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The University of  
**Nottingham**

# Acknowledgements

- Kapil Sayal and Joanne Tarver at Nottingham
- Edmund Sonuga-barke, Saskia Van der Oord, Marina Danckerts, Doepfner & Sam Cortese at EUNETHYDIS

# Sonuga-barke et al (2013)

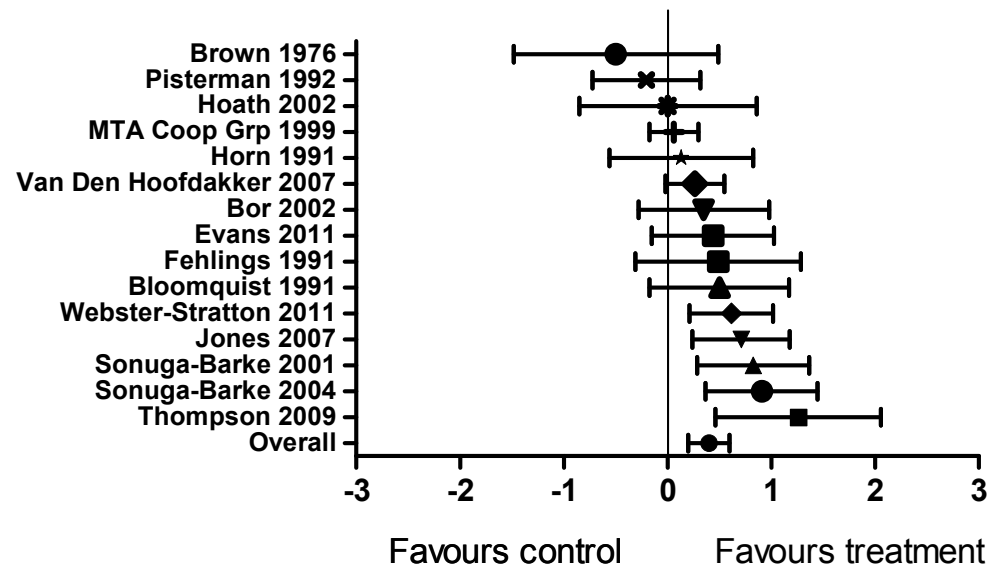
Sonuga-barke et al (2013) conducted a series of six parallel meta-analyses on non-pharmacological interventions for ADHD

- *Most proximal assessment. MPROX*
- *Probably blinded assessment PBLIND*
- Both analysis conducted on ADHD outcomes

# MPROX ADHD Outcome

## f. Behavioural Interventions

Standardised Mean Difference (SMD)  
IV, Random, 95%CI



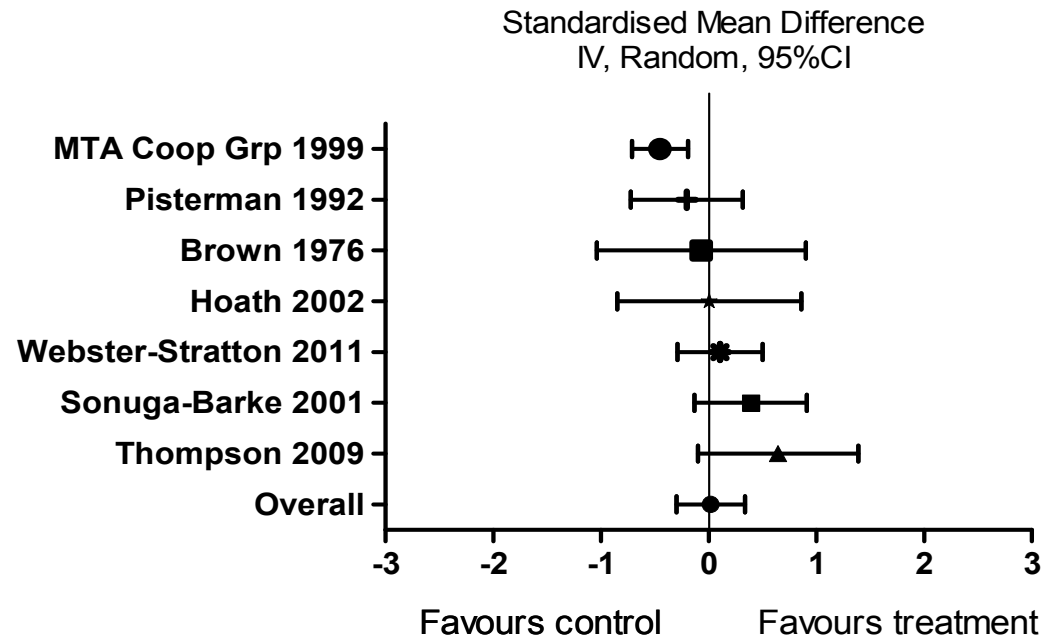
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Test for overall effect:  $Z = 3.88$ ,  $p = 0.0001$

Heterogeneity:  $\chi^2 = 30.73$ ,  $df = 14$ ,  $p = 0.006$ ,  $I^2 = 54\%$

# PBLIND ADHD Outcome

## f. Behavioural Interventions



Overall SMD (95% CI) = 0.02 (-0.30, 0.34)

Test for overall effect:  $Z = 0.09$ ,  $p = 0.92$

Heterogeneity:  $\chi^2 = 15.36$ ,  $df = 6$ ,  $p = 0.02$ ,  $I^2 = 67\%$

# Interim conclusions

- Whilst parent reports of symptoms has obvious clinical significance, they should be supplemented with objective measures.
- Biases in reporting are probably present in previous studies that have reported the beneficial effects of behavioural interventions for ADHD (Fabiano et al 2009).

# What might we expect from Behavioural Intervention?

- Important to remember that behavioural interventions are components of treatment with the potential to target other functional impairments associated with ADHD (Sonuga-barke et al 2006).
- Involving parents in interventions may also have benefits for the parents themselves, especially for parental depression and self-efficacy. Alizadeh et al 2007)

# Where does ADHD come from?

- Before we can hope to intervene and remit or reduce ADHD symptoms
- We need to understand the processes that allow ADHD symptoms to *develop*, be *expressed* and be *maintained*.



# What causes ADHD

- ADHD results from a gene X environment interaction.
- Children are born with a genetic risk for ADHD, not a fault on one single gene but tiny differences on lots of genes.
- Having the genetic risk doesn't mean the environment isn't important

# Example – how tall we are

How tall we are is almost entirely determined by our genes.

Yet during the 20<sup>th</sup> century the population got much taller due to better nutrition  
(environment!)



# Environment

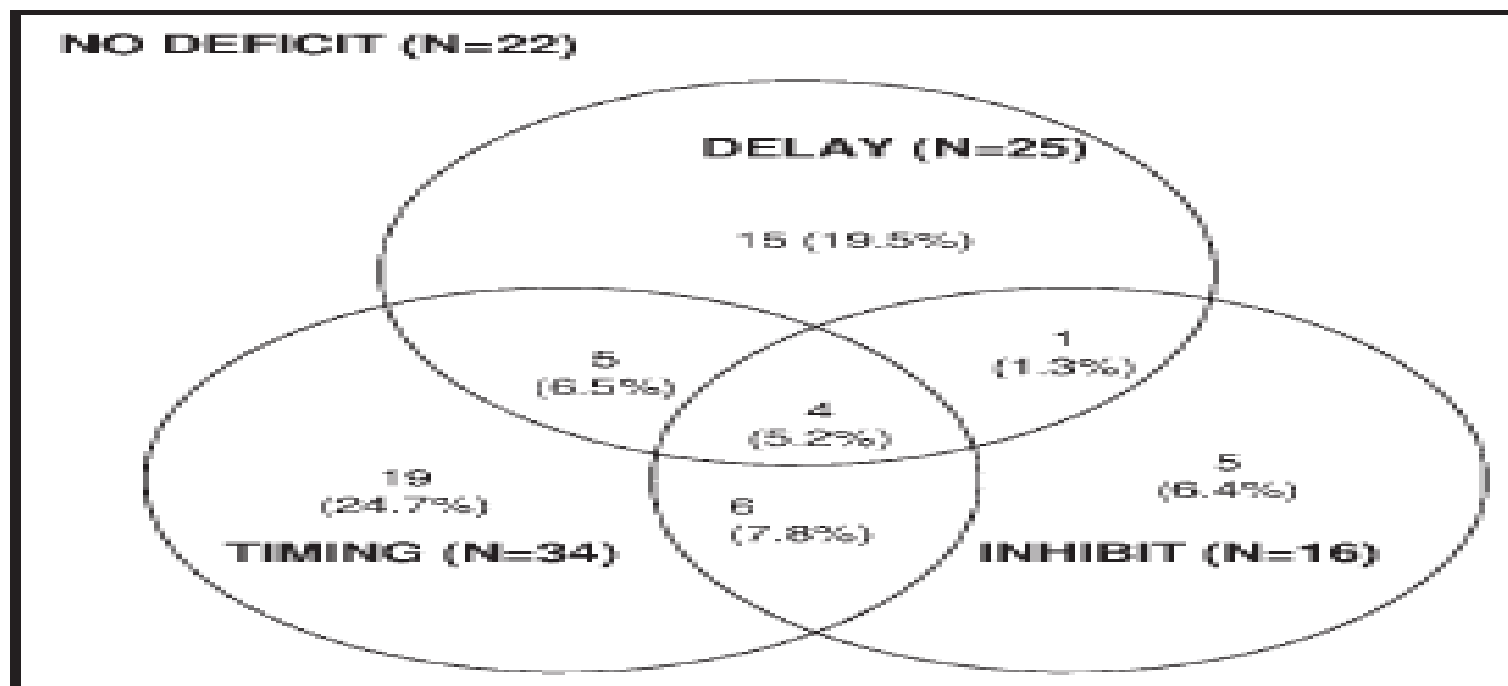
- So just because ADHD is mostly due to genetics doesn't mean that changing the child's environment can't have a dramatic impact.
- Parents play a key role in determining the early environment that their children experience.
- Teachers also have a role in determining the later environment that ADHD children experience.

