

Background

- Despite global public health efforts, smoking remains a leading cause of preventable death which contributes to a range of chronic diseases and economic burdens
- How smokers plan and mentally prepare for behavior change activities suggested by **conversational agents** in an **online smoking cessation intervention**
- The goal is to uncover how digital interventions can better support **personalized behavior change** through insights into real users' planning and reflections.
- Using **thematic analysis** of user-submitted plans (in "if-then" format), the study examines the **motivations, contexts, and strategies** smokers use to carry out these preparatory actions

Research Questions

How do smokers plan to do the proposed preparatory activities by conversational agents as part of online smoking cessation intervention?

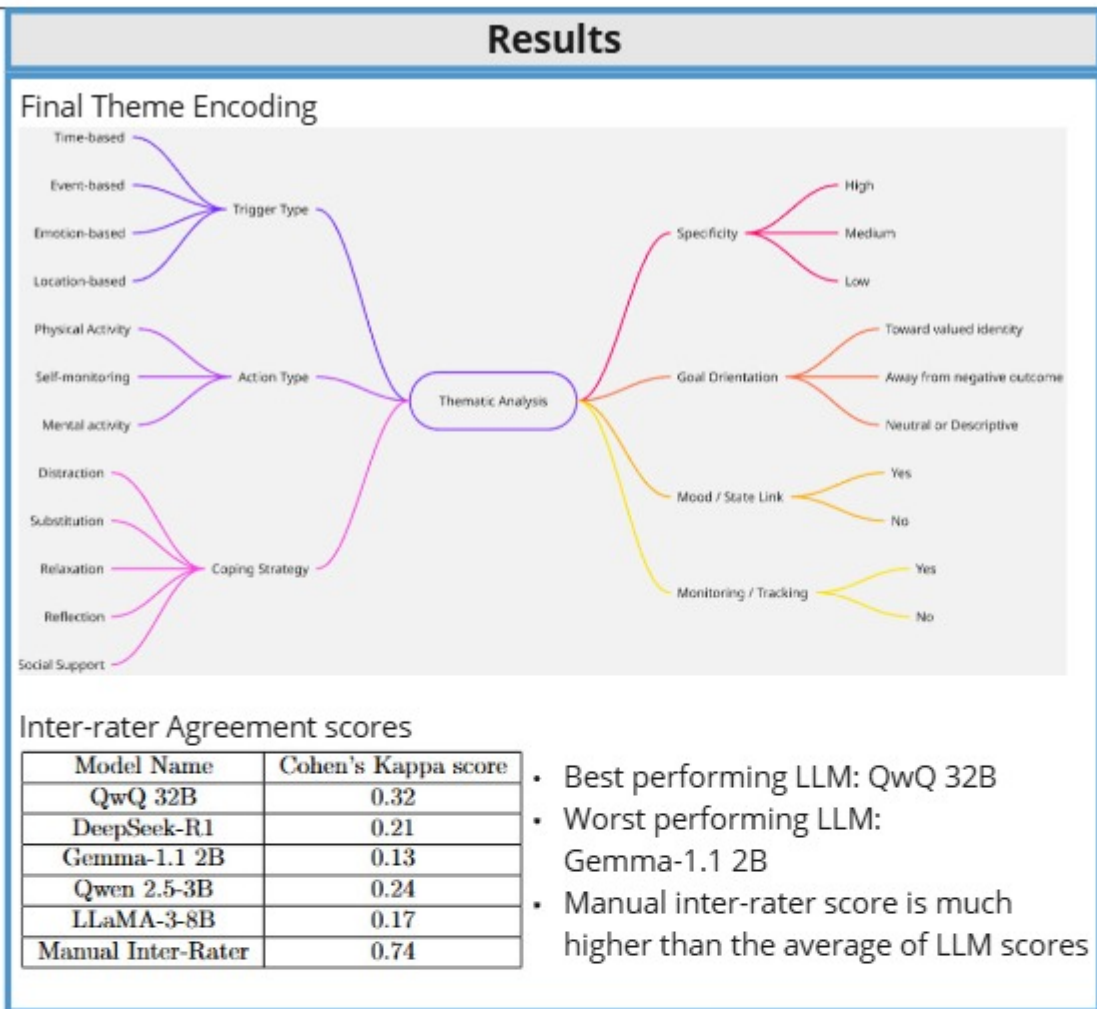
How effectively can large language models identify and categorize smokers' articulated plans in response to preparatory activity suggestions within online cessation interventions?

How do smokers use implementation intentions formulations to express conditional intentions or coping strategies when responding to preparatory suggestions from conversational agents?

Methodology

- Manual thematic analysis for establishing ground truth
 - Own set of initial themes generated using Braun and Clarke's (2006) six-phase framework
 - Familiarization with the data**
 - Generating initial codes**
 - Searching for themes**
 - Reviewing themes**
 - Defining and naming themes**
 - Writing the report**
 - First round peer analysis:
 - Random sample of 150 responses selected
 - Identify patterns, make preliminary set of themes
 - Compare and discuss themes and generate new set
- Application of LLMs for automated theme generation
 - Asked for theme generation after analyzing data
- Inter-rater agreement evaluation via Cohen's Kappa ([0, 1]):
 - $K = P_o - P_c / 1 - P_c$ 1 indicates high agreement
0 indicates no better than random labeling

P_o - Probability of Agreement Observed
 P_c - Probability of Agreement **by Chance**
- Triangulation through trained peer analysis to validate theme clarity
 - Second round peer analysis:
 - Peer training of 25 random responses
 - Peer completed independently analysis of another 25 random response to assess consistency
 - Then apply finalized coding scheme to the new 150 random responses, and once again calculate inter-coder reliability
- Application of thematic rubric via LLMs and comparison with manual labeling
 - Label the same new 150 random responses as the second round peer analysis
 - Compare and calculate inter-rater agreement once again



Conclusion

- Smokers create complex, context-sensitive plans** when responding to preparatory activity suggestions from conversational agents: often triggered by time, emotions, events, or environments.
- Coping strategies** included distraction, substitution, relaxation techniques, and seeking social support, often shaped by personal identity goals.
- Large Language Models** were able to generate some relevant and novel themes, but showed **limited accuracy** and consistency compared to manual coding, highlighting current limitations in AI-assisted qualitative analysis.
- This research provides **actionable insights** for designing more personalized and context-aware digital cessation tools, especially conversational agents.
- It also offers a **critical evaluation of LLMs** in qualitative research, demonstrating both potential benefits and current challenges in reliability and interpretability.

Limitations

- Participant bias:** Likely more motivated and digitally literate than the general population, limiting generalizability.
- LLM performance constraints:** Local large language models were used without domain-specific fine-tuning due to hardware limitations.
- Artificial use of "if-then" statements:** Participants were instructed to use conditional formulations, which may have inflated the presence of implementation intentions.

Future work

- Incorporate active learning** to improve model accuracy while reducing manual labeling effort, helping balance automation with nuanced human interpretation.
- Explore alternative machine learning methods**, such as:
 - Clustering techniques
 - Topic modeling (e.g., BERTopic, LDA)
 - Hybrid human-AI co-coding systems. These approaches could improve pattern discovery while maintaining interpretability.