# Designing your poster

17 November 2021 Modern Research Methods

# Notes on coding papers

- The **moderator names** that you enter in your codebook should match the names of the green variables in your MA data spreadsheet.
- Make sure the values you enter are **readable by R.** For example, if you enter "18 months" into your spreadsheet for age, R is going to treat it as a categorical variable, rather than a number. The correct way to enter this value is simply as 18 (you know it's months from your codebook).
- Don't do any calculations in the spreadsheet by, e.g., using equations. These aren't easily reproducible. Instead, we'll do all the calculations that need to be done later with an R script.
- When defining values for your **categorical moderators**, your values should be machine AND human readable. If you code values using numbers 0/1, it's very easy to get the values confused. Fortunately, R is happy to deal with descriptive labels (e.g., "feedback"/"no feedback").
- In some cases, you may need to **estimate means and SD/SE from plots**. You can do this using any draw program (e.g. powerpoint), or by using an app online (like this one: http://www.graphreader.com/). The app allows you to define the axes and then it will tell you the values of points that you click on. When you estimate SD/SE from the error bars, the SD/SE corresponds to only one "arm" of the error bar.
- Missing data NA (not "not reported")

# Logistics

- Each **person** should code 5 papers (which will each have several ES)
- On Friday, work on converting raw data to effect sizes
- Poster draft due Tuesday (11/23, noon)
  - Should include 4 key figures and text
  - Along with your poster, submit the markdown that you used to create your plots
- 1 markdown and 1 poster per group (1 person from each group should turn in html of markdown on Canvas)

# Poster Session Details

- In conjunction with two other research methods courses
- In person poster session (4:30-6pm on Thursday, 12/2),
- Provide 4 min verbal presentation of poster (each group member speaks)
- Judges will ask questions
- Presentations evaluated for clarity, originality, and ability to answer questions

# Principles of Data Visualization (from week 4)

- Visualization as **communication** 
  - There is no list of rules for what makes a good visualization
  - Design depends on the message you want to communicate
  - And, who your audience is.



- Your goal is to make it as easy as possible for your audience to understand your message.
- Too much detail/information means your audience might not get the intended message.

# Principles of <del>Data Visualization</del> Poster Presentations

- Presentation as **communication** 
  - Design depends on the message you want to communicate
  - And, who your audience is.
- Your goal is to make it as easy as possible for your audience to understand your message.
- Too much detail/information means your audience might not get the intended message.
- You will have done a lot of analyses include what is most important/interesting!



# Poster presentation guidelines

- Who is your audience? Smart psychologists (mostly other faculty) that may or may not be familiar with your phenomenon or the basics of meta-analysis
- There are lots of details to your methods/results your job is to glean it down to the most important ones
- The judges will likely have questions about things you didn't have time to talk about – that's great!
  - Be ready to answer questions about the details of your method/results!
- Many of the specific design guidelines we talked about in the context of data visualization, also apply here (e.g. avoid junk, too much info)

# Poster Template

Template in template folder on Google drive

Your poster should not use smaller than 26 font for the main text.

Dimensions are 3' x 4' - don't change this!!

| A meta-analysis of the mutual exclusivity effect in word learning                   |                           |  |  |  |
|---|---------------------------|--|--|--|
| Molly Lewis and other grou<br>Carnegie Mellon University<br>Modern Research Methods | o members                 |  |  |  |
| Background  | Method                    |  |  |  |
|   |                           |  |  |  |
|   |                           |  |  |  |
|   |                           |  |  |  |
|   |                           |  |  |  |
|   |                           |  |  |  |
|   |                           |  |  |  |
|   | Results                   |  |  |  |
|   |                           |  |  |  |
|   |                           |  |  |  |
|   |                           |  |  |  |
|   |                           |  |  |  |
|   | Conclusion and Next Steps |  |  |  |
|   |                           |  |  |  |
|   |                           |  |  |  |
|   |                           |  |  |  |

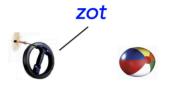
## A meta-analysis of the mutual exclusivity effect in word learning [TEMPLATE]

Method

Molly Lewis and other group members Carnegie Mellon University Modern Research Methods

#### Background

- Mapping a word to its referent is an under-constrained learning problem.
- One of the mechanisms hypothesized to constrain the problem is a bias to map novel words to novel objects termed the "Mutual exclusivity (ME) effect"



- Seminal Paper: Markman & Wachtel, 1988
- Conducted the ME paradigm with 3 and 4 year olds, and found that older but not younger children have shown the effect (+ additional methodological details)
- Since 1988, paper cited over 1000 times, and replicated with many methodological changes
- E.g., if there's space briefly describe 1 other methodological version that have been conducted since the original

**Research Goal:** Evaluate the degree of publication bias in the ME literature, estimate the size of the effect, and examine potential moderators.

