

# Self-control trainings: What we (do not) know so far

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# Self-Control

- ◆ Background
- ◆ Study 1
- ◆ Meta-analysis
- ◆ Discussion



# Self-control

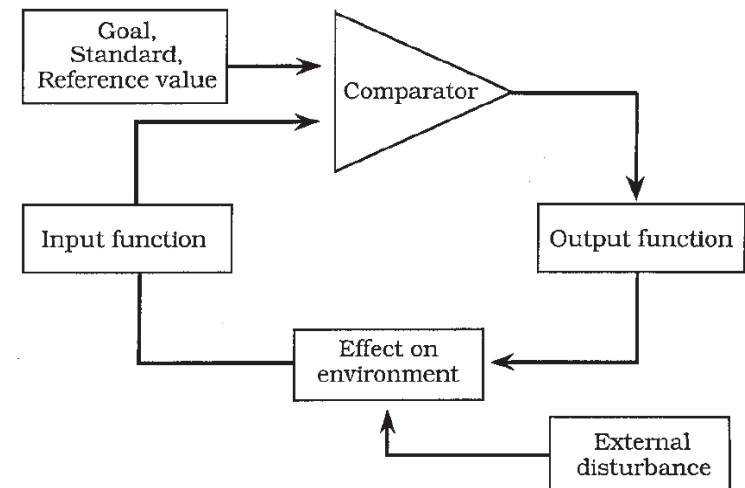
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- Stable individual differences in self-control (e.g., De Ridder et al., 2012; Tangney et al., 2004)
- Self-control helps to
  - Stimulate desirable behavior
  - Inhibit undesirable behavior
- Ways to improve self-control?

# Ways to improve self-control

- ♦ Background
- ♦ Study 1
- ♦ Meta-analysis
- ♦ Discussion

- Multiple ways to improve self-control (Frieze et al., 2011)
- Cybernetic feedback model (Carver & Scheier, 1998)
  - Goal setting (Locke & Latham, 2015)
  - Monitoring (Harkin et al., 2016)
  - Reduction of goal-behavior discrepancy (Gollwitzer & Sheeran, 2006)
- Increase motivation
- Practice self-control



# Strength model of self-control

- ◆ Background
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- Core hypotheses:
  - Self-control works like a muscle
  - Short-term decrements (ego depletion)
  - Long-term benefits
- Self-control strength versus stamina



Baumeister et al. (2007)

