Digital Engagement, Self-management, and Shifting the Locus of Control: A mHealth Program for People with type 2 Diabetes

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Abstract

This paper reports from the halfway point in a longitudinal research project and reveals that digital engagement with a mobile tablet device empowers a person with diabetes in the self-management of their disease. Mobile tablet devices were issued to 28 people with type 2 diabetes at a large, integrated, primary, health care centre in Australia. Participants were invited to engage in various digital activities for the management of their health condition. During this time, plentiful and personalized digital support was provided. Diabetes self-management requires sustainable behavioral changes. Therefore, a longer-term program where patients could develop their self-regulatory skills as well as gain confidence in using the mobile devices, was deemed essential to the success of this pilot mHealth program. Participants report significant benefit and satisfaction with the device and an increased sense of control over their health management.

1. Introduction

Effective strategies to live as successfully as possible with diabetes require an attention to lifestyle that can best be driven by the person with the disease. Thus, patient-centred goals for the management of diabetes may include constant monitoring of blood pressure, weight and blood sugar levels. At the same time, the individual must exercise, purchase and consume medication, adhere to a modified diet, and reduce or maintain their weight. Self-management requires sufficient knowledge about the illness, self-discipline and regulation. Thus, self-care is complex and can overwhelm a person with diabetes. Habitual activities and tasks are crucial to successful self-management and a regular routine in familiar settings proves effective [1].

Research in digital engagement utilising mobile devices for healthcare has been conducted for over a decade and has led to a discourse of mobile health or mHealth. Largely centred on mobile phones, diabetes is one chronic disease that has been targeted in mHealth studies. Yet, mHealth programs are frequently developed from a medical standpoint, without fully considering the context of digital media use in patients’ everyday settings.

Mobile tablet devices are largely personal, connected, and always with their user [2]. They have significant potential to facilitate diabetes self-management, because of their proximity to the user and continuous internet connectivity. Yet possession of a mobile device does not ensure an adequate skill set for health self-management. Lack of digital literacy, especially in older generations, can present an obstacle for participation in mHealth initiatives.

Establishing that self-management programs using mobile digital tools can be effective, Lui and Owgu point out the limitations of current empirical knowledge [3]. They report the need to examine long-term success of programs and to establish a stronger link with real-world healthcare practice. This study explores how mobile tablet devices, when used by the people in the context of their everyday life, can help manage their health. It considers the health locus of control construct and a possible shift in self-responsibility for health that is brought about by digital engagement. Any shift toward individual self-responsibility is beneficial because type 2 diabetes is best managed in the day-to-day lifestyle and choices of each person with the disease.

2. Literature review

2.1. Mobile digital engagement
Information technologies can facilitate self-management of type 2 diabetes [4]. Online information about diabetes is readily acquired via the internet and enables behavioral change and new knowledge that enables self-care [5][6]. Web-based applications successfully complement established diabetes care [7] and provide improved access to health information [8]. Online interaction can be used to facilitate the transmission and visualization of clinical data and communication with health professionals, which contribute to improved health outcomes for diabetes patients [4].

Mobile devices and application (apps) for use on the device are relatively new entrants to the suite of technology that assists in health care [4]. They feature the added benefits of user-centred control of the interface, choice of apps, and greater portability and resultant proximity to their user. Mobile phones are known to support diabetes patients in their self-management of diabetes. Lui and Ogwu [3] conducted a meta-analysis of research reporting the use of mobile phone technology in diabetes self-management, and report improvements in blood glucose, adherence to medication, healthy lifestyle and self-efficacy as demonstrated outcomes.

2.2. Health locus of control among type 2 diabetes patients

Modifications to lifestyle and behavior are key facets in improving type 2 diabetes health outcomes and must largely be executed by individuals with the disease. According to Rotter’s [9] locus of control theory, individuals hold a belief about whether they can create positive change in their life by their own actions. Internality defines a person’s belief that the rewards for an action are dependent upon their own behavior, whereas externality exists when the reward is ascribed to external forces that are beyond an individual’s control. The acquisition of skills or knowledge often occurs when a person receives reinforcement from a behavior, be it positive or negative. However, people react to this reinforcement differently; internality is more likely to lead to repeated behaviour and on-going reinforcement, whereas externality is more likely to lead to a discontinuation of the behaviour. The potential for an individual to engage in a specific behavior is contingent upon an expectancy that the behavior will lead to a desired outcome, based on previous experience from similar situations [10]. Different factors such as levels of education [11], and poor health in old age [12] can affect levels of internality and externality in individuals.