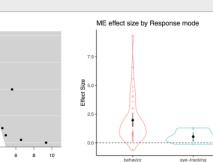
#### Conducted database search on google scholar using term "mutual exclusivity" Inclusion criteria: child participants, no prior experience with objects, etc. • Calculated effect size (Cohen's d) as the proportion of children selecting the novel object, relative to familiar object • Coded moderators: object type, demographic type • Estimated effect size using metafor package in R (Viechtbauer, 2019) Results

• 50 effect sizes • Some evidence for publication bias Overall effect size is 1.41

Meta-analytic approach

[1.06, 1.75] • Effect is bigger in X than Y, and is larger when X is larger (moderator

analyses)



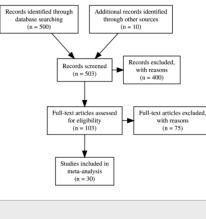
#### **Conclusion and Next Steps**

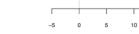
Observed Outcom

- Mutual exclusivity is a robust effect with a large effect size.
- There is little evidence for publication bias
- Next steps: Explore additional moderators (which ones?), and code remaining papers (how many?).
- Markman, E. M., & Wachtel, G. F. (1988). Children's use of mutual exclusivity to constrain the meanings of words. Cognitive Psychology, 20(2), 121-157. Viechtbauer, W. (2010). Conducting meta-analyses in R with the metafor package. Journal of Statistical Software, 36(3), 1-48. URL http://www.jstatsoft.org/v36/i03/

Response Mode

| Study  |                                       |          |    |    | Estimate [95% CI]                        |
|--|---------------------------------------|----------|----|----|--|
| Sludy  |                                       |          |    |    | Estimate [55% Ci]                        |
| Beford et al (2013)                                      |                                       | H        |    |    | 4.00 [ 2.94, 5.06]                       |
| Beford et al (2013)                                      | - F                                   | ■┤       |    |    | 3.00 [2.17, 3.83]                        |
| Beverly & Estis (2003)                                   | $\rightarrow$                         |          |    |    | 2.59 [ 0.76, 4.41]                       |
| Beverly & Estis (2003)                                   | - H                                   |          | 1  |    | 4.50 [ 1.58, 7.42]                       |
| Beverly & Estis (2003)                                   | - i - F                               |          | -  |    | 4.88 [ 1.73, 8.03]                       |
| Bion, Borovsky, & Fernald (2013)                         | <b></b>                               |          |    |    | 0.14 [-0.28, 0.56]                       |
| Bion, Borovsky, & Fernald (2013)                         |                                       |          |    |    | 1.15 [ 0.65, 1.66]                       |
| Bion, Borovsky, & Fernald (2013)                         | H H                                   |          |    |    | 1.29 [ 0.69, 1.88]                       |
| Byers-Heinlein & Werker (2009)                           |                                       |          |    |    | 0.42 [-0.09, 0.93]                       |
| Byers-Heinlein & Werker (2009)                           | <b>H</b>                              |          |    |    | -0.12 [-0.62, 0.37]                      |
| Byers-Heinlein & Werker (2009)                           | <b>}</b> ■                            |          |    |    | 0.67 [ 0.12, 1.21]                       |
| Byers-Heinlein & Werker (2013)                           | <b>.</b>                              |          |    |    | 0.20 [-0.24, 0.64]                       |
| Choi & Hwang (2014)                                      | H                                     |          |    |    | 1.65 [ 0.84, 2.45]                       |
| Choi & Hwang (2014)                                      | - H-                                  | 1        |    |    | 1.91 [ 1.06, 2.76]                       |
| Davidson et al (1997)                                    |                                       |          |    |    | 0.55 [ 0.02, 1.07]                       |
| Davidson et al (1997)                                    | 1                                     |          |    |    | 0.77 [ 0.21, 1.32]                       |
| Davidson et al (1997)                                    | <b>H</b>                              |          |    |    | 0.62 [ 0.09, 1.16]                       |
| Davidson et al (1997)<br>Deak, Yen, & Pettit (2001)      |                                       |          |    |    | 0.36 [-0.14, 0.87]                       |
| Deak, Yen, & Pettit (2001)<br>Deak, Yen, & Pettit (2001) |                                       |          |    |    | 1.64 [ 0.97, 2.31]<br>1.92 [ 1.18, 2.65] |
| Estis & Beverly (2015)                                   | i Hen<br>Hent                         | 1        |    |    | 0.23 [-0.47, 0.93]                       |
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| Evey & Merriman (1998)                                   | H-H                                   |          |    |    | 1.52 [ 0.69, 2.35]                       |
| Evey & Merriman (1998)                                   |                                       | 4        |    |    | 1.74 [ 0.64, 2.83]                       |
| Evey & Merriman (1998)                                   |                                       |          |    |    | 1.89 [ 0.94, 2.83]                       |
| Evey & Merriman (1998)                                   |                                       |          |    |    | 2.00 [ 0.80, 3.20]                       |
| Frank (1999)   |                                       | '        |    |    | 0.67 [ 0.24, 1.09]                       |
| Frank (1999)   |                                       |          |    |    | 0.81 [0.39, 1.24]                        |
| Frank (1999)   | 1                                     |          |    |    | 0.52 [0.13, 0.91]                        |
| Frank (1999)   | i i i                                 |          |    |    | 0.87 [ 0.46, 1.29]                       |
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| Gollek & Doherty (2016)                                  |                                       |          |    |    | 0.89 [ 0.42, 1.35]                       |
| Gollek & Doherty (2016)                                  | 1                                     |          |    |    | 3.58 [ 2.42, 4.75]                       |
| Gollek & Doherty (2016)                                  |                                       | <b>—</b> |    |    | 5.57 [ 3.87, 7.27]                       |
| Gollek & Doherty (2016)                                  | 1                                     |          |    |    | 0.38 [-0.06, 0.83]                       |
| Gollek & Doherty (2016)                                  | i i                                   |          |    |    | 0.17 [-0.24, 0.58]                       |
| Gollek & Doherty (2016)                                  |                                       | ⊢        |    |    | 9.35 [ 5.96, 12.73]                      |
| Gollek & Doherty (2016)                                  | - Heri                                |          |    |    | 1.49 [ 0.70, 2.28]                       |
| Gollek & Doherty (2016)                                  | l=ł                                   |          |    |    | -0.61 [-1.17, -0.06]                     |
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| Graham et al. (1998)                                     |                                       |          |    |    | 0.82 [ 0.40, 1.23]                       |
| Graham et al. (2009)                                     |                                       |          |    |    | 0.95 [ 0.44, 1.47]                       |
| Graham et al. (2009)                                     |                                       |          |    |    | 1.12 [ 0.59, 1.65]                       |
| Graham et al. (2009)                                     | - i H=                                | H        |    |    | 2.12 [ 1.36, 2.87]                       |
| Grassmann & Tomasello (2010)                             | H                                     |          |    |    | 1.53 [ 0.70, 2.36]                       |
| Grassmann & Tomasello (2010)                             | H                                     | ł        |    |    | 1.72 [ 0.83, 2.61]                       |
| RE Model   | •                                     |          |    |    | 1.41 [ 1.06, 1.75]                       |
|  |                                       |          |    |    |  |
|  |                                       |          |    |    |  |
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Observed Outcome