# Where does ADHD come from?

- Why are children with ADHD
  - Impulsive
  - Hyperactive
  - Inattentive
  - *A neuroscience perspective*

# All ADHD children are different

**FIGURE 1** Proportion of Attention-Deficit/Hyperactivity Disorder cases (N = 77) with inhibition, timing, and delay-related problems and their degree of co-occurrence.



# So where do those symptoms come from?

- There are three key explanations for why children with ADHD behave in the way that they do
- Executive functioning
- Motivational style
- Timing difficulties

# Executive functioning

- Executive functioning are higher cognitive processes such as
- Planning
- Working memory
- Inhibitory control

# Executive Functioning

- Poor inhibitory control means you can't modify your response to environmental cues – *impulsivity*
- Poor working memory means that you have lower storage and rehearsal capacity – *forgetful- poor attention*



What's my cell phone number?



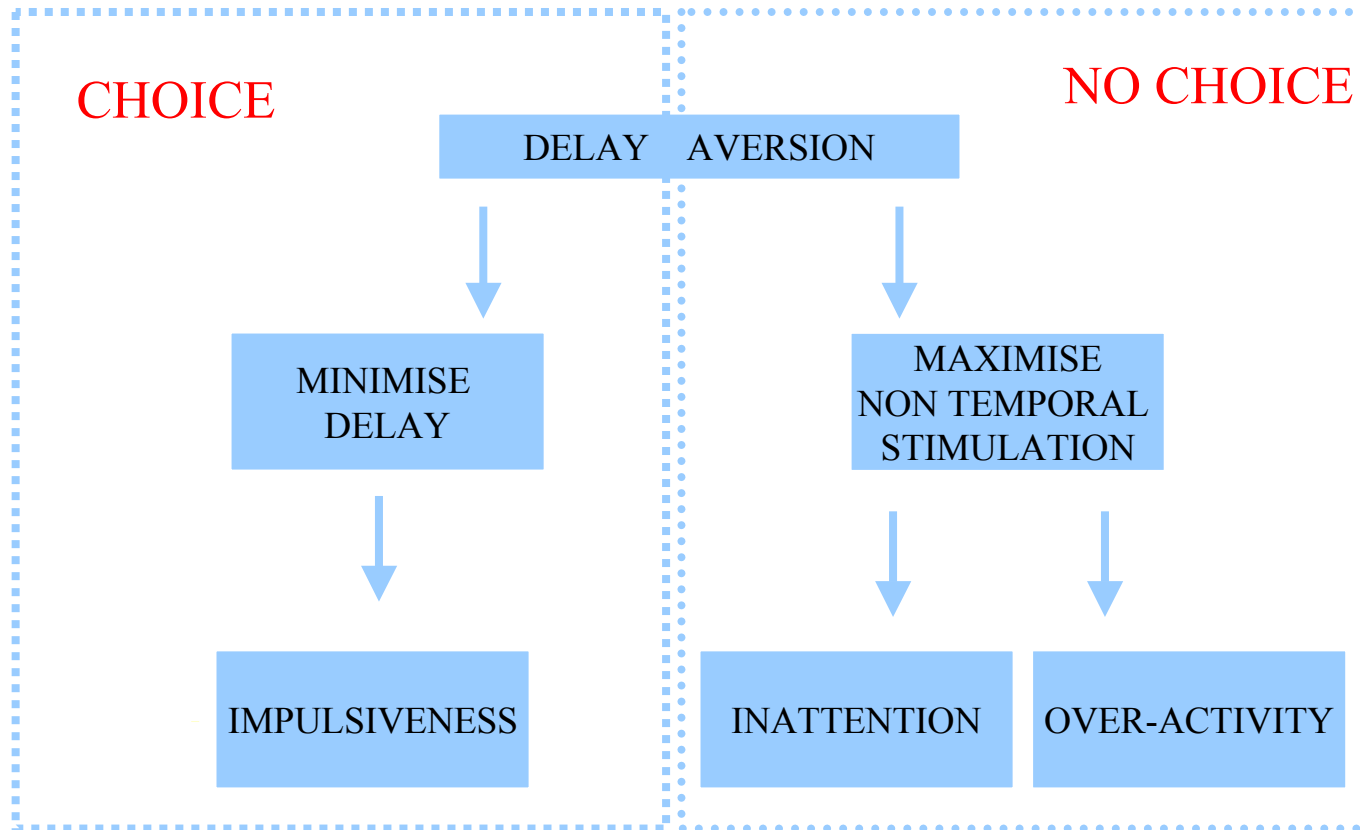
# ADHD as a motivational style

- Sonuga-Barke (2002) argues that ADHD symptoms result from a motivational style
- Function rather than dysfunction
- Escape or avoidance of delay

# Inhibition and waiting are related

- ADHD children can wait even when this does involve inhibition.
- ADHD children sometimes don't wait even when waiting doesn't involve inhibition.
- ADHD children will not wait if this increases overall delay.

# The expression of delay aversion



# ADHD and timing

- ADHD children also have difficulty with timing (Smith et al 2003)
- Both time estimation and time Reproduction. This means that ADHD children find it hard to estimate how long an interval of time actually is.

# ADHD and timing

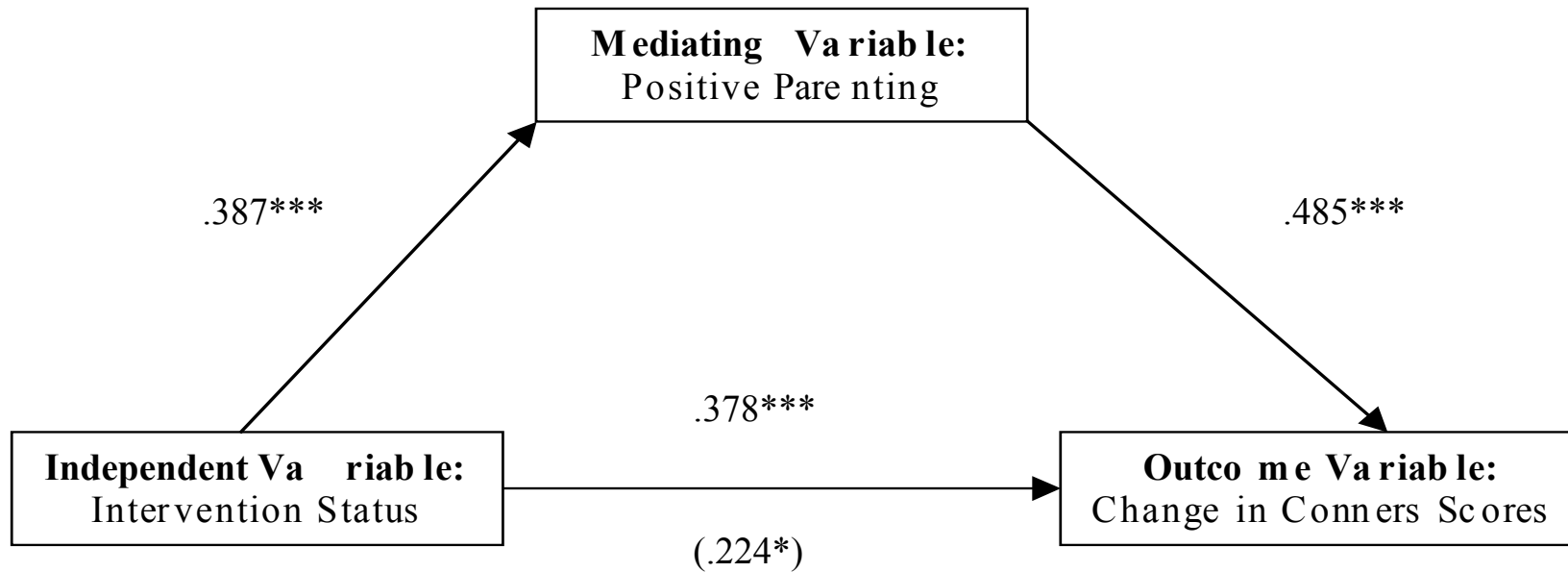


# But it is not just about neuroscience

- Other factors are also important:
  - Parent–child interaction
  - Parental emotional relationships
  - Praise and social reinforcement

# Mediating role of positive parenting

Daley, Jones., Hutchings, J & Whitaker, C. (in press).





