(0.0000)**	0.7833 *(0.0000)***
	0.01	0.20	0.3759 *(0.0000)*	0.3098 *(0.0000)*	0.2748 *(0.0000)*
		0.50	0.8211 *(0.0000)**	0.6422 *(0.0000)*	0.4865 *(0.0000)*
		0.80	0.9771 *(0.0000)**	0.8631 *(0.0000)**	0.6757 *(0.0000)*
	0.05	0.20	0.0352 *(0.0000)*	0.0327 *(0.0000)*	0.0287 *(0.0000)*
		0.50	0.3652 *(0.0000)*	0.2961 *(0.0000)*	0.2753 *(0.0000)*
		0.80	0.6835 *(0.0000)*	0.4817 *(0.0000)*	0.3438 *(0.0000)*
250	0.005	0.20	0.5254 *(0.0000)*	0.4049 *(0.0000)*	0.3288 *(0.0000)*
		0.50	0.9821 *(0.0000)**	0.8561 *(0.0000)**	0.6589 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9916 *(0.0000)**	0.8816 *(0.0000)**
	0.01	0.20	0.3392 *(0.0000)*	0.2734 *(0.0000)*	0.2439 *(0.0000)*
		0.50	0.9228 *(0.0000)**	0.7095 *(0.0000)***	0.5245 *(0.0000)*
		0.80	0.9989 *(0.0000)**	0.9509 *(0.0000)**	0.7375 *(0.0000)***
	0.05	0.20	0.0025 *(0.0000)*	0.0022 *(0.0000)*	0.0027 *(0.0000)*
		0.50	0.3422 *(0.0000)*	0.3021 *(0.0000)*	0.2873 *(0.0000)*
		0.80	0.7271 *(0.0000)***	0.5039 *(0.0000)*	0.3353 *(0.0000)*
500	0.005	0.20	0.5517 *(0.0000)*	0.4016 *(0.0000)*	0.3261 *(0.0000)*
		0.50	0.9983 *(0.0000)**	0.9276 *(0.0000)**	0.7026 *(0.0000)***
		0.80	1.0000 *(0.0000)**	0.9992 *(0.0000)**	0.9516 *(0.0000)**
	0.01	0.20	0.3160 *(0.0000)*	0.2607 *(0.0000)*	0.2419 *(0.0000)*
		0.50	0.9787 *(0.0000)**	0.7496 *(0.0000)***	0.5627 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9917 *(0.0000)**	0.7850 *(0.0000)***
	0.05	0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.3340 *(0.0000)*	0.3126 *(0.0000)*	0.3047 *(0.0000)*
		0.80	0.7578 *(0.0000)***	0.5299 *(0.0000)*	0.3335 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 33

Power and (*Type I error*) for: Partial R-square criterion, “unlike” corr.=0.03, p=4, NV=1

“Like” correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.6692 *(0.3179)*	0.6646 *(0.3077)*	0.6762 *(0.2907)*
		0.50	0.9964 *(0.3185)*	0.9944 *(0.3062)*	0.9948 *(0.2880)*
		0.80	1.0000 *(0.3218)*	1.0000 *(0.3090)*	1.0000 *(0.2847)*
	0.01	0.20	0.5062 *(0.1527)*	0.5098 *(0.1493)*	0.4996 *(0.1328)*
		0.50	0.9810 *(0.1608)*	0.9814 *(0.1476)*	0.9798 *(0.1309)*
		0.80	1.0000 *(0.1597)*	1.0000 *(0.1539)*	1.0000 *(0.1359)*
	0.05	0.20	0.0376 *(0.0019)*	0.0422 *(0.0015)*	0.0394 *(0.0015)*
		0.50	0.6180 *(0.0023)*	0.6210 *(0.0013)*	0.6242 *(0.0013)*
		0.80	0.9924 *(0.0021)**	0.9910 *(0.0017)**	0.9938 *(0.0017)**
250	0.005	0.20	0.7556 *(0.1180)*	0.7460 *(0.1079)*	0.7344 *(0.0965)*
		0.50	1.0000 *(0.1149)*	1.0000 *(0.1086)*	0.9998 *(0.0961)*
		0.80	1.0000 *(0.1205)*	1.0000 *(0.1089)*	1.0000 *(0.0995)*
	0.01	0.20	0.5074 *(0.0269)*	0.5106 *(0.0239)*	0.5080 *(0.0223)*
		0.50	0.9990 *(0.0264)**	0.9998 *(0.0268)**	0.9994 *(0.0245)**
		0.80	1.0000 *(0.0294)**	1.0000 *(0.0301)**	1.0000 *(0.0253)**
	0.05	0.20	0.0020 *(0.0000)*	0.0028 *(0.0000)*	0.0028 *(0.0000)*
		0.50	0.6738 *(0.0000)*	0.6788 *(0.0000)*	0.6734 *(0.0000)*
		0.80	0.9998 *(0.0000)**	0.9996 *(0.0000)**	1.0000 *(0.0000)**
500	0.005	0.20	0.8248 *(0.0258)**	0.8194 *(0.0231)**	0.8296 *(0.0206)**
		0.50	1.0000 *(0.0284)**	1.0000 *(0.0257)**	1.0000 *(0.0261)**
		0.80	1.0000 *(0.0333)**	1.0000 *(0.0307)**	1.0000 *(0.0273)**
	0.01	0.20	0.5068 *(0.0017)*	0.4882 *(0.0015)*	0.5022 *(0.0017)*
		0.50	1.0000 *(0.0017)**	1.0000 *(0.0020)**	1.0000 *(0.0016)**
		0.80	1.0000 *(0.0031)**	1.0000 *(0.0023)**	1.0000 *(0.0025)**
	0.05	0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0002 *(0.0000)*
		0.50	0.7392 *(0.0000)***	0.7372 *(0.0000)***	0.7466 *(0.0000)***
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 34

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=4, NV=3

"Like" correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.5285 *(0.3286)*	0.4441 *(0.3190)*	0.3981 *(0.3258)*
	0.005	0.50	0.9091 *(0.3436)*	0.7555 *(0.3336)*	0.6123 *(0.3208)*
		0.80	0.9927 *(0.3442)*	0.9308 *(0.3312)*	0.7825 *(0.3304)*
		0.20	0.3745 *(0.1632)*	0.3079 *(0.1588)*	0.2690 *(0.1530)*
100	0.01	0.50	0.8272 *(0.1662)*	0.6395 *(0.1606)*	0.4903 *(0.1674)*
		0.80	0.9797 *(0.1904)*	0.8601 *(0.1766)*	0.6749 *(0.1720)*
		0.20	0.0341 *(0.0018)*	0.0291 *(0.0016)*	0.0268 *(0.0012)*
	0.05	0.50	0.3661 *(0.0022)*	0.2957 *(0.0016)*	0.2756 *(0.0026)*
		0.80	0.6843 *(0.0024)*	0.4811 *(0.0020)*	0.3456 *(0.0018)*
		0.20	0.5297 *(0.1228)*	0.4059 *(0.1188)*	0.3289 *(0.1272)*
	0.005	0.50	0.9828 *(0.1412)*	0.8533 *(0.1222)*	0.6625 *(0.1256)*
		0.80	0.9999 *(0.1608)*	0.9899 *(0.1410)*	0.8829 *(0.1344)*
		0.20	0.3363 *(0.0246)*	0.2731 *(0.0258)*	0.2377 *(0.0228)*
250	0.01	0.50	0.9239 *(0.0314)**	0.7079 *(0.0292)***	0.5241 *(0.0292)*
		0.80	0.9985 *(0.0462)**	0.9548 *(0.0350)**	0.7401 *(0.0354)***
		0.20	0.0018 *(0.0000)*	0.0023 *(0.0000)*	0.0020 *(0.0000)*
	0.05	0.50	0.3455 *(0.0000)*	0.3010 *(0.0000)*	0.2893 *(0.0000)*
		0.80	0.7285 *(0.0000)***	0.5032 *(0.0000)*	0.3350 *(0.0000)*
		0.20	0.5525 *(0.0260)*	0.3992 *(0.0250)*	0.3229 *(0.0304)*
	0.005	0.50	0.9987 *(0.0422)**	0.9280 *(0.0338)**	0.6987 *(0.0278)*
		0.80	1.0000 *(0.0642)***	0.9994 *(0.0544)***	0.9499 *(0.0406)**
		0.20	0.3195 *(0.0018)*	0.2605 *(0.0024)*	0.2401 *(0.0020)*
500	0.01	0.50	0.9775 *(0.0026)**	0.7469 *(0.0024)***	0.5589 *(0.0028)*
		0.80	1.0000 *(0.0062)**	0.9915 *(0.0048)**	0.7867 *(0.0022)***
		0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
	0.05	0.50	0.3345 *(0.0000)*	0.3138 *(0.0000)*	0.3009 *(0.0000)*
		0.80	0.7545 *(0.0000)***	0.5313 *(0.0000)*	0.3334 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 35

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=4, NV=4

"Like" correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.4862 *(0.0000)*	0.4001 *(0.0000)*	0.3515 *(0.0000)*
	0.005	0.50	0.8438 *(0.0000)**	0.6600 *(0.0000)*	0.5183 *(0.0000)*
		0.80	0.9681 *(0.0000)**	0.8411 *(0.0000)**	0.6638 *(0.0000)*
		0.20	0.3417 *(0.0000)*	0.2700 *(0.0000)*	0.2299 *(0.0000)*
100	0.01	0.50	0.7407 *(0.0000)***	0.5380 *(0.0000)*	0.3983 *(0.0000)*
		0.80	0.9321 *(0.0000)**	0.7402 *(0.0000)***	0.5520 *(0.0000)*
		0.20	0.0326 *(0.0000)*	0.0286 *(0.0000)*	0.0284 *(0.0000)*
	0.05	0.50	0.3078 *(0.0000)*	0.2366 *(0.0000)*	0.2162 *(0.0000)*
		0.80	0.5687 *(0.0000)*	0.3915 *(0.0000)*	0.2621 *(0.0000)*
		0.20	0.4718 *(0.0000)*	0.3380 *(0.0000)*	0.2623 *(0.0000)*
	0.005	0.50	0.9396 *(0.0000)**	0.7334 *(0.0000)***	0.5316 *(0.0000)*
		0.80	0.9982 *(0.0000)**	0.9364 *(0.0000)**	0.7351 *(0.0000)***
		0.20	0.2953 *(0.0000)*	0.2246 *(0.0000)*	0.1934 *(0.0000)*
250	0.01	0.50	0.8305 *(0.0000)**	0.5789 *(0.0000)*	0.4203 *(0.0000)*
		0.80	0.9904 *(0.0000)**	0.8284 *(0.0000)**	0.5949 *(0.0000)*
		0.20	0.0022 *(0.0000)*	0.0024 *(0.0000)*	0.0017 *(0.0000)*
	0.05	0.50	0.2820 *(0.0000)*	0.2354 *(0.0000)*	0.2240 *(0.0000)*
		0.80	0.5986 *(0.0000)*	0.4113 *(0.0000)*	0.2520 *(0.0000)*
		0.20	0.4796 *(0.0000)*	0.3254 *(0.0000)*	0.2503 *(0.0000)*
	0.005	0.50	0.9839 *(0.0000)**	0.7913 *(0.0000)***	0.5595 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9836 *(0.0000)**	0.7942 *(0.0000)***
		0.20	0.2711 *(0.0000)*	0.2111 *(0.0000)*	0.1894 *(0.0000)*
500	0.01	0.50	0.9011 *(0.0000)**	0.6146 *(0.0000)*	0.4435 *(0.0000)*
		0.80	0.9995 *(0.0000)**	0.8909 *(0.0000)**	0.6418 *(0.0000)*
		0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0001 *(0.0000)*
	0.05	0.50	0.2629 *(0.0000)*	0.2397 *(0.0000)*	0.2335 *(0.0000)*
		0.80	0.6242 *(0.0000)*	0.4316 *(0.0000)*	0.2502 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 36

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=5, NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.6750 *(0.3159)*	0.6606 *(0.3064)*	0.6760 *(0.2886)*
	0.005	0.50	0.9942 *(0.3263)*	0.9940 *(0.3082)*	0.9944 *(0.2824)*
		0.80	1.0000 *(0.3143)*	1.0000 *(0.3108)*	1.0000 *(0.2825)*
		0.20	0.5036 *(0.1569)*	0.5046 *(0.1451)*	0.4980 *(0.1282)*
100	0.01	0.50	0.9812 *(0.1585)*	0.9828 *(0.1483)*	0.9820 *(0.1343)*
		0.80	1.0000 *(0.1632)*	1.0000 *(0.1437)*	1.0000 *(0.1349)*
		0.20	0.0416 *(0.0016)*	0.0358 *(0.0014)*	0.0330 *(0.0015)*
	0.05	0.50	0.6188 *(0.0020)*	0.6114 *(0.0017)*	0.6192 *(0.0014)*
		0.80	0.9924 *(0.0013)**	0.9920 *(0.0016)**	0.9910 *(0.0012)**
		0.20	0.7486 *(0.1156)*	0.7446 *(0.1074)*	0.7414 *(0.0903)*
	0.005	0.50	1.0000 *(0.1141)*	1.0000 *(0.1050)*	0.9998 *(0.0923)*
		0.80	1.0000 *(0.1172)*	1.0000 *(0.1117)*	1.0000 *(0.0956)*
		0.20	0.4996 *(0.0247)*	0.5056 *(0.0226)*	0.4828 *(0.0206)*
250	0.01	0.50	0.9990 *(0.0269)**	0.9992 *(0.0239)**	0.9988 *(0.0212)**
		0.80	1.0000 *(0.0298)**	1.0000 *(0.0251)**	1.0000 *(0.0236)**
		0.20	0.0014 *(0.0000)*	0.0038 *(0.0000)*	0.0018 *(0.0000)*
	0.05	0.50	0.6932 *(0.0000)*	0.6792 *(0.0000)*	0.6730 *(0.0000)*
		0.80	0.9996 *(0.0000)**	0.9998 *(0.0000)**	1.0000 *(0.0000)**
		0.20	0.8228 *(0.0249)**	0.8304 *(0.0246)**	0.8220 *(0.0184)**
	0.005	0.50	1.0000 *(0.0291)**	1.0000 *(0.0257)**	1.0000 *(0.0231)**
		0.80	1.0000 *(0.0303)**	1.0000 *(0.0288)**	1.0000 *(0.0277)**
		0.20	0.4990 *(0.0016)*	0.4894 *(0.0026)*	0.5140 *(0.0018)*
500	0.01	0.50	1.0000 *(0.0022)**	1.0000 *(0.0016)**	1.0000 *(0.0019)**
		0.80	1.0000 *(0.0028)**	1.0000 *(0.0020)**	1.0000 *(0.0021)**
		0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
	0.05	0.50	0.7458 *(0.0000)***	0.7374 *(0.0000)***	0.7498 *(0.0000)***
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 37

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=5, NV=3

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.5241 *(0.3210)*	0.4432 *(0.3109)*	0.3915 *(0.2962)*
		0.50	0.9058 *(0.3259)*	0.7605 *(0.3188)*	0.6095 *(0.3055)*
		0.80	0.9931 *(0.3346)*	0.9299 *(0.3200)*	0.7831 *(0.3061)*
	0.01	0.20	0.3721 *(0.1635)*	0.3038 *(0.1528)*	0.2673 *(0.1459)*
		0.50	0.8254 *(0.1577)*	0.6435 *(0.1567)*	0.4903 *(0.1423)*
		0.80	0.9789 *(0.1829)*	0.8613 *(0.1628)*	0.6777 *(0.1439)*
	0.05	0.20	0.0336 *(0.0009)*	0.0336 *(0.0019)*	0.0303 *(0.0017)*
		0.50	0.3645 *(0.0011)*	0.2975 *(0.0010)*	0.2734 *(0.0011)*
		0.80	0.6883 *(0.0019)*	0.4837 *(0.0012)*	0.3442 *(0.0018)*
250	0.005	0.20	0.5355 *(0.1158)*	0.3999 *(0.1110)*	0.3280 *(0.1000)*
		0.50	0.9821 *(0.1297)*	0.8569 *(0.1166)*	0.6623 *(0.1087)*
		0.80	0.9999 *(0.1491)*	0.9907 *(0.1243)*	0.8806 *(0.1231)*
	0.01	0.20	0.3375 *(0.0248)*	0.2727 *(0.0229)*	0.2398 *(0.0230)*
		0.50	0.9241 *(0.0322)**	0.7064 *(0.0312)***	0.5205 *(0.0249)*
		0.80	0.9995 *(0.0475)**	0.9551 *(0.0350)**	0.7353 *(0.0282)***
	0.05	0.20	0.0029 *(0.0000)*	0.0028 *(0.0000)*	0.0021 *(0.0000)*
		0.50	0.3486 *(0.0000)*	0.3024 *(0.0000)*	0.2878 *(0.0000)*
		0.80	0.7264 *(0.0000)***	0.5084 *(0.0000)*	0.3349 *(0.0000)*
500	0.005	0.20	0.5471 *(0.0251)*	0.4030 *(0.0269)*	0.3256 *(0.0239)*
		0.50	0.9984 *(0.0374)**	0.9279 *(0.0340)**	0.7025 *(0.0261)***
		0.80	1.0000 *(0.0621)***	0.9997 *(0.0493)**	0.9519 *(0.0323)**
	0.01	0.20	0.3159 *(0.0014)*	0.2623 *(0.0022)*	0.2395 *(0.0013)*
		0.50	0.9764 *(0.0043)**	0.7499 *(0.0030)***	0.5647 *(0.0022)*
		0.80	1.0000 *(0.0075)**	0.9919 *(0.0048)**	0.7823 *(0.0032)***
	0.05	0.20	0.0001 *(0.0000)*	0.0001 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.3335 *(0.0000)*	0.3133 *(0.0000)*	0.3018 *(0.0000)*
		0.80	0.7567 *(0.0000)***	0.5343 *(0.0000)*	0.3335 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 38

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=5, NV=5

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.4565 *(0.0000)*	0.3785 *(0.0000)*	0.3356 *(0.0000)*
		0.50	0.7830 *(0.0000)***	0.5846 *(0.0000)*	0.4588 *(0.0000)*
		0.80	0.9343 *(0.0000)**	0.7561 *(0.0000)***	0.5793 *(0.0000)*
	0.01	0.20	0.3124 *(0.0000)*	0.2392 *(0.0000)*	0.2008 *(0.0000)*
		0.50	0.6711 *(0.0000)*	0.4658 *(0.0000)*	0.3380 *(0.0000)*
		0.80	0.8707 *(0.0000)**	0.6432 *(0.0000)*	0.4683 *(0.0000)*
	0.05	0.20	0.0309 *(0.0000)*	0.0281 *(0.0000)*	0.0235 *(0.0000)*
		0.50	0.2683 *(0.0000)*	0.1964 *(0.0000)*	0.1778 *(0.0000)*
		0.80	0.4927 *(0.0000)*	0.3324 *(0.0000)*	0.2146 *(0.0000)*
250	0.005	0.20	0.4218 *(0.0000)*	0.2926 *(0.0000)*	0.2240 *(0.0000)*
		0.50	0.8840 *(0.0000)**	0.6370 *(0.0000)*	0.4465 *(0.0000)*
		0.80	0.9919 *(0.0000)**	0.8480 *(0.0000)**	0.6273 *(0.0000)*
	0.01	0.20	0.2635 *(0.0000)*	0.1900 *(0.0000)*	0.1613 *(0.0000)*
		0.50	0.7498 *(0.0000)***	0.4939 *(0.0000)*	0.3466 *(0.0000)*
		0.80	0.9569 *(0.0000)**	0.7165 *(0.0000)***	0.5010 *(0.0000)*
	0.05	0.20	0.0025 *(0.0000)*	0.0025 *(0.0000)*	0.0018 *(0.0000)*
		0.50	0.2399 *(0.0000)*	0.1926 *(0.0000)*	0.1842 *(0.0000)*
		0.80	0.5138 *(0.0000)*	0.3430 *(0.0000)*	0.2021 *(0.0000)*
500	0.005	0.20	0.4208 *(0.0000)*	0.2806 *(0.0000)*	0.2069 *(0.0000)*
		0.50	0.9491 *(0.0000)**	0.6853 *(0.0000)*	0.4670 *(0.0000)*
		0.80	0.9996 *(0.0000)**	0.9183 *(0.0000)**	0.6753 *(0.0000)*
	0.01	0.20	0.2382 *(0.0000)*	0.1768 *(0.0000)*	0.1590 *(0.0000)*
		0.50	0.8078 *(0.0000)**	0.5203 *(0.0000)*	0.3638 *(0.0000)*
		0.80	0.9921 *(0.0000)**	0.7699 *(0.0000)***	0.5358 *(0.0000)*
	0.05	0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.2175 *(0.0000)*	0.1952 *(0.0000)*	0.1888 *(0.0000)*
		0.80	0.5321 *(0.0000)*	0.3557 *(0.0000)*	0.2002 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 39

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=6, NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.6762 *(0.3175)*	0.6638 *(0.3044)*	0.6758 *(0.2803)*
		0.50	0.9944 *(0.3215)*	0.9918 *(0.3050)*	0.9936 *(0.2813)*
		0.80	1.0000 *(0.3269)*	1.0000 *(0.3053)*	1.0000 *(0.2855)*
	0.01	0.20	0.5080 *(0.1560)*	0.5022 *(0.1450)*	0.5032 *(0.1281)*
		0.50	0.9828 *(0.1557)*	0.9852 *(0.1437)*	0.9816 *(0.1296)*
		0.80	1.0000 *(0.1599)*	0.9998 *(0.1499)*	1.0000 *(0.1294)*
	0.05	0.20	0.0366 *(0.0016)*	0.0350 *(0.0011)*	0.0392 *(0.0013)*
		0.50	0.6230 *(0.0016)*	0.6180 *(0.0014)*	0.6216 *(0.0014)*
		0.80	0.9938 *(0.0014)**	0.9920 *(0.0015)**	0.9924 *(0.0018)**
250	0.005	0.20	0.7434 *(0.1124)*	0.7408 *(0.1026)*	0.7352 *(0.0904)*
		0.50	1.0000 *(0.1115)*	1.0000 *(0.1017)*	1.0000 *(0.0924)*
		0.80	1.0000 *(0.1205)*	1.0000 *(0.1053)*	1.0000 *(0.0958)*
	0.01	0.20	0.4980 *(0.0231)*	0.5018 *(0.0239)*	0.4980 *(0.0189)*
		0.50	0.9992 *(0.0271)**	0.9994 *(0.0234)**	0.9998 *(0.0220)**
		0.80	1.0000 *(0.0294)**	1.0000 *(0.0249)**	1.0000 *(0.0216)**
	0.05	0.20	0.0024 *(0.0000)*	0.0016 *(0.0000)*	0.0030 *(0.0000)*
		0.50	0.6720 *(0.0000)*	0.6824 *(0.0000)*	0.6838 *(0.0000)*
		0.80	0.9998 *(0.0000)**	1.0000 *(0.0000)**	0.9998 *(0.0000)**
500	0.005	0.20	0.8222 *(0.0252)**	0.8230 *(0.0226)**	0.8274 *(0.0188)**
		0.50	1.0000 *(0.0276)**	1.0000 *(0.0254)**	1.0000 *(0.0199)**
		0.80	1.0000 *(0.0314)**	1.0000 *(0.0272)**	1.0000 *(0.0241)**
	0.01	0.20	0.5052 *(0.0013)*	0.5064 *(0.0015)*	0.4990 *(0.0014)*
		0.50	1.0000 *(0.0020)**	1.0000 *(0.0017)**	1.0000 *(0.0015)**
		0.80	1.0000 *(0.0034)**	1.0000 *(0.0024)**	1.0000 *(0.0022)**
	0.05	0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.7448 *(0.0000)***	0.7422 *(0.0000)***	0.7338 *(0.0000)***
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 40

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=6, NV=3

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.5287 *(0.3163)*	0.4502 *(0.3083)*	0.3863 *(0.2944)*
		0.50	0.9071 *(0.3311)*	0.7606 *(0.3090)*	0.6116 *(0.2970)*
		0.80	0.9917 *(0.3340)*	0.9273 *(0.3201)*	0.7818 *(0.2854)*
	0.01	0.20	0.3801 *(0.1598)*	0.3063 *(0.1464)*	0.2673 *(0.1323)*
		0.50	0.8242 *(0.1655)*	0.6415 *(0.1541)*	0.4901 *(0.1383)*
		0.80	0.9781 *(0.1723)*	0.8609 *(0.1567)*	0.6802 *(0.1342)*
	0.05	0.20	0.0368 *(0.0015)*	0.0309 *(0.0012)*	0.0287 *(0.0009)*
		0.50	0.3628 *(0.0019)*	0.2975 *(0.0010)*	0.2749 *(0.0016)*
		0.80	0.6835 *(0.0016)*	0.4837 *(0.0015)*	0.3436 *(0.0017)*
250	0.005	0.20	0.5377 *(0.1171)*	0.4052 *(0.1095)*	0.3264 *(0.0926)*
		0.50	0.9827 *(0.1272)*	0.8553 *(0.1139)*	0.6607 *(0.0995)*
		0.80	1.0000 *(0.1432)*	0.9903 *(0.1244)*	0.8809 *(0.1082)*
	0.01	0.20	0.3403 *(0.0259)*	0.2689 *(0.0230)*	0.2389 *(0.0190)*
		0.50	0.9289 *(0.0328)**	0.7078 *(0.0295)***	0.5281 *(0.0229)*
		0.80	0.9991 *(0.0398)**	0.9530 *(0.0343)**	0.7336 *(0.0308)***
	0.05	0.20	0.0023 *(0.0000)*	0.0021 *(0.0000)*	0.0021 *(0.0000)*
		0.50	0.3467 *(0.0000)*	0.3041 *(0.0000)*	0.2883 *(0.0000)*
		0.80	0.7293 *(0.0000)***	0.5069 *(0.0000)*	0.3348 *(0.0000)*
500	0.005	0.20	0.5526 *(0.0254)*	0.4011 *(0.0240)*	0.3257 *(0.0207)*
		0.50	0.9979 *(0.0399)**	0.9299 *(0.0319)**	0.6962 *(0.0251)*
		0.80	1.0000 *(0.0595)***	0.9995 *(0.0441)**	0.9495 *(0.0339)**
	0.01	0.20	0.3167 *(0.0021)*	0.2599 *(0.0014)*	0.2389 *(0.0012)*
		0.50	0.9776 *(0.0042)**	0.7482 *(0.0023)***	0.5584 *(0.0025)*
		0.80	1.0000 *(0.0071)**	0.9913 *(0.0043)**	0.7847 *(0.0025)***
	0.05	0.20	0.0001 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.3331 *(0.0000)*	0.3133 *(0.0000)*	0.3016 *(0.0000)*
		0.80	0.7562 *(0.0000)***	0.5313 *(0.0000)*	0.3333 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 41

