

Children and adolescents with autism spectrum disorder are less active and less likely to meet recommended moderate-to-vigorous physical activity compared to typically developing peers: A meta-analysis

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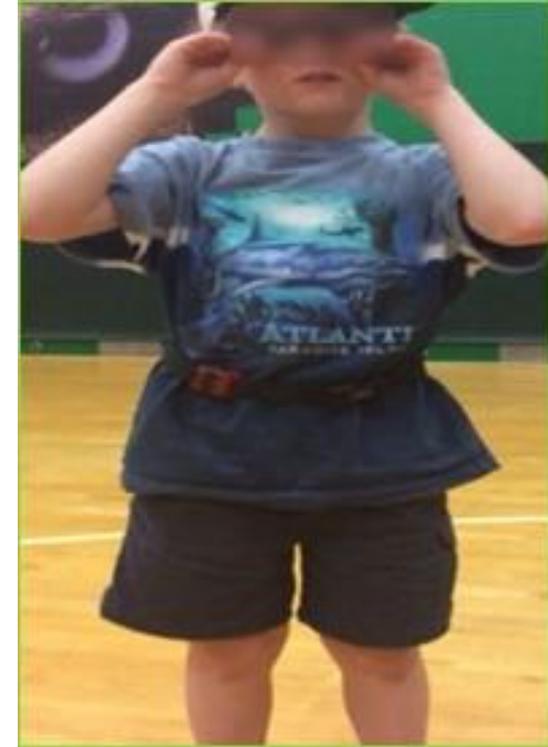
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Introduction

- Autism spectrum disorder (ASD)?
- Self reported physical activity measurement showed Lower physical activity (PA) and higher sedentary time¹
- Objectively measured PA provides a more accurate, reliable, and practical measure of daily PA in children²
- Several studies compared objectively measured PA between children and adolescents with ASD and typically developing (TD) peers



Objective & hypothesis

- To synthesize the results of studies that compare objectively measured **light physical activity (light PA)** and **moderate-to-vigorous physical activity (MVPA)** between children and adolescents with ASD and TD peers.
- We hypothesized that children and adolescents with ASD spent less time in light PA and MVPA compared to TD peers and they are less likely to meet recommended moderate-to-vigorous physical activity MVPA.

Methods

- PubMed, SPORTDiscus and Web of Science
- Full articles in English published from January 1, 1990, to December 30, 2018.
- Peer-reviewed article, written in English and compared objectively measured PA between children and adolescents with ASD (7-18 years old) and TD
- Outcome of interest:
 - Light PA
 - MVPA
 - Number of participants who met the daily 60 minutes of MVPA

Methods

➤ Risk of bias

- Modified version of the Newcastle-Ottawa Quality Assessment Scale (adapted for Cross-Sectional Studies)¹

➤ Meta-analysis

- Random-effects models (Hedges' g (g) and Odds ratio (ORs))
- Q-value (Q) and I-squared (I^2)