## Poster structure

5 parts....

#### A meta-analysis of the mutual exclusivity effect in word learning [TEMPLATE]

Method

Molly Lewis and other group members Carnegie Mellon University Modern Research Methods

#### Background

- Mapping a word to its referent is an under-constrained learning problem.
- One of the mechanisms hypothesized to constrain the problem is a bias to map novel words to novel objects – termed the "Mutual exclusivity (ME) effect"

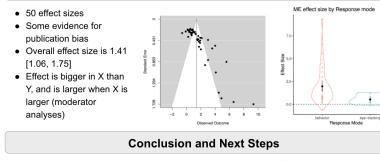


- Seminal Paper: Markman & Wachtel, 1988
- Conducted the ME paradigm with 3 and 4 year olds, and found that older but not younger children have shown the effect (+ additional methodological details)
- Since 1988, paper cited over 1000 times, and replicated with many methodological changes
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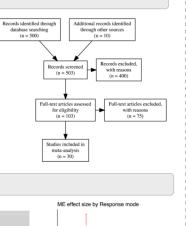
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- Meta-analytic approachConducted database search on google scholar
- using term "mutual exclusivity"Inclusion criteria: child participants, no prior
- experience with objects, etc.Calculated effect size (Cohen's *d*) as the
- proportion of children selecting the novel object, relative to familiar object
- Coded moderators: object type, demographic type
- Estimated effect size using *metafor* package in R (Viechtbauer, 2019)

Results



- Mutual exclusivity is a robust effect with a large effect size.
- There is little evidence for publication bias
- Next steps: Explore additional moderators (which ones?), and code remaining papers (how many?).



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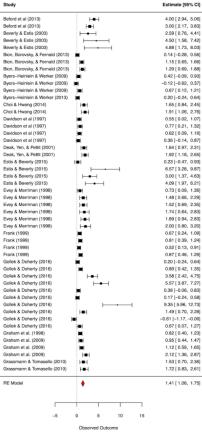
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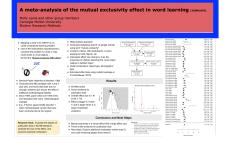
2. Viechtbauer, W. (2010), Conducting meta-analyses in

Software, 36(3), 1-48. URL

http://www.istatsoft.org/v36/i03/

R with the metafor package. Journal of Statistical





## A meta-analysis of the mutual exclusivity effect in word learning [TEMPLATE]

Molly Lewis and other group members Carnegie Mellon University Modern Research Methods

- Informative title
- Title should contextualize the effect
  - "Meta-analysis of mutual exclusivity in word learning" is better than "Mutual exclusivity meta-analysis"
- Even better: Framing your title around a research question/finding
  - "Understanding the relationship between vocabulary and the mutual exclusivity effect through meta-analytic data"

The background section should explain the motivation for conducting the meta-analysis

| A meta-analysis of<br>Molly Lewis and other group<br>Carnegie Mellon University<br>Modern Research Methods  | of the mutual exclusivity effect in wo   | rd learning me     |  |
|---|--|--------------------|--|
| Background  | Method   | hen                | 10000 (01.0                              |
| Moying a nort to its information     or constructed in an only postion.     Or all the northware hypothesis and     or postion in the information of the information of the information     or of an observation of the information | Make and a specific the specific term of the speci  |                    | 1 (1) (1) (1) (1) (1) (1) (1) (1) (1) (1 |
| Seminal Paper: Mahman & Wachtel, 1988   | Results  | Lathere int        |  |
| <ul> <li>Concluded fra ME paralign with 2 and 4<br/>spear site, and the mid that cliebs due not<br/>pointiger shallben trave shown the strate (+<br/>additional resolution) and strate (+<br/>additional resolution) and strate (+<br/>add - regulated with many resolution)<br/>and regulated with many resolution)<br/>(= 0, - themes spears their display dispose +<br/>to the marked resolution) and the trave<br/>been conducted since the original</li> </ul>   | R deta claim<br>Some values for<br>publication toin<br>Control addition to 10<br>Control addition to 10<br>Contr |                    |  |
|   | Conclusion and Next Steps  | National State     |  |
| Research Bool: Evolutio the degree of<br>publication bios in the ME literature,<br>estimate the size of the effect, and<br>examine potential mediendors.  | Matual exclusively is a notwart effect with a large effect also.     There is title evidence for publication bias     Next states: Copiers additional modestation (with smarth),     add code nemaining papers (how maryly).   | Annexe Change (10) | -  |