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=6, NV=6

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.4385 *(0.0000)*	0.3614 *(0.0000)*	0.3229 *(0.0000)*
		0.50	0.7304 *(0.0000)***	0.5353 *(0.0000)*	0.4166 *(0.0000)*
		0.80	0.8893 *(0.0000)**	0.6818 *(0.0000)*	0.5218 *(0.0000)*
	0.01	0.20	0.2939 *(0.0000)*	0.2174 *(0.0000)*	0.1858 *(0.0000)*
		0.50	0.6103 *(0.0000)*	0.4105 *(0.0000)*	0.3019 *(0.0000)*
		0.80	0.8054 *(0.0000)**	0.5726 *(0.0000)*	0.4057 *(0.0000)*
	0.05	0.20	0.0305 *(0.0000)*	0.0261 *(0.0000)*	0.0222 *(0.0000)*
		0.50	0.2387 *(0.0000)*	0.1682 *(0.0000)*	0.1496 *(0.0000)*
		0.80	0.4309 *(0.0000)*	0.2873 *(0.0000)*	0.1805 *(0.0000)*
250	0.005	0.20	0.3815 *(0.0000)*	0.2593 *(0.0000)*	0.1926 *(0.0000)*
		0.50	0.8201 *(0.0000)**	0.5654 *(0.0000)*	0.3857 *(0.0000)*
		0.80	0.9728 *(0.0000)**	0.7639 *(0.0000)***	0.5465 *(0.0000)*
	0.01	0.20	0.2391 *(0.0000)*	0.1691 *(0.0000)*	0.1372 *(0.0000)*
		0.50	0.6777 *(0.0000)*	0.4286 *(0.0000)*	0.2983 *(0.0000)*
		0.80	0.9049 *(0.0000)**	0.6286 *(0.0000)*	0.4307 *(0.0000)*
	0.05	0.20	0.0025 *(0.0000)*	0.0018 *(0.0000)*	0.0019 *(0.0000)*
		0.50	0.2082 *(0.0000)*	0.1617 *(0.0000)*	0.1546 *(0.0000)*
		0.80	0.4443 *(0.0000)*	0.2965 *(0.0000)*	0.1688 *(0.0000)*
500	0.005	0.20	0.3799 *(0.0000)*	0.2430 *(0.0000)*	0.1728 *(0.0000)*
		0.50	0.8955 *(0.0000)**	0.6042 *(0.0000)*	0.4021 *(0.0000)*
		0.80	0.9971 *(0.0000)**	0.8347 *(0.0000)**	0.5863 *(0.0000)*
	0.01	0.20	0.2138 *(0.0000)*	0.1538 *(0.0000)*	0.1365 *(0.0000)*
		0.50	0.7258 *(0.0000)***	0.4513 *(0.0000)*	0.3118 *(0.0000)*
		0.80	0.9631 *(0.0000)**	0.6711 *(0.0000)*	0.4573 *(0.0000)*
	0.05	0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0001 *(0.0000)*
		0.50	0.1874 *(0.0000)*	0.1634 *(0.0000)*	0.1588 *(0.0000)*
		0.80	0.4611 *(0.0000)*	0.3066 *(0.0000)*	0.1669 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 42

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=7, NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.6754 *(0.3159)*	0.6636 *(0.3063)*	0.6728 *(0.2886)*
	0.005	0.50	0.9936 *(0.3134)*	0.9954 *(0.3039)*	0.9944 *(0.2888)*
		0.80	1.0000 *(0.3201)*	1.0000 *(0.3084)*	1.0000 *(0.2828)*
		0.20	0.5120 *(0.1549)*	0.5140 *(0.1413)*	0.4958 *(0.1239)*
100	0.01	0.50	0.9866 *(0.1580)*	0.9800 *(0.1447)*	0.9788 *(0.1214)*
		0.80	1.0000 *(0.1542)*	1.0000 *(0.1395)*	1.0000 *(0.1245)*
		0.20	0.0362 *(0.0010)*	0.0356 *(0.0012)*	0.0370 *(0.0012)*
	0.05	0.50	0.6106 *(0.0016)*	0.6228 *(0.0014)*	0.6330 *(0.0013)*
		0.80	0.9924 *(0.0017)**	0.9930 *(0.0016)**	0.9922 *(0.0016)**
		0.20	0.7380 *(0.1111)*	0.7474 *(0.0972)*	0.7514 *(0.0833)*
	0.005	0.50	1.0000 *(0.1138)*	1.0000 *(0.0992)*	1.0000 *(0.0856)*
		0.80	1.0000 *(0.1148)*	1.0000 *(0.1044)*	1.0000 *(0.0872)*
		0.20	0.4894 *(0.0245)*	0.4892 *(0.0223)*	0.4954 *(0.0184)*
250	0.01	0.50	0.9992 *(0.0259)**	0.9996 *(0.0229)**	1.0000 *(0.0180)**
		0.80	1.0000 *(0.0284)**	1.0000 *(0.0258)**	1.0000 *(0.0187)**
		0.20	0.0032 *(0.0000)*	0.0018 *(0.0000)*	0.0024 *(0.0000)*
	0.05	0.50	0.6718 *(0.0000)*	0.6914 *(0.0000)*	0.6820 *(0.0000)*
		0.80	0.9998 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**
		0.20	0.8156 *(0.0240)**	0.8246 *(0.0220)**	0.8252 *(0.0187)**
	0.005	0.50	1.0000 *(0.0272)**	1.0000 *(0.0244)**	1.0000 *(0.0199)**
		0.80	1.0000 *(0.0308)**	1.0000 *(0.0284)**	1.0000 *(0.0209)**
		0.20	0.4894 *(0.0014)*	0.4914 *(0.0016)*	0.4940 *(0.0011)*
500	0.01	0.50	1.0000 *(0.0018)**	1.0000 *(0.0017)**	1.0000 *(0.0017)**
		0.80	1.0000 *(0.0023)**	1.0000 *(0.0027)**	1.0000 *(0.0020)**
		0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0002 *(0.0000)*
	0.05	0.50	0.7454 *(0.0000)***	0.7422 *(0.0000)***	0.7326 *(0.0000)***
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 43

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=7, NV=3

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.5390 *(0.3217)*	0.4458 *(0.3075)*	0.3901 *(0.2804)*
		0.50	0.9083 *(0.3264)*	0.7613 *(0.3075)*	0.6085 *(0.2836)*
		0.80	0.9927 *(0.3224)*	0.9293 *(0.3134)*	0.7797 *(0.2898)*
	0.01	0.20	0.3808 *(0.1563)*	0.3076 *(0.1486)*	0.2664 *(0.1303)*
		0.50	0.8224 *(0.1610)*	0.6452 *(0.1499)*	0.4881 *(0.1361)*
		0.80	0.9779 *(0.1683)*	0.8597 *(0.1530)*	0.6787 *(0.1315)*
	0.05	0.20	0.0329 *(0.0011)*	0.0290 *(0.0017)*	0.0271 *(0.0014)*
		0.50	0.3638 *(0.0012)*	0.2957 *(0.0021)*	0.2751 *(0.0016)*
		0.80	0.6841 *(0.0021)*	0.4833 *(0.0019)*	0.3451 *(0.0017)*
250	0.005	0.20	0.5331 *(0.1107)*	0.4045 *(0.1038)*	0.3273 *(0.0924)*
		0.50	0.9813 *(0.1260)*	0.8521 *(0.1069)*	0.6580 *(0.0931)*
		0.80	0.9999 *(0.1397)*	0.9921 *(0.1180)*	0.8771 *(0.0990)*
	0.01	0.20	0.3359 *(0.0259)*	0.2735 *(0.0237)*	0.2375 *(0.0201)*
		0.50	0.9256 *(0.0306)**	0.7053 *(0.0265)***	0.5197 *(0.0204)*
		0.80	0.9995 *(0.0409)**	0.9529 *(0.0310)**	0.7385 *(0.0254)***
	0.05	0.20	0.0023 *(0.0000)*	0.0019 *(0.0000)*	0.0021 *(0.0000)*
		0.50	0.3447 *(0.0000)*	0.3036 *(0.0000)*	0.2897 *(0.0000)*
		0.80	0.7284 *(0.0000)***	0.5060 *(0.0000)*	0.3348 *(0.0000)*
500	0.005	0.20	0.5570 *(0.0269)*	0.4038 *(0.0238)*	0.3231 *(0.0219)*
		0.50	0.9981 *(0.0382)**	0.9293 *(0.0298)**	0.7017 *(0.0248)***
		0.80	1.0000 *(0.0584)***	0.9993 *(0.0411)**	0.9472 *(0.0328)**
	0.01	0.20	0.3187 *(0.0012)*	0.2659 *(0.0010)*	0.2430 *(0.0017)*
		0.50	0.9770 *(0.0038)**	0.7465 *(0.0025)***	0.5673 *(0.0016)*
		0.80	1.0000 *(0.0064)**	0.9924 *(0.0045)**	0.7833 *(0.0023)***
	0.05	0.20	0.0001 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.3339 *(0.0000)*	0.3110 *(0.0000)*	0.3015 *(0.0000)*
		0.80	0.7573 *(0.0000)***	0.5317 *(0.0000)*	0.3333 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 44

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=7, NV=5

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.4555 *(0.3218)*	0.3790 *(0.3093)*	0.3363 *(0.3086)*
		0.50	0.7824 *(0.3408)*	0.5851 *(0.3242)*	0.4556 *(0.3051)*
		0.80	0.9326 *(0.3637)*	0.7562 *(0.3290)*	0.5788 *(0.3029)*
	0.01	0.20	0.3165 *(0.1645)*	0.2387 *(0.1522)*	0.2048 *(0.1479)*
		0.50	0.6711 *(0.1714)*	0.4681 *(0.1646)*	0.3395 *(0.1488)*
		0.80	0.8682 *(0.1840)*	0.6444 *(0.1644)*	0.4657 *(0.1486)*
	0.05	0.20	0.0311 *(0.0016)*	0.0281 *(0.0015)*	0.0230 *(0.0016)*
		0.50	0.2694 *(0.0014)*	0.1936 *(0.0013)*	0.1764 *(0.0007)*
		0.80	0.4927 *(0.0018)*	0.3314 *(0.0028)*	0.2130 *(0.0017)*
250	0.005	0.20	0.4208 *(0.1150)*	0.2960 *(0.1122)*	0.2224 *(0.1084)*
		0.50	0.8878 *(0.1399)*	0.6338 *(0.1201)*	0.4453 *(0.1094)*
		0.80	0.9914 *(0.1692)*	0.8499 *(0.1339)*	0.6270 *(0.1130)*
	0.01	0.20	0.2649 *(0.0244)*	0.1894 *(0.0235)*	0.1612 *(0.0274)*
		0.50	0.7512 *(0.0385)***	0.4942 *(0.0276)*	0.3490 *(0.0262)*
		0.80	0.9585 *(0.0500)**	0.7198 *(0.0360)***	0.5021 *(0.0313)*
	0.05	0.20	0.0019 *(0.0000)*	0.0016 *(0.0000)*	0.0020 *(0.0000)*
		0.50	0.2374 *(0.0000)*	0.1924 *(0.0000)*	0.1845 *(0.0000)*
		0.80	0.5096 *(0.0000)*	0.3419 *(0.0000)*	0.2026 *(0.0000)*
500	0.005	0.20	0.4220 *(0.0279)*	0.2811 *(0.0271)*	0.2045 *(0.0248)*
		0.50	0.9526 *(0.0517)***	0.6865 *(0.0352)*	0.4689 *(0.0288)*
		0.80	0.9996 *(0.0842)*	0.9182 *(0.0525)***	0.6746 *(0.0342)*
	0.01	0.20	0.2397 *(0.0019)*	0.1770 *(0.0015)*	0.1587 *(0.0009)*
		0.50	0.8114 *(0.0050)**	0.5230 *(0.0037)*	0.3675 *(0.0022)*
		0.80	0.9927 *(0.0107)**	0.7700 *(0.0052)***	0.5357 *(0.0033)*
	0.05	0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.2160 *(0.0000)*	0.1937 *(0.0000)*	0.1892 *(0.0000)*
		0.80	0.5316 *(0.0000)*	0.3594 *(0.0000)*	0.2001 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 45

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=7, NV=7

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.4158 *(0.0000)*	0.3522 *(0.0000)*	0.3180 *(0.0000)*
		0.50	0.6798 *(0.0000)*	0.4971 *(0.0000)*	0.3937 *(0.0000)*
		0.80	0.8448 *(0.0000)**	0.6254 *(0.0000)*	0.4796 *(0.0000)*
	0.01	0.20	0.2748 *(0.0000)*	0.2031 *(0.0000)*	0.1713 *(0.0000)*
		0.50	0.5620 *(0.0000)*	0.3733 *(0.0000)*	0.2683 *(0.0000)*
		0.80	0.7511 *(0.0000)***	0.5150 *(0.0000)*	0.3620 *(0.0000)*
	0.05	0.20	0.0287 *(0.0000)*	0.0251 *(0.0000)*	0.0198 *(0.0000)*
		0.50	0.2161 *(0.0000)*	0.1465 *(0.0000)*	0.1298 *(0.0000)*
		0.80	0.3866 *(0.0000)*	0.2533 *(0.0000)*	0.1568 *(0.0000)*
250	0.005	0.20	0.3524 *(0.0000)*	0.2366 *(0.0000)*	0.1749 *(0.0000)*
		0.50	0.7659 *(0.0000)***	0.5003 *(0.0000)*	0.3441 *(0.0000)*
		0.80	0.9399 *(0.0000)**	0.6953 *(0.0000)*	0.4831 *(0.0000)*
	0.01	0.20	0.2206 *(0.0000)*	0.1482 *(0.0000)*	0.1231 *(0.0000)*
		0.50	0.6115 *(0.0000)*	0.3819 *(0.0000)*	0.2611 *(0.0000)*
		0.80	0.8443 *(0.0000)**	0.5609 *(0.0000)*	0.3781 *(0.0000)*
	0.05	0.20	0.0022 *(0.0000)*	0.0019 *(0.0000)*	0.0015 *(0.0000)*
		0.50	0.1863 *(0.0000)*	0.1399 *(0.0000)*	0.1336 *(0.0000)*
		0.80	0.3952 *(0.0000)*	0.2599 *(0.0000)*	0.1449 *(0.0000)*
500	0.005	0.20	0.3447 *(0.0000)*	0.2164 *(0.0000)*	0.1516 *(0.0000)*
		0.50	0.8353 *(0.0000)**	0.5365 *(0.0000)*	0.3532 *(0.0000)*
		0.80	0.9845 *(0.0000)**	0.7534 *(0.0000)***	0.5175 *(0.0000)*
	0.01	0.20	0.1945 *(0.0000)*	0.1357 *(0.0000)*	0.1181 *(0.0000)*
		0.50	0.6584 *(0.0000)*	0.3943 *(0.0000)*	0.2707 *(0.0000)*
		0.80	0.9086 *(0.0000)**	0.5926 *(0.0000)*	0.4012 *(0.0000)*
	0.05	0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.1635 *(0.0000)*	0.1411 *(0.0000)*	0.1380 *(0.0000)*
		0.80	0.4065 *(0.0000)*	0.2677 *(0.0000)*	0.1431 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 46

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=8, NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.6672 *(0.3205)*	0.6716 *(0.3034)*	0.6668 *(0.2859)*
	0.005	0.50	0.9956 *(0.3175)*	0.9936 *(0.2990)*	0.9930 *(0.2826)*
		0.80	1.0000 *(0.3193)*	1.0000 *(0.3098)*	1.0000 *(0.2918)*
		0.20	0.5000 *(0.1560)*	0.4874 *(0.1430)*	0.5104 *(0.1209)*
100	0.01	0.50	0.9828 *(0.1522)*	0.9806 *(0.1429)*	0.9826 *(0.1199)*
		0.80	1.0000 *(0.1553)*	1.0000 *(0.1434)*	1.0000 *(0.1245)*
		0.20	0.0312 *(0.0012)*	0.0418 *(0.0013)*	0.0378 *(0.0011)*
	0.05	0.50	0.6264 *(0.0016)*	0.6282 *(0.0013)*	0.6082 *(0.0012)*
		0.80	0.9920 *(0.0018)**	0.9910 *(0.0019)**	0.9942 *(0.0016)**
		0.20	0.7438 *(0.1073)*	0.7366 *(0.0977)*	0.7404 *(0.0821)*
	0.005	0.50	0.9998 *(0.1133)*	1.0000 *(0.1042)*	0.9998 *(0.0845)*
		0.80	1.0000 *(0.1166)*	1.0000 *(0.1009)*	1.0000 *(0.0872)*
		0.20	0.5084 *(0.0243)*	0.5052 *(0.0223)*	0.5024 *(0.0185)*
250	0.01	0.50	0.9992 *(0.0258)**	0.9994 *(0.0207)**	0.9994 *(0.0184)**
		0.80	1.0000 *(0.0295)**	1.0000 *(0.0251)**	1.0000 *(0.0199)**
		0.20	0.0016 *(0.0000)*	0.0014 *(0.0000)*	0.0014 *(0.0000)*
	0.05	0.50	0.6818 *(0.0000)*	0.6882 *(0.0000)*	0.6872 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9998 *(0.0000)**	0.9998 *(0.0000)**
		0.20	0.8186 *(0.0249)**	0.8210 *(0.0243)**	0.8274 *(0.0190)**
	0.005	0.50	1.0000 *(0.0272)**	1.0000 *(0.0240)**	1.0000 *(0.0197)**
		0.80	1.0000 *(0.0310)**	1.0000 *(0.0282)**	1.0000 *(0.0231)**
		0.20	0.4952 *(0.0015)*	0.5024 *(0.0012)*	0.5104 *(0.0013)*
500	0.01	0.50	1.0000 *(0.0020)**	1.0000 *(0.0020)**	1.0000 *(0.0017)**
		0.80	1.0000 *(0.0027)**	1.0000 *(0.0025)**	1.0000 *(0.0021)**
		0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
	0.05	0.50	0.7482 *(0.0000)***	0.7502 *(0.0000)***	0.7384 *(0.0000)***
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 47

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=8, NV=4

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.4882 *(0.3183)*	0.4042 *(0.3078)*	0.3547 *(0.2837)*
		0.50	0.8417 *(0.3248)*	0.6591 *(0.3095)*	0.5175 *(0.2927)*
		0.80	0.9731 *(0.3307)*	0.8354 *(0.3118)*	0.6606 *(0.2854)*
	0.01	0.20	0.3383 *(0.1573)*	0.2674 *(0.1387)*	0.2271 *(0.1298)*
		0.50	0.7374 *(0.1672)*	0.5389 *(0.1500)*	0.3982 *(0.1304)*
		0.80	0.9325 *(0.1795)*	0.7366 *(0.1506)*	0.5494 *(0.1363)*
	0.05	0.20	0.0320 *(0.0018)*	0.0302 *(0.0011)*	0.0230 *(0.0015)*
		0.50	0.3084 *(0.0015)*	0.2354 *(0.0014)*	0.2150 *(0.0010)*
		0.80	0.5729 *(0.0026)*	0.3946 *(0.0019)*	0.2632 *(0.0018)*
250	0.005	0.20	0.4673 *(0.1164)*	0.3389 *(0.1062)*	0.2627 *(0.0931)*
		0.50	0.9395 *(0.1291)*	0.7282 *(0.1108)*	0.5318 *(0.0938)*
		0.80	0.9988 *(0.1469)*	0.9347 *(0.1216)*	0.7316 *(0.0990)*
	0.01	0.20	0.2983 *(0.0243)*	0.2198 *(0.0225)*	0.1918 *(0.0204)*
		0.50	0.8346 *(0.0358)**	0.5813 *(0.0276)*	0.4184 *(0.0226)*
		0.80	0.9913 *(0.0452)**	0.8255 *(0.0326)**	0.5951 *(0.0256)*
	0.05	0.20	0.0022 *(0.0000)*	0.0016 *(0.0000)*	0.0023 *(0.0000)*
		0.50	0.2821 *(0.0000)*	0.2370 *(0.0000)*	0.2249 *(0.0000)*
		0.80	0.5967 *(0.0000)*	0.4094 *(0.0000)*	0.2516 *(0.0000)*
500	0.005	0.20	0.4785 *(0.0266)*	0.3277 *(0.0234)*	0.2501 *(0.0226)*
		0.50	0.9862 *(0.0423)**	0.7971 *(0.0325)***	0.5544 *(0.0267)*
		0.80	1.0000 *(0.0651)***	0.9828 *(0.0436)**	0.7924 *(0.0316)***
	0.01	0.20	0.2731 *(0.0017)*	0.2124 *(0.0017)*	0.1917 *(0.0013)*
		0.50	0.9015 *(0.0048)**	0.6179 *(0.0022)*	0.4449 *(0.0018)*
		0.80	0.9995 *(0.0087)**	0.8894 *(0.0043)**	0.6361 *(0.0029)*
	0.05	0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0001 *(0.0000)*
		0.50	0.2623 *(0.0000)*	0.2402 *(0.0000)*	0.2318 *(0.0000)*
		0.80	0.6255 *(0.0000)*	0.4279 *(0.0000)*	0.2501 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 48

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=8, NV=6

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.4384 *(0.3191)*	0.3632 *(0.3087)*	0.3255 *(0.3035)*
		0.50	0.7307 *(0.3439)*	0.5356 *(0.3127)*	0.4216 *(0.3022)*
		0.80	0.8911 *(0.3647)*	0.6822 *(0.3255)*	0.5190 *(0.3113)*
	0.01	0.20	0.2931 *(0.1656)*	0.2214 *(0.1537)*	0.1847 *(0.1539)*
		0.50	0.6084 *(0.1736)*	0.4144 *(0.1635)*	0.2978 *(0.1529)*
		0.80	0.8069 *(0.1890)*	0.5714 *(0.1651)*	0.4072 *(0.1588)*
	0.05	0.20	0.0283 *(0.0013)*	0.0270 *(0.0016)*	0.0213 *(0.0010)*
		0.50	0.2401 *(0.0017)*	0.1672 *(0.0015)*	0.1505 *(0.0016)*
		0.80	0.4314 *(0.0020)*	0.2866 *(0.0033)*	0.1800 *(0.0019)*
250	0.005	0.20	0.3838 *(0.1182)*	0.2594 *(0.1135)*	0.1948 *(0.1039)*
		0.50	0.8224 *(0.1419)*	0.5635 *(0.1283)*	0.3868 *(0.1123)*
		0.80	0.9733 *(0.1768)*	0.7670 *(0.1425)*	0.5469 *(0.1225)*
	0.01	0.20	0.2390 *(0.0273)*	0.1679 *(0.0283)*	0.1403 *(0.0233)*
		0.50	0.6774 *(0.0349)*	0.4312 *(0.0299)*	0.2965 *(0.0266)*
		0.80	0.9032 *(0.0556)***	0.6310 *(0.0388)*	0.4297 *(0.0346)*
	0.05	0.20	0.0018 *(0.0000)*	0.0016 *(0.0000)*	0.0018 *(0.0000)*
		0.50	0.2066 *(0.0000)*	0.1618 *(0.0000)*	0.1539 *(0.0000)*
		0.80	0.4452 *(0.0000)*	0.2945 *(0.0000)*	0.1691 *(0.0000)*
500	0.005	0.20	0.3782 *(0.0301)*	0.2433 *(0.0271)*	0.1739 *(0.0247)*
		0.50	0.8985 *(0.0541)***	0.6022 *(0.0359)*	0.4023 *(0.0323)*
		0.80	0.9967 *(0.0884)*	0.8331 *(0.0542)***	0.5863 *(0.0381)*
	0.01	0.20	0.2121 *(0.0012)*	0.1529 *(0.0020)*	0.1376 *(0.0009)*
		0.50	0.7249 *(0.0047)***	0.4509 *(0.0032)*	0.3119 *(0.0031)*
		0.80	0.9644 *(0.0128)**	0.6719 *(0.0062)*	0.4581 *(0.0023)*
	0.05	0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.1863 *(0.0000)*	0.1633 *(0.0000)*	0.1580 *(0.0000)*
		0.80	0.4624 *(0.0000)*	0.3046 *(0.0000)*	0.1669 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table 49

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=8, NV=8

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.4099 *(0.0000)*	0.3455 *(0.0000)*	0.3102 *(0.0000)*
		0.50	0.6417 *(0.0000)*	0.4630 *(0.0000)*	0.3808 *(0.0000)*
		0.80	0.8001 *(0.0000)**	0.5853 *(0.0000)*	0.4444 *(0.0000)*
	0.01	0.20	0.2591 *(0.0000)*	0.1944 *(0.0000)*	0.1679 *(0.0000)*
		0.50	0.5170 *(0.0000)*	0.3425 *(0.0000)*	0.2474 *(0.0000)*
		0.80	0.6966 *(0.0000)*	0.4684 *(0.0000)*	0.3277 *(0.0000)*
	0.05	0.20	0.0295 *(0.0000)*	0.0235 *(0.0000)*	0.0182 *(0.0000)*
		0.50	0.1984 *(0.0000)*	0.1313 *(0.0000)*	0.1153 *(0.0000)*
		0.80	0.3493 *(0.0000)*	0.2247 *(0.0000)*	0.1388 *(0.0000)*
250	0.005	0.20	0.3266 *(0.0000)*	0.2167 *(0.0000)*	0.1607 *(0.0000)*
		0.50	0.7132 *(0.0000)***	0.4568 *(0.0000)*	0.3090 *(0.0000)*
		0.80	0.8988 *(0.0000)**	0.6352 *(0.0000)*	0.4346 *(0.0000)*
	0.01	0.20	0.2035 *(0.0000)*	0.1360 *(0.0000)*	0.1079 *(0.0000)*
		0.50	0.5628 *(0.0000)*	0.3420 *(0.0000)*	0.2314 *(0.0000)*
		0.80	0.7841 *(0.0000)***	0.5054 *(0.0000)*	0.3376 *(0.0000)*
	0.05	0.20	0.0021 *(0.0000)*	0.0018 *(0.0000)*	0.0020 *(0.0000)*
		0.50	0.1706 *(0.0000)*	0.1232 *(0.0000)*	0.1188 *(0.0000)*
		0.80	0.3536 *(0.0000)*	0.2318 *(0.0000)*	0.1276 *(0.0000)*
500	0.005	0.20	0.3168 *(0.0000)*	0.1974 *(0.0000)*	0.1338 *(0.0000)*
		0.50	0.7780 *(0.0000)***	0.4837 *(0.0000)*	0.3148 *(0.0000)*
		0.80	0.9620 *(0.0000)**	0.6881 *(0.0000)*	0.4611 *(0.0000)*
	0.01	0.20	0.1785 *(0.0000)*	0.1221 *(0.0000)*	0.1048 *(0.0000)*
		0.50	0.5988 *(0.0000)*	0.3529 *(0.0000)*	0.2388 *(0.0000)*
		0.80	0.8489 *(0.0000)**	0.5292 *(0.0000)*	0.3543 *(0.0000)*
	0.05	0.20	0.0001 *(0.0000)*	0.0001 *(0.0000)*	0.0001 *(0.0000)*
		0.50	0.1470 *(0.0000)*	0.1239 *(0.0000)*	0.1207 *(0.0000)*
		0.80	0.3604 *(0.0000)*	0.2366 *(0.0000)*	0.1252 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