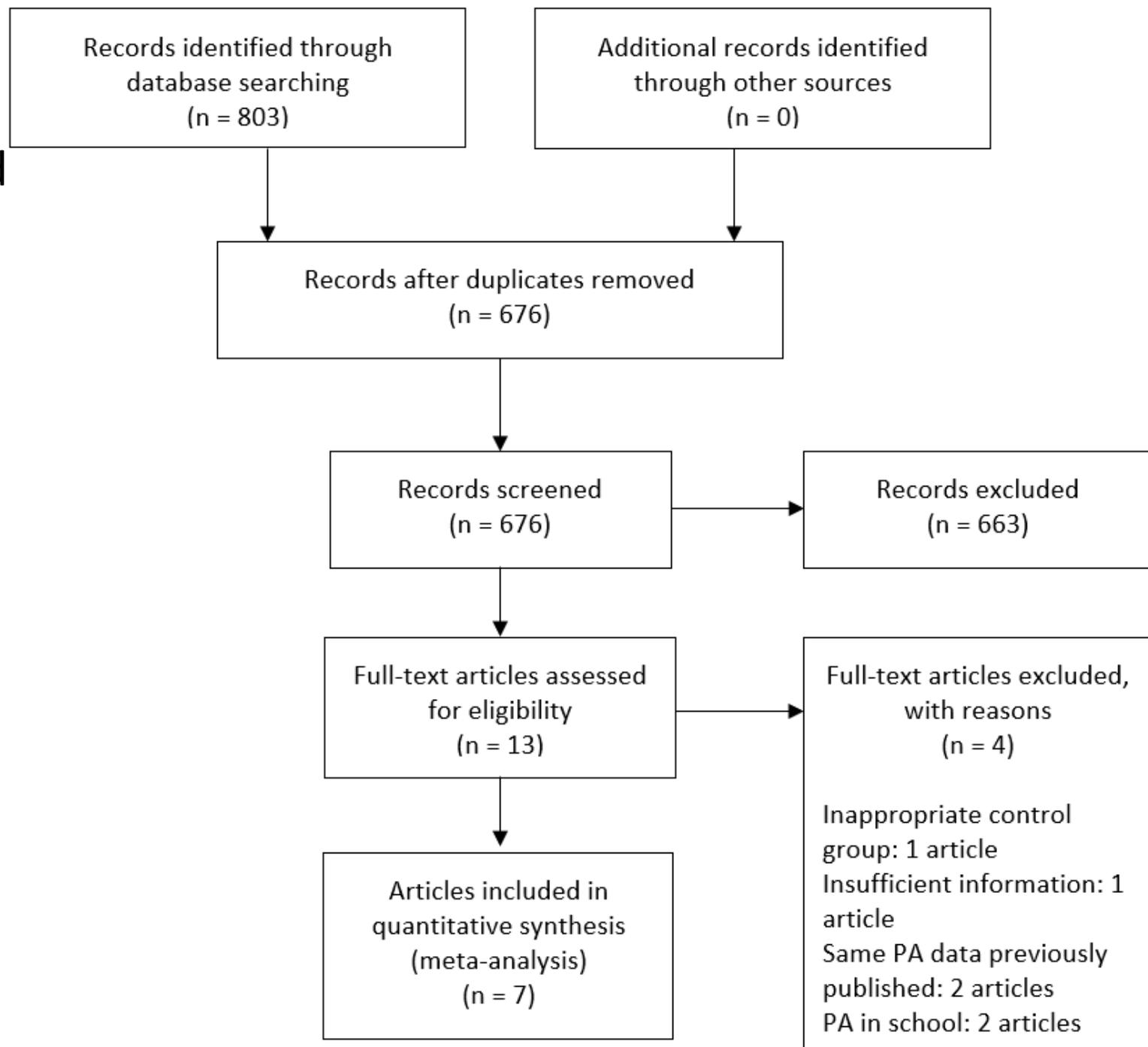
➤ Sensitivity analysis and publication Bias

- Subgroup analysis between studies with low risk of bias and those with a moderate and high risk of bias for daily MVPA
- Re-displayed funnel plots after Duval and Tweedie's Trim and Fill adjustment