# Does Parental Expressed Emotion Moderate Genetic Effects in ADHD?

- Sonuga-barke et al (2008) examined the influence of expressed emotion on ADHD in a genome wide association scan study.
- Expressed Emotion moderated the effects of genes on ADHD severity and comorbid conduct disorder, implicating both novel and established candidate genes.

# Hyper-responsiveness to social reward in ADHD

- Kohls Herpertz-Dahlman & Konrad (2009)
- Most studies examining role of reinforcement in ADHD has examined monetary reinforcers ignoring the power of social-emotional stimuli.

# Kohls, Herpertz-Dahlman & Konrad (2009)

- Examined ADHD and control child performance in the go-no-go task using different rewards non-social (money) and social ( positive facial expressions).
- Both types of reward improved inhibition accuracy in both groups.

# Kohls, Herpertz-Dahlman & Konrad (2009)

- ADHD children displayed a particularly high response to social reward compared to controls.
- Cognitive control in ADHD children can be improved by social reinforcement.

# Conclusions

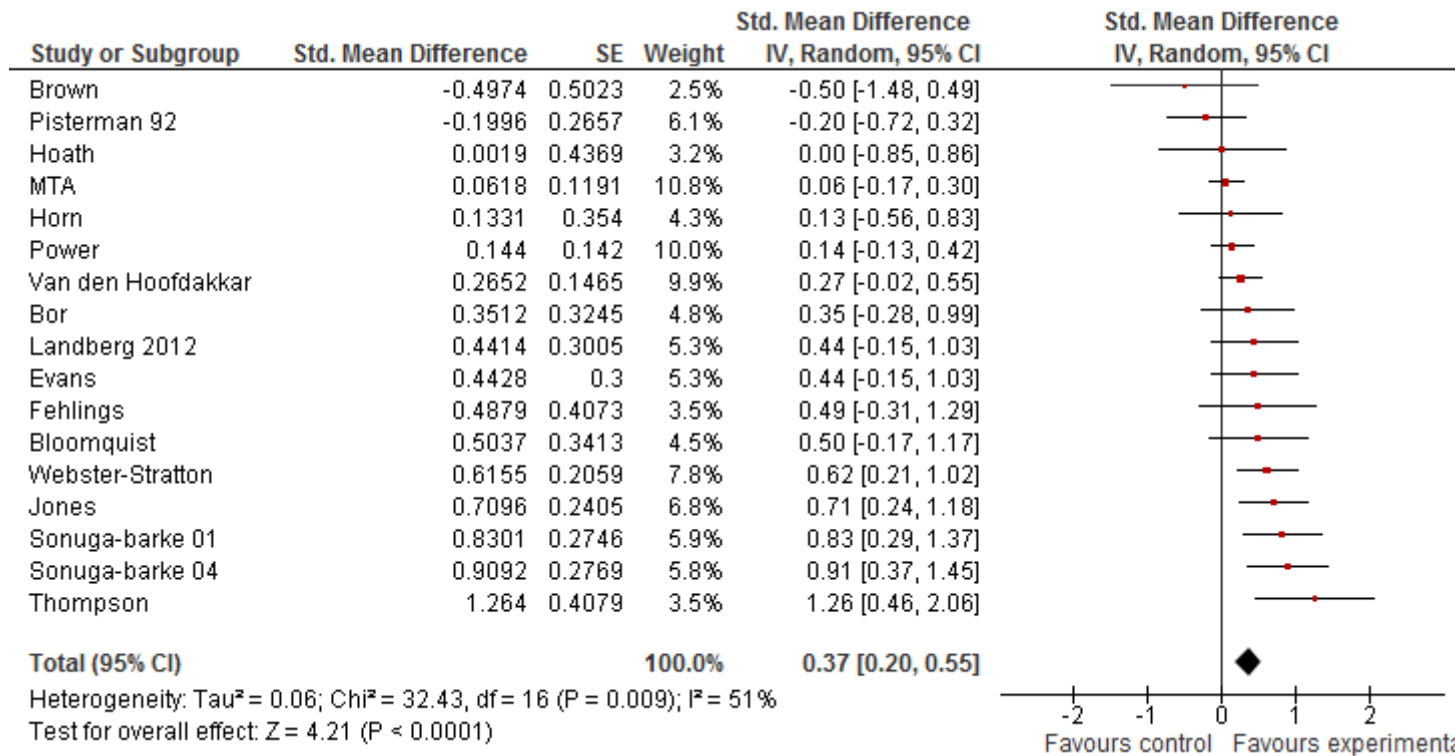
- Through altering the child's experience of interaction it may be possible to alter
- Parental interactional style which may impact on symptoms
- Emotional experiences which may impact on genetic expression and then symptoms.
- Reinforcement contingencies which may alter neuron firing and brain activation.
- The child's delay aversion and working memory capacity which may impact on functioning.

# Daley et al (in preparation)

Extension of Sonuga-barke et al's (2013) meta-analysis focusing just on behavioural interventions but examining a wider range of outcomes beyond symptom control.

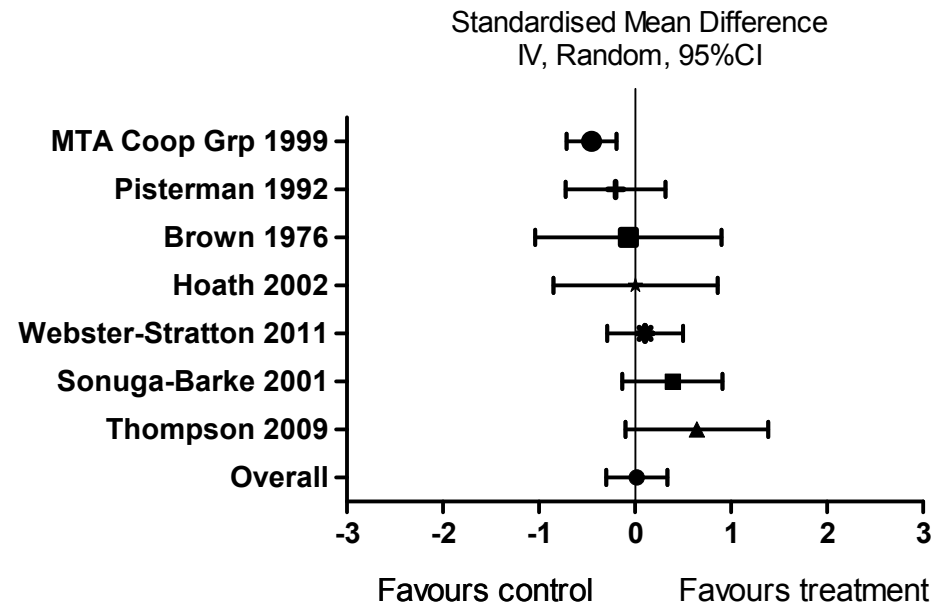
- *Most proximal assessment.*
- *Probably blinded assessment*