Building on the work of Rotter (1966), Wallston et al. [13] developed a multidimensional health locus of control (HLC) scale, which defines and measures both internality and externality. The scale situates an individual’s belief as to whether or not their own behaviour influences their health. [13]. Internal HLC is crucial to self-management of health and illnesses. In health, the externality construct is divided into two; one referring to powerful others and the other to chance, luck, or the influence of religion [13].

Unlike Rotter’s locus of control, which was considered a relatively constant personality trait, HLC is portrayed as a continuum along which an individual can move [14]. HLC has a dependency on an individual’s own health status [13], religious beliefs [14], cultural perceptions of illness and traditional medicine [15], levels of activity in old age [16], and levels of education [17]. Shifts toward greater internal control of health “can be improved through the education and practice of self-care” [15].

Trento et al. found that internality was higher and externality lower in type 2 diabetes patients when compared with type 1 [18]. People with type 1 diabetes have less opportunity to improve their health by lifestyle modification and blood glucose monitoring. Prescriptive insulin dosage and the possibility of hypoglycemia may also be a cause of reluctance to assume full responsibility for their health condition. A greater level of control, however, is possible for people with type 2 diabetes [18].

This research explores the possibility of increasing an individual’s sense of responsibility for the self-management of type 2 diabetes by introducing a mobile tablet device. It explores the potential of mobile digital engagement, as a means of bolstering internality on the HLC continuum.

2.3 Information, knowledge, and self-management

Shaw et al. found that intervention fidelity was an essential element of the design and implementation of mHealth delivery platforms that involve frequent behavioral change [19]. Additional efforts are needed to sustain participants’ interest in new technology over the mid and long-term, as the novelty value of technologies tends to fade.

Information about diabetes is an essential part of both self-management and shared decision-making [20]. Self-management requires goal setting, identifying challenges and self-monitoring of progress. Shared decision-making involves interaction with medical practitioners and building consensus about preferred treatment. This educational process is crucial to diabetes patients,
which is why interacting with health practitioners and obtaining information and social support are important elements of successful self-management of type 2 diabetes.

Online health information seeking is prevalent and computer based interventions have a positive impact on levels of health knowledge [8][21]. Successful mHealth interventions have improved patients' levels of knowledge and their compliance with treatment guidelines [22][23]. Improved access to existing online resources are enabled.

3. Methodology

This study is situated in a large Australian integrated primary healthcare clinic. Clinics of this caliber are a recent initiative of the Australian government, which seeks to build a stronger primary healthcare system. Under one roof, an interdisciplinary team of health professionals, such as GPs, practice nurses, dieticians and psychologists, offer a set of patient-centric services designed to deliver improved health outcomes.

Because type 2 diabetes can be improved by modifications of diet, exercise, and monitoring of biometrics, the theory of HCL provides a useful framework to understand the behaviours of people with the disease. HLC can be shifted in small incremental steps; change develops over time rather than a particular juncture [15] and an iterative cycle of improved self-management can be created.

Using online surveys as the main means of data collection from patient participants, both quantitative and qualitative data were sought. Quantitative data was collected in order to measure and establish trends and preferences, and qualitative data in order to understand a complex arena more fully. In total, four online surveys are conducted over ten-months. This paper reports from the mid-way point in the study after analysis of the first two surveys, at two and five months after participants received the device.

The participatory design of this research resulted in six invitations for digital engagement in diabetes self-management [24]. Those six invitations were categorized as empowered or compelled. Invitations that promoted healthy diet, encouraged exercise, fostered communication and peer support in forums for people with diabetes, and online journaling to encourage reflection and knowledge building were placed in the empowered category. Within the compelled category, two invitations were issued; one that directed participants to authoritative information about diabetes and one that enabled the recording of biometrics such as BGL and blood pressure. No particular activity using the iPad was required, thereby establishing a patient-centric mobile health intervention.

