Factors influencing usability of a smartphone app to reduce excessive alcohol consumption: think-aloud and interview studies

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Abstract

Background

Interventions delivered by smartphone apps have the potential to help drinkers reduce their consumption of alcohol. To optimise engagement and reduce the high rates of attrition associated with the use of digital interventions it is necessary to ensure that an app's design and functionality is appropriate for its intended purposes and target population.

Aims

To understand the usability of an app to help people reduce their alcohol consumption.

Method

The app, Drink Less, contains a core module focusing on goal setting, supplemented by five additional modules: self-monitoring and feedback, identity change, cognitive bias re-training, action planning, and social comparison. Two studies were conducted, a 'think aloud' study performed with people using the app for the first time and a semi-structured interview study performed after users had had access to the app for at least 2 weeks. A thematic analysis of the 'think aloud' and interview transcripts was conducted by one coder and verified by a second.

Results

Twenty-four participants, half of whom were women and half from disadvantaged groups, took part in the two studies. Three main themes identified in the data were: 'Feeling lost and unsure of what to do next'; 'Make the app easy to use'; and 'Make the app beneficial and rewarding to use'. These themes reflected participants' need for (i) guidance, particularly when first using the app or when entering data; (ii) the data entry process to be simple and the navigation intuitive; (iii) neither the amount of text nor range of options to be overwhelming; (iv) the app to reward them for effort and progress; and (v) it to be clear how the app could help alcohol reduction goals be reached.

Conclusion

First time and experienced users want an alcohol reduction app to be easy, rewarding and beneficial to use. An easy-to-use app would reduce user burden, offer ongoing help and be aesthetically pleasing. A rewarding and beneficial app would provide positive reinforcement, give feedback about progress and demonstrate credibility. Users need help when first using the app and they need a compelling reason to continue using it.

Introduction

1 Excessive alcohol consumption is a major public health issue [1,2]. Alcohol is responsible for
2 approximately 3.3 million deaths worldwide each year and is a causal factor in over 200
3 diseases and conditions [1,3,4]. Face-to-face interventions to reduce alcohol consumption are
4 effective and cost-effective but not widely offered [5–8]. Digital behaviour change
5 interventions (DBCIs) such as web sites and smartphone apps may be able to overcome some
6 of the barriers associated with the uptake of face-to-face interventions [9–12]. Greater use of
7 a DBCI has been associated with more favourable outcomes [13,14], but DBCIs commonly
8 experience low rates of engagement and apps tend to be infrequently used [15–18]. To
9 increase engagement it is necessary to examine the usability of the DBCI with the target
10 population to ensure that its design and functionality meets user needs [19,20].

11 Traditional user testing has tended to focus on the utilitarian or hedonic qualities of a
12 technology [21–25], such as how fun or absorbing a technology is to use [25–30]. However,
13 this approach is not entirely appropriate for DBCIs, where the goal is not necessarily to create
14 a technology that is fun or absorbing but rather, one that encourages sufficient engagement
15 with the intervention for the intended outcomes to be achieved [31]. A potentially more
16 suitable method is the person-based approach to intervention development [32]. The person-
17 based approach melds traditional user testing with a method that seeks to understand not just
18 the hedonic or utilitarian qualities of a technology, but also the appropriateness of the
19 component behaviour change techniques (BCTs) and the challenges faced or anticipated in
20 adhering to them. In this way, acceptable and feasible BCTs can be identified and improved,
21 with impractical or intrusive BCTs replaced [32].

22 Usability studies of DBCIs commonly use the 'think aloud' method to capture experiences of
23 using technology [33–35]. The method encourages users to verbalise in running commentary
24 what they are looking at, thinking about, doing and feeling as they engage with the
25 technology spontaneously or in response to researcher-directed tasks [36]. 'Think aloud'
26 studies can be performed with small numbers of participants [37,38] who provide information
27 about difficulties encountered using the technology, whether the BCTs appear acceptable or
28 impractical, and what users think of the technology's graphic design, navigation and
29 functionality.

30 'Think aloud' studies are a valuable tool for user testing but are typically not conducted in
31 real-world settings. Smartphones are often used in contexts that present specific challenges to
32 usability, e.g. when walking or on public transport, in noisy or distracting environments, and
33 for brief periods of time [39]. Furthermore, whilst it is useful to conduct studies that evaluate
34 a user's first impressions of an app, DBCIs often require repeated use in order to influence
35 behaviour. The extent to which a user returns spontaneously to the intervention, the degree to
36 which prompts and notifications are intrusive, the suitability of prolonged used of the BCTs
37 suggested and the ease of interaction in different contexts of use can better be answered after

38 users have engaged with the app for a period of time. Conducting usability studies after users
39 have had the opportunity to use the app repeatedly and in natural settings is recommended
40 [32,39–41].

41 The studies reported here assessed the usability of a new app in terms of both immediate
42 impression and experience of use. The first study aimed to assess initial impressions and the
43 ease of using features, entering data and navigating to specific items of content by a 'think
44 aloud' study performed with users encountering the app for the first time. The second study
45 aimed to understand the lived experience of the app by a semi-structured interview study
46 performed with users who have had access to the app for at least two weeks. Both studies
47 adopted a person-based approach in order to determine whether the BCTs used in the
48 intervention are acceptable, easy to use and feasible and if not, what suggestions for
49 improvement can be gained.

50 The app to be assessed, Drink Less, is intended to help harmful and hazardous drinkers
51 reduce their consumption of alcohol. Users have access to modules that allow them to set
52 goals, create action plans, monitor their drinking and engage in a range of tasks designed to
53 help reframe their responses toward alcohol. Feedback is provided on consumption and how
54 this relates to the goals set and to other people in the UK (further information on the modules
55 and their BCTs is in Materials, below).

56 BCTs were selected on the basis of theory and evidence, and many have been used in
57 face-to-face and web-based interventions [42]. However, there does not appear to be
58 evidence about whether these BCTs are acceptable to users of an alcohol reduction app,
59 whose small screens and keyboards, and the wide range of settings in which the app is
60 likely to be used, may present particular usability challenges [39,43–46]. There is
61 evidence that users value the BCT of self-monitoring, but are critical of difficulties with
62 entering drinks [47]. This finding indicates that simply providing an alcohol reduction
63 BCT is unlikely to ensure engagement; the BCT must also be implemented in ways that
64 people find usable for the specific task at hand. Previous studies of alcohol apps have
65 examined usability in general terms, such as ease of use and helpfulness, but have not
66 examined the implementation of BCTs or detailed what aspects may need to be
67 improved [48–51]. Greater understanding of how the BCTs in alcohol reduction apps
68 can be made more acceptable and usable is needed if more effective interventions are to
69 be developed.

70 Given the huge amount of research on the usability of apps it is natural to ask, why
71 study usability of an alcohol reduction app in particular? Our rationale for undertaking
72 this study arises from 1) the characteristics and needs of users, and 2) what the app is
73 attempting to achieve.

74 In terms of the characteristics and needs of users, this is a group motivated to change
75 their behaviour and who hope the app will help them do so. This is very different from
76 the case with most apps, which seek to entertain or provide an immediate function. The
77 key reward that users of an alcohol reduction app are likely to gain is a sense of
78 satisfaction at having moved closer toward their goal. There is, therefore, much greater
79 burden on an app to provide intermediate rewards and also to be extremely easy to use
80 in order to increase a user's persistence.

81 In terms of what the app is trying to achieve, the assumption is that a certain level of
82 continued engagement with the app is important for success. We do not know what that level
83 is, but it demands a more structured engagement than the kind of 'as-and-when' mode of
84 operation of other apps. Typically users have to remember, and be motivated to, initiate a
85 session with the app themselves out of a sense of commitment to the behaviour change goal.

86 Concern has been expressed that DBCIs may exacerbate health inequalities [56], since people
87 with greater social disadvantage tend to have poorer online literacy [57]. However, it is an
88 empirical issue and there are promising results for the effectiveness of DBCIs among
89 disadvantaged groups for other health behaviours (e.g., smoking [58]). Specific evidence for
90 the effectiveness of apps for alcohol reduction among disadvantaged groups appears to be
91 lacking [59]. Few apps seem specifically targeted at disadvantaged groups and studies that
92 have included people from these groups tend not to report results for them separately [60,61].
93 Care should be taken to ensure that alcohol reduction interventions are suitable for
94 disadvantaged groups because of the disproportionally negative effect alcohol has on them
95 [62,63]. Including disadvantaged groups in the design and usability testing of new
96 interventions can produce DBCIs that are more appealing to these groups [64]. We will
97 therefore recruit half the participants for each study from disadvantaged groups in order the
98 needs of people in these groups are understood.

99 The aim of this study is to explore user views toward an app to help people reduce their
100 consumption of alcohol and determine whether the BCTs are acceptable and feasible to users
101 and how they might be improved. Findings will not only inform the refinement of the app
102 but, depending on the outcome of the RCT, may also inform intervention developers about
103 how an app's BCTs and design can be altered to improve usability, reduce attrition and
104 increase engagement.

Study 1: Investigation of first impressions: 'Think aloud'

105 **Methods**

106 **Study sample**

107 Participants were recruited from a convenience sample of members of staff at a London
108 university, their family and friends, as well as subscribers to an alcohol-reduction mailing list.
109 Inclusion criteria were people interested in reducing their alcohol consumption and who had
110 an AUDIT-C (Alcohol Use Disorder Identification Test – Consumption) score greater than 5,
111 which reflects potentially harmful levels of drinking [65]. A purposeful sampling approach
112 was taken in order to ensure the views of disadvantaged groups were gathered; half the
113 participants in both studies had no post-16 educational qualifications, were unemployed, or
114 were employed in a routine/manual occupation. Participants were given £20 in compensation
115 for their time.

