Critiquing and evaluating this new generation of LLM-based evidence synthesis tools

James Thomas

- Generative AI tools are appearing everywhere!

- There are real benefits

- But there are also major weaknesses in some new tools

- We need to develop ways of using them reliably

Searching for research

Is mindfulness an effective intervention for smoking cessation among adults?

Example of conventional search: OpenAlex

Example of citation / related papers: ConnectedPapers
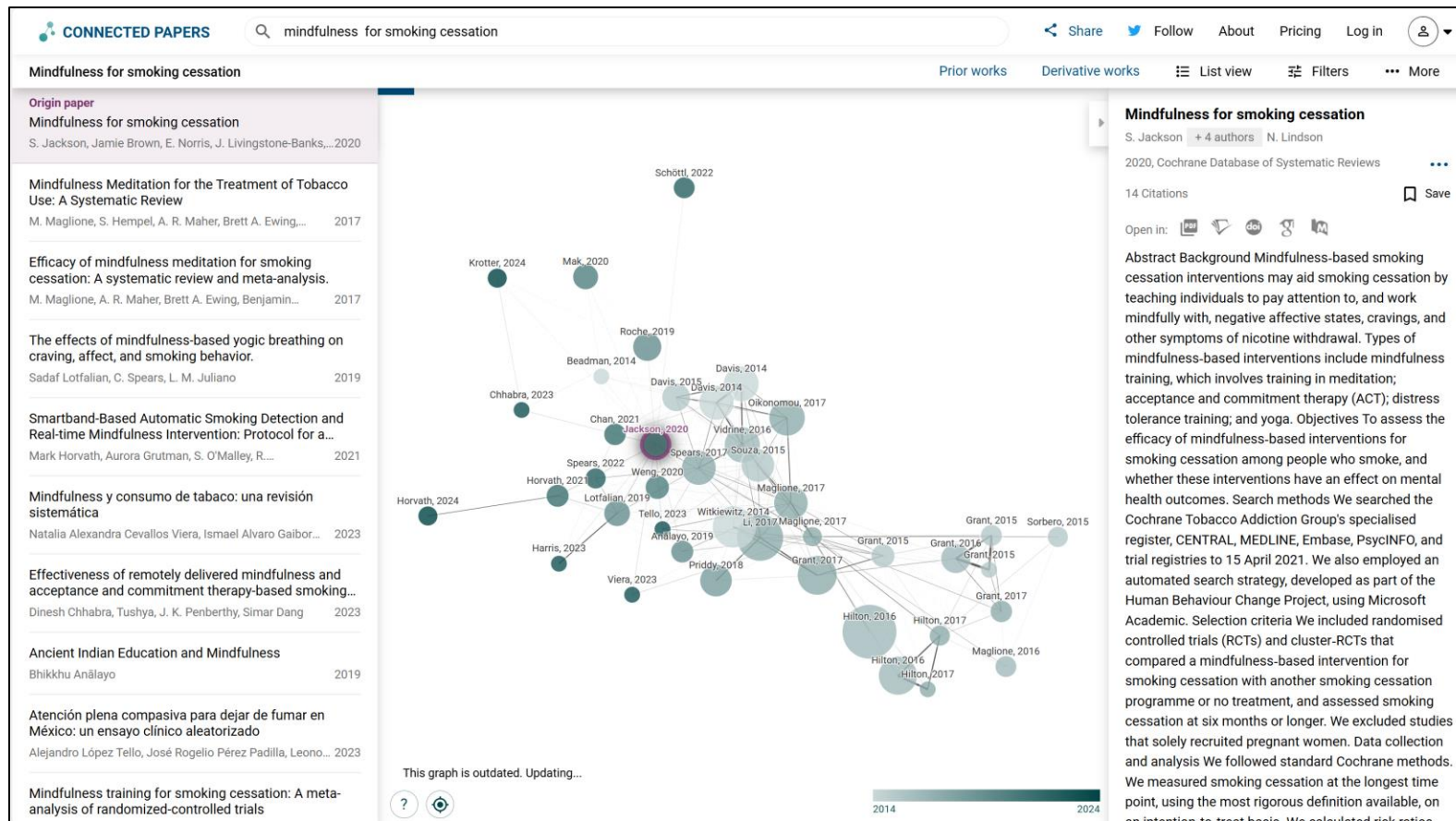
Example of hybrid search: Elicit

