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### BLOCKO VERSION VI

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Program BLOCKO is a FORTRAN computer program for the analysis of block designs. There are three types of variables in BLOCKO:

dyadic variables: scores for each member of a dyad,  
self measures: scores for person with self as partner,  
and

personality variables: scores that refer to a given person and not to any particular partner.

In a block design, a group of persons is divided into two subgroups. Measurements are taken from dyads who are members of different subgroups. There may be more than one of these groups, but BLOCKO currently allows only for groups of the same size. The number persons in each of the two subgroups must also be the same for each group. So if there are multiple groups each with six persons and within one group there are four in one subgroup and two in the other, then for the remaining groups the division must also be four-two.

The basic data structure for a block design with two persons in subgroup 1 and three in subgroup 2 is as follows:

		PARTNER				
		1	2	3	4	5
A	1	S	R	X	X	X
C	2	R	S	X	X	X
T	3	Y	Y	S	R	R
O	4	Y	Y	R	S	R
R	5	Y	Y	R	R	S

There are five persons in the group, two being in one subgroup and three in the other. Observations labeled as S

are self measures and observations labeled as R are not part of the block design but may have been collected. The observations labeled X and Y are present in the symmetric and asymmetric block designs. The variance components are estimated separately for the asymmetric design and are combined in the symmetric design. In the half block design only the X observations have been measured. There are then three different types of block designs: symmetric block, asymmetric block, and half block. In most applications of the program, one will have a symmetric block design.

In terms of data input the data can either be inputted in block or round robin form. In round robin input the Rs, Ss (they may be blanks), Xs, and Ys are inputted. With round robin input, the Rs are read even though the data are not analyzed. In block input the Xs and Ys (and maybe the Ss) are inputted. If the half block design is analyzed, only the Xs are inputted (and maybe the Ss).

The basic setup for BLOCKO is

```

title record
problem record
label record(s) for dyadic variables
label record(s) for personality variables
(optional)
construct designation record (optional)
correlated indicator record (optional)
label record for constructs (optional)
reversal record (optional)
input format record(s)
second input format record(s) (optional)
reorder record(s) for group 1 (optional)
deletion record(s) for group 1 (optional)
reorder and deletion record(s) for remaining groups
(optional)

```

### **Running BLOCKO on a Personal Computer**

To run BLOCKO on an IBM compatible computer, use WINBLOCKO. It will create a setup that contains the title, problem, variable names, labels, and format records. The second file is the data file.

Consider the Warner, Kenny, and Stoto (1979) data. The data file might be located in a file called C:WARN.DAT. The user would create a file called C:WARN.SET that would

contain the control record for BLOCKO. Imagine that the user wants the output to be put on a disk to a file called A:WARN.OUT. The user would then create the following three-line file, called perhaps BLOCKO.SET:

```
C:WARN.SET  
C:WARN.DAT  
A:WARN.OUT
```

When prompted for the file with I/O instructions, the user types BLOCKO.SET. The order of files in BLOCKO.SET cannot be changed. If the user inadvertently made C:WARN.DAT the last line in the file, BLOCKO would write over the data file. Note that WINBLOCKO can create do all of this.

If the covariance matrices are outputted (see below, Problem Record, column 12, option 4), the name of a fourth file must be included. Also if a file of estimated actor and partner effects is desired (Problem Record, column 23, option 1), another file name is needed. If covariances matrices are outputted, the file of actor and partner effect estimates file is the fifth file, otherwise it is the fourth.

If the run is not completed, the user should check the output file or A:WARN.OUT, as BLOCKO may indicate the user error. The data file contains only raw data. If a new drop subjects record or format record is needed for each group, these records are included in the output setup file.

### **Description of Control Records**

#### *Title record*

```
descriptive information column 1-64  
  if the asymmetric block or half-block design is  
  used (blank otherwise)  
  name of subgroup 1 column 65-72  
  name of subgroup 2 column 73-80
```

