A Motivational-Interviewing Chatbot with Generative Reflections for Increasing Readiness to Quit Among Smokers

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Addiction to Smoking Kills

- 1.3 billion worldwide smokers
  - 7 million die each year; 45K in Canada alone

Clincian-based Talk Therapy using **Motivational Interviewing** (MI) has shown success in:

1. Moving smokers towards the decision to quit smoking
2. Helping them actually quit

Clinicians are Hard to Access

- Clinician-based talk therapy is expensive
  - not accessible, applied too late
- If we could **automate** MI talk therapy
  - would be more accessible to many more people
  - available where & when it is needed
- A **population-level** intervention

Most Smokers are Ambivalent

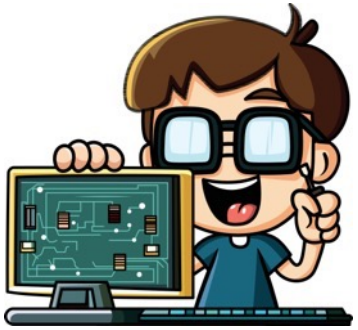
- Know smoking is bad, but positives keeps them smoking
  - 70% of all smokers are in this state of ambivalence

- **Goal**:
  - Create chatbot to guide smokers towards **decision to quit**
  - using Motivational Interviewing approach

Research Project is a Collaboration

Between:

- MI Clincian/Researchers
- Computer Engineers
- Social Scientists



Methods

Method – Conversation Design

- Conversation is 5 Open-Ended Questions
  - Uses MI "Running head start" approach:

1. What is the thing you like **most** about smoking?
2. What is the thing you like **least** about smoking?
3. What is one thing about your smoking habit that you would like to **change**?
4. What will it **look like** when you have made this change in your smoking habit?
5. What are the **steps** you need to take to make this change?

Conversation Design, cont'd

- After each question, client responds
  - All through a textual interface
- Chabot responds with a **reflection**
  - which restates the client statement (**simple** reflection)
  - connects response to guess of motivation (**complex** reflection)
- Purpose of reflection: to encourage contemplation

Example Interaction

MIBot: To start, what is the thing you like most about smoking? **Scripted**

Client: stress relief

MIBot: You enjoy smoking because it helps you cope with stressful situations.

Generated!

Reflections Use Generative AI

- Have been working on automatic reflections for 4 years.
  - during the incredible progress on generative AI
- Use a fine-tuned version of GPT-2 to generate both simple and complex reflections
  - Roughly 55% of the reflection deemed acceptable
  - Also built a classifier to filter out bad reflections
- Can also hit 98% with GPT-4 (not reported in this work)

Two Forms of Conversation

Form 1: Just asks the 5 questions

- No reflection, just respond with ‘thank you’

Form 2: For each of the 5 questions:

- Respond with generative reflection
- Ask, ‘**Did that make sense?**’
- If yes, thank, if no, apologize.

- some extra branches, see: JMIR Mental Health in press https://preprints.jmir.org/preprint/49132

Recruitment

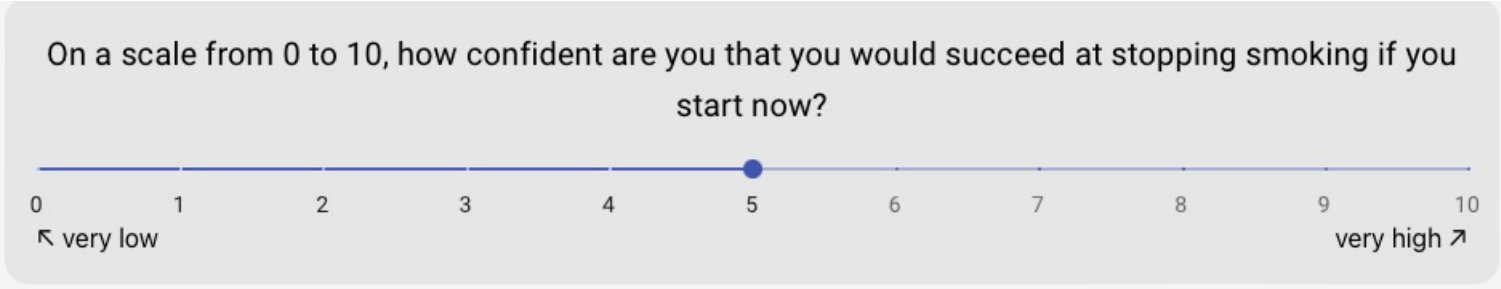
- Used **Prolific.com** online recruitment platform
  - Inclusion: smokers, English speaking, age 18+
- Enables higher number of subjects
- Less control/guarantee of quality of subjects
  - Addressed through double filter of subjects