Participant recruitment commenced on 6 August 2014 and the quota was filled by 22 August 2014 (N=30). With information and invitation to be part of the study placed in the patient waiting room, the recruitment was primarily based on a first-come, first-served principle. However, GPs and nurses guided the recruitment during consultations and by recommending individuals that they considered appropriate candidates. In the latter case, the nurses invited patients by phone. Diabetes patients visit their GPs in two or three-month intervals and the narrow window of 2-3 weeks for recruitment did not give opportunity for all potential participants to join the study. Follow-up phone calls were made between 25 and 28 August by the research team to confirm participation. Due to participant withdrawal from the study in the first two months, three additional participants were recruited. The main reasons for discontinuing centered on changed personal circumstances but one withdrew because he lacked interest in learning how to use the tablet device. The final sample consisted of 28 participants.

Previous studies have provided evidence that participant digital literacy is critical to a successful mobile health intervention [25]. Thus, the design of this research included digital support and workshops. Set-up sessions, individual consultations, and online support were offered for as long as the participants’ need was apparent. Individual consultations and online support are available until the end of the ten-month study. It was important to rule out lack of digital skill as a cause for non-engagement in the intervention.

All participants attended an initial workshop where Wi-Fi and 3G enabled iPads with 16GB were distributed. Participants were asked to either supply their Apple ID or supported to create one, so that the research team could keep in touch with the participants for the following 10 months.

Pseudonyms are used when quoting participants in this paper and the qualitative data supplied draws from 24 of the 28 participants. A summary of the demographics of participants is provided in Table 1.

<table>
<thead>
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<th>Table 1. Summary of participants</th>
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<td><strong>Gender</strong></td>
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4. Findings

Clinic patients were given six invitations for digital engagement, but were not required to accept any invitation. The findings reported below are from the three most accepted invitations for digital engagement. They are diet management, recording of biometrics, and access to authoritative information about the disease of diabetes. Table 2 indicates the relative use of apps for specific invitations. The invitation to journal using the iPad is not included in table 2 because a pre-installed app was not supplied to participants. In the following section of the paper, discussion of the three most accepted invitations to digital engagement is followed by an analysis of diabetes self-management and shifts in well-being.

Table 2. Percentage of patients using pre-installed apps at two and five months (%)

<table>
<thead>
<tr>
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<th>Two months</th>
<th>Five months</th>
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<tr>
<td><strong>BGL</strong></td>
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<tr>
<td>Glucose Wiz</td>
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<td>75</td>
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<td>Community</td>
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<tr>
<td>DCUK</td>
<td>61</td>
<td>50</td>
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<tr>
<td>Sgroups</td>
<td>54</td>
<td>64</td>
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<td><strong>Diet</strong></td>
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<tr>
<td>Foodswitch</td>
<td>89</td>
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<tr>
<td>EasyDiet</td>
<td>61</td>
<td>68</td>
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<tr>
<td>iCookbook</td>
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<td>86</td>
</tr>
<tr>
<td><strong>Exercise</strong></td>
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<tr>
<td>BUPA</td>
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<tr>
<td><strong>Information</strong></td>
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<tr>
<td>Diabetes AU</td>
<td>82</td>
<td>82</td>
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<tr>
<td>ACT Health</td>
<td>79</td>
<td>86</td>
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</table>

4.1. Improved knowledge of the disease

The tablet device that was issued to participants had the Diabetes Australia and the state government Health Diabetes Service websites ‘pinned’ to the screen, visually presented in the same way as apps. The invitation to use this authoritative information was categorized as a compelled behavior; it had low expectation of participant autonomy and initiative, and originated from the voice of authority. Participants, however, quickly used the tablet device to reach beyond formal information about their health condition. A large number of participants reported using the device to find extensive amounts of information about type 2 diabetes. Information-seeking extended to a greater breadth and depth than the authoritative material that was provided on the screen of the tablet device. Looking beyond authoritative public health information, one participant states, “the iPad has helped me understand the different types of diabetes conditions in different parts of the world.” (Kylie).