#### *Problem record*

```
column 1-2 number of subjects in subgroup 1 (max = 20)  
column 3-4 number of subjects in subgroup 2 (max = 20)  
(The division of subjects into subgroups must be  
the same for all groups.)
```

column 5-6 number of dyadic variables (max = 20)  
column 7-9 number of groups  
column 10 design type  
    0 = symmetric block (default)  
    1 = asymmetric block  
    2 = half block  
column 11 input pattern  
    0 = block with dyad input  
    1 = round robin with dyad input  
    2 = block with person input, partners fastest moving  
    3 = block with person input, variables fastest moving  
    4 = round robin with person input, partners fastest moving  
    5 = round robin with person input, variables fastest moving  
column 12 output options  
    0 = univariate, summary only  
    1 = univariate, every group and summary  
    2 = multivariate, summary only  
    3 = multivariate, every group and summary  
    4 = construct variances and covariances to a file  
    If option 4 is chosen, an additional line on the setup file is needed that contains the name of the file.  
column 13 personality variables  
    0 = no  
    1 = yes, before dyadic variables  
    2 = yes, after dyadic variables (col 11 must be greater than 1, column 10 cannot be 2, the design cannot be half block)  
column 14-15 number of personality variables (max = 20; column 13 must not be zero)  
column 16 self data  
    0 = no  
    1 = yes (Self data must be included on the diagonal of the dyadic data with round robin input; with cell input "self dyads" must be included; with block input the self data is read between the personality variables and the dyadic variable and there must be a 1 or 2 in column 13 even if there are no personality variables. Self data are currently not an option for the half block design.)  
column 17 technical output  
    0 = no

1 = yes, output covariance matrices  
 column 18 second variable format record for subgroup 2  
 1 = yes  
 0 = no  
 column 19 additional format record(s)  
 0 = no, 1, 2, or 3 depending on the number of records. To repeat, this is the number of *additional* format records.  
 column 20 subjects to be dropped from the analysis  
 0 = no  
 1 = yes (This option can be used only if there is a single group.)  
 column 21-22 number of latent constructs (between 0 and 20)  
 column 23 print out actor and partner effect estimates, self measures, and personality variables to a file  
 0 = no  
 1 = yes with means removed for the effect estimates  
 2 = yes with means remaining  
 If options 1 or 2 are chosen, an additional line on the setup file is needed that contains the name of the output file. Option 1 is seen as preferable.  
 column 24 print out raw data  
 column 25 reorder pattern  
 0 = no reorder record  
 1 = reorder rows only  
 2 = reorder rows and columns in the same way  
 3 = reorder columns only  
 4 = reorder rows and columns in different ways  
 5 = reorder columns differently for each row  
 6 = reorder rows and reorder columns differently for each row  
 column 26 new or same reorder records  
 0 = new reorder record for each group  
 1 = reorder record for first group alone (col 25 must be nonzero)  
 column 27 reverse scoring for some variables  
 0 = no  
 1 = yes

*Label Record(s) for Dyadic Variables*

The dyadic variable names are in 10 column fields. Continue onto a second record when there are between nine

and sixteen dyadic variables, and onto a third record if there are between sixteen and twenty variables.

*Label Record(s) for Personality Variables*

This record is optional, but must be included if there are personality variables. The form is the same as the dyadic label record.

*Construct Designation Record*

If a given construct has multiple replications, a construct designation record is necessary to signal which dyadic variables load on which construct. There are multiple replications if the same construct is measured at multiple times or by multiple indicators. The units of measurement of these indicators must be the same.

This record is read if there is something besides a zero in columns 21-22 of the problem record. Currently, the user must also request multivariate output (a 2 or 3 in column 12 of the problem record) to employ the construct option. Whenever there is not a zero in columns 21-22, the Correlated Indicator Record and the Label Record for Constructs must also be read. If this option is chosen, the dyadic and self variables are assumed to be indicators of a latent construct.

The construct designation record tells the program which measure indicates which construct. Imagine that there are seven variables and three constructs. If the first three variables load on the first construct, the next three on the second, and the seventh variable on the third factor, the construct designation record would be:

01010102020203

In general, the format of the record consists of two-column fields beginning in column 1. The first field gives the number of the construct for the first dyadic variable. The second field gives the construct for the second dyadic variable, and so on until all dyadic variables have been designated. Every variable must be linked to a construct and so, as in the example, there may be one variable that is linked to a construct. The constructs are numbered from 1 to m where m is given in columns 21-22 of the problem record. The ordering of the

constructs is determined by the user. So the following construct designation record

02020203030301

is the same as the earlier described record. The only difference is that the constructs have been reordered. The prior construct 1 is now construct 2, the prior construct 2 is now 3, and the prior construct 3 is now 1.

#### *Correlated Indicator Record*

This record is used to tell the program which indicators have correlated measurement error. Two indicators have correlated measurement error if they are both measured using the same method or at the same time. This record is required if there is not a zero in columns 21-22 of the problem record. For two indicators to have correlated measurement error, they must be indicators of two different constructs. The sets of correlated indicators are designated numerically. For example, consider the earlier described construct designation record and its correlated indicator record:

01010102020203  
01020301020304

The records tell BLOCKO that variable pairs 1,4 and 2,5 and 3,6 are correlated. If an indicator shares no measurement error, a unique number is put in the fields. So the record

01020304050607

would indicate that none of the seven indicators has correlated measurement error. The ordering of the numbers is arbitrary. If a construct has only a single indicator, it must be given a unique number on the correlated indicator record.

