Table S1: Principles generated from the COM-B model [1] and PRIME theory [2]

I. Capability (psychological)
1. Improve knowledge of the health effects of smoking and benefits of smoking cessation.
2. Improve knowledge of the types of smoking cessation support available.
3. Improve skills to cope with cravings and stress.
4. Improve self-regulatory capacity by adopting strategies that conserve mental energy.

II. Opportunity (social)
5. Advise on and facilitate social support.
6. Advise on avoiding social cues for smoking.

III. Opportunity (environmental)
7. Provide easy access to stop smoking support resources in the locality or telephone helplines.
8. Advise on avoiding environmental cues for smoking.
9. Provide feedback on progress with stopping smoking (e.g. by including visual cues to show progress)

IV. Motivation (automatic)
10. Provide distraction from urges to smoke to conserve mental energy.
11. Provide support to cope with negative emotional states and stress.
12. Provide positive reinforcements.
13. Prompt pregnant smokers' desire to stop smoking.

V. Motivation (reflective)
14. Foster a non-smoker identity and associate it with positive mental images and feelings.
15. Increase the salience of pregnant smokers' identity as a 'mother'/'mum-to-be' to promote cessation.
16. Boost self-confidence in stopping smoking.
17. Facilitate self-monitoring of smoking behaviour.
18. Change beliefs regarding smoking and its effects to reduce stress.
19. Advise on making a plan to stick to a personal rule: 'not smoking at all no matter what' or 'cutting down to three or fewer cigarettes per day'.

Table S2: Design principles

| I. Design principles adopted from the development of the StopAdvisor website [3] |
|---|
| 1. Use images (graphics or video) to convey information. |
| 2. Give control, choice and personal relevance. |
| 3. Keep text as brief as possible. |
| 4. Try to avoid grouping more than two sentences together. |
| 5. Navigation must be consistent and straightforward. |
| 6. Avoid a patronising tone in the text. |
| 7. Make the app as interactive as possible (e.g. questions, feedback, videos etc.) |
| 8. The app must look professional. |
| 9. Keep consistency throughout the app with regard to layout and grammar. |
| 10. Avoid small font size. |
| 11. Avoid replication. |
| 12. Remove all unnecessary words. |
| 13. Personalise as much as possible. |
| 14. Use 'chatty' everyday language, avoiding formality as much as possible. |
| 15. Express content in brief and specific terms. |
| 16. Feature an interactive component in each feature of the app (e.g. questions, text entry, videos etc.). |
| 17. Emphasize choice as much as possible. |
| 18. Make font consistent throughout the app. |
| 19. Keep number of fonts to a minimum. |
| 20. Remove unhelpful jargon and terminology. |
| 21. Manage expectations about the app in general and specifically about terms like personalised and tailoring by explaining them. |
| 22. Encourage regular use of the app to overcome the belief it should only be used if things are going badly. |
| 23. Personalise the source of SmokeFree Baby by expanding the 'about the team' section and adding smoking histories. |
| II. Design principles adopted from a study of optimal features of health-related websites [4] |
| 24. Login procedures in the app have to be easy. |
| 25. Keep the length of the background questionnaire to the minimum. |
| 26. Present background questionnaire with a progress bar. |
| III. Design principles identified in a study of health care providers working with pregnant smokers [5] |
| 27. Explain how the intervention works. |
| 28. Provide information in a format of 'daily tips'. |
| IV. Design principles identified by the research team |
| 29. Include visuals and interactive elements in general app features and full modules. |
| 30. Use text only to convey information in the control version of each module. |
| 31. Make some content available pre-quit. |
| 32. Use teasers to content that can be unlocked at a later stage. |
| 33. Release new content throughout pregnancy. |
| 34. Reward daily logins with new content. |
| 35. Use daily push notifications to remind participants to log in the app. |
| 36. Use in-app notifications to signpost new content in various features. |

*Design principles that may promote user engagement.

Figure S1: Process of a multiphase intervention development of the SmokeFree Baby smartphone app

Preparation phase → **Design phase** ⟷ **Piloting phase**

Preparation phase

Step 1
Identify target behaviours

- Specify the target population
- Select target behaviours

Step 2
Identify the theoretical base

- Identify key tenets of the COM-B model [a]
- Identify key tenets of the PRIME theory [b]
- Identify potential intervention targets

Step 3
Review relevant scientific literature

- Identify relevant empirical evidence
- Identify potential intervention targets

Step 4
Conduct exploratory work and needs assessment

- Specify what needs to change in pregnant smokers and/or in their environment
- Identify potential intervention targets

Design phase

Step 5
Select mode of delivery

- Select digital platforms

Step 6
Select intervention components

- Specify general app features
- Specify core intervention modules

Step 7
Specify the intervention content by behaviour change techniques (BCTs)

- Select BCTs from the BCT Taxonomy v1 [c] to specify the content

Step 8
Translate the intervention content into app features

- Ensure that the app delivers the specified content as intended

Step 9
Design a prototype intervention

- Specify design principles
- Create a detailed intervention specification document

Piloting phase

Step 10
Pilot test the app

- Check the content for accuracy
- Test app features
- Assess user experience
- Refine the app if needed

[a] COM-B model [1]; [b] PRIME theory [2]; [c] BCTTv1 [6]

Figure S2: Sample screenshots of the SmokeFree Baby app
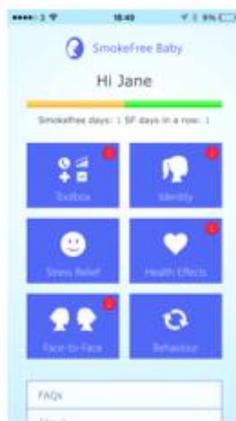
Main dashboard of the app