Deeper layers of knowledge about the disease are obtained in accessing the web using the mobile tablet device. “It gives me other information about other health problems. I also like the fact that it gives me an idea what to watch out for with complications with having diabetes” (Kaylee). This new knowledge yields a greater understanding and perhaps acceptance of the disease. For one participant, the mobile tablet “has helped me come to grips with my diabetes by helping me to understand more about the disease” (Emily). Research and in-depth knowledge about the disease led to one self-diagnosis of a rare form of diabetes “I also used it to research different types of diabetes and found that Latent Autoimmune Diabetes of Adults (LADA) symptoms are very similar to my symptoms so I took my iPad to the doctor and showed her and she then tested me for this rare type of diabetes. Unfortunately it appears my research is correct because the blood tests have returned positive for this type of diabetes. If I didn't have this iPad I probably wouldn't have researched to the depths I did” (Rachel). Knowledge acquisition was not confined to diabetes: “It’s like a whole new world of information has opened up for me, my knowledge of the world and of technology was very narrow before I got the iPad, but that has changed now” (Emily).

Burford and Park report that when information is known to exist, apps are considered an easier and faster route than an interrogation of the whole web [2]. Once an app in a particular domain is selected, “it was the channel of choice for the information
actor in possession of a mobile tablet device. Apps were reported to be more effective for specific information enquiries than the Internet at large” [2]. In keeping with these findings, it was evident in this study that participants appreciated the direct support of an app for diet; they did not have to search the entire web and evaluate the advice and recipes that they discovered. “I also tried to look up recipes on the internet and became overwhelmed with information and totally confused as to what information was going to help me” (Leah). “The ease of access to nutritional information, food alternatives and recipes has made this much easier than having to locate books and locate the information I needed by trawling through pages of irrelevant information” (Zayne). The timeliness of information was also appreciated. The device “made finding information and communication immediate” (Zayne). “The mobile nature of this health technology/applications makes information a lot more accessible and timely” (Ryder). It also avoids trips to libraries and health centres. “Normally, I would go to the medical library at the hospital to find answers to my questions, but now I can get up to date information really quickly” (Madelyn).

Extensive research and reading about diabetes using the tablet device were considered, evaluated and compared to other forms of information. Some participants found value in being able to access and read published research and lecture material about diabetes: “I have been able to access some research on diabetes. I find the actual research more useful than the "pop culture" advice offered by others” (Samuel). Other participants were willing to contest the authoritative information provided to them: “Sometimes the information given by diabetes educators is not helpful. People who are living the diabetes often have a better idea of what actually works” (Madelyn).

4.2. Mindful of diet

A large number of research participants took up the invitation to use apps to manage their diet (see Table 2). In the participatory design of this study, the researchers categorized this invitation as an empowering activity; one, which requires commitment and motivation, yet enables an autonomous approach [24]. A number of scholars report that adherence to a recommended diet is the most difficult component of diabetes self-care [26] [27] [28]. The invitation to use pre-populated or self-installed apps for diet in this study, however, resulted in considerable acceptance by participants. Participant’s attention to diet using apps produced reports of progress toward weight loss and maintenance, and glycemic control.

Various dietary apps were used by some participants on a daily basis and self-management of diet was slowly improved by attention to detail: “Nearly every day I use it. It is perfect for anyone that is looking at controlling their eating. It allows me the record things easy and to work out what I could potentially eat to keep my kilojoules down” (Preston). The dietary invitation allowed participants to choose a strategy for diet management and a suitable, supportive app. Thus, a range of strategies were reported, including recommended recipes, keeping a diet diary, switching foods to healthier options, calorie counting and portion control. In the main, several apps in beneficial combination were used by participants for diet management. One participant focuses on planning a diet, sourcing recipes and maintaining a diary of her diet. “I am able to plan my diet intake a bit more and have access to nice recipes and also the Easy Diet Diary app helps to keep track with my fat intake” (Ken). The diet apps have been of particular benefit to a person, newly diagnosed with diabetes “The iCookbook Diabetic is great for me as I have only recently been diagnosed with diabetes and am still learning about what I should and should not be eating” (Lily). Important in the self-management of diabetes, is knowledge of food groups and compositions. Digital engagement bolsters this knowledge and its application: “Now, in the app, I can see all the components of my food choices, as to carbs, protein and fats, etc. Also, I can see how my diet regime has measured over the whole week” (Madelyn).