[1] Modesti et al., 2016. PLoS One

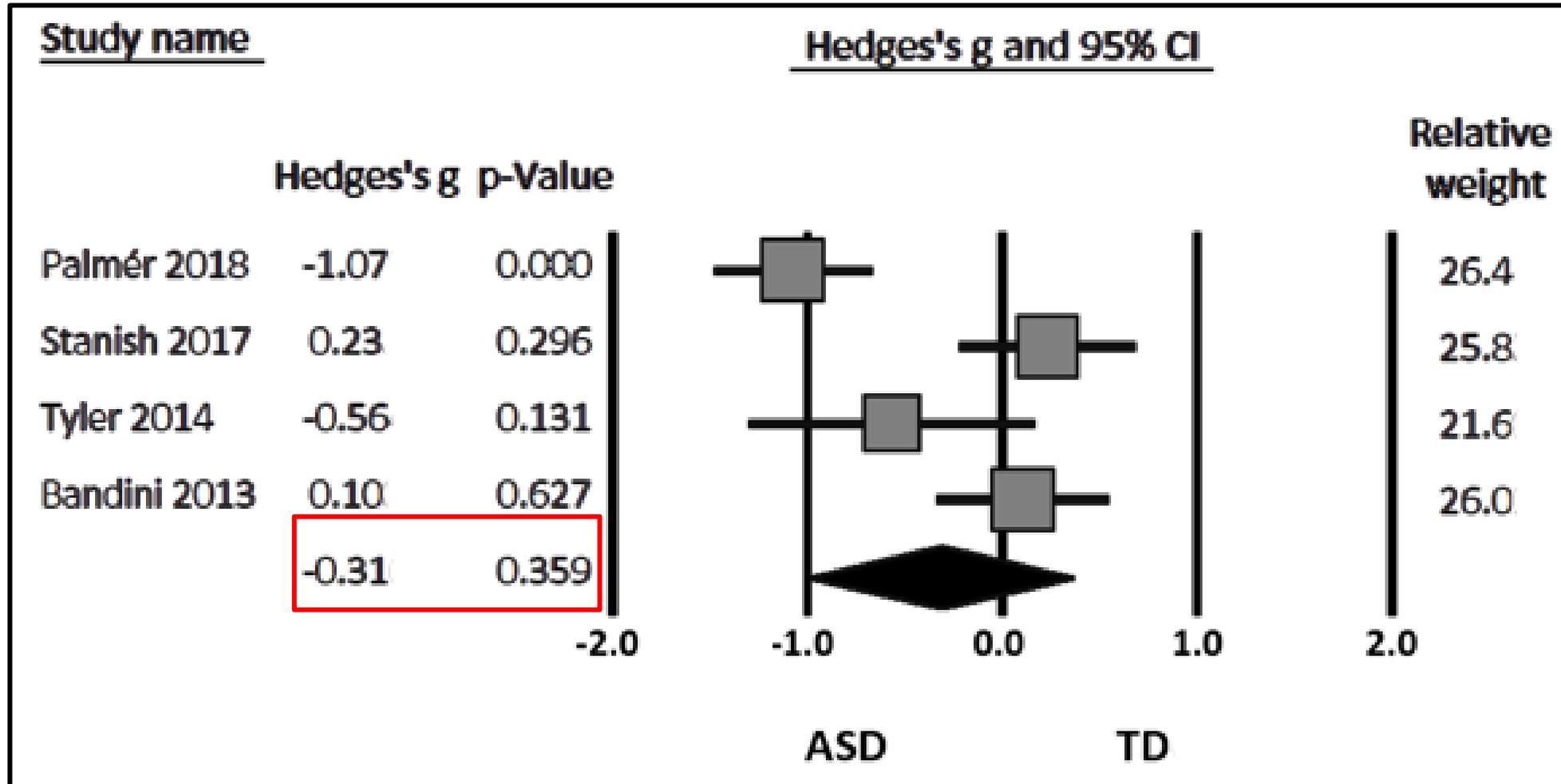
Results

- Seven studies were included
- Included studies showed:
 - Low risk of bias (3 studies)
 - Moderate risk of bias (3 studies)
 - High risk of bias (one study)
- MVPA did not differ between studies with low risk of bias and studies with a moderate or high risk of bias ($P > 0.05$).