# An Intriguing and Bold Hypothesis

- ◆ Background

- ◆ Study 1

- ◆ Meta-analysis

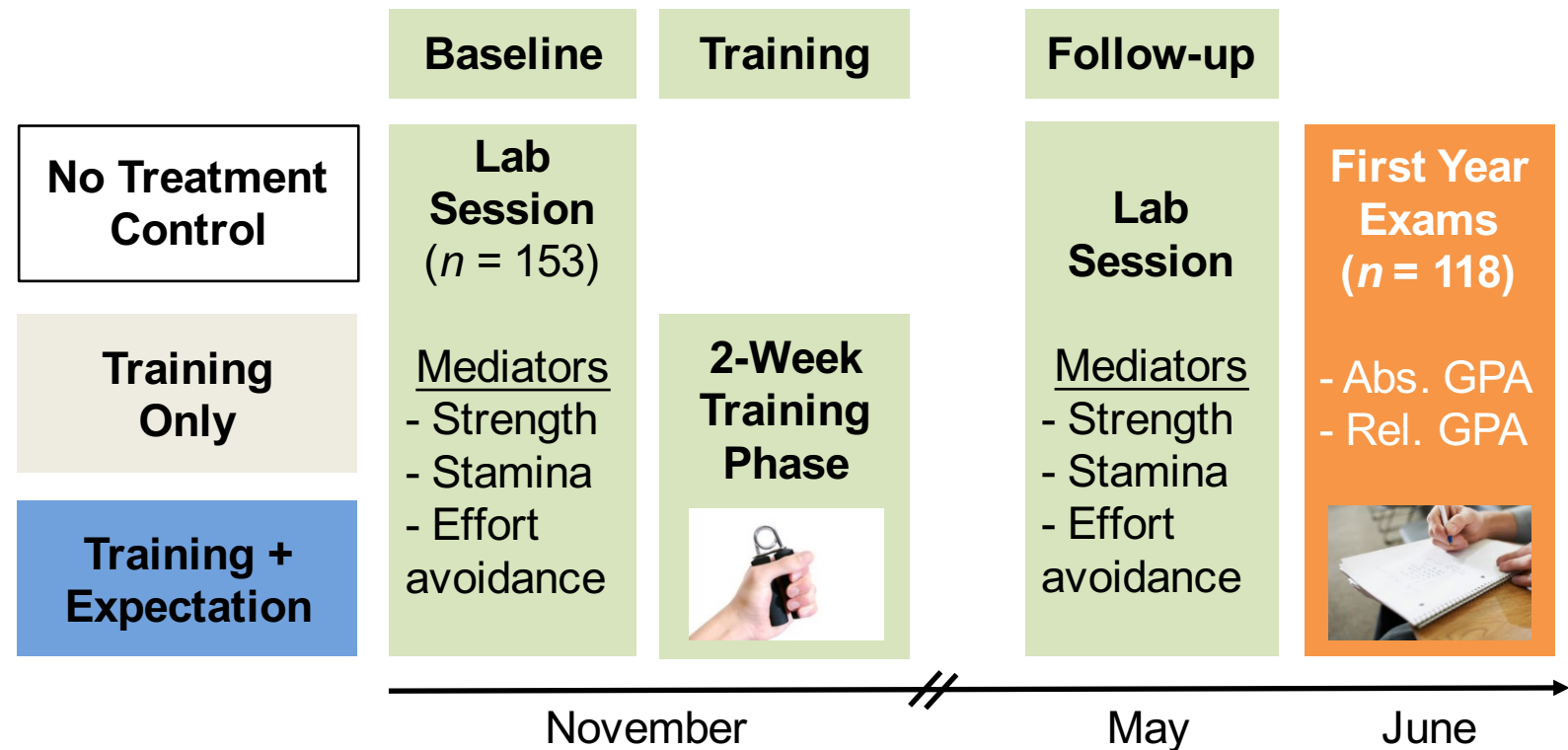
- ◆ Discussion

- Intriguing:
  - Train in one domain, profit in many others
  - Tremendous practical implications
- Bold
  - Literature on training of executive functions (Melby-Lervag & Hulme, 2013, Owen et al., 2010)
  - Trait self-control not dominantly about inhibition (de Ridder et al., 2012; Hofmann et al., 2012)
- What is the validity of the hypothesis?

# Self-Control Training & Academic Performance

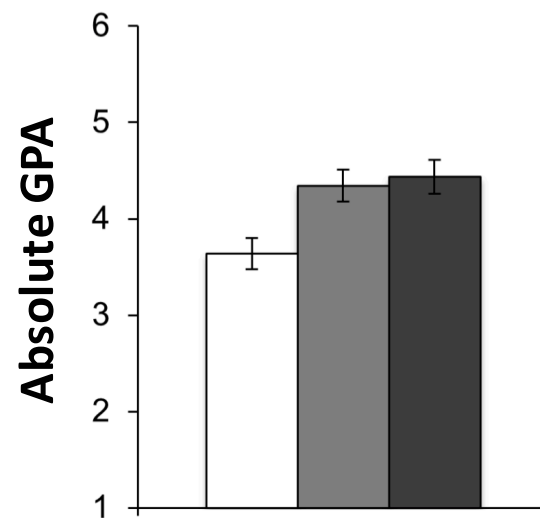
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- Academic performance depends on self-control (Duckworth & Seligman, 2005)



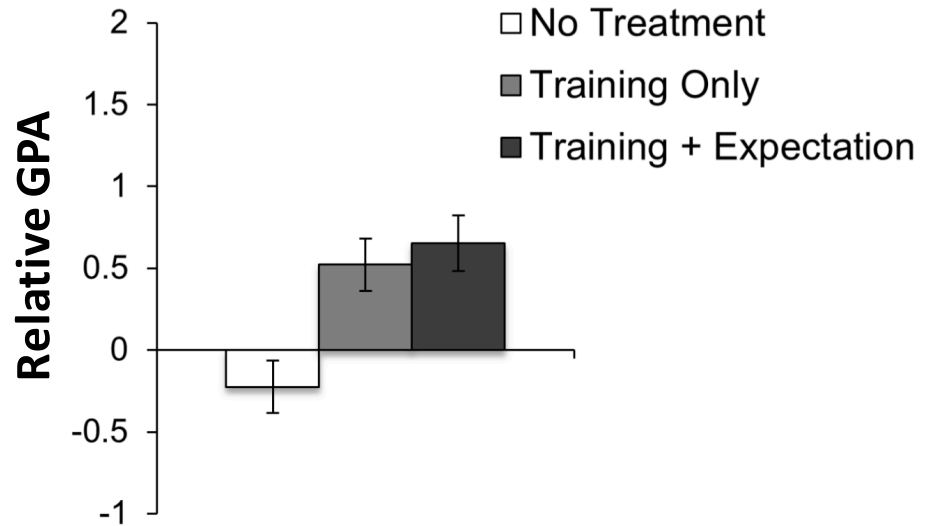
# Study 1: Effects on GPA

- ◆ Background
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Condition

$d = 0.57, BF_{10} = 78^*$



Condition

$d = 0.75, BF_{10} > 100^*$

\*Based on default priors in JASP

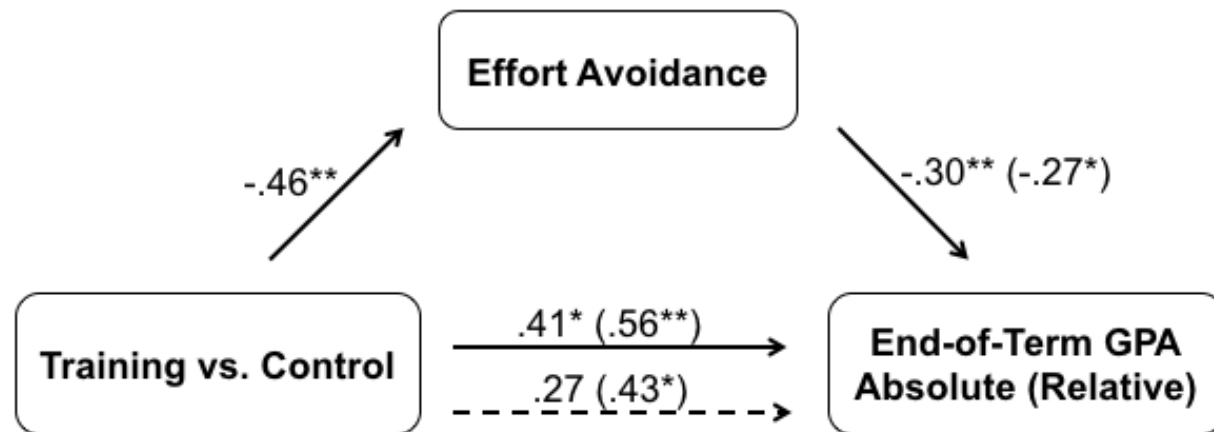
Job, Friese, & Bernecker (in press)



