MA* Packages

meta-analysis packages for the R statistical software program

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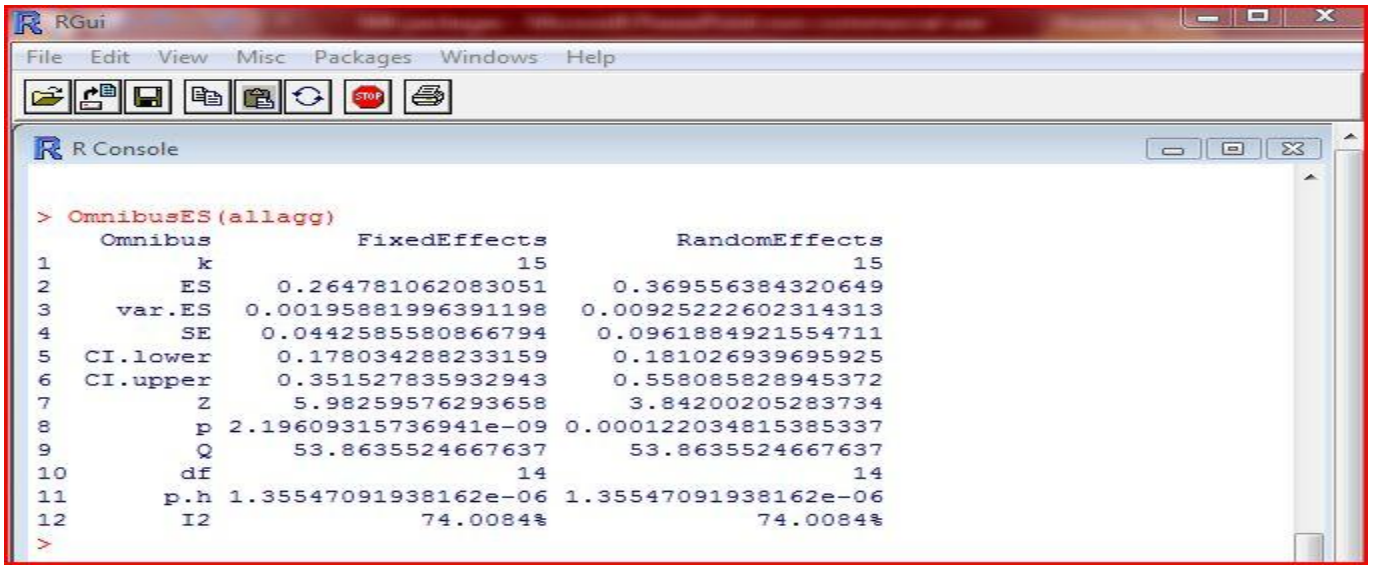
Overview

- 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



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

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

Data file structure for 'MAd'