APPENDIX A

TABLES FOR POWER AND TYPE I ERROR WITH "UNLIKE" CORRELATIONS EQUAL TO 0.07

Table A1

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.07, p=2 and NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0274 *(0.0010)*	0.0322 *(0.0006)*	0.0326 *(0.0012)*
		0.50	0.5746 *(0.0014)*	0.5694 *(0.0018)*	0.5736 *(0.0008)*
		0.80	0.9900 *(0.0024)**	0.9868 *(0.0014)**	0.9884 *(0.0032)**
	0.005	0.20	0.0848 *(0.0032)*	0.0866 *(0.0050)*	0.0766 *(0.0048)*
		0.50	0.7538 *(0.0076)***	0.7620 *(0.0046)***	0.7476 *(0.0068)***
		0.80	0.9974 *(0.0064)**	0.9978 *(0.0070)**	0.9970 *(0.0072)**
	0.01	0.20	0.1218 *(0.0098)*	0.1214 *(0.0092)*	0.1246 *(0.0094)*
		0.50	0.8234 *(0.0112)**	0.8232 *(0.0146)**	0.8194 *(0.0120)**
		0.80	0.9990 *(0.0134)**	0.9982 *(0.0154)**	0.9992 *(0.0130)**
250	0.001	0.20	0.1496 *(0.0008)*	0.1504 *(0.0008)*	0.1392 *(0.0008)*
		0.50	0.9870 *(0.0020)**	0.9878 *(0.0012)**	0.9856 *(0.0008)**
		0.80	1.0000 *(0.0024)**	1.0000 *(0.0046)**	1.0000 *(0.0026)**
	0.005	0.20	0.2828 *(0.0056)*	0.2730 *(0.0052)*	0.2886 *(0.0044)*
		0.50	0.9966 *(0.0102)**	0.9978 *(0.0074)**	0.9970 *(0.0080)**
		0.80	1.0000 *(0.0114)**	1.0000 *(0.0132)**	1.0000 *(0.0132)**
	0.01	0.20	0.3542 *(0.0118)*	0.3544 *(0.0122)*	0.3550 *(0.0088)*
		0.50	0.9982 *(0.0154)**	0.9988 *(0.0164)**	0.9986 *(0.0162)**
		0.80	1.0000 *(0.0276)**	1.0000 *(0.0234)**	1.0000 *(0.0274)**
500	0.001	0.20	0.4354 *(0.0010)*	0.4406 *(0.0016)*	0.4528 *(0.0008)*
		0.50	1.0000 *(0.0038)**	1.0000 *(0.0024)**	1.0000 *(0.0038)**
		0.80	1.0000 *(0.0054)**	1.0000 *(0.0068)**	1.0000 *(0.0064)**
	0.005	0.20	0.6458 *(0.0046)*	0.6298 *(0.0054)*	0.6356 *(0.0056)*
		0.50	1.0000 *(0.0108)**	1.0000 *(0.0122)**	1.0000 *(0.0116)**
		0.80	1.0000 *(0.0240)**	1.0000 *(0.0254)**	1.0000 *(0.0220)**
	0.01	0.20	0.7032 *(0.0132)***	0.7084 *(0.0120)***	0.7188 *(0.0106)***
		0.50	1.0000 *(0.0198)**	1.0000 *(0.0164)**	1.0000 *(0.0260)**
		0.80	1.0000 *(0.0372)**	1.0000 *(0.0424)**	1.0000 *(0.0396)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A2

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.07, p=2 and NV=2

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0286 *(0.0000)*	0.0287 *(0.0000)*	0.0247 *(0.0000)*
		0.50	0.4310 *(0.0000)*	0.3866 *(0.0000)*	0.3592 *(0.0000)*
		0.80	0.8348 *(0.0000)**	0.6041 *(0.0000)*	0.5037 *(0.0000)*
	0.005	0.20	0.0745 *(0.0000)*	0.0733 *(0.0000)*	0.0674 *(0.0000)*
		0.50	0.5549 *(0.0000)*	0.4638 *(0.0000)*	0.4374 *(0.0000)*
		0.80	0.9240 *(0.0000)**	0.7384 *(0.0000)***	0.5361 *(0.0000)*
	0.01	0.20	0.1083 *(0.0000)*	0.1085 *(0.0000)*	0.0969 *(0.0000)*
		0.50	0.6256 *(0.0000)*	0.5026 *(0.0000)*	0.4605 *(0.0000)*
		0.80	0.9529 *(0.0000)**	0.7962 *(0.0000)***	0.5738 *(0.0000)*
250	0.001	0.20	0.1294 *(0.0000)*	0.1193 *(0.0000)*	0.1140 *(0.0000)*
		0.50	0.8707 *(0.0000)**	0.6519 *(0.0000)*	0.5038 *(0.0000)*
		0.80	0.9998 *(0.0000)**	0.9845 *(0.0000)**	0.8020 *(0.0000)**
	0.005	0.20	0.2343 *(0.0000)*	0.2163 *(0.0000)*	0.1943 *(0.0000)*
		0.50	0.9457 *(0.0000)**	0.7771 *(0.0000)***	0.5516 *(0.0000)*
		0.80	0.9997 *(0.0000)**	0.9950 *(0.0000)**	0.9027 *(0.0000)**
	0.01	0.20	0.2948 *(0.0000)*	0.2774 *(0.0000)*	0.2509 *(0.0000)*
		0.50	0.9675 *(0.0000)**	0.8326 *(0.0000)**	0.5958 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9978 *(0.0000)**	0.9395 *(0.0000)**
500	0.001	0.20	0.3459 *(0.0000)*	0.3091 *(0.0000)*	0.2983 *(0.0000)*
		0.50	0.9985 *(0.0000)**	0.9538 *(0.0000)**	0.7151 *(0.0000)***
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	0.9948 *(0.0000)**
	0.005	0.20	0.4869 *(0.0000)*	0.4109 *(0.0000)*	0.3857 *(0.0000)*
		0.50	0.9997 *(0.0000)**	0.9850 *(0.0000)**	0.8476 *(0.0000)**
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	0.9985 *(0.0000)**
	0.01	0.20	0.5524 *(0.0000)*	0.4554 *(0.0000)*	0.4238 *(0.0000)*
		0.50	0.9997 *(0.0000)**	0.9921 *(0.0000)**	0.8932 *(0.0000)**
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	0.9992 *(0.0000)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A3

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.07, p=3 and NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0300 *(0.0009)*	0.0272 *(0.0009)*	0.0280 *(0.0011)*
		0.50	0.5816 *(0.0008)*	0.5814 *(0.0014)*	0.5872 *(0.0011)*
		0.80	0.9874 *(0.0012)**	0.9882 *(0.0022)**	0.9874 *(0.0016)**
	0.005	0.20	0.0904 *(0.0054)*	0.0720 *(0.0047)*	0.0852 *(0.0054)*
		0.50	0.7538 *(0.0056)***	0.7626 *(0.0061)***	0.7390 *(0.0063)***
		0.80	0.9984 *(0.0076)**	0.9970 *(0.0067)**	0.9966 *(0.0084)**
	0.01	0.20	0.1244 *(0.0106)*	0.1246 *(0.0099)*	0.1198 *(0.0076)*
		0.50	0.8276 *(0.0129)**	0.8170 *(0.0104)**	0.8202 *(0.0112)**
		0.80	0.9994 *(0.0129)**	0.9988 *(0.0167)**	0.9994 *(0.0137)**
250	0.001	0.20	0.1400 *(0.0014)*	0.1552 *(0.0012)*	0.1460 *(0.0010)*
		0.50	0.9868 *(0.0009)**	0.9910 *(0.0016)**	0.9894 *(0.0018)**
		0.80	1.0000 *(0.0036)**	1.0000 *(0.0033)**	1.0000 *(0.0037)**
	0.005	0.20	0.2758 *(0.0043)*	0.2800 *(0.0062)*	0.2802 *(0.0048)*
		0.50	0.9970 *(0.0079)**	0.9968 *(0.0079)**	0.9970 *(0.0060)**
		0.80	1.0000 *(0.0143)**	1.0000 *(0.0133)**	1.0000 *(0.0115)**
	0.01	0.20	0.3560 *(0.0129)*	0.3566 *(0.0106)*	0.3670 *(0.0083)*
		0.50	0.9984 *(0.0141)**	0.9996 *(0.0132)**	0.9980 *(0.0136)**
		0.80	1.0000 *(0.0220)**	1.0000 *(0.0225)**	1.0000 *(0.0222)**
500	0.001	0.20	0.4392 *(0.0018)*	0.4402 *(0.0013)*	0.4342 *(0.0009)*
		0.50	1.0000 *(0.0039)**	1.0000 *(0.0029)**	1.0000 *(0.0025)**
		0.80	1.0000 *(0.0057)**	1.0000 *(0.0066)**	1.0000 *(0.0062)**
	0.005	0.20	0.6346 *(0.0058)*	0.6318 *(0.0057)*	0.6430 *(0.0053)*
		0.50	1.0000 *(0.0108)**	1.0000 *(0.0116)**	1.0000 *(0.0111)**
		0.80	1.0000 *(0.0211)**	1.0000 *(0.0227)**	1.0000 *(0.0216)**
	0.01	0.20	0.7230 *(0.0111)***	0.7178 *(0.0113)***	0.7190 *(0.0100)***
		0.50	1.0000 *(0.0211)**	1.0000 *(0.0197)**	1.0000 *(0.0218)**
		0.80	1.0000 *(0.0401)**	1.0000 *(0.0365)**	1.0000 *(0.0321)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A4

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.07, p=3 and NV=2

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0314 *(0.0012)*	0.0269 *(0.0010)*	0.0248 *(0.0008)*
		0.50	0.4258 *(0.0028)*	0.3826 *(0.0024)*	0.3588 *(0.0012)*
		0.80	0.8331 *(0.0030)**	0.6092 *(0.0020)*	0.5038 *(0.0016)*
	0.005	0.20	0.0747 *(0.0052)*	0.0666 *(0.0050)*	0.0667 *(0.0038)*
		0.50	0.5583 *(0.0070)*	0.4717 *(0.0076)*	0.4364 *(0.0066)*
		0.80	0.9232 *(0.0130)**	0.7375 *(0.0090)***	0.5339 *(0.0072)*
	0.01	0.20	0.1111 *(0.0076)*	0.1054 *(0.0086)*	0.0959 *(0.0106)*
		0.50	0.6291 *(0.0148)*	0.5085 *(0.0138)*	0.4624 *(0.0122)*
		0.80	0.9493 *(0.0232)**	0.7926 *(0.0192)***	0.5741 *(0.0140)*
250	0.001	0.20	0.1232 *(0.0006)*	0.1163 *(0.0008)*	0.1099 *(0.0014)*
		0.50	0.8743 *(0.0042)**	0.6391 *(0.0026)*	0.5055 *(0.0018)*
		0.80	0.9997 *(0.0096)**	0.9834 *(0.0076)**	0.8015 *(0.0044)**
	0.005	0.20	0.2405 *(0.0054)*	0.2190 *(0.0052)*	0.2021 *(0.0060)*
		0.50	0.9454 *(0.0124)**	0.7808 *(0.0112)***	0.5532 *(0.0082)*
		0.80	0.9999 *(0.0298)**	0.9944 *(0.0264)**	0.9011 *(0.0184)**
	0.01	0.20	0.3012 *(0.0120)*	0.2702 *(0.0112)*	0.2478 *(0.0114)*
		0.50	0.9660 *(0.0208)**	0.8313 *(0.0210)**	0.6030 *(0.0184)*
		0.80	1.0000 *(0.0544)***	0.9985 *(0.0380)**	0.9410 *(0.0336)**
500	0.001	0.20	0.3477 *(0.0016)*	0.3188 *(0.0008)*	0.2938 *(0.0012)*
		0.50	0.9989 *(0.0090)**	0.9600 *(0.0054)**	0.7104 *(0.0030)***
		0.80	1.0000 *(0.0248)**	1.0000 *(0.0156)**	0.9941 *(0.0110)**
	0.005	0.20	0.4885 *(0.0094)*	0.4148 *(0.0054)*	0.3871 *(0.0054)*
		0.50	0.9997 *(0.0290)**	0.9844 *(0.0186)**	0.8473 *(0.0160)**
		0.80	1.0000 *(0.0608)***	1.0000 *(0.0538)***	0.9983 *(0.0328)**
	0.01	0.20	0.5553 *(0.0102)*	0.4620 *(0.0116)*	0.4238 *(0.0106)*
		0.50	0.9999 *(0.0458)**	0.9938 *(0.0336)**	0.8942 *(0.0260)**
		0.80	1.0000 *(0.1048)*	1.0000 *(0.0818)*	0.9996 *(0.0588)***

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A5

Power and (*Type I error*) for: F-statistic, “unlike” correlation=0.07, p=3 and NV=3

“Like” correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0291 *(0.0000)*	0.0250 *(0.0000)*	0.0223 *(0.0000)*
		0.50	0.3463 *(0.0000)*	0.2853 *(0.0000)*	0.2615 *(0.0000)*
		0.80	0.6542 *(0.0000)*	0.4573 *(0.0000)*	0.3402 *(0.0000)*
	0.005	0.20	0.0717 *(0.0000)*	0.0673 *(0.0000)*	0.0565 *(0.0000)*
		0.50	0.4483 *(0.0000)*	0.3393 *(0.0000)*	0.3059 *(0.0000)*
		0.80	0.7621 *(0.0000)***	0.5631 *(0.0000)*	0.3775 *(0.0000)*
	0.01	0.20	0.1018 *(0.0000)*	0.0936 *(0.0000)*	0.0802 *(0.0000)*
		0.50	0.5091 *(0.0000)*	0.3732 *(0.0000)*	0.3185 *(0.0000)*
		0.80	0.8166 *(0.0000)**	0.6107 *(0.0000)*	0.4191 *(0.0000)*
250	0.001	0.20	0.1178 *(0.0000)*	0.1046 *(0.0000)*	0.0927 *(0.0000)*
		0.50	0.7085 *(0.0000)***	0.4904 *(0.0000)*	0.3445 *(0.0000)*
		0.80	0.9841 *(0.0000)**	0.7707 *(0.0000)***	0.5940 *(0.0000)*
	0.005	0.20	0.2044 *(0.0000)*	0.1831 *(0.0000)*	0.1631 *(0.0000)*
		0.50	0.8185 *(0.0000)**	0.5971 *(0.0000)*	0.3953 *(0.0000)*
		0.80	0.9963 *(0.0000)**	0.8742 *(0.0000)**	0.6505 *(0.0000)*
	0.01	0.20	0.2520 *(0.0000)*	0.2091 *(0.0000)*	0.1980 *(0.0000)*
		0.50	0.8690 *(0.0000)**	0.6429 *(0.0000)*	0.4419 *(0.0000)*
		0.80	0.9977 *(0.0000)**	0.9117 *(0.0000)**	0.6763 *(0.0000)*
500	0.001	0.20	0.2899 *(0.0000)*	0.2441 *(0.0000)*	0.2212 *(0.0000)*
		0.50	0.9721 *(0.0000)**	0.7244 *(0.0000)***	0.5362 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9901 *(0.0000)**	0.7605 *(0.0000)***
	0.005	0.20	0.3962 *(0.0000)*	0.3078 *(0.0000)*	0.2767 *(0.0000)*
		0.50	0.9914 *(0.0000)**	0.8277 *(0.0000)**	0.6199 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9971 *(0.0000)**	0.8621 *(0.0000)**
	0.01	0.20	0.4580 *(0.0000)*	0.3401 *(0.0000)*	0.2985 *(0.0000)*
		0.50	0.9961 *(0.0000)**	0.8777 *(0.0000)**	0.6501 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9982 *(0.0000)**	0.9029 *(0.0000)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A6

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.07, p=4 and NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0330 *(0.0009)*	0.0258 *(0.0009)*	0.0288 *(0.0004)*
		0.50	0.5932 *(0.0010)*	0.5928 *(0.0012)*	0.5844 *(0.0011)*
		0.80	0.9876 *(0.0023)**	0.9858 *(0.0018)**	0.9878 *(0.0016)**
	0.005	0.20	0.0762 *(0.0057)*	0.0816 *(0.0037)*	0.0768 *(0.0042)*
		0.50	0.7538 *(0.0069)***	0.7534 *(0.0060)***	0.7644 *(0.0053)***
		0.80	0.9972 *(0.0089)**	0.9976 *(0.0073)**	0.9978 *(0.0069)**
	0.01	0.20	0.1220 *(0.0094)*	0.1130 *(0.0097)*	0.1134 *(0.0087)*
		0.50	0.8188 *(0.0113)**	0.8284 *(0.0110)**	0.8180 *(0.0115)**
		0.80	0.9996 *(0.0160)**	0.9990 *(0.0131)**	0.9986 *(0.0119)**
250	0.001	0.20	0.1524 *(0.0008)*	0.1536 *(0.0009)*	0.1540 *(0.0011)*
		0.50	0.9888 *(0.0017)**	0.9870 *(0.0014)**	0.9890 *(0.0015)**
		0.80	1.0000 *(0.0025)**	1.0000 *(0.0035)**	1.0000 *(0.0035)**
	0.005	0.20	0.2826 *(0.0055)*	0.2796 *(0.0055)*	0.2980 *(0.0037)*
		0.50	0.9968 *(0.0089)**	0.9974 *(0.0083)**	0.9962 *(0.0069)**
		0.80	1.0000 *(0.0137)**	1.0000 *(0.0122)**	1.0000 *(0.0117)**
	0.01	0.20	0.3658 *(0.0101)*	0.3646 *(0.0101)*	0.3576 *(0.0093)*
		0.50	0.9984 *(0.0167)**	0.9988 *(0.0137)**	0.9986 *(0.0129)**
		0.80	1.0000 *(0.0231)**	1.0000 *(0.0222)**	1.0000 *(0.0191)**
500	0.001	0.20	0.4438 *(0.0011)*	0.4366 *(0.0009)*	0.4318 *(0.0013)*
		0.50	1.0000 *(0.0028)**	1.0000 *(0.0029)**	1.0000 *(0.0026)**
		0.80	1.0000 *(0.0061)**	1.0000 *(0.0055)**	1.0000 *(0.0045)**
	0.005	0.20	0.6460 *(0.0051)*	0.6346 *(0.0055)*	0.6298 *(0.0058)*
		0.50	1.0000 *(0.0102)**	1.0000 *(0.0115)**	1.0000 *(0.0090)**
		0.80	1.0000 *(0.0246)**	1.0000 *(0.0219)**	1.0000 *(0.0189)**
	0.01	0.20	0.7130 *(0.0104)***	0.7162 *(0.0113)***	0.7210 *(0.0082)***
		0.50	1.0000 *(0.0209)**	1.0000 *(0.0189)**	1.0000 *(0.0173)**
		0.80	1.0000 *(0.0372)**	1.0000 *(0.0337)**	1.0000 *(0.0299)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A7

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.07, p=4 and NV=3

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0281 *(0.0008)*	0.0261 *(0.0008)*	0.0249 *(0.0012)*
		0.50	0.3457 *(0.0012)*	0.2833 *(0.0018)*	0.2618 *(0.0006)*
		0.80	0.6607 *(0.0042)*	0.4563 *(0.0038)*	0.3402 *(0.0008)*
	0.005	0.20	0.0730 *(0.0054)*	0.0637 *(0.0038)*	0.0571 *(0.0032)*
		0.50	0.4518 *(0.0078)*	0.3402 *(0.0076)*	0.3049 *(0.0068)*
		0.80	0.7669 *(0.0160)***	0.5594 *(0.0104)*	0.3804 *(0.0074)*
	0.01	0.20	0.1048 *(0.0100)*	0.0901 *(0.0120)*	0.0809 *(0.0138)*
		0.50	0.5069 *(0.0178)*	0.3752 *(0.0116)*	0.3181 *(0.0130)*
		0.80	0.8150 *(0.0318)**	0.6117 *(0.0204)*	0.4195 *(0.0166)*
250	0.001	0.20	0.1186 *(0.0002)*	0.1047 *(0.0014)*	0.0871 *(0.0012)*
		0.50	0.7080 *(0.0026)***	0.4948 *(0.0048)*	0.3442 *(0.0020)*
		0.80	0.9833 *(0.0172)**	0.7673 *(0.0070)***	0.5926 *(0.0036)*
	0.005	0.20	0.2057 *(0.0052)*	0.1818 *(0.0052)*	0.1601 *(0.0046)*
		0.50	0.8209 *(0.0190)**	0.5962 *(0.0132)*	0.3972 *(0.0070)*
		0.80	0.9953 *(0.0516)***	0.8695 *(0.0290)**	0.6500 *(0.0202)*
	0.01	0.20	0.2547 *(0.0092)*	0.2135 *(0.0130)*	0.1937 *(0.0098)*
		0.50	0.8641 *(0.0332)**	0.6392 *(0.0218)*	0.4450 *(0.0204)*
		0.80	0.9979 *(0.0788)*	0.9135 *(0.0450)**	0.6805 *(0.0342)*
500	0.001	0.20	0.2895 *(0.0020)*	0.2453 *(0.0012)*	0.2233 *(0.0010)*
		0.50	0.9711 *(0.0104)**	0.7254 *(0.0056)***	0.5336 *(0.0054)*
		0.80	1.0000 *(0.0564)***	0.9883 *(0.0242)**	0.7579 *(0.0160)***
	0.005	0.20	0.3989 *(0.0082)*	0.3095 *(0.0066)*	0.2837 *(0.0066)*
		0.50	0.9907 *(0.0548)***	0.8268 *(0.0196)**	0.6210 *(0.0154)*
		0.80	1.0000 *(0.1252)*	0.9969 *(0.0686)***	0.8629 *(0.0464)**
	0.01	0.20	0.4562 *(0.0140)*	0.3427 *(0.0124)*	0.2977 *(0.0122)*
		0.50	0.9948 *(0.0728)*	0.8732 *(0.0396)**	0.6487 *(0.0330)*
		0.80	1.0000 *(0.1696)*	0.9983 *(0.0978)*	0.9043 *(0.0688)***

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A8

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.07, p=4 and NV=4

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0287 *(0.0000)*	0.0242 *(0.0000)*	0.0199 *(0.0000)*
		0.50	0.2871 *(0.0000)*	0.2248 *(0.0000)*	0.2076 *(0.0000)*
		0.80	0.5449 *(0.0000)*	0.3706 *(0.0000)*	0.2584 *(0.0000)*
	0.005	0.20	0.0686 *(0.0000)*	0.0590 *(0.0000)*	0.0491 *(0.0000)*
		0.50	0.3820 *(0.0000)*	0.2697 *(0.0000)*	0.2351 *(0.0000)*
		0.80	0.6490 *(0.0000)*	0.4551 *(0.0000)*	0.3000 *(0.0000)*
	0.01	0.20	0.0941 *(0.0000)*	0.0816 *(0.0000)*	0.0706 *(0.0000)*
		0.50	0.4426 *(0.0000)*	0.3004 *(0.0000)*	0.2446 *(0.0000)*
		0.80	0.7059 *(0.0000)***	0.4893 *(0.0000)*	0.3329 *(0.0000)*
250	0.001	0.20	0.1092 *(0.0000)*	0.0923 *(0.0000)*	0.0805 *(0.0000)*
		0.50	0.5972 *(0.0000)*	0.4008 *(0.0000)*	0.2619 *(0.0000)*
		0.80	0.9039 *(0.0000)**	0.6301 *(0.0000)*	0.4635 *(0.0000)*
	0.005	0.20	0.1828 *(0.0000)*	0.1524 *(0.0000)*	0.1293 *(0.0000)*
		0.50	0.7071 *(0.0000)***	0.4788 *(0.0000)*	0.3112 *(0.0000)*
		0.80	0.9622 *(0.0000)**	0.7181 *(0.0000)***	0.5025 *(0.0000)*
	0.01	0.20	0.2266 *(0.0000)*	0.1794 *(0.0000)*	0.1561 *(0.0000)*
		0.50	0.7600 *(0.0000)***	0.5133 *(0.0000)*	0.3549 *(0.0000)*
		0.80	0.9778 *(0.0000)**	0.7592 *(0.0000)***	0.5312 *(0.0000)*
500	0.001	0.20	0.2472 *(0.0000)*	0.1979 *(0.0000)*	0.1776 *(0.0000)*
		0.50	0.8822 *(0.0000)**	0.5870 *(0.0000)*	0.4268 *(0.0000)*
		0.80	0.9992 *(0.0000)**	0.8724 *(0.0000)**	0.6118 *(0.0000)*
	0.005	0.20	0.3420 *(0.0000)*	0.2451 *(0.0000)*	0.2189 *(0.0000)*
		0.50	0.9501 *(0.0000)**	0.6858 *(0.0000)*	0.4834 *(0.0000)*
		0.80	0.9999 *(0.0000)**	0.9438 *(0.0000)**	0.7031 *(0.0000)***
	0.01	0.20	0.3912 *(0.0000)*	0.2740 *(0.0000)*	0.2322 *(0.0000)*
		0.50	0.9673 *(0.0000)**	0.7268 *(0.0000)***	0.5068 *(0.0000)*
		0.80	0.9999 *(0.0000)**	0.9634 *(0.0000)**	0.7359 *(0.0000)***

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A9

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.07, p=5 and NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0250 *(0.0008)*	0.0298 *(0.0013)*	0.0292 *(0.0008)*
		0.50	0.5808 *(0.0012)*	0.5792 *(0.0012)*	0.5740 *(0.0018)*
		0.80	0.9858 *(0.0019)**	0.9888 *(0.0020)**	0.9884 *(0.0011)**
	0.005	0.20	0.0780 *(0.0044)*	0.0770 *(0.0047)*	0.0748 *(0.0045)*
		0.50	0.7476 *(0.0056)***	0.7648 *(0.0055)***	0.7570 *(0.0057)***
		0.80	0.9976 *(0.0070)**	0.9978 *(0.0070)**	0.9978 *(0.0064)**
	0.01	0.20	0.1216 *(0.0098)*	0.1178 *(0.0090)*	0.1226 *(0.0074)*
		0.50	0.8310 *(0.0127)**	0.8256 *(0.0112)**	0.8222 *(0.0088)**
		0.80	0.9986 *(0.0136)**	0.9996 *(0.0136)**	0.9982 *(0.0113)**
250	0.001	0.20	0.1444 *(0.0012)*	0.1406 *(0.0010)*	0.1484 *(0.0009)*
		0.50	0.9872 *(0.0017)**	0.9874 *(0.0014)**	0.9866 *(0.0014)**
		0.80	1.0000 *(0.0038)**	1.0000 *(0.0034)**	1.0000 *(0.0026)**
	0.005	0.20	0.2866 *(0.0052)*	0.2828 *(0.0046)*	0.2762 *(0.0044)*
		0.50	0.9964 *(0.0074)**	0.9958 *(0.0072)**	0.9978 *(0.0067)**
		0.80	1.0000 *(0.0128)**	1.0000 *(0.0110)**	1.0000 *(0.0103)**
	0.01	0.20	0.3612 *(0.0108)*	0.3656 *(0.0098)*	0.3760 *(0.0075)*
		0.50	0.9986 *(0.0156)**	0.9988 *(0.0140)**	0.9976 *(0.0121)**
		0.80	1.0000 *(0.0211)**	1.0000 *(0.0200)**	1.0000 *(0.0170)**
500	0.001	0.20	0.4460 *(0.0012)*	0.4462 *(0.0010)*	0.4510 *(0.0007)*
		0.50	1.0000 *(0.0037)**	1.0000 *(0.0020)**	1.0000 *(0.0026)**
		0.80	1.0000 *(0.0067)**	1.0000 *(0.0067)**	1.0000 *(0.0051)**
	0.005	0.20	0.6366 *(0.0053)*	0.6398 *(0.0052)*	0.6458 *(0.0051)*
		0.50	1.0000 *(0.0098)**	1.0000 *(0.0115)**	1.0000 *(0.0091)**
		0.80	1.0000 *(0.0225)**	1.0000 *(0.0206)**	1.0000 *(0.0166)**
	0.01	0.20	0.7126 *(0.0096)***	0.7196 *(0.0095)***	0.7112 *(0.0089)***
		0.50	1.0000 *(0.0199)**	1.0000 *(0.0188)**	1.0000 *(0.0156)**
		0.80	1.0000 *(0.0354)**	1.0000 *(0.0317)**	1.0000 *(0.0266)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A10