# Study 1: Effect on Mediators

- ◆ Background
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- Potential mediators
  - Strength: No effects.  $BF_{01} = 4.05^*$
  - Stamina: No effects.  $BF_{01} = 3.37^*$
  - Effort avoidance:
    - Less effort avoidance after training.  $BF_{01} = 0.21^*$



\*Based on default priors in JASP

Job, Friese, & Bernecker (in press)

# Study 1: Discussion

- ◆ Background
- ◆ Study 1
- ◆ Meta-analysis
- ◆ Discussion

- Two weeks of handgrip training
- Better GPA 7 months later
  - No-treatment control group similar to non-participating students
- How is this possible?
- Trained participants more willing to exert effort
- “Small interventions – large effects” not unknown (Yeager & Walton, 2011)

# Many open questions

- ◆ Background
- ◆ Study 1
- ◆ Meta-analysis
- ◆ Discussion

- Puzzling effect
  - No effect on strength and stamina
  - Moderate evidence for effort avoidance
  - Very different process than assumed by SM
  - Inactive control condition
  - Mixed findings in the literature  
(Miles et al., in press; Oaten & Cheng, 2006)
- Need for a meta-analysis

# Meta-Analysis

- ◆ Background
- ◆ Study 1
- ◆ Meta-analysis
- ◆ Discussion

- Two previous meta-analyses  
(Inzlicht & Berkman, 2015; Hagger et al., 2010)
  - Small subsets of literature
  - Only published studies
  - Diverging conclusions
- Goals
  1. Average self-control training effect
  2. Moderator effects
  3. Small-study effects & publication bias

# Inclusion criteria

- ◆ Background
- ◆ Study 1
- ◆ Meta-analysis
- ◆ Discussion

1. Treatment: Control of dominant responses
  2. Control group
  3. Random assignment to conditions
  4. At least one self-control related DV outside the domain of training
  5. DVs measured at least one day after training
  6. Mentally healthy adults
- Pre-registered at PROSPERO
  - Documentation, data, code and results on OSF

# Meta-Analytic Procedure

- ◆ Background
- ◆ Study 1
- ◆ Meta-analysis
- ◆ Discussion

- Coding of various moderators
- Combination of
  - multiple training groups
  - control groups
  - dependent measures
- Effect size  $g$
- Random-effects meta-analysis
- Assessment and estimation of small-study effects and publication bias