#### Background

 Mapping a word to its referent is an under-constrained learning problem.

zot

 One of the mechanisms hypothesized to constrain the problem is a bias to map novel words to novel objects – termed the "<u>Mutual exclusivity (ME) effect</u>"

Seminal paper

Introduces name of effect

Broad question

Narrower question

relates to theory

Briefly describe 1 methodological variations just to give the audience a sense of the variability in the literature

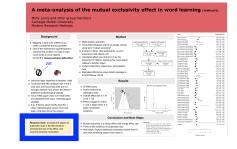
## Schema of paradigm

Seminal Paper: Markman & Wachtel, 1988

- Conducted the ME paradigm with 3 and 4 year olds, and found that older but not younger children have shown the effect (+ additional methodological details)
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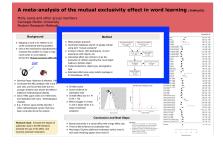
## Brief description of seminal paper

### Brief summary of literature



- What are your research goals?
- Similar to "hypothesis" section of experimental poster.
- "examine the difference in learning between monotonic and nonmonotonic functions"

**Research Goal:** Evaluate the degree of publication bias in the ME literature, estimate the size of the effect, and examine potential moderators.



# Brief description of your search protocol

Description of effect size metric

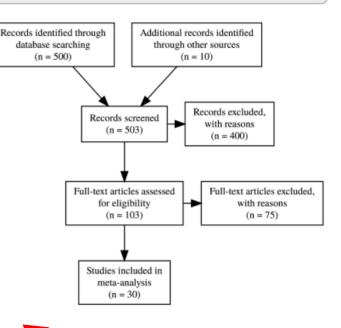
What moderators did you code?

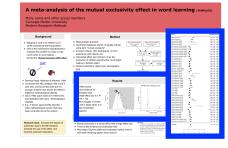
What software did you use? This will be the same for everyone.

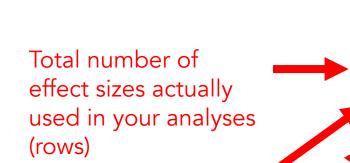
## Method

- Meta-analytic approach
- Conducted database search on google scholar using term "mutual exclusivity"
- Inclusion criteria: child participants, no prior experience with objects, etc.
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Prisma flow diagram

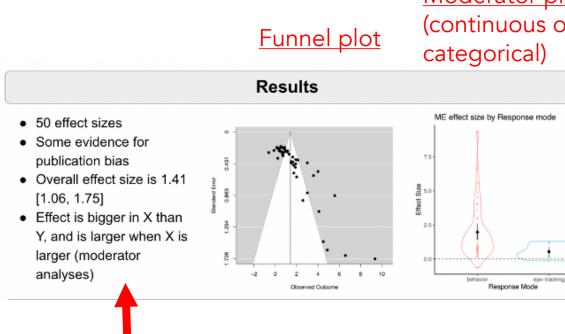






Does it look like there's evidence for publication bias based on looking at the funnel plot?

Overall effect size and confidence interval (this should match the values corresponding to the red diagram on the forest plot)

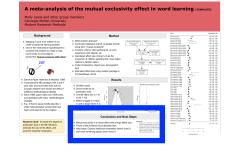


Description of your moderator analyses. There's only room to plot 1-2, but you can describe more.

## Moderator plot (continuous or

## Forest plot

| Study                            | Estimate [95% CI]    |
|----------------------------------|----------------------|
| Beford et al (2013)              | 4.00 [ 2.94, 5.06]   |
| Beford et al (2013)              | 3.00 [ 2.17, 3.83]   |
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| Grassmann & Tomasello (2010) HEH | 1.72 [ 0.83, 2.61]   |
| RE Model                         | 1.41 [ 1.06, 1.75]   |
|                                  |                      |
| -5 0 5                           | 10 15                |
|                                  | 10 10                |



## Summary of effect size (relate to Cohen's descriptions of "small", "medium" and "large" effect sizes, if using Cohen's d)

Summarize publication *bias* 

Summarize moderator findings

What would you do if you had infinite time?

## **Conclusion and Next Steps**

- Mutual exclusivity is a robust effect with a large effect size.
  - There is little evidence for publication bias
  - Next steps: Explore additional moderators (which ones?), and code remaining papers (how many?).

#### References:

- Markman, E. M., & Wachtel, G. F. (1988). Children's use of mutual exclusivity to constrain the meanings of words. Cognitive Psychology, 20(2), 121-157.
- Viechtbauer, W. (2010). Conducting meta-analyses in R with the metafor package. Journal of Statistical Software, 36(3), 1-48. URL: http://www.jstatsoft.org/v38/i03/

<u>References</u>: Seminal paper, Metafor software, any other paper you reference

## A meta-analysis of the mutual exclusivity effect in word learning [TEMPLATE]

Method

Molly Lewis and other group members Carnegie Mellon University Modern Research Methods

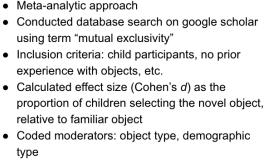
#### Background

- Mapping a word to its referent is an under-constrained learning problem.
- One of the mechanisms hypothesized to constrain the problem is a bias to map novel words to novel objects – termed the "<u>Mutual exclusivity (ME) effect</u>"



- Seminal Paper: Markman & Wachtel, 1988
- Conducted the ME paradigm with 3 and 4 year olds, and found that older but not younger children have shown the effect (+ additional methodological details)
- Since 1988, paper cited over 1000 times, and replicated with many methodological changes
- E.g., if there's space briefly describe 1 other methodological version that have been conducted since the original

**Research Goal:** Evaluate the degree of publication bias in the ME literature, estimate the size of the effect, and examine potential moderators.