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.07, p=5 and NV=3

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0261 *(0.0006)*	0.0239 *(0.0010)*	0.0229 *(0.0014)*
		0.50	0.3445 *(0.0014)*	0.2815 *(0.0023)*	0.2638 *(0.0015)*
		0.80	0.6536 *(0.0037)*	0.4599 *(0.0021)*	0.3405 *(0.0017)*
	0.005	0.20	0.0713 *(0.0062)*	0.0631 *(0.0060)*	0.0541 *(0.0046)*
		0.50	0.4518 *(0.0082)*	0.3381 *(0.0053)*	0.3061 *(0.0061)*
		0.80	0.7657 *(0.0145)***	0.5615 *(0.0122)*	0.3803 *(0.0079)*
	0.01	0.20	0.1019 *(0.0109)*	0.0918 *(0.0084)*	0.0785 *(0.0101)*
		0.50	0.5117 *(0.0135)*	0.3749 *(0.0131)*	0.3191 *(0.0110)*
		0.80	0.8203 *(0.0253)**	0.6119 *(0.0189)*	0.4207 *(0.0171)*
250	0.001	0.20	0.1116 *(0.0012)*	0.1031 *(0.0006)*	0.0912 *(0.0010)*
		0.50	0.7063 *(0.0047)***	0.4941 *(0.0035)*	0.3442 *(0.0018)*
		0.80	0.9834 *(0.0160)**	0.7669 *(0.0076)***	0.5905 *(0.0050)*
	0.005	0.20	0.2087 *(0.0056)*	0.1735 *(0.0051)*	0.1551 *(0.0058)*
		0.50	0.8161 *(0.0194)**	0.5909 *(0.0112)*	0.3972 *(0.0087)*
		0.80	0.9953 *(0.0470)**	0.8736 *(0.0285)**	0.6493 *(0.0169)*
	0.01	0.20	0.2524 *(0.0113)*	0.2191 *(0.0084)*	0.1955 *(0.0088)*
		0.50	0.8687 *(0.0331)**	0.6323 *(0.0211)*	0.4439 *(0.0149)*
		0.80	0.9980 *(0.0751)*	0.9117 *(0.0450)**	0.6773 *(0.0307)*
500	0.001	0.20	0.2892 *(0.0007)*	0.2467 *(0.0011)*	0.2256 *(0.0014)*
		0.50	0.9683 *(0.0136)**	0.7240 *(0.0072)***	0.5367 *(0.0039)*
		0.80	1.0000 *(0.0460)**	0.9890 *(0.0225)**	0.7540 *(0.0117)***
	0.005	0.20	0.4039 *(0.0067)*	0.3077 *(0.0055)*	0.2795 *(0.0065)*
		0.50	0.9913 *(0.0450)**	0.8249 *(0.0205)**	0.6207 *(0.0154)*
		0.80	1.0000 *(0.1126)*	0.9971 *(0.0608)***	0.8599 *(0.0340)**
	0.01	0.20	0.4595 *(0.0131)*	0.3362 *(0.0120)*	0.2975 *(0.0106)*
		0.50	0.9947 *(0.0655)***	0.8724 *(0.0362)**	0.6497 *(0.0273)*
		0.80	1.0000 *(0.1637)*	0.9986 *(0.0935)*	0.9069 *(0.0556)***

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A11

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.07, p=5 and NV=5

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0240 *(0.0000)*	0.0225 *(0.0000)*	0.0206 *(0.0000)*
		0.50	0.2544 *(0.0000)*	0.1889 *(0.0000)*	0.1697 *(0.0000)*
		0.80	0.4698 *(0.0000)*	0.3174 *(0.0000)*	0.2080 *(0.0000)*
	0.005	0.20	0.0622 *(0.0000)*	0.0508 *(0.0000)*	0.0450 *(0.0000)*
		0.50	0.3393 *(0.0000)*	0.2278 *(0.0000)*	0.1911 *(0.0000)*
		0.80	0.5631 *(0.0000)*	0.3793 *(0.0000)*	0.2464 *(0.0000)*
	0.01	0.20	0.0846 *(0.0000)*	0.0752 *(0.0000)*	0.0652 *(0.0000)*
		0.50	0.3805 *(0.0000)*	0.2532 *(0.0000)*	0.1987 *(0.0000)*
		0.80	0.6112 *(0.0000)*	0.4084 *(0.0000)*	0.2791 *(0.0000)*
250	0.001	0.20	0.0993 *(0.0000)*	0.0838 *(0.0000)*	0.0732 *(0.0000)*
		0.50	0.5168 *(0.0000)*	0.3374 *(0.0000)*	0.2130 *(0.0000)*
		0.80	0.8063 *(0.0000)**	0.5346 *(0.0000)*	0.3780 *(0.0000)*
	0.005	0.20	0.1646 *(0.0000)*	0.1316 *(0.0000)*	0.1111 *(0.0000)*
		0.50	0.6152 *(0.0000)*	0.3999 *(0.0000)*	0.2601 *(0.0000)*
		0.80	0.8868 *(0.0000)**	0.6082 *(0.0000)*	0.4094 *(0.0000)*
	0.01	0.20	0.2037 *(0.0000)*	0.1535 *(0.0000)*	0.1346 *(0.0000)*
		0.50	0.6714 *(0.0000)*	0.4325 *(0.0000)*	0.2947 *(0.0000)*
		0.80	0.9220 *(0.0000)**	0.6474 *(0.0000)*	0.4386 *(0.0000)*
500	0.001	0.20	0.2169 *(0.0000)*	0.1685 *(0.0000)*	0.1486 *(0.0000)*
		0.50	0.7864 *(0.0000)***	0.4944 *(0.0000)*	0.3522 *(0.0000)*
		0.80	0.9889 *(0.0000)**	0.7502 *(0.0000)***	0.5158 *(0.0000)*
	0.005	0.20	0.3014 *(0.0000)*	0.2083 *(0.0000)*	0.1788 *(0.0000)*
		0.50	0.8715 *(0.0000)**	0.5803 *(0.0000)*	0.3944 *(0.0000)*
		0.80	0.9971 *(0.0000)**	0.8281 *(0.0000)**	0.5822 *(0.0000)*
	0.01	0.20	0.3428 *(0.0000)*	0.2318 *(0.0000)*	0.1883 *(0.0000)*
		0.50	0.9072 *(0.0000)**	0.6196 *(0.0000)*	0.4128 *(0.0000)*
		0.80	0.9991 *(0.0000)**	0.8660 *(0.0000)**	0.6119 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A12

Power and (*Type I error*) for: F-statistic, “unlike” correlation=0.07, p=6 and NV=1

“Like” correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.0284 *(0.0016)*	0.0310 *(0.0007)*	0.0308 *(0.0009)*
	0.001	0.50	0.5690 *(0.0008)*	0.5822 *(0.0012)*	0.5754 *(0.0010)*
		0.80	0.9868 *(0.0014)**	0.9870 *(0.0018)**	0.9902 *(0.0021)**
		0.20	0.0756 *(0.0058)*	0.0802 *(0.0044)*	0.0830 *(0.0042)*
100	0.005	0.50	0.7504 *(0.0054)***	0.7652 *(0.0058)***	0.7450 *(0.0037)***
		0.80	0.9978 *(0.0079)**	0.9980 *(0.0067)**	0.9974 *(0.0056)**
		0.20	0.1204 *(0.0089)*	0.1152 *(0.0090)*	0.1254 *(0.0087)*
	0.01	0.50	0.8226 *(0.0121)**	0.8218 *(0.0102)**	0.8174 *(0.0101)**
		0.80	0.9994 *(0.0138)**	0.9968 *(0.0137)**	0.9990 *(0.0120)**
		0.20	0.1378 *(0.0008)*	0.1438 *(0.0009)*	0.1410 *(0.0005)*
	0.001	0.50	0.9868 *(0.0020)**	0.9894 *(0.0014)**	0.9894 *(0.0016)**
		0.80	1.0000 *(0.0029)**	1.0000 *(0.0026)**	1.0000 *(0.0027)**
		0.20	0.2760 *(0.0052)*	0.2742 *(0.0051)*	0.2948 *(0.0050)*
250	0.005	0.50	0.9960 *(0.0078)**	0.9966 *(0.0064)**	0.9970 *(0.0062)**
		0.80	1.0000 *(0.0121)**	1.0000 *(0.0112)**	1.0000 *(0.0098)**
		0.20	0.3756 *(0.0097)*	0.3668 *(0.0094)*	0.3646 *(0.0086)*
	0.01	0.50	0.9984 *(0.0148)**	0.9990 *(0.0140)**	0.9988 *(0.0114)**
		0.80	1.0000 *(0.0209)**	1.0000 *(0.0177)**	1.0000 *(0.0168)**
		0.20	0.4558 *(0.0007)*	0.4466 *(0.0010)*	0.4444 *(0.0007)*
	0.001	0.50	1.0000 *(0.0030)**	1.0000 *(0.0033)**	1.0000 *(0.0025)**
		0.80	1.0000 *(0.0057)**	1.0000 *(0.0055)**	1.0000 *(0.0059)**
		0.20	0.6328 *(0.0065)*	0.6334 *(0.0055)*	0.6492 *(0.0045)*
500	0.005	0.50	1.0000 *(0.0100)**	1.0000 *(0.0113)**	1.0000 *(0.0080)**
		0.80	1.0000 *(0.0219)**	1.0000 *(0.0189)**	1.0000 *(0.0178)**
		0.20	0.7148 *(0.0115)***	0.7296 *(0.0109)***	0.7118 *(0.0090)***
	0.01	0.50	1.0000 *(0.0193)**	1.0000 *(0.0184)**	1.0000 *(0.0145)**
		0.80	1.0000 *(0.0345)**	1.0000 *(0.0302)**	1.0000 *(0.0268)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A13

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.07, p=6 and NV=3

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0280 *(0.0011)*	0.0250 *(0.0011)*	0.0223 *(0.0012)*
		0.50	0.3414 *(0.0016)*	0.2830 *(0.0011)*	0.2671 *(0.0011)*
		0.80	0.6564 *(0.0039)*	0.4594 *(0.0019)*	0.3397 *(0.0019)*
	0.005	0.20	0.0672 *(0.0051)*	0.0639 *(0.0049)*	0.0571 *(0.0048)*
		0.50	0.4543 *(0.0077)*	0.3419 *(0.0053)*	0.3061 *(0.0055)*
		0.80	0.7623 *(0.0163)***	0.5646 *(0.0097)*	0.3788 *(0.0083)*
	0.01	0.20	0.1031 *(0.0106)*	0.0883 *(0.0083)*	0.0786 *(0.0089)*
		0.50	0.5130 *(0.0142)*	0.3711 *(0.0115)*	0.3179 *(0.0108)*
		0.80	0.8192 *(0.0278)**	0.6057 *(0.0163)*	0.4217 *(0.0155)*
250	0.001	0.20	0.1149 *(0.0014)*	0.1004 *(0.0012)*	0.0959 *(0.0012)*
		0.50	0.7134 *(0.0040)***	0.4898 *(0.0023)*	0.3458 *(0.0025)*
		0.80	0.9836 *(0.0155)**	0.7691 *(0.0087)***	0.5912 *(0.0053)*
	0.005	0.20	0.2046 *(0.0055)*	0.1775 *(0.0049)*	0.1670 *(0.0045)*
		0.50	0.8219 *(0.0173)**	0.5980 *(0.0097)*	0.3969 *(0.0072)*
		0.80	0.9959 *(0.0453)**	0.8756 *(0.0251)**	0.6516 *(0.0165)*
	0.01	0.20	0.2511 *(0.0123)*	0.2204 *(0.0091)*	0.1905 *(0.0093)*
		0.50	0.8711 *(0.0342)**	0.6388 *(0.0210)*	0.4437 *(0.0146)*
		0.80	0.9976 *(0.0665)***	0.9119 *(0.0403)**	0.6786 *(0.0244)*
500	0.001	0.20	0.2846 *(0.0016)*	0.2435 *(0.0015)*	0.2256 *(0.0011)*
		0.50	0.9698 *(0.0139)**	0.7261 *(0.0055)***	0.5373 *(0.0027)*
		0.80	0.9999 *(0.0432)**	0.9888 *(0.0205)**	0.7569 *(0.0117)***
	0.005	0.20	0.3957 *(0.0083)*	0.3077 *(0.0061)*	0.2790 *(0.0048)*
		0.50	0.9901 *(0.0427)**	0.8317 *(0.0222)**	0.6213 *(0.0137)*
		0.80	1.0000 *(0.1008)*	0.9975 *(0.0541)***	0.8707 *(0.0316)**
	0.01	0.20	0.4561 *(0.0125)*	0.3341 *(0.0115)*	0.2989 *(0.0106)*
		0.50	0.9959 *(0.0643)***	0.8748 *(0.0369)**	0.6492 *(0.0224)*
		0.80	1.0000 *(0.1439)*	0.9987 *(0.0805)*	0.9082 *(0.0469)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A14

Power and (*Type I error*) for: F-statistic, “unlike” correlation=0.07, p=6 and NV=6

“Like” correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0245 *(0.0000)*	0.0214 *(0.0000)*	0.0183 *(0.0000)*
		0.50	0.2238 *(0.0000)*	0.1596 *(0.0000)*	0.1462 *(0.0000)*
		0.80	0.4103 *(0.0000)*	0.2721 *(0.0000)*	0.1749 *(0.0000)*
	0.005	0.20	0.0578 *(0.0000)*	0.0495 *(0.0000)*	0.0404 *(0.0000)*
		0.50	0.2968 *(0.0000)*	0.1948 *(0.0000)*	0.1615 *(0.0000)*
		0.80	0.4973 *(0.0000)*	0.3262 *(0.0000)*	0.2125 *(0.0000)*
	0.01	0.20	0.0824 *(0.0000)*	0.0695 *(0.0000)*	0.0551 *(0.0000)*
		0.50	0.3398 *(0.0000)*	0.2193 *(0.0000)*	0.1664 *(0.0000)*
		0.80	0.5399 *(0.0000)*	0.3520 *(0.0000)*	0.2412 *(0.0000)*
250	0.001	0.20	0.0912 *(0.0000)*	0.0763 *(0.0000)*	0.0626 *(0.0000)*
		0.50	0.4565 *(0.0000)*	0.2901 *(0.0000)*	0.1800 *(0.0000)*
		0.80	0.7189 *(0.0000)***	0.4609 *(0.0000)*	0.3215 *(0.0000)*
	0.005	0.20	0.1496 *(0.0000)*	0.1167 *(0.0000)*	0.0997 *(0.0000)*
		0.50	0.5490 *(0.0000)*	0.3423 *(0.0000)*	0.2245 *(0.0000)*
		0.80	0.8044 *(0.0000)**	0.5232 *(0.0000)*	0.3478 *(0.0000)*
	0.01	0.20	0.1823 *(0.0000)*	0.1339 *(0.0000)*	0.1164 *(0.0000)*
		0.50	0.5951 *(0.0000)*	0.3740 *(0.0000)*	0.2565 *(0.0000)*
		0.80	0.8473 *(0.0000)**	0.5667 *(0.0000)*	0.3735 *(0.0000)*
500	0.001	0.20	0.1946 *(0.0000)*	0.1462 *(0.0000)*	0.1295 *(0.0000)*
		0.50	0.7004 *(0.0000)***	0.4303 *(0.0000)*	0.3020 *(0.0000)*
		0.80	0.9515 *(0.0000)**	0.6522 *(0.0000)*	0.4420 *(0.0000)*
	0.005	0.20	0.2706 *(0.0000)*	0.1781 *(0.0000)*	0.1521 *(0.0000)*
		0.50	0.7939 *(0.0000)***	0.5004 *(0.0000)*	0.3329 *(0.0000)*
		0.80	0.9842 *(0.0000)**	0.7330 *(0.0000)***	0.4958 *(0.0000)*
	0.01	0.20	0.3085 *(0.0000)*	0.1994 *(0.0000)*	0.1595 *(0.0000)*
		0.50	0.8374 *(0.0000)**	0.5384 *(0.0000)*	0.3511 *(0.0000)*
		0.80	0.9917 *(0.0000)**	0.7713 *(0.0000)***	0.5249 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A15

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.07, p=7 and NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.0320 *(0.0009)*	0.0318 *(0.0008)*	0.0292 *(0.0008)*
	0.001	0.50	0.5590 *(0.0010)*	0.5782 *(0.0008)*	0.5948 *(0.0012)*
		0.80	0.9894 *(0.0015)**	0.9916 *(0.0017)**	0.9914 *(0.0016)**
		0.20	0.0802 *(0.0048)*	0.0778 *(0.0046)*	0.0814 *(0.0046)*
100	0.005	0.50	0.7490 *(0.0060)***	0.7422 *(0.0054)***	0.7464 *(0.0043)***
		0.80	0.9976 *(0.0073)**	0.9982 *(0.0070)**	0.9976 *(0.0053)**
		0.20	0.1242 *(0.0091)*	0.1194 *(0.0088)*	0.1186 *(0.0081)*
	0.01	0.50	0.8220 *(0.0112)**	0.8166 *(0.0103)**	0.8244 *(0.0078)**
		0.80	0.9994 *(0.0144)**	0.9996 *(0.0119)**	0.9988 *(0.0109)**
		0.20	0.1386 *(0.0009)*	0.1466 *(0.0012)*	0.1352 *(0.0009)*
	0.001	0.50	0.9886 *(0.0019)**	0.9884 *(0.0020)**	0.9878 *(0.0019)**
		0.80	1.0000 *(0.0031)**	1.0000 *(0.0030)**	1.0000 *(0.0027)**
		0.20	0.2770 *(0.0051)*	0.2736 *(0.0044)*	0.2768 *(0.0041)*
250	0.005	0.50	0.9970 *(0.0085)**	0.9980 *(0.0067)**	0.9966 *(0.0060)**
		0.80	1.0000 *(0.0124)**	1.0000 *(0.0115)**	1.0000 *(0.0092)**
		0.20	0.3664 *(0.0107)*	0.3638 *(0.0088)*	0.3570 *(0.0077)*
	0.01	0.50	0.9990 *(0.0147)**	0.9990 *(0.0127)**	0.9976 *(0.0123)**
		0.80	1.0000 *(0.0209)**	1.0000 *(0.0179)**	1.0000 *(0.0161)**
		0.20	0.4646 *(0.0010)*	0.4454 *(0.0013)*	0.4456 *(0.0012)*
	0.001	0.50	1.0000 *(0.0029)**	1.0000 *(0.0026)**	1.0000 *(0.0023)**
		0.80	1.0000 *(0.0062)**	1.0000 *(0.0058)**	1.0000 *(0.0057)**
		0.20	0.6304 *(0.0050)*	0.6260 *(0.0052)*	0.6224 *(0.0046)*
500	0.005	0.50	1.0000 *(0.0105)**	1.0000 *(0.0100)**	1.0000 *(0.0095)**
		0.80	1.0000 *(0.0206)**	1.0000 *(0.0178)**	1.0000 *(0.0159)**
		0.20	0.7234 *(0.0106)***	0.7174 *(0.0093)***	0.7158 *(0.0088)***
	0.01	0.50	1.0000 *(0.0185)**	1.0000 *(0.0160)**	1.0000 *(0.0135)**
		0.80	1.0000 *(0.0341)**	1.0000 *(0.0283)**	1.0000 *(0.0230)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A16

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.07, p=7 and NV=3

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0277 *(0.0009)*	0.0251 *(0.0009)*	0.0255 *(0.0009)*
		0.50	0.3453 *(0.0016)*	0.2851 *(0.0014)*	0.2685 *(0.0013)*
		0.80	0.6575 *(0.0036)*	0.4659 *(0.0022)*	0.3396 *(0.0014)*
	0.005	0.20	0.0687 *(0.0051)*	0.0627 *(0.0047)*	0.0562 *(0.0049)*
		0.50	0.4558 *(0.0075)*	0.3371 *(0.0059)*	0.3051 *(0.0046)*
		0.80	0.7714 *(0.0156)***	0.5609 *(0.0102)*	0.3785 *(0.0068)*
	0.01	0.20	0.1037 *(0.0103)*	0.0908 *(0.0098)*	0.0811 *(0.0077)*
		0.50	0.5124 *(0.0128)*	0.3741 *(0.0119)*	0.3193 *(0.0087)*
		0.80	0.8233 *(0.0279)**	0.6129 *(0.0174)*	0.4187 *(0.0132)*
250	0.001	0.20	0.1131 *(0.0010)*	0.1028 *(0.0009)*	0.0918 *(0.0010)*
		0.50	0.7130 *(0.0052)***	0.4916 *(0.0027)*	0.3436 *(0.0018)*
		0.80	0.9847 *(0.0141)**	0.7727 *(0.0070)***	0.5917 *(0.0044)*
	0.005	0.20	0.2049 *(0.0052)*	0.1790 *(0.0047)*	0.1585 *(0.0037)*
		0.50	0.8160 *(0.0174)**	0.5993 *(0.0107)*	0.3971 *(0.0064)*
		0.80	0.9950 *(0.0437)**	0.8754 *(0.0239)**	0.6517 *(0.0128)*
	0.01	0.20	0.2533 *(0.0097)*	0.2177 *(0.0109)*	0.1944 *(0.0099)*
		0.50	0.8661 *(0.0308)**	0.6391 *(0.0195)*	0.4451 *(0.0141)*
		0.80	0.9980 *(0.0672)***	0.9154 *(0.0385)**	0.6770 *(0.0241)*
500	0.001	0.20	0.2887 *(0.0014)*	0.2423 *(0.0010)*	0.2243 *(0.0011)*
		0.50	0.9695 *(0.0138)**	0.7220 *(0.0061)***	0.5349 *(0.0032)*
		0.80	1.0000 *(0.0438)**	0.9879 *(0.0194)**	0.7594 *(0.0097)***
	0.005	0.20	0.3994 *(0.0073)*	0.3089 *(0.0060)*	0.2787 *(0.0055)*
		0.50	0.9926 *(0.0401)**	0.8255 *(0.0215)**	0.6203 *(0.0126)*
		0.80	1.0000 *(0.0938)*	0.9977 *(0.0498)**	0.8647 *(0.0286)**
	0.01	0.20	0.4619 *(0.0138)*	0.3430 *(0.0127)*	0.2967 *(0.0104)*
		0.50	0.9962 *(0.0604)***	0.8779 *(0.0335)**	0.6483 *(0.0216)*
		0.80	1.0000 *(0.1303)*	0.9991 *(0.0707)*	0.9036 *(0.0436)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A17

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.07, p=7 and NV=5

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0253 *(0.0012)*	0.0220 *(0.0012)*	0.0192 *(0.0009)*
		0.50	0.2530 *(0.0020)*	0.1877 *(0.0015)*	0.1702 *(0.0011)*
		0.80	0.4700 *(0.0044)*	0.3137 *(0.0027)*	0.2078 *(0.0022)*
	0.005	0.20	0.0604 *(0.0035)*	0.0546 *(0.0060)*	0.0439 *(0.0052)*
		0.50	0.3362 *(0.0109)*	0.2261 *(0.0103)*	0.1910 *(0.0064)*
		0.80	0.5635 *(0.0216)*	0.3805 *(0.0109)*	0.2464 *(0.0092)*
	0.01	0.20	0.0848 *(0.0108)*	0.0730 *(0.0103)*	0.0618 *(0.0086)*
		0.50	0.3790 *(0.0159)*	0.2502 *(0.0133)*	0.1978 *(0.0109)*
		0.80	0.6113 *(0.0367)*	0.4104 *(0.0228)*	0.2808 *(0.0170)*
250	0.001	0.20	0.1018 *(0.0007)*	0.0802 *(0.0011)*	0.0688 *(0.0009)*
		0.50	0.5191 *(0.0063)*	0.3390 *(0.0021)*	0.2128 *(0.0019)*
		0.80	0.8039 *(0.0237)**	0.5347 *(0.0069)*	0.3807 *(0.0050)*
	0.005	0.20	0.1626 *(0.0061)*	0.1312 *(0.0057)*	0.1142 *(0.0043)*
		0.50	0.6151 *(0.0269)*	0.3998 *(0.0126)*	0.2622 *(0.0104)*
		0.80	0.8875 *(0.0763)*	0.6078 *(0.0306)*	0.4103 *(0.0189)*
	0.01	0.20	0.2023 *(0.0120)*	0.1532 *(0.0115)*	0.1347 *(0.0102)*
		0.50	0.6707 *(0.0431)*	0.4307 *(0.0249)*	0.2983 *(0.0174)*
		0.80	0.9228 *(0.1093)*	0.6488 *(0.0503)*	0.4375 *(0.0288)*
500	0.001	0.20	0.2151 *(0.0007)*	0.1663 *(0.0011)*	0.1495 *(0.0013)*
		0.50	0.7860 *(0.0248)***	0.4988 *(0.0080)*	0.3542 *(0.0034)*
		0.80	0.9901 *(0.1006)*	0.7516 *(0.0292)***	0.5135 *(0.0131)*
	0.005	0.20	0.3030 *(0.0085)*	0.2068 *(0.0058)*	0.1778 *(0.0081)*
		0.50	0.8736 *(0.0719)*	0.5786 *(0.0272)*	0.3944 *(0.0154)*
		0.80	0.9976 *(0.1953)*	0.8266 *(0.0731)*	0.5826 *(0.0399)*
	0.01	0.20	0.3460 *(0.0144)*	0.2311 *(0.0127)*	0.1876 *(0.0116)*
		0.50	0.9097 *(0.1102)*	0.6210 *(0.0440)*	0.4155 *(0.0285)*
		0.80	0.9988 *(0.2583)*	0.8670 *(0.1107)*	0.6162 *(0.0606)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A18

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.07, p=7 and NV=7

"Like" correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.0246 *(0.0000)*	0.0219 *(0.0000)*	0.0162 *(0.0000)*
	0.001	0.50	0.2008 *(0.0000)*	0.1407 *(0.0000)*	0.1278 *(0.0000)*
		0.80	0.3662 *(0.0000)*	0.2407 *(0.0000)*	0.1504 *(0.0000)*
		0.20	0.0578 *(0.0000)*	0.0482 *(0.0000)*	0.0368 *(0.0000)*
100	0.005	0.50	0.2698 *(0.0000)*	0.1730 *(0.0000)*	0.1393 *(0.0000)*
		0.80	0.4462 *(0.0000)*	0.2840 *(0.0000)*	0.1853 *(0.0000)*
		0.20	0.0774 *(0.0000)*	0.0635 *(0.0000)*	0.0523 *(0.0000)*
	0.01	0.50	0.3043 *(0.0000)*	0.1949 *(0.0000)*	0.1453 *(0.0000)*
		0.80	0.4855 *(0.0000)*	0.3093 *(0.0000)*	0.2095 *(0.0000)*
		0.20	0.0867 *(0.0000)*	0.0682 *(0.0000)*	0.0574 *(0.0000)*
	0.001	0.50	0.4078 *(0.0000)*	0.2570 *(0.0000)*	0.1569 *(0.0000)*
		0.80	0.6439 *(0.0000)*	0.4027 *(0.0000)*	0.2774 *(0.0000)*
		0.20	0.1381 *(0.0000)*	0.1053 *(0.0000)*	0.0895 *(0.0000)*
250	0.005	0.50	0.4923 *(0.0000)*	0.3010 *(0.0000)*	0.1967 *(0.0000)*
		0.80	0.7351 *(0.0000)***	0.4613 *(0.0000)*	0.3017 *(0.0000)*
		0.20	0.1671 *(0.0000)*	0.1196 *(0.0000)*	0.1030 *(0.0000)*
	0.01	0.50	0.5394 *(0.0000)*	0.3300 *(0.0000)*	0.2247 *(0.0000)*
		0.80	0.7788 *(0.0000)***	0.4993 *(0.0000)*	0.3283 *(0.0000)*
		0.20	0.1771 *(0.0000)*	0.1285 *(0.0000)*	0.1128 *(0.0000)*
	0.001	0.50	0.6306 *(0.0000)*	0.3794 *(0.0000)*	0.2638 *(0.0000)*
		0.80	0.8893 *(0.0000)**	0.5725 *(0.0000)*	0.3877 *(0.0000)*
		0.20	0.2422 *(0.0000)*	0.1579 *(0.0000)*	0.1317 *(0.0000)*
500	0.005	0.50	0.7236 *(0.0000)***	0.4419 *(0.0000)*	0.2892 *(0.0000)*
		0.80	0.9507 *(0.0000)**	0.6527 *(0.0000)*	0.4302 *(0.0000)*
		0.20	0.2828 *(0.0000)*	0.1763 *(0.0000)*	0.1375 *(0.0000)*
	0.01	0.50	0.7711 *(0.0000)***	0.4767 *(0.0000)*	0.3061 *(0.0000)*
		0.80	0.9675 *(0.0000)**	0.6923 *(0.0000)*	0.4617 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A19

