HÖGSKOLAN
I SKÖVDE

Institutionen för

TENTAMEN

Kurs: Forskningsmetoder och tekniker inom User Experience Design G1F

Examinationsmoment: Salstentamen 2

Kurskod: IT425G

Högskolepoäng för examinationsmomentet: 3

Datum: 2026-02-19

Tentamenstid: 08.15 – 13.30

Ansvarig lärare: Tarja Susi

Berörda lärare: Niklas Torstensson

Hjälpmedel/bilagor: Det är tillåtet att ha med sig kurslitteratur och egna anteckningar.

Övrigt

Anvisningar

- ☐ Ta nytt blad för varje lärare
- ☒ Ta nytt blad för varje ny fråga
- ☒ Skriv endast på en sida av papperet.
- ☒ Skriv namn och personnummer på samtliga inlämnade blad.
- ☒ Numrera lösbladen löpande.
- ☒ Använd inte röd penna.
- ☒ Markera med kryss på omslaget vilka uppgifter som är lösta.

Poänggränser

För att få G på tentamen krävs minst 60% av det totala poängantalet.

För att få VG på tentamen krävs minst 80% av det totala poängantalet.

Skrivningsresultat bör offentliggöras inom 18 arbetsdagar

Lycka till!

Antal sidor totalt 23: framsida = 1, tentamensfrågor = 1, tillhörande artikel = 21 sidor

2026-02-19

Tentamensfrågor

Fråga 1
(12 p)

Inom kvalitativa undersökningar finns olika strategiska ideal som eftersträvas. Din uppgift är att redogöra för vad följande ideal innebär:

a) Holistiskt perspektiv
b) Induktiv analys och kreativ syntes
c) Empatisk neutralitet
d) Avsiktligt urval

Fråga 2
(12 p)

Du har fått i uppgift att introducera kvalitativa metoder för personer som inte vet vad det innebär. Förklara för dem vad som kännetecknar kvalitativa metoder och vad de kan användas till. Du vill även framhäva observationer och du ska därför noggrant beskriva vad det innebär samt samt vilka metodologiska och etiska ställningstaganden som behöver göras när observationer ska användas (ett exempel på metodologiskt ställningstagande är forskarens roll i en studie).
Tänk på att det tydligt ska framgå att du har förstått vad kvalitativa metoder innebär och att du har god kunskap om kvalitativa metoder och etiska ställningstaganden.

Fråga 3
(16 p)

Den bifogade artikeln ligger till grund för denna fråga och ska diskuteras utifrån ett kvalitativt metodperspektiv.

> Anderson, K., Burford, O., & Emmerton, L. (2016). Mobile health apps to facilitate self-care: a qualitative study of user experiences. *PloS one, 11*(5), e0156164.

För att uppnå en hög grad av trovärdighet (trustworthiness) hos resultaten i en kvalitativ studie finns det olika kvalitetskriterier att beakta.

Kvalitetskriterierna är *tillförlitlighet* (credibility), *överförbarhet* (transferability), *pålitlighet* (dependability) och *överrenstämmelse* (confirmability). Du ska med hjälp av dessa faktorer granska den studie som presenteras i artikeln och bedöma studiens trovärdighet.

Din uppgift är att systematiskt gå igenom metod i artikeln (avsnitt Materials and method), och identifiera och diskutera de styrkor och svagheter som finns där. Du kan även behöva inkludera andra delar av artikeln för att bedöma studiens trovärdighet.

Tänk på att det tydligt ska framgå att du har förstått vad som ökar respektive äventyrar trovärdigheten i en kvalitativ undersökning. Samtliga svar ska motiveras.

PLOS | ONE

RESEARCH ARTICLE

Mobile Health Apps to Facilitate Self-Care: A Qualitative Study of User Experiences

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Abstract

Objective

Consumers are living longer, creating more pressure on the health system and increasing their requirement for self-care of chronic conditions. Despite rapidly-increasing numbers of mobile health applications ('apps') for consumers' self-care, there is a paucity of research into consumer engagement with electronic self-monitoring. This paper presents a qualitative exploration of how health consumers use apps for health monitoring, their perceived benefits from use of health apps, and suggestions for improvement of health apps.