# ADHD MPROX



# ADHD PBLIND

## f. Behavioural Interventions



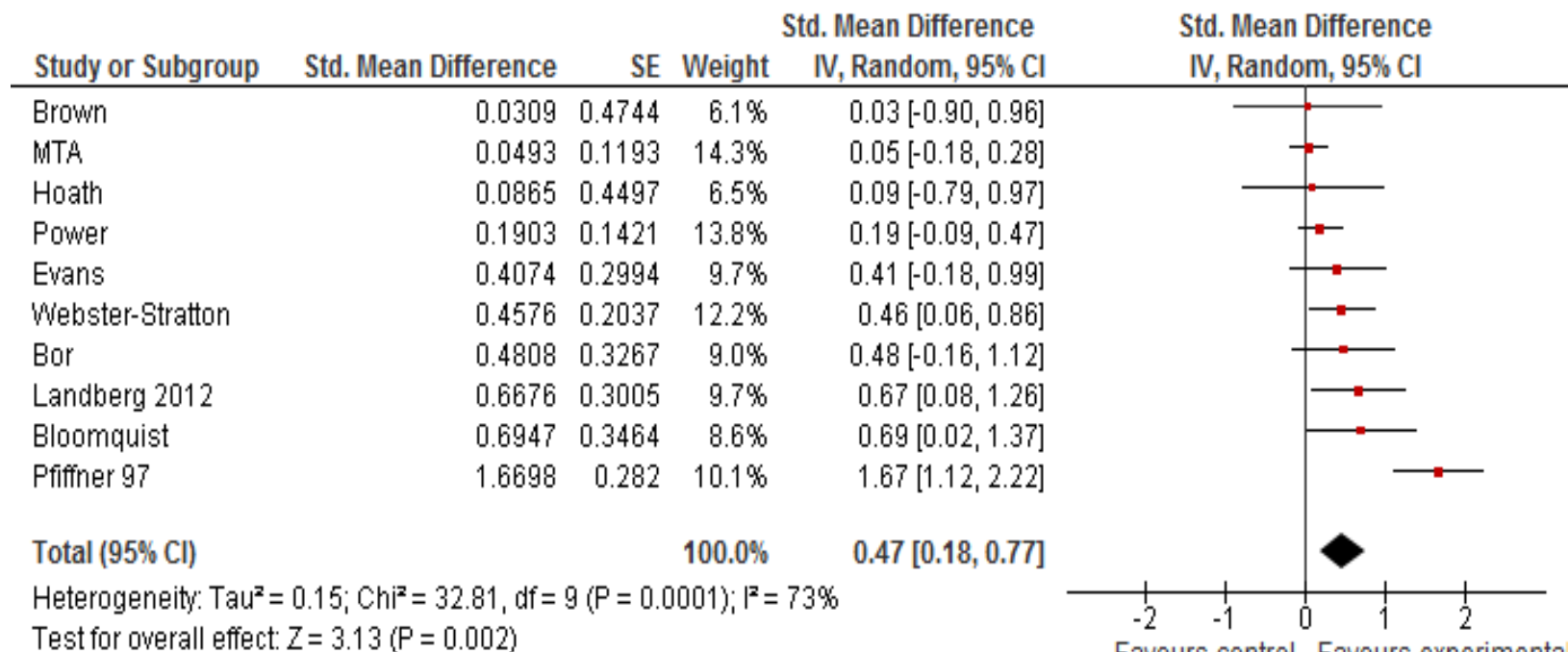
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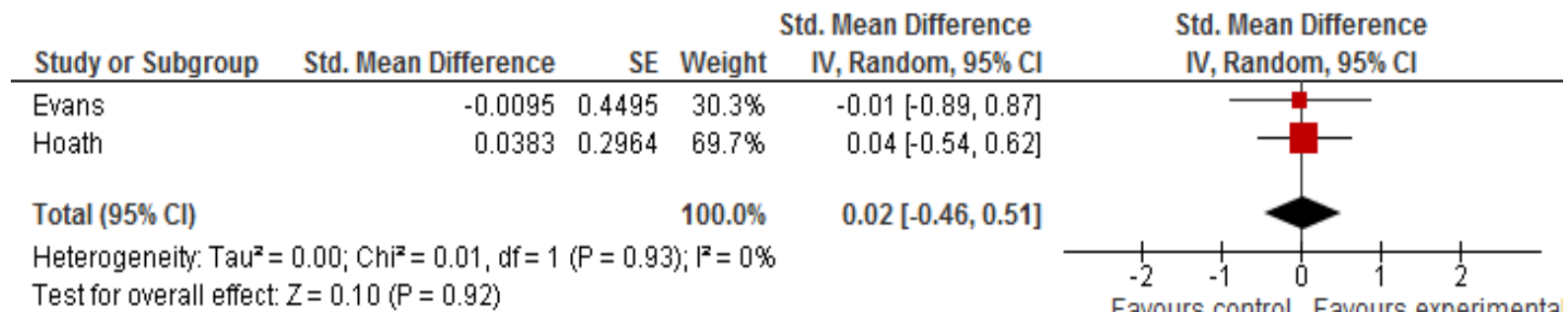
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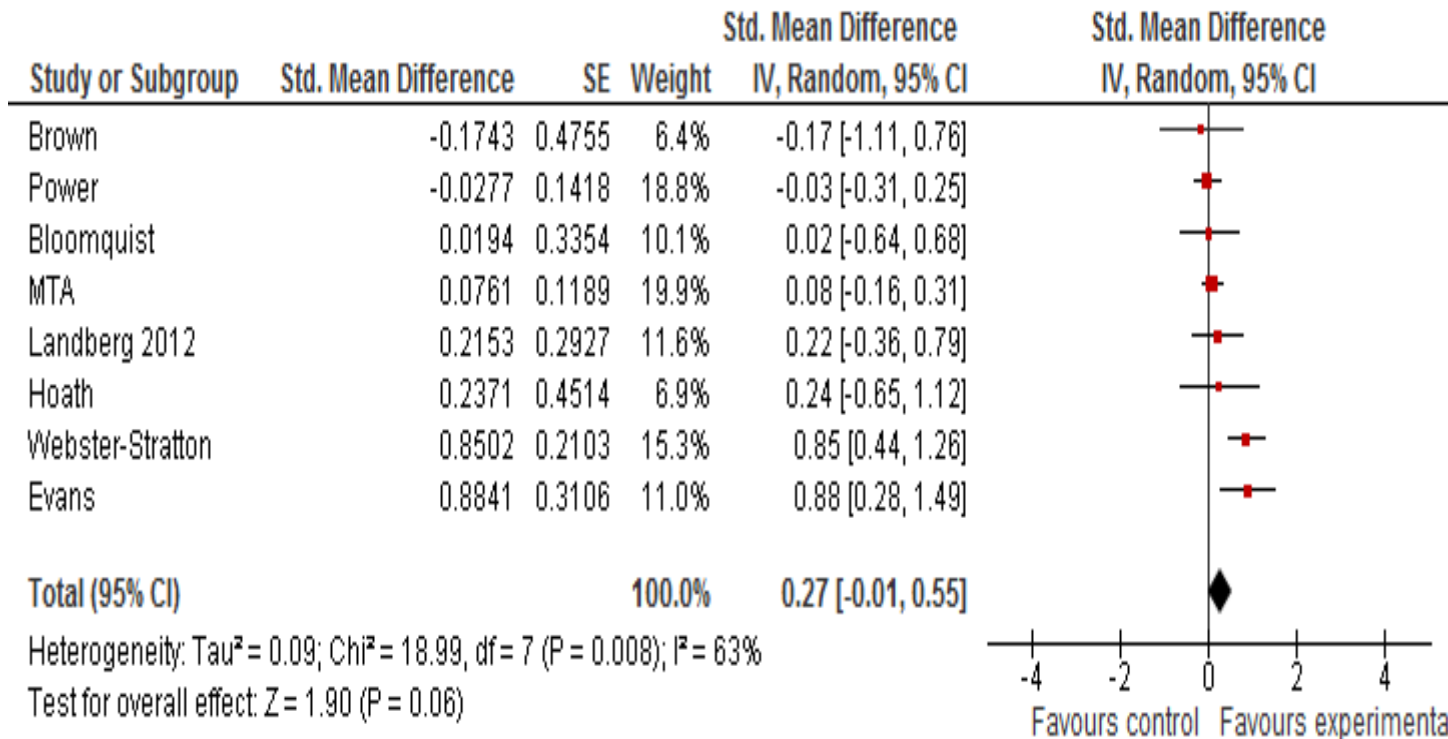
# Inattention MPROX