Power and (*Type I error*) for: F-statistic, “unlike” correlation=0.07, p=8 and NV=1

“Like” correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0300 *(0.0009)*	0.0288 *(0.0011)*	0.0280 *(0.0008)*
		0.50	0.5764 *(0.0012)*	0.5828 *(0.0011)*	0.5868 *(0.0012)*
		0.80	0.9918 *(0.0017)**	0.9866 *(0.0016)**	0.9872 *(0.0015)**
	0.005	0.20	0.0778 *(0.0051)*	0.0798 *(0.0043)*	0.0796 *(0.0041)*
		0.50	0.7602 *(0.0061)***	0.7594 *(0.0047)***	0.7566 *(0.0050)***
		0.80	0.9974 *(0.0074)**	0.9974 *(0.0073)**	0.9980 *(0.0055)**
	0.01	0.20	0.1252 *(0.0100)*	0.1178 *(0.0087)*	0.1194 *(0.0071)*
		0.50	0.8278 *(0.0113)**	0.8270 *(0.0110)**	0.8306 *(0.0089)**
		0.80	0.9990 *(0.0139)**	0.9994 *(0.0126)**	0.9990 *(0.0102)**
250	0.001	0.20	0.1402 *(0.0009)*	0.1420 *(0.0012)*	0.1540 *(0.0008)*
		0.50	0.9876 *(0.0016)**	0.9896 *(0.0017)**	0.9890 *(0.0015)**
		0.80	1.0000 *(0.0035)**	1.0000 *(0.0027)**	1.0000 *(0.0025)**
	0.005	0.20	0.2892 *(0.0046)*	0.2890 *(0.0043)*	0.2816 *(0.0037)*
		0.50	0.9968 *(0.0081)**	0.9960 *(0.0073)**	0.9966 *(0.0059)**
		0.80	1.0000 *(0.0121)**	1.0000 *(0.0107)**	1.0000 *(0.0078)**
	0.01	0.20	0.3684 *(0.0107)*	0.3656 *(0.0089)*	0.3772 *(0.0079)*
		0.50	0.9974 *(0.0141)**	0.9980 *(0.0131)**	0.9990 *(0.0102)**
		0.80	1.0000 *(0.0209)**	1.0000 *(0.0181)**	1.0000 *(0.0147)**
500	0.001	0.20	0.4564 *(0.0015)*	0.4408 *(0.0009)*	0.4396 *(0.0009)*
		0.50	1.0000 *(0.0029)**	1.0000 *(0.0029)**	1.0000 *(0.0023)**
		0.80	1.0000 *(0.0070)**	1.0000 *(0.0057)**	1.0000 *(0.0042)**
	0.005	0.20	0.6390 *(0.0051)*	0.6428 *(0.0052)*	0.6258 *(0.0044)*
		0.50	1.0000 *(0.0110)**	1.0000 *(0.0089)**	1.0000 *(0.0083)**
		0.80	1.0000 *(0.0217)**	1.0000 *(0.0167)**	1.0000 *(0.0130)**
	0.01	0.20	0.7134 *(0.0104)***	0.7144 *(0.0098)***	0.7262 *(0.0083)***
		0.50	1.0000 *(0.0185)**	1.0000 *(0.0164)**	1.0000 *(0.0135)**
		0.80	1.0000 *(0.0343)**	1.0000 *(0.0285)**	1.0000 *(0.0218)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A20

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.07, p=8 and NV=4

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0262 *(0.0011)*	0.0238 *(0.0013)*	0.0200 *(0.0012)*
		0.50	0.2870 *(0.0013)*	0.2270 *(0.0018)*	0.2078 *(0.0008)*
		0.80	0.5444 *(0.0047)*	0.3699 *(0.0031)*	0.2580 *(0.0022)*
	0.005	0.20	0.0639 *(0.0058)*	0.0592 *(0.0053)*	0.0486 *(0.0043)*
		0.50	0.3832 *(0.0085)*	0.2699 *(0.0070)*	0.2354 *(0.0056)*
		0.80	0.6439 *(0.0162)*	0.4515 *(0.0113)*	0.2969 *(0.0074)*
	0.01	0.20	0.0948 *(0.0106)*	0.0817 *(0.0101)*	0.0697 *(0.0093)*
		0.50	0.4377 *(0.0155)*	0.2988 *(0.0117)*	0.2442 *(0.0095)*
		0.80	0.7020 *(0.0317)***	0.4899 *(0.0202)*	0.3341 *(0.0138)*
250	0.001	0.20	0.1079 *(0.0011)*	0.0954 *(0.0012)*	0.0795 *(0.0011)*
		0.50	0.5982 *(0.0056)*	0.4001 *(0.0028)*	0.2619 *(0.0015)*
		0.80	0.9074 *(0.0204)**	0.6342 *(0.0085)*	0.4647 *(0.0039)*
	0.005	0.20	0.1817 *(0.0065)*	0.1501 *(0.0050)*	0.1312 *(0.0047)*
		0.50	0.7119 *(0.0200)***	0.4770 *(0.0110)*	0.3147 *(0.0084)*
		0.80	0.9642 *(0.0539)***	0.7231 *(0.0257)***	0.5032 *(0.0132)*
	0.01	0.20	0.2271 *(0.0112)*	0.1790 *(0.0108)*	0.1564 *(0.0091)*
		0.50	0.7589 *(0.0364)***	0.5132 *(0.0192)*	0.3563 *(0.0142)*
		0.80	0.9786 *(0.0851)*	0.7611 *(0.0407)***	0.5306 *(0.0252)*
500	0.001	0.20	0.2476 *(0.0016)*	0.1993 *(0.0015)*	0.1792 *(0.0014)*
		0.50	0.8844 *(0.0198)**	0.5874 *(0.0065)*	0.4264 *(0.0029)*
		0.80	0.9992 *(0.0617)***	0.8715 *(0.0227)**	0.6148 *(0.0091)*
	0.005	0.20	0.3437 *(0.0081)*	0.2452 *(0.0067)*	0.2190 *(0.0053)*
		0.50	0.9487 *(0.0525)***	0.6863 *(0.0238)*	0.4841 *(0.0114)*
		0.80	1.0000 *(0.1286)*	0.9432 *(0.0561)***	0.7023 *(0.0323)***
	0.01	0.20	0.3979 *(0.0159)*	0.2721 *(0.0137)*	0.2302 *(0.0092)*
		0.50	0.9680 *(0.0783)*	0.7304 *(0.0373)***	0.5053 *(0.0219)*
		0.80	1.0000 *(0.1716)*	0.9657 *(0.0795)*	0.7360 *(0.0461)***

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A21

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.07, p=8 and NV=6

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0252 *(0.0015)*	0.0215 *(0.0011)*	0.0181 *(0.0008)*
		0.50	0.2232 *(0.0013)*	0.1615 *(0.0017)*	0.1468 *(0.0014)*
		0.80	0.4106 *(0.0062)*	0.2733 *(0.0026)*	0.1754 *(0.0026)*
	0.005	0.20	0.0595 *(0.0046)*	0.0497 *(0.0044)*	0.0405 *(0.0042)*
		0.50	0.2982 *(0.0114)*	0.1961 *(0.0064)*	0.1602 *(0.0064)*
		0.80	0.4984 *(0.0216)*	0.3233 *(0.0114)*	0.2106 *(0.0085)*
	0.01	0.20	0.0819 *(0.0117)*	0.0675 *(0.0099)*	0.0574 *(0.0103)*
		0.50	0.3385 *(0.0218)*	0.2203 *(0.0146)*	0.1669 *(0.0119)*
		0.80	0.5445 *(0.0387)*	0.3542 *(0.0227)*	0.2436 *(0.0154)*
250	0.001	0.20	0.0919 *(0.0006)*	0.0758 *(0.0006)*	0.0644 *(0.0009)*
		0.50	0.4587 *(0.0055)*	0.2925 *(0.0027)*	0.1812 *(0.0019)*
		0.80	0.7146 *(0.0267)***	0.4591 *(0.0097)*	0.3209 *(0.0049)*
	0.005	0.20	0.1521 *(0.0068)*	0.1159 *(0.0066)*	0.0986 *(0.0051)*
		0.50	0.5517 *(0.0252)*	0.3425 *(0.0128)*	0.2248 *(0.0097)*
		0.80	0.8097 *(0.0825)*	0.5272 *(0.0323)*	0.3466 *(0.0181)*
	0.01	0.20	0.1843 *(0.0137)*	0.1371 *(0.0100)*	0.1149 *(0.0127)*
		0.50	0.6007 *(0.0507)*	0.3732 *(0.0258)*	0.2565 *(0.0158)*
		0.80	0.8513 *(0.1247)*	0.5636 *(0.0548)*	0.3748 *(0.0281)*
500	0.001	0.20	0.1961 *(0.0017)*	0.1458 *(0.0009)*	0.1281 *(0.0011)*
		0.50	0.7039 *(0.0239)***	0.4290 *(0.0069)*	0.3031 *(0.0053)*
		0.80	0.9534 *(0.1163)*	0.6519 *(0.0287)*	0.4436 *(0.0153)*
	0.005	0.20	0.2703 *(0.0104)*	0.1787 *(0.0071)*	0.1511 *(0.0056)*
		0.50	0.7966 *(0.0849)*	0.4991 *(0.0292)*	0.3334 *(0.0165)*
		0.80	0.9851 *(0.2285)*	0.7329 *(0.0838)*	0.4954 *(0.0393)*
	0.01	0.20	0.3129 *(0.0182)*	0.2025 *(0.0133)*	0.1607 *(0.0120)*
		0.50	0.8433 *(0.1247)*	0.5385 *(0.0511)*	0.3514 *(0.0277)*
		0.80	0.9916 *(0.2905)*	0.7724 *(0.1186)*	0.5261 *(0.0606)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A22

Power and (*Type I error*) for: F-statistic, "unlike" correlation=0.07, p=8 and NV=8

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.001	0.20	0.0231 *(0.0000)*	0.0199 *(0.0000)*	0.0156 *(0.0000)*
		0.50	0.1830 *(0.0000)*	0.1251 *(0.0000)*	0.1131 *(0.0000)*
		0.80	0.3312 *(0.0000)*	0.2182 *(0.0000)*	0.1335 *(0.0000)*
	0.005	0.20	0.0550 *(0.0000)*	0.0449 *(0.0000)*	0.0352 *(0.0000)*
		0.50	0.2448 *(0.0000)*	0.1549 *(0.0000)*	0.1227 *(0.0000)*
		0.80	0.4032 *(0.0000)*	0.2547 *(0.0000)*	0.1664 *(0.0000)*
	0.01	0.20	0.0742 *(0.0000)*	0.0581 *(0.0000)*	0.0479 *(0.0000)*
		0.50	0.2813 *(0.0000)*	0.1751 *(0.0000)*	0.1271 *(0.0000)*
		0.80	0.4419 *(0.0000)*	0.2767 *(0.0000)*	0.1881 *(0.0000)*
250	0.001	0.20	0.0809 *(0.0000)*	0.0644 *(0.0000)*	0.0513 *(0.0000)*
		0.50	0.3724 *(0.0000)*	0.2290 *(0.0000)*	0.1374 *(0.0000)*
		0.80	0.5872 *(0.0000)*	0.3599 *(0.0000)*	0.2443 *(0.0000)*
	0.005	0.20	0.1276 *(0.0000)*	0.0952 *(0.0000)*	0.0792 *(0.0000)*
		0.50	0.4491 *(0.0000)*	0.2676 *(0.0000)*	0.1768 *(0.0000)*
		0.80	0.6718 *(0.0000)*	0.4118 *(0.0000)*	0.2668 *(0.0000)*
	0.01	0.20	0.1566 *(0.0000)*	0.1108 *(0.0000)*	0.0931 *(0.0000)*
		0.50	0.4930 *(0.0000)*	0.2961 *(0.0000)*	0.2000 *(0.0000)*
		0.80	0.7154 *(0.0000)***	0.4494 *(0.0000)*	0.2913 *(0.0000)*
500	0.001	0.20	0.1629 *(0.0000)*	0.1147 *(0.0000)*	0.1006 *(0.0000)*
		0.50	0.5741 *(0.0000)*	0.3411 *(0.0000)*	0.2325 *(0.0000)*
		0.80	0.8271 *(0.0000)**	0.5136 *(0.0000)*	0.3438 *(0.0000)*
	0.005	0.20	0.2250 *(0.0000)*	0.1412 *(0.0000)*	0.1158 *(0.0000)*
		0.50	0.6664 *(0.0000)*	0.3949 *(0.0000)*	0.2547 *(0.0000)*
		0.80	0.9015 *(0.0000)**	0.5848 *(0.0000)*	0.3812 *(0.0000)*
	0.01	0.20	0.2560 *(0.0000)*	0.1605 *(0.0000)*	0.1224 *(0.0000)*
		0.50	0.7095 *(0.0000)***	0.4281 *(0.0000)*	0.2735 *(0.0000)*
		0.80	0.9279 *(0.0000)**	0.6249 *(0.0000)*	0.4095 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A23

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.07, p=2, NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.6688 *(0.3130)*	0.6756 *(0.3302)*	0.6598 *(0.3266)*
	0.005	0.50	0.9942 *(0.3324)*	0.9942 *(0.3298)*	0.9924 *(0.3332)*
		0.80	1.0000 *(0.3518)*	1.0000 *(0.3622)*	1.0000 *(0.3490)*
		0.20	0.5088 *(0.1624)*	0.4964 *(0.1578)*	0.5042 *(0.1594)*
100	0.01	0.50	0.9828 *(0.1826)*	0.9830 *(0.1616)*	0.9830 *(0.1738)*
		0.80	1.0000 *(0.1896)*	1.0000 *(0.1786)*	1.0000 *(0.1814)*
		0.20	0.0364 *(0.0016)*	0.0370 *(0.0024)*	0.0394 *(0.0014)*
	0.05	0.50	0.6174 *(0.0024)*	0.6212 *(0.0026)*	0.6162 *(0.0018)*
		0.80	0.9904 *(0.0016)**	0.9932 *(0.0014)**	0.9916 *(0.0024)**
		0.20	0.7524 *(0.1176)*	0.7378 *(0.1128)*	0.7480 *(0.1166)*
	0.005	0.50	0.9998 *(0.1426)*	0.9996 *(0.1428)*	0.9998 *(0.1430)*
		0.80	1.0000 *(0.1650)*	1.0000 *(0.1834)*	1.0000 *(0.1798)*
		0.20	0.4954 *(0.0248)*	0.4998 *(0.0282)*	0.5050 *(0.0270)*
250	0.01	0.50	0.9994 *(0.0356)**	0.9998 *(0.0368)**	0.9990 *(0.0364)**
		0.80	1.0000 *(0.0472)**	1.0000 *(0.0486)**	1.0000 *(0.0500)**
		0.20	0.0016 *(0.0000)*	0.0024 *(0.0000)*	0.0020 *(0.0000)*
	0.05	0.50	0.6858 *(0.0000)*	0.6792 *(0.0000)*	0.6886 *(0.0000)*
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**
		0.20	0.8128 *(0.0242)**	0.8224 *(0.0300)**	0.8210 *(0.0250)**
	0.005	0.50	1.0000 *(0.0496)**	1.0000 *(0.0516)***	1.0000 *(0.0480)**
		0.80	1.0000 *(0.0814)*	1.0000 *(0.0856)*	1.0000 *(0.0800)*
		0.20	0.5000 *(0.0016)*	0.4992 *(0.0026)*	0.4888 *(0.0016)*
500	0.01	0.50	1.0000 *(0.0044)**	1.0000 *(0.0054)**	1.0000 *(0.0040)**
		0.80	1.0000 *(0.0114)**	1.0000 *(0.0074)**	1.0000 *(0.0094)**
		0.20	0.0000 *(0.0000)*	0.0002 *(0.0000)*	0.0000 *(0.0000)*
	0.05	0.50	0.7472 *(0.0000)***	0.7382 *(0.0000)***	0.7418 *(0.0000)***
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A24

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=2, NV=2

"Like" correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.5839 *(0.0000)*	0.5136 *(0.0000)*	0.4670 *(0.0000)*
	0.005	0.50	0.9625 *(0.0000)**	0.8960 *(0.0000)**	0.7717 *(0.0000)***
		0.80	0.9994 *(0.0000)**	0.9931 *(0.0000)**	0.9462 *(0.0000)**
		0.20	0.4323 *(0.0000)*	0.3809 *(0.0000)*	0.3419 *(0.0000)*
100	0.01	0.50	0.9138 *(0.0000)**	0.8027 *(0.0000)**	0.6400 *(0.0000)*
		0.80	0.9979 *(0.0000)**	0.9758 *(0.0000)**	0.8853 *(0.0000)**
		0.20	0.0346 *(0.0000)*	0.0352 *(0.0000)*	0.0325 *(0.0000)*
	0.05	0.50	0.4549 *(0.0000)*	0.3990 *(0.0000)*	0.3820 *(0.0000)*
		0.80	0.8585 *(0.0000)**	0.6317 *(0.0000)*	0.5091 *(0.0000)*
		0.20	0.6173 *(0.0000)*	0.5169 *(0.0000)*	0.4491 *(0.0000)*
	0.005	0.50	0.9974 *(0.0000)**	0.9736 *(0.0000)**	0.8719 *(0.0000)**
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	0.9946 *(0.0000)**
		0.20	0.4031 *(0.0000)*	0.3445 *(0.0000)*	0.3220 *(0.0000)*
250	0.01	0.50	0.9844 *(0.0000)**	0.9056 *(0.0000)**	0.6970 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9990 *(0.0000)**	0.9707 *(0.0000)**
		0.20	0.0021 *(0.0000)*	0.0032 *(0.0000)*	0.0029 *(0.0000)*
	0.05	0.50	0.4588 *(0.0000)*	0.4224 *(0.0000)*	0.4035 *(0.0000)*
		0.80	0.9493 *(0.0000)**	0.6630 *(0.0000)*	0.5008 *(0.0000)*
		0.20	0.6648 *(0.0000)*	0.5306 *(0.0000)*	0.4604 *(0.0000)*
	0.005	0.50	1.0000 *(0.0000)**	0.9974 *(0.0000)**	0.9423 *(0.0000)**
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	0.9998 *(0.0000)**
		0.20	0.3861 *(0.0000)*	0.3412 *(0.0000)*	0.3241 *(0.0000)*
500	0.01	0.50	0.9990 *(0.0000)**	0.9677 *(0.0000)**	0.7531 *(0.0000)***
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	0.9970 *(0.0000)**
		0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
	0.05	0.50	0.4638 *(0.0000)*	0.4465 *(0.0000)*	0.4287 *(0.0000)*
		0.80	0.9890 *(0.0000)**	0.6897 *(0.0000)*	0.5001 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A25

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.07, p=3, NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.6666 *(0.3190)*	0.6722 *(0.3193)*	0.6714 *(0.2998)*
	0.005	0.50	0.9938 *(0.3263)*	0.9942 *(0.3134)*	0.9948 *(0.2951)*
		0.80	1.0000 *(0.3467)*	1.0000 *(0.3304)*	1.0000 *(0.3120)*
		0.20	0.4982 *(0.1624)*	0.4964 *(0.1538)*	0.4904 *(0.1463)*
100	0.01	0.50	0.9842 *(0.1699)*	0.9836 *(0.1614)*	0.9820 *(0.1479)*
		0.80	1.0000 *(0.1825)*	1.0000 *(0.1724)*	1.0000 *(0.1646)*
		0.20	0.0364 *(0.0015)*	0.0412 *(0.0012)*	0.0336 *(0.0013)*
	0.05	0.50	0.6132 *(0.0023)*	0.6240 *(0.0018)*	0.6250 *(0.0024)*
		0.80	0.9924 *(0.0022)**	0.9934 *(0.0031)**	0.9926 *(0.0027)**
		0.20	0.7430 *(0.1170)*	0.7486 *(0.1132)*	0.7506 *(0.1060)*
	0.005	0.50	1.0000 *(0.1327)*	0.9998 *(0.1248)*	0.9998 *(0.1238)*
		0.80	1.0000 *(0.1617)*	1.0000 *(0.1522)*	1.0000 *(0.1458)*
		0.20	0.5010 *(0.0281)*	0.4858 *(0.0268)*	0.4918 *(0.0241)*
250	0.01	0.50	0.9990 *(0.0398)**	0.9988 *(0.0342)**	0.9996 *(0.0328)**
		0.80	1.0000 *(0.0513)***	1.0000 *(0.0474)**	1.0000 *(0.0442)**
		0.20	0.0012 *(0.0000)*	0.0014 *(0.0000)*	0.0016 *(0.0000)*
	0.05	0.50	0.6728 *(0.0000)*	0.6794 *(0.0000)*	0.6792 *(0.0000)*
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**
		0.20	0.8158 *(0.0264)**	0.6492 *(0.0050)*	0.8122 *(0.0270)**
	0.005	0.50	1.0000 *(0.0478)**	1.0000 *(0.0124)**	1.0000 *(0.0377)**
		0.80	1.0000 *(0.0738)*	1.0000 *(0.0212)**	1.0000 *(0.0644)***
		0.20	0.5010 *(0.0016)*	0.7244 *(0.0109)***	0.5112 *(0.0017)*
500	0.01	0.50	1.0000 *(0.0046)**	1.0000 *(0.0199)**	1.0000 *(0.0057)**
		0.80	1.0000 *(0.0101)**	1.0000 *(0.0391)**	1.0000 *(0.0087)**
		0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
	0.05	0.50	0.7450 *(0.0000)***	0.7462 *(0.0000)***	0.7492 *(0.0000)***
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A26

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.03, p=3, NV=2

"Like" correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.5877 *(0.3302)*	0.5198 *(0.3206)*	0.4698 *(0.3412)*
	0.005	0.50	0.9623 *(0.3648)*	0.8967 *(0.3402)*	0.7719 *(0.3324)*
		0.80	0.9993 *(0.4028)*	0.9927 *(0.3886)*	0.9477 *(0.3670)*
		0.20	0.4259 *(0.1704)*	0.3760 *(0.1588)*	0.3440 *(0.1660)*
100	0.01	0.50	0.9185 *(0.1920)*	0.8027 *(0.1786)*	0.6420 *(0.1794)*
		0.80	0.9981 *(0.2244)*	0.9765 *(0.2122)*	0.8870 *(0.1984)*
		0.20	0.0368 *(0.0004)*	0.0342 *(0.0016)*	0.0311 *(0.0020)*
	0.05	0.50	0.4546 *(0.0016)*	0.3997 *(0.0020)*	0.3827 *(0.0018)*
		0.80	0.8581 *(0.0040)**	0.6344 *(0.0022)*	0.5079 *(0.0024)*
		0.20	0.6268 *(0.1268)*	0.5208 *(0.1142)*	0.4495 *(0.1182)*
	0.005	0.50	0.9978 *(0.1794)*	0.9767 *(0.1556)*	0.8700 *(0.1518)*
		0.80	1.0000 *(0.2638)*	0.9998 *(0.2228)*	0.9941 *(0.1974)*
		0.20	0.3940 *(0.0278)*	0.3554 *(0.0266)*	0.3265 *(0.0266)*
250	0.01	0.50	0.9840 *(0.0554)***	0.9029 *(0.0488)**	0.6958 *(0.0436)*
		0.80	1.0000 *(0.1032)*	0.9995 *(0.0752)*	0.9717 *(0.0636)***
		0.20	0.0024 *(0.0000)*	0.0021 *(0.0000)*	0.0020 *(0.0000)*
	0.05	0.50	0.4560 *(0.0000)*	0.4214 *(0.0000)*	0.4045 *(0.0000)*
		0.80	0.9515 *(0.0000)**	0.6633 *(0.0000)*	0.5011 *(0.0000)*
		0.20	0.6609 *(0.0282)*	0.4132 *(0.0070)*	0.4626 *(0.0300)*
	0.005	0.50	1.0000 *(0.0906)*	0.9875 *(0.0214)**	0.9461 *(0.0630)***
		0.80	1.0000 *(0.1722)*	1.0000 *(0.0452)**	0.9998 *(0.1076)*
		0.20	0.3866 *(0.0026)*	0.4646 *(0.0136)*	0.3231 *(0.0012)*
500	0.01	0.50	0.9990 *(0.0104)**	0.9933 *(0.0328)**	0.7489 *(0.0058)***
		0.80	1.0000 *(0.0300)**	1.0000 *(0.0820)*	0.9966 *(0.0156)**
		0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0001 *(0.0000)*
	0.05	0.50	0.4603 *(0.0000)*	0.4405 *(0.0000)*	0.4290 *(0.0000)*
		0.80	0.9891 *(0.0000)**	0.8854 *(0.0000)**	0.5001 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A27

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.07, p=3, NV=3

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.5271 *(0.0000)*	0.4495 *(0.0000)*	0.3890 *(0.0000)*
		0.50	0.9053 *(0.0000)**	0.7616 *(0.0000)***	0.6104 *(0.0000)*
		0.80	0.9923 *(0.0000)**	0.9314 *(0.0000)**	0.7822 *(0.0000)***
	0.01	0.20	0.3768 *(0.0000)*	0.3112 *(0.0000)*	0.2677 *(0.0000)*
		0.50	0.8253 *(0.0000)**	0.6443 *(0.0000)*	0.4933 *(0.0000)*
		0.80	0.9771 *(0.0000)**	0.8603 *(0.0000)**	0.6801 *(0.0000)*
	0.05	0.20	0.0338 *(0.0000)*	0.0295 *(0.0000)*	0.0292 *(0.0000)*
		0.50	0.3641 *(0.0000)*	0.2979 *(0.0000)*	0.2775 *(0.0000)*
		0.80	0.6809 *(0.0000)*	0.4892 *(0.0000)*	0.3461 *(0.0000)*
250	0.005	0.20	0.5375 *(0.0000)*	0.4027 *(0.0000)*	0.3254 *(0.0000)*
		0.50	0.9813 *(0.0000)**	0.8551 *(0.0000)**	0.6593 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9911 *(0.0000)**	0.8833 *(0.0000)**
	0.01	0.20	0.3386 *(0.0000)*	0.2725 *(0.0000)*	0.2427 *(0.0000)*
		0.50	0.9245 *(0.0000)**	0.7054 *(0.0000)***	0.5221 *(0.0000)*
		0.80	0.9994 *(0.0000)**	0.9547 *(0.0000)**	0.7343 *(0.0000)***
	0.05	0.20	0.0015 *(0.0000)*	0.0025 *(0.0000)*	0.0018 *(0.0000)*
		0.50	0.3427 *(0.0000)*	0.3031 *(0.0000)*	0.2873 *(0.0000)*
		0.80	0.7241 *(0.0000)***	0.5020 *(0.0000)*	0.3345 *(0.0000)*
500	0.005	0.20	0.5513 *(0.0000)*	0.3079 *(0.0000)*	0.3250 *(0.0000)*
		0.50	0.9983 *(0.0000)**	0.8299 *(0.0000)**	0.6975 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9983 *(0.0000)**	0.9509 *(0.0000)**
	0.01	0.20	0.3127 *(0.0000)*	0.3411 *(0.0000)*	0.2381 *(0.0000)*
		0.50	0.9776 *(0.0000)**	0.8728 *(0.0000)**	0.5602 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9979 *(0.0000)**	0.7857 *(0.0000)***
	0.05	0.20	0.0001 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.3329 *(0.0000)*	0.3212 *(0.0000)*	0.3005 *(0.0000)*
		0.80	0.7621 *(0.0000)***	0.5640 *(0.0000)*	0.3334 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A28