Results – Light PA

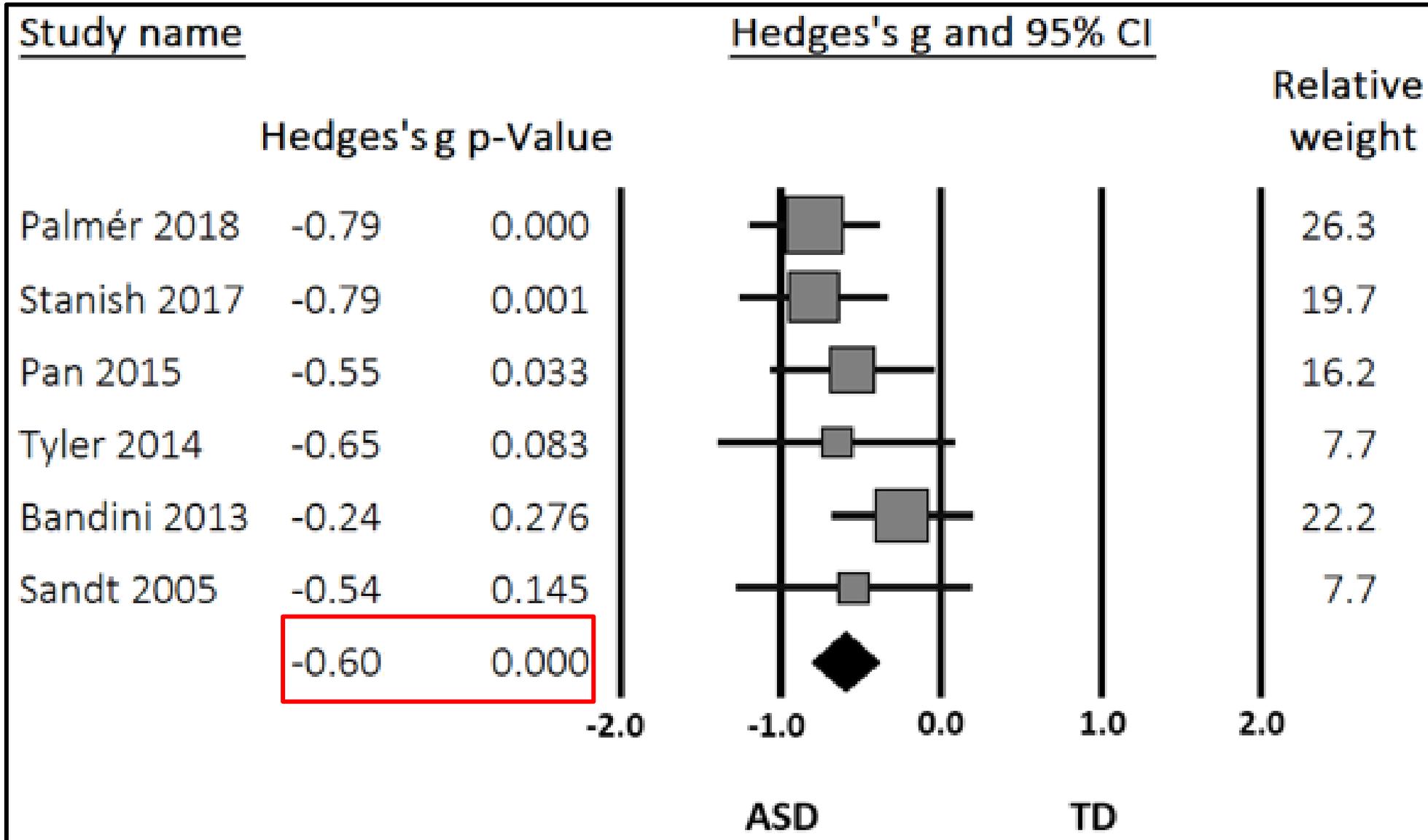
Forest plot of Light PA



Q = 23.59
P < 0.001
I² = 87%

Results- MVPA

Forest plot of MVPA

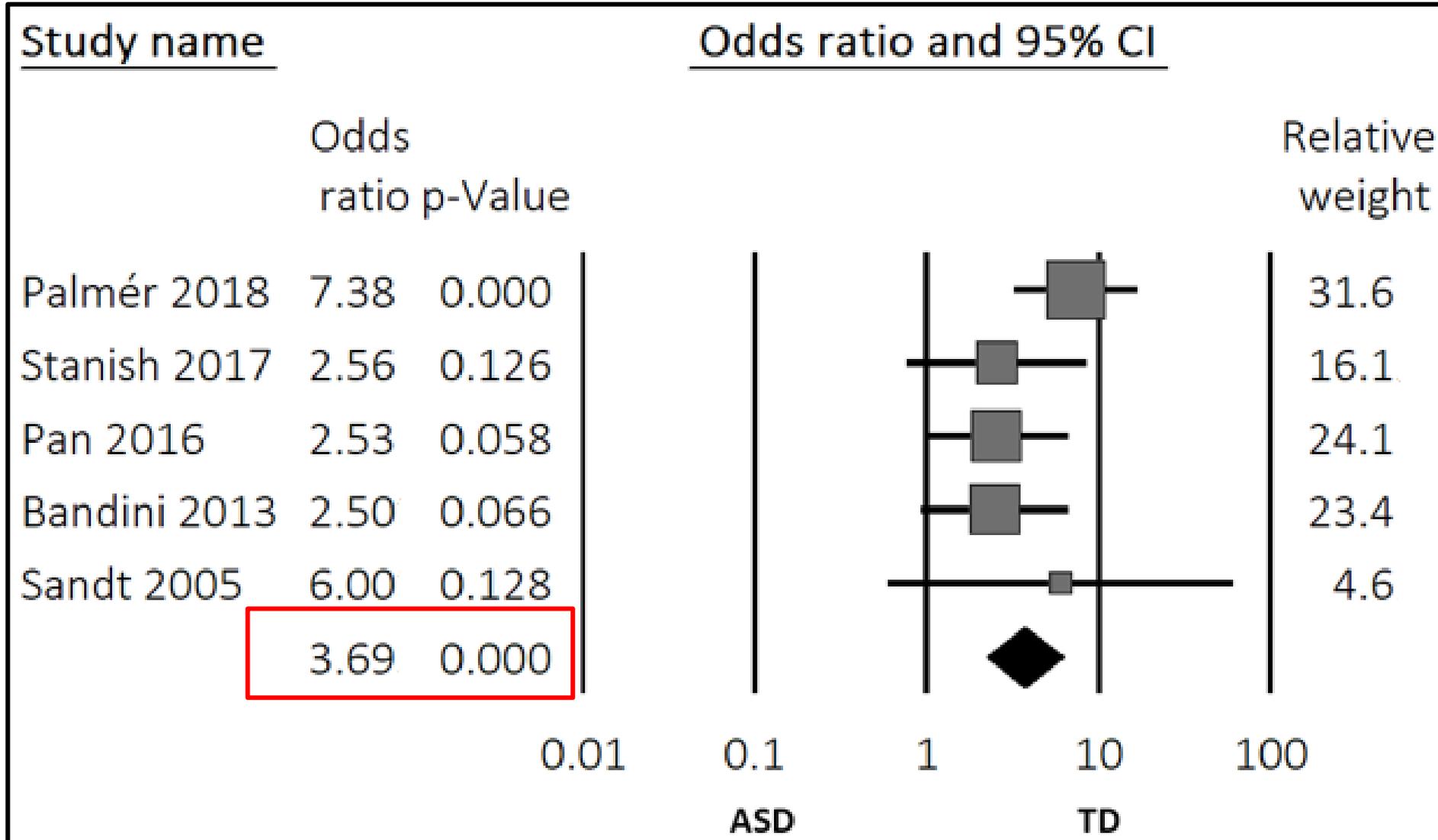


Q = 7.07
P = 0.216
I² = 29 %

Children and adolescents with ASD spent ~27 minutes daily less in MVPA

Results- Recommended MVPA

Forest plot of risk of not meeting 60 min daily MVPA



Q = 4.45
P = 0.348
I² = 10 %

Children and adolescents with ASD were 79% less likely to accumulate recommended daily MVPA

Discussion

- Children and adolescents with ASD were less active and less likely to accumulate 60 minutes daily MVPA
- Lower PA and particularly lower MVPA in children and adolescents with ASD might be linked to higher obesity rate^{1,2} and bone deficit^{3,4}
- Reasons for Lower PA:
 - Difficulties in social interaction⁵
 - Personal and physical barriers^{6,7}
 - Lack of motivation⁸



[1] Matheson et al., 2017. J. Autism Dev. Disord [2] Egan et al., 2013. Child. Obes [3] Neumeyer., 2017. Bone [4] Neumeyer., 2017. J. Pediatr [5] Pan et al., 2011. Res Q Exerc Sport [6] Must et al., 2015. J. Phys. Act. Health [7] Obrusnikova and Cavalier., 2011. J. Dev. Phys. Disabil [8] Pan et al., 2011. Res. Autism Spectr. Disord

Strengths and Limitations

- Synthesized accelerometer measured PA which is more accurate and reliable
- We evaluated publication bias using re-displayed funnel plots after Duval and Tweedie's Trim and Fill
- Discrepancies between included studies in determining of light PA and MVPA result in inconsistent estimates of time spent in light PA or MVPA

Conclusion

- Children and adolescents with ASD were less active and spent less daily time in MVPA compared to TD peers
- Children and adolescents with ASD were also less likely to meet daily recommended MVPA
- Tailored interventions to increase daily PA and particularly MVPA in children and adolescents with ASD are warranted



Dr. Kontulainen



Tiffany Wharton



Bob and Rita Mirwald

Many thanks to:

