APIMPowerR Documentation

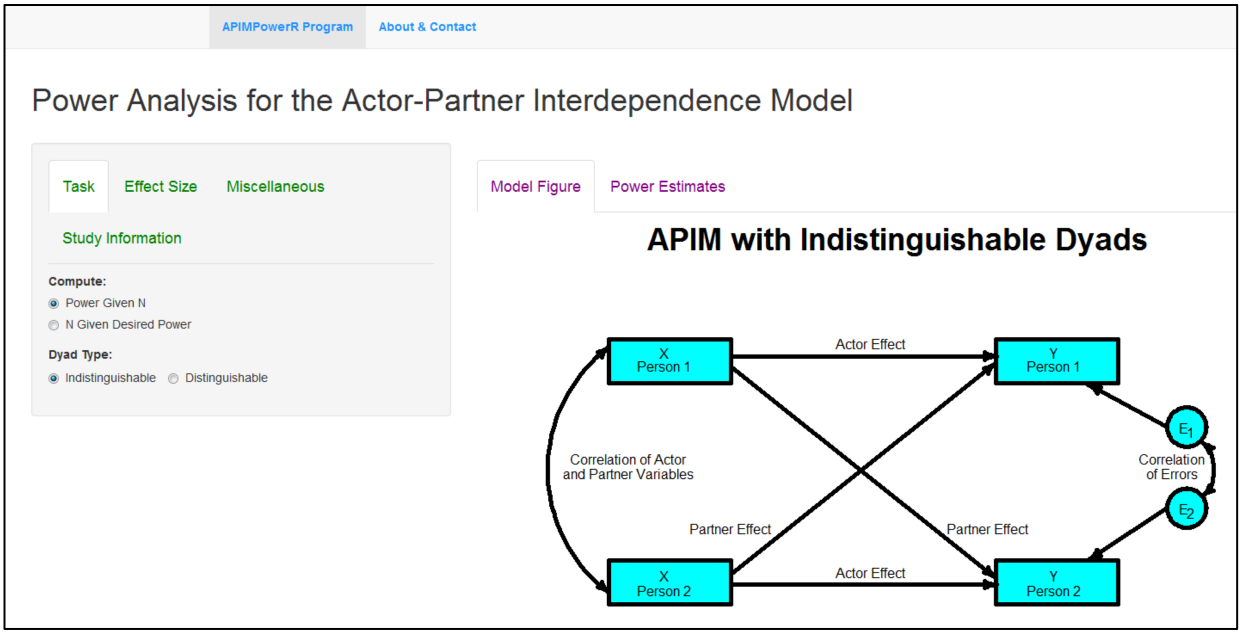
APIMPowerR (available at https://robert-a-ackerman.shinyapps.io/APIMPowerRdis/) estimates power for the Actor-Partner Interdependence Model (APIM) with indistinguishable or distinguishable dyads. Power can be determined for a given sample size or sample size can be determined given a desired level of power.

Although great effort has been undertaken to ensure the accuracy of results, no complete guarantee can be made about their accuracy. It is your responsibility to check the results for accuracy. Should the user notice any problems with the program, he or she should notify Robert Ackerman at raa110030@utdallas.edu.

Table of Contents

(Note that some screen shots differ a bit due to program revision.)

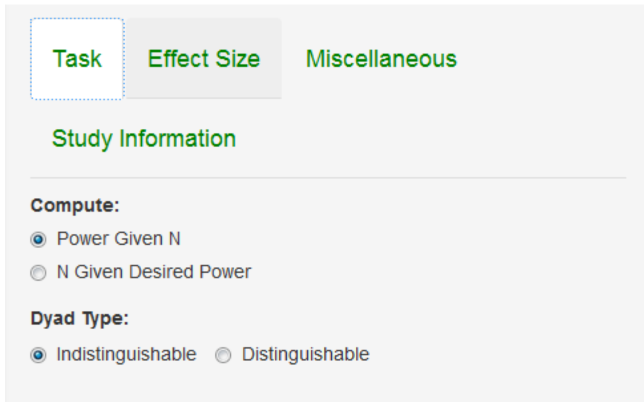
Input Panel and Output Panel for APIMPowerR



The app consists of an input panel to the left and an output panel to the right. The input panel contains four green tabs (i.e., **Task, Effect Size, Miscellaneous, and Study Information**) that permit the user to specify different features of the analysis (e.g., alpha level, effect size measure). To facilitate the specification of different parameters in the Study Information tab (e.g., Correlation of the Errors), a depiction of the Actor-Partner Interdependence Model with the corresponding parameters labeled is provided in the purple **Model Figure** tab in the output panel. The user is advised to click the four green tabs sequentially and choose the appropriate options. Once the analysis is completed, results are presented in the purple **Power Estimates** tab in the output panel.