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.07, p=4, NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.6700 *(0.3271)*	0.6718 *(0.3044)*	0.6736 *(0.2897)*
	0.005	0.50	0.9930 *(0.3264)*	0.9932 *(0.3143)*	0.9942 *(0.2887)*
		0.80	1.0000 *(0.3397)*	1.0000 *(0.3185)*	1.0000 *(0.2937)*
		0.20	0.5004 *(0.1530)*	0.5006 *(0.1478)*	0.4986 *(0.1355)*
100	0.01	0.50	0.9838 *(0.1642)*	0.9834 *(0.1499)*	0.9818 *(0.1456)*
		0.80	1.0000 *(0.1779)*	1.0000 *(0.1627)*	1.0000 *(0.1474)*
		0.20	0.0414 *(0.0015)*	0.0380 *(0.0013)*	0.0354 *(0.0013)*
	0.05	0.50	0.6314 *(0.0022)*	0.6136 *(0.0019)*	0.6220 *(0.0019)*
		0.80	0.9918 *(0.0027)**	0.9882 *(0.0026)**	0.9938 *(0.0025)**
		0.20	0.7562 *(0.1118)*	0.7354 *(0.1100)*	0.7464 *(0.1021)*
	0.005	0.50	1.0000 *(0.1332)*	1.0000 *(0.1237)*	1.0000 *(0.1066)*
		0.80	1.0000 *(0.1529)*	1.0000 *(0.1414)*	1.0000 *(0.1266)*
		0.20	0.4974 *(0.0267)*	0.5050 *(0.0253)*	0.5068 *(0.0232)*
250	0.01	0.50	0.9998 *(0.0326)**	0.9992 *(0.0330)**	0.9998 *(0.0314)**
		0.80	1.0000 *(0.0491)**	1.0000 *(0.0440)**	1.0000 *(0.0372)**
		0.20	0.0022 *(0.0000)*	0.0016 *(0.0000)*	0.0018 *(0.0000)*
	0.05	0.50	0.6774 *(0.0000)*	0.6742 *(0.0000)*	0.6622 *(0.0000)*
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**
		0.20	0.8254 *(0.0281)**	0.8316 *(0.0279)**	0.8164 *(0.0240)**
	0.005	0.50	1.0000 *(0.0452)**	1.0000 *(0.0403)**	1.0000 *(0.0381)**
		0.80	1.0000 *(0.0705)*	1.0000 *(0.0648)***	1.0000 *(0.0583)***
		0.20	0.4816 *(0.0020)*	0.5090 *(0.0019)*	0.4968 *(0.0013)*
500	0.01	0.50	1.0000 *(0.0051)**	1.0000 *(0.0039)**	1.0000 *(0.0038)**
		0.80	1.0000 *(0.0089)**	1.0000 *(0.0089)**	1.0000 *(0.0077)**
		0.20	0.0002 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
	0.05	0.50	0.7294 *(0.0000)***	0.7452 *(0.0000)***	0.7394 *(0.0000)***
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A29

Power and (*Type I error*) for: Partial R-square criterion, “unlike” corr.=0.07, p=4, NV=3

“Like” correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.5263 *(0.3456)*	0.4503 *(0.3264)*	0.3921 *(0.3274)*
	0.005	0.50	0.9053 *(0.3814)*	0.7585 *(0.3566)*	0.6081 *(0.3378)*
		0.80	0.9922 *(0.4352)*	0.9304 *(0.3974)*	0.7846 *(0.3694)*
		0.20	0.3783 *(0.1676)*	0.3101 *(0.1636)*	0.2665 *(0.1678)*
100	0.01	0.50	0.8300 *(0.2048)*	0.6471 *(0.1818)*	0.4885 *(0.1808)*
		0.80	0.9791 *(0.2620)*	0.8635 *(0.2210)*	0.6817 *(0.2058)*
		0.20	0.0342 *(0.0014)*	0.0316 *(0.0020)*	0.0279 *(0.0014)*
	0.05	0.50	0.3647 *(0.0026)*	0.2967 *(0.0016)*	0.2765 *(0.0020)*
		0.80	0.6846 *(0.0048)*	0.4839 *(0.0024)*	0.3472 *(0.0026)*
		0.20	0.5285 *(0.1272)*	0.4015 *(0.1246)*	0.3265 *(0.1148)*
	0.005	0.50	0.9810 *(0.2200)*	0.8586 *(0.1794)*	0.6587 *(0.1630)*
		0.80	0.9999 *(0.3510)*	0.9906 *(0.2606)*	0.8829 *(0.2172)*
		0.20	0.3405 *(0.0296)*	0.2755 *(0.0300)*	0.2436 *(0.0264)*
250	0.01	0.50	0.9221 *(0.0724)*	0.7058 *(0.0498)***	0.5235 *(0.0376)*
		0.80	0.9991 *(0.1332)*	0.9556 *(0.0942)*	0.7390 *(0.0668)***
		0.20	0.0015 *(0.0000)*	0.0015 *(0.0000)*	0.0018 *(0.0000)*
	0.05	0.50	0.3464 *(0.0000)*	0.3014 *(0.0000)*	0.2868 *(0.0000)*
		0.80	0.7266 *(0.0000)***	0.5043 *(0.0000)*	0.3349 *(0.0000)*
		0.20	0.5551 *(0.0370)*	0.4013 *(0.0326)*	0.3247 *(0.0310)*
	0.005	0.50	0.9983 *(0.1350)*	0.9271 *(0.0830)*	0.7013 *(0.0658)***
		0.80	1.0000 *(0.2772)*	0.9996 *(0.1628)*	0.9513 *(0.1230)*
		0.20	0.3136 *(0.0018)*	0.2628 *(0.0014)*	0.2417 *(0.0020)*
500	0.01	0.50	0.9782 *(0.0188)**	0.7487 *(0.0104)***	0.5649 *(0.0064)*
		0.80	0.9999 *(0.0622)***	0.9909 *(0.0308)**	0.7844 *(0.0212)***
		0.20	0.0001 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
	0.05	0.50	0.3343 *(0.0000)*	0.3128 *(0.0000)*	0.3028 *(0.0000)*
		0.80	0.7570 *(0.0000)***	0.5356 *(0.0000)*	0.3335 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A30

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.07, p=4, NV=4

"Like" correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.4967 *(0.0000)*	0.4066 *(0.0000)*	0.3533 *(0.0000)*
	0.005	0.50	0.8423 *(0.0000)**	0.6575 *(0.0000)*	0.5170 *(0.0000)*
		0.80	0.9712 *(0.0000)**	0.8412 *(0.0000)**	0.6635 *(0.0000)*
		0.20	0.3424 *(0.0000)*	0.2674 *(0.0000)*	0.2273 *(0.0000)*
100	0.01	0.50	0.7408 *(0.0000)***	0.5399 *(0.0000)*	0.3969 *(0.0000)*
		0.80	0.9359 *(0.0000)**	0.7429 *(0.0000)***	0.5502 *(0.0000)*
		0.20	0.0328 *(0.0000)*	0.0310 *(0.0000)*	0.0253 *(0.0000)*
	0.05	0.50	0.3106 *(0.0000)*	0.2359 *(0.0000)*	0.2158 *(0.0000)*
		0.80	0.5731 *(0.0000)*	0.3952 *(0.0000)*	0.2634 *(0.0000)*
		0.20	0.4712 *(0.0000)*	0.3343 *(0.0000)*	0.2616 *(0.0000)*
	0.005	0.50	0.9399 *(0.0000)**	0.7345 *(0.0000)***	0.5346 *(0.0000)*
		0.80	0.9988 *(0.0000)**	0.9338 *(0.0000)**	0.7353 *(0.0000)***
		0.20	0.2996 *(0.0000)*	0.2245 *(0.0000)*	0.1916 *(0.0000)*
250	0.01	0.50	0.8306 *(0.0000)**	0.5820 *(0.0000)*	0.4201 *(0.0000)*
		0.80	0.9903 *(0.0000)**	0.8231 *(0.0000)**	0.5966 *(0.0000)*
		0.20	0.0021 *(0.0000)*	0.0018 *(0.0000)*	0.0016 *(0.0000)*
	0.05	0.50	0.2832 *(0.0000)*	0.2348 *(0.0000)*	0.2256 *(0.0000)*
		0.80	0.6001 *(0.0000)*	0.4108 *(0.0000)*	0.2518 *(0.0000)*
		0.20	0.4846 *(0.0000)*	0.3287 *(0.0000)*	0.2500 *(0.0000)*
	0.005	0.50	0.9852 *(0.0000)**	0.7938 *(0.0000)***	0.5570 *(0.0000)*
		0.80	0.9999 *(0.0000)**	0.9832 *(0.0000)**	0.7948 *(0.0000)***
		0.20	0.2726 *(0.0000)*	0.2099 *(0.0000)*	0.1915 *(0.0000)*
500	0.01	0.50	0.9037 *(0.0000)**	0.6130 *(0.0000)*	0.4455 *(0.0000)*
		0.80	0.9996 *(0.0000)**	0.8896 *(0.0000)**	0.6403 *(0.0000)*
		0.20	0.0000 *(0.0000)*	0.0001 *(0.0000)*	0.0001 *(0.0000)*
	0.05	0.50	0.2615 *(0.0000)*	0.2400 *(0.0000)*	0.2311 *(0.0000)*
		0.80	0.6269 *(0.0000)*	0.4309 *(0.0000)*	0.2502 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A31

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.07, p=5, NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.6788 *(0.3254)*	0.6778 *(0.3029)*	0.6676 *(0.2880)*
	0.005	0.50	0.9948 *(0.3222)*	0.9962 *(0.3152)*	0.9942 *(0.2921)*
		0.80	1.0000 *(0.3361)*	1.0000 *(0.3199)*	1.0000 *(0.2880)*
		0.20	0.5118 *(0.1551)*	0.5182 *(0.1458)*	0.5068 *(0.1301)*
100	0.01	0.50	0.9850 *(0.1645)*	0.9818 *(0.1512)*	0.9826 *(0.1341)*
		0.80	1.0000 *(0.1744)*	1.0000 *(0.1605)*	1.0000 *(0.1391)*
		0.20	0.0402 *(0.0016)*	0.0370 *(0.0017)*	0.0322 *(0.0013)*
	0.05	0.50	0.6312 *(0.0018)*	0.6160 *(0.0024)*	0.6226 *(0.0016)*
		0.80	0.9930 *(0.0029)**	0.9910 *(0.0023)**	0.9892 *(0.0020)**
		0.20	0.7480 *(0.1119)*	0.7520 *(0.1034)*	0.7548 *(0.0917)*
	0.005	0.50	1.0000 *(0.1292)*	1.0000 *(0.1184)*	1.0000 *(0.1029)*
		0.80	1.0000 *(0.1468)*	1.0000 *(0.1324)*	1.0000 *(0.1138)*
		0.20	0.5028 *(0.0250)*	0.4894 *(0.0231)*	0.5094 *(0.0215)*
250	0.01	0.50	0.9994 *(0.0336)**	0.9998 *(0.0310)**	0.9992 *(0.0281)**
		0.80	1.0000 *(0.0455)**	1.0000 *(0.0405)**	1.0000 *(0.0366)**
		0.20	0.0024 *(0.0000)*	0.0026 *(0.0000)*	0.0026 *(0.0000)*
	0.05	0.50	0.6870 *(0.0000)*	0.6828 *(0.0000)*	0.6784 *(0.0000)*
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**
		0.20	0.8236 *(0.0276)**	0.8228 *(0.0255)**	0.8206 *(0.0224)**
	0.005	0.50	1.0000 *(0.0431)**	1.0000 *(0.0375)**	1.0000 *(0.0346)**
		0.80	1.0000 *(0.0654)***	1.0000 *(0.0573)***	1.0000 *(0.0505)***
		0.20	0.4996 *(0.0019)*	0.4952 *(0.0016)*	0.5010 *(0.0013)*
500	0.01	0.50	1.0000 *(0.0038)**	1.0000 *(0.0036)**	1.0000 *(0.0035)**
		0.80	1.0000 *(0.0086)**	1.0000 *(0.0086)**	1.0000 *(0.0070)**
		0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
	0.05	0.50	0.7440 *(0.0000)***	0.7422 *(0.0000)***	0.7388 *(0.0000)***
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A32

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.07, p=5, NV=3

"Like" correlations			0.20	0.40	0.60
n	α	ES			
		0.20	0.5329 *(0.3327)*	0.4465 *(0.3188)*	0.3961 *(0.3007)*
	0.005	0.50	0.9131 *(0.3655)*	0.7606 *(0.3354)*	0.6134 *(0.3125)*
		0.80	0.9927 *(0.4073)*	0.9347 *(0.3631)*	0.7845 *(0.3294)*
		0.20	0.3808 *(0.1689)*	0.3094 *(0.1531)*	0.2680 *(0.1439)*
100	0.01	0.50	0.8287 *(0.1923)*	0.6461 *(0.1722)*	0.4941 *(0.1513)*
		0.80	0.9797 *(0.2474)*	0.8645 *(0.2000)*	0.6809 *(0.1741)*
		0.20	0.0354 *(0.0008)*	0.0291 *(0.0014)*	0.0273 *(0.0013)*
	0.05	0.50	0.3639 *(0.0031)*	0.2951 *(0.0030)*	0.2771 *(0.0021)*
		0.80	0.6876 *(0.0052)*	0.4861 *(0.0027)*	0.3432 *(0.0035)*
		0.20	0.5380 *(0.1256)*	0.4039 *(0.1111)*	0.3307 *(0.0978)*
	0.005	0.50	0.9817 *(0.2053)*	0.8579 *(0.1638)*	0.6591 *(0.1372)*
		0.80	1.0000 *(0.2944)*	0.9921 *(0.2164)*	0.8831 *(0.1713)*
		0.20	0.3385 *(0.0285)*	0.2741 *(0.0259)*	0.2429 *(0.0273)*
250	0.01	0.50	0.9285 *(0.0697)***	0.7105 *(0.0476)***	0.5271 *(0.0371)*
		0.80	0.9991 *(0.1316)*	0.9578 *(0.0861)*	0.7360 *(0.0599)***
		0.20	0.0021 *(0.0000)*	0.0026 *(0.0000)*	0.0019 *(0.0000)*
	0.05	0.50	0.3473 *(0.0000)*	0.3030 *(0.0000)*	0.2911 *(0.0000)*
		0.80	0.7277 *(0.0000)***	0.5077 *(0.0000)*	0.3348 *(0.0000)*
		0.20	0.5590 *(0.0339)*	0.4010 *(0.0276)*	0.3229 *(0.0270)*
	0.005	0.50	0.9988 *(0.1218)*	0.9296 *(0.0799)*	0.6983 *(0.0544)*
		0.80	1.0000 *(0.2355)*	0.9993 *(0.1454)*	0.9478 *(0.1000)*
		0.20	0.3205 *(0.0021)*	0.2589 *(0.0018)*	0.2410 *(0.0015)*
500	0.01	0.50	0.9775 *(0.0200)**	0.7481 *(0.0094)***	0.5633 *(0.0060)*
		0.80	1.0000 *(0.0623)***	0.9911 *(0.0279)**	0.7873 *(0.0160)***
		0.20	0.0001 *(0.0000)*	0.0000 *(0.0000)*	0.0001 *(0.0000)*
	0.05	0.50	0.3367 *(0.0000)*	0.3131 *(0.0000)*	0.3035 *(0.0000)*
		0.80	0.7592 *(0.0000)***	0.5297 *(0.0000)*	0.3335 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A33

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.07, p=5, NV=5

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.4606 *(0.0000)*	0.3804 *(0.0000)*	0.3390 *(0.0000)*
		0.50	0.7786 *(0.0000)***	0.5893 *(0.0000)*	0.4567 *(0.0000)*
		0.80	0.9360 *(0.0000)**	0.7564 *(0.0000)***	0.5808 *(0.0000)*
	0.01	0.20	0.3144 *(0.0000)*	0.2380 *(0.0000)*	0.2030 *(0.0000)*
		0.50	0.6679 *(0.0000)*	0.4672 *(0.0000)*	0.3395 *(0.0000)*
		0.80	0.8699 *(0.0000)**	0.6448 *(0.0000)*	0.4644 *(0.0000)*
	0.05	0.20	0.0324 *(0.0000)*	0.0285 *(0.0000)*	0.0239 *(0.0000)*
		0.50	0.2694 *(0.0000)*	0.1974 *(0.0000)*	0.1762 *(0.0000)*
		0.80	0.4898 *(0.0000)*	0.3334 *(0.0000)*	0.2127 *(0.0000)*
250	0.005	0.20	0.4188 *(0.0000)*	0.2934 *(0.0000)*	0.2220 *(0.0000)*
		0.50	0.8857 *(0.0000)**	0.6350 *(0.0000)*	0.4463 *(0.0000)*
		0.80	0.9915 *(0.0000)**	0.8474 *(0.0000)**	0.6267 *(0.0000)*
	0.01	0.20	0.2653 *(0.0000)*	0.1888 *(0.0000)*	0.1617 *(0.0000)*
		0.50	0.7485 *(0.0000)***	0.4951 *(0.0000)*	0.3465 *(0.0000)*
		0.80	0.9550 *(0.0000)**	0.7162 *(0.0000)***	0.4991 *(0.0000)*
	0.05	0.20	0.0022 *(0.0000)*	0.0022 *(0.0000)*	0.0019 *(0.0000)*
		0.50	0.2396 *(0.0000)*	0.1920 *(0.0000)*	0.1846 *(0.0000)*
		0.80	0.5122 *(0.0000)*	0.3447 *(0.0000)*	0.2018 *(0.0000)*
500	0.005	0.20	0.4236 *(0.0000)*	0.2790 *(0.0000)*	0.2032 *(0.0000)*
		0.50	0.9511 *(0.0000)**	0.6846 *(0.0000)*	0.4678 *(0.0000)*
		0.80	0.9996 *(0.0000)**	0.9186 *(0.0000)**	0.6747 *(0.0000)*
	0.01	0.20	0.2366 *(0.0000)*	0.1754 *(0.0000)*	0.1587 *(0.0000)*
		0.50	0.8084 *(0.0000)**	0.5194 *(0.0000)*	0.3667 *(0.0000)*
		0.80	0.9921 *(0.0000)**	0.7714 *(0.0000)***	0.5363 *(0.0000)*
	0.05	0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.2162 *(0.0000)*	0.1948 *(0.0000)*	0.1896 *(0.0000)*
		0.80	0.5322 *(0.0000)*	0.3564 *(0.0000)*	0.2001 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A34

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.07, p=6, NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.6710 *(0.3171)*	0.6656 *(0.3062)*	0.6808 *(0.2837)*
		0.50	0.9960 *(0.3244)*	0.9922 *(0.3068)*	0.9948 *(0.2900)*
		0.80	1.0000 *(0.3304)*	1.0000 *(0.3112)*	1.0000 *(0.2908)*
	0.01	0.20	0.5108 *(0.1541)*	0.5006 *(0.1477)*	0.5016 *(0.1299)*
		0.50	0.9794 *(0.1646)*	0.9842 *(0.1445)*	0.9854 *(0.1295)*
		0.80	1.0000 *(0.1659)*	1.0000 *(0.1530)*	1.0000 *(0.1329)*
	0.05	0.20	0.0404 *(0.0016)*	0.0360 *(0.0014)*	0.0404 *(0.0010)*
		0.50	0.6290 *(0.0016)*	0.6302 *(0.0014)*	0.6166 *(0.0018)*
		0.80	0.9938 *(0.0030)**	0.9908 *(0.0033)**	0.9926 *(0.0022)**
250	0.005	0.20	0.7420 *(0.1131)*	0.7370 *(0.1032)*	0.7458 *(0.0938)*
		0.50	1.0000 *(0.1261)*	0.9998 *(0.1118)*	1.0000 *(0.0967)*
		0.80	1.0000 *(0.1422)*	1.0000 *(0.1260)*	1.0000 *(0.1070)*
	0.01	0.20	0.4854 *(0.0246)*	0.4968 *(0.0238)*	0.5096 *(0.0212)*
		0.50	1.0000 *(0.0324)**	0.9996 *(0.0286)**	0.9996 *(0.0253)**
		0.80	1.0000 *(0.0454)**	1.0000 *(0.0408)**	1.0000 *(0.0325)**
	0.05	0.20	0.0024 *(0.0000)*	0.0026 *(0.0000)*	0.0022 *(0.0000)*
		0.50	0.6702 *(0.0000)*	0.6982 *(0.0000)*	0.6834 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9996 *(0.0000)**	1.0000 *(0.0000)**
500	0.005	0.20	0.8166 *(0.0280)**	0.8256 *(0.0250)**	0.8196 *(0.0224)**
		0.50	1.0000 *(0.0436)**	1.0000 *(0.0372)**	1.0000 *(0.0299)**
		0.80	1.0000 *(0.0630)***	1.0000 *(0.0540)***	1.0000 *(0.0457)**
	0.01	0.20	0.4948 *(0.0017)*	0.4996 *(0.0018)*	0.4990 *(0.0014)*
		0.50	1.0000 *(0.0043)**	1.0000 *(0.0034)**	1.0000 *(0.0041)**
		0.80	1.0000 *(0.0094)**	1.0000 *(0.0092)**	1.0000 *(0.0075)**
	0.05	0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.7512 *(0.0000)***	0.7410 *(0.0000)***	0.7324 *(0.0000)***
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A35

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.07, p=6, NV=3

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.5369 *(0.3266)*	0.4499 *(0.3141)*	0.3935 *(0.2895)*
		0.50	0.9127 *(0.3589)*	0.7650 *(0.3127)*	0.6131 *(0.2986)*
		0.80	0.9934 *(0.3965)*	0.9351 *(0.3381)*	0.7803 *(0.3059)*
	0.01	0.20	0.3795 *(0.1638)*	0.3095 *(0.1515)*	0.2676 *(0.1322)*
		0.50	0.8311 *(0.1893)*	0.6470 *(0.1628)*	0.4949 *(0.1445)*
		0.80	0.9805 *(0.2296)*	0.8638 *(0.1879)*	0.6785 *(0.1613)*
	0.05	0.20	0.0350 *(0.0012)*	0.0344 *(0.0015)*	0.0257 *(0.0016)*
		0.50	0.3657 *(0.0023)*	0.2987 *(0.0017)*	0.2723 *(0.0017)*
		0.80	0.6837 *(0.0051)*	0.4847 *(0.0041)*	0.3443 *(0.0029)*
250	0.005	0.20	0.5360 *(0.1243)*	0.4089 *(0.1145)*	0.3261 *(0.1005)*
		0.50	0.9839 *(0.1989)*	0.8588 *(0.1463)*	0.6669 *(0.1169)*
		0.80	1.0000 *(0.2701)*	0.9917 *(0.1907)*	0.8847 *(0.1443)*
	0.01	0.20	0.3405 *(0.0284)*	0.2717 *(0.0241)*	0.2423 *(0.0225)*
		0.50	0.9256 *(0.0679)***	0.7093 *(0.0414)***	0.5263 *(0.0323)*
		0.80	0.9995 *(0.1177)*	0.9583 *(0.0783)*	0.7395 *(0.0515)***
	0.05	0.20	0.0019 *(0.0000)*	0.0021 *(0.0000)*	0.0017 *(0.0000)*
		0.50	0.3447 *(0.0000)*	0.3047 *(0.0000)*	0.2896 *(0.0000)*
		0.80	0.7298 *(0.0000)***	0.5071 *(0.0000)*	0.3349 *(0.0000)*
500	0.005	0.20	0.5576 *(0.0359)*	0.4015 *(0.0281)*	0.3256 *(0.0256)*
		0.50	0.9985 *(0.1162)*	0.9306 *(0.0695)***	0.7006 *(0.0487)***
		0.80	1.0000 *(0.2139)*	0.9995 *(0.1251)*	0.9514 *(0.0859)*
	0.01	0.20	0.3162 *(0.0018)*	0.2608 *(0.0023)*	0.2368 *(0.0017)*
		0.50	0.9773 *(0.0179)**	0.7505 *(0.0097)***	0.5634 *(0.0053)*
		0.80	1.0000 *(0.0561)***	0.9915 *(0.0292)**	0.7879 *(0.0138)***
	0.05	0.20	0.0001 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.3332 *(0.0000)*	0.3107 *(0.0000)*	0.3023 *(0.0000)*
		0.80	0.7566 *(0.0000)***	0.5270 *(0.0000)*	0.3337 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A36

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.07, p=6, NV=6

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.4308 *(0.0000)*	0.3596 *(0.0000)*	0.3149 *(0.0000)*
		0.50	0.7296 *(0.0000)***	0.5344 *(0.0000)*	0.4183 *(0.0000)*
		0.80	0.8927 *(0.0000)**	0.6812 *(0.0000)*	0.5208 *(0.0000)*
	0.01	0.20	0.2865 *(0.0000)*	0.2182 *(0.0000)*	0.1859 *(0.0000)*
		0.50	0.6075 *(0.0000)*	0.4135 *(0.0000)*	0.2975 *(0.0000)*
		0.80	0.8076 *(0.0000)**	0.5731 *(0.0000)*	0.4040 *(0.0000)*
	0.05	0.20	0.0297 *(0.0000)*	0.0260 *(0.0000)*	0.0216 *(0.0000)*
		0.50	0.2396 *(0.0000)*	0.1672 *(0.0000)*	0.1512 *(0.0000)*
		0.80	0.4317 *(0.0000)*	0.2875 *(0.0000)*	0.1807 *(0.0000)*
250	0.005	0.20	0.3826 *(0.0000)*	0.2605 *(0.0000)*	0.1944 *(0.0000)*
		0.50	0.8209 *(0.0000)**	0.5605 *(0.0000)*	0.3861 *(0.0000)*
		0.80	0.9727 *(0.0000)**	0.7671 *(0.0000)***	0.5466 *(0.0000)*
	0.01	0.20	0.2383 *(0.0000)*	0.1657 *(0.0000)*	0.1378 *(0.0000)*
		0.50	0.6756 *(0.0000)*	0.4293 *(0.0000)*	0.2999 *(0.0000)*
		0.80	0.9065 *(0.0000)**	0.6312 *(0.0000)*	0.4323 *(0.0000)*
	0.05	0.20	0.0022 *(0.0000)*	0.0020 *(0.0000)*	0.0016 *(0.0000)*
		0.50	0.2096 *(0.0000)*	0.1626 *(0.0000)*	0.1555 *(0.0000)*
		0.80	0.4473 *(0.0000)*	0.2966 *(0.0000)*	0.1687 *(0.0000)*
500	0.005	0.20	0.3812 *(0.0000)*	0.2436 *(0.0000)*	0.1720 *(0.0000)*
		0.50	0.8940 *(0.0000)**	0.6024 *(0.0000)*	0.4044 *(0.0000)*
		0.80	0.9961 *(0.0000)**	0.8354 *(0.0000)**	0.5856 *(0.0000)*
	0.01	0.20	0.2140 *(0.0000)*	0.1533 *(0.0000)*	0.1382 *(0.0000)*
		0.50	0.7261 *(0.0000)***	0.4493 *(0.0000)*	0.3114 *(0.0000)*
		0.80	0.9634 *(0.0000)**	0.6710 *(0.0000)*	0.4575 *(0.0000)*
	0.05	0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.1861 *(0.0000)*	0.1635 *(0.0000)*	0.1586 *(0.0000)*
		0.80	0.4612 *(0.0000)*	0.3051 *(0.0000)*	0.1669 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A37