116 Of the 12 participants in the 'think aloud' study 50% were female and 50% were from
117 disadvantaged groups. Their mean age was 42 years and the mean interview length was 59
118 minutes.

119 **Materials**

120 Five behaviour change modules were included in the app: Normative Feedback, Self-
121 monitoring and Feedback, Action Planning, Cognitive Bias Re-training and Identity
122 Change. The contents of each module and the registration process is summarised below.
123 Full details of the content of the app can be found in two PhD theses [55,56].

124 **Registration**

125 On opening the app for the first time users were presented with the ten-item Alcohol
126 Use Disorders Identification Test (AUDIT), on completion of which the user's AUDIT
127 score and brief information about what the score indicated was provided. Users were
128 then asked to complete baseline demographic measures, after which registration was
129 complete.

130 **Normative Feedback**

131 Following registration users were asked to indicate how they thought their drinking
132 compared to 1) other people in the UK and 2) other people of their age and gender,
133 using a dial mechanism (Figure 1.1.1). Users were then given feedback which showed
134 how their drinking actually compared to people in the UK and people their own age and
135 gender, using the same dial mechanism and other graphical representations (Figures
136 1.1.2 and 1.1.3).

Self-monitoring and Feedback

Participants were able to self-monitor their consumption of alcohol and the consequences of consumption. To monitor alcohol consumption, participants tapped a large plus sign in the middle of the navigation bar at the bottom of each screen, choose from one of six drink types and then choose various options for the selected drink (Figures 1.2.1 and 1.2.2). To self-monitor the consequences of consumption users recorded a score for mood, productivity, clarity and sleep quality each morning on a slider (Figure 1.2.3). Users were prompted to record their consumption and their mood scores each day by way of an onscreen alert and message within the app (Figure 1.3).

Several forms of feedback were provided. The total amount of alcohol (in units), calories consumed from alcohol and spend on alcohol was displayed in graphs on the dashboard (Figure 1.4.1). The dashboard also displayed summary feedback about progress against goals and provided links to three types of other goal-related feedback: 1) whether the previous week's goal had been achieved or missed, 2) progress against the goal for each completed week since the app had been downloaded, and 3) a summary of how many times each goal had been achieved or missed (Figure 1.5). The calendar provided an overview of a user's recorded drinks (Figure 1.4.2), with each day underlined according to whether a user had drank (coloured orange), not drank (coloured green) or not made an entry for that day (coloured grey). Users could tap any day to see details of drinks entered; these records could be edited, added to or deleted.

Feedback about the consequences of consumption was presented on the 'Your hangover and you' screen, which contained four graphs comparing a participant's mood, productivity, clarity and sleep quality on days after drinking with days after not drinking (Figure 1.4.3).

Action Planning

Action planning was presented within a 'Create and View Action Plans' section. At the top of the screen was information about the benefits of setting an action plan and an example of one (Figure 1.6.1). The term 'Action plan' was used in place of the more accurate, but potentially less well-understood, 'implementation intentions'. The Create an Action Plan screen asked users to fill in two fields corresponding to the If and Then components of an implementation intention (Figure 1.6.2). Other screens displayed the action plans users had already set and provided further information about, and examples of, action plans (Figure 1.6.3).

Cognitive Bias Re-training

The cognitive bias re-training game presented users with either an image of an alcoholic drink or an image of a non-alcoholic one. Users were instructed to use their finger to

173   push pictures in portrait form ('tall') away from them and to pull pictures in landscape
174   form ('wide') toward them (Figure 1.7.1). The total score for each game was the
175   number of images correctly pulled or pushed in a 60-second period. Other screens
176   provided instructions about the game and displayed a graph of previous scores over time
177   (Figure 1.7.2).

Identity Change

179   The Identity Change section contained three elements: 1) Flipsides of drinking, which
180   showed images and text representing a positive or benefit of drinking with a negative or
181   cost of drinking (Figure 1.8.1); 2) Memos, which allowed users to record video
182   messages to watch at a later date, for example they could record a message when sober
183   to remind themselves of their goal during a night of drinking (Figure 1.8.2); and 3) 'I
184   am…', which allowed users to select personal values of importance to them, such as
185   being honest or responsible, and then reflect on how these values might be affected by
186   alcohol consumption (Figure 1.8.3).

Goal-setting

188   Users were able to set an overarching reason for drinking less and were presented with
189   links to set new goals and view existing ones. They were also given information about
190   how to set good goals. Users could set goals for any combination of the number of units
191   and/or alcohol free days they wanted to have each week or month, the maximum
192   number of calories and/or the maximum amount of money they wanted to spend on
193   alcohol each week or month (Figure 1.9).

Procedure

195   Participants were set a series of tasks, for example: complete the registration process; add
196   drinks to the drinking diary; set goals; play the game, browse the app. They were asked to
197   verbalise what they thinking about, looking at, doing and feeling throughout the process.
198   After the 'think aloud' study had finished, users were asked if they have any suggestions for
199   how the app could be improved or any additional comments they wished to make. A full list
200   of tasks set and questions asked can be found in Appendix 1.

201   Participants chose the date and time of the interview, and were reassured that their responses
202   would be anonymised and stored securely and that they had a right to withdraw any time.
203   Participants gave written informed consent before the study commenced. All interviews were
204   carried out by the first author and were audio recorded.

205   Ethical approval was obtained from the Clinical, Educational, and Health Psychology
206   Research Department's Ethics Committee at University College London (UCL), Reference:
207   CEHP/2013/50, 1st May 2015.

208 **Analysis**

209 Interviews were audio recorded, transcribed verbatim and analysed with thematic analysis, a
210 method commonly used in qualitative research for "identifying, analysing and reporting
211 patterns (themes) within data" (p79 [66]). The method allows for the similarities, differences
212 and key features of a large body of data to be summarised and for its predominant themes to
213 be identified. Thematic analysis is suitable for mixed-methods qualitative studies [67] and
214 has been used to analyse usability studies of internet interventions and smartphone apps [68–
215 70].

216 Transcripts were read multiple times in order their content be familiarised. Notes taken
217 during these readings were used to generate an initial set of themes. Extracts were coded
218 against these initial themes in an iterative process that led to new themes being identified or
219 existing themes renamed in ways that more accurately captured the essence of the data.
220 Transcripts were read multiple times during the coding process and then again once coded
221 had finished in order to ensure that all extracts relevant to the research question of
222 understanding user views toward an alcohol reduction app had been identified and that
223 extracts had been coded against the most appropriate theme. Themes were grouped into
224 themes and sub-themes and hierarchically organised to reflect their prevalence in the data.
225 Quotes that accurately illustrated the themes were identified. Quotes were edited to improve
226 readability without changing the essence of the quote (unedited transcripts are available from
227 the first author on request). To verify coding accuracy a second coder independently coded
228 10% of the extracts, chosen at random, against the finalised set of themes. Percentage
229 agreements were 84% agreement for the first study and 90% agreement for the second.

230 **Results**

231 Three themes and 12 sub-themes were identified, as summarised below.

232 **1. 'Feeling lost and unsure of what to do next'**

233 Participants using the app for the first time frequently expressed confusion about how to use
234 the app and how to navigate through it. Confusion was most pronounced when participants
235 first started using the app after completing the registration process.

236 **1.1 'Help me when first using the app'**

237 Registration is an expected, familiar and uncomplicated process which participants worked
238 through sequentially. When complete, participants were automatically taken to their
239 dashboard, a screen that contained an empty graph and a number of links to other modules in
240 the app. The abrupt appearance of this screen, its lack of visual concordance with the screens
241 that preceded it, and the number of links available confused participants, who were unsure if
242 registration had finished and which link they should start with. This created a poor first

243 impression, with almost all participants expressing a desire for a stepped guide to walk them
244 through their initial use of the app.

245 *I want something to tell me "Do number 1 first, then number 2. When you've*
246 *done this go here" so I don't have to think too much about it. Once I've got*
247 *it up and running I'm fine.*

248 [P1, Female]

249 *I got confused when I'd finished logging-in. There was nowhere to say*
250 *"Welcome, you've registered". There was nothing that told me I'd finished*
251 *registering. Which was annoying.*

252 [P12, Male]

253 **1.2 'How do I get to where I need to be?'**

254 Participants often felt disoriented within the app and were unsure how to navigate through
255 it. They were not comfortable exploring the app and clicking links at will, often because they
256 thought there were things they should be doing to set the app up but weren't clear what these
257 things were. When unsure where to go next, participants tried to retrace their steps and
258 became frustrated when there was no easy or obvious way for them to do so. In the absence
259 of guidance, some participants worked logically through the app, moving left-to-right through
260 the horizontal tab bar at the bottom of the app and top to bottom on the screen. If the order of
261 items didn't make sense, if links took participants to an unexpected place, or when the
262 navigation was inconsistent (on some screens the horizontal tab bar was hidden) participants
263 felt confused and annoyed.

264 *Okay, I've done my goals. But I don't know what I do next. Do I press Games,*
265 *do I press Dashboard again?*

266 [P5, Female]

267 *Okay, so now the mist has gone up again, because it's not telling me where*
268 *to go next. There's no Exit button, there's nothing.*

269 [P4, Male]

270 **2. 'Make the app easy to use'**

271 Participants wanted a visually appealing app that helped them learn how to use it and did not
272 overwhelm them with choice.

2.1 'Do not make me work'

Participants wanted an app whose use required minimal effort. Some said they may be willing to invest more time than they would with other apps because this app was designed to help them. Others said they would stop using the app if it was too difficult, despite believing that their drinking was an issue they needed to address. Participants had formed expectations about how elements of the app should work based on their experience of using other apps, and were disappointed when the app failed to meet these expectations (for example, users expected a calendar to appear when a date was tapped). Elements that were straightforward and intuitive, such as adding drinks were praised.

What I'm thinking is, this better be easy, because otherwise I'm probably not going to do it. If there are too many obstacles in the way I won't. Even though I know I need to do this, I probably won't.