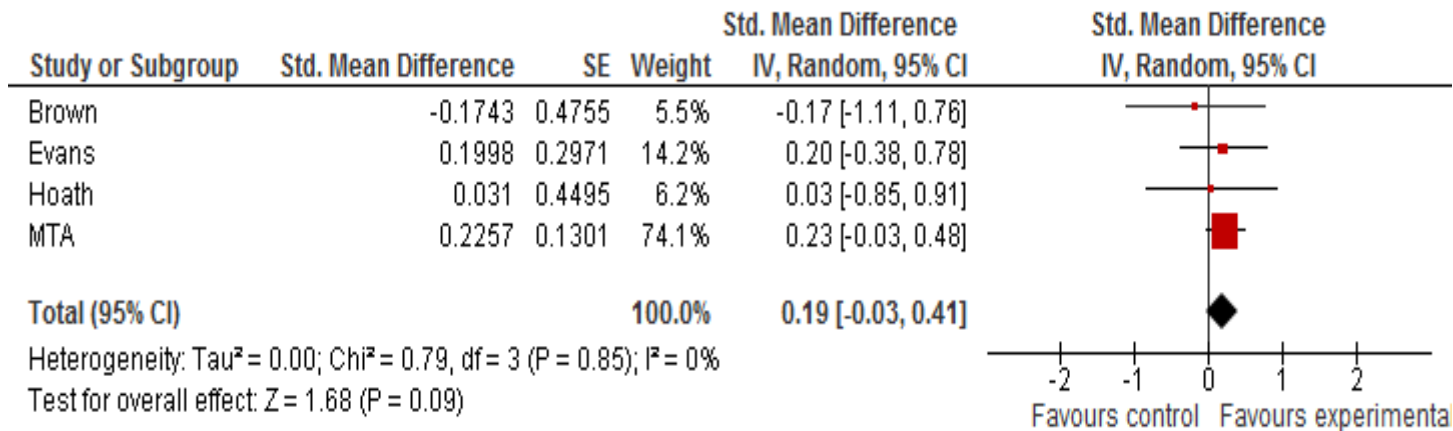
# Inattention PBLIND



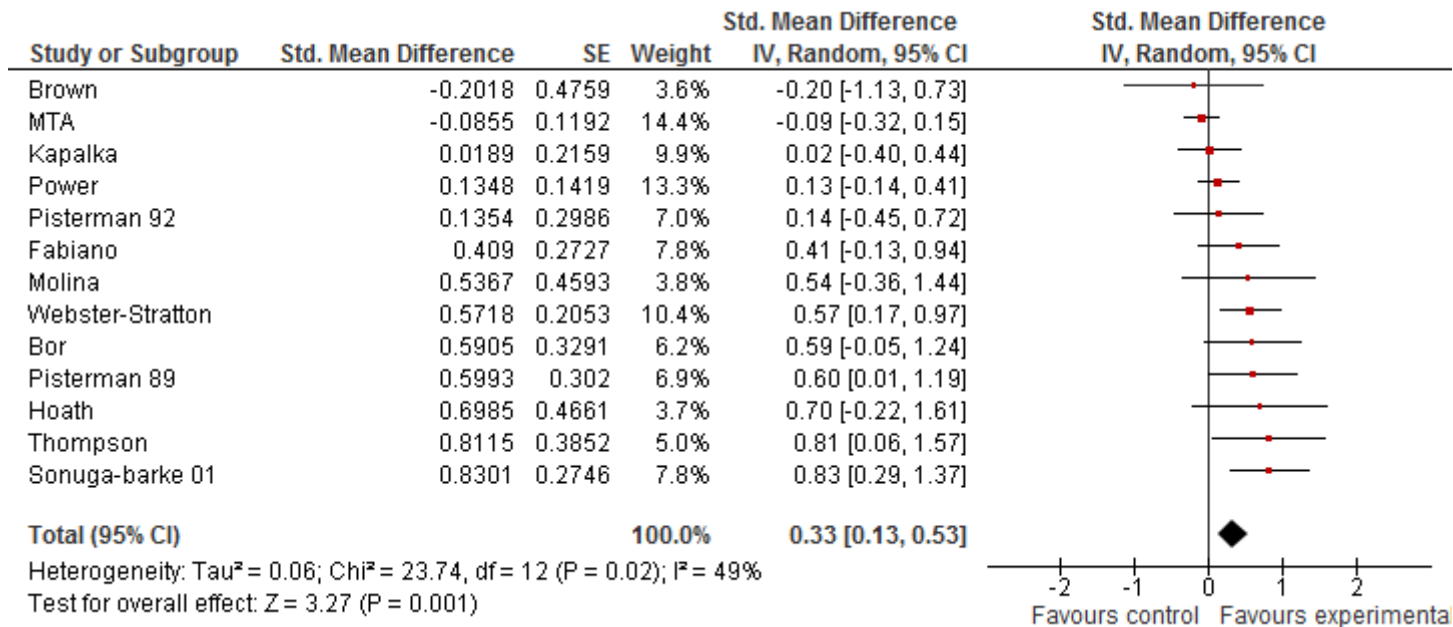
# Hyp/Impulsive MPROX



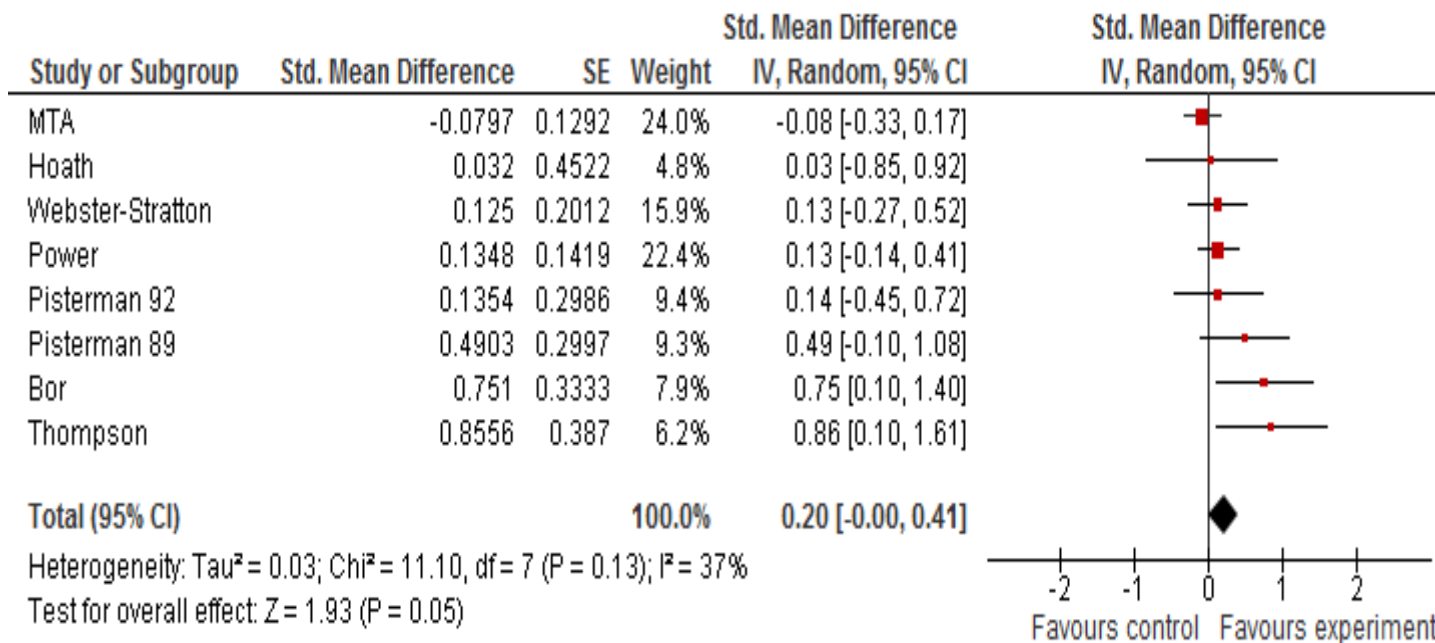
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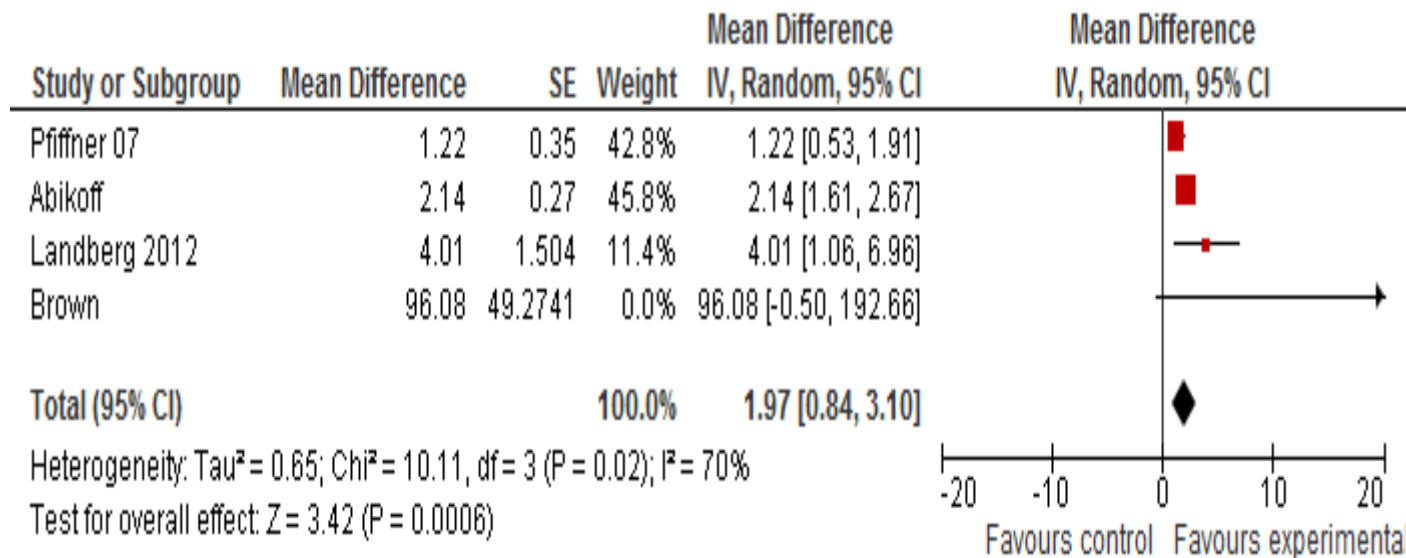
# Conduct MPROX