Task Tab from Input Panel

Task Tab when Dyad Type is Indistinguishable



Task: This tab enables users to specify the type of analysis they would like to conduct as well as the dyad type with which they are working.

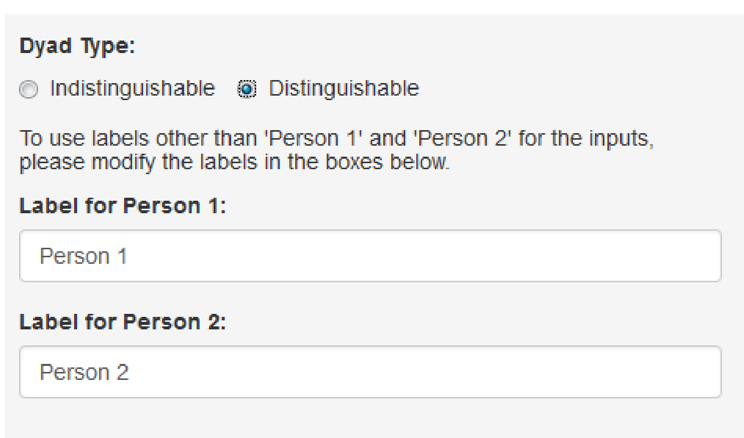
Compute: Users are provided two options:

a) Power Given N (i.e., determine the levels of power available to detect the actor and partner effects given a particular sample size and alpha), or

b) N Given Desired Power (i.e., determine the minimum sample sizes necessary to detect the actor and partner effects given a desired level of power and alpha).

Dyad Type: Users can specify whether their design entails indistinguishable dyads (i.e., dyad members that cannot be meaningfully differentiated by a categorical variable that only varies within dyads; for instance, same-sex roommates) or distinguishable dyads (i.e., dyad members that can be meaningfully differentiated by a categorical variable that only varies within dyads; for instance, gender in heterosexual dating relationships).

Task Tab When Dyad Type Is Distinguishable



If users choose distinguishable dyads, they are given the option to provide labels for 'Person 1' and 'Person 2' (e.g., Man and Woman or Supervisor and Subordinate) so that these can be used as labels for other inputs and outputs in the program.

<u>Effect Size Tab from Input Panel</u>

Effect Size Tab

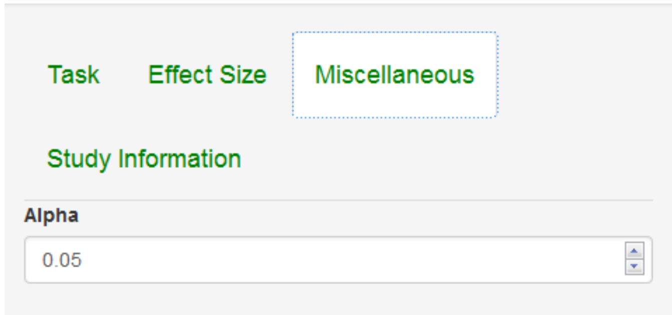
Effect Size: This tab is used to specify the effect size measure to be used in the power analysis.

Effect Size Measure: Users can specify their effect size measure to be the standardized regression coefficient (i.e., Beta), Cohen's *d* (i.e., d), or partial *r.* The program defaults to using Beta as the effect size measure.

If Cohen's *d* or partial *r* is chosen by the user, the program converts the value for the effect size measure to the corresponding Beta value before conducting the power analysis.

<u>Miscellaneous Tab from Input Panel</u>

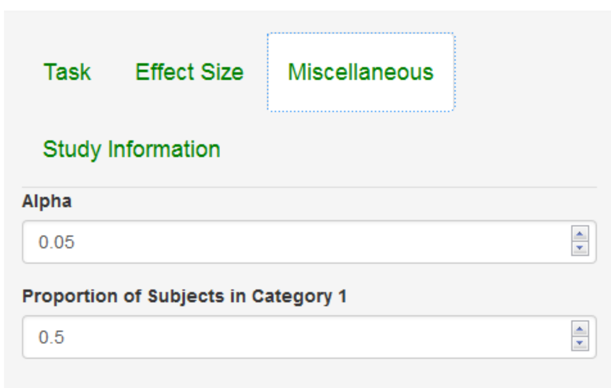
Miscellaneous Tab when Dyad Type is Indistinguishable and Effect Size Measure is Beta or partial r



Miscellaneous: This tab is used to specify the desired Type I Error Rate (i.e., alpha).

> **Alpha:** Users specify their desired Type I Error Rate here. The program defaults to .05, two-sided.