Participants reported that the iPad was very portable and easily moved within the home. Thus, it was easy for them to use for diet - in the kitchen, in the pantry, in planning sessions in the lounge room, or at the table whilst eating. “The apps that I'm accessing via my iPad allow me to bring the cooking video demonstration to my cooking workbench giving me greater opportunities to prepare better food challenges to better control my weight” (Todd). The tablet device, with useful apps, fitted well into the rhythm and locale of everyday dietary life. The device, in some cases, accompanied the participant to the supermarket: “This app helps me purchase the best products for a low sugar diet and helps to make the decision faster in the shopping isle” (Leah).

Participant’s knowledge and awareness of food and meals is developed by digital engagement and new dietary behaviors and positions come into play. One patient described a new dietary stance: “I am now eating more mindfully. This means I have
started to make healthy food choices and observe moderate food portions” (Ryder). Achieving this awareness of diet was a process of deliberate interaction with the diet app that was used to plan meals. Habits were formed by the constant digital interaction and advice. “The Easy Diet Diary is useful for diabetes patients because eating healthier becomes a habit” (Ryder). For others, their use of a diet app quickly pointed to flaws in the diet “I was shocked recently when I ate two cream biscuits and realized they alone were 1/5 of the daily kilojoule allowance and two carbohydrate portions!” (Ruth). Feedback to the consumer of the two cream biscuits was immediate and startling rather than remote and theoretical – very swiftly the relationship between her eating choices and her calorie intake was made evident by her mobile digital engagement.

Participant’s attention to diet using apps produced reports of progress toward weight loss and maintenance, and glycemic control. For one participant, the use of dietary apps and changes in her dietary practices were the most significant change in her diabetes self-management since acquiring the mobile tablet device: “the biggest change is examining food intake and readjusting menus and eating habits accordingly” (Zayne). The use of diet apps creates lasting shifts in the dietary practices of participants. One participant is able to state: “I am now eating different types of food. No starchy food and sugar free alternatives. I have been using more grains in my diet. It has helped me choose to eat more salads, fish and legumes” (Kylie). Digital feedback to participants reinforces the link between their actions and outcomes: “I find this app ideal …. it gives all cooking instruction, it is great support to keep my glucose levels between 4-6” (Porter).

4.3 Recording and interpreting the measures

Patient centered goals for management of type 2 diabetes may include recording and interpreting BGL, weight, and blood pressure, and typically, notebooks and pens have been used to record these measures. The researchers issued an invitation to the participants to record their biometrics, classifying the invite as a compelled behavior during the research design [24]. It was classified thus because it was a routine, monotonous, measuring task, prescribed or recommended by an authority. A person with diabetes may be tasked to measure and record this data by their healthcare professional.

The majority of the research participants took up this invitation and used either the pre-populated app, or another of their choice, to record their daily data. At two months, the apps for BGL tracking was one of the most frequently used by participants. The apps that were rated as most useful were Glucose Wiz (N=12, multiple response), iCookbook Diabetic (N=11, multiple response), and Food Switch (N=7, multiple response).

One participant outlines the simplicity of the process: “I use this app to record my glucose readings 3 times a day. It's very simple to use - just enter the reading and it records it for you” (Lily). Another participant compares data entry before the iPad: “before I had the iPad and the apps, I was trying to keep records on paper, spread sheets on the computer, it was a mess, I would lose the paperwork, forget to record on my desktop” (Leah).

However, what began as a behavior that was best described as compelled [24] quickly became an empowering one when the modelling capacity of the app, in combination with the graphical capability of the iPad screen, was discovered. A visual, graphical representation of data was extremely beneficial to participants. The benefit of this digital engagement was improved cognition from the display of visual patterns and trends. “I like the clarity of the BGL graph” (Ruth). The visual display of data could be modelled in a variety of ways, and the participants were empowered to produce varied models of their own data, which could be graphically displayed. “Glucose Regulator is an easy and quick app to record and graph my BGL’s and makes the trends in my levels so clear. (Rachel). Participants could look at their history with ease. “There are two functions that I particularly like though - once recorded you can look at your readings in a graph format over a period of days, plus it will also give you an average reading - which is great for your doctor to view too!” (Lily).