'Agentic search'

vector representations of documents are stored in the database as well as text

LLM

user

user queries are transformed by the agent into text and vector searches; the database is searched; the agent then screens results, identifies related records and (often) undertakes multiple 'rounds' of searching before returning results to the user

PaperFinder from Ai2

https://paperfinder.allen.ai/

An agentic, iterative search that analyses your query before constructing and carrying out a search using standard free text terms as well as vector indexes

Uses LLMs to help develop the search at multiple points

✤ Ai2 Paper Finder

U **User** Today, 6:09 p.m.

Is mindfulness an effective intervention for smoking cessation among adults?

✤ Analyzing request. ✓

This is how I interpreted your request:

Look for a set of papers.

Content criteria: Search for "whether mindfulness is an effective intervention for smoking cessation among adults"

To be considered relevant, the paper's content must satisfy:

- **Mindfulness Intervention**: The paper discusses mindfulness-based interventions, practices, or techniques. This includes meditation, mindful breathing, body scan, or other related approaches.
- **Smoking Cessation**: The paper focuses on smoking cessation, quitting smoking, or reducing cigarette consumption. It should address methods, strategies, or interventions aimed at helping individuals stop smoking.
- **Adult Population**: The study population consists of adults (typically 18 years or older). The paper should explicitly mention or imply that the

✤ Ai2 Paper Finder

helping individuals stop smoking.
- **Adult Population**: The study population consists of adults (typically 18 years or older). The paper should explicitly mention or imply that the participants are adults.
- **Effectiveness Evaluation**: The paper evaluates the effectiveness of mindfulness interventions for smoking cessation. It should present data, results, or analyses that assess whether mindfulness helps adults quit or reduce smoking. This includes studies that compare mindfulness to other interventions or control groups.

Processing request: *"Find academic papers about whether mindfulness is an effective intervention for smoking cessation among adults."*.	✓
Searching for papers.	✓
Running keyword and semantic searches for *"whether mindfulness is an effective intervention for smoking cessation among adults"*.	✓
Following citations that were mentioned in relevant passages.	✓
Reranking candidate documents.	✓
Judging relevance of top documents.	✓
Found 34 relevant papers.	✓
Found 30 perfectly relevant papers.	✓
Sorting result set.	✓
Found 2 relevant papers.	✓
Found 3 perfectly relevant papers.	✓
Finalizing response.	✓

Strengths and limitations: agentic search

– Can provide more semantically powerful searches

– Less 'fragile' than a Boolean search (and not necessary to know all relevant terms in advance)

– BUT

– Dependent on the right documents being available for indexing

– Dependent on the query being translated effectively by the agent

– Little in the way of an evidence base to support their use in evidence synthesis

How do we evaluate these kinds of tools?

- – Standard metrics?
  - – Sensitivity / specificity

- – Additional considerations?
  - – Consistency
    - – Are the results the same each time?
  - – Robustness
    - – Do minor changes in input change output substantially?
  - – Hallucinations?
  - – Contamination
    - – Is the LLM 'cheating'?

Searching…

Conventional tools
– https://scholar.google.com

Using open data for identifying related papers
– https://www.connectedpapers.com/ (only two networks for free!)
– https://openalex.org/

'Semantic search'
– https://elicit.com/ (select 'find papers')

'Agentic search'
– http://paperfinder.allen.ai

Searching for research

Cochrane Library

Trusted evidence.
Informed decisions.
Better health.

Cochrane Database of Systematic reviews | Review - Intervention

Mindfulness for smoking cessation

✉ **Sarah Jackson, Jamie Brown, Emma Norris, Jonathan Livingstone-Banks, Emily Hayes, Nicola Lindson**
Authors' declarations of interest

Authors' conclusions

We did not detect a clear benefit of mindfulness-based smoking cessation interventions for increasing smoking quit rates or changing mental health and well-being. This was the case when compared with intensity-matched smoking cessation treatment, less intensive smoking cessation treatment, or no treatment. However, the evidence was of low and very low certainty due to risk of bias, inconsistency, and imprecision, meaning future evidence may very likely change our interpretation of the results. Further RCTs of mindfulness-based interventions for smoking cessation compared with active comparators are needed. There is also a need for more consistent reporting of mental health and well-being outcomes in studies of mindfulness-based interventions for smoking cessation.