Toolbox features provided for everyone
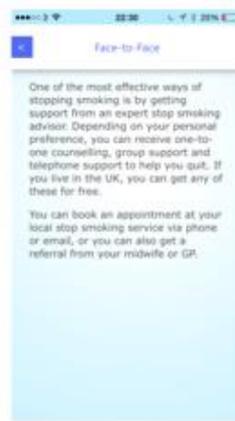
Generic layout of the 'control' version of each module
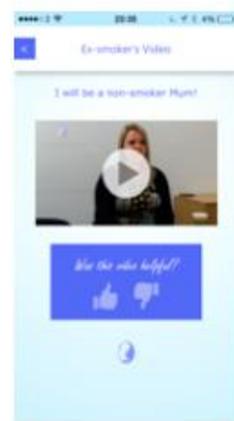
Ex-smoker's videos in the 'Identity' module
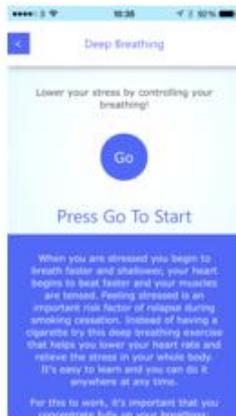
Deep breathing exercise in the 'Stress relief' module
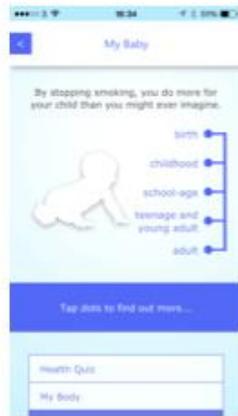
Interactive visual in the 'Health effects' module
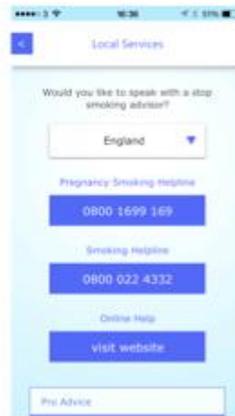
Links to external stop smoking support in the 'Face-to-face' module
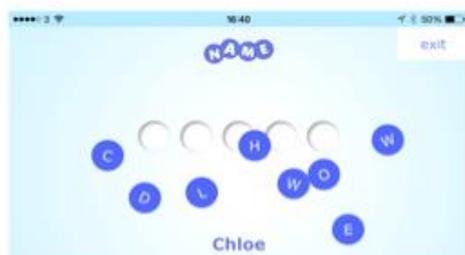
Distraction game in the 'Behaviour' module

Figure S3: Structure of the core intervention modules
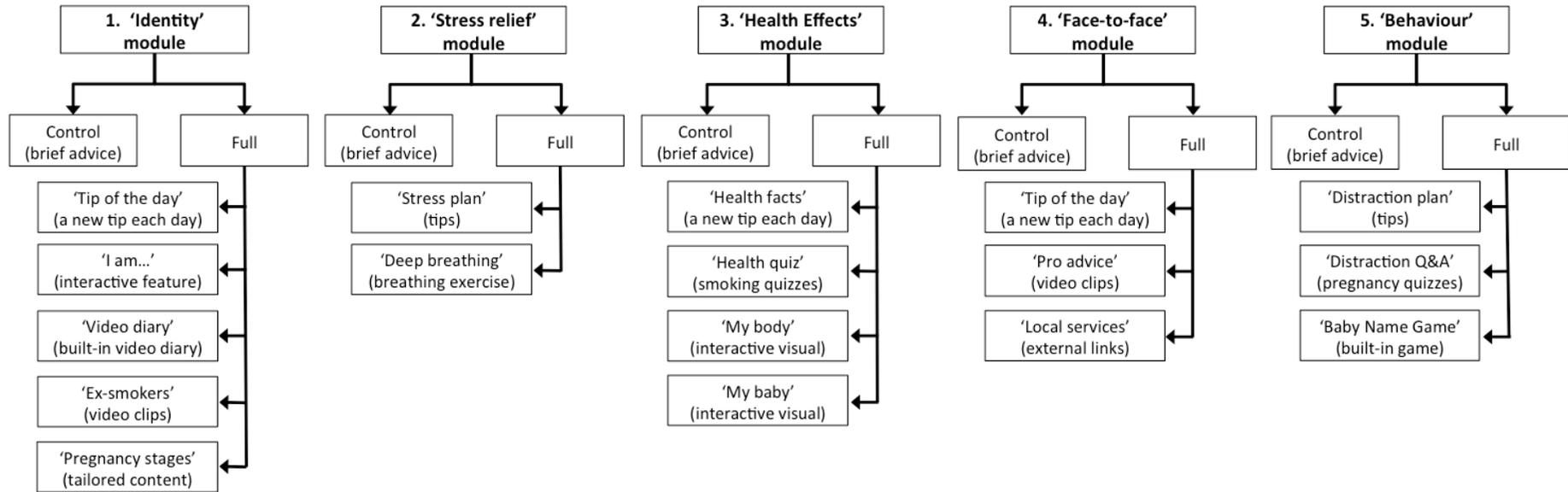
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4. Schneider, F., L. van Osch, and H. de Vries, *Identifying factors for optimal development of health-related websites: a Delphi study among experts and potential future users.* JMIR Mhealth Uhealth, 2012. **14**(1): p. e18.
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6. Michie, S., et al., *The Behavior Change Technique Taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions.* Annals of Behavioral Medicine, 2013. **46**(1): p. 81-95.