Roberta on the Job

A proof-of-concept study of a customised GPT tool for risk-of-bias assessment of randomised clinical trials

MSR 183

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INTRODUCTION

Risk-of-bias (ROB) assessment is a key element of systematic reviews.[1] However, procedures using instruments such as the Cochrane Risk of Bias Tool for Randomised Trials (ROB-2),[2,3] are known to be:

- challenging to use;[4–6]
- highly time-consuming;[4,5,7]
- marred by low inter-rater consistency.[7–9]

Various attempts have been made to use general-purpose large language models (LLMs) such as ChatGPT (Generative Pre-trained Transformer) for ROB-2 assessment.[10–13] However, the success of these attempts have been *mixed,* with fair to moderate agreement with human reviewers, hallucinations, and unknown consistency over time.

OUR KEY IDEA

A customised GPT-based tool may have the potential to assist in ROB-2 assessments with greater efficiency and consistency.

Customisation refers to the process of adapting a generic LLM to become more domain-specific, targeting particular operations and using specialised knowledge.[14,15]

AIM

To develop and assess a simple, customised GPT-based tool for ROB-2 assessment

METHODS

Study design

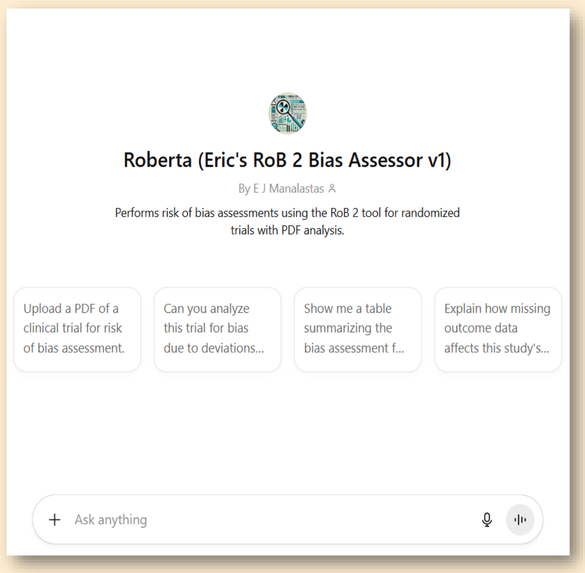
Proof-of-concept study.

Tool development

A customised GPT for ROB-2 assessment of randomised trials, aligned with Cochrane standards (nicknamed: Roberta)

- **Model:** OpenAI's GPT-4o architecture
- **Customisation:** Retrieval-augmented generation using published guidance documents for the ROB-2 tool.

Roberta's interface (screenshot)



Testing & evaluation

We tested Roberta on three evaluation criteria:

- **Speed** (time to generate a ROB-2 assessment)
- **Accuracy** (performance against ratings by trained human assessors)
- **Test–retest reliability** (consistency of assessments across time points)

RESULTS

Speed — Evaluation for speed indicated extremely rapid performance.

In tests using 20 clinical trial publications, average time per ROB-2 assessment was less than half a minute (M: 25.2 seconds, SD: 4.7).

Accuracy — Evaluation for accuracy showed variation by level of ROB.

For domains rated by human assessors as low-risk and 'some concerns', high agreement was observed. However, considerable disagreement was observed in domains rated as 'high-risk', with Roberta ratings being more lenient than human assessors.

Reliability — Evaluation for test–retest reliability indicated acceptable reliability across one week (Cohen's kappa = 1.00; perfect consistency) and two weeks (Cohen's kappa = 0.54; moderate consistency).

VERY HIGH SPEED

25.2 seconds on average to draft a ROB-2 assessment

vs. human standard of 28 minutes per assessment[5]

FAIR ACCURACY

96% agreement for low-risk domains

83% agreement for domains with 'some concerns'

ACCEPTABLE RELIABILITY

κ=1.00 perfect consistency across one week

κ=0.54 moderate consistency across two weeks

CONCLUSIONS

Preliminary proof-of-concept evaluations suggest a customised GPT tool such as Roberta can support rapid ROB-2 assessments with a fair degree of accuracy and acceptable test–retest reliability, complementing – but not replacing – human review.

Further testing will enhance the utility of LLM-based (including GPT) tools, towards realising the potential of AI to facilitate systematic reviews and evidence synthesis.[17,18]

Specifically, future tests should:

- Compare the customised GPT versus its base version (i.e. uncustomised GPT)
- Evaluate the customised GPT using the latest models which are rapidly evolving
- Explore the utility of such tools to ROB assessments of non-randomised trials

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