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.07, p=7, NV=1

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.6668 *(0.3206)*	0.6670 *(0.3131)*	0.6778 *(0.2813)*
		0.50	0.9948 *(0.3248)*	0.9932 *(0.3087)*	0.9948 *(0.2802)*
		0.80	1.0000 *(0.3257)*	1.0000 *(0.3090)*	1.0000 *(0.2896)*
	0.01	0.20	0.5088 *(0.1609)*	0.4976 *(0.1439)*	0.5150 *(0.1199)*
		0.50	0.9862 *(0.1646)*	0.9856 *(0.1462)*	0.9818 *(0.1304)*
		0.80	1.0000 *(0.1691)*	1.0000 *(0.1447)*	1.0000 *(0.1312)*
	0.05	0.20	0.0370 *(0.0015)*	0.0350 *(0.0014)*	0.0354 *(0.0014)*
		0.50	0.6252 *(0.0016)*	0.6108 *(0.0017)*	0.6156 *(0.0016)*
		0.80	0.9936 *(0.0028)**	0.9940 *(0.0023)**	0.9906 *(0.0017)**
250	0.005	0.20	0.7434 *(0.1124)*	0.7504 *(0.0986)*	0.7408 *(0.0834)*
		0.50	1.0000 *(0.1251)*	1.0000 *(0.1074)*	1.0000 *(0.0922)*
		0.80	1.0000 *(0.1355)*	1.0000 *(0.1197)*	1.0000 *(0.1039)*
	0.01	0.20	0.4958 *(0.0254)*	0.4976 *(0.0217)*	0.4952 *(0.0178)*
		0.50	0.9994 *(0.0328)**	0.9998 *(0.0279)**	0.9998 *(0.0221)**
		0.80	1.0000 *(0.0424)**	1.0000 *(0.0360)**	1.0000 *(0.0314)**
	0.05	0.20	0.0038 *(0.0000)*	0.0024 *(0.0000)*	0.0026 *(0.0000)*
		0.50	0.6736 *(0.0000)*	0.6748 *(0.0000)*	0.6834 *(0.0000)*
		0.80	1.0000 *(0.0000)**	0.9998 *(0.0000)**	1.0000 *(0.0000)**
500	0.005	0.20	0.8214 *(0.0265)**	0.8190 *(0.0258)**	0.8304 *(0.0213)**
		0.50	1.0000 *(0.0422)**	1.0000 *(0.0343)**	1.0000 *(0.0298)**
		0.80	1.0000 *(0.0628)***	1.0000 *(0.0508)***	1.0000 *(0.0418)**
	0.01	0.20	0.4934 *(0.0014)*	0.4922 *(0.0016)*	0.4982 *(0.0014)*
		0.50	1.0000 *(0.0039)**	1.0000 *(0.0038)**	1.0000 *(0.0031)**
		0.80	1.0000 *(0.0083)**	1.0000 *(0.0078)**	1.0000 *(0.0060)**
	0.05	0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0002 *(0.0000)*
		0.50	0.7308 *(0.0000)***	0.7430 *(0.0000)***	0.7374 *(0.0000)***
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A38

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.07, p=7, NV=3

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.5404 *(0.3299)*	0.4473 *(0.3063)*	0.3866 *(0.2877)*
		0.50	0.9117 *(0.3369)*	0.7616 *(0.3161)*	0.6131 *(0.2922)*
		0.80	0.9938 *(0.3833)*	0.9315 *(0.3252)*	0.7905 *(0.2955)*
	0.01	0.20	0.3783 *(0.1592)*	0.3073 *(0.1472)*	0.2657 *(0.1285)*
		0.50	0.8351 *(0.1859)*	0.6500 *(0.1553)*	0.4937 *(0.1361)*
		0.80	0.9801 *(0.2180)*	0.8656 *(0.1696)*	0.6806 *(0.1390)*
	0.05	0.20	0.0347 *(0.0016)*	0.0298 *(0.0016)*	0.0287 *(0.0011)*
		0.50	0.3630 *(0.0028)*	0.2969 *(0.0023)*	0.2776 *(0.0019)*
		0.80	0.6857 *(0.0059)*	0.4829 *(0.0027)*	0.3444 *(0.0020)*
250	0.005	0.20	0.5328 *(0.1203)*	0.4049 *(0.1018)*	0.3283 *(0.0912)*
		0.50	0.9810 *(0.1768)*	0.8573 *(0.1351)*	0.6605 *(0.1106)*
		0.80	1.0000 *(0.2446)*	0.9902 *(0.1697)*	0.8822 *(0.1351)*
	0.01	0.20	0.3373 *(0.0282)*	0.2708 *(0.0228)*	0.2452 *(0.0195)*
		0.50	0.9269 *(0.0604)***	0.7109 *(0.0419)***	0.5249 *(0.0321)*
		0.80	0.9993 *(0.1072)*	0.9554 *(0.0687)***	0.7372 *(0.0485)***
	0.05	0.20	0.0025 *(0.0000)*	0.0022 *(0.0000)*	0.0021 *(0.0000)*
		0.50	0.3490 *(0.0000)*	0.3047 *(0.0000)*	0.2893 *(0.0000)*
		0.80	0.7302 *(0.0000)***	0.5076 *(0.0000)*	0.3353 *(0.0000)*
500	0.005	0.20	0.5516 *(0.0324)*	0.4003 *(0.0284)*	0.3246 *(0.0231)*
		0.50	0.9989 *(0.1025)*	0.9293 *(0.0622)***	0.7011 *(0.0414)***
		0.80	1.0000 *(0.1915)*	0.9997 *(0.1146)*	0.9535 *(0.0730)*
	0.01	0.20	0.3146 *(0.0016)*	0.2613 *(0.0019)*	0.2401 *(0.0020)*
		0.50	0.9783 *(0.0187)**	0.7501 *(0.0078)***	0.5626 *(0.0051)*
		0.80	1.0000 *(0.0530)***	0.9922 *(0.0260)**	0.7875 *(0.0129)***
	0.05	0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.3340 *(0.0000)*	0.3121 *(0.0000)*	0.3030 *(0.0000)*
		0.80	0.7549 *(0.0000)***	0.5273 *(0.0000)*	0.3334 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A39

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.07, p=7, NV=5

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.4608 *(0.3313)*	0.3793 *(0.3250)*	0.3326 *(0.2970)*
		0.50	0.7856 *(0.3893)*	0.5934 *(0.3392)*	0.4579 *(0.3124)*
		0.80	0.9387 *(0.4527)*	0.7540 *(0.3694)*	0.5839 *(0.3279)*
	0.01	0.20	0.3193 *(0.1675)*	0.2392 *(0.1615)*	0.2023 *(0.1416)*
		0.50	0.6750 *(0.2178)*	0.4722 *(0.1837)*	0.3390 *(0.1562)*
		0.80	0.8764 *(0.2886)*	0.6513 *(0.2107)*	0.4696 *(0.1716)*
	0.05	0.20	0.0320 *(0.0018)*	0.0291 *(0.0015)*	0.0239 *(0.0018)*
		0.50	0.2700 *(0.0026)*	0.1951 *(0.0018)*	0.1776 *(0.0028)*
		0.80	0.4884 *(0.0069)*	0.3324 *(0.0040)*	0.2144 *(0.0043)*
250	0.005	0.20	0.4213 *(0.1315)*	0.2952 *(0.1185)*	0.2252 *(0.1075)*
		0.50	0.8896 *(0.2592)*	0.6400 *(0.1678)*	0.4462 *(0.1380)*
		0.80	0.9928 *(0.3850)*	0.8548 *(0.2470)*	0.6292 *(0.1851)*
	0.01	0.20	0.2642 *(0.0307)*	0.1913 *(0.0258)*	0.1604 *(0.0282)*
		0.50	0.7515 *(0.0915)*	0.4950 *(0.0473)*	0.3491 *(0.0394)*
		0.80	0.9608 *(0.1897)*	0.7190 *(0.0973)*	0.5013 *(0.0620)*
	0.05	0.20	0.0020 *(0.0000)*	0.0028 *(0.0000)*	0.0016 *(0.0000)*
		0.50	0.2395 *(0.0000)*	0.1921 *(0.0000)*	0.1824 *(0.0000)*
		0.80	0.5136 *(0.0001)*	0.3438 *(0.0000)*	0.2026 *(0.0000)*
500	0.005	0.20	0.4262 *(0.0414)*	0.2783 *(0.0337)*	0.2036 *(0.0273)*
		0.50	0.9525 *(0.1841)*	0.6889 *(0.0879)*	0.4680 *(0.0574)*
		0.80	0.9996 *(0.3540)*	0.9188 *(0.1839)*	0.6748 *(0.1158)*
	0.01	0.20	0.2370 *(0.0026)*	0.1766 *(0.0018)*	0.1609 *(0.0014)*
		0.50	0.8106 *(0.0314)**	0.5188 *(0.0112)*	0.3660 *(0.0066)*
		0.80	0.9934 *(0.1203)*	0.7739 *(0.0395)***	0.5364 *(0.0174)*
	0.05	0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0001 *(0.0000)*
		0.50	0.2170 *(0.0000)*	0.1944 *(0.0000)*	0.1879 *(0.0000)*
		0.80	0.5316 *(0.0000)*	0.3602 *(0.0000)*	0.2002 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A40

Power and (*Type I error*) for: Partial R-square criterion, “unlike” corr.=0.07, p=7, NV=7

“Like” correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.4151 *(0.0000)*	0.3494 *(0.0000)*	0.3159 *(0.0000)*
		0.50	0.6815 *(0.0000)*	0.4917 *(0.0000)*	0.3938 *(0.0000)*
		0.80	0.8452 *(0.0000)**	0.6281 *(0.0000)*	0.4757 *(0.0000)*
	0.01	0.20	0.2705 *(0.0000)*	0.2085 *(0.0000)*	0.1759 *(0.0000)*
		0.50	0.5610 *(0.0000)*	0.3752 *(0.0000)*	0.2678 *(0.0000)*
		0.80	0.7497 *(0.0000)***	0.5120 *(0.0000)*	0.3600 *(0.0000)*
	0.05	0.20	0.0291 *(0.0000)*	0.0249 *(0.0000)*	0.0199 *(0.0000)*
		0.50	0.2180 *(0.0000)*	0.1471 *(0.0000)*	0.1296 *(0.0000)*
		0.80	0.3857 *(0.0000)*	0.2505 *(0.0000)*	0.1579 *(0.0000)*
250	0.005	0.20	0.3515 *(0.0000)*	0.2363 *(0.0000)*	0.1759 *(0.0000)*
		0.50	0.7646 *(0.0000)***	0.5042 *(0.0000)*	0.3413 *(0.0000)*
		0.80	0.9413 *(0.0000)**	0.6964 *(0.0000)*	0.4821 *(0.0000)*
	0.01	0.20	0.2185 *(0.0000)*	0.1485 *(0.0000)*	0.1228 *(0.0000)*
		0.50	0.6141 *(0.0000)*	0.3809 *(0.0000)*	0.2609 *(0.0000)*
		0.80	0.8444 *(0.0000)**	0.5611 *(0.0000)*	0.3772 *(0.0000)*
	0.05	0.20	0.0015 *(0.0000)*	0.0017 *(0.0000)*	0.0018 *(0.0000)*
		0.50	0.1879 *(0.0000)*	0.1399 *(0.0000)*	0.1343 *(0.0000)*
		0.80	0.3947 *(0.0000)*	0.2600 *(0.0000)*	0.1452 *(0.0000)*
500	0.005	0.20	0.3447 *(0.0000)*	0.2159 *(0.0000)*	0.1515 *(0.0000)*
		0.50	0.8377 *(0.0000)**	0.5339 *(0.0000)*	0.3533 *(0.0000)*
		0.80	0.9861 *(0.0000)**	0.7539 *(0.0000)***	0.5177 *(0.0000)*
	0.01	0.20	0.1927 *(0.0000)*	0.1342 *(0.0000)*	0.1171 *(0.0000)*
		0.50	0.6572 *(0.0000)*	0.3956 *(0.0000)*	0.2697 *(0.0000)*
		0.80	0.9085 *(0.0000)**	0.5930 *(0.0000)*	0.4008 *(0.0000)*
	0.05	0.20	0.0001 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.1645 *(0.0000)*	0.1408 *(0.0000)*	0.1370 *(0.0000)*
		0.80	0.4051 *(0.0000)*	0.2681 *(0.0000)*	0.1430 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A41

Power and (*Type I error*) for: Partial R-square criterion, “unlike” corr.=0.07, p=8, NV=1

“Like” correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.6680 *(0.3196)*	0.6786 *(0.3031)*	0.6602 *(0.2832)*
		0.50	0.9958 *(0.3204)*	0.9924 *(0.3103)*	0.9938 *(0.2850)*
		0.80	1.0000 *(0.3257)*	1.0000 *(0.3086)*	1.0000 *(0.2839)*
	0.01	0.20	0.5058 *(0.1574)*	0.4994 *(0.1410)*	0.5056 *(0.1237)*
		0.50	0.9832 *(0.1608)*	0.9824 *(0.1433)*	0.9800 *(0.1237)*
		0.80	1.0000 *(0.1679)*	1.0000 *(0.1468)*	1.0000 *(0.1272)*
	0.05	0.20	0.0398 *(0.0017)*	0.0360 *(0.0013)*	0.0396 *(0.0011)*
		0.50	0.6224 *(0.0020)*	0.6132 *(0.0018)*	0.6224 *(0.0015)*
		0.80	0.9918 *(0.0028)**	0.9902 *(0.0026)**	0.9906 *(0.0022)**
250	0.005	0.20	0.7362 *(0.1123)*	0.7372 *(0.1043)*	0.7428 *(0.0842)*
		0.50	1.0000 *(0.1197)*	1.0000 *(0.1030)*	1.0000 *(0.0909)*
		0.80	1.0000 *(0.1374)*	1.0000 *(0.1163)*	1.0000 *(0.1018)*
	0.01	0.20	0.4936 *(0.0236)*	0.5082 *(0.0220)*	0.5014 *(0.0192)*
		0.50	0.9992 *(0.0344)**	0.9990 *(0.0279)**	0.9996 *(0.0232)**
		0.80	1.0000 *(0.0410)**	1.0000 *(0.0344)**	1.0000 *(0.0278)**
	0.05	0.20	0.0018 *(0.0000)*	0.0022 *(0.0000)*	0.0022 *(0.0000)*
		0.50	0.6792 *(0.0000)*	0.6750 *(0.0000)*	0.6718 *(0.0000)*
		0.80	0.9998 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**
500	0.005	0.20	0.8216 *(0.0276)**	0.8166 *(0.0224)**	0.8244 *(0.0198)**
		0.50	1.0000 *(0.0391)**	1.0000 *(0.0335)**	1.0000 *(0.0287)**
		0.80	1.0000 *(0.0583)***	1.0000 *(0.0489)**	1.0000 *(0.0411)**
	0.01	0.20	0.4912 *(0.0013)*	0.4940 *(0.0017)*	0.5002 *(0.0015)*
		0.50	1.0000 *(0.0039)**	1.0000 *(0.0036)**	1.0000 *(0.0028)**
		0.80	1.0000 *(0.0084)**	1.0000 *(0.0077)**	1.0000 *(0.0066)**
	0.05	0.20	0.0000 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.7400 *(0.0000)***	0.7420 *(0.0000)***	0.7470 *(0.0000)***
		0.80	1.0000 *(0.0000)**	1.0000 *(0.0000)**	1.0000 *(0.0000)**

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A42

Power and (*Type I error*) for: Partial R-square criterion, “unlike” corr.=0.07, p=8, NV=4

“Like” correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.4968 *(0.3268)*	0.4056 *(0.3098)*	0.3510 *(0.2918)*
		0.50	0.8497 *(0.3577)*	0.6658 *(0.3210)*	0.5209 *(0.2935)*
		0.80	0.9738 *(0.3949)*	0.8430 *(0.3290)*	0.6604 *(0.3003)*
	0.01	0.20	0.3438 *(0.1635)*	0.2669 *(0.1478)*	0.2321 *(0.1343)*
		0.50	0.7489 *(0.1908)*	0.5410 *(0.1598)*	0.4014 *(0.1408)*
		0.80	0.9388 *(0.2385)*	0.7457 *(0.1826)*	0.5534 *(0.1512)*
	0.05	0.20	0.0350 *(0.0015)*	0.0273 *(0.0013)*	0.0266 *(0.0009)*
		0.50	0.3084 *(0.0020)*	0.2367 *(0.0018)*	0.2152 *(0.0017)*
		0.80	0.5701 *(0.0064)*	0.3921 *(0.0038)*	0.2616 *(0.0026)*
250	0.005	0.20	0.4680 *(0.1230)*	0.3427 *(0.1102)*	0.2644 *(0.0937)*
		0.50	0.9454 *(0.1973)*	0.7375 *(0.1357)*	0.5341 *(0.1112)*
		0.80	0.9990 *(0.2786)*	0.9385 *(0.1807)*	0.7429 *(0.1340)*
	0.01	0.20	0.2958 *(0.0295)*	0.2250 *(0.0269)*	0.1924 *(0.0237)*
		0.50	0.8346 *(0.0690)***	0.5827 *(0.0422)*	0.4210 *(0.0295)*
		0.80	0.9910 *(0.1384)*	0.8323 *(0.0708)*	0.5978 *(0.0451)*
	0.05	0.20	0.0025 *(0.0000)*	0.0023 *(0.0000)*	0.0021 *(0.0000)*
		0.50	0.2819 *(0.0000)*	0.2338 *(0.0000)*	0.2236 *(0.0000)*
		0.80	0.5989 *(0.0000)*	0.4097 *(0.0000)*	0.2524 *(0.0000)*
500	0.005	0.20	0.4808 *(0.0342)*	0.3296 *(0.0285)*	0.2509 *(0.0224)*
		0.50	0.9876 *(0.1285)*	0.7956 *(0.0662)***	0.5634 *(0.0434)*
		0.80	1.0000 *(0.2358)*	0.9845 *(0.1212)*	0.7957 *(0.0805)*
	0.01	0.20	0.2702 *(0.0023)*	0.2121 *(0.0019)*	0.1931 *(0.0016)*
		0.50	0.9043 *(0.0252)**	0.6178 *(0.0094)*	0.4445 *(0.0057)*
		0.80	0.9994 *(0.0824)*	0.8929 *(0.0318)**	0.6389 *(0.0133)*
	0.05	0.20	0.0001 *(0.0000)*	0.0000 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.2620 *(0.0000)*	0.2408 *(0.0000)*	0.2337 *(0.0000)*
		0.80	0.6278 *(0.0000)*	0.4272 *(0.0000)*	0.2502 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A43

Power and (*Type I error*) for: Partial R-square criterion, "unlike" corr.=0.07, p=8, NV=6

"Like" correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.4392 *(0.3286)*	0.3596 *(0.3137)*	0.3224 *(0.3063)*
		0.50	0.7328 *(0.3933)*	0.5380 *(0.3412)*	0.4203 *(0.3125)*
		0.80	0.8934 *(0.4680)*	0.6818 *(0.3783)*	0.5223 *(0.3318)*
	0.01	0.20	0.2947 *(0.1623)*	0.2220 *(0.1585)*	0.1910 *(0.1471)*
		0.50	0.6161 *(0.2301)*	0.4133 *(0.1802)*	0.2984 *(0.1575)*
		0.80	0.8115 *(0.2968)*	0.5748 *(0.2074)*	0.4076 *(0.1824)*
	0.05	0.20	0.0320 *(0.0011)*	0.0256 *(0.0016)*	0.0222 *(0.0017)*
		0.50	0.2392 *(0.0016)*	0.1685 *(0.0013)*	0.1512 *(0.0026)*
		0.80	0.4325 *(0.0074)*	0.2875 *(0.0031)*	0.1802 *(0.0035)*
250	0.005	0.20	0.3850 *(0.1418)*	0.2622 *(0.1196)*	0.1944 *(0.1091)*
		0.50	0.8290 *(0.2697)*	0.5623 *(0.1784)*	0.3863 *(0.1415)*
		0.80	0.9749 *(0.4129)*	0.7689 *(0.2431)*	0.5483 *(0.1863)*
	0.01	0.20	0.2417 *(0.0289)*	0.1679 *(0.0265)*	0.1395 *(0.0245)*
		0.50	0.6786 *(0.1021)*	0.4321 *(0.0560)*	0.2985 *(0.0363)*
		0.80	0.9068 *(0.2061)*	0.6321 *(0.0970)*	0.4310 *(0.0658)*
	0.05	0.20	0.0021 *(0.0000)*	0.0022 *(0.0000)*	0.0018 *(0.0000)*
		0.50	0.2091 *(0.0000)*	0.1620 *(0.0000)*	0.1549 *(0.0000)*
		0.80	0.4462 *(0.0000)*	0.2967 *(0.0000)*	0.1686 *(0.0000)*
500	0.005	0.20	0.3801 *(0.0433)*	0.2448 *(0.0332)*	0.1735 *(0.0273)*
		0.50	0.9006 *(0.2055)*	0.6043 *(0.0893)*	0.4034 *(0.0582)*
		0.80	0.9982 *(0.3909)*	0.8365 *(0.1873)*	0.5879 *(0.1158)*
	0.01	0.20	0.2108 *(0.0028)*	0.1528 *(0.0025)*	0.1340 *(0.0016)*
		0.50	0.7278 *(0.0371)***	0.4513 *(0.0116)*	0.3111 *(0.0086)*
		0.80	0.9647 *(0.1387)*	0.6717 *(0.0395)*	0.4602 *(0.0174)*
	0.05	0.20	0.0000 *(0.0000)*	0.0001 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.1862 *(0.0000)*	0.1638 *(0.0000)*	0.1585 *(0.0000)*
		0.80	0.4611 *(0.0000)*	0.3051 *(0.0000)*	0.1669 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

Table A44

Power and (*Type I error*) for: Partial R-square criterion, “unlike” corr.=0.07, p=8, NV=8

“Like” correlations			0.20	0.40	0.60
n	α	ES			
100	0.005	0.20	0.4027 *(0.0000)*	0.3481 *(0.0000)*	0.3165 *(0.0000)*
		0.50	0.6410 *(0.0000)*	0.4613 *(0.0000)*	0.3772 *(0.0000)*
		0.80	0.7978 *(0.0000)***	0.5812 *(0.0000)*	0.4475 *(0.0000)*
	0.01	0.20	0.2583 *(0.0000)*	0.1972 *(0.0000)*	0.1656 *(0.0000)*
		0.50	0.5188 *(0.0000)*	0.3401 *(0.0000)*	0.2467 *(0.0000)*
		0.80	0.6931 *(0.0000)*	0.4685 *(0.0000)*	0.3283 *(0.0000)*
	0.05	0.20	0.0297 *(0.0000)*	0.0243 *(0.0000)*	0.0197 *(0.0000)*
		0.50	0.1977 *(0.0000)*	0.1327 *(0.0000)*	0.1160 *(0.0000)*
		0.80	0.3489 *(0.0000)*	0.2258 *(0.0000)*	0.1382 *(0.0000)*
250	0.005	0.20	0.3258 *(0.0000)*	0.2183 *(0.0000)*	0.1611 *(0.0000)*
		0.50	0.7120 *(0.0000)***	0.4584 *(0.0000)*	0.3073 *(0.0000)*
		0.80	0.9032 *(0.0000)**	0.6362 *(0.0000)*	0.4329 *(0.0000)*
	0.01	0.20	0.2041 *(0.0000)*	0.1344 *(0.0000)*	0.1084 *(0.0000)*
		0.50	0.5631 *(0.0000)*	0.3436 *(0.0000)*	0.2331 *(0.0000)*
		0.80	0.7817 *(0.0000)***	0.5028 *(0.0000)*	0.3363 *(0.0000)*
	0.05	0.20	0.0023 *(0.0000)*	0.0019 *(0.0000)*	0.0016 *(0.0000)*
		0.50	0.1705 *(0.0000)*	0.1231 *(0.0000)*	0.1183 *(0.0000)*
		0.80	0.3538 *(0.0000)*	0.2319 *(0.0000)*	0.1275 *(0.0000)*
500	0.005	0.20	0.3187 *(0.0000)*	0.1962 *(0.0000)*	0.1332 *(0.0000)*
		0.50	0.7799 *(0.0000)***	0.4822 *(0.0000)*	0.3163 *(0.0000)*
		0.80	0.9639 *(0.0000)**	0.6878 *(0.0000)*	0.4641 *(0.0000)*
	0.01	0.20	0.1803 *(0.0000)*	0.1214 *(0.0000)*	0.1068 *(0.0000)*
		0.50	0.5984 *(0.0000)*	0.3533 *(0.0000)*	0.2374 *(0.0000)*
		0.80	0.8469 *(0.0000)**	0.5317 *(0.0000)*	0.3546 *(0.0000)*
	0.05	0.20	0.0000 *(0.0000)*	0.0001 *(0.0000)*	0.0000 *(0.0000)*
		0.50	0.1479 *(0.0000)*	0.1235 *(0.0000)*	0.1207 *(0.0000)*
		0.80	0.3607 *(0.0000)*	0.2371 *(0.0000)*	0.1252 *(0.0000)*