Overwhelmed by the capacity and capability of her chosen app, this participant reports: “This app makes charts of blood pressure fluctuations, with upper and lower parameters with color warnings. As well this app records the time, the measurement, the arm used, body position, recent meal, weight, height, BMI, body fat, cholesterol, LDL, HDL and water consumption. It is easy to use and the charts are just like magic” (Madelyn). The app is seen as a tool of empowerment and user control of their health. The mobile tablet device presents self-management data with graphical clarity. It is an exercise in accuracy and realism for diabetes self-management for this participant: “While you may have an idea of how you are managing your diabetes, the graphical information presented in the app clearly shows how well you are in fact managing” (Anna).

4.4 Improved self-management
After five months, 71% (N=20) participants stated that the iPad had helped them manage their health. “The end result is better diabetic management” (Anna) and “the iPad has significantly improved the management of my diabetes. Information is recorded daily and is an important resource for my record-keeping” (Leah). The beginnings of improved self-management start with attention to detailed recording of biochemistry and behavior and became “a vital component of managing my diabetes” (Todd).

Many patients demonstrated that the monitoring and recording of various bio-measures, and dietary intake and planning, were being mapped and considered in an integrated way to give greater insight into the relationship between their actions and their disease. “All of these apps work well together and are easy to use” (Leah). Many were seeking to establish the link between a specific food and high BGL readings. “I use the Glucose Wiz almost daily and it reminds me if something I have eaten is high in sugar and to look at my diet carefully over the previous day or so and adjust my eating accordingly” (Ryan). Without prompting, research participants were integrating the invitations that they had accepted and were performing informal cross-tabulation. Observed interrelationships between behaviors and bio-measures shift the self-management of diabetes by an individual to a higher level of complexity and effectiveness. The following participant makes a number of connections: “it has been easier to manage life with diabetes through constant monitoring and accessing information. It has helped me, for instance, to monitor my sugar levels and to adjust the way I eat and commit to an exercise regime” (Jackson). Immediate feedback is appreciated: “I like these apps as they are easy to use and provide effective feedback on performance” (Ryan).

The iPad was seen as a valuable digital engagement device. It proved portable enough to be used in the activities of daily life and was moved around the participant’s home as the need arose. “The iPad has been effective in the sense that I am able to use it wherever I am. No bulky equipment to carry around” (Sophia). “I find the iPad is easier to use than the laptop. It is easier to hold and easy to use” (Preston). Seamless access to the device in varied contexts encouraged routine: “As a person not much given to routine, this device has encouraged me to daily activity and record-keeping in a way that does not seem intrusive” (Madelyn). With an ease of access, one participant describes his “reach for the iPad first thing in the morning and last thing at night” (Ryan).

The iPad was identified as a successful tool for diabetes self-management. “I leave it (iPad) on the table and it reminds twice a day to record my taking of medication” (Gilbert). So integrated into this participant’s life, “the iPad has become like another part of me. I use it in the morning, noon, evening and before bed. It means that I don’t have to sit in front of a screen getting chronic headaches or back pain” (Sophia). “My iPad is becoming a vital part of my daily activities. I have greater mobility to access information and this greater mobility has become like a personal assistant in making informed decisions” (Todd). Self-management itself becomes a reflection for some participants and apps become a key management tool – they provide data capture, recall, and an ongoing ability to manage. “The apps, apart from providing actual information of your management, help maintain good management” (Anna). Good management is possible because the necessary data is available – stored in the chosen app, and presented in various ways that are under the control of the individual. A great sense of control is given to those who used the tablet device extensively to integrate various aspects of self-management. “Now all my notes can be maintained in one location with no difficulty associated with memory, as was the case when, in the evening, I struggled to remember what on earth I had eaten that day” (Madelyn). Management itself becomes achievable: “The iPad has given me a stress free way of keeping all the information together and the tools to do this on one device” (Leah). The mobile device and the chosen apps and activities also bring a renewed concentration on diabetes self-management. The iPad is attributed to “improving my focus on diabetic management” (Anna) and “greater focus on the management of my condition” (Samuel).