Materials and Methods

'Health app' was defined as any commercially-available health or fitness app with capacity for self-monitoring. English-speaking consumers aged 18 years and older using any health app for self-monitoring were recruited for interview from the metropolitan area of Perth, Australia. The semi-structured interview guide comprised questions based on the Technology Acceptance Model, Health Information Technology Acceptance Model, and the Mobile Application Rating Scale, and is the only study to do so. These models also facilitated deductive thematic analysis of interview transcripts. Implicit and explicit responses not aligned to these models were analyzed inductively.

Results

Twenty-two consumers (15 female, seven male) participated, 13 of whom were aged 26–35 years. Eighteen participants reported on apps used on iPhones. Apps were used to monitor diabetes, asthma, depression, celiac disease, blood pressure, chronic migraine, pain management, menstrual cycle irregularity, and fitness. Most were used approximately weekly for several minutes per session, and prior to meeting initial milestones, with significantly decreased usage thereafter. Deductive and inductive thematic analysis reduced the data to four dominant themes: engagement in use of the app; technical functionality of the app; ease of use and design features; and management of consumers' data.

Since self-care transfers most of the responsibility to the consumer, the usability of technology for this purpose is imperative. Consequently, self-care technologies need to be adaptable to technological environments and user preferences.

A growing number of studies have explored the impact of technological interventions on consumers' health outcomes. These interventions have included automated reminders (via text messaging)[18, 19] and internet-based information,[20] and have been assessed using self-report by participants,[21] with little, if any, external validation. Poor persistence with long-term self-monitoring is evident in chronic conditions such as asthma.[22] Gamification can be used to increase engagement through use of rewards for repeat logins within a period of time and achieved milestones.[23] With many usability features conceived to date, mobile health app design is constantly evolving;[24] many app development frameworks offer fast, scalable interfaces to deploy changes to user interfaces seamlessly.

An American health app study reported sociodemographic characteristics of app users, through a 36-item cross-sectional survey of 1604 English-speaking adults.[25] At least one health app had been downloaded by 934 of the participants. Data from open-ended questions, such as effectiveness of the app and reasons for halted use, were thematically analyzed by two researchers, and revealed Weight Loss, Calorie Tracking, Nutrition, and Physical Activity as their main themes. While facilitating statistical analysis, large-scale studies are compromised by their limited ability to probe participants for in-depth responses.

Studies into self-care using mobile apps have predominantly involved custom-designed apps. Examples are a pre-post intervention for asthma using the *Smart Phone Application*,[26] randomised-controlled trials for asthma using the *t+ Asthma* app[27] and another unnamed purpose-built app,[28] as well as a diabetes randomised-controlled trial using *Glucose Buddy*.[29] In these studies, self-efficacy was the only measurement of consumer experience, while participants' engagement with the app was determined via self-report. Engagement does not necessarily mean long-term commitment to using the app; therefore, combining such data with usage statistics, such as login time and frequency and accessed features would add value to these studies. In contrast, mobile app-based obesity management in South Korea[30] applied the purpose-built *obesity-management app* constructed with 'knowledge statements' from an expert committee. Other custom-designed apps include an app for self-monitoring and guiding lifestyle management for breast cancer survivors[31] and PD Dr, a home-based monitoring assessment system for Parkinson's disease.[32]

Notable deficiencies collectively demonstrated in these studies are their relatively short follow-up periods and lack of detailed consumer experience findings. Additionally, self-management programs have measured select outcomes, rather than a more holistic spectrum of outcomes relevant to conditions such as diabetes, osteoarthritis and hypertension.[4]

Theoretical Frameworks

The Technology Acceptance Model (TAM), published in 1989, quantifies how consumers accept technology.[33] It is an extension of the Theory of Reasoned Action,[34] and is used to predict intended behaviour, adopting a technology-focussed paradigm in decision-making.[35] The TAM has been applied in qualitative[36] and quantitative[37] studies of health apps to determine the acceptance of mobile technology amongst physicians and medical students, respectively, and in health-related studies on topics such as adoption of health apps.[38]

The Health Information Technology Acceptance Model (HITAM) is an evolution of the third version of the TAM for the health technology field,[39] combining behavioural, personal, social and IT factors. This model also embraces the Health Belief Model[40] and has been used

Table 1. Interview Guide.

