

# MA\* Packages

*meta-analysis packages for the R statistical software program*

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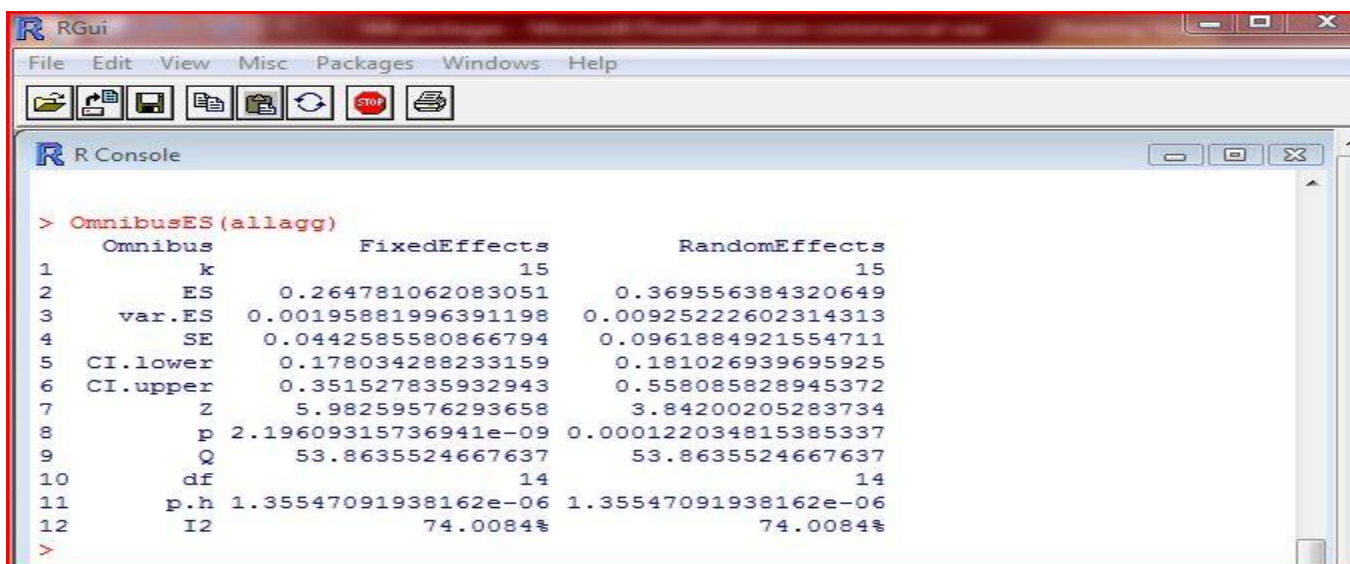
# Overview

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- What is R?
- Brief description of meta-analysis programs
  - 'compute.es' (Compute Effect Sizes)
  - 'MA\*' (Meta-Analysis with Correlations or Mean Differences)
  - 'MA\*' GUI ('Point & click' option for the packages)
- Brief tutorial
  - running program and importing files (excel & .csv files)
  - running functions using R programming language and GUI
  - interpreting output from the Meta-Analysis packages
- Summary
- Resources

# What is R?

- R is a open-source (free!) statistical software program
  - software of choice for many statisticians around the world.
  - command line interface (although GUI options for menu-driven data analysis)
  - user-contributed packages (e.g, SEM, multilevel modeling) for various statistical analyses



The screenshot shows the RGui window with the R Console. The console displays the output of the `OmnibusES(allagg)` function, which is a table comparing fixed and random effects. The table has three columns: 'Omnibus', 'FixedEffects', and 'RandomEffects'. The rows show various statistical measures including k, ES, var.ES, SE, CI.lower, CI.upper, Z, p, Q, df, p.h, and I2.

```
> OmnibusES(allagg)
```