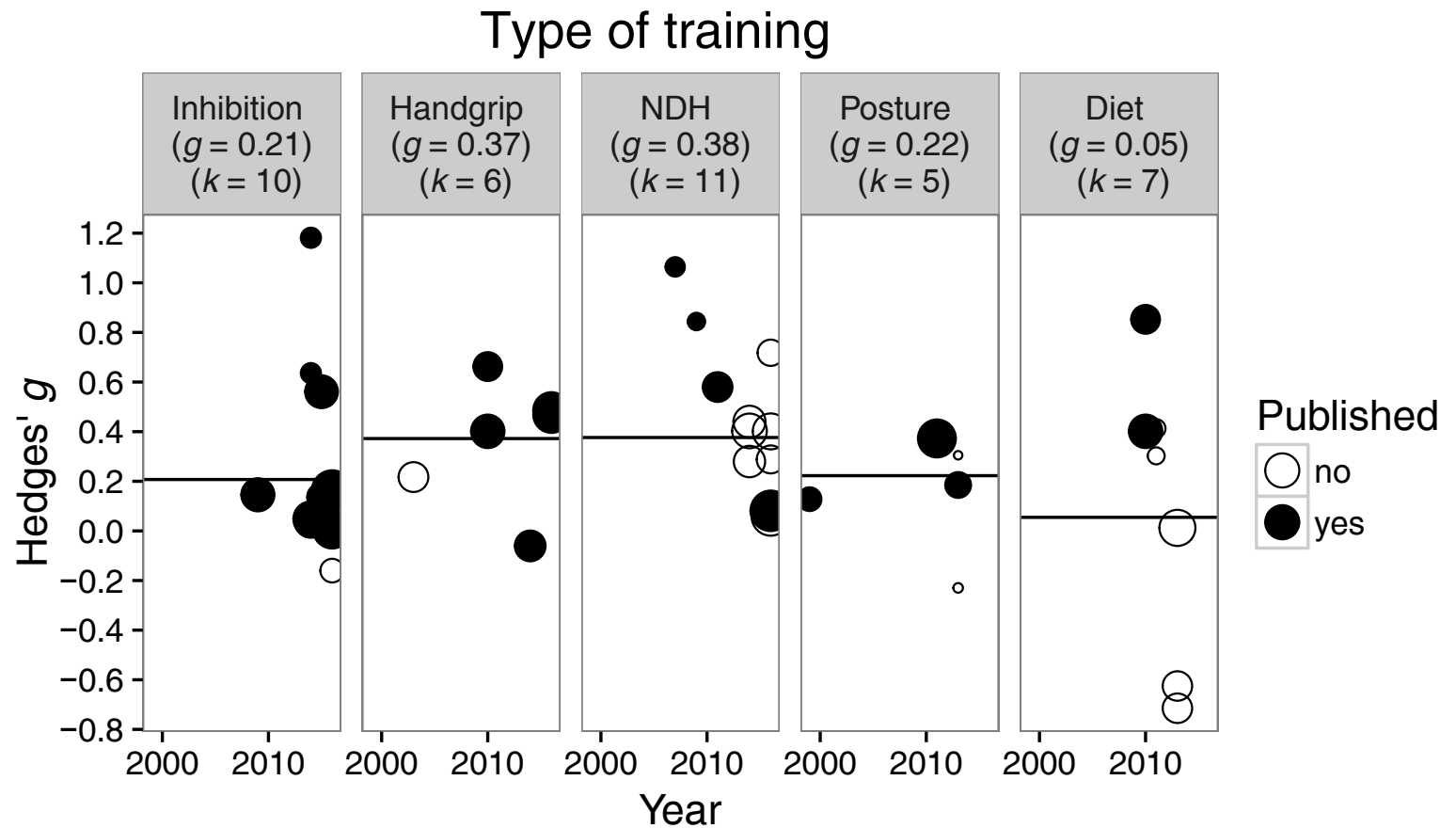
# Meta-Analysis: Results

- ◆ Background
- ◆ Study 1
- ◆ Meta-analysis
- ◆ Discussion

- 34 studies (13 unpublished)
- $N = 2661$  (67% female)
- Mean random-effects ES:  $g = 0.28$ , CI [0.19, 0.38]
- Heterogeneity:  $I^2 = 47\%$ ,  $p = .002$