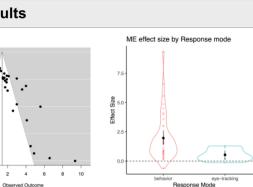
• Estimated effect size using *metafor* package in R (Viechtbauer, 2019)

#### Results

-2

0

- 50 effect sizes
- Some evidence for publication bias
- Overall effect size is 1.41 [1.06, 1.75]
  Effect is bigger in X than
- Y, and is larger when X is larger (moderator analyses)



Records screened

(n = 503)

Full-text articles assessed

for eligibility

(n = 103)

Studies included in

meta-analysis (n = 30)

Records identified through

database searching

(n = 500)

Additional records identified

through other sources

(n = 10)

Records excluded,

with reasons

(n = 400)

Full-text articles excluded,

with reason

(n = 75)

#### **Conclusion and Next Steps**

- Mutual exclusivity is a robust effect with a large effect size.
- There is little evidence for publication bias
- Next steps: Explore additional moderators (which ones?), and code remaining papers (how many?).
- References:
- Markman, E. M., & Wachtel, G. F. (1988). Children's use of mutual exclusivity to constrain the meanings of words. *Cognitive Psychology*, 20(2), 121-157.
- Viechtbauer, W. (2010). Conducting meta-analyses in R with the metafor package. Journal of Statistical Software, 36(3), 1-48. URL: http://www.jstatsoft.org/v38/i03/

| Study                            |              |            |    |    | Estimate [95% CI]    |
|----------------------------------|--------------|------------|----|----|----------------------|
| Beford et al (2013)              | i H          | ∎i         |    |    | 4.00 [ 2.94, 5.06]   |
| Beford et al (2013)              | - H-         | 1          |    |    | 3.00 [ 2.17, 3.83]   |
| Beverly & Estis (2003)           |              | -          |    |    | 2.59 [ 0.76, 4.41]   |
| Beverly & Estis (2003)           | - i -        |            |    |    | 4.50 [ 1.58, 7.42]   |
| Beverly & Estis (2003)           | - i-         |            | 4  |    | 4.88 [ 1.73, 8.03]   |
| Bion, Borovsky, & Fernald (2013) | ÷ .          |            |    |    | 0.14 [-0.28, 0.56]   |
| Bion, Borovsky, & Fernald (2013) |              |            |    |    | 1.15 [ 0.65, 1.66]   |
| Bion, Borovsky, & Fernald (2013) | H=H          |            |    |    | 1.29 [ 0.69, 1.88]   |
| Byers-Heinlein & Werker (2009)   | <b>H</b>     |            |    |    | 0.42 [-0.09, 0.93]   |
| Byers-Heinlein & Werker (2009)   | ÷.           |            |    |    | -0.12 [-0.62, 0.37]  |
| Byers-Heinlein & Werker (2009)   | 1            |            |    |    | 0.67 [ 0.12, 1.21]   |
| Byers-Heinlein & Werker (2013)   | É.           |            |    |    | 0.20 [-0.24, 0.64]   |
| Choi & Hwang (2014)              | H∎H          |            |    |    | 1.65 [ 0.84, 2.45]   |
| Choi & Hwang (2014)              | i Heri       |            |    |    | 1.91 [ 1.06, 2.76]   |
| Davidson et al (1997)            | i=i          |            |    |    | 0.55 [ 0.02, 1.07]   |
| Davidson et al (1997)            | i mi         |            |    |    | 0.77 [ 0.21, 1.32]   |
| Davidson et al (1997)            | 1            |            |    |    | 0.62 [ 0.09, 1.16]   |
| Davidson et al (1997)            |              |            |    |    | 0.36 [-0.14, 0.87]   |
| Deak, Yen, & Pettit (2001)       | ī.           |            |    |    | 1.64 [ 0.97, 2.31]   |
| Deak, Yen, & Pettit (2001)       | H            |            |    |    | 1.92 [ 1.18, 2.65]   |
| Estis & Beverly (2015)           |              |            |    |    | 0.23 [-0.47, 0.93]   |
| Estis & Beverly (2015)           | 'E' F        |            | _  |    | 6.57 [ 3.28, 9.87]   |
| Estis & Beverly (2015)           | - L -        | -          | ·  |    | 3.00 [ 1.37, 4.63]   |
| Estis & Beverly (2015)           |              | ÷          |    |    | 4.09 [ 1.97, 6.21]   |
| Evey & Merriman (1998)           | H <b>e</b> H |            |    |    | 0.73 [ 0.09, 1.36]   |
| Evey & Merriman (1998)           | H <b>e</b> H |            |    |    | 1.48 [ 0.66, 2.29]   |
| Evey & Merriman (1998)           | H            |            |    |    | 1.52 [ 0.69, 2.35]   |
| Evey & Merriman (1998)           | H            |            |    |    | 1.74 [ 0.64, 2.83]   |
| Evey & Merriman (1998)           | H            |            |    |    | 1.89 [ 0.94, 2.83]   |
| Evey & Merriman (1998)           | H=-1         |            |    |    | 2.00 [ 0.80, 3.20]   |
| Frank (1999)                     |              |            |    |    | 0.67 [ 0.24, 1.09]   |
| Frank (1999)                     |              |            |    |    | 0.81 [ 0.39, 1.24]   |
| Frank (1999)                     | 1            |            |    |    | 0.52 [ 0.13, 0.91]   |
| Frank (1999)                     | <b>.</b>     |            |    |    | 0.87 [ 0.46, 1.29]   |
| Gollek & Doherty (2016)          | i i          |            |    |    | 0.20 [-0.24, 0.64]   |
| Gollek & Doherty (2016)          |              |            |    |    | 0.89 [ 0.42, 1.35]   |
| Gollek & Doherty (2016)          | н            | н          |    |    | 3.58 [ 2.42, 4.75]   |
| Gollek & Doherty (2016)          |              | <b>—</b> — |    |    | 5.57 [ 3.87, 7.27]   |
| Gollek & Doherty (2016)          | <b>H</b>     |            |    |    | 0.38 [-0.06, 0.83]   |
| Gollek & Doherty (2016)          | <b>.</b>     |            |    |    | 0.17 [-0.24, 0.58]   |
| Gollek & Doherty (2016)          |              | ⊢          |    |    | 9.35 [ 5.96, 12.73]  |
| Gollek & Doherty (2016)          | H=H          | -          |    |    | 1.49 [ 0.70, 2.28]   |
| Gollek & Doherty (2016)          | l <b>a</b> ł |            |    |    | -0.61 [-1.17, -0.06] |
| Gollek & Doherty (2016)          | 1            |            |    |    | 0.67 [ 0.07, 1.27]   |
| Graham et al. (1998)             |              |            |    |    | 0.82 [ 0.40, 1.23]   |
| Graham et al. (2009)             |              |            |    |    | 0.95 [ 0.44, 1.47]   |
| Graham et al. (2009)             |              |            |    |    | 1.12 [ 0.59, 1.65]   |
| Graham et al. (2009)             | 1.00         |            |    |    | 2.12 [ 1.36, 2.87]   |
| Grassmann & Tomasello (2010)     | E H          |            |    |    | 1.53 [ 0.70, 2.36]   |
| Grassmann & Tomasello (2010)     | H            |            |    |    | 1.72 [ 0.83, 2.61]   |
|                                  |              |            |    |    |                      |
| RE Model                         | •            |            |    |    | 1.41 [ 1.06, 1.75]   |
|                                  |              |            |    |    |                      |
|                                  |              |            |    |    |                      |
|                                  |              | Ι          | I  |    |                      |
| -5                               | 0            | 5          | 10 | 15 |                      |

