

# Does exposure to cigarette smoke associate with lower IQ?

## A systematic review and meta-analysis

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### Introduction

Does exposure to cigarette smoke impact cognitive/ intellectual ability?

- Especially on developing brain of adolescents
- Does nicotine vaping (actually) decrease IQ?

This study assess this **association** by:

- **systematically review and meta-analyze**
- cross-sectional and longitudinal studies that assess
- the relationship between **exposure to active and passive smoking** and **IQ**

### Method

Design and protocol: PRISMA

Search strategy

- Smoking and IQ-related search terms
- Database: PubMed, Embase, Scopus, Web of Science and PsycINFO
- Additionally searched on Elicit

Quality assessment: Newcastle-Ottawa Quality Assessment Scale

Results synthesis:

- Narrative synthesis
- Meta-analysis using a random effects model

### Eligibility criteria

P <sub>opulation</sub>	General population
E <sub>xposure</sub>	<ul style="list-style-type: none"><li>• Tobacco Smoking</li><li>• Second-hand smoking</li></ul>
C <sub>omparison</sub>	<ul style="list-style-type: none"><li>• Never/ former smoking</li><li>• No exposure to second-hand smoking</li></ul>
O <sub>utcomes</sub>	<ul style="list-style-type: none"><li>• <b>Intelligence quotient (IQ) standardized scale</b>: Wechsler Adult Intelligence Scale (WAIS), Wechsler Intelligence Scale for Children (WISC)</li><li>• <b>Converted IQ-type scores on non-IQ standardized scale</b> (e.g., Moray House Test [MHT]).</li></ul>

### Exclusion criteria

- prenatal studies;
- not original studies;
- did not include IQ as an outcome;
- had poor measures of smoking exposure;
- non - English

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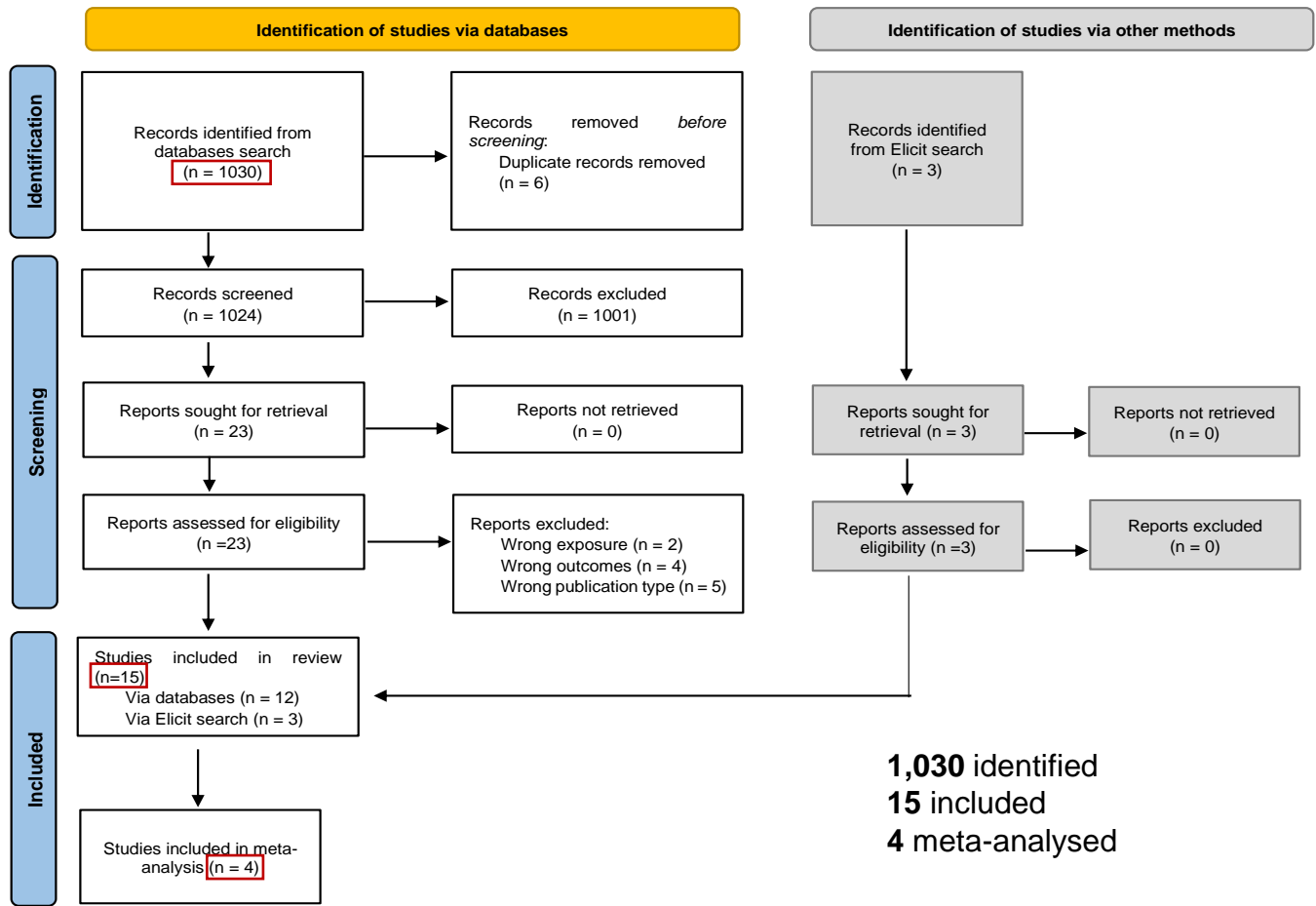