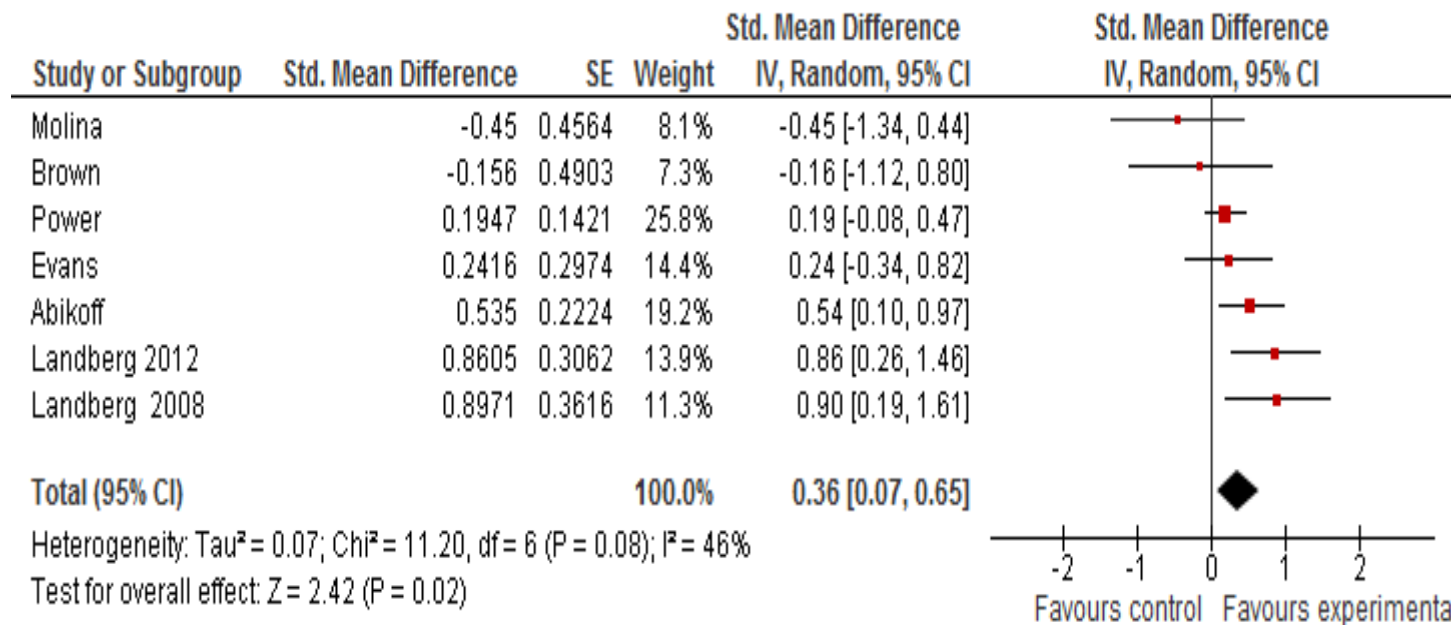
# Conduct PBLIND



# Child Cognitive Skills

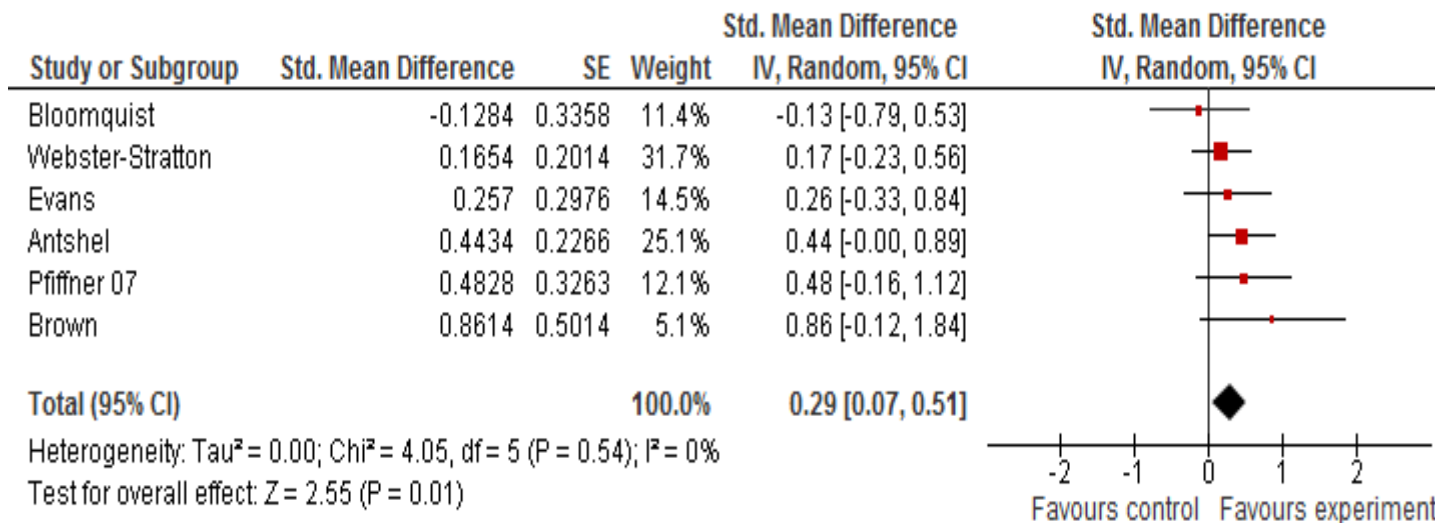


# Academic





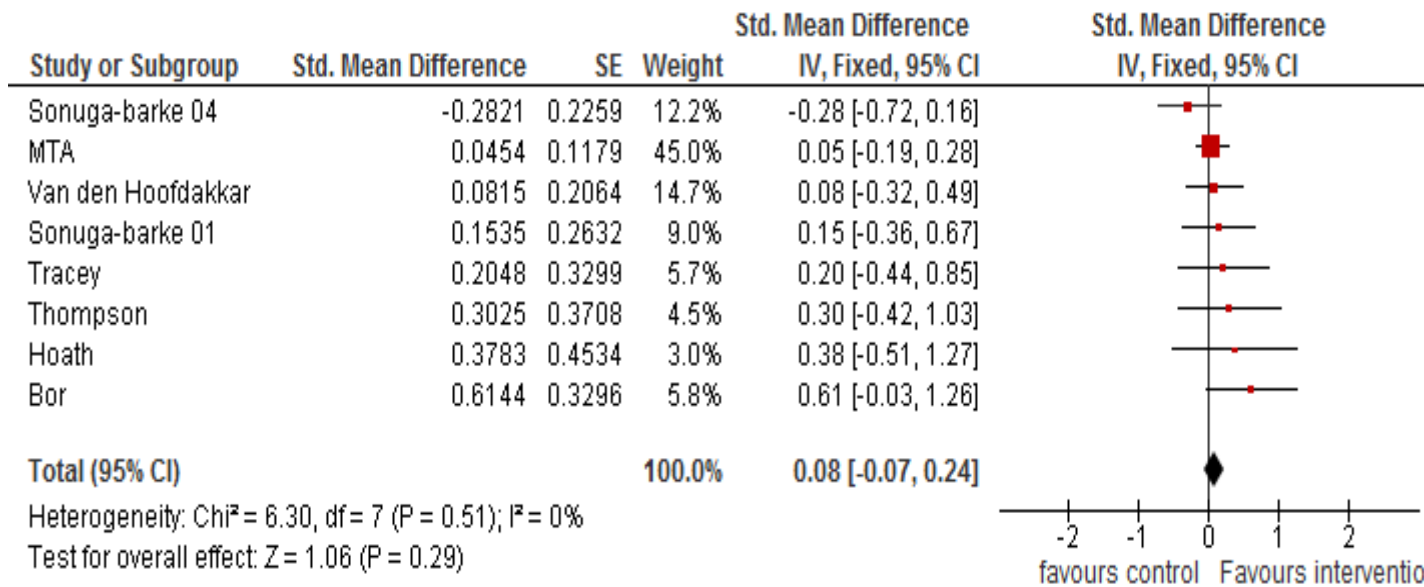
# Child social Skills



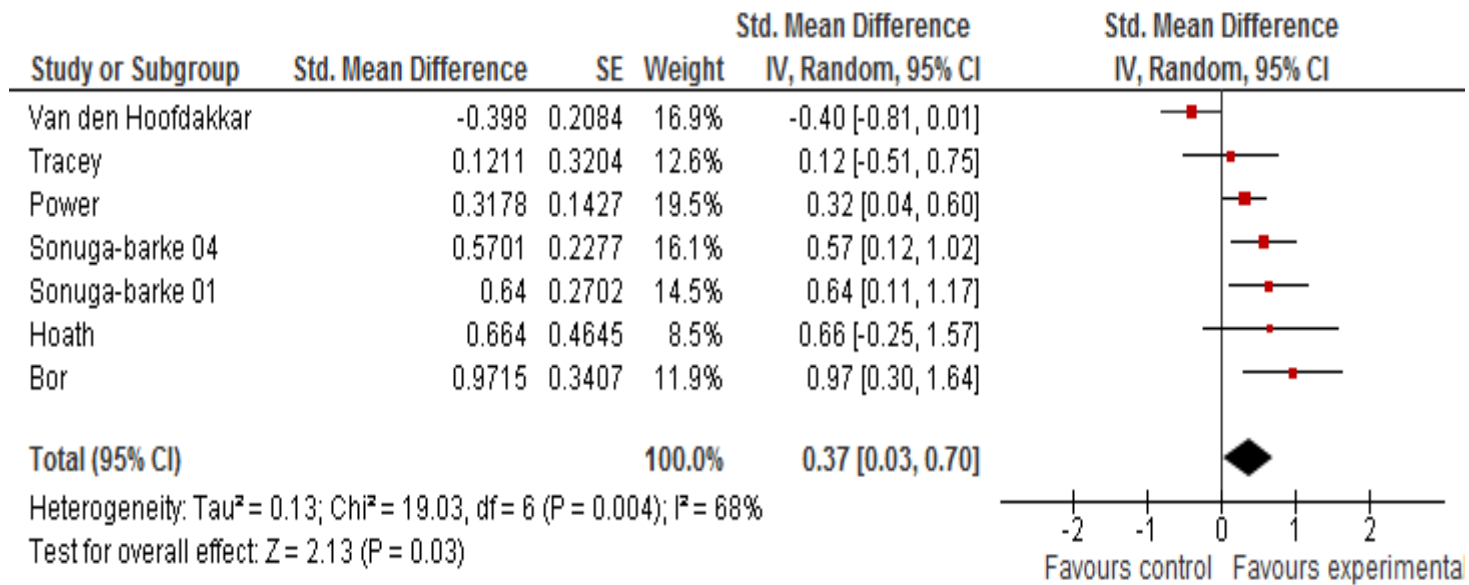
# Interim summary Child outcomes

- Clear impact of behavioural interventions on MPROX ratings of symptoms but also conduct, academic, social and especially cognitive.
- Where available PBLIND ratings followed the same trend as in Sonuga-barke et al (2013) being considerably lower than MPROX and usually non-significant