Miscellaneous Tab When Dyad Type Is Indistinguishable and Effect Size Measure Is Cohen's d

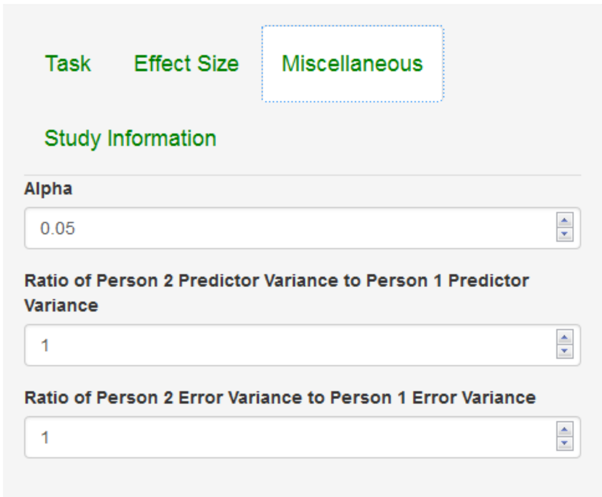


Miscellaneous: This tab is used to specify the desired Type I Error Rate (i.e., alpha) and the proportion of participants in Category 1 of the X variable.

> **Alpha:** Users specify their desired Type I Error Rate here. The program defaults to .05, two-sided.

Proportion of Subjects in Category 1: Users specify the proportion of participants that are in Category 1 of the X variable (which is assumed to be a dichotomy) here. The program defaults to .50. Note if the user expects an 80/20 split, one can put .8 or .2 in this box.

Miscellaneous Tab When Dyad Type Is Distinguishable and Effect Size Measure Is Beta or Partial r



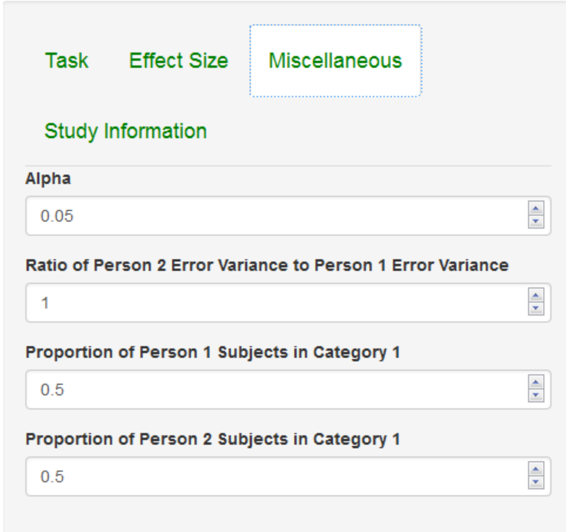
Miscellaneous: This tab is used to specify the desired Type I Error Rate (i.e., alpha) and the Ratios of Variances between the dyad members.

Alpha: Users specify their desired Type I Error Rate here. The program defaults to .05, two-sided.

Ratio of Person 2 Predictor Variance to Person 1 Predictor Variance: Users specify how much bigger (or smaller) the variance in the predictor is for Person 1 compared to Person 2 in the form of a ratio here. The program defaults to 1 (i.e., assumes the variances are equal).

Ratio of Person 2 Error Variance to Person 1 Error Variance: Users specify how much bigger (or smaller) the error variance is for Person 1 compared to Person 2 in the form of a ratio here. The program defaults to 1 (i.e., assumes the variances are equal in size).

Miscellaneous Tab when Dyad Type Is Distinguishable and Effect Size Measure Is Cohen's d



Miscellaneous: This tab is used to specify the desired Type I Error Rate (i.e., alpha), the Ratios of Variances between the dyad members, and the Proportion of Participants in Category 1 of the X variable.

Alpha: Users specify their desired Type I Error Rate here. The program defaults to .05, two-sided.

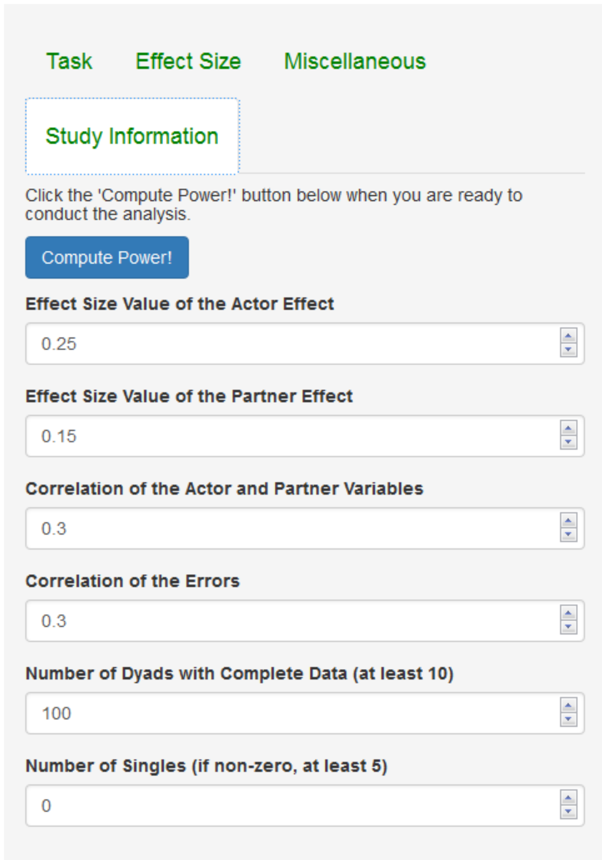
Ratio of Person 2 Error Variance to Person 1 Error Variance: Users specify how much bigger (or smaller) the error variance is for Person 1 compared to Person 2 in the form of a ratio here. The program defaults to 1 (i.e., assumes the variances are equal in size).