[P1, Female]

There was frustration but I wouldn't just bin it because I know it's an app that is trying to help me. It probably needs a little bit more time, and I'd be willing to do that.

[P7, Male]

2.2 'Provide clear guidance throughout'

Guidance was sought when using many other areas of the app, particularly when using modules that required input but came without instruction, for example setting goals, adding drinks, creating action plans, or using the identity section. Participants often hesitated before entering information, partly because they were unsure what was required of them; partly because they felt the accuracy of their entries was important and did not know if mistakes could be corrected; and partly because they wanted more help from the app about what entries were appropriate (for example some participants wanted to know whether the goals they had set were realistic). Participants were frustrated when the app prevented them from completing tasks, such as saving an action plan, without clear indication about what they were doing wrong. Instructions provided on how to play the game were thought overly complex and difficult to follow.

302 *So I guess that's the kind of information I was crying out for when I was*
303 *doing the goals. How do I set good goals? Is [spending a maximum of] £40*
304 *unrealistic at this stage?*

305 [P7, Male]

306 *What's annoying is that I'm really happy that I opened up and put my real*
307 *reasons, but now I can't save it because you can't save unless you put an*
308 *action in. But if I knew how to take the action I wouldn't be using the app.*
309 *Now I'm getting frustrated. Tell me! I want it to tell me.*

310 [P1, Female]

311 **2.3 'Make it visually appealing'**

312 The visual appearance of the app played an important role in its perceived ease of use.
313 Visually unattractive screens were off-putting to participants, who often expressed a desire
314 for more graphic ways of presenting information. Participants found icons more pleasing and
315 more memorable than text links and requested they be used more frequently. Some of the
316 graphs did not make unintuitive sense at first and participants suggested better ways be found
317 of displaying these data. Screens that were clean and simple were praised and held in contrast
318 to those that were busy and aesthetically dull. Many participants appreciated the consistent
319 design of the app but the green colour used throughout was not universally liked.

320 *The drink panel was easy to use because it was really visual.*

321 [P8, Female]

322 *I'd probably like to see a page with icons on rather than text. Because it*
323 *always feels a bit more serious when you've got the text.*

324 [P11, Male]

325 **2.4 'Do not overwhelm me'**

326 The range of modules available was overwhelming for some participants who wanted a
327 leaner and more condensed app. Screens full of text, or text that appeared complex to read
328 and understand, were off-putting to participants who wanted to keep their reading to a
329 minimum.

330   *First of all, this is a wall of text so it's not that inviting*

331   [P3, Female]

332   *There seems to be too much on there, I think I would find it off-putting. If I*
333   *was going to use something it needs to be quick and straightforward. There*
334   *seems to be too much, too many pages of things to do, which I know that I*
335   *probably wouldn't end up doing.*

336   [P10, Female]

337 **2.5 'Blame myself, not the app, if it's too hard to use'**

338 When a minority of participants did not understand what was asked of them, or did not know
339 how to use the technology, their tendency was to blame themselves and their shortcomings
340 rather than the app for its poor design.

341   *I'm sure my six year-old nephew would be able to do this by now*

342   [P2, Female]

343   *I'm always my own worst critic. Realising I can't do this makes me think that*
344   *I'm at fault, not the app.*

345   [P9, Male]

346 **3. 'Make the app beneficial and rewarding to use'**

347 Participants didn't understand how some of the modules could help them reduce their
348 consumption of alcohol and wanted to know why they should trust the information provided.
349 They sought messages of congratulations and encouragement for actions they had taken and
350 thought the app unrewarding to use when its tone was judgemental or formal. Instead,
351 participants wanted the app to use language that was more friendly and funny.

352 **3.1 'How will it help me?'**

353 Participants thought the app potentially useful overall, but did not understand the benefit of
354 using some of the individual modules, especially the cognitive bias re-training game and the
355 identity change section, where the relationship between use of the module and reducing
356 alcohol consumption was unclear. The effectiveness of the game was particularly doubted;
357 many participants were unsure of its purpose, or thought it simplistic and unlikely to work.
358 Participants were unlikely to use modules they could see no obvious benefit to and expressed

359 a desire for more information about why a module had been included and how it was
360 theorised to work.

361   *You have finished the game. What was the point of that? Seriously. Really,*
362   *what was the point of that? Am I missing something? No, I'm not impressed,*
363   *I don't know what it was, I don't know why I've just done that.*

364   [P12, Male]

365   *Actually I think more explanation about the psychology around why this*
366   *might help as a training game would be really useful.*

367   [P8, Female]

3.2 'Reward me for my achievements'

369 Participants were often unsure if they had successfully completed a task and expressed a
370 desire for visual or audible confirmation at the point of task completion, for example when a
371 goal had been set. Participants often requested more positive reinforcement from the app and
372 were appreciative when it congratulated them for actions. The sound that was played when
373 participants recorded a drink was particularly appreciated as it was felt to be a reward for
374 their achievements and helped establish a positive relationship with the app.

375   *There's nothing saying "Right, thank you for that. Next option".*

376   [P4, Male]

377   *The big green continue at the bottom and when it moves on to the next thing*
378   *I feel great, I've achieved something, I've filled something in correctly. I like*
379   *that. And a nice little noise which made me think, Oh, I'm not an idiot.*

380   [P9, Male]

3.3 'Do not be judgemental'

382 Some participants felt the app delivered information in a straightforward and non-
383 judgemental tone. Others took the opposite view and considered the information to be
384 judgemental or preaching; a tone they strongly disliked and which made use of the app feel
385 dissatisfying. The feeling of being judged was often expressed when participants received
386 feedback about their levels of drinking which contrasted with their perception of their
387 consumption, for example when they received their AUDIT (Alcohol Use Disorder
388 Identification Test) score or were given normative feedback (where participants were shown

389 how their drinking compares to other people in the UK). Participants who greatly
390 underestimated their levels of drinking compared to others found the comparison shocking
391 and thought the app was placing them in a category of drinkers to which they felt they did not
392 belong. It was notable that once participants saw one module of the app as judgemental they
393 tended to see other modules as judgemental too.

394   *It didn't make me feel judged. Aside from one or two words here and there it*
395   *was understanding. I think the tone is understanding.*

396   [P8, Female]

3.4 'Be friendly and funny'

398 Participants disliked when text was perceived as overly formal or impersonal. They wanted
399 the app to have a friendly, humorous, tongue-in-cheek and light-hearted tone of voice, despite
400 the serious nature of the subject. A too formal tone was perceived as judgemental and off-
401 putting. Participants appreciated parts of the app that were more light-hearted and said it
402 helped them feel relaxed and made them want to engage more with the app.

403   *The language is a bit stale. It could be more personal.*

404   [P8, Female]

405   *I suppose* [informal language] *is a slightly cheeky, jokey, way in. Of maybe*
406   *making me feel a little bit more relaxed, maybe not feeling too conscious*
407   *about giving all my drinking secrets away.*

408   [P1, Female]

3.5 'Tell me I can trust the app'

410 The credibility of the app and the information delivered by it was an issue for a number of
411 participants, particularly those who felt their normative feedback had judged them harshly
412 and who then expressed a distrust of data about other people's drinking. Participants found
413 that credibility was established by use of the University College London logo on the first
414 screen they saw after installing the app and by referencing of studies within the app. A
415 number of participants said that the academic nature of the app and the fact that their data
416 would be part of a study, increased the trustworthiness of the information and their positive
417 views toward the app.

418   *I don't believe that one iota. Less than a pint a day is 85% more than people*
419   *in Great Britain drink. I don't believe that for a moment. Either other people*

420 *are lying, which I assume they might with something like this, or it's skewed*

421 *to scare me.*

422 [P9, Male]

423 *I think the UCL thing is quite important, that it is actually coming from*

424 *academics. One of the things I really liked is when you go into the*

425 *information and it shows you the research, that gives it some gravitas. I think*

426 *that gives the app a lot more credibility.*

427 [P5, Female]

Study 2: Investigation of the experience of app use: Semi-structured interviews

Study sample

429 Participants were recruited from users who had downloaded the app from the iTunes Store

430 and volunteered their email address when completing the app's registration process. Inclusion

431 criteria were the same as for Study 1, with the additional requirement that participants need to

432 have downloaded the app at least two weeks prior to the interview taking place. A purposeful

433 sampling approach enabled the views of disadvantaged groups to be gathered; half the

434 participants were required to have no post-16 educational qualifications, or be unemployed,

435 or be employed in a routine/manual occupation. Participants were given £20 in compensation

436 for their time.

437 Of the 12 participants in the semi-structured interview study, 50% were women and 50%

438 were from disadvantaged groups. Their mean age was 40 years.

Procedure

440 Participants were asked a series of semi-structured interview questions with a mean interview

441 length of 33 minutes. Topics included: how they found the registration process, what their

442 first impressions of the app were, how easy or difficult they found the app to use, whether

443 they had any suggestions for how it could be improved or any additional comments they

444 wished to make. A question was added in response to feedback from the first study. A

445 number of users in the first study said they thought normative feedback about their drinking,

446 which compared their drinking to other people in the UK, was not credible. In order to

447 determine the extent to which this view was shared by people in the second study,

448 participants were asked specifically to recall what their response was to the normative

449 feedback. A full set of interview topics is in Appendix 1.

450 As with Study 1, participants chose the date and time of the interview, and were reassured
451 that their responses would be anonymised and stored securely and that they had a right to
452 withdraw any time. Participants gave written informed consent before the study commenced.
453 All interviews were carried out by the first author and were audio recorded.

454 Ethical approval was obtained from the Clinical, Educational, and Health Psychology
455 Research Department's Ethics Committee at UCL, Reference: CEHP/2013/50, 1st May 2015.