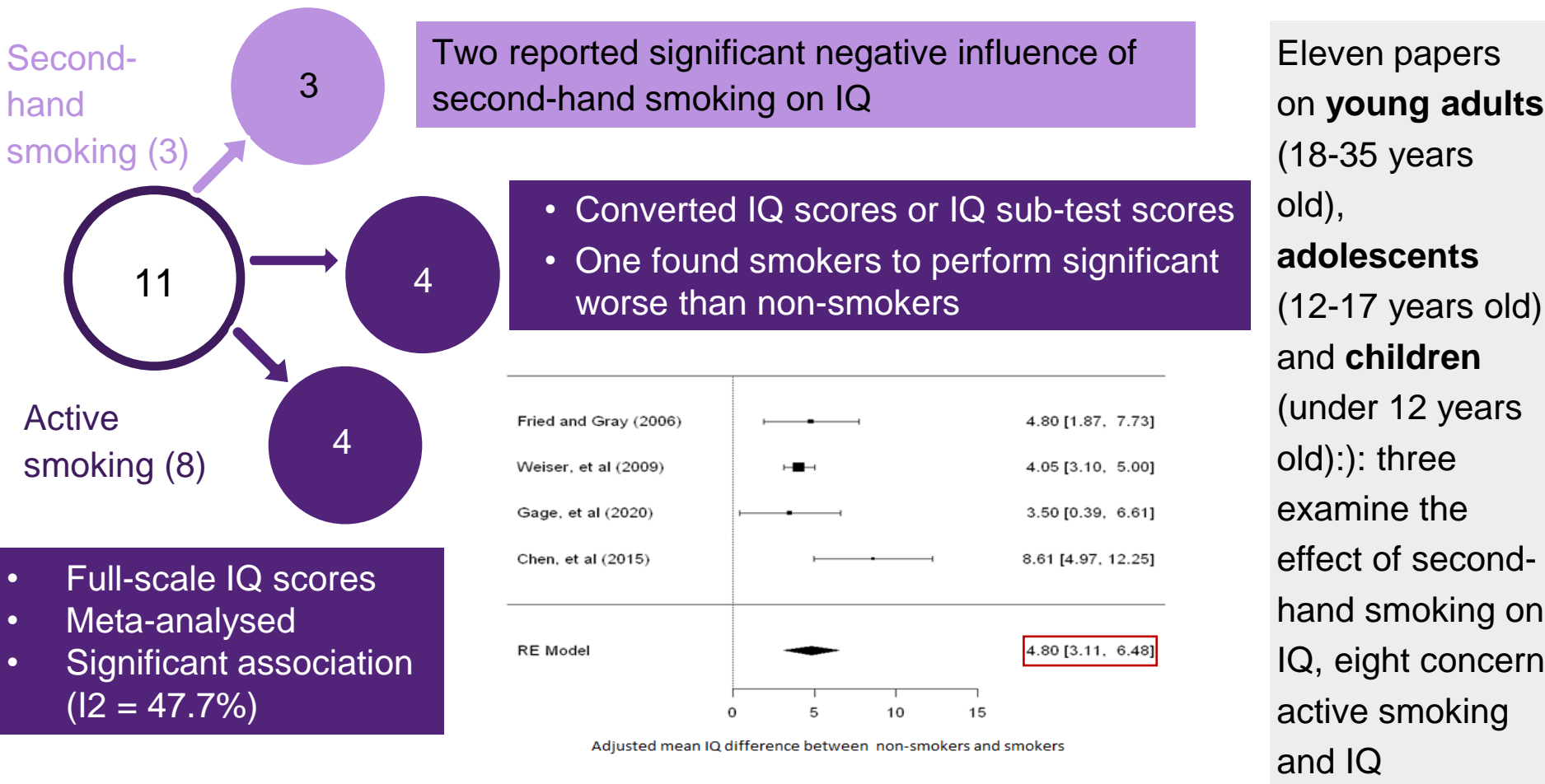
Figure 1. PRISMA flowchart of search results and inclusion of studies

### Quality Appraisal

- Low score: average 5.6/10
- Cross-sectional: 5.5/10
- Longitudinal: 6/10
- Weaknesses:
  - Insufficient controlling for confounders
  - Non-representative sample,
  - Unjustified sample size,
  - Self-reported recall bias

### Results

#### Cross-sectional studies: small, significant negative association



#### Longitudinal studies: small, significant negative association

**Older adult** populations (aged 64 to 80), from Lothian Birth Cohorts of 1921 and 1936: comparing converted IQ score at 11 and IQ at 64, 66, 70 and 80

Significantly lower IQ score (-1.9 points to -6.6 points) among people who currently smoke compared to non- and former- smokers, but small effect ( $\eta_p^2 < .015$ )

### Conclusions

- **Significant**
  - for smoking and second-hand smoking
  - in children, adolescents, adults and the elderly
- Difference between current and former smokers suggest possible **cognitive recovery after quitting**: further examination needed
- **Limitations** of included studies:
  - Self-reported recall bias
  - Varying IQ measures
  - Varying adjustment for confounders

What about:

- The **influence of confounding factors**? Genetic variants, socio-economic background, maternal IQ
- The role of nicotine?

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