# Moderator Analyses

- ◆ Background
- ◆ Study 1
- ◆ **Meta-analysis**
- ◆ Discussion

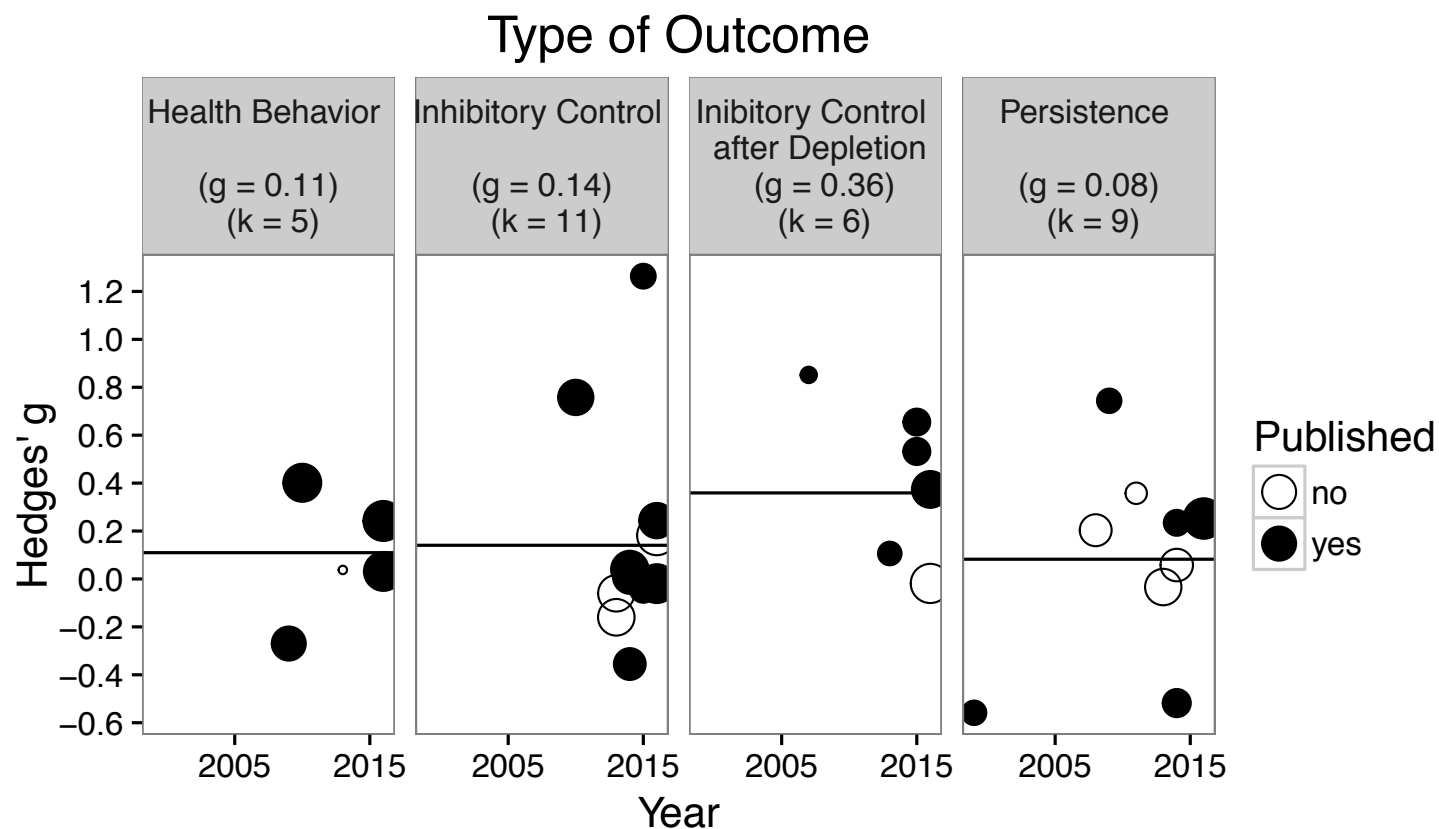


$$Q(4) = 5.34, p = .254$$



# Moderator Analyses

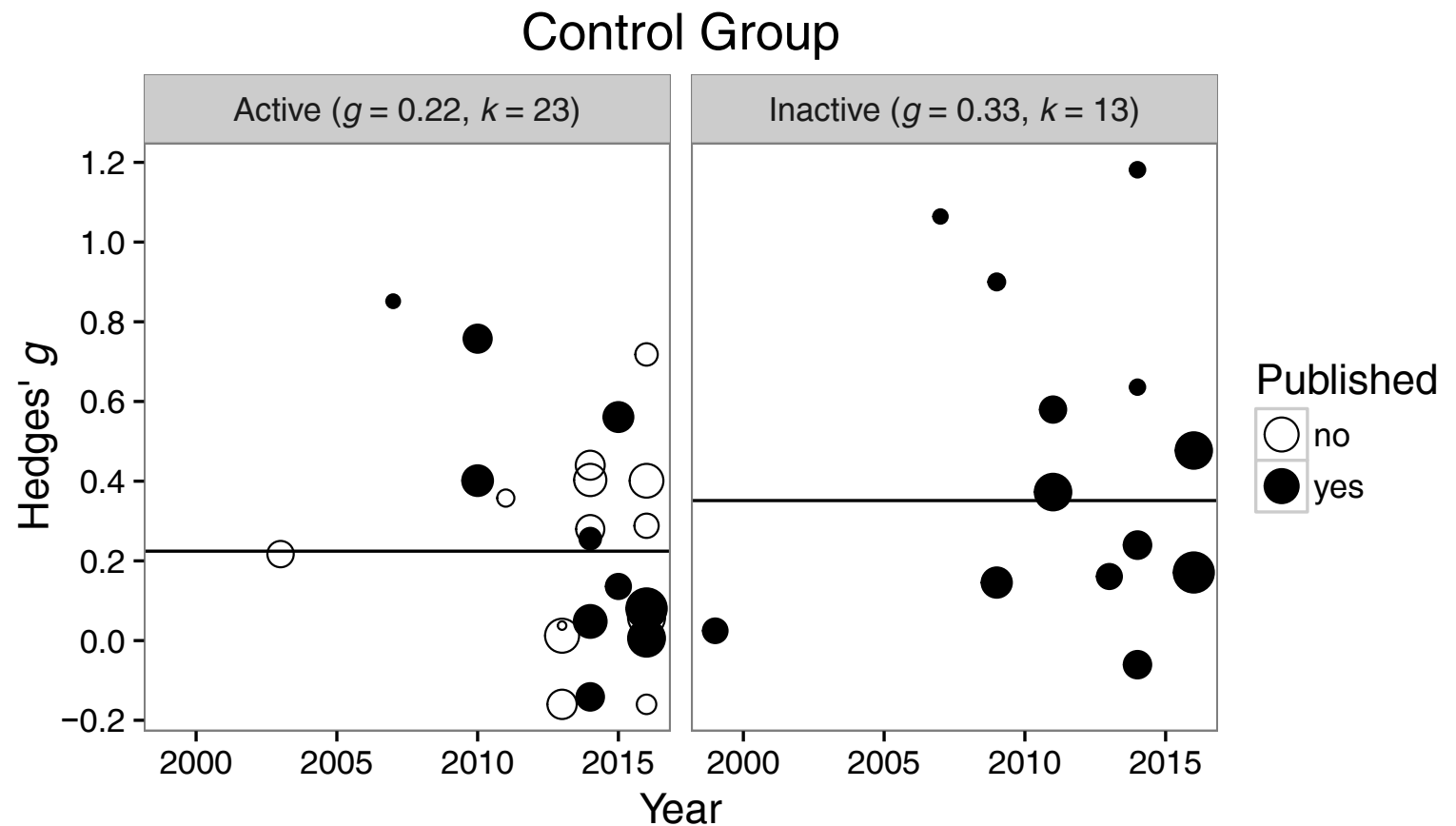
- ◆ Background
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- ◆ **Meta-analysis**
- ◆ Discussion