456 **Analysis**

457 Data were analysed using the same procedure as described for Study 1.

458 **Results**

459 The themes identified were broadly similar to those identified in the first study. However, the
460 theme most prominent in the first study: 'Feeling 'lost' and unsure what to do next', was not
461 identified in the second study. The two other themes from the first study: 'Make the app
462 beneficial and rewarding to use' and 'Make it easy to use', were also predominant in the
463 second study albeit with some different subthemes emerging.

464 **1 'Make the app beneficial and rewarding to use'**

465 As with the first study, participants wanted an app that engaged them and provided clear
466 reasons to continue using it. However, this study revealed that for many participants the
467 engaging elements were either missing or not apparent. Participants felt dissuaded from using
468 the app when it adopted a judgemental tone of voice and wanted to know that the time and
469 emotional investment they were making would be worthwhile.

470 **1.1 'How will it continue to help me?'**

471 Participants thought there was little within the app that would encourage repeated use and
472 either never used, or had stopped using, modules they thought offered no benefit. As with the
473 first study, this was particularly true of the cognitive bias re-training game and the identity
474 change modules, where it was unclear how the module could help reduce alcohol
475 consumption. The self-monitoring and feedback module was thought to have most benefit,
476 and a number of participants used the app for this feature alone, although some said they'd
477 prefer to use an app like MyFitnessPal which allowed them to self-monitor their food intake
478 as well.

479   *I think that's where it let itself down for me. Once I'd played with it, once I*

480   *tried the game, done the identity and whatnot, there wasn't much else there*

481   *for me.*

482   [P4, Female]

483   *So in the end I reverted back to one app. It may not necessarily provide*

484   *something I want, it was just a lot more convenient. I drink a wide variety of*

485   *drinks and I don't necessarily always know the content. And with*

486   *MyFitnessPal you can just scan the barcode.*

487   [P10, Male]

1.2 'Reward me for my achievements'

488

489 Participants appreciated positive visual and audible confirmations of their actions and
490 achievements. They liked the sound played after a drink has been entered, the green tick that
491 appeared when an alcohol-free day has been recorded and the green lines under the calendar
492 that show periods of abstinence. Many participants asked for more encouragement and
493 positive reinforcement in the form of badges or smiley faces to indicate periods of success,
494 and supportive messages to encourage drinking reduction.

495   *Then when you say 'drink free day' the app goes 'Congratulations!' and I feel*

496   *great.*

497   [P6, Female]

498   *I know this sounds really pathetic but if you could earn badges for your non-*

499   *alcoholic days, that might make people a bit more focussed on actually not*

500   *drinking because they know they're going to earn points.*

501   [P4, Female]

1.3 'Update me on how I am doing'

502

503 Participants wanted to receive feedback about their drinking and how it was changing over
504 time. However, they often could not find this feedback, a situation they found frustrating and
505 demotivating. Some participants had stopped entering data into parts of the app because
506 without feedback, entering data was an unrewarding task. There were requests to make the
507 feedback more prominent and the app was compared negatively with apps where feedback
508 was easier to find. Participants who managed to locate the feedback appreciated it, though
509 they asked for more encouraging and positive messages.

510   *But one thing that's a bit strange is you can set goals but there's never any*

511   *feedback about whether you've made it or not.*

512   [P6, Female]

513   *I couldn't find any graph that's reflected the mood so therefore I didn't see*

514   *the point of having to fill that part out and I stopped filling it out*

515   [P7, Male]

516   **1.4 'Do not be judgemental'**

517   As with the first study, some participants saw the app as an impartial tool that did not make
518   judgements about their drinking. Others perceived the app's agenda was to get them to stop
519   drinking, believed some of the AUDIT questions were overly personal, felt guilty if they had
520   not completed the daily tasks set by the app and saw the language used as sometimes
521   patronising. Participants also worried about other people judging them and wanted to keep
522   their use of the app private. They worried that the daily prompt to complete their drinking
523   diary might be seen by colleagues or friends and were concerned that people such as their
524   boss might gain access to their drinking data.

525   *"You should drink less" was quite abrasive to me but potentially that's the*

526   *objective if you are trying to get people to drink less.*

527   [P10, Male]

528   *I don't think it's made me feel guilty, I think it's made me feel very conscious*

529   *of what I'm doing.*

530   [P2, Female]

531   **1.5 'Tell me I can trust the app'**

532   There were mixed views about the credibility of the normative feedback information, which
533   compared a participant's drinking to other people in the UK. Some participants found the
534   feedback untrustworthy and thought other people must have underreported how much alcohol
535   they consume. Others valued the comparison as it shocked them into action. In general, the
536   normative feedback information was more trusted than in the first study. However, as
537   participants for this study had searched for and downloaded an alcohol reduction app, it is
538   likely they felt their drinking was problematic and may not have been as surprised to learn it
539   was comparatively high to other people in the UK. Some participants liked that the app was
540   linked to an academic study, appreciated the references that were included and thought more

541 information about the reliability of the information would further support the credibility of
542 the app and its modules.

543   *I didn't really believe it either. I thought 'Wow other people must lie' because*
544   *it said I drank more than 95% of the female population and I was thinking*
545   *'There's no way that's true'.*

546   [P6, Female]

547   *The reason* [for choosing the app] *was that it was linked to an academic*
548   *study, it had people behind it who were identifiable, it had some kind of*
549   *purpose which was bigger than just the app itself. That was the probably the*
550   *strongest attraction I had to it.*

551   [P1, Male]

552 2. 'Make the app easy to use'

553 As with the first study, participants wanted a visually appealing app that made minimal
554 demands on them, and provided guidance about how to use the modules.

555 2.1 'Do not make me work'

556 Participants in the second study tended to report that the app was easy to use. This was
557 particularly true for the self-monitoring and goals modules, both of which were said to be
558 simple and straightforward, in part because they did not require a great deal of typing.
559 Participants encountered few difficulties with the registration process, some even said they
560 appreciated its comprehensiveness as they felt the app needed to ask a lot of questions in
561 order to be able to help. Participants were disappointed when their expectations about how
562 the app would work, expectations formed from using other apps, were not realised. Modules
563 that were new to participants, such as the action plan and cognitive bias re-training game,
564 were not intuitive and a bug which caused the mood diary to record drinks for the wrong day
565 was seen as annoying.

566   *[The app] was quite simple and sleek and straightforward. The worst apps*

567   *are things that make it too complicated or take a long time to fill in.*

568   [P3, Female]

569   *When you enter a drink it's very easy to vary and be precise. For example,*

570   *say you've got beer you've got variations on alcohol content, variations in*

571   *size. It's very flexible that is, so you can be accurate.*

572   [P1, Male]

573 2.2 'Provide clear guidance throughout'

574 Participants in the second study reported much less need for guidance on how to use the app.

575 However, confusion remained about a number of modules where input was required but

576 instruction was lacking. Participants wanted more examples and clearer guidance in order to

577 resolve their uncertainty about what constituted an effective action plan or realistic goal.

578 Instructions about how to play the game were considered unclear and the game itself not self-

579 explanatory. Participants also requested guidance on how to get the most from the app, for

580 example they wanted the app to recommend the mood diary be completed at the same time

581 each day in order to make the data more accurate. Some of the graphs were seen as

582 unintuitive and advice on how to delete drinks or enter drinks for different days was

583 requested.

584   *I think it was quite hard to begin with, not in terms of the app usage itself but*

585   *creating goals. I found that quite tricky. Maybe if there had been some*

586   *suggestions about what goals I should have been setting that would have*

587   *been really useful.*

588   [P8, Female]

589   *I think really I need to play with it more. It's not self-explanatory to me how*

590   *you actually fill in some of the bits.*

591   [P4, Female]

592 2.3 'Make it visually appealing'

593 The visual appeal of the app was positively commented upon by many participants in the

594 second study who thought the app looked friendly, trustworthy and non-intrusive. The

595 simple, clean and clear design, use of green as the main colour, the calendar and the app icon

596　were all liked by participants. Some found the app little dull to view and wanted more
597　imagery, but these were fewer in number than in the first study.

598　　　*I think generally it's very well designed. It's clear, it's useful. I like the design.*

599　　　*I quite like the way it's all mapped out, I think it's very good.*

600　　　[P7, Male]

601　　　*I liked the way it looked. It felt quite friendly. Not intrusive and not scary I*

602　　　*suppose. The colours I liked. They weren't judgemental colours, there wasn't*

603　　　*a lot of red, so it was quite a safe feeling in terms of the colours that were*

604　　　*used.*

605　　　[P8, Female]

Discussion

606　Participants using an alcohol reduction app for the first time and participants who had been
607　using the app for at least two weeks wanted an app that was both easy and rewarding to use.
608　Whilst these findings are perhaps unsurprising, few people are likely to want an app to be
609　difficult or unrewarding, the contribution this study makes is to increase understanding of the
610　particular ways in which an alcohol reduction app could be made easy and rewarding to use,
611　findings which may be applicable to other apps aiming to promote self-directed behaviour
612　change.

Make the app easy to use

614　The finding that participants wanted an alcohol reduction app to be easy to use accords with a
615　considerable literature about the importance to users of simplicity. The Technology
616　Acceptance Model, a theory of the factors that determine use of a technology, posits that
617　people accept or reject a technology based on how easy to use and how useful they perceive
618　that technology to be [71]. Users frequently experience difficulty with new technology [72]
619　and consider ease of use an important and desirable criteria for DBCIs [73]. Ease of use
620　affects users' perceptions of, satisfaction with and intention to use DBCIs [74], moderates
621　continuing engagement with DBCIs [75,76] and may influence the perceived credibility of
622　health information delivered digitally [77].