Question	Elaboration Questions	Theory, study or construct
Which health app(s) have you used?	Do you still use that/those app(s)? (If multiple apps) Which of those apps are still on your device? Which of these do you still use? Which one(s) would you like to talk about today?	Experience
(If on present device) Please show me how you use your health app.	How did you set it up? What problems do you recall in setting it up? (Prompts: user interface, prompts, permissions, language used)	Technological literacy
For approximately how long have you used (did you use) this app?	How often do/did you use it? (If discontinued) Why did you stop using the app?	Experience
How did you 'discover' this app?	(Prompts: health prof recommendation, peer/family recommendation, self-search)	TAM—subjective norms[50]
On which platform do/did you use this app?	(Prompts: iPhone, iPad, Android phone, Android tablet)	Descriptors of use
What do/did you like about this app?	Does/did the app fulfil your needs? Why or why not? Do/did you enjoy sessions with your health app? How is/was working with your app satisfying? Is/was your health app worth recommending to others?	TAM—usefulness;[50] Mobile App Rating Scale[43]
How easy is/was using your app?	What makes/made the app information clear and understandable? How do/did you find the font size and representation? How do/did you add remarks to your readings?	TAM—ease of use;[50] Acceptance Factors of mobile apps[51]
Have you sometimes not known (did you sometimes not know) what to do next with your app?	Are/were there any parts of the app you don't use, because they're complicated? What app features do/did you find unintuitive? Do/did you sometimes wonder if you're using the app the right way? Who do/would/did you turn to for help using the app (prompts: family, friends, or online forum)?	Technological literacy; Acceptance Factors of mobile apps[51]
Have you found any 'bugs' in your health app, or things it can't do?	If the app crashes or freezes (crashed or froze), is/was it easy to restart? Have you ever given up due to technical glitches? Have you ever contacted the company about any technical glitches?	Limitations of the app; Acceptance Factors of mobile apps[51]
How much sight and sound stimulation do/did you get from your health app?	(Prompts: graphs, things that flash up, reminders about personal targets, warnings, sound effects/reminders)	Mobile App Rating Scale[43]
What customization features would you like to see in your health app?		Mobile App Rating Scale[43]
What is your view of information stored on the cloud?	Do you find it an invasion of privacy?	
Describe your Initial user profile setup	Was registration via social media e.g. Facebook, Google + an option?	
Is your health app affiliated with a government health organization?	(Researcher to check later if participant unsure)	Mobile App Rating Scale[43]
Does/did your doctor (or other main health care provider) know you have used this app?	(If yes) How would you describe his/her reaction? Are you encouraged by a health professional (pharmacist, general practitioner) to self-reflect on your chronic condition?	Doherty[52] Design and Evaluation Guidelines
What medical or technical jargon have you seen in your app which you don't understand?		Doherty[52] Design and Evaluation Guidelines
Does your app use technology you are already familiar with?	Are the dialogue boxes and input fields similar to what you are used to?	Doherty[52] Design and Evaluation Guidelines
Do you feel you require a peripheral (plug-in or Bluetooth) device to operate your app more effectively?		Yin[53] Usability Risk Level Evaluation
Do you prefer tactile feedback (vibrations) over plain text feedback?	Have you noticed anything vibrate when you've done something wrong or you receive a warning?	Yin[53] Usability Risk Level Evaluation
What features of your app do you think conflict with each other?	(Prompt: inconsistent shortcuts)	Yin[53] Usability Risk Level Evaluation
Are you satisfied with the time taken to perform tasks on your app?	(Prompts: time to display graphs, time to synchronize information)	Yin[53] Usability Risk Level Evaluation
What age bracket are you?	18–25; 26–35; 36–45; 46–55; >55 years	
Your occupation?		
Your highest education?	Year 10 (junior high school); Year 12 (senior high school); TAFE (technical college); University	

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section to demonstrate legitimacy of the identified themes.[57] Step Four involved reduction of themes into most prevalent implicit and explicit ideas.[57] Redundant themes derived from the three published models were deleted. Step Five involved describing the parameters of, and naming, the themes, whilst Step Six involved reporting to convey the analysis made. Outcomes from Steps Four, Five and Six are reported in the Results.

Data are presented based on emergent themes from thematic analysis, exploring how health consumers use apps for health monitoring (addressing Objective 1). Perceived benefits from use of health apps (addressing Objective 2) and suggestions for improvement of health apps (addressing Objective 3) are presented descriptively.