$$Q(3) = 2.32, p = .508$$

# Moderator Analyses

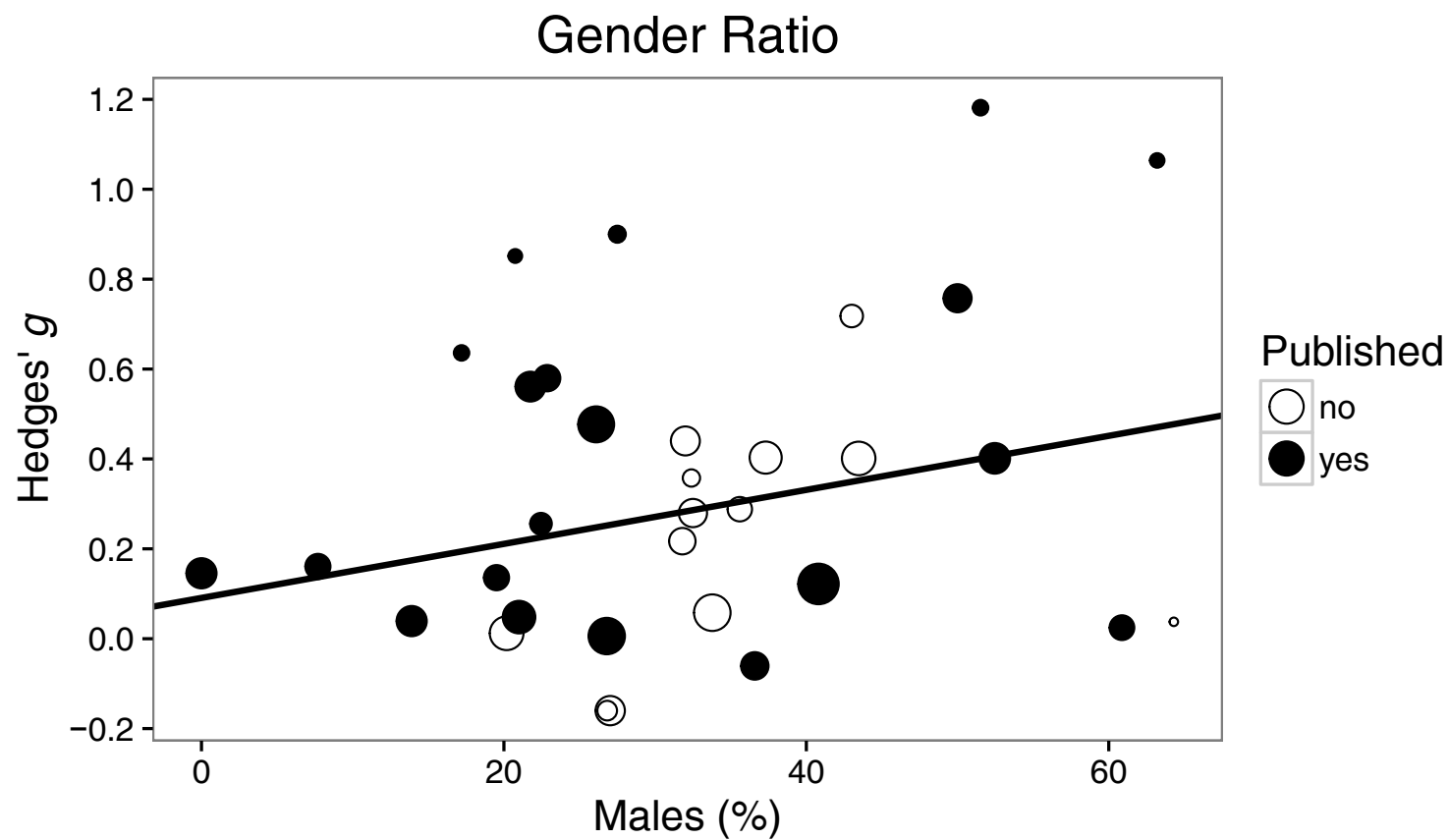
- ◆ Background
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$$Q(1) = 1.80, p = .180$$

# Moderator Analyses

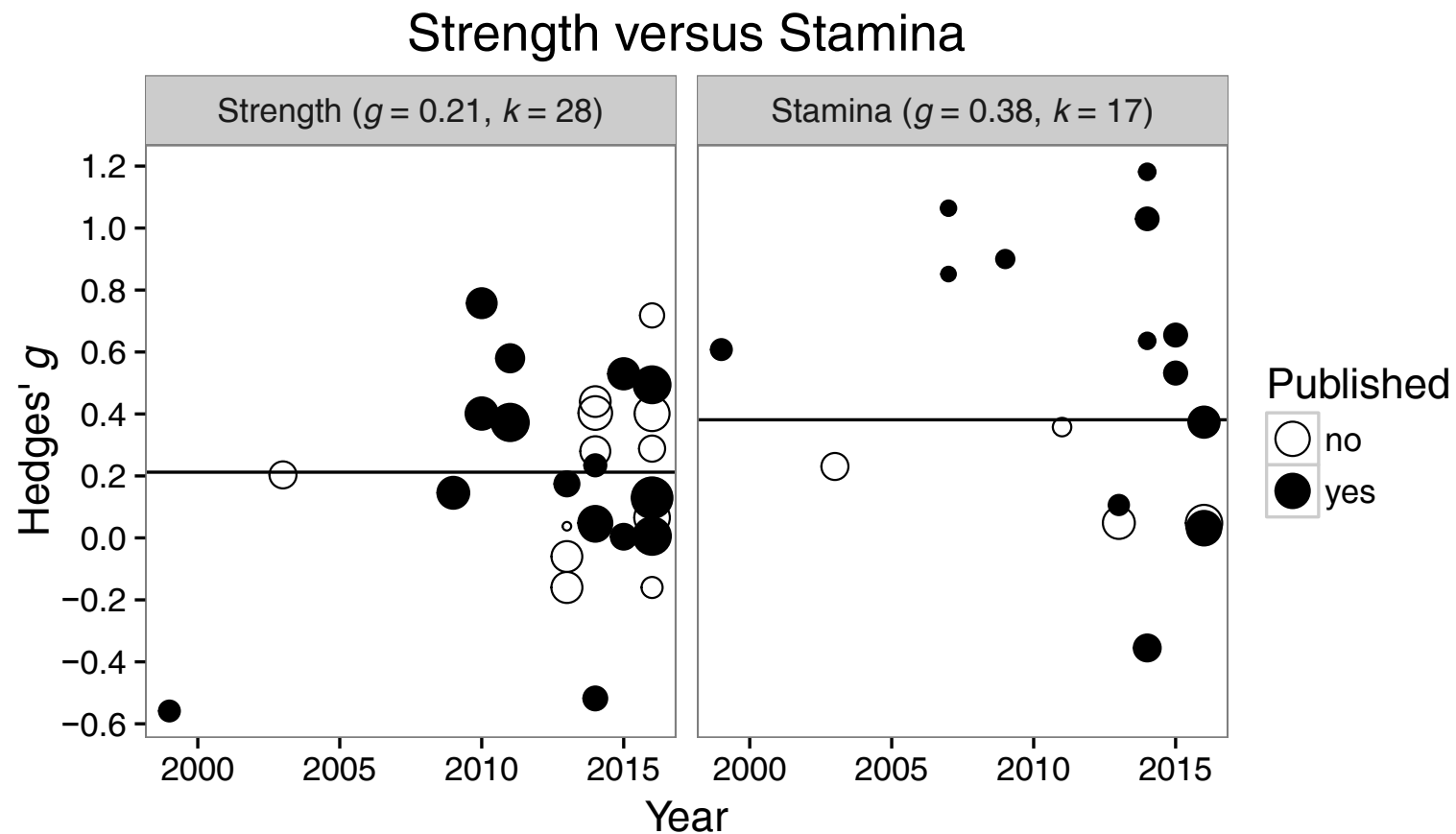
- ◆ Background
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$$Q(1) = 2.79, p = .095$$