	Omnibus	FixedEffects	RandomEffects
1	k	15	15
2	ES	0.264781062083051	0.369556384320649
3	var.ES	0.00195881996391198	0.00925222602314313
4	SE	0.0442585580866794	0.0961884921554711
5	CI.lower	0.178034288233159	0.181026939695925
6	CI.upper	0.351527835932943	0.558085828945372
7	Z	5.98259576293658	3.84200205283734
8	p	2.19609315736941e-09	0.000122034815385337
9	Q	53.8635524667637	53.8635524667637
10	df	14	14
11	p.h	1.35547091938162e-06	1.35547091938162e-06
12	I2	74.0084%	74.0084%

```
>
```

# MA\* packages

- There are currently 5 related packages for conducting a meta-analysis:
  1. 'compute.es' (*Compute Effect Sizes*; Del Re, 2010)
  2. 'MAc' (*Meta-Analysis with Correlations*; Del Re & Hoyt, 2010)
  3. 'MAc' GUI (*RcmdrPlugin.MAc*; Del Re, 2010)
  4. 'MAd' (*Meta-Analysis with Mean Differences*; Del Re & Hoyt, 2010)
  5. 'MAd' GUI (*RcmdrPlugin.MAd*; Del Re, 2010)

# Description of 'MAd' package

*“This package contains a variety of functions relevant for conducting a mean differences meta-analysis using recommended procedures as described in The Handbook of Research Synthesis and Meta-Analysis (Cooper, Hedges, and Valentine, 2009).*

*The goal in creating this package was to provide user-friendly functions for assist researchers in the process of conducting a meta-analysis, from the initial to final stages of their analytic endeavor.*

*The meta-analyst can begin their project by using MAd functions to derive  $d$  (standardized mean differences) and  $g$  (unbiased  $d$ ) from a variety of statistics / values reported in the primary studies (e.g., raw means and sd, t-test).*

*Then, the analyst can aggregate all within-study effect sizes (while accounting for within-study correlations among outcome measures and eliminating any dependencies in the dataset) based on recommended procedures by Gleser & Olkin (1994 & 2009), calculate omnibus effect sizes under a fixed and random effects model, and assess for significant moderators (categorical and continuous, single and multi-predictor models) in the dataset.*

*Finally, the meta-analyst can use one of several user-friendly graphics functions to visually represent their data in an elegant manner.”*

# Brief Tutorial

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- file structure, importing files (excel & .csv files), and running program
- running functions using R programming language and GUI

# Data file structure for 'MAd'

- Although all data can be entered directly into R, it is typically easier to use a spreadsheet interface program (e.g., Excel) for data entry.
- In Excel, (for mean differences meta-analyses) make sure to have columns:
  - **id** (study id)
  - **m.1** (post-test mean for treatment group)
  - **n.1** (treatment sample size)
  - **sd.1** (treatment standard deviation)
  - **m.2** (post-test mean for control/comparison group)
  - **n.2** (control/comparison sample size)
  - **sd.2** (control/comparison standard deviation)
  - and **moderators** (named to your liking)
- Alternatively, columns for:
  - **d** and/or **g** (standardized mean difference)
  - **var.d** and/or **var.g** (variance of standardized mean difference)
  - **n.1** (treatment sample size)
  - **n.2** (control/comparison sample size)