* Power > 0.80 and Type I Error < 0.05, ** Power > 0.70 and Type I Error < 0.07

APPENDIX B

SAS SIMULATIONS PROGRAM

```
dm log 'clear';
dm output 'clear';

/*
SAS code for SWDA simulations
Raj Chandran
2008
*/

filename logtemp 'C:\Documents and Settings\math\Desktop\My SAS
Files\log_simulation';
proc printto log=logtemp new;
run;

******************** create permanent results data set ***********;
*libname rajc "C:\Users\Pimp D Raj\Desktop\Statistics\results";
*libname rajc "C:\Simulations\Raj";
libname rajc "C:\Documents and Settings\math\Desktop\My SAS Files";
*********************************************************************;

data rajc.results;
      power=0;
      delete;
run;

options nonotes;
options nosource;
options errors=5;
ods listing close;
ods noresults;

data _null_;
      startime=datetime();
      format startime datetime.;
      put startime=;
run;

*************************** main macro ****************************;

%macro temp;

%let n = 100;
      *specify n (n = 50, 100, 500);

%do p = 7 %to 7;                    * begin p loop (p = 1-8);

%let l = .2;                        *specify "like" correlations;
                                    *(l = .2, .4, .6);

%let u = .03;                       *specify "unlike" correlations;
                                    *(u = .03, .07);

%let ys=;
%do i = 1 %to &p;
      %let ys=&ys y&i;
```

```
%end;

/*
%do j = 1 %to 3;
      %if &j = 1 %then %let alpha = .001;             *alpha loop;
      %if &j = 2 %then %let alpha = .005;
      %if &j = 3 %then %let alpha = .01;
*/

%do j = 1 %to 3;
      %if &j = 1 %then %let alpha = .005;             *PR2 loop;
      %if &j = 2 %then %let alpha = .01;
      %if &j = 3 %then %let alpha = .05;

%do meancase = 1 %to 12;            *begin meancase loop;
                                    *For p=2, meancase = 1-6;
                                    *For p=3,4,5,6, meancase = 1-9;
                                    *For p=7,8, meancase = 1-12;

*correctly assigns each corrcase to a meancase;
%if &meancase < 4 %then %let corrcase = 1;
%if (&meancase > 3 & &meancase < 7) %then %let corrcase = 2;
%if (&meancase > 6 & &meancase < 10) %then %let corrcase = 3;
%if &meancase > 9 %then %let corrcase = 4;

proc iml;

start buildpopmean(p,meancase);

/*******************  Effect sizes for p = 2 **********************/

      if (p=2 & meancase = 1) then popmean = {0,0.2};       * NV = 1;

      if (p=2 & meancase = 2) then popmean = {0,0.5};

      if (p=2 & meancase = 3) then popmean = {0,0.8};


      if (p=2 & meancase = 4) then popmean = {0.2,0.2};     * NV = 2;

      if (p=2 & meancase = 5) then popmean = {0.5,0.5};

      if (p=2 & meancase = 6) then popmean = {0.8,0.8};

/*******************  Effect sizes for p = 3 **********************/

      if (p=3 & meancase = 1) then popmean = {0, 0, 0.2};   * NV = 1;

      if (p=3 & meancase = 2) then popmean = {0, 0, 0.5};

      if (p=3 & meancase = 3) then popmean = {0, 0, 0.8};


      if (p=3 & meancase = 4) then popmean = {0, 0.2, 0.2}; * NV = 2;
```

```
if (p=3 & meancase = 5) then popmean = {0, 0.5, 0.5};

if (p=3 & meancase = 6) then popmean = {0, 0.8, 0.8};

if (p=3 & meancase = 7) then popmean = {0.2 ,0.2, 0.2};* NV = 3;

if (p=3 & meancase = 8) then popmean = {0.5, 0.5, 0.5};

if (p=3 & meancase = 9) then popmean = {0.8, 0.8, 0.8};

/********************  Effect sizes for p = 4 *****************/

if (p=4 & meancase = 1) then popmean = {0, 0, 0, 0.2};* NV = 1;

if (p=4 & meancase = 2) then popmean = {0, 0, 0, 0.5};

if (p=4 & meancase = 3) then popmean = {0, 0, 0, 0.8};

* NV = 3;
if (p=4 & meancase = 4) then popmean = {0, 0.2, 0.2, 0.2};

if (p=4 & meancase = 5) then popmean = {0, 0.5, 0.5, 0.5};

if (p=4 & meancase = 6) then popmean = {0, 0.8, 0.8, 0.8};

* NV = 4;
if (p=4 & meancase = 7) then popmean = {0.2, 0.2, 0.2, 0.2};

if (p=4 & meancase = 8) then popmean = {0.5, 0.5, 0.5, 0.5};

if (p=4 & meancase = 9) then popmean = {0.8, 0.8, 0.8, 0.8};

/********************  Effect sizes for p = 5 *****************/
* NV = 1;
if (p=5 & meancase = 1) then popmean = {0, 0, 0, 0, 0.2};

if (p=5 & meancase = 2) then popmean = {0, 0, 0, 0, 0.5};

if (p=5 & meancase = 3) then popmean = {0, 0, 0, 0, 0.8};

* NV = 3;
if (p=5 & meancase = 4) then popmean = {0, 0, 0.2, 0.2, 0.2};

if (p=5 & meancase = 5) then popmean = {0, 0, 0.5, 0.5, 0.5};

if (p=5 & meancase = 6) then popmean = {0, 0, 0.8, 0.8, 0.8};

* NV = 5;
if (p=5 & meancase = 7) then popmean = {0.2, 0.2, 0.2, 0.2, 0.2};

if (p=5 & meancase = 8) then popmean = {0.5, 0.5, 0.5, 0.5, 0.5};

if (p=5 & meancase = 9) then popmean = {0.8, 0.8, 0.8, 0.8, 0.8};
```

```
/******************  Effect sizes for p = 6 ******************/
* NV = 1;
if (p=6 & meancase = 1) then popmean = {0, 0, 0, 0, 0, 0.2};

if (p=6 & meancase = 2) then popmean = {0, 0, 0, 0, 0, 0.5};

if (p=6 & meancase = 3) then popmean = {0, 0, 0, 0, 0, 0.8};

* NV = 3;
if (p=6 & meancase = 4) then popmean = {0, 0, 0, 0.2, 0.2, 0.2};

if (p=6 & meancase = 5) then popmean = {0, 0, 0, 0.5, 0.5, 0.5};

if (p=6 & meancase = 6) then popmean = {0, 0, 0, 0.8, 0.8, 0.8};

* NV = 6;
if (p=6 & meancase = 7) then popmean = {0.2, 0.2, 0.2, 0.2, 0.2,
0.2};

if (p=6 & meancase = 8) then popmean = {0.5, 0.5, 0.5, 0.5, 0.5,
0.5};

if (p=6 & meancase = 9) then popmean = {0.8, 0.8, 0.8, 0.8, 0.8,
0.8};

/********************  Effect sizes for p = 7 *****************/
* NV = 1;
if (p=7 & meancase = 1) then popmean = {0, 0, 0, 0, 0, 0, 0.2};

if (p=7 & meancase = 2) then popmean = {0, 0, 0, 0, 0, 0, 0.5};

if (p=7 & meancase = 3) then popmean = {0, 0, 0, 0, 0, 0, 0.8};

* NV = 3;
if (p=7 & meancase = 4) then popmean = {0, 0, 0, 0, 0.2, 0.2,
0.2};

if (p=7 & meancase = 5) then popmean = {0, 0, 0, 0, 0.5, 0.5,
0.5};

if (p=7 & meancase = 6) then popmean = {0, 0, 0, 0, 0.8, 0.8,
0.8};

* NV = 5;
if (p=7 & meancase = 7) then popmean = {0, 0, 0.2, 0.2, 0.2, 0.2,
0.2};

if (p=7 & meancase = 8) then popmean = {0, 0, 0.5, 0.5, 0.5, 0.5,
0.5};

if (p=7 & meancase = 9) then popmean = {0, 0, 0.8, 0.8, 0.8, 0.8,
0.8};
```

```
      * NV = 7;
      if (p=7 & meancase = 10) then popmean = {0.2, 0.2, 0.2, 0.2, 0.2,
0.2, 0.2};

      if (p=7 & meancase = 11) then popmean = {0.5, 0.5, 0.5, 0.5, 0.5,
0.5, 0.5};

      if (p=7 & meancase = 12) then popmean = {0.8, 0.8, 0.8, 0.8, 0.8,
0.8, 0.8};

      /********************  Effect sizes for p = 8 *****************/
      * NV = 1;
      if (p=8 & meancase = 1) then popmean = {0, 0, 0, 0, 0, 0, 0,
0.2};

      if (p=8 & meancase = 2) then popmean = {0, 0, 0, 0, 0, 0, 0,
0.5};

      if (p=8 & meancase = 3) then popmean = {0, 0, 0, 0, 0, 0, 0,
0.8};

      * NV = 4;
      if (p=8 & meancase = 4) then popmean = {0, 0, 0, 0, 0.2, 0.2,
0.2, 0.2};

      if (p=8 & meancase = 5) then popmean = {0, 0, 0, 0, 0.5, 0.5,
0.5, 0.5};

      if (p=8 & meancase = 6) then popmean = {0, 0, 0, 0, 0.8, 0.8,
0.8, 0.8};

      * NV = 6;
      if (p=8 & meancase = 7) then popmean = {0, 0, 0.2, 0.2, 0.2, 0.2,
0.2, 0.2};

      if (p=8 & meancase = 8) then popmean = {0, 0, 0.5, 0.5, 0.5, 0.5,
0.5, 0.5};

      if (p=8 & meancase = 9) then popmean = {0, 0, 0.8, 0.8, 0.8, 0.8,
0.8, 0.8};

      * NV = 8;
      if (p=8 & meancase = 10) then popmean = {0.2, 0.2, 0.2, 0.2, 0.2,
0.2, 0.2, 0.2};

      if (p=8 & meancase = 11) then popmean = {0.5, 0.5, 0.5, 0.5, 0.5,
0.5, 0.5, 0.5};

      if (p=8 & meancase = 12) then popmean = {0.8, 0.8, 0.8, 0.8, 0.8,
0.8, 0.8, 0.8};

      return (popmean);
finish buildpopmean;
```

```
popmean1 = j(&p,1,0);                                          * build
populations;
store popmean1;
popmean2 = buildpopmean(&p,&meancase);
store popmean2;
quit;                                                          * end IML;

proc iml;                                                      * start
IML;

start buildpopcorr(p,corrcase,meancase,l,u);    * define correlation
                                                *function;
      pdtest = 0;                               *do until (pdtest = 1);
            corr = i(p);

      * off diagonal elements have correlation u;

/******************** Correlations for p = 2 **********************/

            if (p=2 & corrcase = 1) then do;          * p = 2, NV = 1;
                  corr[1,2]=u;
                  corr[2,1]=u;
            end;

            if (p=2 & corrcase = 2) then do;          * p = 2, NV = 2;
                  corr[1,2]=l;
                  corr[2,1]=l;
            end;

/******************** Correlations for p = 3 *********************/

            if (p=3 & corrcase=1) then do;            * p = 3, NV = 1;
                  corr[1,2]=l;
                  corr[1,3]=u;
                  corr[2,3]=u;
                  corr[2,1]=l;
                  corr[3,1]=u;
                  corr[3,2]=u;
            end;

            if (p=3 & corrcase=2) then do;            * p = 3, NV = 2;
                  corr[1,2]=u;
                  corr[1,3]=u;
                  corr[2,3]=l;
                  corr[2,1]=u;
                  corr[3,1]=u;
                  corr[3,2]=l;
            end;

            if (p=3 & corrcase=3) then do;            * p = 3, NV = 3;
                  corr[1,2]=l;
                  corr[1,3]=l;
                  corr[2,3]=l;
                  corr[2,1]=l;
                  corr[3,1]=l;
```

```
            corr[3,2]=l;
      end;

/******************** Correlations for p = 4 *********************/

      if (p=4 & corrcase=1) then do;            * p = 4, NV = 1;
            corr[1,2]=l;
            corr[1,3]=l;
            corr[1,4]=u;
            corr[2,3]=l;
            corr[2,4]=u;
            corr[3,4]=u;
            do i = 1 to p;
            do j = (i+1) to p;
                  corr[j,i]=corr[i,j];
            end;
            end;
      end;

      if (p=4 & corrcase=2) then do;            * p = 4, NV = 3;
            corr[1,2]=u;
            corr[1,3]=u;
            corr[1,4]=u;
            corr[2,3]=l;
            corr[2,4]=l;
            corr[3,4]=l;
            do i = 1 to p;
            do j = (i+1) to p;
                  corr[j,i]=corr[i,j];
            end;
            end;
      end;

      if (p=4 & corrcase=3) then do;            * p = 4, NV = 4;
            corr[1,2]=l;
            corr[1,3]=l;
            corr[1,4]=l;
            corr[2,3]=l;
            corr[2,4]=l;
            corr[3,4]=l;
            do i = 1 to p;
            do j = (i+1) to p;
                  corr[j,i]=corr[i,j];
            end;
            end;
      end;

 /******************** Correlations for p = 5 ******************/

      if (p=5 & corrcase=1) then do;            * p = 5, NV = 1;
            corr[1,2]=l;
            corr[1,3]=l;
            corr[1,4]=l;
            corr[1,5]=u;
            corr[2,3]=l;
```

```
        corr[2,4]=l;
        corr[2,5]=u;
        corr[3,4]=l;
        corr[3,5]=u;
        corr[4,5]=u;
        do i = 1 to p;
        do j = (i+1) to p;
              corr[j,i]=corr[i,j];
        end;
        end;
  end;


  if (p=5 & corrcase=2) then do;            * p = 5, NV = 3;
        corr[1,2]=l;
        corr[1,3]=u;
        corr[1,4]=u;
        corr[1,5]=u;
        corr[2,3]=u;
        corr[2,4]=u;
        corr[2,5]=u;
        corr[3,4]=l;
        corr[3,5]=l;
        corr[4,5]=l;
        do i = 1 to p;
        do j = (i+1) to p;
              corr[j,i]=corr[i,j];
        end;
        end;
  end;

  if (p=5 & corrcase=3) then do;            * p = 5, NV = 5;
        corr[1,2]=l;
        corr[1,3]=l;
        corr[1,4]=l;
        corr[1,5]=l;
        corr[2,3]=l;
        corr[2,4]=l;
        corr[2,5]=l;
        corr[3,4]=l;
        corr[3,5]=l;
        corr[4,5]=l;
        do i = 1 to p;
        do j = (i+1) to p;
              corr[j,i]=corr[i,j];
        end;
        end;
  end;

/******************** Correlations for p = 6 ******************/

  if (p=6 & corrcase=1) then do;            * p = 6, NV = 1;
        corr[1,2]=l;
        corr[1,3]=l;
        corr[1,4]=l;
```

```
        corr[1,5]=l;
        corr[1,6]=u;
        corr[2,3]=l;
        corr[2,4]=l;
        corr[2,5]=l;
        corr[2,6]=u;
        corr[3,4]=l;
        corr[3,5]=l;
        corr[3,6]=u;
        corr[4,5]=l;
        corr[4,6]=u;
        corr[5,6]=u;
        do i = 1 to p;
        do j = (i+1) to p;
              corr[j,i]=corr[i,j];
        end;
        end;
end;

if (p=6 & corrcase=2) then do;            * p = 6, NV = 3;
        corr[1,2]=l;
        corr[1,3]=l;
        corr[1,4]=u;
        corr[1,5]=u;
        corr[1,6]=u;
        corr[2,3]=l;
        corr[2,4]=u;
        corr[2,5]=u;
        corr[2,6]=u;
        corr[3,4]=u;
        corr[3,5]=u;
        corr[3,6]=u;
        corr[4,5]=l;
        corr[4,6]=l;
        corr[5,6]=l;
        do i = 1 to p;
        do j = (i+1) to p;
              corr[j,i]=corr[i,j];
        end;
        end;
end;

if (p=6 & corrcase=3) then do;            * p = 6, NV = 6;
        corr[1,2]=l;
        corr[1,3]=l;
        corr[1,4]=l;
        corr[1,5]=l;
        corr[1,6]=l;
        corr[2,3]=l;
        corr[2,4]=l;
        corr[2,5]=l;
        corr[2,6]=l;
        corr[3,4]=l;
        corr[3,5]=l;
        corr[3,6]=l;
```

```
            corr[4,5]=l;
            corr[4,6]=l;
            corr[5,6]=l;
            do i = 1 to p;
            do j = (i+1) to p;
                  corr[j,i]=corr[i,j];
            end;
            end;
      end;

/******************** Correlations for p = 7 *****************/

      if (p=7 & corrcase=1) then do;           * p = 7, NV = 1;
            corr[1,2]=l;
            corr[1,3]=l;
            corr[1,4]=l;
            corr[1,5]=l;
            corr[1,6]=l;
            corr[1,7]=u;
            corr[2,3]=l;
            corr[2,4]=l;
            corr[2,5]=l;
            corr[2,6]=l;
            corr[2,7]=u;
            corr[3,4]=l;
            corr[3,5]=l;
            corr[3,6]=l;
            corr[3,7]=u;
            corr[4,5]=l;
            corr[4,6]=l;
            corr[4,7]=u;
            corr[5,6]=l;
            corr[5,7]=u;
            corr[6,7]=u;
            do i = 1 to p;
            do j = (i+1) to p;
                  corr[j,i]=corr[i,j];
            end;
            end;
      end;

      if (p=7 & corrcase=2) then do;           * p = 7, NV = 3;
            corr[1,2]=l;
            corr[1,3]=l;
            corr[1,4]=l;
            corr[1,5]=u;
            corr[1,6]=u;
            corr[1,7]=u;
            corr[2,3]=l;
            corr[2,4]=l;
            corr[2,5]=u;
            corr[2,6]=u;
            corr[2,7]=u;
            corr[3,4]=l;
            corr[3,5]=u;
```

```
        corr[3,6]=u;
        corr[3,7]=u;
        corr[4,5]=u;
        corr[4,6]=u;
        corr[4,7]=u;
        corr[5,6]=l;
        corr[5,7]=l;
        corr[6,7]=l;
        do i = 1 to p;
        do j = (i+1) to p;
              corr[j,i]=corr[i,j];
        end;
        end;
end;

if (p=7 & corrcase=3) then do;            * p = 7, NV = 5;
        corr[1,2]=l;
        corr[1,3]=u;
        corr[1,4]=u;
        corr[1,5]=u;
        corr[1,6]=u;
        corr[1,7]=u;
        corr[2,3]=u;
        corr[2,4]=u;
        corr[2,5]=u;
        corr[2,6]=u;
        corr[2,7]=u;
        corr[3,4]=l;
        corr[3,5]=l;
        corr[3,6]=l;
        corr[3,7]=l;
        corr[4,5]=l;
        corr[4,6]=l;
        corr[4,7]=l;
        corr[5,6]=l;
        corr[5,7]=l;
        corr[6,7]=l;
        do i = 1 to p;
        do j = (i+1) to p;
              corr[j,i]=corr[i,j];
        end;
        end;
end;

if (p=7 & corrcase=4) then do;            * p = 7, NV = 7;
        corr[1,2]=l;
        corr[1,3]=l;
        corr[1,4]=l;
        corr[1,5]=l;
        corr[1,6]=l;
        corr[1,7]=l;
        corr[2,3]=l;
        corr[2,4]=l;
        corr[2,5]=l;
        corr[2,6]=l;
```

```
        corr[2,7]=l;
        corr[3,4]=l;
        corr[3,5]=l;
        corr[3,6]=l;
        corr[3,7]=l;
        corr[4,5]=l;
        corr[4,6]=l;
        corr[4,7]=l;
        corr[5,6]=l;
        corr[5,7]=l;
        corr[6,7]=l;
        do i = 1 to p;
        do j = (i+1) to p;
              corr[j,i]=corr[i,j];
        end;
        end;
  end;

/******************** Correlations for p = 8 ****************/

  if (p=8 & corrcase=1) then do;           * p = 8, NV = 1;
        corr[1,2]=l;
        corr[1,3]=l;
        corr[1,4]=l;
        corr[1,5]=l;
        corr[1,6]=l;
        corr[1,7]=l;
        corr[1,8]=u;
        corr[2,3]=l;
        corr[2,4]=l;
        corr[2,5]=l;
        corr[2,6]=l;
        corr[2,7]=l;
        corr[2,8]=u;
        corr[3,4]=l;
        corr[3,5]=l;
        corr[3,6]=l;
        corr[3,7]=l;
        corr[3,8]=u;
        corr[4,5]=l;
        corr[4,6]=l;
        corr[4,7]=l;
        corr[4,8]=u;
        corr[5,6]=l;
        corr[5,7]=l;
        corr[5,8]=u;
        corr[6,7]=l;
        corr[6,8]=u;
        corr[7,8]=u;
        do i = 1 to p;
        do j = (i+1) to p;
              corr[j,i]=corr[i,j];
        end;
        end;
  end;
```

```
if (p=8 & corrcase=2) then do;            * p = 8, NV = 4;
      corr[1,2]=l;
      corr[1,3]=l;
      corr[1,4]=l;
      corr[1,5]=u;
      corr[1,6]=u;
      corr[1,7]=u;
      corr[1,8]=u;
      corr[2,3]=l;
      corr[2,4]=l;
      corr[2,5]=u;
      corr[2,6]=u;
      corr[2,7]=u;
      corr[2,8]=u;
      corr[3,4]=l;
      corr[3,5]=u;
      corr[3,6]=u;
      corr[3,7]=u;
      corr[3,8]=u;
      corr[4,5]=u;
      corr[4,6]=u;
      corr[4,7]=u;
      corr[4,8]=u;
      corr[5,6]=l;
      corr[5,7]=l;
      corr[5,8]=l;
      corr[6,7]=l;
      corr[6,8]=l;
      corr[7,8]=l;
      do i = 1 to p;
      do j = (i+1) to p;
            corr[j,i]=corr[i,j];
      end;
      end;
end;

if (p=8 & corrcase=3) then do;            * p = 8, NV = 6;
      corr[1,2]=l;
      corr[1,3]=u;
      corr[1,4]=u;
      corr[1,5]=u;
      corr[1,6]=u;
      corr[1,7]=u;
      corr[1,8]=u;
      corr[2,3]=u;
      corr[2,4]=u;
      corr[2,5]=u;
      corr[2,6]=u;
      corr[2,7]=u;
      corr[2,8]=u;
      corr[3,4]=l;
      corr[3,5]=l;
      corr[3,6]=l;
      corr[3,7]=l;
```

```
      corr[3,8]=l;
      corr[4,5]=l;
      corr[4,6]=l;
      corr[4,7]=l;
      corr[4,8]=l;
      corr[5,6]=l;
      corr[5,7]=l;
      corr[5,8]=l;
      corr[6,7]=l;
      corr[6,8]=l;
      corr[7,8]=l;
      do i = 1 to p;
      do j = (i+1) to p;
            corr[j,i]=corr[i,j];
      end;
      end;
end;

if (p=8 & corrcase=4) then do;            * p = 8, NV = 1;
      corr[1,2]=l;
      corr[1,3]=l;
      corr[1,4]=l;
      corr[1,5]=l;
      corr[1,6]=l;
      corr[1,7]=l;
      corr[1,8]=l;
      corr[2,3]=l;
      corr[2,4]=l;
      corr[2,5]=l;
      corr[2,6]=l;
      corr[2,7]=l;
      corr[2,8]=l;
      corr[3,4]=l;
      corr[3,5]=l;
      corr[3,6]=l;
      corr[3,7]=l;
      corr[3,8]=l;
      corr[4,5]=l;
      corr[4,6]=l;
      corr[4,7]=l;
      corr[4,8]=l;
      corr[5,6]=l;
      corr[5,7]=l;
      corr[5,8]=l;
      corr[6,7]=l;
      corr[6,8]=l;
      corr[7,8]=l;
      do i = 1 to p;
      do j = (i+1) to p;
            corr[j,i]=corr[i,j];
      end;
      end;
end;
```

```
            /* make sure popcorr is positive definite */
            call eigen(pdval,pdvec,corr);
            min = pdval[p,1];
            if (min < 0) then pdtest = 0;
               else pdtest = 1;

      return (corr);
finish buildpopcorr;                * end of correlation function;

popcorr  = buildpopcorr(&p,&corrcase,&meancase,&l,&u);
store popcorr;
quit;                               * end IML;


%do b = 1 %to 5000;
      * begin replication loop;

data sasdata;
      group = 0;
      delete;
run;

proc iml;                           * start IML;


load popmean1;
load popmean2;
load popcorr;

*********************** Define Function buildsam *******************;

start buildsam(popmean,popcorr,n,p,group) ;
  m=repeat(popmean`,n,1);
  g=root(popcorr);
  z=rannor(j(n,p,0));
  y=z*g+m;
  b=j(n,1,group);
  ysam = b||y;
  return (ysam);
finish buildsam;

*************************************************;


ysam1 = buildsam(popmean1,popcorr,&n,&p,1);     ** Take samples;
ysam2 = buildsam(popmean2,popcorr,&n,&p,2);


s = ysam1//ysam2;                   ** create SAS data set for sample;

create sasdata var{group &ys};
append from s;
```

```
create popmean2sas var{d};          * transfer popmean2 to SAS;
append from popmean2;
quit;

*************************** end IML ********************************;


*************************** Start SAS ******************************;

data mySummary;
            ** empty mySummary;
      p=0;
      delete;

data power_type1_compute;           * empty power_type1_compute;
      p = 0;
      delete;

proc stepdisc data = sasdata  PR2Entry= &alpha PR2Stay= &alpha;
                  *for F-statistic use sle= &alpha sls= &alpha;
class group;      *For partial r-square use PR2Entry= &Rsquare;
                                         *PR2Stay = &Rsquare;
ods select Summary;
ods output Summary = mySummary;

%let empty=1;           * check to see if mySummary was created;
data _null_;
      set mySummary end=last;
      test=(_N_=1) and (last) and (Step=.);
      call symput('empty',test);
run;

%if not &empty %then %do;

      data counter;                 * identify variables selected;
            set mySummary;
            keep y1-y&p;
            %do i = 1 %to &p;
                  retain y&i;
            %end;

            %do i = 1 %to &p;
                  if entered = "Y&i" then y&i=1; if removed = "Y&i"
                  then y&i=0;
            %end;

            %do i = 1 %to &p;
                  if y&i = "" then y&i=0;
            %end;

************ Compute Power and Type 1 Error for single sample *******;
      data counter;
            set counter  end = last;
            if last then output;
```

```
	proc transpose data = counter out = stepwise_result;

	data compute;
		merge stepwise_result popmean2sas;
		rename col1 = selected;

	data compute;
		set compute;
		powercount = 0;
		powervarcount = 0;
		type1count = 0;
		type1varcount = 0.000001;
		if selected =1 & d > 0 then powercount = powercount + 1;
		if d > 0 then powervarcount = powervarcount + 1;
		if selected =1 & d = 0 then type1count = type1count + 1;
		if d = 0 then type1varcount = type1varcount + 1;

	proc means data = compute sum;
		var powercount powervarcount type1count type1varcount;
			output out = power_type1_compute sum(powercount
			powervarcount type1count type1varcount) = powercount
			powervarcount type1count type1varcount;

	data power_type1_compute;
		set power_type1_compute;
		power = powercount / powervarcount;
		type1error = type1count / type1varcount;
		n=&n;
		p=&p;
		meancase=&meancase;
		corrcase=&corrcase;
		alpha=&alpha;
		LikeCorr = &l;
		UnlikeCorr = &u;
		keep power type1error n p meancase corrcase alpha LikeCorr
	UnlikeCorr;

**** End of Power and Type 1 Error computation for single sample *****;

%end;

%else %do;
* When no variables are identified by STEPDISC;

******* Compute Power and Type 1 Error for single sample *******;
	data power_type1_compute;
			power = 0;
			type1error = 0;
			p=&p;
			n=&n;
			meancase=&meancase;
			corrcase = &corrcase;
			alpha=&alpha;
			LikeCorr = &l;
			UnlikeCorr = &u;
```

```
**** End of Power and Type 1 Error computation for single sample *****;

%end;

      data rajc.results;
      set rajc.results power_type1_compute;

run;
quit;

%end; * replication loop (b);
%end; * meancase loop;
%end; * alpha or PR2 loop (j);
%end; * p loop;


%mend temp;

%temp;

options notes;

data _null_;
      endtime=datetime();
      format endtime datetime.;
      put endtime=;
run;
```