Yes, **mindfulness-based interventions (MBIs)** have shown **promising effectiveness** as a tool for **smoking cessation among adults**, particularly when integrated with other treatment strategies.

Evidence from Research:

1. **Randomized Controlled Trials (RCTs)**:

   - Multiple RCTs have found that mindfulness training can **reduce cigarette use**, **increase abstinence rates**, and **decrease relapse rates**.

   - A well-cited study by **Brewer et al. (2011)** compared mindfulness training to the American Lung Association's Freedom From Smoking (FFS) program. Results showed that participants in the mindfulness group had significantly higher abstinence rates at 4 and 17 weeks post-quit.

2. **Mechanisms of Action**:

   - Mindfulness helps individuals become more aware of **cravings** and **emotional triggers** without reacting impulsively.

   - It reduces **automaticity of smoking behavior**, allowing for more conscious decision-making.

   - It may help regulate **stress and negative emotions**, which are common triggers for smoking.

3. **Meta-analyses**:

   - A 2020 meta-analysis published in *Nicotine & Tobacco Research* concluded that MBIs were significantly more effective than minimal interventions or no treatment, and had comparable efficacy to other active treatments like cognitive behavioral therapy (CBT).

4. **Neuroscientific Findings**:

   - Neuroimaging studies show mindfulness may modulate activity in brain regions involved in **craving**, **self-control**, and **reward processing**, such as the **prefrontal cortex** and **insula**.

Ask anything

Google

is mindfulness effective for smoking cessation among adults?

AI Mode   All   Short videos   Forums   Images   Videos   Shopping   More ▾   Tools ▾

✦ AI Overview   ⋮

Yes, mindfulness is effective for smoking cessation in adults, with research showing it can help maintain abstinence longer than usual care and traditional treatments like cognitive-behavioral therapy (CBT). Mindfulness interventions work by teaching smokers to observe and accept negative feelings and urges without acting on them, thus weakening the link between cravings and smoking behavior. 🔗

How Mindfulness Helps

Targets Negative Affect:
Mindfulness addresses the underlying emotional factors of smoking, helping smokers cope with the negative feelings and stress that often trigger a relapse. 🔗

Breaks the Craving-Behavior Cycle:
By cultivating non-judgmental awareness, individuals can notice their cravings and urges without acting impulsively, which helps to decouple the association between craving and smoking. 🔗

Increases Self-Awareness:
Mindfulness training can enhance a person's awareness of their internal experiences, leading to lower levels of negative affect and increased positive affect, which supports quitting. 🔗

Evidence of Effectiveness

Mindfulness for smoking cessation - PMC - PubMed Central

Mindfulness-based smoking cessation interventions may aid smoking cessation by teaching individuals to pay attention to,…

🌐 PubMed Central   ⋮

Mindfulness-Based Smoking Cessation Enhanced With Mobile …

24 Jun 2019 — Training in mindfulness (ie, purposeful, nonjudgmental, present-focused attention [9,10]) shows…

🌐 National Institutes of Health (NIH) | (.gov)   ⋮

The effects of a brief mindfulness exercise on state …

Mindfulness-based interventions, which teach present moment awareness and acceptance as a way of managing smoking…

Ε ScienceDirect.com   ⋮

Show all

Mindfulness for smoking cessation

Sarah Jackson [1,✉], Jamie Brown [1], Emma Norris [2], Jonathan Livingstone-Banks [3], Emily Hayes [4], Nicola Lindson [3]

Editor: Cochrane Tobacco Addiction Group

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PMCID: PMC9009295 PMID: 35420700

This article is an update of "Mindfulness for smoking cessation" in volume 2020, CD013696.

Abstract

Background

Mindfulness-based smoking cessation interventions may aid smoking cessation by teaching individuals to pay attention to, and work mindfully with, negative affective states, cravings, and other symptoms of nicotine withdrawal. Types of mindfulness-based interventions include mindfulness training, which involves training in meditation; acceptance and commitment therapy (ACT); distress tolerance training; and yoga.