The following rules apply in setting up correlated measurement error on this record. First, constructs that have a single indicator cannot have correlated measurement error and must be given a unique number. BLOCKO ignores any instructions to correlate the error of a single indicator variable. Second, for two indicators to have correlated measurement error, they must be indicators of different constructs. So two indicators of the same construct cannot share measurement error. Third, if the

indicators of two constructs share measurement error, then the number of indicators of the constructs must be the same, and each indicator of one construct must be paired with one, different indicator of the other construct.

Consider as an example the following pair of record, the first being the construct designation record and the second being the correlated measurement record:

```
01010202030304040506
01020102010203040506
```

The construct designation record signals that the eight variables form six constructs. The pattern is:

Construct	Indicators
1	1 and 2
2	3 and 4
3	5 and 6
4	7 and 8
5	9
6	10

The correlated indicator record states that variables 1, 3, and 5 share measurement error as well as 2, 4 and 6. So the indicators constructs 1, 2, and 3 share correlated measurement error. But the indicators of construct 4 do not share measurement error. The indicators of constructs 5 and 6 cannot share measurement error because they each have a single indicator.

#### *Label Record for Constructs*

This record is optional, but must be included if there is not a zero in columns 21-22 of the problem record. Its form is the same as other label record. The number and order of the constructs is given in the construct designation record.

#### *Reverse Scoring Record*

This record is signaled by a 1 in column 27 of the problem record. Sometimes the dyadic variables are scored in different directions. For instance, a high score on one variable means having more of something while a high score on another variable means having less. Reverse scoring of the second variable would make the results more interpretable and would be necessary if the two variables



were supposed to be two indicators of the same construct. Say for instance, there are two measures of extroversion: outgoing and quiet. People are rated on a 7-point scale. For outgoing, higher numbers would mean more extroversion, but for quiet lower numbers would mean more extroversion. If these two measures are to be used to form a construct, then one of the variables, probably quiet, would need to be reversed.

In columns 1 to 5 of this record is the sum of the upper and lower limits of the variable. So if the scores can range from 1 to 6, then one would put a 7 in column 5. If the reversed variables have different upper and lower limits, it is probably best to leave these columns blank.

If the user wants to reverse the first variable a one is put in column 6. To leave a variable as it is, a blank or zero is left in the appropriate column. In general to reverse the  $n$ th variable, put a one in the  $n$  plus five column of this record. For instance, to reverse the 9th variable, a one is put in column 14. Whenever a dyadic variable is reversed, the self variable is also reversed. One cannot reverse personality variables within BLOCKO.

#### *Input Format*

The entire record can be used for the input format. BLOCKO can read one cell of the block design at a time (for example, (8F3.0) indicates eight variables) or it can read all the scores for an actor. For example, (10F3.0) might indicate two variables and five partners. Make sure to include on the format record the personality variables. There is no need to include the self-measures if round robin input is used since the diagonal is always read when the row of the design is read. However, if cell input is used the additional "dyads" for self are needed. If the number of persons is not equal in the two blocks, it may be necessary to have a second format record for subgroup 2.

If cell input is used, personality data cannot be inputted. Self data can be inputted by creating additional "self dyads." These self dyads come before the other dyads for the first subgroup and after the other dyads for the second subgroup. If block input is used, the self data comes between the personality and the dyadic data. For block input the self data are always read variables fastest moving even if there is a 2 in column 11. The location of

the self measures in signaled by column 13 of the problem record. It is then possible for column 13 to be nonzero, but there are no personality variables.

If the half-block design is used, there cannot be personality variables or self data. However, the following strategy can be used to analyze such data. One must read the missing half-block even though there are no data for those observations. One then treats the data as an asymmetric block and ignores the results from the lower block.

These are examples of four different types of data input. It is assumed that there are two people in each subgroup, hence four rows and columns.

Data

x	x	x	x
x	x	x	x
x	x	x	x
x	x	x	x

Cell block

1	x	2	3
x	4	5	6
7	8	9	x
10	11	x	12

Cell round robin

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

Person block

x	x	1	1
x	x	2	2
3	3	x	x
4	4	x	x

Person round robin

1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4

Each number symbolizes a different record or set of records that are read. The x's are not read. If there are no self

data, then for cell input the self dyads are not read. For person block input, the self data, if there are any, must come either before or after the person's dyadic variables as indicated by the personality signal.