Sometimes progression in monitoring, management, and learning was intermittent. Intensive use of an app took place when the rhythm of life was slow and there was time for concentration and routine. “I find I tend to use this app for a few weeks at a time to get a general idea of intake and I fill it in more regularly when I am at home and life is more normal. Over holiday and busy times this routine tends to be neglected.” (Claire). However, this sporadic inattention to digital self-management is mitigated by the learning that has occurred during previous routine. “Using this app frequently not only helps maintain levels, but over time will educate you on what you eat” (Jackson). Another participant was learning more about the composition of food: “FoodSwitch, great app to use initially to educate oneself on the nutrition information of various products and see alternatives. After that I found that I
use it infrequently but as a learning tool it was great” (Ryan).

4.5 Improved health and well-being

Many participants reported that an improvement in their health and well-being resulted from their digital engagement with a mobile tablet device for diabetes self-management. “I have improved my health by losing weight and exercising. The weight loss was not only due to the exercise, but also from information and dieting and blood sugar monitoring, which was made easy with the use of the iPad” (Jackson). A number of participants reported weight loss: “My weight is now within 2 kilos of optimal, which I am pleased about. It would have been much more difficult to achieve this without the iPad” (Madelyn). Adherence to recommended diet and subsequent weight loss was followed by a reduction in medication for one participant: “As a side issue at the start of the program I was injecting 30 units of insulin twice a day. Having lost weight I have found, to maintain acceptable levels of glucose, I am now injecting 5-20 twice per day.” (Anna). Others claimed that their energy and performance at work was strengthened. “I am able to plan my healthy meals and be confident that what I eat contributes to my overall health. I have observed that my energy levels have increased so I am able to perform better at work and in my daily life” (Ryder).

A number of research participants commented on a shift in their mental well-being as a result of their successes in using the iPad for self-management. “I think I am feeling even more cheerful than usual” (Madelyn). “If nothing else, the weight loss has greatly improved my outlook on life and given me the will to reach my target of 75-80 Kg or better” (Anna). A sense of obligation and gratitude came with being given a tablet device and being part of the program. Speaking of her weight loss and her determination to continue, one participant says: “with being given the opportunity to be part of this program I need to give back. The iPad has given me access to the help I need” (Jasmine).

Research participants who were using the tablet to manage their diabetes were proud of themselves and their new skills. Supported by training, this participant reports “The training sessions have helped me feel proud that I feel I can do this.” (Emily). One participant is particularly proud of her use of the iPad and management of her diabetes. She takes her iPad to a family occasion and reports: “I had a discussion with my Aunty about my diabetes and showed her the apps I have been trying to use…..I love the fact that I can take the iPad anywhere with me and can show family and friends what I use it for” (Kaylee). Satisfaction results from being more in control and making progress: “I normally feel a great satisfaction if the day is going well or if I come in under my daily calorie allowance. If things have not been so good it reminds me of where I need to modify my diet. I usually feel a sense of achievement when using it” (Claire). One participant expresses a greater sense of connection to other people with diabetes and better mental health resultant of his digital engagement: “Even when I am by myself, having the iPad always makes me feel connected to people who are in similar situation and facing the same health challenges. Hence, it indirectly also positively affects my mental health since I'm not isolated because of the easy access to relevant information and available forum for sharing” (Ryder). Another participant’s life has a greater sense of order and happiness: “I am so happy that I have this iPad and the apps. This has put some order in my life. Over all, the iPad has changed my life, it is my best friend” (Leah).

5. Discussion

In this study, iPads were issued to people who were willing to participate in a ten-month program of digital engagement and self-management. Thus, participants have demonstrated an interest in altering their management of their diabetes by incorporating the use of a mobile tablet and have exhibited a degree of intrinsic motivation that contrasts with those that chose not to participate. Even so, one participant reported that his motivation has ebbed over the first five months of the intervention saying: “I started off really well but have dropped off lately. I found the iPad has definitely helped but since it is still user driven if your motivation drops so does the iPad usage” (Preston).