Objectives

Is mindfulness an effective intervention for smoking cessation among adults

✳ Perplexity   ⁘ Sources · 9

The Cochrane Databas…	JMIR Research Protoc…	oatext	cochrane.org
Mindfulness for smoking cessation - PMC - PubMed…	Mindfulness-Based Smoking Cessation…	Mindfulness based treatment for smoking…	Can mindfulness help people to stop smoking? -…

Effectiveness of Mindfulness for Smoking Cessation

Summary of Evidence

- There is mixed evidence on the effectiveness of mindfulness-based interventions (MBIs) for smoking cessation among adults. Some systematic reviews and meta-analyses indicate no clear or conclusive evidence that mindfulness-based treatments are more effective than standard care in helping people quit smoking or improving mental health outcomes [1] [4] . However, other studies and clinical trials suggest that mindfulness can increase smoking cessation rates and aid in recovery from lapses [2] [6] [8] .

Key Findings from Research

- **Potential Benefits:**

  - Mindfulness interventions teach individuals to observe cravings and negative emotions without reacting, which may help reduce the automatic response to smoke when triggered [2] [9] .

  - Some studies show that MBIs can increase abstinence rates and reduce cigarette consumption, particularly by improving emotion regulation and self-efficacy [3] [6] [5] .

  - Mindfulness-based relapse prevention has been found to be more effective than traditional relapse prevention in some populations, particularly among racially and

Is mindfulness an effective intervention for smoking cessation among adults

Perplexity　　Sources · 9　　Tasks

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MAY 19, 2025

Is mindfulness an effective intervention for smoking cessation among adults?

Meta-analysis and multiple studies show that mindfulness interventions are generally no more effective than standard treatments for smoking cessation, though they may help reduce cigarette consumption and cravings.

ABSTRACT

Mindfulness interventions for adult smoking cessation yield mixed outcomes. ✳ Brewer et al. (2011) observed a 36% abstinence rate at treatment's end and 31% at 17 weeks (versus 15% and 6% with a standard program, respectively; p = 0.063 and 0.012). ✳ Davis et al. (2014b) reported 38.7% abstinence at 24 weeks among treatment initiators compared with 20.6% for usual care (p = 0.05). ✳ In contrast, Davis et al. (2014a), Spears et al. (2017), Janes et al. (2019), and others found no significant differences between mindfulness and control groups. ✳ A meta-analysis (Jackson et al., 2020) indicated risk ratios near unity when mindfulness interventions were compared with matched or less intensive treatments. ✳

Some studies noted that mindfulness training reduced daily cigarette consumption, alleviated urges, or produced neural changes correlated with smoking reduction. ✳ Mindfulness programs were delivered in varied formats, including in-person groups and smartphone apps, with adherence levels ranging from 67% to 88% in studies that quantified retention. ✳ These findings support the view that mindfulness-based approaches may improve certain aspects of smoking behavior. ✳ However, only a minority of studies reported statistically significant advantages in abstinence outcomes compared with standard interventions. ✳

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Has the appearance of a research report

But has the same weaknesses as other tools:
- incomplete evidence base searched;
- no critical appraisal;
- summarises evidence from primary papers with systematic reviews

How do we evaluate these kinds of tools?

– Standard metrics?
  – Sensitivity / specificity

– Additional considerations?
  – Consistency
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Vision: RAISE guidance for the responsible use of AI in evidence synthesis

- A draft of the guidance and recommendations is now online for consultation
- Our vision is for it to be a 'living' set of guidelines, that is updated through community input and helps to define roles & responsibilities within the ecosystem
- Should the ecosystem develop in this well-organized way, we hope to see the development of AI tools that adhere to the principles of research integrity, and so enable evidence accessibility in equitable and rigorous ways
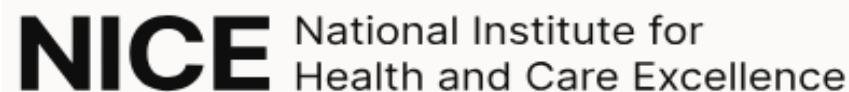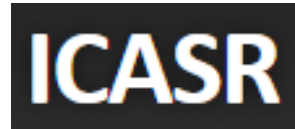
Where to find the guidance

– The link : https://osf.io/fwaud/

– The latest version is online now
– Three documents:
  – Roles-based recommendations for practice
  – Guidance on building and evaluating AI tools
  – Guidance on selecting and using AI tools
– Do take a look and let us know what you think!