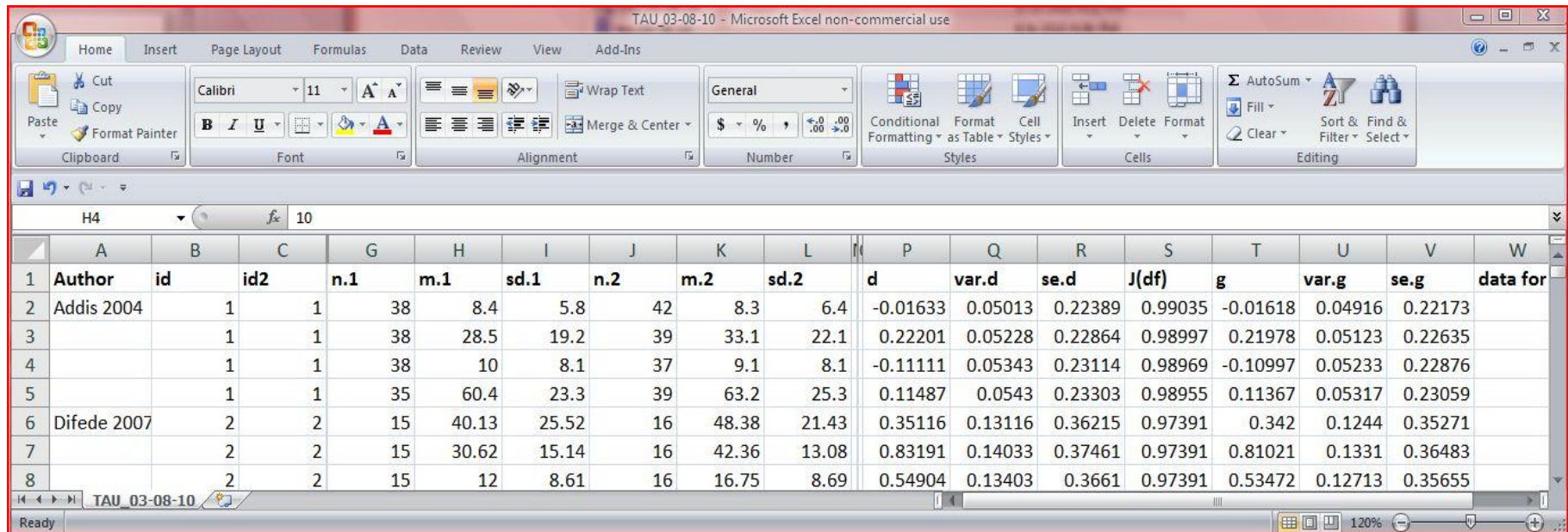
# Data file structure for 'MAc'

- Although all data can be entered directly into R, it is typically easier to use a spreadsheet interface program (e.g., Excel) for data entry.
- In Excel, (for correlational meta-analyses) make sure to have columns:
  - **id** (study id)
  - **r** (correlation)
  - **n** (sample size)
  - and **moderators** (named to your liking)



# Mean differences data

One format structure for data entry (using Excel)



TAU\_03-08-10 - Microsoft Excel non-commercial use

Home Insert Page Layout Formulas Data Review View Add-Ins

Clipboard: Cut, Copy, Paste, Format Painter

Font: Calibri, 11, Bold, Italic, Underline, Text Color, Fill Color

Alignment: Wrap Text, Merge & Center

Number: General, Currency, Percentage, Decimal, Fraction

Styles: Conditional Formatting, Format as Table, Cell Styles

Cells: Insert, Delete, Format

Editing: AutoSum, Fill, Clear, Sort & Filter, Find & Select

	A	B	C	G	H	I	J	K	L	P	Q	R	S	T	U	V	W
1	Author	id	id2	n.1	m.1	sd.1	n.2	m.2	sd.2	d	var.d	se.d	J(df)	g	var.g	se.g	data for
2	Addis 2004	1	1	38	8.4	5.8	42	8.3	6.4	-0.01633	0.05013	0.22389	0.99035	-0.01618	0.04916	0.22173	
3		1	1	38	28.5	19.2	39	33.1	22.1	0.22201	0.05228	0.22864	0.98997	0.21978	0.05123	0.22635	
4		1	1	38	10	8.1	37	9.1	8.1	-0.11111	0.05343	0.23114	0.98969	-0.10997	0.05233	0.22876	
5		1	1	35	60.4	23.3	39	63.2	25.3	0.11487	0.0543	0.23303	0.98955	0.11367	0.05317	0.23059	
6	Difede 2007	2	2	15	40.13	25.52	16	48.38	21.43	0.35116	0.13116	0.36215	0.97391	0.342	0.1244	0.35271	
7		2	2	15	30.62	15.14	16	42.36	13.08	0.83191	0.14033	0.37461	0.97391	0.81021	0.1331	0.36483	
8		2	2	15	12	8.61	16	16.75	8.69	0.54904	0.13403	0.3661	0.97391	0.53472	0.12713	0.35655	