For block and round robin input, there are two types of data input: variable fastest moving and person fastest moving. Imaging two variables and four persons. Variable would be fastest moving if the order of the eight scores for each person is

```
P1V1 P1V2 P2V1 P2V2 P3V1 P3V2 P4V1 P4V2
```

where "P" indicates person and "V" variable. Person would be fastest moving if the order of the eight scores for each person is

```
P1V1 P2V1 P3V1 P4V1 P1V2 P2V2 P3V2 P4V2
```

Note that the personality variables must be read before or after all the dyadic variables have been read.

#### *Additional Format Records*

This record is optional. If the format information cannot fit onto a single record, additional record may be necessary. If more than one format record is used and there is a second format record, the same number of additional record must be read for the second set of format record. Up to three additional record may be read.

A second input format record is signaled by a 1 in column 18 of the problem record. A second format record may be necessary if the number of persons in columns 1-2 and 3-4 of the problem record are not the same. The first format record is used to read the first  $n$  reordered rows (subgroup 1) and the second to read the next  $m$  rows (subgroup 2).

#### *FORTTRAN Format Conventions*

The following are the standard FORTRAN conventions for a format record:

- a) opening parenthesis "(" : This is always used to begin the input format record.

- b) closing parenthesis ")": This is always used to end the input format record.
- c) skip symbol "X": This skip-field specification is always preceded by an integer (e.g., 32X), and specifies the number of columns which should not be read. For example, the statement 5X at the beginning of a record means skip 5 columns, and begin reading data in column 6. If 20 columns of data have already been read, the statement 5X means skip columns 21-25, and begin reading data in column 26.
- d) tab "T": This statement is always followed by an integer (e.g., T21), and specifies the column number in which to begin reading data. Unlike the X-type conversion, which moves the reading of data only to the right on the data record, the tab statement can move data reading to the right or the left on the data record. For example, the statement T9 at the beginning of a record means tab to the right and begin reading data in column 9. If columns 11-14 have already been read, the statement T9 means tab to the left, going back to column 9, and begin reading data in column 9.
- e) slash "/": This statement forwards the reading of data to the next data record. The slash can be preceded by an integer, specifying the number of record to skip. For example, 5/ means skip 5 record.
- f) comma ",": This specification is always used to separate specification statements which are not separated by a slash.
- g) data format statement in F-mode - wFy.z, where w, y, and z are variables - this is read as w fields of y.z, and specifies the number of data points to be read, and how many digits each has to the right of the decimal. For example, 2F3.1 means two fields of 3-column data, with one column to the right of the decimal (e.g., 15.9 5.1). If all data are in integers, the number of digits to the right of the decimal must be specified as zero (e.g., 3F2.0). Always use F-mode, never I-mode.
- h) embedded parentheses "(( ))": Embedding statements within the input format record can be useful when there are many data record, all with the same format. For example, if there are 25 data record, all with the format 5X,15F1.0, rather than writing

(5X,15F1.0/5X,15F1.0/ etc.) 25 times, it is much easier to write (24(5X,15F1.0/),5X,15F1.0). This means read 5X,15F1.0 on 24 separate data record, then read one more record with the format 5X,15F1.0. The separate specification for the last record is necessary because a slash, indicating read the next record, will be read after the twenty-fourth record, so the program expects another record of data. If all the data are in blocks of the same format and on a single data record, embedded parentheses can be used without a slash. For example, the format (5(6F2.0,2X)) means read 5 blocks of data, with each block containing 6F2.0 data then 2 skipped spaces, all on a single data record.

Assume the following data set:

```
record 1:    32 51 67113
record 2:   211613      41016215 5031798
```

With the following format record:

```
(3X,4F3.1/T14,4F4.2,T1,2F3.2)
```

The data will be read as:

```
record 1:  3.2  5.1  6.7  11.3
record 2: 41.01 62.15 5.03 17.98 2.11 6.13
```

#### *Reorder Record(s)*

These records are optional. The reorder records are used for two major purposes. First, the data may not be organized such that the first  $n$  rows are members of the first subgroup. The reorder record can reorder persons so that the first  $n$  persons are members of the first subgroup and that the next  $m$  rows of the data matrix are members of the second subgroup. This is a reordering of the rows. This is signaled by 1, 2, or 6 in column 25.

Second, the columns may need to be reordered so that the first  $n$  columns are ordered as the first  $n$  rows are ordered and the remaining  $m$  columns are ordered as the remaining  $n$  rows. The columns can also be used to designate where self measures are on the record. Sometimes all columns are reordered in the same way (2, 3, or 4 in column 25) while other times they are reordered differently for each row (5 or 6 in column 25).