Results

Description of Participants

The most common age bracket of participants was 26–35 years; one participant was over 50 years and another recently turned 18 years old; further participant demographics are provided in Table 2. Interviews were completed in 20 minutes on average, during which time, most participants answered all questions relevant to their experience.

Table 3 displays the types of apps reportedly used by the 22 participants, three of whom did not report any chronic condition. Nine apps were self-discovered, and two recommended by friends, four by a family member or partner, four by a healthcare professional and one by information from a health association or gym. The remaining two participants were influenced by multiple sources for different apps: self-discovery then a friend; and partner then a gym. All participants located their app using the respective app store on their smart device. For commercial reasons, the marketed names of the apps are not reported here. Persistence with each health app ranged from "a couple of weeks" for a diabetes app to "over two years" for a pain management app.

The chronic conditions reported by participants included sleep disorders, chronic migraines, menstrual irregularities, chronic depression, arthritis and Behçet's disease. A number of participants reported more than one condition. Although the interviews focused on user experiences rather than their medical condition(s), participants were keen to share insights into their health as well as app usage.

One participant presented with the new Apple Watch®, seven participants presented with Android smartphones, and the remaining participants owned an iPhone 4, 5 or 6.

User Experiences

Four emergent themes are described below, based on deductive analysis with reference to the TAM, HITAM and MARS. The themes were named Engagement, Functionality, Information Management, and Ease of Use. Each of the four themes aligned with constructs of one or more of the three published models.

Engagement

Aligned with the MARS, the Engagement theme covers consumer interaction with their app, motivation to sustain usage, ability to self-reflect or write notes against readings, and social factors enabling competition with other users. Apps that can sustain positive behaviors and adapt to changes in consumer requirements were more likely to be used on a continual basis. This was particularly noted amongst users of pain, sleep and depression management apps. The following user of a blood pressure-monitoring app demonstrated persistence with his/her app:

Table 3. Types of Health Apps used by Participants.

Type of App	Used by Android Participant Number	Used by iOS Participant Number	Number of Participants
Blood pressure monitoring app (1 type)		P6	1
Diabetes monitoring app (2 types)		P2, P17, P20	3
Migraine management app (2 types)		P5, P8	2
Menstrual cycle monitoring (4 types)	P1, P22	P6, P4	4
Anxiety management app (1 type)		P13	1
Calorie management and weight loss monitoring app (5 types)	P1	P2, P3, P16, P20	5
Celiac disease management app (1 type)	P11		1
Sleep monitoring app (4 types)	P14	P6, P13, P21,	4
Pain management app (2 types)		P8	1
Cycling app (2 types)		P12	1
Fitness App (22 types)	P8, P9, P11, P14, P18, P22	P2, P3, P7, P9, P10, P15, P16, P17, P19, P20, P21	17
Other (saliva analysis kit)		P16	1

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would be great, but when you actually use it, it's not the same."
[P2]

Most participants reduced or stopped using their app when they were familiar with how to self-manage and did not require constant interaction with their app. This finding was evident in users of strength training and fitness apps, whereby users who had reached their goal were not stimulated to achieve further, as well as the following user of a pain monitor:

"I think the migraine one's probably outlived its usefulness for me, but the back pain one, I could still go back to that at any time. If I started to need to monitor my pain again in a systematic way, I'd still go back to it. But I haven't had back pain that's needed that."
[P8]

The same participant reported 'outgrowing' two pain-management apps:

"So they've [migraine and pain tracking app apps have] sort of exceeded their usefulness now, but initially they were very helpful. Well, initially I was using them to track migraine symptoms and to track the effects of medication. But now I know what most of my triggers are, and I know what medication works. I guess for me to use it again, it would have to offer something different. So maybe alternative management strategies to what I'm already doing."
[P8]

Convenience was found to be the main factor why participants engage with health apps, as exemplified by a participant who used a smartwatch app for weight management:

"I really want to have a more active lifestyle . . . Being able to just look at [the smartwatch] on the fly and going, 'Right, if it just means that I have to go move that little bit more, or I have to exercise that little bit more', I will do it, because you have a real-time gauge of how well you've done for the day. So that gets me going because the perceived barrier of just getting the thing done is a lot lower."
[P7]

App functionality is dependent on the environment in which it is used. For example, a participant using a cycling app did not use any tactile or sound feedback:

"I usually keep it [the smartphone with the cycling app] on my bike while I'm riding, so I can see the speed, and the time, and distance and things. I don't think I use any sound or anything like that."
[P12]