Observed Outcome

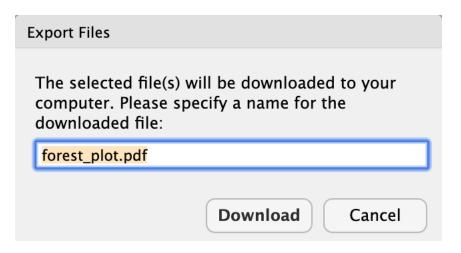
E-timete IOEN ON

# Once I have a plot in Rstudio, how do I get it into my google slideshow?

- The best way to save a high quality plot in R is as a pdf
- But! You can't insert a pdf into a google slide show
- So, we need to convert the pdf into a png before adding it to our poster

\* No screenshots!

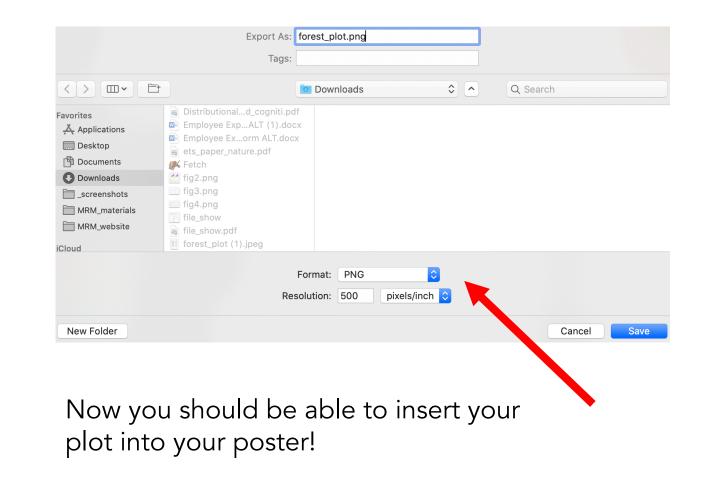
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| <ul> <li>moderator_plot1.pdf</li> <li>prisma_plot.pdf</li> </ul>   | Set As Working Directory<br>Go To Working Directory<br>Show Hidden Files |