**REORDERING IS VERY DIFFICULT AND CONFUSING. IF YOU THINK YOU UNDERSTAND THIS OPTION, YOU ARE FOOLING YOURSELF. IF THIS OPTION IS CHOSEN, ONE SHOULD CHECK TO SEE THAT THE DATA WERE PROPERLY REORDERED BY OUTPUTTING RAW DATA (A 1 IN COLUMN 24 OF THE PROBLEM RECORD).**

If all groups are reordered in the same way, a one is put in column 26 and only one set of reorder record need be read. If a blank or zero is in column 26 and reordering is done, then there must be a reorder record for each group. The number of reorder record depends on the option chosen. Row and column reorder record are read separately, row before column. If columns are reordered differently for each row, then there is one record for each row. If the rows and columns are ordered in the same way (a 4 in column 25) then a single reorder record is read.

The column reorder record are ordered as the rows are ordered at input, and they are not ordered as they are after reordering. So the first column reorder record refers to the first subject in the data even if that subject is not the first person in the first subgroup.

The form of a reorder record is as follows. Given  $n$  persons in the first subgroup and  $m$  in the second, the first set of  $n$  columns in the reorder record refer to which of the unordered subjects are in the first subgroup. The remaining fields refer to the remaining  $m$  persons in the second subgroup. For a reorder record, the subject numbers begin in column 1 in two column fields separated by commas. So if  $n$  is 4 and  $m$  is 3, the following reorder record 03,04,06,07,01,02,05 signals that persons 3, 4, 6, and 7 are in subgroup one and persons 1, 2, and 5 are in subgroup two. The *numbers* on the column reorder record refer to persons after the rows were reordered. All subjects must be reordered even if they are to be deleted.

The use of the column reordering interacts with the choice of input. If round robin input is used, then for each row  $n + m$  columns are inputted and so  $n + m$  columns must be reordered. If block input is used, then  $m$  columns are read if the row is in subgroup 1 or  $n$  columns are read if the row is in subgroup 2.

Let us consider some examples of the reorder option. In each example, we will present the input matrix. The numbers in these matrices refer not to the data but to the

subject number who produces the data. The rows represent different actors. The first column represents the first score read. The entry in a given row-column refer to the partner for that actor. So the following matrix

```

23
13
21

```

has three persons or actors. Person 1's first partner is person 2 and the second is person 3. For person 2, the partners are 1 and 3.

*A one in column 25.* This option would be chosen if the data are in checkerboard format:

```

24
13
24
13

```

In this format, persons 1 and 3 interact with persons 2 and 4. The row reorder record would be 01,03,02,04. There is no need for any column reordering.

*A two in column 25.* In this case, the rows and columns are reordered in the same way. Most likely round robin input was used and this reorder is used to put persons into the appropriate subgroups. For instance, the reorder record 02,05,03,01,04,06 with three persons in each subgroup would put persons 2, 5, and 3 in subgroup one, and persons 1, 2, and 6 in subgroup two.

*A three in column 25.* This option would be chosen if the columns are ordered differently from the rows. Consider the following matrix:

```

465
465
465
312
312
312

```

The reorder record would be 02,03,01,04,06,05. (Note that this reordering can be alternatively accomplished by using option 1 and the same reorder record.)

A *four* in column 25. In this case both the rows and columns are reordered in different ways. Given the following data matrix

```

456
132
132
456
132
456

```

The reorder record are:

```

01,04,06,02,03,05
01,03,02,04,05,06

```

The first record puts persons 1, 4, and 6 into subgroup 1 and 2, 3, and 5 into subgroup 2. The second record reorders the columns.

A *five* in column 25. This would be used if the data are entered as they are gathered. For instance, if the data were

```

34
43
12
21

```

the following reorder record would be used:

```

03,04
04,03
01,02
02,01

```

A *six* in column 25. For the following data matrix

```

24
13
42
31

```

we would need the following reorder record

```

01,03,02,04
03,04

```



01,02

04,03

02,01

the first record reorder rows and the next four reorder the columns for each row.

The use of reorder record is not simple and can be very confusing. The researcher should attempt to punch up the data so that reordering is not necessary. If it is, the researcher should carefully check the results to determine if the reordering is successful. It is generally advisable to print the raw data to check the accuracy of the reordering.