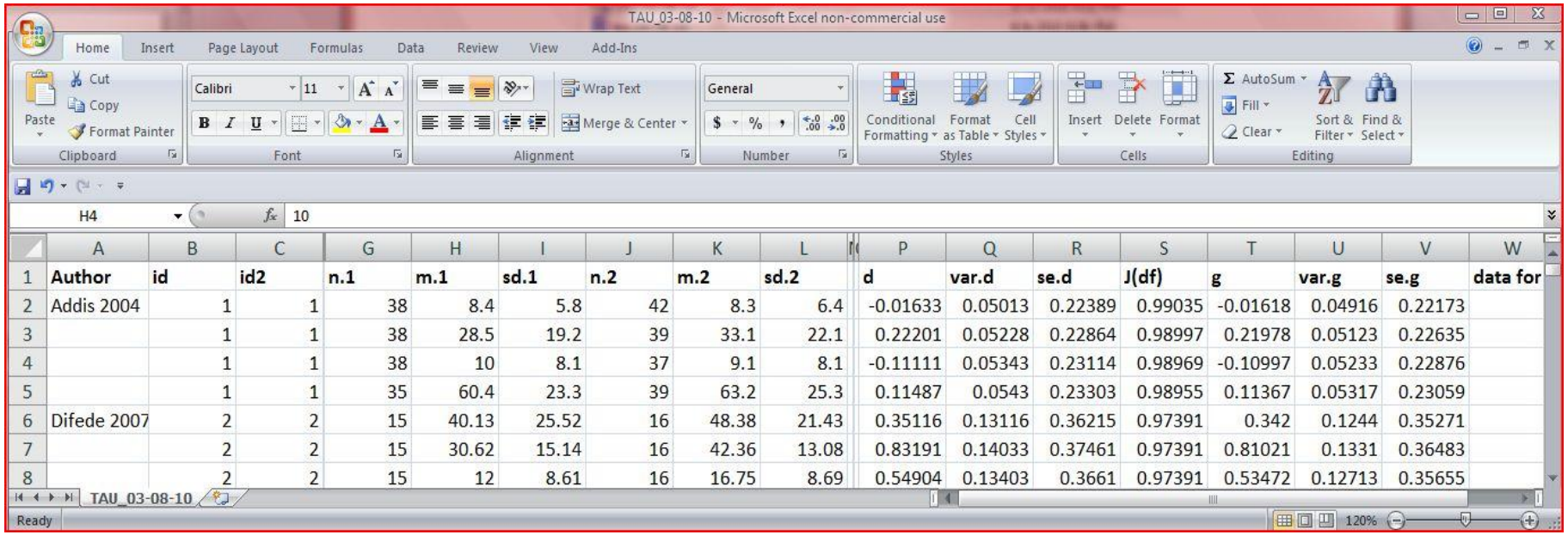
- Although all data can be entered directly into R, it is typically easier to use a spreadsheet interface program (e.g., Excel) for data entry.
- In Excel, (for mean differences meta-analyses) make sure to have columns:
  - **id** (study id)
  - **m.1** (post-test mean for treatment group)
  - **n.1** (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

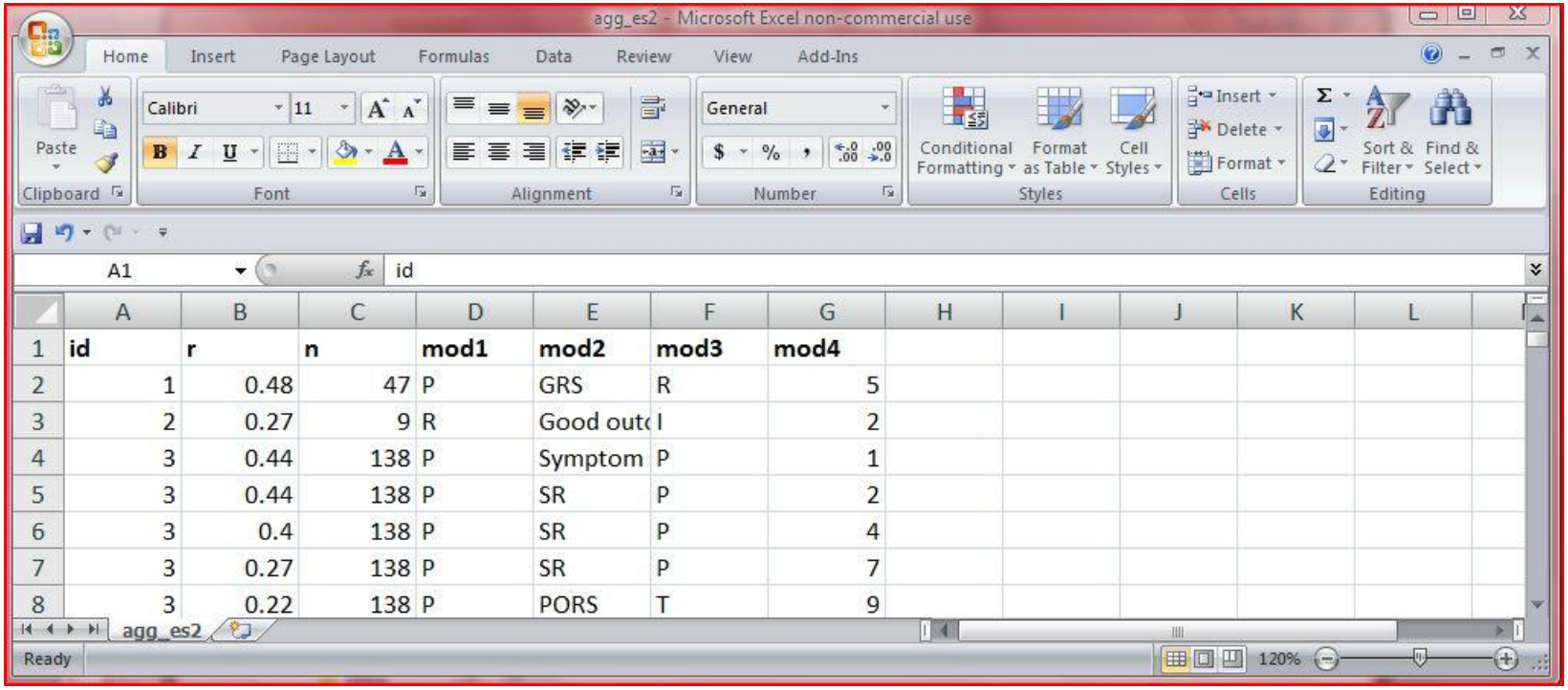
One format structure for data entry (using Excel)