# Open the file in preview (or some other pdf reader), then export

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| Beford et al (2 | Enter Password             |        | 4.00 [ 2.94, 5.06]  |
| Beford et al (2 |                            |        | 3.00 [ 2.17, 3.83]  |
| Beverly & Est   | Import from iPhone         |        | 2.59 [ 0.76, 4.41]  |
| Beverly & Est   | Import from Camera         |        | 4.50 [ 1.58, 7.42]  |
| Beverly & Est   | Import from Scanner        |        | 4.88 [ 1.73, 8.03]  |
| Bion, Borovsł   | Take Screenshot            | •      | 0.14 [-0.28, 0.56]  |
| Bion, Borovsł   | Export                     |        | 1.15 [ 0.65, 1.66]  |
| Bion, Borovsł   | Export as PDF              |        | 1.29 [ 0.69, 1.88]  |
| Byers-Heinle    | Share                      | •      | 0.42 [-0.09, 0.93]  |
| Byers-Heinle    |                            | 00.0   | -0.12 [-0.62, 0.37] |
| Byers-Heinle    | Print                      | ЖР     | 0.67 [ 0.12, 1.21]  |
| -               | n & Werker (2013)          |        | 0.20 [-0.24, 0.64]  |
| Choi & Hwang    |                            |        | 1.65 [ 0.84, 2.45]  |
| Choi & Hwang    |                            |        | 1.91 [ 1.06, 2.76]  |
| Davidson et a   |                            |        | 0.55 [ 0.02, 1.07]  |
| Davidson et a   |                            |        | 0.77 [ 0.21, 1.32]  |
| Davidson et a   | , ,                        |        | 0.62 [ 0.09, 1.16]  |
| Davidson et a   |                            |        | 0.36 [-0.14, 0.87]  |
| Deak, Yen, &    |                            |        | 1.64 [ 0.97, 2.31]  |
| Deak, Yen, &    |                            |        | 1.92 [ 1.18, 2.65]  |
| Estis & Beverl  |                            |        | 0.23 [-0.47, 0.93]  |
| Estis & Beverl  | y (2015) :                 | ∎      | 6.57 [ 3.28, 9.87]  |

## Export as png



# Summary of poster design principles

You should adapt the template for your MA, keeping in mind the design principles we've talked about.

## Keep in simple (don't over-crowd!)

Make important stuff stand out!

## Line things up on axes

#### More detail: https://campusquides.lib.utah.ed u/researchposters

#### A meta-analysis of the mutual exclusivity effect in word learning [TEMPLATE]

Method

Records ident

database

(n =

Molly Lewis and other group members **Carnegie Mellon University** Modern Research Methods

#### Background

· Mapping a word to its referent is an under-constrained learning problem.

· One of the mechanisms hypothesized to constrain the problem is a bias to map novel words to novel objects termed the "Mutual exclusivity (ME) effect'

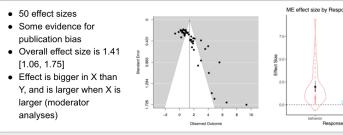
# zot

- Seminal Paper: Markman & Wachtel, 1988 Conducted the ME paradigm with 3 and 4 year olds, and found that older but not younger children have shown the effect (+ additional methodological details)
- Since 1988, paper cited over 1000 times. and replicated with many methodological changes
- E.g., if there's space briefly describe 1 other methodological version that have been conducted since the original

Research Goal: Evaluate the degree of publication bias in the ME literature estimate the size of the effect, and examine potential moderators.

- Meta-analytic approach
- · Conducted database search on google scholar using term "mutual exclusivity"
- · Inclusion criteria: child participants, no prior experience with objects, etc. • Calculated effect size (Cohen's d) as the
- proportion of children selecting the novel object relative to familiar object
- · Coded moderators: object type, demographic type
- Estimated effect size using metafor package in R (Viechtbauer, 2019)

#### Results



#### Conclusion and Next Steps

- Mutual exclusivity is a robust effect with a large effect size.
- There is little evidence for publication bias
- Next steps: Explore additional moderators (which ones?). and code remaining papers (how many?).

|                        |  | Study  |
|------------------------|--|--|
|                        |  | Beford et al (2013)                                |
|                        |  | Beford et al (2013)                                |
|                        |  | Beverly & Estis (2003)                             |
| tified through         | Additional records identified          | Beverly & Estis (2003)                             |
| searching              | through other sources                  | Beverly & Estis (2003)                             |
| 500)                   | (n = 10)                               | Bion, Borovsky, & Fernald (2013)                   |
|                        |  | Bion, Borovsky, & Fernald (2013)                   |
| $\sim$                 |  | Bion, Borovsky, & Fernald (2013)                   |
|                        | . Records excluded.                    | Byers-Heinlein & Werker (2009)                     |
| Records s              | creened with reasons                   | Byers-Heinlein & Werker (2009)                     |
| (n = 5                 | (n = 400)                              | Byers-Heinlein & Werker (2009)                     |
|                        |  | Byers-Heinlein & Werker (2013)                     |
|                        |  | Choi & Hwang (2014)                                |
|                        |  | Choi & Hwang (2014)                                |
| Full-text artic        | les assessed Full-text articles exclud | led, Davidson et al (1997)                         |
| for eligi              |  | Davidson et al (1997)                              |
| (n = 1                 | 03) (n = 75)                           | Davidson et al (1997)                              |
|                        |  | Davidson et al (1997)                              |
| 1                      |  | Deak, Yen, & Pettit (2001)                         |
|                        | ]                                      | Deak, Yen, & Pettit (2001)                         |
| Studies inc<br>meta-an |  | Estis & Beverly (2015)                             |
| (n =                   |  | Estis & Beverly (2015)                             |
| (                      |  | Estis & Beverly (2015)                             |
|                        |  | Estis & Beverly (2015)                             |
|                        |  | Evey & Merriman (1998)                             |
| ME                     | effect size by Response mode           | Evey & Merriman (1998)                             |
| - I                    |  | Evey & Merriman (1998)                             |
|                        |  | Frank (1999)                                       |
|                        |  | Frank (1999)                                       |
| 7.5 •                  |  | Frank (1999)                                       |
|                        | 1                                      | Frank (1999)                                       |
|                        | А                                      | Gollek & Doherty (2016)                            |
| S 5.0                  |  | Gollek & Doherty (2016)                            |
| Effect Size            |  | Gollek & Doherty (2016)                            |
| 10                     |  | Gollek & Doherty (2016)                            |
| 2.5                    |  | Gollek & Doherty (2016)                            |
|                        |  | Gollek & Doherty (2016)                            |
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| 0.0                    |  |  |
|                        | <u></u>                                | Gollek & Doherty (2016)<br>Gollek & Doherty (2016) |
|                        | behavior eye-tracking                  | Graham et al. (1998)                               |
|                        | Response Mode                          | Graham et al. (1998)<br>Graham et al. (2009)       |
|                        |  | Granan dt al. (2009)                               |