Reminders to upgrade app versions for greater functionality were deemed annoying:

"With [the weight management app], they always ask you to upgrade to Pro, so you get more advice and stuff, but that's really annoying."
[P1]

When asked about peripheral devices to synchronize with a diabetes app, a participant responded:

"*That would be very helpful, yes."*
[P2]

Despite well-received navigation and layout features, the physical requirements for apps to measure sleep duration and quality were inconvenient:

"You have to put it [the phone] under your sheet, on the mattress, or under your pillow, and I think I just always had that consciousness that my phone was there and I had to remember to turn [the app] on before I went to sleep and turn it off again when I woke up, and it just wasn't really contributing to good sleep hygiene."
[P6]

Some participants indicated inclination towards customizing app features to suit their requirements:

"I would love . . . to be able to record reps, and sets, and weights and things like that [if their running app were more customisable]."
[P3]

Information Management

Information Management is aligned with the HITAM, and describes reliability, privacy to third parties, data security at rest and in transit, and quality and quantity of data. Without acceptable information management processes, health apps would lack the ability to compute readings, analyse data accurately, reject false or faulty entries and securely manage data. Data security appeared highly valued by participants, but was generally dependent on the type of data. For example, self-documenting height and weight did not raise any concern, although concerns were raised around access to those data by health insurers. One participant [P8], who used a sleep management app, expressed some concerns about potential access to stored data. Another [P13] had created a separate account for services used to preserve privacy. A user of a menstrual cycle tracker [P4] was not comfortable with the prospect of her data accessed by third parties, while another was less concerned:

to be exact, but if it's within a few hundred steps, then that's fine."
[P10]

The following consumer was familiar with environments instigating inaccurate heart rate readings, and was able to rectify the issue:

"Sometimes [the heart rate app] gives numbers that are definitely not right, and then I'm like, "Okay, the lighting was too low" and discard that. I've noticed when . . . you're really cold, or if the florescent lighting is coming on a funny angle that [the phone's camera] will sometimes not register that there's too little lighting, or that the situation isn't going to give a good [heart rate] reading. So I tend to do it [measure heart rate using the app] twice rather than once."
[P13]

Some participants were particularly keen on statistics, and utilized their data in a more sophisticated way than others who merely glanced at their graphs and charts:

"I think I'm the sort of person that I like to see the data around whatever problem I've got, just to help me understand it and monitor it. So I'm always really interested in seeing the statistic."
[P6]

"For me, the major interest was the ability to export my data and consume it, and interpret it, and analyse it in a set of third-party tools. . . "I use some of our heavier statistical analysis tools from work against the number of times I go running and get some insight there."
[P16]

The same participant [P16] particularly valued using existing phone hardware to measure heart rate and blood pressure:

"So this technology is a really interesting use of the phone. Obviously, the camera flash, and the camera, and the light weren't intended for that use [heart rate, blood pressure using the smartphone's flash and camera]. I quite like that an entrepreneur somewhere has seen that these pieces of technology can be used to create something different . . . I would be interested more in things like blood pressure and even . . . blood glucose levels, and some of the measurements which I suspect are probably useful for people with diabetes and what have you."
[P16]

Ease of Use

Ease of Use is aligned with the TAM, and includes concepts such as automation, convenience, fun and health literacy suitable to cater a range of consumers. Recurring patterns among the 22 participants included the desire to use the app, particularly until consumers had reached their self-management goal. Various app features were appreciated by consumers, for example:

"The audio cues [telling me my duration and distance on my running app . . . I really like them."
[P3]

Automation of in-app functions reduces time to perform tasks and was appreciated by all participants:

The aforementioned limitation about fitness-tracking apps not recognizing certain activities was also mentioned by another participant, who suggested:

"I guess being able to track different styles of exercise, so not just running and cardio-based activities, but if it could somehow track better movement with the bodyweight exercises or high-intensity exercises, which aren't as cardio-based."
[P3]

Furthermore, the same participant [P3] gravitated towards more interconnectivity of raw data from Medicare and data from multiple apps aggregated in one graph. Suggestions for improvement included appropriate use of gamification techniques throughout the app.