Outcome Metric

- Readiness Ruler:
  - Survey taken **before** conversation and **1 week later**

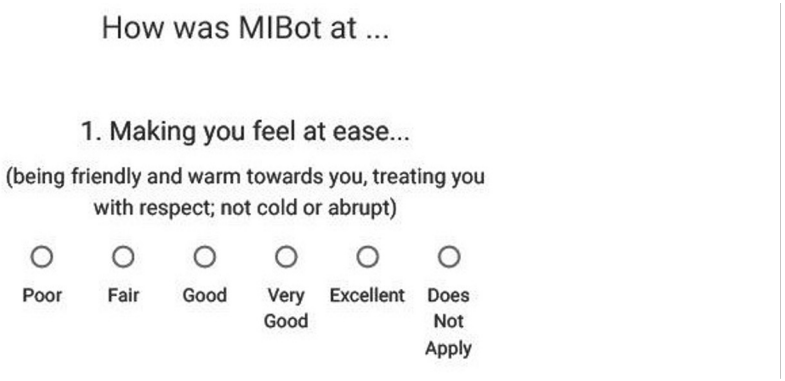
On scale from 0 to 10, how **confident** are you that you can quit?

- Also, how **ready,** how **important**
- Confidence is the most predictive of cessation success



Other Metrics

- The CARE Survey
  - Measures empathy of a care giver; validated for clinicians

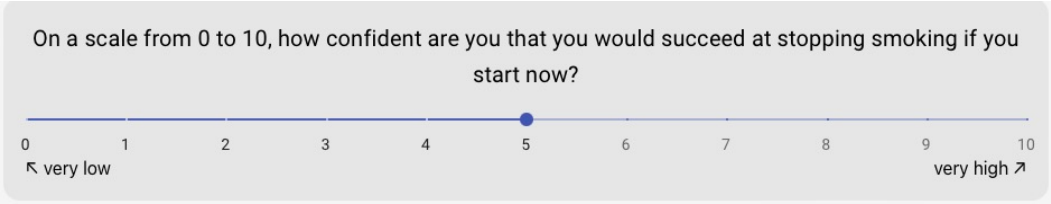


- Quit Attempts
  - Did you attempt to quit smoking during the week

- Written feedback on bot experience

Results

Change in Confidence to Quit



Conversation	N	Average Confidence Before	Average Confidence 1 Week Later	Average Change	Signif
Full Conversation	100	3.3	4.7	+1.3	P <0.001
Only Questions	52	3.6	4.7	+1.0	P=0.0001

- Get most of the impact just by asking the questions

Effect on Importance and Readiness

- Full conversation does better:
  - Importance scale +.7, P<.001
  - Readiness scale +.4, P=.01

CARE – Empathy Scale (/50)

Conversation	N	Average CARE	St. Dev.
Full Conversation	100	**36**	9.1
Only Questions	52	**32**	9.6

- Significantly higher CARE score with reflections (P=.004)
  - generative reflections respond to what the person said
- But: Human clinicians do much better, near perfect 50

Resolution of Ambivalence

- Also classified outcome into three categories
  - Moving towards quitting
  - Moving towards smoking
  - Stayed the same

- Manual classification based on
  - change in confidence and feedback 1 week later:
  - “Did the conversation help you realize anything about your smoking behavior? Why or why not?”

Direction of Resolution of Ambivalence

Conversation	Towards Quitting	Towards Smoking	Stayed Same
Full Conversation	30%	6%	64%

- Promising impact; needs RCT to really see
  - No significant difference between the two conversations

Quit Attempts

- "Consciously Not Smoking for 24 hours or more"

Conversation	% with Quit Attempt Week Before Conversation	Quit Attempt Week After Conversation
Full Conversation	40%	38%

- Not significantly different
- Relatively high fraction,
  - is a younger cohort average age 30

Summary

- Conversation has significant impact on confidence to quit
- Most of the impact comes from asking the questions
- Generative **reflection** appears to have more impact
  - Improves perceived empathy
  - Improves readiness and importance

Next Steps in “MIBot” Project

- Have already used GPT-4 for reflections
  - Much more reliable and better

- Big decision: choose between
  1. Evolving the ‘engineered’ conversation
  2. Using a prompted GPT-4 and guiding it

  3. Some mixture of the above.