Proportion of Person 1 Subjects in Category 1: When users choose *d* as the Effect Size Measure, the X variable is assumed to be a dichotomy. As such, users can specify the proportion of Person 1 participants that are in Category 1 of the X variable here. The program defaults to .50.

Proportion of Person 2 Subjects in Category 1: When users choose *d* as the Effect Size Measure, the X variable is assumed to be a dichotomy. As such, users can specify the proportion of Person 2 participants that are in Category 1 of the X variable here. The program defaults to .50.

Study Information Tab from Input Panel

Study Information Tab when Dyad Type is Indistinguishable and Task is to Compute Power Given N



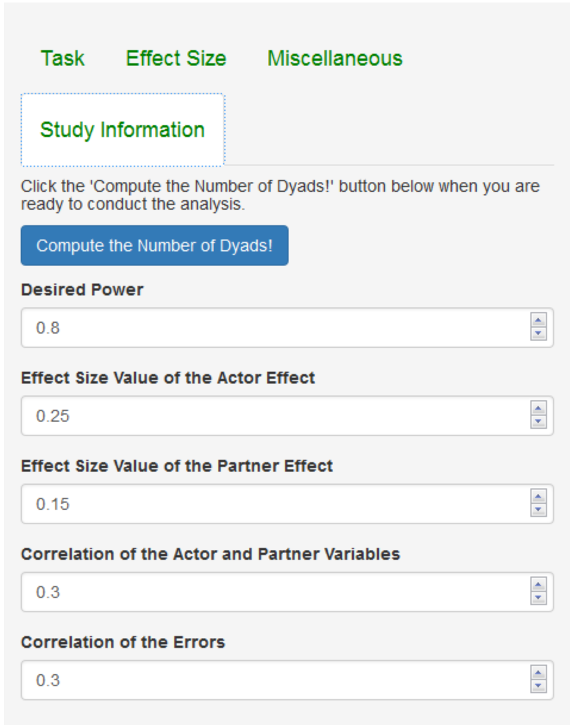
Study Information: This tab is used to specify the primary effect size values for the analysis and the given sample size.

> **Effect Size Value of the Actor Effect:** Users specify the effect size value for the actor effect here. The program defaults to .25. Note if *d* or *r* is chosen earlier, the effect size is for that measure.
>
> **Effect Size Value of the Partner Effect:** Users specify the effect size value for the partner effect here. The program defaults to .15.
>
> **Correlation of the Actor and Partner Variables:** Users specify the value of the correlation between the two dyad members' predictor variables here. The program defaults to .30.
>
> **Correlation of the Errors:** Users specify the value of the correlation between the two dyad members' residuals here. The program defaults to .30.

Number of Dyads with Complete Data (at least 10): Users specify the number of dyads with complete data here (i.e., dyads for which both members supply data). The program defaults to 100.

Number of Singles (if non-zero, at least 5): Users specify the number of singles here (i.e., dyads for which only one of the members supply data). The program defaults to 0.

Study Information Tab When Dyad Type Is Indistinguishable and Task Is to Determine N Given Desired Level of Power



Study Information: This tab is used to specify the primary effect size values for the analysis and the desired level of power.

Desired Power: Users specify their desired level of power here. The program defaults to .80. The value should be larger than alpha and less than one.