	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	

Correlational data

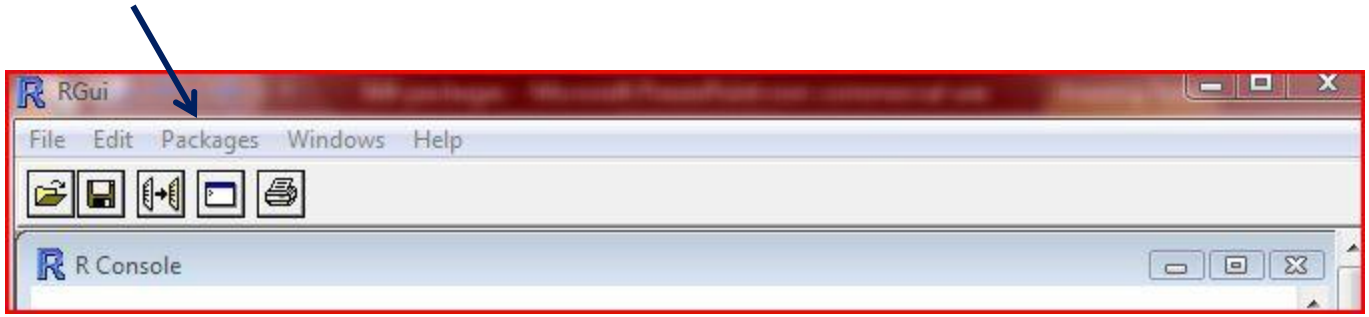
One format structure for data entry (using Excel)



	A	B	C	D	E	F	G
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	I	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.