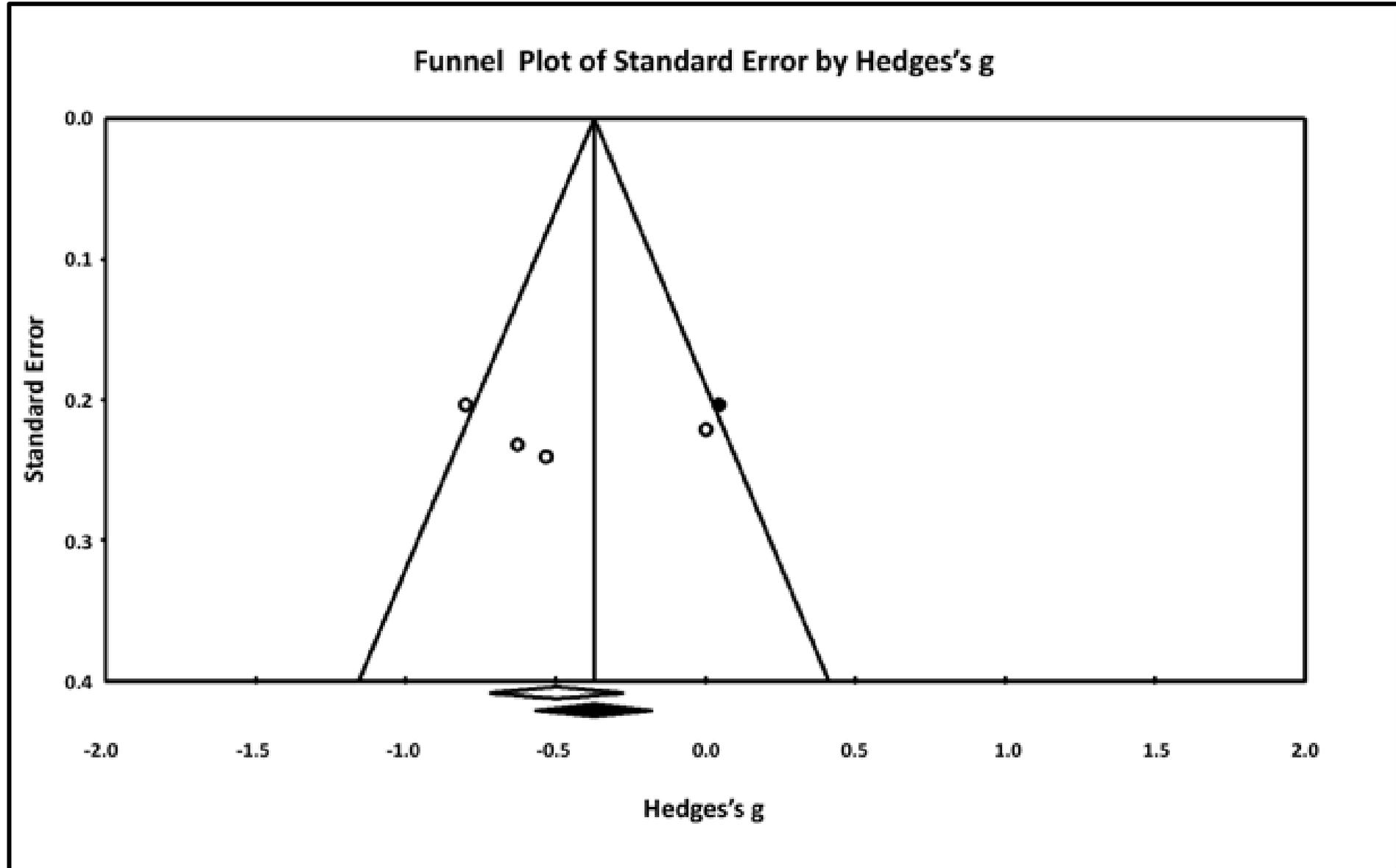
- My Supervisor Dr. Kontulainen
- Tiffany Wharton for helping with searching the databases and screening the articles
- Dr. Bandini and Dr. Stanish and their colleagues for sharing PA data of their publications
- Bob and Rita Mirwald for Travel Award

Thank You!