#### *Deletion Record*

There must be a one in column 20 of the problem record for this record to be read. This record tells BLOCKO which subjects are to be dropped from the analysis. If the first subject (before reordering) is to remain in the analysis, put a one in column one. If the subject is to be dropped put a zero. Column 2 refers to the second subject and so on. (If there has been reordering, the number on the deletion record refers to the subject after reordering.) The record 011111101 would mean that subjects 1 and 8 would be dropped from the analysis. This option can be used only when a single group is analyzed.

#### **Missing Data**

As a rule, BLOCKO does not allow for any missing data. Blanks and periods are read as zeros, and codes for missing data (e.g., 99) are read as real numbers. Self data, coded as blanks, may be missing for all persons on a given variable, and if round-robin input is used, data can be missing for the dyads which are members of the same subgroup.

Missing data must either be imputed or the person must be deleted. There is no standard way to impute values for block structures. One strategy is to use the mean, median, or the mode of the entire sample, the block, the subgroup, or the actor. If an actor has no data, it is usually best to delete the person. However, sometimes deleting a person requires deleting the entire group if the minimum sample

size is not met. Also deleting subjects can make groups sizes unequal which can complicate the analysis. Common sense is needed in developing a reasonable missing data strategy.

### **Significance Tests**

If there are at least two groups and the jackknife option is not chosen, the tests of actor, partner, and relationship effects are done using group, weighted by the number of groups less one as the unit of analysis. Thus, the variance or covariance component is estimated for each group and the mean of the estimates is tested whether it is different from zero.

Tests of the correlations that involve only the self-measures or the personality variables are ordinary tests of partial correlations with subgroup effects partialled. Essentially the correlations are computed with the subgroup means subtracted. Tests of the personality or self measures with actor or partner effects involve correlations of each with the effect estimates. The degrees of freedom for these correlations are the total number of persons minus twice the number of groups minus one. Although these are the correlations that are tested, the correlations presented in the output are the disattenuated correlations which take into account the reliability of actor and partner effects. Tests of the self measures and the personality variables are only available for summaries across multiple groups.

The user can output a file with the individual difference variables (a 1 or 2 is placed in column 23 of the problem record). Potentially, four sets of individual differences are outputted for each person in each group on separate records: actor effects (A), partner effects (P), self scores (S), and personality variables (I). Scores are ordered on the record in the same order as the variables and if there are more than six variables there will be multiple records. Correlations computed from the data using this file will differ somewhat from BLOCKO correlations because the latter are disattenuated. It is generally advisable to use the actor and partner effect estimates with the means removed in computing correlatons.

BLOCKO does not test the construct means, variances, and covariances. However, these means, variances, and

covariances can be outputted to a file using output option 4. Then that output can be read as a data file by some statistical package and tests can be performed. One should weight by group size less one. The matrices are outputted in matrix format. Columns 1-3 give the group number, 4-6 record number, columns 7-8 matrix type, and columns 9-80 the 7 values of the matrix. There symbols for means are:

```
DM -- dyadic variable means
SM -- self means
IM -- personality variable means
```

and for variances and covariances:

```
AA -- actor by actor
PP -- partner by actor
AP -- actor by partner
RR -- relationship intrapersonal
R' -- relationship interpersonal
II -- personality variables by personality
variables
IA -- personality variables by actor
IP -- personality variables by partner
SS -- self by self
S' -- self by self adjusted
SA -- self by actor
SP -- self by partner
SI -- self by personality variables
```

If the design is asymmetric, two sets of covariance matrices (except for RR) are outputted for each group and the second group is designated by a 1. If there are correlated errors, there are two sets and the unstable variance is denoted by 1. Finally, if there are correlated errors and an asymmetric design the designations are as follows:

```
none: subgroup 1, stable variance
      1: subgroup 1, unstable variance
      2: subgroup 2, stable variance
      3: subgroup 2, unstable variance
```

This option can be used to perform specialized tests of the univariate estimates. For instance, one may wish to test that there is more actor than target variance. One sets the number of constructs equal to the number of variables and has each variable be its own construct.

BLOCKO then outputs to a file all of the means, variances, and covariances of the different measures.

If a construct has two indicators, the test of the correlation between these two indicators evaluates construct variance. So if there are two indicators of a Liking construct, the correlation between the two indicators at the relationship intrapersonal level evaluates whether there is any relationship stable variance in the construct.

To test a complex hypothesis (e.g., actor variance is greater than partner) use output option 4 and make the number of constructs equal to the number of variables. For the construct designation record, use consecutive numbers, e.g. 01020304, etc. The output can then serve as input for the test of the complex hypothesis. One would test whether the mean of the actor minus the partner variance was significantly different from zero.

### **Description of the Output**

The initial output consists of information about the job specifications. A list of options chosen is printed by BLOCKO. The remainder of the description concerns the summary output only.