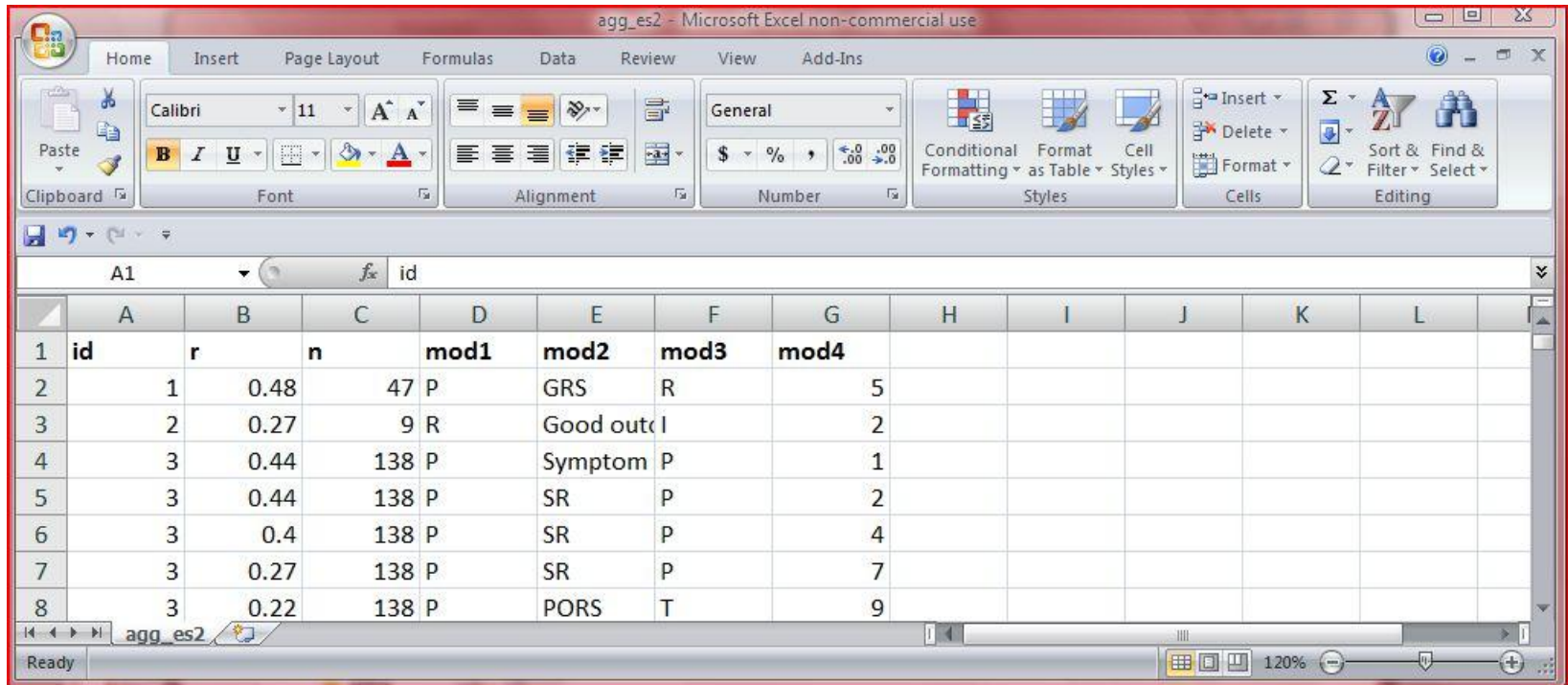
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Ready