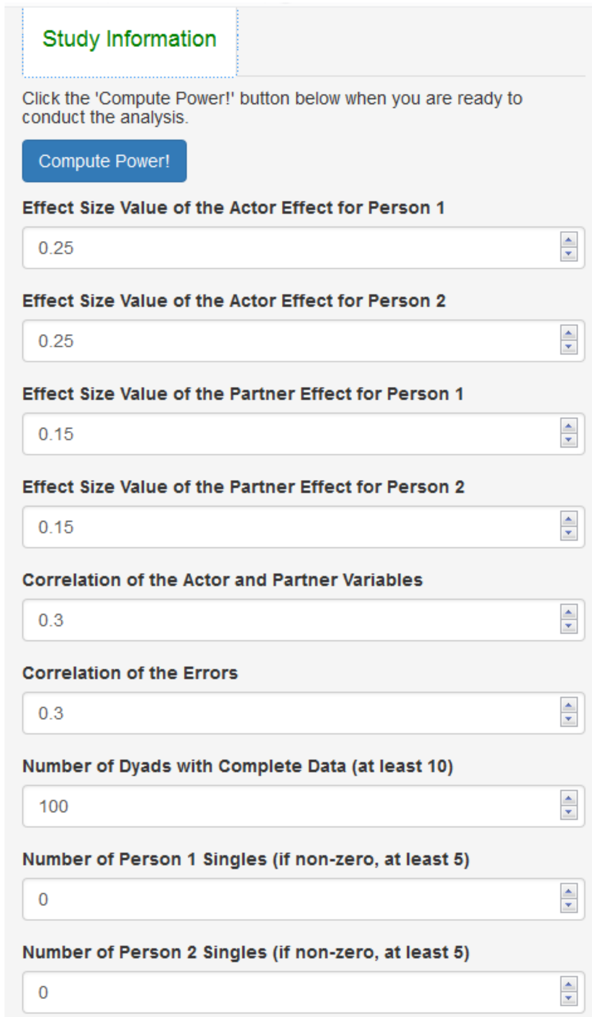
Effect Size Value of the Actor Effect: Users specify the effect size value for the actor effect here. The program defaults to .25.

Effect Size Value of the Partner Effect: Users specify the effect size value for the partner effect here. The program defaults to .15.

Correlation of the Actor and Partner Variables: Users specify the value of the correlation between the two dyad members' predictor variables here. The program defaults to .30.

Correlation of the Errors: Users specify the value of the correlation between the two dyad members' residuals here. The program defaults to .30.

Study Information Tab When Dyad Type Is Distinguishable and Task Is to Compute Power Given N



Study Information: This tab is used to specify the effect size values for the power analysis and the given sample size.

Effect Size Value of the Actor Effect for Person 1: Users specify the effect size value for the actor effect for Person 1 here. The program defaults to .25.

Effect Size Value of the Actor Effect for Person 2: Users specify the effect size value for the actor effect for Person 2 here. The program defaults to .25.

Effect Size Value of the Partner Effect for Person 1: Users specify the effect size value for the partner effect for Person 1 here. The program defaults to .15.

Effect Size Value of the Partner Effect for Person 2: Users specify the effect size value for the partner effect for Person 2 here. The program defaults to .15.

Correlation of the Actor and Partner Variables: Users specify the value of the correlation between the two dyad members' predictor variables here. The program defaults to .30.

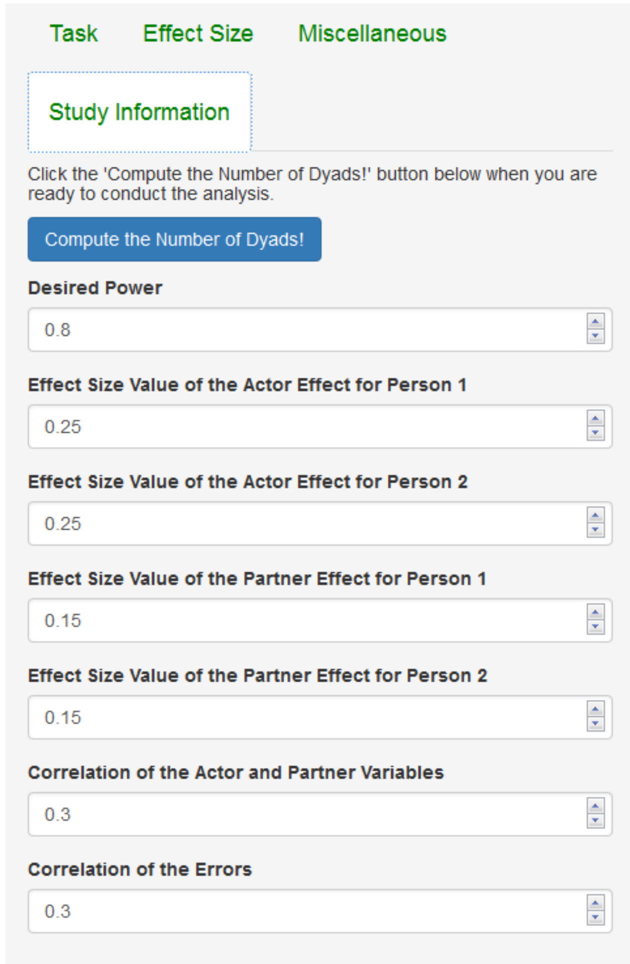
Correlation of the Errors: Users specify the value of the correlation between the two dyad members' residuals here. The program defaults to .30.