Summing up

- There are some great tools that may soon be ready for use

- Tools for searching, extraction and classification may be useful for some purposes

- Synthesis across documents needs to be carefully checked

- We need to increase our 'AI literacy'

- Some guidance available in RAISE
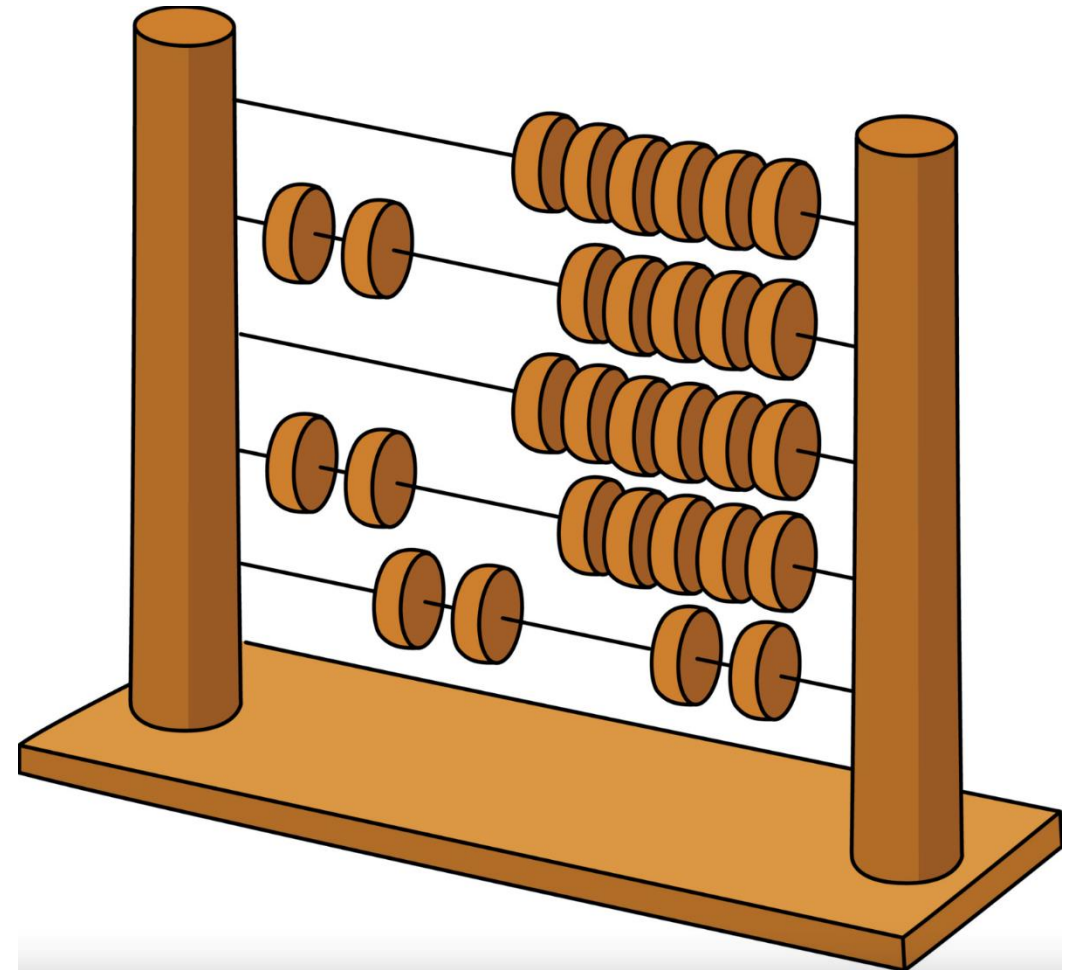
Thank you

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BlueSky jm-thomas.bsky.social

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