120%

# Correlational data

One format structure for data entry (using Excel)



The screenshot shows a Microsoft Excel spreadsheet titled "agg\_es2 - Microsoft Excel non-commercial use". The ribbon includes tabs for Home, Insert, Page Layout, Formulas, Data, Review, View, and Add-Ins. The Home tab is active, showing options for Clipboard, Font, Alignment, Number, Styles, Cells, and Editing. The spreadsheet data is as follows:

	A	B	C	D	E	F	G	H	I	J	K	L
1	id	r	n	mod1	mod2	mod3	mod4					
2	1	0.48	47	P	GRS	R	5					
3	2	0.27	9	R	Good outc		2					
4	3	0.44	138	P	Symptom	P	1					
5	3	0.44	138	P	SR	P	2					
6	3	0.4	138	P	SR	P	4					
7	3	0.27	138	P	SR	P	7					
8	3	0.22	138	P	PORS	T	9					

# Running the meta-analysis program

- First, download R (statistical software program) at:
  - <http://cran.r-project.org/>
- Next, download preferred meta-analysis package.
  - In your local R program: Packages --> (select a CRAN mirror--find any mirror that is in relatively close proximity, if possible) --> (scroll down to RcmdrPlugin.MAd [or RcmdrPlugin.MAc] and click on it). The other required packages should automatically download.



# Importing data files

- Save main data file (excel or spss) to a .csv file (e.g., see save options in Excel)
- In R, set the working directory to the location of your .csv data file :
  - R menu: File --> Change Dir --> (location of .csv file)
- Use command to import the data:
- `mydata <- read.csv("MetaData.csv", header=TRUE, na.strings="")`
- Where `mydata` is the name of the 'object' the data file will be saved in and `MetaData.csv` = name of .csv file (you should change these names accordingly)
- Note: this package requires the names of the required variables to be named exactly as stated in the previous slides 'Data file structure for...'

# Loading the 'MA\*' programs

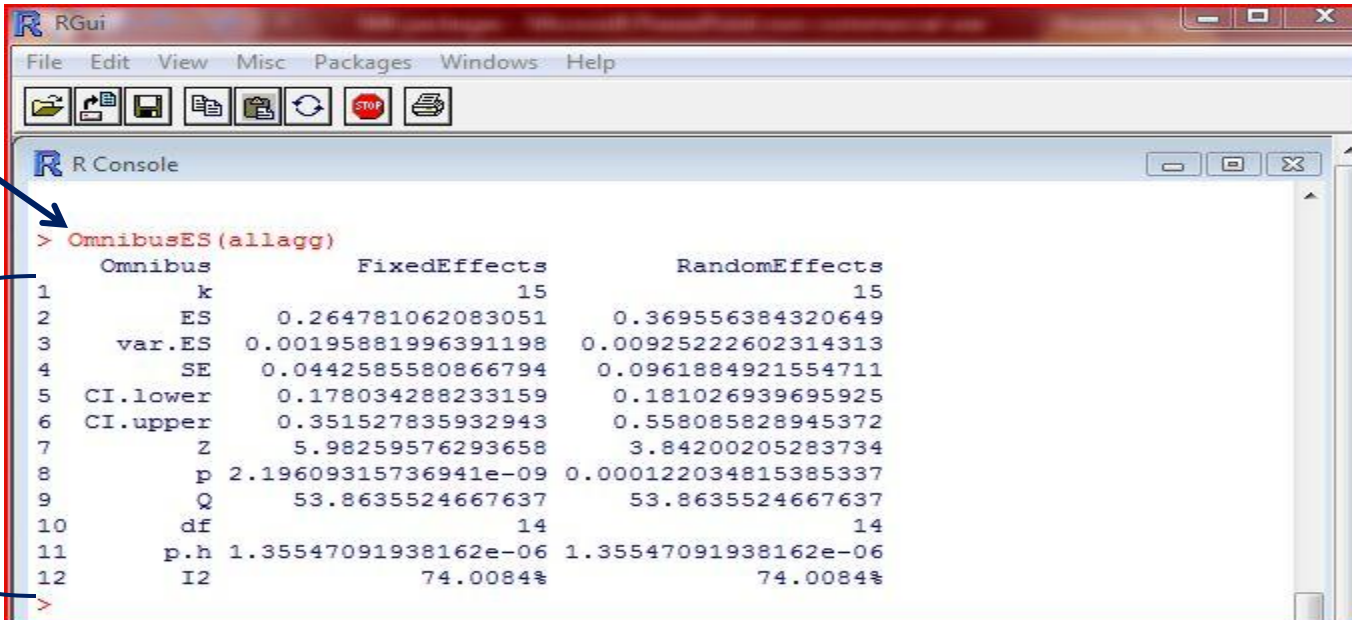
- To load the meta-analysis programs into the current R working session:
  - Either type:
    - `library(RcmdrPlugin.MAd)` or
    - `library(RcmdrPlugin.MAc)`
    - at the command prompt or at the R pull-down menu click:
    - Packages → Load Package → RcmdrPlugin.MAd