623　Ease of use for our participants meant that the app needed to do more than reduce user
624　burden, as important as that is [78,79]. Participants often hesitated before entering
625　information, not because the process itself was difficult but because they wanted to enter the
626　'right' information and were concerned their entries might not be changeable. They

627 understood that the app's ability to help was at least partly dependent on the accuracy of their
628 input and were keen to ensure they correctly recorded consumption, set realistic goals and
629 created effective action plans. For participants, an easy-to-use alcohol reduction app told
630 them what action was required, gave guidance about how fields should be completed,
631 provided recommendations about, or offered examples of, suitable entries, and made clear
632 how these entries could be edited. The effectiveness of DBCIs may be enhanced when users
633 are given guidance and direction about how to enact the behaviour [Crane et al, in prep].
634 Findings from this study suggest that users may also benefit from guidance and direction
635 about how to engage with the technology.

636 Ease of use was enhanced when the app was aesthetically pleasing. Visually unattractive
637 screens or those heavy with text were described as off-putting; screens with more imagery
638 were praised. Ease of use criteria were also applied to the type of imagery used; some
639 participants found graphs difficult to interpret and preferred data to be displayed in more a
640 simple form by, for example, showing the calories consumed from alcohol in a figure, with a
641 separate figure showing how that differed to the previous week. An aesthetically appealing
642 app can not only increase ease of use but can also enhance the perceived trustworthiness of
643 the information provided. Participants who liked the design of this app said it seemed friendly
644 and safe. A study of how web-based health information was appraised saw a professional
645 design as indicating credibility to users [77]. The skills needed to create a visually appealing
646 app fall outside the traditional expertise of behavioural science researchers [80] but the value
647 placed on design by users emphasises the need for expert involvement in the design of
648 DBCIs.

649 The importance of making the app easy to use was illustrated by participants who seemed
650 resistant to change. These participants were interested in reducing their consumption of
651 alcohol (it was an inclusion criteria for the first study and participants in the second study had
652 searched for and downloaded an alcohol reduction app of their own accord). However, it
653 appeared they could be easily dissuaded from using an app to help by relatively minor ease of
654 use issues. Resistance to change can be overcome in therapeutic settings through the creation
655 of a 'working alliance', formed when the client perceives the therapist as an ally who can
656 help [81]. Findings from this study suggest that ease of use issues may create the impression
657 that the app is not an ally, cannot be relied upon, and so can be discarded. Resolving ease of
658 use issues may strengthen the relationship between user and app, which could result in more
659 effective interventions [82].

660 **Make the app beneficial and rewarding**

661 The Technology Acceptance Model defines the perceived usefulness of a technology as "the
662 degree to which a person believes that using a particular system would enhance his or her job
663 performance" (Davis, 1989, p320 [71]), a definition which reflects the workplace origins of
664 the model. Findings from this study suggest that users of an alcohol reduction app want their

665 technology to be more than just useful. Their needs are for an app that is both beneficial and
666 rewarding.

667 Health behaviour change can often seem an unrewarding process with immediate costs and
668 remote benefits. Behaviour change is also an often unsuccessful process; most attempts to eat
669 better, exercise more, stop smoking, or drink less alcohol are not maintained long-term [83–
670 86]. Unsuccessful attempts to maintain behaviour can lead to increased negative affect and
671 decreased self-efficacy [87,88] which can result in disengagement from goal pursuit [89,90].
672 Theories such as Thorndike's Law of Effect, Operant Learning and Rothman's Model of
673 Behaviour Maintenance propose that to promote prolonged goal pursuit and encourage
674 maintenance of a new behaviour it may be necessary to positively reinforce change and make
675 salient the beneficial outcomes achieved [91–93].

676 Users want apps that are rewarding to use [94,95] and delete those they find difficult,
677 unhelpful, annoying or burdensome [79,96–98]. Smoking cessation, and healthy eating and
678 physical activity apps often seek to provide users with a gratifying experience, either by
679 making use of the app intrinsically rewarding or through positive reinforcement of effort or
680 progress [99–101]. Providing positive feedback as a reward for behaviour is considered
681 important for persuasive technologies [102]. Alcohol reduction apps, however, tend not to
682 use reward BCTs [103]; findings from this study suggest that may be an omission.

683 Participants in both studies reported here described a rewarding experience as positive
684 reinforcement in the form of congratulations for achievements (such as recording a no
685 drinking day), recognition for actions (such as setting a goal) and the provision of feedback
686 about progress toward their goals. The app was considered beneficial when it reassured
687 participants about the trustworthiness of the information provided and spoke to them in a
688 friendly, informal and non-judgemental tone. Doubts about the benefits of the app, for
689 example how certain modules might help reduce consumption, were assuaged when
690 participants understood more about why these modules were theorised to work.

691 **Differences between studies**

692 **Feeling 'lost' and unsure of what to do next**

693 The third theme identified, that of 'feeling lost and unsure what to do next', was identified
694 only among participants in the first study. Participants in the second study reported being able
695 to navigate through the app without great difficulty, perhaps because repeated use resolved
696 their initial confusion. However, users tend not to use new apps repeatedly; more than half
697 the apps downloaded are used less than five times [104]. Therefore, it is not safe to assume
698 that users will resolve issues of initial use without help. The commercial world addresses
699 these problems with a process known as onboarding [105]. Onboarding helps users become
700 familiar with a technology and learn how its use might benefit them. It often takes the form of

701 messages that guide users through the various elements on a screen or a stepped guide that
702 walks users through the process of first using the app. Almost all participants in the first
703 study requested a stepped guide be provided to help them first use the app and many asked
704 that guidance be provided about using elements throughout.

705 **'Do not overwhelm me', 'Blame myself, not the app, if it's too hard to use'**

706 Two sub-themes were identified only in the 'think aloud' study: 'Do not overwhelm me' and
707 'Blame myself, not the app, if it's too hard to use'. Participants in the 'think aloud' study
708 expressed concern that the range of options in the app might present an overwhelming
709 amount of choice, a concern which corresponds with the theory that an excess of choice can
710 inhibit action [106]. Given that this sub-theme was not identified amongst experienced users
711 in the interview study it is possible that people managed issues of overwhelm by using only
712 the modules they found useful, a strategy some participants in the 'think aloud' study had
713 indeed proposed adopting. The presence of the 'Blame myself, not the app, if it's too hard to
714 use' theme in only the 'think aloud' study may also be explained by the ability of experienced
715 users to solve problems with use. Alternatively, it is possible that the reason that both sub-
716 themes were not found in the interview study is because users who experienced these issues
717 had stopped using the app and so did not respond to invitations to participate.

718 **'Update me on how I am doing', 'Be friendly and funny'**

719 The sub-theme 'Update me on how I am doing', could only have been identified in the
720 interview study with experienced users (and not the 'think aloud' study of first time users)
721 because feedback about progress requires repeated use of the app. It is unclear why the sub-
722 theme 'Be friendly and funny', was identified only in the 'think aloud' study. However, one
723 person in the interview study commented that the friendliness of the app increased with use,
724 and evidence suggests that use of a system can increase user satisfaction with that system
725 [107].

Strengths and limitations

726 A strength of the current evaluation was the use of two distinct approaches to usability. The
727 first study identified issues with initial use, the second identified issues with repeated use.
728 Identifying and addressing both types of issue are essential if engagement with the DBCI is to
729 be secured. In addition, the combination of findings from both studies allowed issues
730 common to both first time and repeated use to be identified and given priority. This is
731 important given the likelihood that limited timescales and budget will prevent all possible
732 improvements arising from usability studies from being implemented.

733 A limitation of the study concerned the representativeness of the sample. A number of
734 participants for the 'think aloud' study were recruited from convenience sample of members
735 of staff at a London university and their family and friends; the views of whom may not

736   represent those of a typical drinker. Attempts to ensure representativeness were made by
737   ensuring all participants were seeking to reduce their alcohol consumption and had scores on
738   the AUDIT-C questionnaire that represented potentially harmful levels of drinking.
739   Representativeness for the second study was further increased by recruiting participants from
740   users who had downloaded the app unbidden. A second limitation concerned the analysis.
741   Steps to ensure that findings accurately summarised the extracts included multiple readings
742   of interviews and use of a second researcher to verify coding. However, researchers with
743   greater experience in qualitative analyses and/or the evidence on alcohol reduction may have
744   reached additional and/or different conclusions. A third limitation concerned the findings.
745   Many of the findings may be considered usability basics, but it was clear that these issues
746   remained of central importance to users, despite a concerted effort to address them in the
747   version evaluated in this study. Care should also be taken when generalising these findings:
748   this was a study of a particular alcohol reduction app whose BCTs were implemented in a
749   particular way, findings may not apply to other behaviour change apps. Analysis was also
750   limited because participants were only audio recorded, greater understanding may have been
751   gained by video recording participants' interactions with the app and analysing their
752   comments and actions together [108]. Lastly, some of the participants were known to the first
753   author and were aware of his role in the app's development. It is possible that demand
754   characteristics [109] may have affected these participants' views toward the app.

Conclusions

755   First time and experienced users want an alcohol reduction app to be easy, rewarding and
756   beneficial to use. An easy-to-use app would reduce user burden, offer ongoing help and be
757   aesthetically pleasing. A rewarding and beneficial app would demonstrate credibility, provide
758   positive reinforcement and give feedback about progress. First time users need particular help
759   to become familiar with the app; experienced users need compelling reasons to continue its
760   use.