Discussion

Principal Findings

Data from this limited sample of health app users suggest self-management by health consumers with chronic conditions can be enhanced via use of mobile applications. This is the first-known research to combine these models, benefits of which include chronic condition-specific dimensions such as targeting health and information technology literacy, as well as functionality, engagement and information management. Additionally, more depth identifying usability issues when exploring consumer interaction with self-management goals via health apps was encountered when combining these three models. While the TAM and HITAM were not developed specifically for mobile apps, combining it with the MARS enabled a targeted, mobile health app focus and backing from more established technology acceptance constructs. Combining the TAM and HITAM with the more-recently-published MARS also provides an updated framework to assess health app usability. As confirmed by one study, health behavior is too complex and multi-faceted for one model to cover comprehensively,[39] which is why relevant constructs from TAM, HITAM and MARS were combined.

Similar qualitative studies include user perception of an oral health app.[59] However, user responses in that study were gathered via an online survey with no follow-up questions. Another health app study measured spirometry readings from adolescents with asthma and had no qualitative component.[60] This is the first study to explore self-care consumer experiences with health apps amongst adults. Our study covers a broader range of health apps, and more depth in exploring consumers' experiences.

Randomised-controlled trials have reported clinical impact of health apps on outcomes such as self-efficacy, but have not focused on consumer interaction and engagement. No controlled trials have been published exploring consumer engagement with health apps. Adopting a qualitative approach has enabled insight into consumers' experiences with health apps across a range of health conditions and with sufficient depth to understand motivators, desired features and issues relating to persistence.

The MARS was designed to provide quality star ratings for health apps.[43] This research has aligned the 'Engagement' theme from the MARS in the context of health apps. 'Functionality', concerning the operability of apps, is aligned with the MARS and HITAM, the HITAM introducing concepts such as health beliefs. 'Information Management' was aligned from the HITAM, while 'Ease of Use' was aligned from the TAM and relates to personalization of the user experience. This research provides novel insight from combined models to describe the experiences of users of health apps. User experience design considers user experience, including usability and perceived enjoyment of the product.[33, 61]

advanced, ubiquitous features.[25] Partnerships between health researchers and start-up communities, known for their agile coding methods, could help develop health apps conformant with the themes identified in this research: Engagement, Functionality, Information Management and Ease of Use.

Strengths and Limitations

As explained previously, strengths of this study include combining the TAM, HITAM and MARS in a single study, which has not been attempted before, providing greater breadth in the deductive analytical framework than with the use of a single model. Additionally, using the post-positivism paradigm supports the concept of ever-changing consumer user requirements by viewing "knowledge as conjectural."[64]

Limitations in this study include not referring participants to suitable apps based on their insight, and not scheduling a follow-up interview to gauge a change in their user experience. As such, these data represent a point-in-time measurement, and longitudinal research would better gauge individuals' changes in self-monitoring patterns. This study was limited to a predominantly tertiary-educated Australian perspective; apps marketed internationally may incorporate different user experience metrics. This study did not quantify participants' experiences, which would be of greater use and relevance when a single app is studied. It is unknown whether male and female users of health apps differ in their usage and expectations of these apps. The present sample comprised mostly female participants, possibly due to the recruitment methods.

This study is unable to correlate user experiences with credibility of health app. It may be possible for users to report positive experiences with an app that lacks an evidence base; conversely, an evidence-based app might be poorly designed, with low levels of engagement or usability. There are minimum design guidelines for the Apple App Store®[65] and similar guidelines for Google's Play Store®,[66] although these were not assessed in our study.

Our research has revealed a range of apps used by consumers with a particular health condition, and use of multiple health apps. It would not be feasible to focus the study on one app; this would also limit the generalizability of the findings.

This study deliberately included a broad range of users of a variety of health apps, and it is not feasible to draw correlations or associations between groups of participants. Because some consumers used more than one app to manage their condition, any attempt to document the outcomes from use of a particular app could be confounded, and would rely on self-report. Evaluation of the clinical contribution of apps to health care requires careful experimental design and control of environmental influences on self-management of the medical condition of interest.

Participants discussed the app with which they are most familiar (most engaged), as this would highlight any frustrations they had encountered with programming bugs and limitations. However, participants were welcome to discuss other health/fitness apps with which they had experience. In the interests of keeping participants engaged in the interview, and ensuring currency and validity of the data, it was not considered worthwhile for participants to discuss all health/fitness apps they recalled using.