Number of Dyads with Complete Data (at least 10): Users specify the number of dyads with complete data here (i.e., dyads for which both members supply data). The program defaults to 100.

Number of Person 1 Singles: Users specify the number of Person 1 singles here (i.e., dyads for which only Person 1 supplies data). The program defaults to 0.

Number of Person 2 Singles: Users specify the number of Person 2 singles here (i.e., dyads for which only Person 2 supplies data). The program defaults to 0.

Study Information Tab When Dyad Type Is Distinguishable and Task Is to Determine Sample Size Given a Desired Level of Power



Study Information: This tab is used to specify the primary effect size values for the analysis and the desired level of power.

Desired Power: Users specify their desired level of power here. The program defaults to .80. The value should be larger than alpha and less than one.

Effect Size Value of the Actor Effect for Person 1: Users specify the effect size value for the actor effect for Person 1 here. The program defaults to .25.

Effect Size Value of the Actor Effect for Person 2: Users specify the effect size value for the actor effect for Person 2 here. The program defaults to .25.

Effect Size Value of the Partner Effect for Person 1: Users specify the effect size value for the partner effect for Person 1 here. The program defaults to .15.

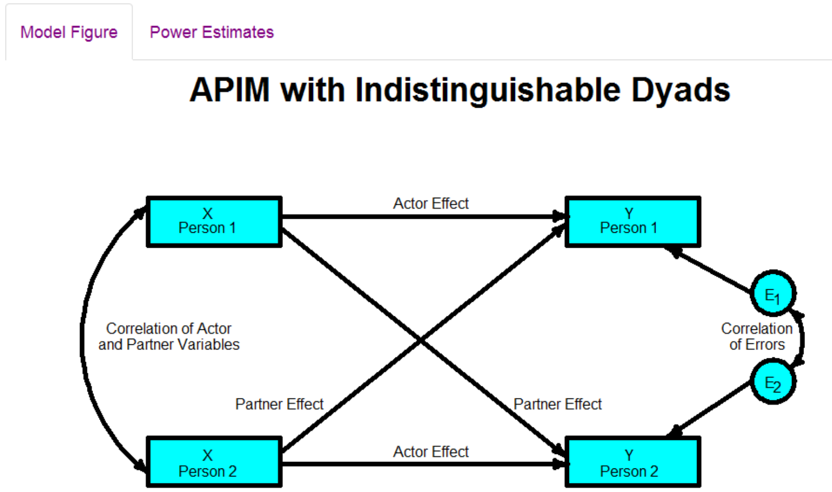
Effect Size Value of the Partner Effect for Person 2: Users specify the effect size value for the partner effect for Person 2 here. The program defaults to .15.

Correlation of the Actor and Partner Variables: Users specify the value of the correlation between the two dyad members' predictor variables here. The program defaults to .30.

Correlation of the Errors: Users specify the value of the correlation between the two dyad members' residuals here. The program defaults to .30.

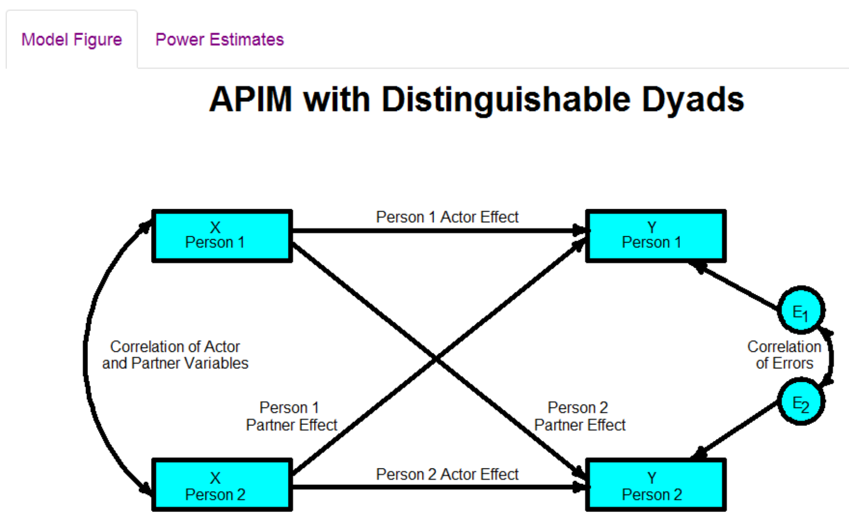
Model Figure from Output Panel

Model Figure When Dyad Type is Indistinguishable



Model Figure: When users choose “indistinguishable” as their Dyad Type, the APIM with Indistinguishable Dyads is displayed.