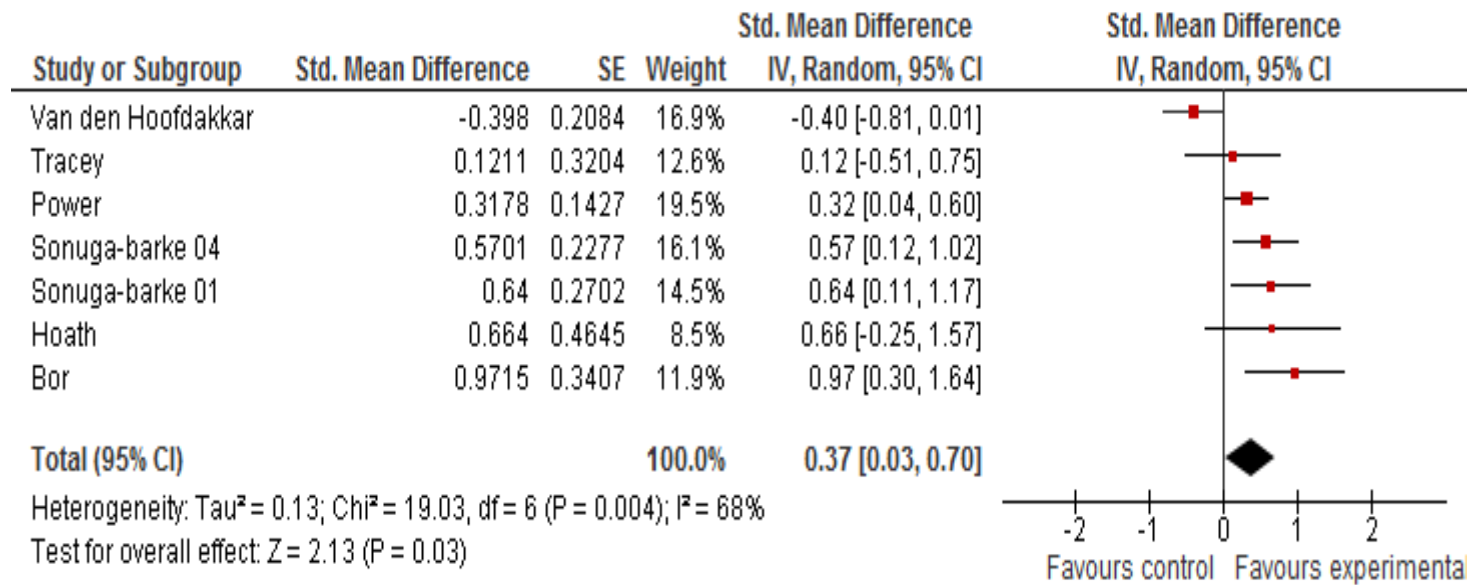
# Parental Mental Health MPROX



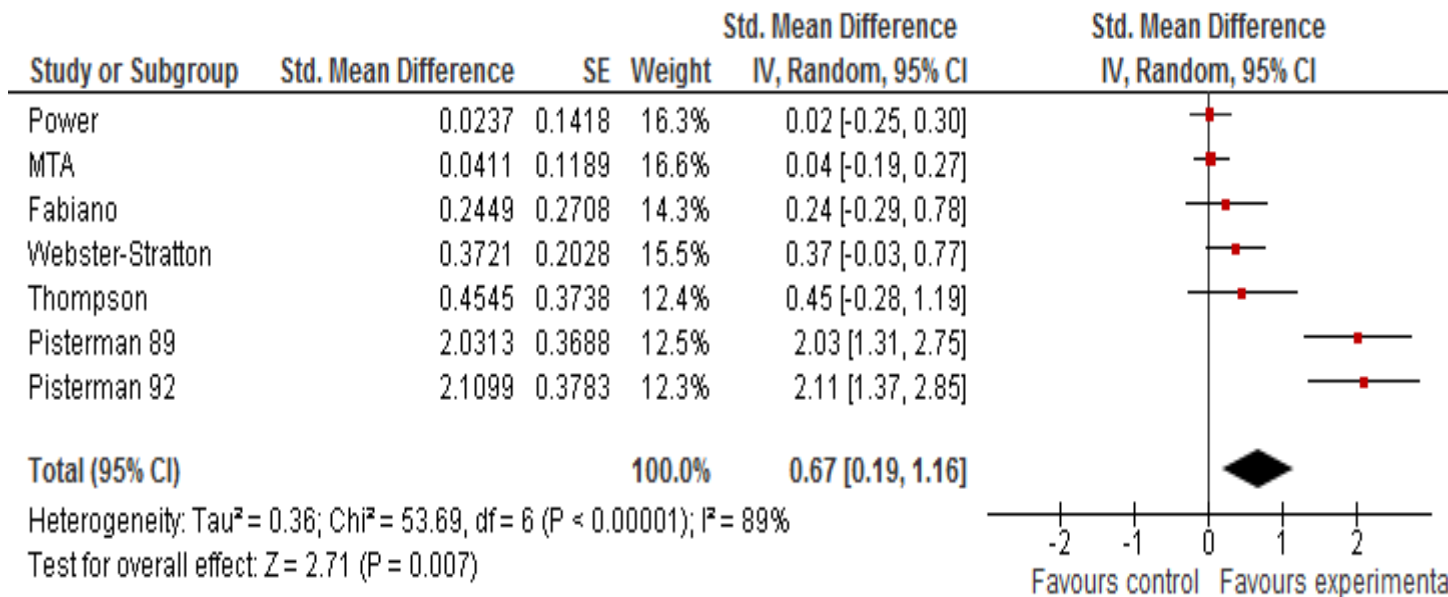
# Parental self-concept



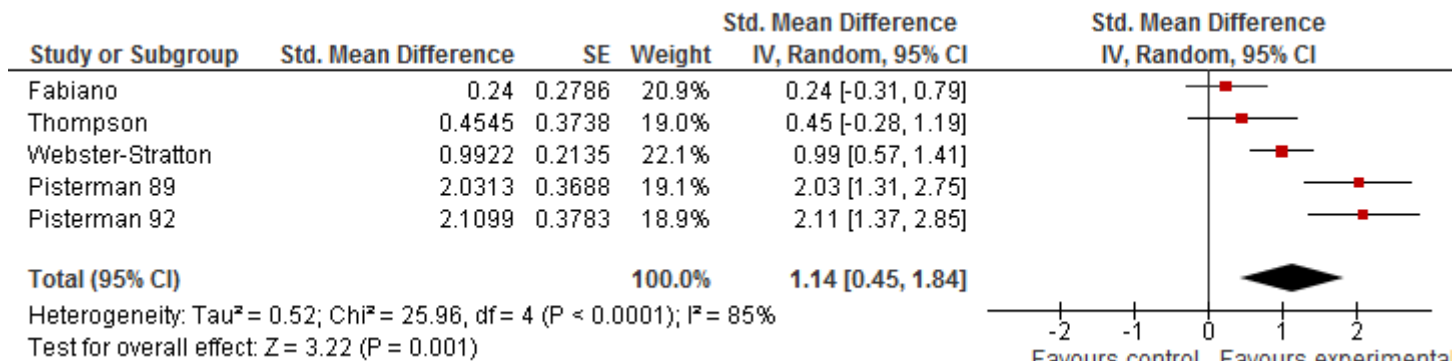
# Family Functioning



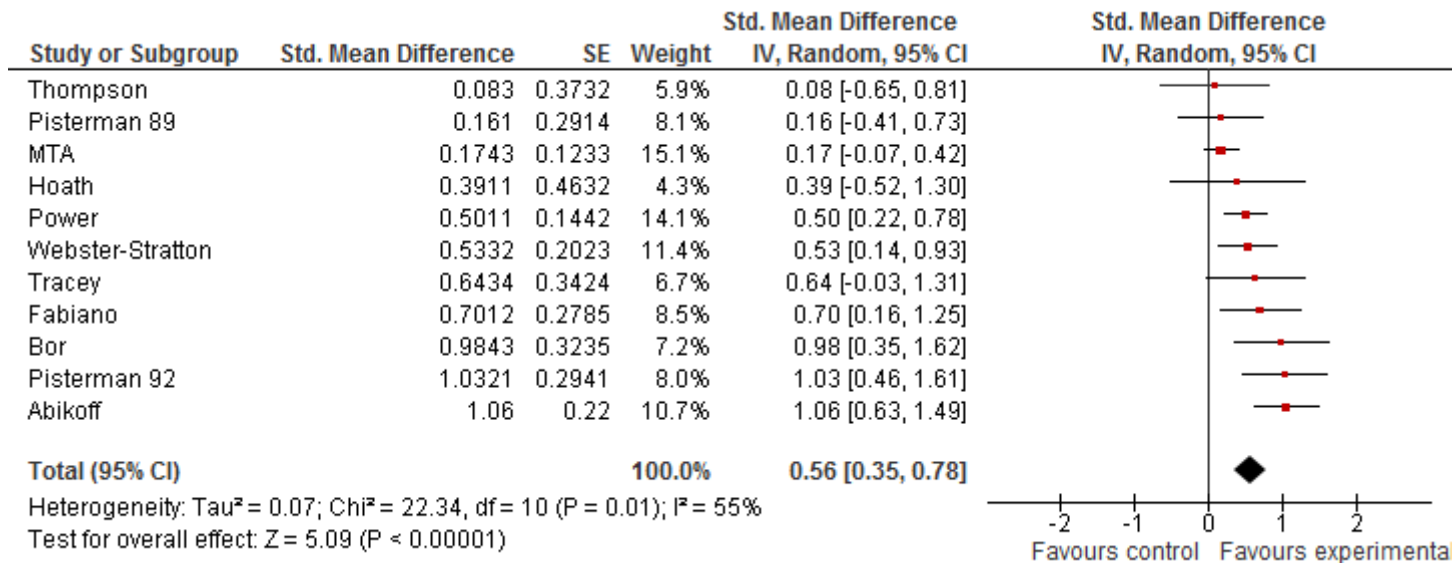
# Positive Parenting MPROX



# Positive Parenting PBLIND

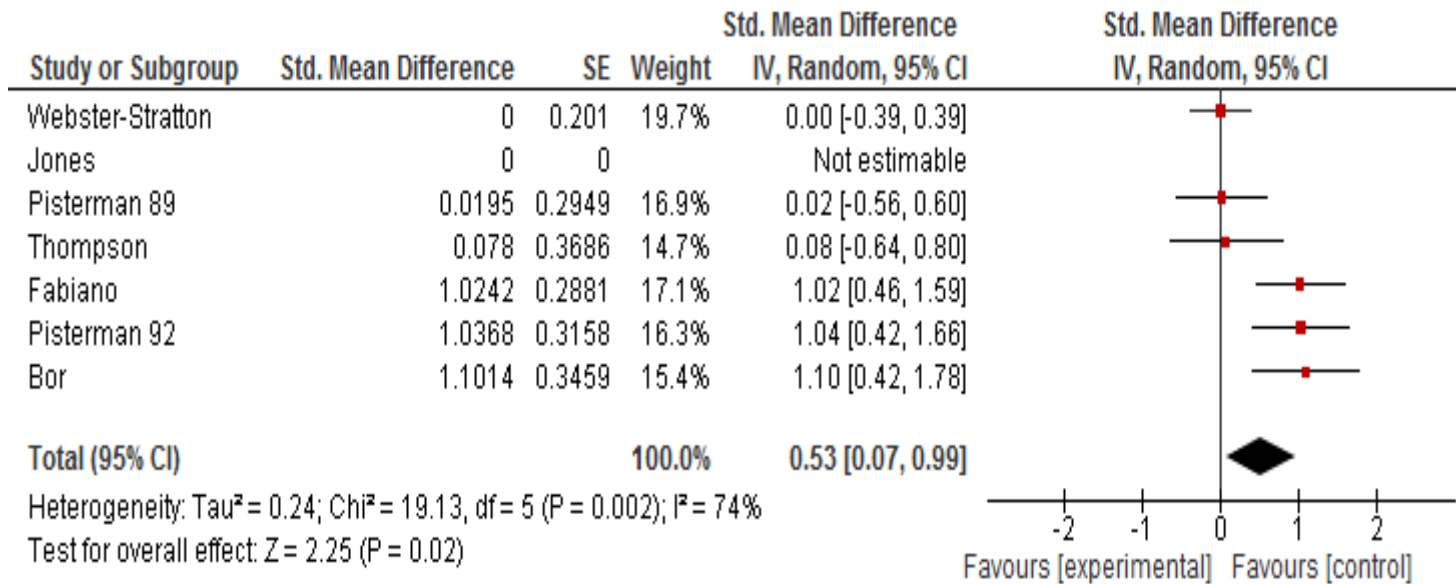


# Negative Parenting MPROX





# Negative Parenting PBLIND



# Interim Summary Parental Outcomes

- No impact of behavioural interventions on parental mental health, but some impact on family functioning and Self-concept all at MPROX.
- Greater improvement on positive and negative parenting on MPROX ratings and these findings remain on PBLIND outcomes

# Conclusions

- Underlying aetiology of ADHD and its myriad of associated impairments requires behavioural intervention as medication is less effective in improving functioning deficits (Langberg & Becker 2012; Nijmeijer et al 2008)
- Behavioural intervention is not just about improving parenting, but about helping parents to change their child's environmental experience.

# Take home messages!

- While behavioural interventions are beneficial at targeting child symptoms the lack of agreement between MPROX and PBLIND raters is a concern.
- It is reassuring that behavioural interventions improve parenting practices and that those improvements are evident to PBLIND raters.
- It is also reassuring that behavioural interventions appear to improve core impairments such as academic, social and cognitive difficulties for which there is less theoretical and empirical evidence of impact.