Before discussing the interpretation of correlations, a few general words of advice may be helpful in interpreting correlations involving actor or partner effects. One should generally only interpret correlations involving actor or partner in which the actor or partner variance is significant. One can determine whether a variable has significant actor or partner variance by examining the relative variance partitioning table and seeing if there is an asterisk by the variable's variance. If an asterisk is present, the correlation can be interpreted. If a variable is estimated to have negative variance, then all of its correlations are automatically set to zero. Occasionally, a correlation can be larger than one. Assuming both the variances are significant, such a large correlation indicates that the true correlation is a large value near one. BLOCKO automatically changes out of range correlations to plus or minus one.

### *Means*

The first set of output is the means of the dyadic variables, the self measures, and the personality variables, if there are any. If the asymmetric design is used, means of the dyadic variables are given for each subgroup. The mean for each of the self measures is tested to determine if it differs from the mean of dyadic variables. (Group is the unit of analysis.)

### *Variance Partitioning*

The program presents the actor, partner, and relationship variances for each variable. If a component has negative variance, it is set to zero. If the asymmetric design is used, there are two partitionings of variance.

Also outputted are the relative variances. A given variance component is divided by the sum of the other components. Again negative components are treated as zero. For both actor and partner variance, an asterisk indicates that the component is significantly greater than zero at the .05 level of statistical significance. All tests of variance components are one-tailed because variances in principle should not be negative. *The relationship variance must be nonnegative, and so it is not tested for significance.*

When the constructs' variances are partitioned, they are broken up into six sources. First, variance is divided into stable and unstable components. The stable and unstable components are divided into actor, partner, and relationship. Stable variance is variance that is consistent across indicators. Unstable variance is inconsistent variance. Unstable relationship variance corresponds to what was previously called error or occasion variance.

The reliabilities of the actor and partner effects are presented. They provide the user a sense as to whether one can meaningfully interpret actor and partner effects for a given variable. The reliability is a function of group size: the larger the group, the greater the reliability.

The program also outputs reciprocity correlations and self correlations for each variable. An asterisk by these correlations indicates that the correlation is statistically significant at the .05 level of significance (two-tailed). A question mark after the asterisk indicates

that the correlation involves either an actor or partner effect that does not have statistically reliable variance. (It can happen that the numerator of the correlation is significant but the denominator is zero. In such a case, the correlation is outputted as zero and contains an asterisk and a question mark.)

If the user requests multivariate output a series of matrices follow. A brief description of each is provided. If the asymmetric block design is used, each matrix (except relationship interpersonal) is printed twice, once for each subgroup.

#### *Actor by Actor*

For the actor-actor covariance matrix, the diagonal contains the actor variances. Off diagonal values are the actor-actor covariances. They are more easily interpreted by examining the actor-actor correlations. Say the actor-actor correlation between peer ratings of intelligence and peer ratings of extroversion is .60. That would indicate that if a person has a high actor effect on ratings of intelligence (he or she sees others as intelligent), he or she would tend to have a high actor effect on ratings of extroversion (he or she sees others as extroverted).

#### *Partner by Partner*

For the partner-partner covariance matrix the diagonal contains the partner variances. Off diagonal values are the partner-partner covariances. They are more easily interpreted by examining the partner-partner correlations. Say the partner-partner correlation between the variables of observer rated dominance and friendliness is .20. That would indicate that if a person has a high partner effect on dominance (that is, he or she elicits dominance from others), he or she would tend to have a somewhat high partner effect on friendliness (that is, he or she elicits friendliness from others).

#### *Actor (Row) by Partner (Column)*

One generally only examines the correlation matrix. The diagonal of the matrix gives the actor-partner correlation for a given variable. So if the variable is smiling, then a positive actor-partner correlation would indicate that, if a person tends to smile frequently, his or her partner tends to smile frequently. Unlike the

previous two matrices, the actor-partner matrix is not symmetric. So, for variables X and Y, there is the actor X, partner Y correlation and the actor Y, partner X correlation. Actor forms the row of the matrix and partner the column. And so for the following matrix

	X	Y
X	.4	.3
Y	.1	.7

the actor X, partner Y correlation is .3 and the actor Y, partner X correlation is .1. (This matrix cannot be computed for the half-block design.)