Further Research

Future research may focus on users of apps for a particular health condition (e.g. asthma), with longitudinal monitoring of their engagement with a selected app(s) and changes in user experiences. Usage of apps incorporating gamification is an area requiring supplementary research,

11. Thomas O. Apple's health app is an embarrassment [Internet]. c2014. Available: http://readwrite.com/2014/10/02/apple-health-app. Accessed 2 November 2015.
12. Finkelstein EA, Chay J, Bajpai S. The economic burden of self-reported and undiagnosed cardiovascular diseases and diabetes on Indonesian households. PLoS ONE. 2014; 9(6):e99572. PMID: 24915510; PubMed Central PMCID: PMC4051736. doi: 10.1371/journal.pone.0099572
13. Miller KM, Beck RW, Bergenstal RM, Goland RS, Haller MJ, McGill JB, et al. Evidence of a strong association between frequency of self-monitoring of blood glucose and hemoglobin A1c levels in T1D exchange clinic registry participants. Diabetes Care. 2013; 36(7):2009–14. doi: 10.2337/dc12-1770 PMID: 23378621.
14. Host T, Person C, Lewis P. Health Market Validation Program (Health MVP) call for proposal application form for SMEs. [Internet]. c2014. Available: http://www.business.vic.gov.au/grants-and-assistance/programs/health-market-validation-program. Accessed 20 February 2015.
15. Blödt S, Pach D, Roll S, Witt CM. Effectiveness of app-based relaxation for patients with chronic low back pain (RelaxBack) and chronic neck pain (RelaxNeck): study protocol for two randomized pragmatic trials. Trials. 2014; 15(1):490–99. doi: 10.1186/1745-6215-15-490
16. Nilges P, Köster B, Schmidt CO. Pain acceptance—concept and validation of a German version of the chronic pain acceptance questionnaire. Schmerz. 2007; 21(1):57–8. PMID: 17111168
17. Morrison LG, Hargood C, Lin SX, Dennison L, Joseph J, Hughes S, et al. Understanding usage of a hybrid website and smartphone app for weight management: a mixed-methods study. J Med Internet Res. 2014; 16(10):e201. doi: 10.2196/jmir.3579 PMC4259922. PMID: 25355131
18. Cooper S, Foster K, Naughton F, Leonardi-Bee J, Sutton S, Ussher M, et al. Pilot study to evaluate a tailored text message intervention for pregnant smokers (MiQuit): study protocol for a randomised controlled trial. Trials. 2015; 16(1):s13063-014-0546-4. doi: 10.1186/s13063-014-0546-4 PMID: 25622639; PubMed Central PMCID: PMCPmc4318454.
19. Haug S, Castro RP, Filler A, Kowatsch T, Fleisch E, Schaub MP. Efficacy of an Internet and SMS-based integrated smoking cessation and alcohol intervention for smoking cessation in young people: study protocol of a two-arm cluster randomised controlled trial. BMC Public Health. 2014; 14(1):1140–48. doi: 10.1186/1471-2458-14-1140 PMID: 25369857; PubMed Central PMCID: PMCPmc4228117.
20. Proudfoot J, Clarke J, Birch M, Whitton AE, Parker G, Manicavasagar V, et al. Impact of a mobile phone and web program on symptom and functional outcomes for people with mild-to-moderate depression, anxiety and stress: a randomised controlled trial. BMC Psychiatry. 2013; 13(1):312–24. doi: 10.1186/1471-244X-13-312
21. Eyles H, McLean R, Neal B, Doughty R, Jiang Y, Mhurchu C. Using mobile technology to support lower-salt food choices for people with cardiovascular disease: protocol for the SaltSwitch randomized controlled trial. BMC Public Health. 2014; 14(1):950–8. doi: 10.1186/1471-2458-14-950 PMID: 25217039.
22. Hasford J, Uricher J, Tauscher M, Bramlage P, Virchow JC. Persistence with asthma treatment is low in Germany especially for controller medication—a population based study of 483051 patients. Allergy. 2010; 65(3):347–54. PMID: 19712117
23. Zichermann G. Gamification by design: implementing game mechanics in web and mobile apps. Cunningham C, editor. Sebastopol: O'Reilly Media; 2011.
24. Pandey A, Hasan S, Dubey D, Sarangi S. Smartphone apps as a source of cancer information: changing trends in health information-seeking behavior. J Cancer Educ. 2013; 28(1):138–42. doi: 10.1007/s13187-012-0446-9 PMID: 23275239
25. Krebs P D D. Health app use among US mobile phone owners: a national survey. JMIR mHealth uHealth. 2015; 3(4):e101. doi: 10.2196/mhealth.4924 PMID: 26537656
26. Licskai CJ, Sands T, Ferrone M. Development and pilot testing of a mobile health solution for asthma self-management: Asthma action plan smartphone application pilot study. Can Respir J. 2013; 20 (4):301–6. PMID: 23936890
27. Ryan D, Price D, Musgrave SD, Malhotra S, Lee AJ, Ayansina D, et al. Clinical and cost effectiveness of mobile phone supported self monitoring of asthma: multicentre randomised controlled trial. BMJ. 2012; 296(6614):e1756. doi: 10.1136/bmj.e1756
28. Liu WT, Huang CD, Wang CH, Lee KY, Lin SM, Kuo HP. A mobile telephone-based interactive self-care system improves asthma control. Eur Respir J. 2011; 37(2):310–7. doi: 10.1183/09031936.00000810 PMID: 20562122.
29. Kirwan M, Vandelanotte C, Fenning A, Duncan M. Diabetes self-management smartphone application for adults with type 1 diabetes: randomized controlled trial. J Med Internet Res. 2013; 15(11):e235. doi: 10.2196/jmir.2588 PMID: 24225149.