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1120

1121

Appendix I – Tasks given and questions asked

Appendix II Interview topics

1122 **Study 1 – 'Think aloud'**

1123 **Tasks**

1124 1. Register for the app and complete baseline measures
1125 2. Add drinks to the drinking diary
1126 3. Set a goal
1127 4. Create an action plan
1128 5. Play the thanks/no thanks game
1129 6. Try the identity module
1130 7. Browse the app

1131 **Questions**

1132 1. What are your overall views toward the app?
1133 2. Was there anything you particularly disliked?
1134 3. Was there anything you found particularly hard to use?
1135 4. Was there anything you particularly liked?
1136 5. Was there anything you found particularly easy to use?
1137 6. Anything you wanted to see there/expected to see there but didn't?
1138 7. Do you have any suggestions for how the app could be improved?
1139 8. Are there any other comments you would like to make?
1140

1141 **Study 2 – Semi-structured interview**

1142 **Questions**

1143 1. What made you choose this app in preference to others?
1144 2. What was the registration process like? Was it too long? Or too intrusive?
1145 3. What did you think of the feedback about your drinking? Did you believe it? What was
1146   your response to it?
1147 4. What were your first impressions of the app?
1148 5. What was your first impression of the dashboard?
1149 6. What are your views of it now?
1150 7. Do you remember what you did first when using the app and your views toward it?
1151 8. Did you set any goals? How did you find the process?
1152 9. Have you received any feedback yet? What do you think of it?
1153 10. What do you think of the mood diary?

1154   11. Did you set any action plans? How did you find the process? Have you found them
1155   useful?
1156   12. How have you found the process of adding drinks?
1157   13. Have you played the game? How did you find it? Were the instructions clear?
1158   14. Have you tried the Identity section? How did you find it?
1159   15. What do you think of the help section?
1160   16. What are your overall views toward the app?
1161   17. Was there anything you particularly disliked?
1162   18. Was there anything you found particularly hard to use?
1163   19. Was there anything you particularly liked?
1164   20. Was there anything you found particularly easy to use?
1165   21. Anything you wanted or expected to see but didn't?
1166   22. Do you have any other suggestions for how the app could be improved?
1167   23. Are there any other comments you would like to make?

Screenshots

Figure 1.1 Normative feedback

1
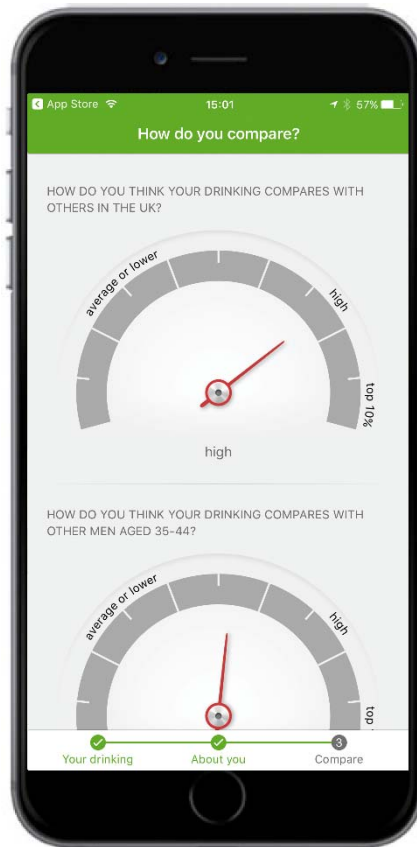
Users were asked to indicate how they thought their drinking compared to 1) other people in the UK and 2) other people of their age and gender

2

Feedback showed how a user's drinking actually compared to people in the UK and people their own age and gender

3

More feedback showed how a user's drinking compared to people in the UK and people their own age and gender (screens not shown)

Figure 1.2 Self-monitoring and Feedback: Monitoring consumption and the consequences of consumption

1
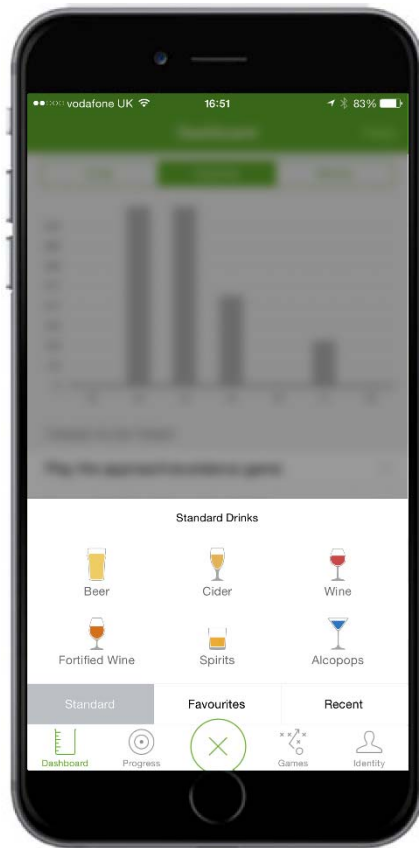
Users could select one of six types of drink…

2
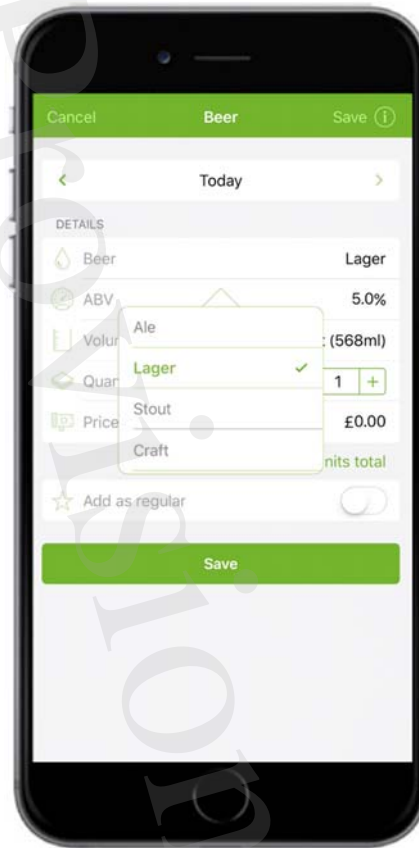
… and then chose options for each

3
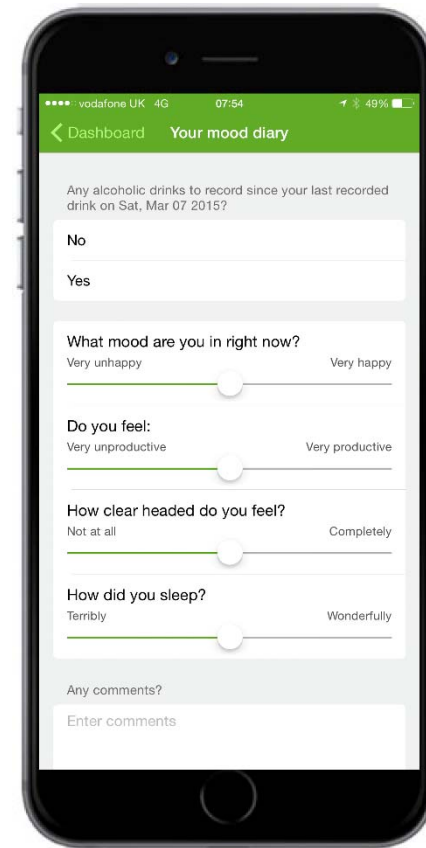
Users monitored the consequences of consumption by recording daily their mood, productivity, clarity and sleep quality scores

Figure 1.3 Self-monitoring and Feedback: Alerts to monitor consumption and consequences of consumption

1
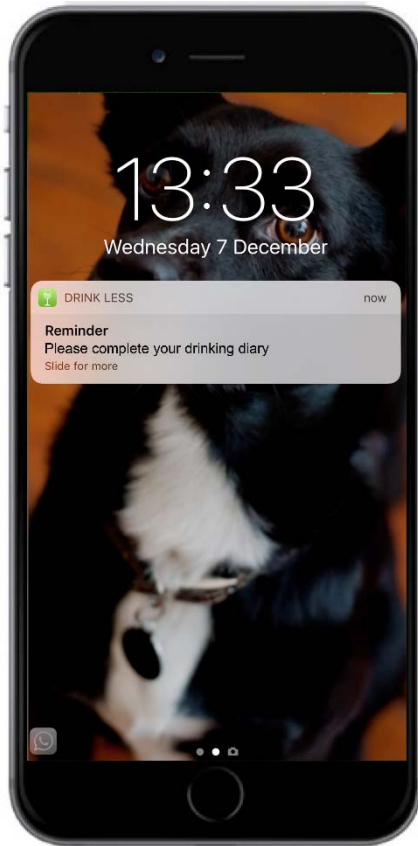
Prompt on the user's home screen

2

Alert on the 'badge app icon' (5th row, last app)

3
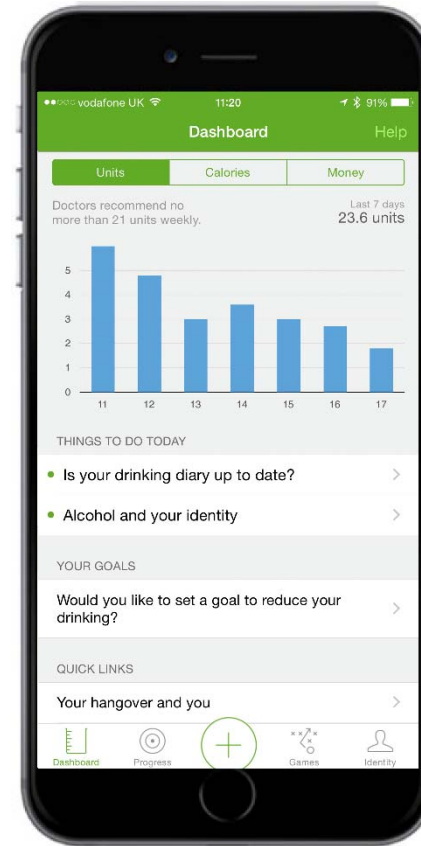
Alert on the Dashboard (In 'Things to do today')

Figure 1.4 Self-monitoring and Feedback: Feedback about consumption and consequences of consumption