# Sample 'MA\*' function at R command prompt

- OmnibusES (mydata)
  - Where
    - OmnibusES = function to derive an overall omnibus effect size under a fixed and random effects model
    - mydata = object with relevant meta-analysis data. This 'object' can be names to ones liking.

input



```
> OmnibusES(allagg)
```

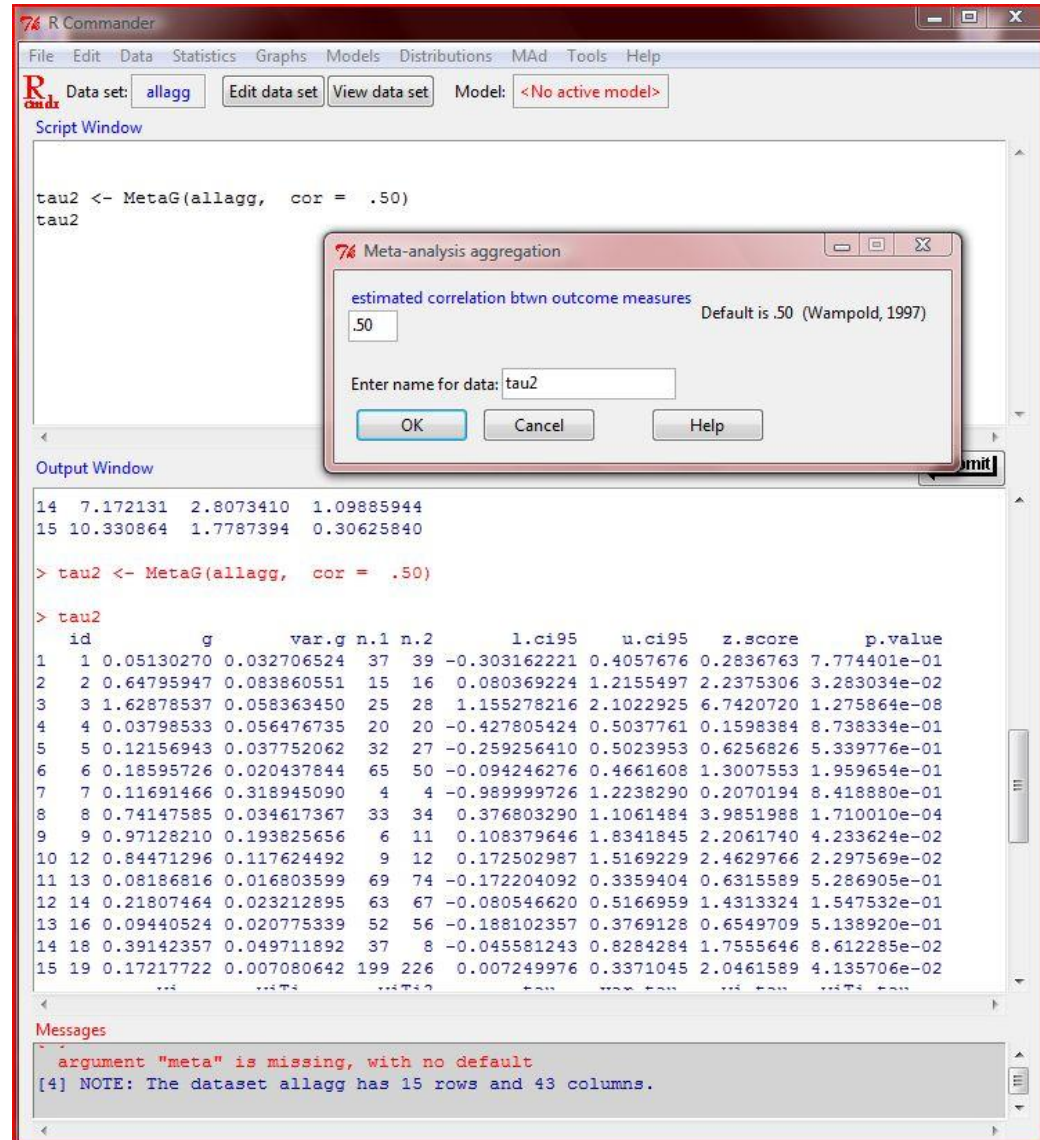
	Omnibus	FixedEffects	RandomEffects
1	k	15	15
2	ES	0.264781062083051	0.369556384320649
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12	I2	74.0084%	74.0084%