# Moderator Analyses

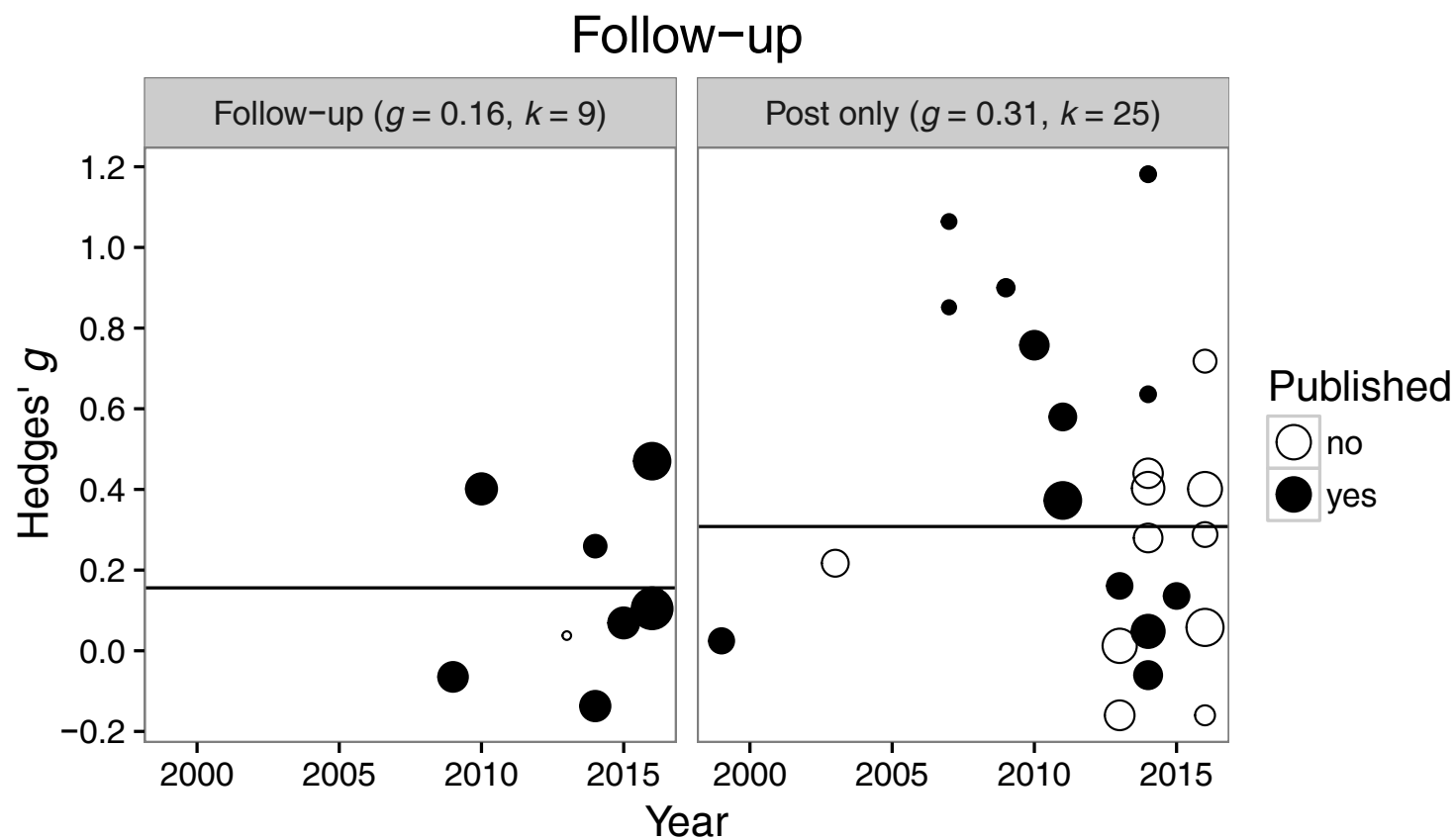
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$$Q(1) = 2.75, p = .097$$