1

2

3
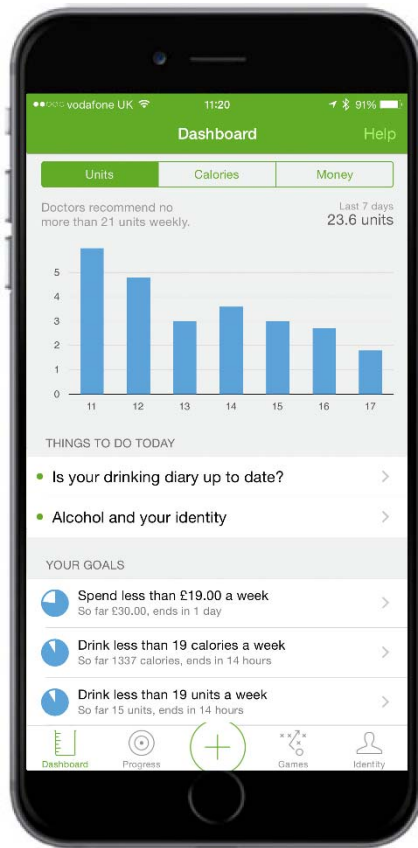
Dashboard shows units, calories and spending graphs as well as summary feedback about progress against goals.
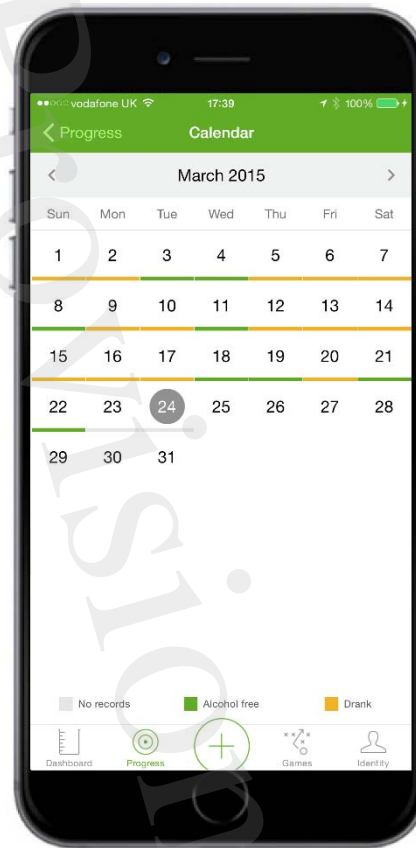
The calendar provided an overview of a user's recorded drinks, with days underlined according to whether a user had drank or not
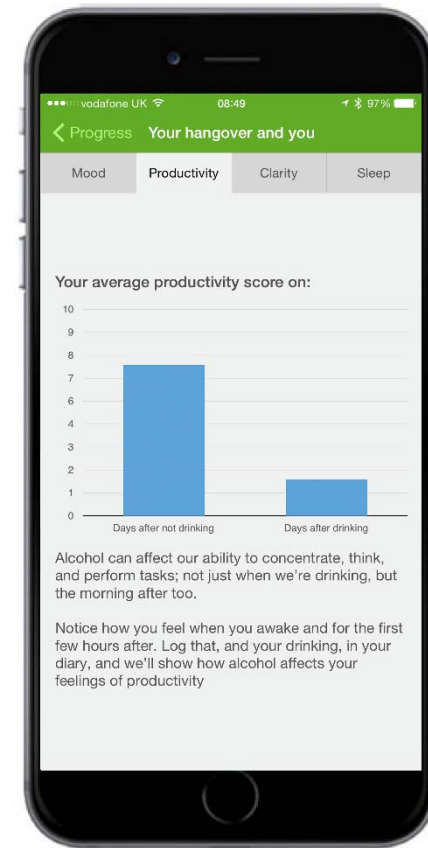
Your Hangover and You presented scores from the Mood Diary (Figure 1.2.3) in graph form

Figure 1.5 Self-monitoring and Feedback: Feedback about consumption

1

Drink less than 19 units a week

?

During the last completed goal period which ended on 2 Mar 2015 you consumed 0 units of alcohol compared to your goal of 19 units a week.

You're doing brilliantly, but perhaps this goal is too easy. How about setting a slightly harder one?
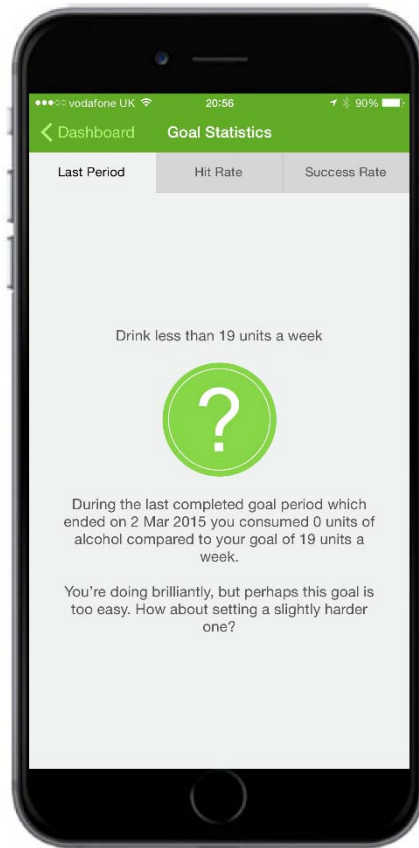
The Last Week screen shows whether a user exceeded, hit or missed the goal for the previously completed week

2

Have at least 3 free days a week

You've hit 88% of your goals to have at least 3 free days a week.
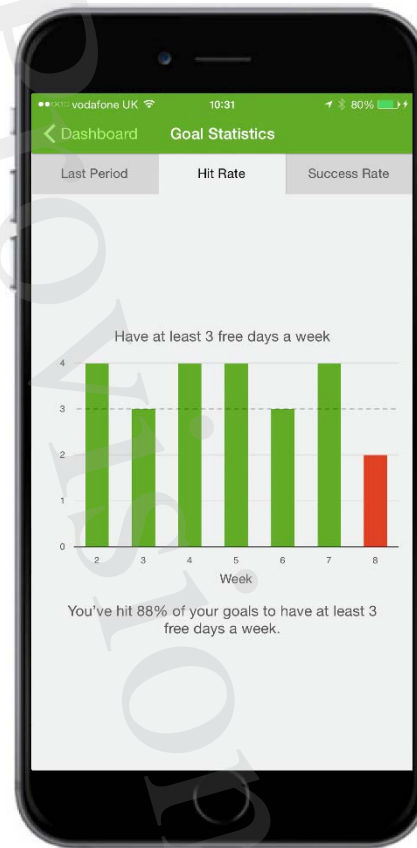
The 'Hit Rate' screen provided an overview of how many times the goal had been exceeded, hit or missed since the app was downloaded

3

Have at least 3 free days a week

12%

88%

Hit the goal   Missed the goal

Your longest hit streak lasted 7 weeks.
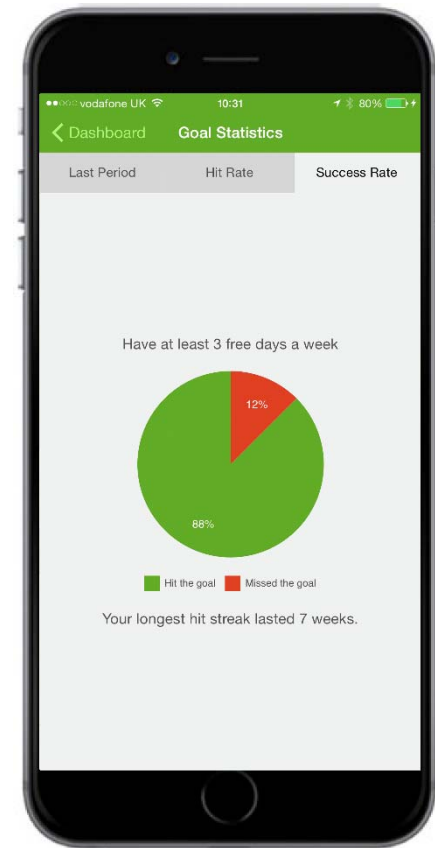
The 'Success Rate' screen provided a total of how many times the goal had been exceeded, hit or missed since the app was downloaded

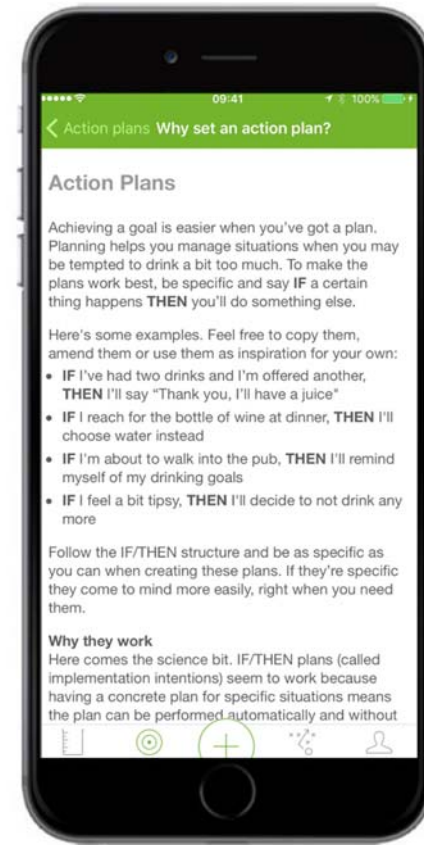**Figure 1.6 Action Plans – Main screen and Why set an action plan**