Model Figure when Dyad Type is Distinguishable



Model Figure: When users choose ‘Distinguishable’ as their Dyad Type, the APIM with Distinguishable Dyads is displayed. In addition, if the labels for ‘Person 1’ and ‘Person 2’ are modified, those changes are reflected in the figure.

Power Estimates Tab from Output Panel

Power Estimates Tab When Dyad Type Is Indistinguishable and Task Is to Compute Power Given N

Model Figure | Power Estimates

	Size	Power	N	Beta	r	partial r	ncp
Actor	.250	.959	100	.250	.295	.245	3.714
Partner	.150	.602	100	.150	.225	.150	2.229

The task is to determine the levels of power available to detect the actor and partner effects for an Actor-Partner Interdependence Model analysis with indistinguishable dyads given a particular sample size and alpha.

Alpha is set to .050. N refers to the number of dyads. There are 100 dyads (and 0 singles).

The measure of effect size is beta, the standardized regression coefficient. The correlation between the two members' scores on X is .300, and the correlation of the errors is .300. The term "ncp" is the non-centrality parameter or the regression coefficient divided by its standard error.

There is .959 power to detect an actor effect of size .250 (i.e., a beta of .250 or a partial r of .245).

There is .602 power to detect a partner effect of size .150 (i.e., a beta of .150 or a partial r of .150).

Power Estimates: This tab provides users with the results of the analysis (i.e., the power available to detect the actor and partner effects).

Table: The 'Size' column contains the effect size value that was specified on the Study Information tab of the Input Panel. The 'Power' column contains the estimated level of power available to detect the effect. The term "N" refers to the number of complete dyads that were specified on the Study Information tab of the Input Panel (note: if 'Singles' is specified to be greater than 0, this would be reflected in an additional column in the table). The 'Beta' column contains the size of the effect in terms of the standardized regression coefficient. The 'r' column contains the zero-order correlation coefficient for the effect. The 'partial r' column contains the size of the effect in terms of the partial correlation coefficient. The 'ncp' column contains the non-centrality parameter for the effect.

Text: Summary text for the analyses is presented underneath the table.

Power Estimates Tab When Dyad Type Is Indistinguishable and Task Is to Determine Sample Size Given Desired Level of Power

Model Figure Power Estimates

	Size	Power	N	df	Beta	r	partial r	ncp
Actor	.250	.803	59	114.97	.250	.295	.245	4.697
Partner	.150	.802	159	314.99	.150	.225	.150	2.818

The task is to determine the minimum sample sizes necessary to detect the actor and partner effects for an Actor-Partner Interdependence Model analysis with indistinguishable dyads given a desired level of power and alpha.

Alpha is set to .050. N refers to the number of dyads. The N given is the smallest number of dyads required to detect the effect when power is at least 0.8.

The measure of effect size is beta, the standardized regression coefficient. The correlation between the two members' scores on X is .300, and the correlation of the errors is .300. The term "ncp" is the non-centrality parameter or the regression coefficient divided by its standard error.

At minimum, 59 dyads are needed to have adequate power to detect an actor effect of size .250 (i.e., a beta of .250 or a partial r of .245).

At minimum, 159 dyads are needed to have adequate power to detect a partner effect of size .150 (i.e., a beta of .150 or a partial r of .150).

Power Estimates: This tab provides users with the results of the analysis (i.e., the minimum number of dyads needed to have adequate power to detect the actor and partner effects)

Table: The 'Size' column contains the effect size value that was specified on the Study Information tab of the Input Panel. The 'Power' column contains the desired level of power to detect the effect. N refers to the minimum number of complete dyads that are needed to detect the effect with the desired power. Note the N is almost certainly a different value for actor and partner. The 'df' column contains the degrees of freedom associated with the minimum number of dyads needed to detect the effect with adequate power. The 'Beta' column contains the size of the effect in terms of the standardized regression coefficient. The 'r' column contains the zero-order correlation coefficient for the effect. The 'partial r' column contains the size of the effect in terms of the partial correlation coefficient. The 'ncp' column contains the non-centrality parameter for the effect.

Text: Summary text for the analyses is presented underneath the table.

Power Estimates Tab when Dyad Type Is Distinguishable and Task Is to Compute Power Given N

Model Figure | Power Estimates

	Effect	Power	N	df	Beta	r	partial r	ncp
Actor Effect for Person 1	.250	.692	100	97	.250	.295	.245	2.486
Actor Effect for Person 2	.250	.692	100	97	.250	.295	.245	2.486
Partner Effect for Person 1	.150	.315	100	97	.150	.225	.150	1.492
Partner Effect for Person 2	.150	.315	100	97	.150	.225	.150	1.492
Difference in Actor Effects	.000	.050	100					0.000
Difference in Partner Effects	.000	.050	100					0.000

The task is to determine the levels of power available to detect the actor and partner effects for an Actor-Partner Interdependence Model analysis with distinguishable dyads given a particular sample size and alpha.