#### *Relationship-Intrapersonal*

The previous three matrices examine variables at the individual level. The next two matrices are at the dyadic level. Consider the relationship effect of A interacting with B. The relationship effect of A with B for one variable can be correlated with the relationship effect of A with B for a second variable. This would be an intrapersonal correlation because the same person is the actor in each variable. Additionally, the relationship effect of A with B for one variable can be correlated with the relationship effect of B with A for a second variable. This would be an interpersonal correlation because a different person is the actor in each variable. So there are two types of correlations at the dyadic level: intrapersonal and interpersonal.

#### *Relationship-Interpersonal*

The diagonal of the relationship-interpersonal matrix gives the dyadic reciprocity. So if the variable is perceptions of friendliness and the diagonal element is -.3, then if A feels that B is friendly, then B tends to think that A is not friendly. The off diagonal elements, measure the correlations between relationship components in which the persons flip-flop as actor and partner. So for instance, the interpersonal relationship correlation between smiling and gazing assesses the amount of smiling of A with B with the amount of gazing of B with A. The intrapersonal relationship correlation between smiling and gazing assesses the amount of smiling of A with B with the amount of gazing of A with B.

If the design is asymmetric, then this is not a symmetric matrix. If the design is half block, this matrix cannot be computed.

*Personality Variables by Personality Variables*

These are the ordinary correlations with the group means subtracted. So if there are two personality variables, say self monitoring and self consciousness, then a correlation between the two would be based on taking each person's self monitoring score and subtracting the group's mean on self monitoring and correlating it with the parallel score for self consciousness.

*Personality Variables (Row) by Actor (Column)*

These correlations state the association between an actor effect and a personality variable. For instance, do people who are high in self monitoring see others as more or less intelligent?

*Personality Variables (Row) by Partner (Column)*

These correlations ask whether there is any association between a partner effect and a personality variable. For instance, are people who are high in self monitoring seen by others as more or less intelligent?

*Self by Self*

These are the ordinary correlations with group mean subtracted. So if there are two self ratings, say intelligence and popularity, then a correlation between the two would be based on taking each person's self rating of intelligence and subtracting the group's mean and correlating it with the parallel score for self rating of popularity.

*Self by Self Adjusted*

This matrix is optional and can be requested by asking for technical output in column 16 of the problem record. There are two types of output here. First there are the regressions of the self measure on the actor and partner effects and then there is the adjusted covariance and correlation matrix. First is discussed the regressions. If self ratings do not differ from other ratings, then the person's actor and partner effect should emerge in the self



measure. The regression coefficients should be equal to 1.0. To the extent that the coefficients are greater than 1.0, the component is more important when rating self; if less than 1.0, the component is less important when rating self. If it is zero, then the component is not present in self ratings. If it is negative, then it is present in self ratings but in the opposite direction. For instance, if the variable is the ratings of intelligence and the self-partner regression coefficient is negative, then a person whom peers feel is stupid, see him or herself as more intelligent.

After the regressions have been computed, the effects of actor and partner from the peer ratings are removed. The covariance and correlations matrices for the self ratings can be recomputed with adjustments made for the actor and partner effects. The diagonal of this matrix is in essence the self relationship variances and they can be compared to the relationship variances of the dyadic variables.

#### *Self (Row) by Actor (Column)*

These correlations determine whether persons who have a high actor effect see themselves as high on the trait. For instance, in a study of peer ratings of social adjustment, the self actor correlation would ask whether persons who see others as adjusted see themselves as adjusted.

#### *Self (Row) by Partner (Column)*

These correlations determine whether persons who have a high partner effect see themselves as high on the trait. For instance, in a study of peer ratings of social adjustment, the self-partner correlation would ask whether persons who are seen by their peers as adjusted see themselves as adjusted.

### **Miscellaneous**

The measurement model used in BLOCKO presumes that the measures are parallel but means may vary. That is, all the indicators of a construct have equal loadings on the construct. Also correlated measurement error across a pair of constructs is assumed to be equal for all pairs of correlated indicators of the two constructs.

Significance tests are not currently available for the constructs. Also tests of the self measures and the personality variables are only available for summaries across multiple groups.

**Disclaimer and Availability**

Although every effort has been made to assure accuracy, there is no guarantee that all results are accurate. Please proceed with caution. In particular, the following have not been extensively tested:

- subgroups of unequal size,
- designs other than the symmetric block design,
- self measures,
- personality variables,
- significance tests with the above,
- deletion,
- reorder option, and
- constructs.

All results should be carefully scrutinized. Although we have successfully used this program, we cannot guarantee its complete accuracy.

Please report all questions and errors to:

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To download BLOCKO and WINBLOCKO, consult the website

<http://davidakenny.net/srm/srmp.htm>

#### Reference

Kenny, D. A. (1994). *Interpersonal perception: A social relations analysis*. New York: Guilford.