1

2

3
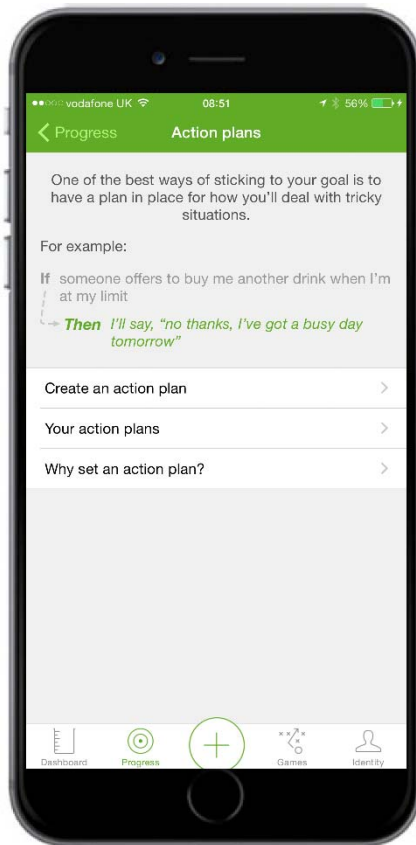
The main Action Plans screen contained information about the benefits of setting an action plan and an example of one
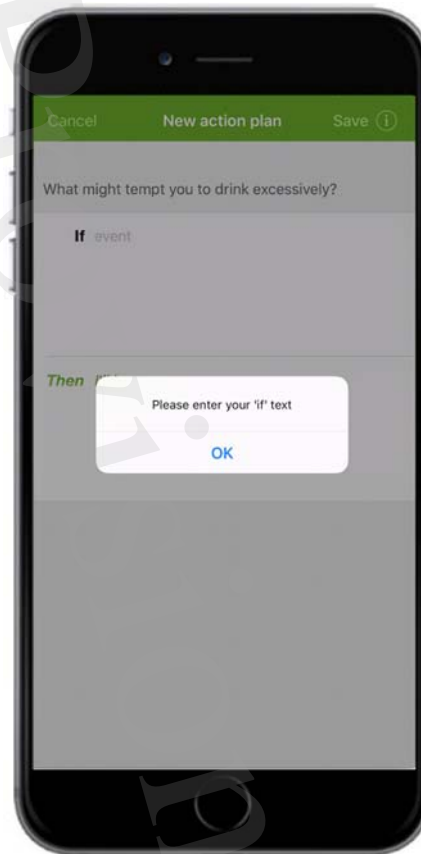
The Create an Action Plan screen asked users to fill in two fields corresponding to the If and Then components of an implementation intention

Information explaining the benefits of an action plan and examples of action plans

Figure 1.7 Cognitive Bias Re-training

1

2

Users were instructed to use their finger to push the alcoholic drink away from them and to pull the non-alcoholic drink toward them

Other screens displayed a graph of previous scores over time

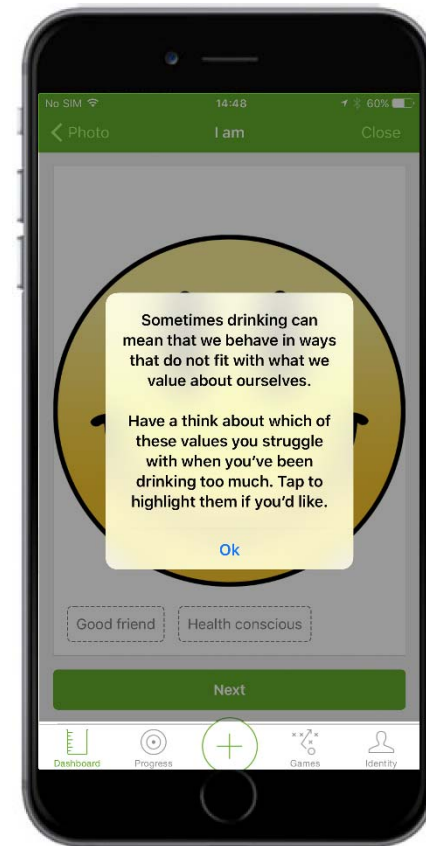p44

Figure 1.8 Identity Change

1
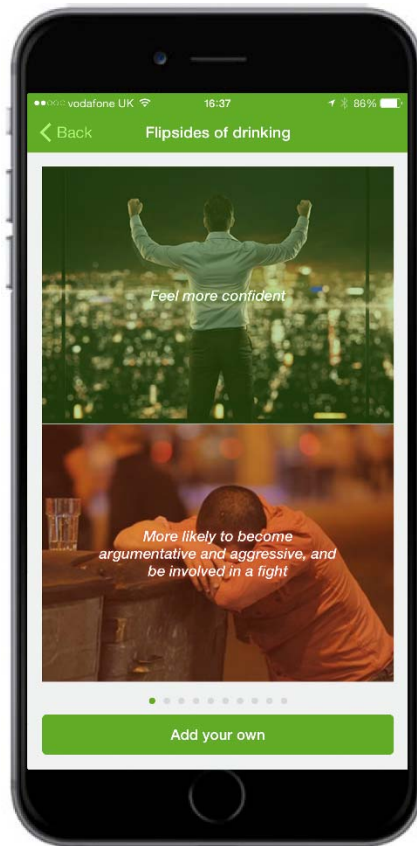
Flipsides of drinking showed images and text representing a positive or benefit of drinking with a negative or cost of drinking

2
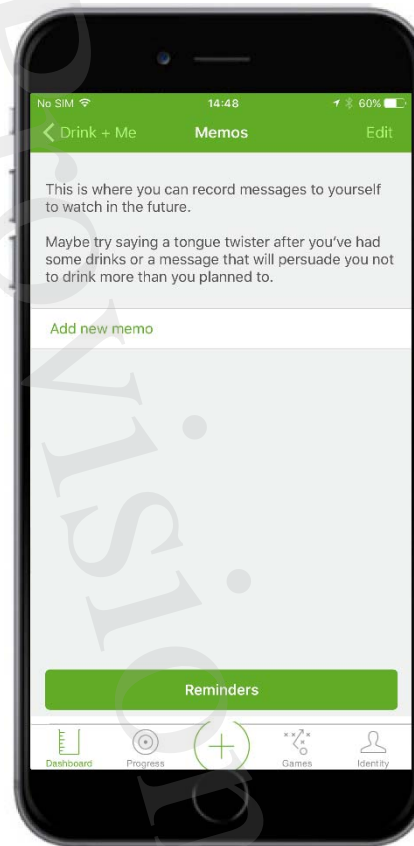
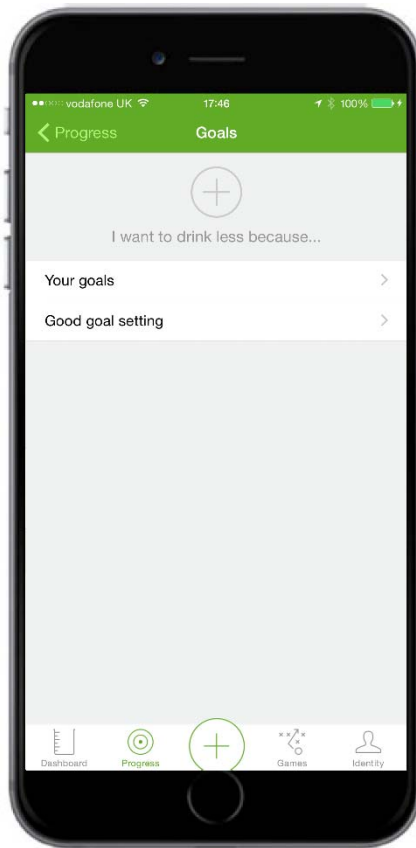Memos allowed users to record video messages to watch at a later date

3

I am… allowed users to select values of importance to them and then reflect on how these values might be affected by alcohol
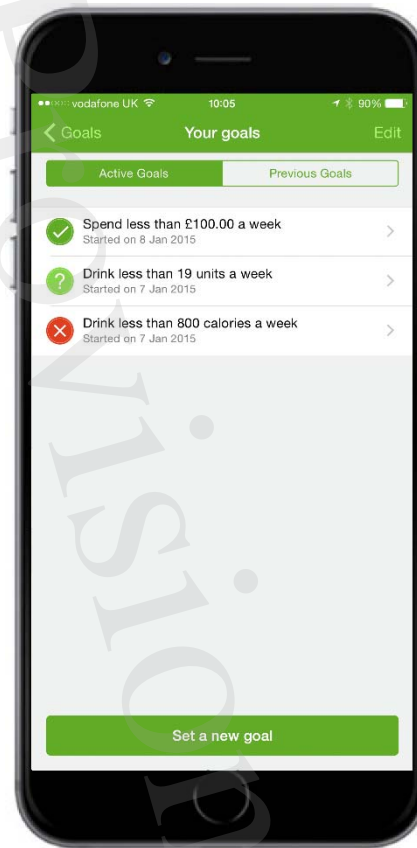
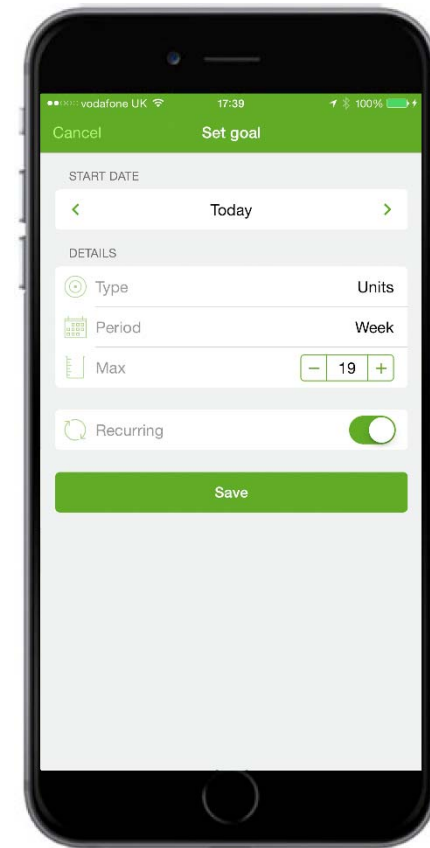**Figure 1.9 Goal setting**

1

Users could set an overarching goal for drinking less, create new goals or get information about good goal setting

2

'Your goals' allowed users to set new goals and see summary feedback about current goals

3

Users could choose Unit, Spending, Calorie or Alcohol Free Day goals.