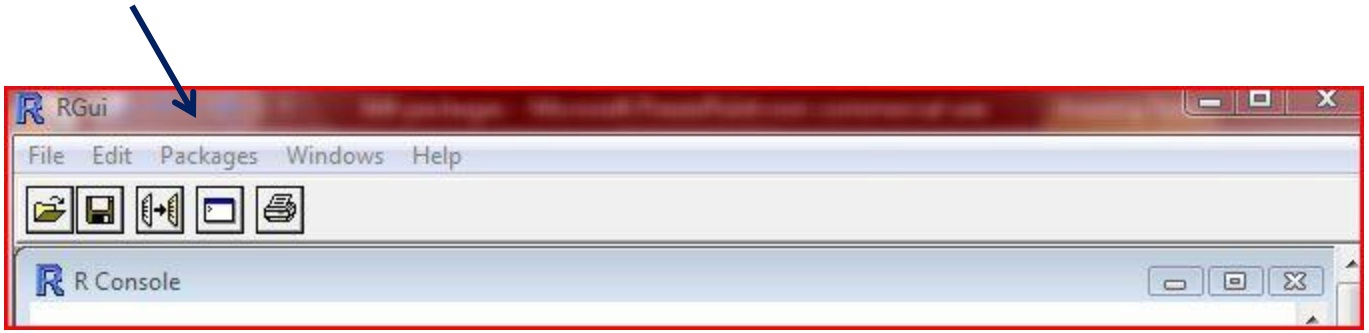


Importing data files

- 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: these 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

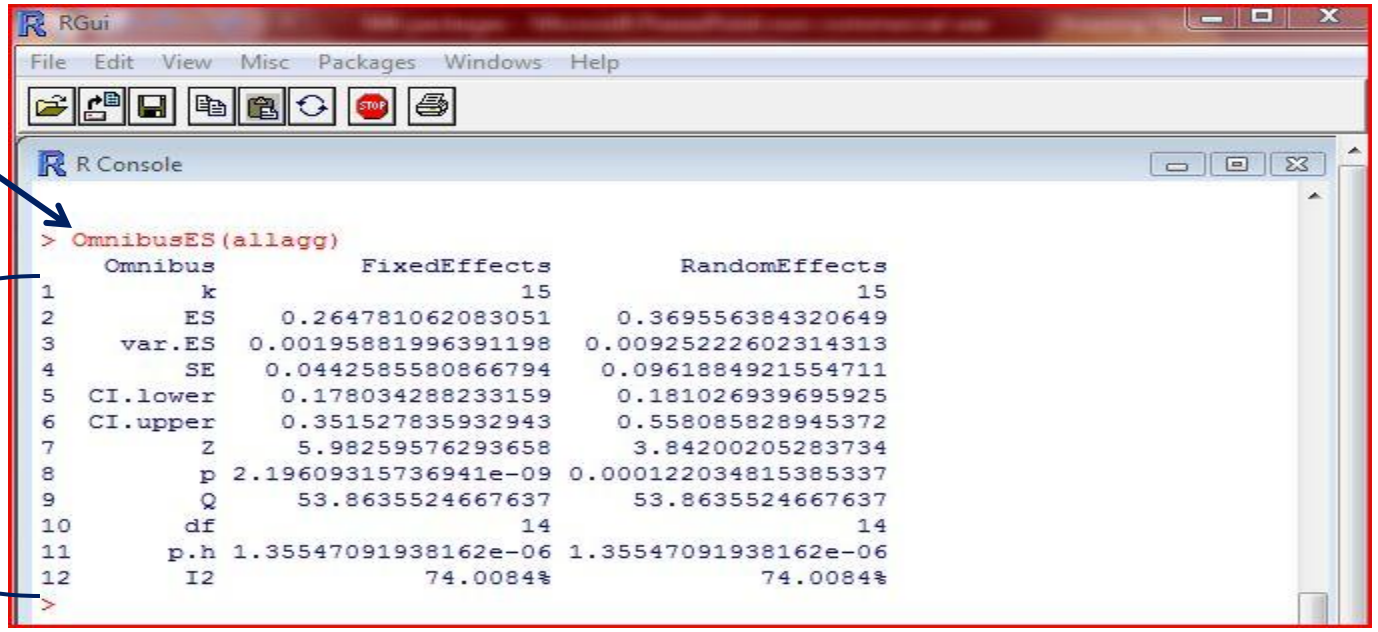


Sample 'MA*' function at R command prompt

- `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.