This paper confidently reports an improvement in the individual management of diabetes at the five-month mark in the study. Participants clearly indicate that the mobile device and its apps were enabling tools in the self-management of type 2 diabetes, and, as a result, report achievements in better health and well-being. One participant predicts that digital engagement with the tablet device is a strategy that will endure in his self-management of diabetes. “I am well on the way to turn my temporary arrangement into a lifestyle” (Ryan). Another participant labels the tablet device as essential in effective self-management of his diabetes: “my iPad has become a vital tool in assisting me to better manage and mitigate the impacts of my diabetic condition” (Todd). He goes
on to promote the device as a valuable management tool for all people with diabetes and other chronic diseases. “The promotion of the iPad's potential is, I believe, the key to greater self-management of chronic diseases such as diabetes” (Todd).

The mobile tablet is an optimal computing device for diabetes self-management in its screen size and quality, portability, seamless access, and ease of use. Most participants emphasised the value of its integration in the daily rhythm of life in various locations within the home. Yet one participant signaled that universal claims of device usefulness cannot be made: “I had difficulty carrying it around, I have Parkinson’s Disease and the weight of the iPad upset my balance” (Mitchell). Multi-morbidity and the weight of the tablet led to disengagement.

Digital intervention has been influential in establishing improved self-management, successful outcomes and immediate feedback from behavior. Participants report a preference for the recording of BGLs and other biometric data, the use of apps for managing diet and the use of the iPad to achieve a greater depth of knowledge about diabetes. A large proportion of participants map information from one invitation to another. In particular, measures of BGL are mapped to dietary patterns and, conversely, a food or amount of a food is linked to trends in BGL. With clarity and immediacy, informal digital mappings are demonstrated on the tablet device. A visual display of cause and effect is revealed, demonstrating to participants the outcome of their behavior. External forces are not at play.

Whilst fully participating in the intervention, some participants demonstrated a critical awareness in their use of apps. Whilst in prominent use, one participant critiqued the Glucose Wiz app saying it “should be modified to make it a lot more user friendly as it is far too cumbersome and time consuming to enter information” (Porter). Others expressed the desire for a more Australian customization of the apps to include more local food products and a metric system of measurement.

Digital engagement, which provides immediate feedback to individuals about their behaviors, is educating a person with type 2 diabetes and encouraging self-care, both of which are known to shift HCL toward greater internality [15] [17]. Whilst HLC is not quantitatively measured in this study, a shift toward an internal HLC is noted in the analysis of qualitative data as some individuals report a new sense of empowerment and responsibility for their health. The following participant reports a significant shift in responsibility for his health, from his Doctor to himself, saying: “Before I started using the iPad, I had no idea what my BGLs were, except the Doctor said they were high and any figures he gave me just went over my head. Since the iPad, I got my own BGL kit and now I am responsible for the management myself” (Ryan). New senses of responsibility and control have emerged.

Entrenched externality in HLC was also demonstrated; the iPad was give position of power by several research participants who likened the device to a powerful other. “It forces me to keep accurate records, which I sometimes used to forget to record” (Tristan). With successful outcomes, another participant empowers the device: “The iPad is like someone looking over your shoulder and checking your progress. Someone to answer to… I have been eating healthier and using the apps my weight has reduced over 10kg” (Ryan).

6. Conclusion

The complexities of living with type 2 diabetes and the possibilities of digital engagement with a mobile tablet device to strengthen self-management practices are explored in this paper. Given choice and freedom in using the tablet device, the research participants elected to focus on dietary management, recording and monitoring of biometrics and seeking information about their disease. The findings of this study suggest increased self-management and a valuable digital feedback loop that it likely to increase an individual’s sense of responsibility for their own health-care. Early findings suggest that this specific mobile health intervention is instrumental in shifting the HLC toward the internal dimension. Further quantitative data is needed to progress this emergent conclusion.

The mobile tablet device was found to interface well to the daily routine of diabetes self-management. Its portability, particularly around the home, seamless access and the quality and readability of the screen are all positively regarded by the participants and are contributing aspects of success in diabetes self-management.

7. References