# Take home messages II

- The lack of any impact on parental mental health is a considerable limitation.
- This is all the more striking given the small impacts on family functioning and parental self-efficacy (**although not necessarily in the same studies**)
- Clearly behavioural interventions need to consider parental characteristics such as mental health and Parental ADHD which is a known mediator of intervention but could not be tested in this analysis
- Before we can use the parent as the agent of change to help their child

Thank you

Q

# New Forest Parent Training Programme

- 8 one hour individual sessions
- **Psycho-education about ADHD**
- Mother-child relationship, simple games with no set up time, snap, pairs, I went to market
- **Attention training and delay re-structuring, enforcing short periods of delay before treats.**
- Behaviour training, calm down rather than time-out, giving limited choices, praise

# New Forest Parent Training Programme



Step by Step Help for  
**Children**  
with **ADHD**

*A Self-Help Manual for Parents*



Cathy Laver-Bradbury, Margaret Thompson, Anne Weeks,  
David Daley and Edmund J. S. Sonuga-Barke

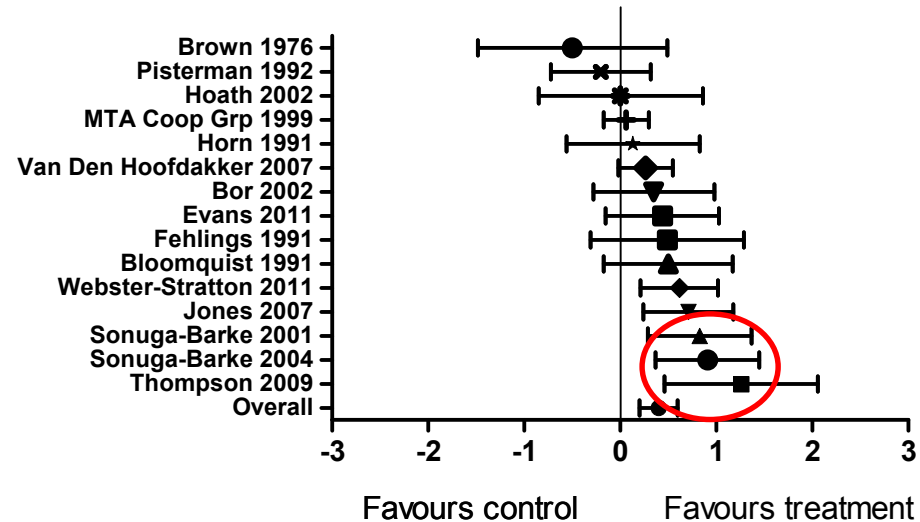


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- Insert self-help data here

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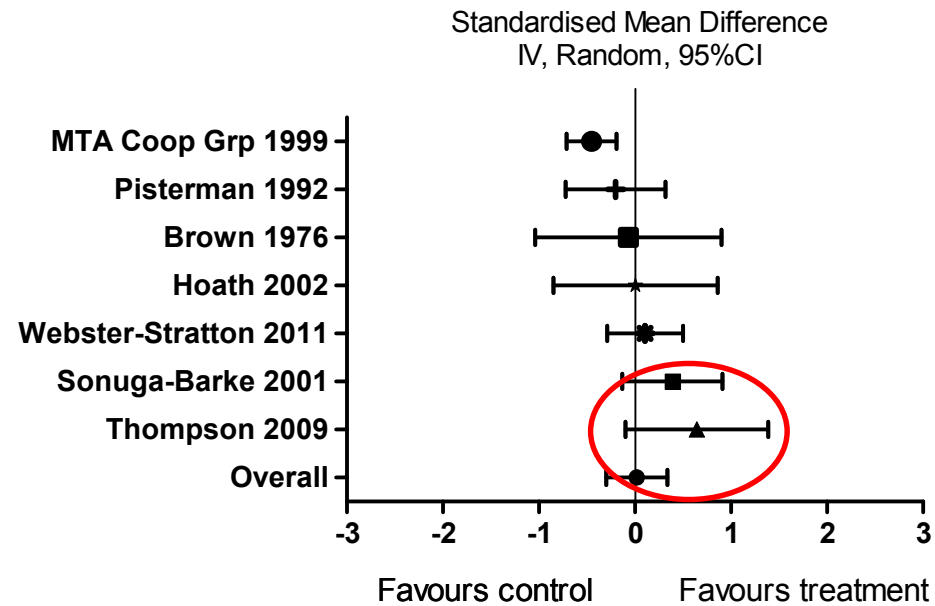
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