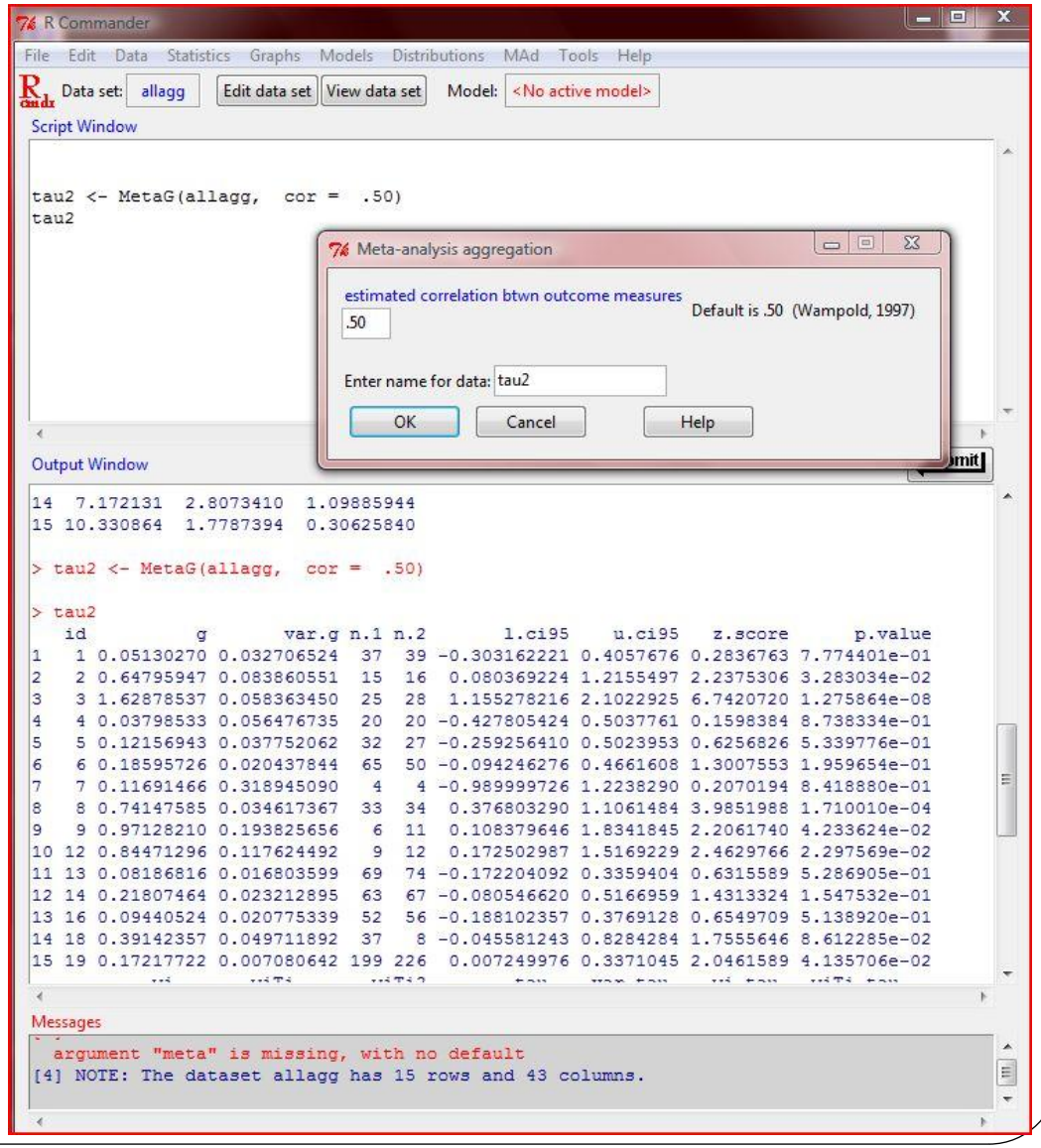
input

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



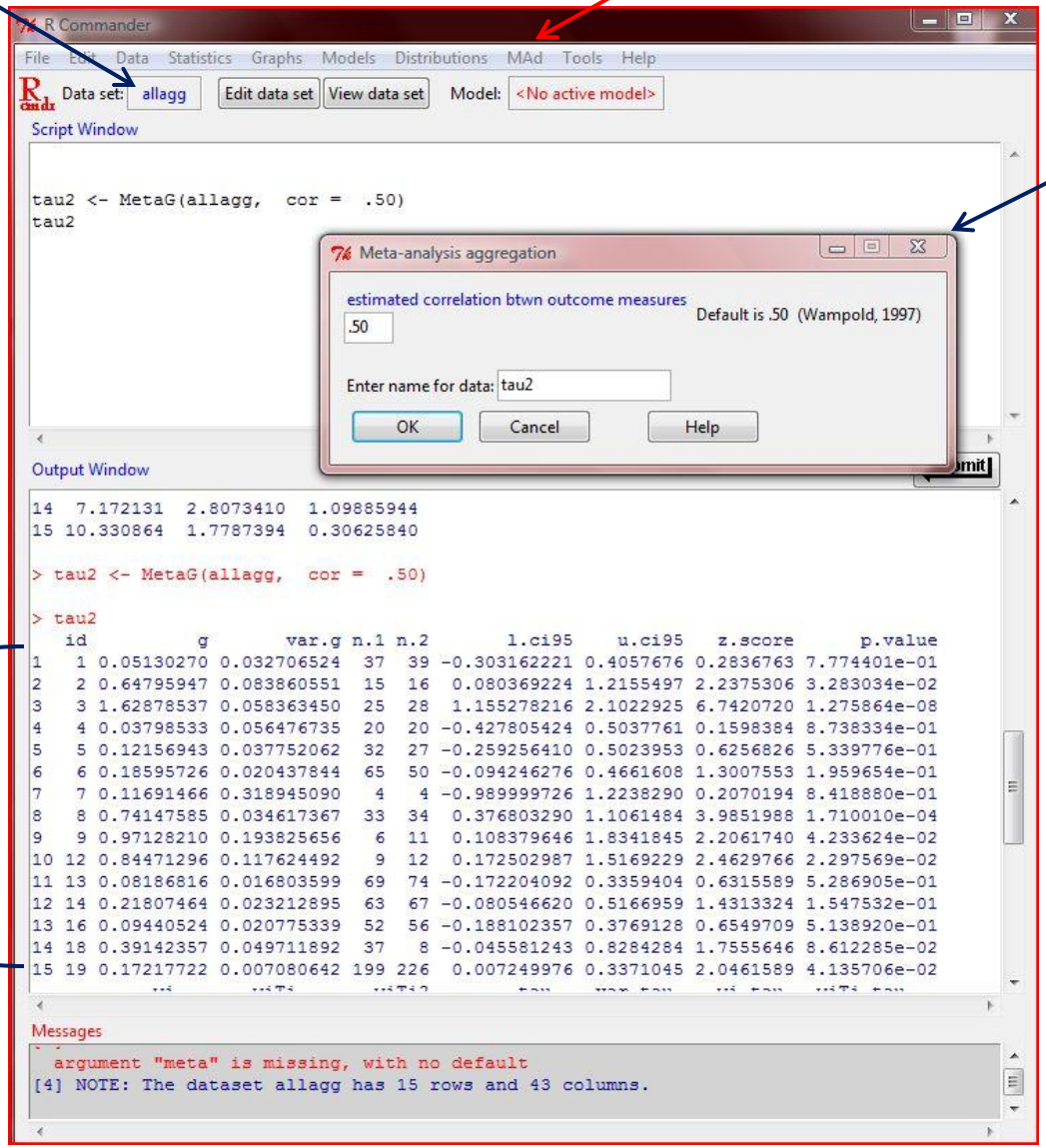
Start by selecting the dataset that was imported into R

Meta-analysis menu

input

output

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/