# Moderator Analyses

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*Mdn* = 9.5 days

$Q(1) = 2.10, p = .147$

# Small-Study Effect & Publication Bias

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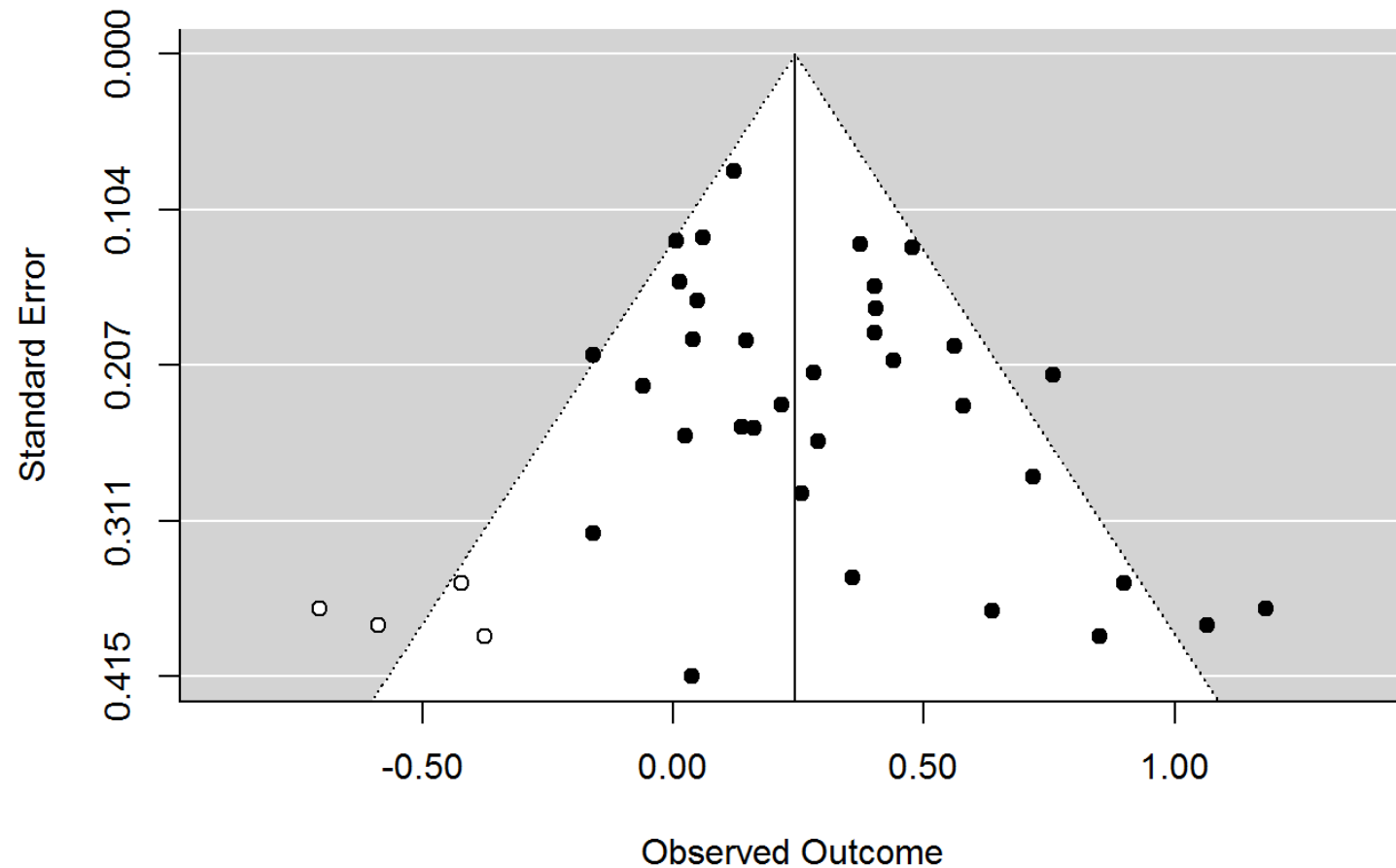


Figure 1: Funnel plot of standardized mean difference (SMD) and 95% confidence interval (CI) for the true effect size:  $g = 0.24 [0.14, 0.34]$

# Small-Study Effect & Publication Bias

- ◆ Background
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- PEESE: bias-corrected estimate
  - All studies:  $g = 0.13 [-0.01, 0.27], p = .063$
  - Published studies:  $g = 0.10 [-0.07, 0.27], p = .239$
  - Unpublished studies:  $g = 0.20 [-0.03, 0.42], p = .089$

# Discussion

- ◆ Background
- ◆ Study 1
- ◆ Meta-analysis
- ◆ Discussion

- Revisiting the goals
  1. Average self-control training effect
  2. Moderator effects
  3. Small-study effects & publication bias
- What causes relation between precision and effect size?
  - Small-study effects
  - $p$ -hacking, garden of forking paths
  - Publication bias



# Discussion

- ◆ Background
- ◆ Study 1
- ◆ Meta-analysis
- ◆ Discussion

- Mechanisms
  - Few studies investigated working mechanisms
  - Little evidence for control of dominant responses
- Future directions
  - Expectancies
    - What do participants expect from the study?
  - Motivation
    - Pursuit of goal/change motivation

# Many thanks to...

- ◆ Background
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- ◆ Discussion



Julius  
Frankenbach



Veronika Job



David  
Loschelder



Katharina  
Bernecker