Alpha is set to .050. N refers to the number of dyads. There are 100 dyads (and 0 Person 1 singles and 0 Person 2 singles).

The measure of effect size is beta, the standardized regression coefficient. The correlation between the two members' scores on X is .300, and the correlation of the errors is .300. The term "ncp" is the non-centrality parameter or the regression coefficient divided by its standard error.

There is .692 power to detect an actor effect for Person 1 of size .250 (i.e., a beta of .250 or a partial r of .245).

There is .692 power to detect an actor effect for Person 2 of size .250 (i.e., a beta of .250 or a partial r of .245).

There is .315 power to detect a partner effect for Person 1 of size .150 (i.e., a beta of .150 or a partial r of .150).

There is .315 power to detect a partner effect for Person 2 of size .150 (i.e., a beta of .150 or a partial r of .150).

Power Estimates: This tab provides users with the results of the analysis (i.e., the power to detect the actor and partner effects for persons 1 and 2, as well as the difference in the actor effects and the difference in the partner effects).

> **Table:** The ‘Effect’ column contains the effect size value that was specified on the Study Information tab of the Input Panel. The ‘Power’ column contains the level of power available to detect the effect. N refers to the number of complete dyads that were specified on the Study Information tab of the Input Panel (note: if ‘Singles’ is specified to be greater than 0, this would be reflected in an additional column in the table). The ‘df’ column contains the degrees of freedom associated with the number of dyads (and/or singles) specified in the Study Information tab from the Input Panel. The ‘Beta’ column contains the size of the effect in terms of the standardized regression coefficient. The ‘r’ column contains the zero-order correlation coefficient for the effect. The ‘partial r’ column contains the size of the effect in terms of the partial correlation coefficient. (If Cohen’s d is chosen as the Effect Size Measure, an additional column for the effect size value for d will be reflected in the table). The ‘ncp’ column contains the non-centrality parameter for the effect.
>
> **Text:** Summary text for the analyses is presented underneath the table.

Power Estimates Tab when Dyad Type is Distinguishable and Task is to Determine Sample Size Given Desired Level of Power

Model Figure | Power Estimates

	Effect	Power	N	df	Beta	r	partial r	ncp
Actor Effect for Person 1	.250	.803	129	126	.250	.295	.245	2.834
Actor Effect for Person 2	.250	.803	129	126	.250	.295	.245	2.834
Partner Effect for Person 1	.150	.801	348	345	.150	.225	.150	2.813
Partner Effect for Person 2	.150	.801	348	345	.150	.225	.150	2.813
Difference in Actor Effects	.000	.05	0					0.000
Difference in Partner Effects	.000	.05	0					0.000

The task is to determine the minimum sample sizes necessary to detect the actor and partner effects for an Actor-Partner Interdependence Model analysis with distinguishable dyads given a desired level of power and alpha.

Alpha is set to .050. N refers to the number of dyads. The N given is the smallest number of dyads required to detect the effect when power is at least 0.8.

The measure of effect size is beta, the standardized regression coefficient. The correlation between the two members' scores on X is .300, and the correlation of the errors is .300. The term "ncp" is the non-centrality parameter or the regression coefficient divided by its standard error.

At minimum, 129 dyads are needed to have adequate power to detect an actor effect for Person 1 of size .250 (i.e., a beta of .250 or a partial r of .245).

At minimum, 129 dyads are needed to have adequate power to detect an actor effect for Person 2 of size .250 (i.e., a beta of .250 or a partial r of .245).

At minimum, 348 dyads are needed to have adequate power to detect a partner effect for Person 1 of size .150 (i.e., a beta of .150 or a partial r of .150).

At minimum, 348 dyads are needed to have adequate power to detect a partner effect for Person 2 of size .150 (i.e., a beta of .150 or a partial r of .150).

Power Estimates: This tab provides users with the results of the analysis (i.e., the minimum number of dyads needed to have adequate power to detect the actor and partner effects for persons 1 and 2, as well as the difference in the actor effects and the difference in the partner effects)

Table: The ‘Effect’ column contains the effect size value that was specified on the Study Information tab of the Input Panel. The ‘Power’ column contains the level of power available to detect the effect. N refers to the minimum number of complete dyads that are needed to detect the effect with adequate power. The ‘df’ column contains the degrees of freedom associated with the minimum number of dyads needed to detect the effect with adequate power. The ‘Beta’ column contains the size of the effect in terms of the standardized regression coefficient. The ‘r’ column contains the zero-order correlation coefficient for the effect. The ‘partial r’ column contains the size of the effect in terms of the partial correlation coefficient. The ‘ncp’ column contains the non-centrality parameter for the effect.

Text: Summary text for the analyses is presented underneath the table.