output



# Sample 'MAd' function using the GUI

- Using the Graphical User Interface (GUI) option will provide the user with a 'point-and-click' option (think SPSS) for conducting a meta-analysis using the 'MAd' package
- Notice the 'MAd' menu above. This menu is added to the 'Rcmdr' program and contains all the options for running various meta-analyses



Start by selecting the dataset that was imported into R

Meta-analysis menu

input

Pop-up menu for aggregating the meta-analytic dataset.

output

The screenshot shows the R Commander window with the following components:

- Menu Bar:** File, Edit, Data, Statistics, Graphs, Models, Distributions, MAd, Tools, Help. A red arrow points to the 'MAd' menu, labeled 'Meta-analysis menu'.
- Data set:** 'allagg' is selected in the 'Data set:' dropdown.
- Script Window:** Contains the R code:

```
tau2 <- MetaG(allagg, cor = .50)
tau2
```
- Output Window:** Displays the execution of the code, showing a table of results with columns: id, g, var.g, n.1, n.2, l.ci95, u.ci95, z.score, p.value. A blue bracket labeled 'output' points to this window.
- Messages:** Shows a warning: 'argument "meta" is missing, with no default' and a note: '[4] NOTE: The dataset allagg has 15 rows and 43 columns.'
- Meta-analysis aggregation dialog:** A pop-up window titled 'Meta-analysis aggregation' is open. It has a text field for 'estimated correlation btwn outcome measures' with the value '.50' and a label 'Default is .50 (Wampold, 1997)'. Below it is a text field 'Enter name for data:' with the value 'tau2'. There are 'OK', 'Cancel', and 'Help' buttons. A blue arrow points to this dialog, labeled 'Pop-up menu for aggregating the meta-analytic dataset.'



# Resources/References

- ‘MAc’ package:

<http://cran.r-project.org/web/packages/MAc/>

- ‘MAc’ GUI:

<http://cran.r-project.org/web/packages/RcmdrPlugin.MAc/>

- ‘MAd’ package:

<http://cran.r-project.org/web/packages/MAd/>

- ‘MAd’ GUI:

<http://cran.r-project.org/web/packages/RcmdrPlugin.MAd/>

- R statistical software program:

<http://cran.r-project.org/>