1. Markman, E. M., & Wachtel, G. F. (1988), Children's

use of mutual exclusivity to constrain the meanings

with the metafor package. Journal of Statistical

Software, 36(3), 1-48, URI

http://www.istatsoft.org/v36/i03

of words. Cognitive Psychology, 20(2), 121-157. Viechtbauer, W. (2010). Conducting meta-analyses in Cturds

on et al (1997) 0.62[0.09, 1.16] on et al (1997) 0.36 [-0.14, 0.87 Yen. & Pettit (2001 1.64[0.97, 2.31] Ven. & Pettit (2001 1.92[1.18, 2.65] Beverly (2015) 0.23 [-0.47, 0.93] Beverly (2015) 6.57 [ 3.28, 9.87 Beverly (2015) 3.00 [ 1.37, 4.63] 4.09 [ 1.97, 6.21] Beverly (2015) Merriman (1998) 0.73 [ 0.09. 1.36] Merriman (1998) 1.48 [ 0.66, 2.29] 1.52 [ 0.69, 2.35] Merriman (1998) 1.74 [ 0.64, 2.83] Merriman (1998) H=H Merriman (1998) H 1.89 [ 0.94, 2.83] 2.00 [ 0.80, 3.20] Merriman (1998) 0.67 [ 0.24, 1.09] 0.81 [ 0.39, 1.24 0.52[0.13, 0.91] 0.87 [ 0.46, 1.29 & Doherty (2016) 0.20 [-0.24, 0.64 & Doherty (2016) 0.89[0.42, 1.35 & Doherty (2016) 3.58 [ 2.42, 4.75] & Doherty (2016) 5.57 [ 3.87. 7.27 & Doherty (2016 0.38 [-0.06, 0.83 & Doherty (2016 0.17 [-0.24, 0.58 & Doherty (2016 9.35 [ 5.96, 12.73 & Doherty (2016) 1.49 [ 0.70, 2.28] & Doherty (2016) 0.61 [-1.17, -0.06 & Doherty (2016) 0.67 [ 0.07, 1.27] n et al. (1998) 0.82 [ 0.40, 1.23 0.95 [ 0.44, 1.47] ham et al. (2009) 1.12 [ 0.59, 1.65] Graham et al. (2009) Graham et al. (2009) 2.12 [ 1.36, 2.87] Grassmann & Tomasello (2010) 1.53 [ 0.70, 2.36] Grassmann & Tomasello (2010) 1.72 [ 0.83, 2.61] RE Mode 1.41 [ 1.06, 1.75] Observed Outcom

H=H

**---**

Estimate [95% CI]

4.00 [ 2.94, 5.06

3.00 [ 2.17, 3.83

2.59 [ 0.76, 4.41]

4.50 [ 1.58, 7.42

4.88 [ 1.73, 8.03]

0.14 [-0.28, 0.56]

1.15 [ 0.65, 1.66

1.29 [ 0.69, 1.88

0.42 [-0.09, 0.93]

-0.12 [-0.62, 0.37]

0.67[0.12, 1.21]

0.20 [-0.24, 0.64]

1.65 [ 0.84, 2.45]

1.91 [ 1.06, 2.76]

0.55[0.02 1.07]

0.77 [ 0.21, 1.32]

## Don't center align!!

# AIKIDO



Aikido is a unique martial art that integrates body, mind and spirit. Graceful and powerful, it emphasizes peace and harmony over aggression and violence.

#### BEGINNER CLASS

Starts Sunday, April 27, 2008 1:00 - 2:00 p.m.

8-week course – \$95

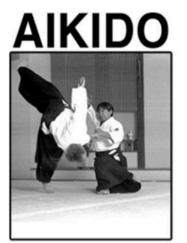
Adult class (12 and older). No martial arts experience necessary. Call to reserve a space.

Regular Classes Tuesday 7:30 p.m. Thursday 7:45 p.m. Sundays, 1:00 & 2:15 p.m.

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Graceful and powerful, it emphasizes peace and harmony over aggression and violence.



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Come Visit Please come and visit any of our classes to determine if Aikido is right for you!

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