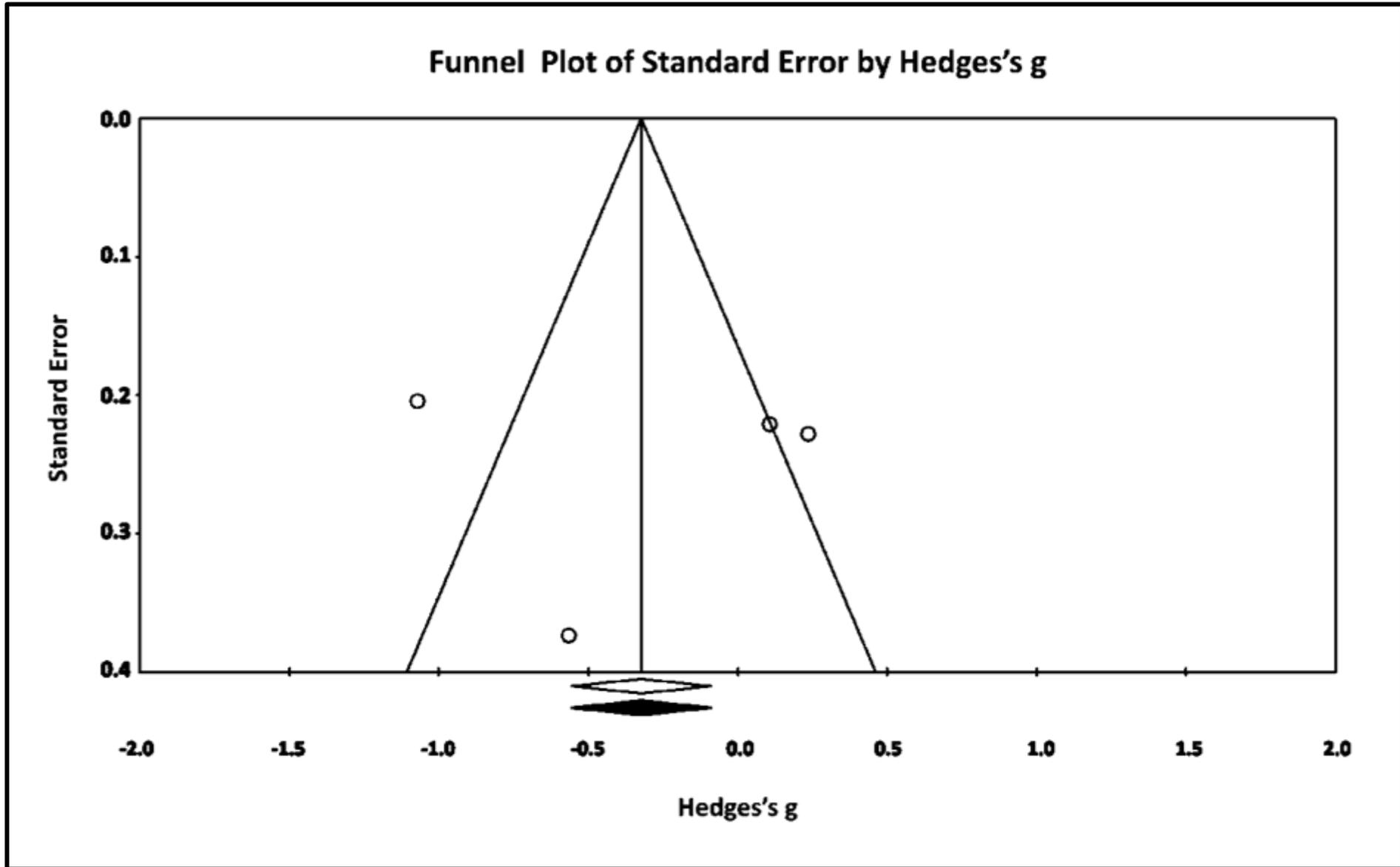
Search strategy

Database	Search details
PubMed	((("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields]) OR ("Childhood"[Journal] OR "childhood"[All Fields]) OR ("adolescent"[MeSH Terms] OR "adolescent"[All Fields] OR "adolescents"[All Fields])) AND ((("exercise"[MeSH Terms] OR "exercise"[All Fields] OR ("physical"[All Fields] AND "activity"[All Fields]) OR "physical activity"[All Fields]) AND ("autistic disorder"[MeSH Terms] OR ("autistic"[All Fields] AND "disorder"[All Fields]) OR "autistic disorder"[All Fields] OR "autism"[All Fields])) AND (("1990/01/01"[PDAT] : "2018/12/31"[PDAT]) AND English[lang])
SPORTDiscus	Boolean/Phrase: (Children or Childhood or Adolescents) AND Physical Activity AND Autism Limiters Published Date: 19900101-20181231 Language: English Source Types: Academic Journals
Web of Science	TOPIC: ((Children or Childhood or Adolescents) and Physical Activity and Autism) Refined by: DOCUMENT TYPES: (ARTICLE OR REVIEW) AND LANGUAGES: (ENGLISH) Timespan: 1990-2018. Indexes: SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC.

Publication Bias (Overall PA)



Publication Bias (Light PA)



Publication Bias (MVPA)