54. Charmaz K. Constructing grounded theory: a practical guide through qualitative analysis / Kathy Charmaz. London: London: SAGE Publications; 2006.

55. Radcliffe C, Lester H. Perceived stress during undergraduate medical training: a qualitative study. Med Educ. 2003; 37(1):32–8. PMID: 12535113

56. Green J, Thorogood N. Qualitative methods for health research. 2nd ed. Los Angeles: SAGE; 2009.

57. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol. 2006; 3(2):77–101.

58. Fereday J, Muir-Cochrane E. Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. Int J Qual Methods. 2008; 5(1):80–92.

59. Underwood B, Birdsall J, Kay E. The use of a mobile app to motivate evidence-based oral hygiene behaviour. Br Dent J. 2015; 219(4):7. http://dx.doi.org/10.1038/sj.bdj.2015.660. 1707792818.

60. Elias P, Rajan NO, McArthur K, Dacso CC. InSpire to promote lung assessment in youth: evolving the self-management paradigms of young people with asthma. Med 20. 2013; 2(1):e1. Epub 2013/01/01. PMID: 25075232; PubMed Central PMCID: PMCPmc4084766.

61. Hebly P. Willingness to pay for mobile apps [Dissertation]. Rotterdam (Holland): Erasmus University Rotterdam; 2012.

62. Lister C, West JH, Cannon B, Sax T, Brodegard D. Just a fad? Gamification in health and fitness apps. JMIR Serious Games. 2014; 2(2):e9. doi: 10.2196/games.3413 PMID: 25654660.

63. Dolan B. The rise of the seemingly serious but "just for entertainment purposes" medical app [Internet]. 2014. Available: http://mobihealthnews.com/35444/the-rise-of-the-seemingly-serious-but-just-for-entertainment-purposes-medical-app. Accessed 20 January 2016.

64. Phillips DC, Burbules NC. Postpositivism and educational research. Lanham: Rowman & Littlefield Publishers; 2000.

65. Apple. App Store review guidelines [Internet]. 2015. Available: https://developer.apple.com/app-store/review/guidelines/. Accessed 12 April 2016.

66. Android. Launch checklist [Internet]. 2016. Available: http://developer.android.com/distribute/tools/launch-checklist.html. Accessed 12 April 2016.

67. OptumHealth. OptumHealth debuts OptumizeMe fitness app to help Microsoft(R) Windows Phone 7 users connect and compete for better health [Internet]. c2010. Available: http://www.businesswire.com/news/home/20101115005281/en/OptumHealth-Debuts-OptumizeMe-Fitness-App-Microsoft%C2%AE-Windows. Accessed 17 January 2015.

68. Anderson K, Emmerton LM. The contribution of mobile health applications to self-management by consumers: review of published evidence. Aust Health Rev. 2015;In Press. doi: 10.1071/AH15162 PMID: 26681206.

69. Korhonen I, Parkka J, Van Gils M. Health monitoring in the home of the future. IEEE Eng Med Biol Mag. 2003; 22(3):66–73. PMID: 12845821